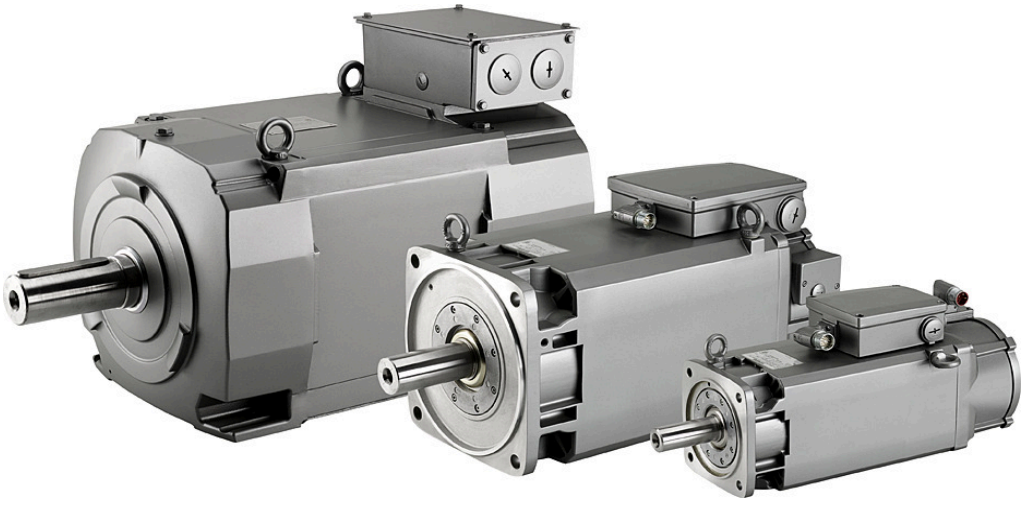


Edition 09/2026

CONFIGURATION MANUAL

SIMOTICS M

1PH8 main motors

www.siemens.com/drives

SIEMENS

SIEMENS

SIMOTICS M

Drive technology
1PH8 SIMOTICS M main motors

Configuration Manual

Introduction 1

Fundamental safety instructions 2

Motor description 3

Mechanical properties 4

Motor components and options 5

Configuration 6

Technical data and characteristics 7

Preparing for use 8

Electrical connection 9

Dimension drawings 10

Appendix A

09/2026
A5E51895839B AC

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ **DANGER**
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ **WARNING**
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ **CAUTION**
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified persons are those who, because of their training and experience, are familiar with the installation, assembly, commissioning, operation, decommissioning and disassembly of the product and can recognize risks and avoid possible hazards.

Proper use of Siemens products

Note the following:

⚠ **WARNING**
Siemens products may only be used for the application described in the catalog and the associated usage information. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens Aktiengesellschaft. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Published by
Siemens Aktiengesellschaft
Digital Industries
P.O. Box 32 20
91058 Erlangen, GERMANY

For the U.S. published by
Siemens Industry Inc.
100 Technology Drive
Alpharetta, GA 30005
UNITED STATES

A5E51895839B AC
08/2026 Subject to change

© Siemens 2010 - 2026
All rights reserved

Table of contents

1 Introduction 7

1.1 About SIMOTICS 7

1.2 About this usage information 7
1.2.1 Target group 8
1.2.2 Standard scope 8
1.2.3 Use of third-party products in this documentation 9
1.2.4 Websites of third-party companies 9

1.3 SIMOTICS documentation 9

1.4 Service and support 12
1.4.1 ID link and Siemens Online Support 12
1.4.2 Spare parts services 13
1.4.3 Extended Warranty – Service Protect 13

1.5 Use for the intended purpose 13
1.5.1 Reasonably foreseeable misuse_1FN3_1FW6 15

2 Fundamental safety instructions 17

2.1 General safety instructions 17

2.2 Product damage due to electric fields or electrostatic discharge 24

2.3 Cybersecurity information 24

2.4 Residual risks of power drive systems 26

3 Motor description 29

3.1 Highlights and benefits 29

3.2 Technical characteristics and environmental conditions 30
3.2.1 Directives 30
3.2.2 Technical features 34
3.2.3 Classifying environmental conditions according to climate classes 37

3.3 Derating factors 38
3.3.1 Reduction of the max. DC-link voltage 39

3.4 Selection and ordering data 39
3.4.1 Article No. suffixes for shaft height 80 to 160 41
3.4.2 Article No. suffixes for SH 80 Premium Performance 44
3.4.3 Article No. supplements for SH 132 and 160, synchronous-reluctance 46
3.4.4 Article No. suffixes for SH 180 to 280 48
3.4.5 Article No. suffixes for SH 280 51
3.4.6 Article No. supplement for shaft height 80 to 160 + holding brake DE 54
3.4.7 Article No. supplement for SH 132 and 160, synchronous-reluctance + holding brake 57
3.4.8 Article No. supplements for SH 180 to 225 + holding brake 59
3.4.9 Options 60

3.5 Rating plate data 67

4 Mechanical properties 71

4.1 Cooling 71
4.1.1 General 71
4.1.2 Forced ventilation 71
4.1.3 Water cooling 75

4.2 Degree of protection 87

4.3 Construction types 89

4.4 Types of bearing 90
4.4.1 Drive output types and bearing versions 90
4.4.2 Bearing lifetime 95
4.4.3 NDE bearing with insulated shaft (option L27) 98

4.5 Shaft end 100

4.6 Mounting of rotating unions on 1PH8 hollow-shaft motors 100
4.6.1 Rotor-supported rotating union 103
4.6.2 Bearingless, frame-supported rotating union 107
4.6.3 Mounting information and instructions 111
4.6.4 Suggestion for an adapter for bearingless, frame-supported rotating unions 114

4.7 Radial and axial forces 115
4.7.1 Radial force 115
4.7.2 Axial force 117
4.7.3 Permissible radial and axial forces for 1PH808 Premium Performance 119
4.7.4 Radial and axial force diagrams 119

4.8 Radial eccentricity, concentricity and axial eccentricity 142

4.9 Balancing 144
4.9.1 Requirements 144
4.9.2 Balancing 1PH8 motors with "Premium Performance" bearing version 145

4.10 Vibration response 150
4.10.1 Mounting and mounting instructions 150
4.10.2 Natural frequency when mounted 152
4.10.3 Misalignment 153
4.10.4 Flywheels 155
4.10.5 Vibration stressing 155

4.11 Vibration severity grade 158

4.12 Noise emission 159

5 Motor components and options 161

5.1 Motor components 161
5.1.1 Thermal motor protection 161
5.1.2 Encoder 162
5.1.2.1 Encoder overview 162
5.1.2.2 Encoder connection for motors with a DRIVE-CLiQ interface 163
5.1.2.3 Encoder connection for motors without DRIVE-CLiQ (12/17-pole) 164
5.1.2.4 Encoder assignment as a function of maximum permissible speeds 164
5.1.2.5 Incremental encoder HTL 1024 S/R or HTL 2048 S/R 167
5.1.2.6 Incremental encoders IC 2048 S/R, IN 512 S/R and IN 256 S/R 169
5.1.2.7 Absolute encoder AM 2048 S/R 172

5.2 Options ... 173
5.2.1 Overview of options ... 173
5.2.2 Sealing air connection (option Q12) ... 173
5.2.3 Protection against explosion (options M03 and M39) ... 175
5.2.4 Increased resistance to vibration (option L03) ... 182
5.2.5 Holding brake (option) ... 184
5.2.5.1 Properties ... 184
5.2.5.2 Mounted holding brake for SH 80 to SH 160 ... 189
5.2.5.3 Mounted holding brake for SH 180 and SH 225 ... 199
5.2.6 Anti-condensation heating (option K45) ... 201
5.2.7 Condensation drain hole (option L12) ... 201
5.2.8 Higher number of grounding terminals in the terminal box (Q00) ... 203
5.2.9 Chain of PTC thermistors for alarm and trip (option A12) ... 203

6 Configuration ... 205

6.1 Configuring software ... 205
6.1.1 TST engineering tool (TIA-Selection-Tool) ... 205

6.2 Procedure when engineering ... 206
6.2.1 SINAMICS configuring procedure ... 206
6.2.2 Specifying the duty cycle ... 208
6.2.3 Selecting induction motors ... 211
6.2.4 Selecting synchronous motors ... 212
6.2.5 Selecting synchronous-reluctance motors ... 213

6.3 Different rated points for induction motors ... 214

6.4 Configuration for SINAMICS G ... 217

6.5 Configuration for 1PH808 Premium Performance ... 218

7 Technical data and characteristics ... 221

8 Preparing for use ... 223

9 Electrical connection ... 225

9.1 Permissible line system configurations ... 225

9.2 Circuit diagram of the motor ... 225

9.3 System integration ... 226
9.3.1 SINAMICS drive I/O ... 226
9.3.2 Connecting-up information ... 227
9.3.3 Routing cables in a damp environment ... 229
9.3.4 Power connection ... 230
9.3.5 External fan ... 245
9.3.6 Signal connection ... 255

10 Dimension drawings ... 259

10.1 SIEMENS Product Configurator ... 259

A Appendix ... 261

A.1 Operating Instructions for the holding brake ... 261
A.1.1 Holding brake operating instructions Stromag 2HPB DE ... 261
A.1.2 Holding brake operating instructions Stromag 2HPB EN ... 311
A.1.3 Holding brake operating instructions Stromag 4HPB DE ... 361

A.1.4 Holding brake operating instructions Stromag 4HPB EN 418
A.2 Description of terms 504
A.3 Environmental compatibility 506

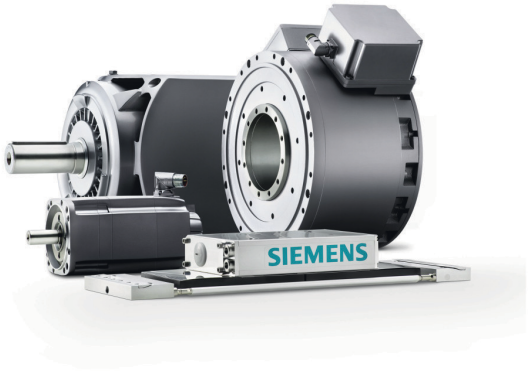
Introduction

1

1.1 About SIMOTICS

SIMOTICS electric motors are based on synchronous or asynchronous technology. The following variants are available:

- SIMOTICS S servomotors
- SIMOTICS M main motors
- SIMOTICS L linear motors
- SIMOTICS T torque motors
- SIMOTICS E extra low-voltage motors



The range also includes built-in motors and motor spindles. Every motor for motion control is harmonized to operate with a SINAMICS frequency converter.

1.2 About this usage information

This Equipment Manual provides information about the motor and its components. You will learn how to correctly and safely handle the motor from delivery to disposal:

- Transport and storage
- Setup and mounting
- Connecting
- Commissioning
- Testing
- Operating
- Searching for and eliminating faults

- Disassembly
- Disposal

To illustrate possible application areas for our products, typical use cases are listed in this product documentation and in the online help. These are purely exemplary and do not constitute a statement on the suitability of the respective product for applications in specific individual cases. Unless explicitly contractually agreed, Siemens assumes no liability for such suitability. Suitability for a particular application in specific individual cases must be assessed by the user, taking into account all technical, legal, and other requirements on a case-by-case basis. Always observe the descriptions of the technical properties and the applicable constraints of the respective product provided in the product documentation.

1.2.1 Target group

This Equipment Manual is intended for:

- Planning engineers
- Design engineers
- Mechanical design engineers
- Installation personnel
- Commissioning engineers
- Machine operators
- Service and maintenance personnel
- Warehouse personnel
- Personnel that decommission the motor
- Personnel that dispose of the motor

1.2.2 Standard scope

The functions of the system as delivered can only be found in the order documents.

Further functions may be executable in the system, which are not explained in this documentation. However, there is no entitlement to these functions in the case of a new delivery or service.

This documentation does not contain all detailed information on all types of the product. Furthermore, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications they make to the product themselves.

1.2.3 Use of third-party products in this documentation

Siemens does not accept any warranty for the use of third-party products. Suppliers recommended by Siemens are listed on the following Internet page (https://www.siemens.com/global/en/company/partners/product-partners-industry.html).

1.2.4 Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.3 SIMOTICS documentation

Comprehensive documentation on SIMOTICS and the SINAMICS converter family is provided on the Internet.

You can display documents or download them in PDF and HTML5 format.

The documentation is divided into the following categories:

Table 1-1 SIMOTICS documentation

Information	**Documentation class**[1)]	**Content**	**Target group**
General information	Equipment Manual	Includes all the contents of the configuration guide and operating instructions. Detailed collection of all information required for the safe operation of products, plant/system parts and complete plants (IEC 82079). Rules, guidelines, and tools for configuring products, systems, and plants. Also contains information on the operating and ambient conditions for hardware and software, use of functions, as well as on circuit diagrams and terminal diagrams and the installation of software insofar as this is necessary for commissioning.	Planners Project engineers Installation personnel Commissioning engineers Service and maintenance personnel
	Configuration guide	Rules, guidelines, and tools for configuring products, systems, and plants. Also contains information on the operating and ambient conditions for hardware and software, use of functions, as well as on circuit diagrams and terminal diagrams and the installation of software insofar as this is necessary for commissioning.	Planners, project engineers
Device information	Installation instructions	All relevant information on setting up, installing and cabling, as well as the required dimensional drawings and circuit diagrams	Installation personnel Commissioning engineers Service and maintenance personnel

Information	Documentation class[1)]	Content	Target group
Basic information	Operating instructions	Detailed collection of all information required for the safe operation of products, plant/system parts, and complete plants (IEC 82079).	Machine operators, plant operators
	Compact instructions	Essential contents of the operating instructions in a reduced and condensed form	Machine operators Plant operators
	Product information	Information that only becomes known shortly before or even after start of delivery and is therefore not included in the associated user documentation	Planners Project engineers Technologists Installation personnel Constructors Commissioning engineers Machine operators Programmers Service and maintenance personnel
	Readme	New supplementary information that is not yet included in the current version of the user documentation.	Planners Project engineers Technologists Installation personnel Constructors Commissioning engineers Machine operators Programmers Service and maintenance personnel
	Online help	Instructions for configuring, programming, and commissioning	Project engineers Programmers Commissioning engineers
Specific information	Commissioning instructions	Detailed description for commissioning a plant, system or product	Commissioning engineers
	Service manual	Comprehensive compilation of all information required for service and maintenance	Service and maintenance personnel

[1)] Not all documentation classes are available for every SIMOTICS product.

1.4 Service and support

1.4.1 ID link and Siemens Online Support

You can find additional information about the product:

- via ID link
- using the Siemens Industry Online Support
  - Website: SiePortal (https://support.industry.siemens.com/cs/ww/en/)
  - App Industry Online Support (for Apple iOS and Android)

Product-specific information via ID link

There is a QR code on your product and the product packaging which contains an identification link (ID link).
The ID link serves as a Digital Nameplate (DNP) and is a globally unique identifier in accordance with IEC 61406-1. It links the product to the associated information from the Digital Product Passport (DPP).

Scan the QR code on the product or the packaging label with a smartphone camera, barcode scanner, or suitable app.

The ID link gives you access to relevant product information such as:

- Product data
- Manuals
- Declarations of Conformity
- Certificates



Figure 1-1 QR code with ID link

The ID link is characterized by a frame with a black corner at the bottom right.

Content of Siemens Online Support

- Product support
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via the contact person database (→ Contact)
- Product information

- FAQs (frequently asked questions)
- Application examples
- Manuals
- Downloads
- Compatibility tool
- Newsletter with product selection
- Catalogs/brochures
- Certificates

1.4.2 Spare parts services

The "Spares on Web (https://www.sow.siemens.com)" online spare parts service offers spare parts for specific products.

1.4.3 Extended Warranty – Service Protect

Service Protect provides an extended warranty period for your registered hardware product, covering repair or replacement. The specific duration(s) of the extended warranty offering and the terms for repair or replacement are determined by the product type. Product registration @ myReg (https://myregistration.siemens.com/) is required.

1.5 Use for the intended purpose

Intended use

⚠ WARNING

Non-proper usage

If you do not use the motors correctly, there is a risk of death, severe injury and/or material damage.

- Only use the motors for their intended purpose.
- Do not use the motors in hazardous areas (where there is a risk of explosion) if the motors are not expressly released and authorized for this purpose. Comply with the separately added supplementary notes.
- Make sure that the conditions at the location of use comply with all the rating plate data.
- Make sure that the conditions at the location of use comply with the conditions specified in this documentation. Take into consideration deviations regarding approvals or country-specific regulations.

The motor is intended for industrial or commercial plants.

The motor is designed for operation in sheltered areas under normal climatic conditions, such as those found on shop floors.

More detailed information is provided in Chapter Classifying environmental conditions according to climate classes (Page 37).

Operating the motor in a hazardous zone is prohibited unless the motor is approved for this purpose.

The motor is only approved for converter operation.

Any other application of the motor is considered to be not as intended.

Correct and intended use includes compliance with all of the specifications in the product documentation.

Observe the data on the rating plate.

Contact your sales partner if you have questions regarding proper and intended use, or if you wish to use special versions and design variants.

S9 operation

This motor is designed for operation on the converter with non-periodic load and speed variations.

Typical applications include machine tools or production machines with non-periodic speed and duty cycles. This complies with IEC 60034-1 operating mode S9.

⚠ WARNING

Danger to life and material damage when not used as intended

There is a risk of death, serious injury and/or material damage when direct drives or their components are used for a purpose for which they were not intended.

- Only use the motors for industrial or commercial plants and systems.
- Do not install the motors in hazardous zones if the motors have not been expressly and explicitly designed and authorized for this purpose. Carefully observe any special additional notes provided.
- Only use direct drives and their components for applications that Siemens has explicitly specified.
- Protect the motors against dirt and contact with corrosive substances.
- Ensure that the installation conditions comply with the rating plate specifications and the condition specifications contained in this documentation. Where relevant, take into account deviations regarding approvals or country-specific regulations.
- If you have any questions regarding intended use, please contact your local sales partner.
- If you wish to use special versions and design versions whose technical details vary from the motors described in this document, then you must contact your local sales partner.

⚠ WARNING

Danger to life for wearers of active implants due to magnetic and electrical fields

Persons with active implants, for example cardiac pacemakers, standing close to the motors can be negatively affected, which could cause serious damage to their health or even death.

- If you are affected, stay at a minimum distance of 500 mm from the motors (tripping threshold for static magnetic fields of 0.5 mT according to the Directive 2013/35/EU).

1.5.1 Reasonably foreseeable misuse_1FN3_1FW6

Predictable incorrect use

Avoid the following incorrect uses:

- Disregarding safety information and instructions in this manual
- Directly connecting the motor power connection to the line supply
- Directly connecting temperature sensors to the converter
- Untrained or non-authorized personnel working at the motor
- Working on a motor that is not adequately secured
- Handling the motor carelessly or in a deliberately negligent way
- Underestimating the magnetic force of attraction of permanent magnets
- Disregarding safety clearances for persons with pacemakers, implanted defibrillators and/or metal implants
- Underestimating voltages at cable connections caused by induction
- Incorrect commutation setting when installing and replacing the encoder
- Contact with hot surfaces
- Handling the motor without personal protection equipment
- Disregarding any damage
- Using the motor
  - For non-industrial or commercial applications
  - In impermissible environmental conditions
  - In hazardous zones
  - In a dirty state
  - When in contact with aggressive substances
  - With inadequate cooling
- Disregarding data on the rating plate
- Incorrect packaging, storage and/or incorrect transport

- Opening the motor
- Incorrect disposal of the motor

Fundamental safety instructions

2

2.1 General safety instructions



⚠ WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.



⚠ WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.



⚠ WARNING

Electric shock from a damaged product

Improper handling can damage the product. If a product is damaged, hazardous voltages may be present on the housing or exposed components, which can result in serious injury or death if touched.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Never use a damaged product.



⚠ WARNING

Electric shock due to unconnected cable shield

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.



⚠ WARNING

Electric shock in the absence of grounding

For products with protection class I, a faulty protective conductor connection means that the product is not grounded in conformance with the applicable regulations. In the absence of grounding, high voltages may be present in open, exposed parts, which can result in serious injury or death if touched.

- Ground the product in conformance with the applicable regulations.



⚠ WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

NOTICE

Property damage due to loose power connections

An insufficient tightening torque or vibrations can result in loose power connections. This can result in damage due to fire, product defects, or malfunctions.

- Tighten all power connections to the prescribed torque.
- Regularly check all power connections, particularly after equipment has been transported.

NOTICE

Product damage caused by an unsuitable screw-tightening tool

Unsuitable screw-tightening tools or tightening methods can damage the product screws.

- Use a screw-tightening tool that fits the screw head exactly.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.
- Regularly calibrate the screw-tightening tool used.

⚠ WARNING

Unexpected machine motion caused by radio devices or cell phones

Radio devices, cell phones, or mobile WLAN devices in the immediate vicinity of the product can cause the product to malfunction or damage the product. The malfunction may impair the functional safety of machines and can therefore endanger persons or result in material damage.

- Avoid operating radio devices, cell phones, and mobile WLAN devices in the direct vicinity of converters and operating units.
- Scan the machine readable code, e.g. a QR code at least 0.4 m away from the converter, or switch off the converter power supply before scanning.
- Only operate built-in devices with the control cabinet doors closed.
- When the control cabinet doors are open, only qualified personnel may perform service and maintenance work.

⚠ WARNING

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

⚠ WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important Safety instructions for Safety Integrated

If you want to use Safety Integrated functions, you must observe the Safety instructions in the Safety Integrated documentation.

⚠ WARNING

Active implant malfunctions due to electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment, such as transformers, converters, or motors. People with pacemakers or implants are at particular risk in the immediate vicinity of this equipment.

- If this applies to you, maintain the minimum distances to the respective motors as specified in the Information for use.



⚠ WARNING

Active implant malfunctions due to permanent-magnet fields

Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.

- If this affects you, maintain the minimum distances specified in the Information for use.
- When transporting or storing permanent-magnet motors, always use the original packing materials.
- Clearly mark the storage locations with the appropriate warning labels.
- IATA regulations must be observed when transported by air.



⚠ WARNING

Improper lifting and transportation operations

Improper lifting and transportation of the motor may cause death, severe bodily injury, or damage to property.

- When disassembling the motor, watch out for imminent movements when the motor is released.
- Use all lifting equipment, industrial trucks, and load handling devices in accordance with the regulations.
- Only use lifting equipment and load handling devices with maximum capacities which match the weight of the motor.
- Do not attach any additional loads to the lifting equipment.
- To hoist the motor, use suitable cable-guidance or spreading equipment, particularly if the motor is equipped with built-on assemblies.
- Do not attach lifting equipment to the power connector or signal connector of the motor.
- Do not stand in the slewing range of hoisting gear or under suspended loads.
- When placing down the motor, ensure that it cannot roll away.
- If anything is unclear, please contact the machine manufacturer, stating the machine type and serial number.

NOTICE

Shaft sealing rings damaged by solvent

Solvents can damage the shaft sealing rings of the motor.

- When removing preservation agents or when carrying out cleaning work, avoid that any solvent comes into contact with the shaft sealing rings.

⚠ WARNING

Injury caused by moving or ejected parts

Contact with moving motor parts or drive output elements and the ejection of loose motor parts (e.g. feather keys) out of the motor enclosure can result in severe injury or death.

- Remove any loose parts or secure them so that they cannot be flung out.
- Do not touch any moving parts.
- Safeguard all moving parts using the appropriate safety guards.

⚠ WARNING

Danger to life caused by machine movement and loose objects

Machine movement and loose objects that can fall out or be ejected can cause death or severe bodily injury.

- Be sure to complete all assembly and adjustment work on the machine.
- Ensure that there are no people in the danger zone of the machine before it is switched on.
- Before switching on, check that there are no loose objects in or on the motor that can fall or be flung off.
- Before switching on, check that all safety guard covers for touch protection are installed and all safety equipment functions correctly.

⚠ WARNING

Uncovered rotating or live parts

Covers over rotating or live parts and covers that ensure the motor degree of protection or are required for air guidance, and thus for cooling, must be closed during operation.

Death, serious bodily injury, or material damage may result if the required covers are removed.

- Do not remove covers while the motor is running.

⚠ WARNING

Danger to life due to a changed operating behavior of the machine

Changes in the operating behavior of the machine compared with normal operation indicate that the function of the machine is impaired. Changes in the operating behavior of the machine can be seen, for example, in one or more of the following effects:

- An increased power consumption
- Higher temperatures
- Vibration
- Unusual noises
- Unusual smells
- The monitoring devices respond

Impaired machine functioning can cause faults that may result directly or indirectly in death, serious bodily injury, or property damage.

- Immediately inform the maintenance personnel.
- If in doubt, shut down the motor immediately, taking into account the plant-specific safety regulations.

NOTICE

Motor damage in the event of uneven running or abnormal noises

Improper handling during transportation, storage, or assembly can damage the motor. A damaged motor may run unevenly or make abnormal noises during operation. If you operate a damaged motor, this may result in damage to the winding or bearings, or even total destruction of the system.

- Switch the motor off in case of uneven running or abnormal noises.
- Identify the cause.

NOTICE

Motor damage when the maximum speed is exceeded

The maximum speed n_{max} is the highest permissible motor operating speed. The maximum speed is specified on the rating plate (nameplate).

Impermissible speeds can cause damage to the motor.

- Enable speed setpoint monitoring in the control unit or drive so as not to exceed the maximum speed n_{max}.

⚠ WARNING

Fire due to incorrect operation of the motor

When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors.

- Operate the motor according to the relevant specifications.
- Only operate the motors in conjunction with effective temperature monitoring.
- Immediately switch off the motor if excessively high temperatures occur.

NOTICE

Wear of the holding brake due to impermissible voltage supply

Operating the holding brake outside the permissible voltage range at the motor connection will damage the brake.

- Only operate the holding brake within its permissible voltage range.



⚠ CAUTION

Burns and thermal damage caused by hot surfaces

Temperatures above 100 °C may occur on the surfaces of motors, converters, and other drive components.

Touching hot surfaces may result in burns. Hot surfaces may damage or destroy temperature sensitive parts.

- Ensure that temperature-sensitive parts do not come into contact with hot surfaces.
- Mount drive components so that they are not accessible during operation.

Measures when maintenance is required:

- Allow drive components to cool off before starting any work.
- Use appropriate personnel protection equipment, e.g. gloves.

2.2 Product damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESDs) are electronic devices, modules, or individual components with freely accessible contacts, e.g. products with signal and communication interfaces or modules without an enclosed housing, which can be damaged by electrostatic fields or electrostatic discharges.



NOTICE

Product damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can damage individual electronic components, integrated circuits, and modules. A pre-damaged or damaged product causes malfunctions, which in turn increase the probability of failure and a shortened service life.

- Only pack, store, transport, and ship individual electronic components, modules, or products in their original packaging or in other suitable materials, e.g. conductive ESD foam or aluminum foil.
- When you open the product, e.g. to replace a component or a module, or if you touch electrical contacts, then ground yourself using one of the following measures:
  - Wear an ESD armband
  - Wear ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic modules or individual components on a conductive surface, e.g. on an ESD surface, on ESD foam, on an ESD packaging bag, or an ESD transport container.

2.3 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://www.siemens.com/cert.

Further information is provided on the Internet:

Configuration Manual Industrial Cybersecurity (https://support.industry.siemens.com/cs/ww/en/view/109975311)

⚠ WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

2.4 Residual risks of power drive systems

When assessing the machine or system-related risk in accordance with the respective local regulations (e.g. EC Machinery Directive), the machine manufacturer or system integrator must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware faults and/or software errors in the sensors, control system, actuators, and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures inside and outside the components, including open flames, as well as emissions of light, noise, particles, gases, etc. due to fault conditions, e.g.:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
   - Short circuits or ground faults in the intermediate DC circuit of the converter
3. Hazardous shock voltages caused by, for example:
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly

6. Influence of network-connected and wireless communications systems, e.g. ripple-control transmitters or data communication via the network or mobile radio, WLAN or Bluetooth.
7. Motors for use in potentially explosive areas:
   When moving components such as bearings become worn, this can cause enclosure components to exhibit unexpectedly high temperatures during operation, creating a hazard in areas with a potentially explosive atmosphere.

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

Motor description

3

3.1 Highlights and benefits

Overview

The SIMOTICS M-1PH8 motor series, referred to as 1PH8 in the following, is a motor generation developed for universal implementation in plants and machines with motion control applications. The motors are based on a flexible, modular principle and are available as induction, synchronous-reluctance and compact synchronous variants, with either forced ventilation or water cooling.

In comparison to the freely selectable performance of vector and servo control with the SINAMICS S120 drive system, it is possible to select between induction, synchronous-reluctance or synchronous variants in the case of the new SIMOTICS M-1PH8 motor series.

Thanks to this flexible interplay between converter and motor, it is now even easier to implement applications which involve

- extreme duty cycles,
- short rise times,
- high precision with respect to speed, torque and positioning.

The motors have been designed specifically for use in conjunction with the SINAMICS S120 drive system. Depending on the control requirements, appropriate encoder systems are available for the motors for sensing the motor speed and indirect position.

Encoder systems for C-axis operation are also available for machine tools.

1PH8 motors are available in two different cooling types:

- Forced ventilation
- Water cooling

SH 80 to SH 160
Forced ventilation



SH 80 to SH 160
Water cooling



SH 180 to SH 280
Water cooling



SH 180 to SH 225
Forced ventilation



SH 280
Forced ventilation



Highlights and benefits

- Wide power spectrum with low envelope dimensions
- Wide speed control ranges
- High degree of flexibility due to the choice of
  - Induction, synchronous-reluctance or synchronous version
  - Forced ventilation or water cooling
  - Solid or hollow shaft
  - Various bearing concepts
  - Different encoder types for speed control and precision positioning
- Outstanding performance characteristics
  - Maximum speeds up to 24,000 r/min
  - Minimal torque oscillations up to 10 µm
  - Excellent vibration magnitudes
  - High dynamic response (short ramp-up times)
- Low noise emission
- Simple and flexible connection system
- Commissioning with electronic type plate and DRIVE-CLiQ interface

3.2 Technical characteristics and environmental conditions

3.2.1 Directives

Below is an overview of directives for the SIMOTICS motor series.

Conformité Européenne (CE)



The SIMOTICS motor series is CE certified.

European Low-Voltage Directive

SIMOTICS motors comply with Low-Voltage Directive 2014/35/EU.

European RoHS Directive

The SIMOTICS motor series complies with the Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

European Directive on Waste Electrical and Electronic Equipment (WEEE)

SIMOTICS motors comply with the 2012/19/EU directive on taking back and recycling waste electrical and electronic equipment.

Note

The SIMOTICS motor series does not fall within the scope of the following directives:

European Machinery Directive

SIMOTICS motors do not fall within the scope covered by the Machinery Directive.

However, the use of the products in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

European EMC Directive

SIMOTICS motors do not fall within the scope covered by the EMC Directive. The products are not considered as devices in the sense of the directive. Installed and operated with a converter, the motor - together with the Power Drive System - must comply with the requirements laid down in the applicable EMC Directive.

European Directive 2005/32/EC defining requirements for environmentally friendly design of electric motors

The SIMOTICS motor series is not subject to (EC) Regulation No. 640/2009 for implementation of this directive.

European Directive 2009/125/EC defining ecodesign requirements of electric motors and speed controls

The SIMOTICS motor series is not subject to (EU) Regulation 2019/1781 for implementation of this directive.

Eurasian conformity

SIMOTICS motors comply with the requirements of the Russia/Belarus/Kazakhstan (EAC) customs union.

UKCA - United Kingdom Conformity Assessed

SIMOTICS motors fulfill the conformity requirements for England, Wales and Scotland.

China RoHS

SIMOTICS motors comply with the China RoHS requirements.



The number indicated in the logo, e.g. 50, indicates the Environmentally Friendly Use Period (EFUP) in years.

When used as intended, the product does not release any hazardous substances during its environmentally friendly service life.

The EFUP does not constitute a guarantee or warranty period, however.



The green label means that the product does not contain any hazardous substances above the set Chinese limits.

Note

China Compulsory Certification

SIMOTICS motors do not fall within the scope covered by the China Compulsory Certification (CCC).

Underwriters Laboratories



SIMOTICS motors generally comply with UL and cUL requirements as components of motor applications, and are appropriately listed.

Specifically developed motors and functions are the exceptions in this case. Here, it is crucial that you carefully observe the content of the quotation and that there is a UL or cUL mark on the rating plate!

See also

CCC negative certification (https://support.industry.siemens.com/cs/ww/en/view/93013317)

Certificates for SIMOTICS motors (https://support.industry.siemens.com/cs/ww/de/ps/13347/cert)

China Energy Label

Table 3-1 The motors meet the requirements for the "China Energy Label".

China National standard	Minimum allowable values of energy efficiency and energy efficiency grades for permanent-magnet synchronous motors (GB 30253).
Date of entry into force	January 1, 2026
Affected motors	Permanent-magnet synchronous motors with a rated power of 0.55 kW to 1 250 kW and a rated speed of 45 r/min to 6 000 r/min, and which are operated by a variable frequency converter at a power supply of up to 1 140 V.
Motor requirements	From the implementation date of the standard, all affected motors must be provided with the "China Energy Label".

3.2.2 Technical features

The technical features specified in the tables below refer to basic 1PH8 motors and are applicable for induction, synchronous-reluctance and synchronous variants.

Depending on the electrical and mechanical configuration, it is possible to add options to the basic model in order to adapt it to a specific drive application (refer to Options, Selection and Ordering data).

Table 3-2 Forced ventilation

Insulation of the stator winding in accordance with EN 60034–1 (IEC 60034–1)	For an ambient air temperature up to 40 °C Shaft heights 80 ... 280 temperature class 180 (H)	
Cooling in accordance with EN 60034-6 (IEC 60034-6)	Forced ventilation Shaft heights 80 ... 225: Fan mounted axially at NDE SH 280: Fan mounted radially at NDE	
Temperature monitoring	Temperature sensor in the stator winding Shaft heights 180 ... 280: Additional temperature sensor as a standby	
Fan supply voltage (See Chapter "Technical data")	Shaft height 80: Shaft heights 100 ... 160: Shaft heights 180 ... 225: Shaft height 280:	1 AC 230 V 50/60 Hz, 1 AC 265 V 60 Hz 3 AC 400 V, 50/60 Hz, 3 AC 480 V 60 Hz 1 AC 200 V ... 277 V, 50/60 Hz (EC fan) 3 AC 380 V ... 480 V, 50/60 Hz (EC fan)
Type in accordance with EN 60034-7 (IEC 60034-7)	Shaft height 80: Shaft heights 100 ... 280:	IM B3, IM B5 IM B3, IM B5, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	Shaft heights 80 ... 280: Shaft heights 180 ... 280:	IP55 IP23
Shaft extension at the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft or feather key For feather key, full-key or half-key balancing	
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1)]	Shaft heights 80 ... 160: Shaft height 180 ... 280:	Tolerance R (reduced), SPECIAL[2)] Tolerance N (normal)
Vibration magnitudes in accordance with Siemens / EN 60034-14 (IEC 60034-14)	Shaft heights 80 ... 160: Shaft height 180 ... 280:	Level R/A, SPECIAL/B Level A

Sound pressure level in accordance with DIN EN ISO 1680, max. tolerance +3 dB, external fan 50 Hz	Shaft heights 80 ... 132:	70 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 r/min
	Shaft height 160:	73 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 r/min
	Shaft heights 180 and 225:	73 dB at a rated pulse frequency of 2 kHz and a speed range: Forced ventilation (IP55) • Shaft height 180 to 5000 r/min • Shaft height 225 to 3500 r/min Open-circuit ventilation (IP23) • Shaft height 180 to 3000 r/min • Shaft height 225 to 2000 r/min
	Shaft height 280	74 dB at a rated pulse frequency of 2 kHz and a speed range: up to 3300 r/min Forced ventilation (IP55) • Shaft height 280 to 3300 r/min Open-circuit ventilation (IP23) • Shaft height 280 to 2800 r/min
Bearing versions and maximum speeds	See Chapter "Mechanical properties of the motors"	
Encoder systems, built-in without DRIVE-CLiQ interface	• Absolute encoder EnDat 2048 S/R (AM2048 S/R encoder) • Incremental encoder sin/cos 1 Vpp 2048 S/R with C and D tracks (encoder IC2048S/R) • Incremental encoder sin/cos 1 Vpp 512 S/R without C and D tracks (encoder IN512S/R) • Incremental encoder sin/cos 1 Vpp 256 S/R without C and D track (encoder IN256S/R) • Incremental encoder HTL 1024 S/R (encoder HTL1024 S/R) • Incremental encoder HTL 2048 S/R (encoder HTL2048 S/R)	
Encoder systems, built-in with DRIVE-CLiQ interface	• Absolute encoder 22 bit singleturn + 12 bit multiturn (encoder AM22DQ) • Incremental encoder 22 bit with commutation position (encoder IC22DQ) • Incremental encoder 20 bit without commutation position (encoder IN20DQ) • Incremental encoder 19 bit without commutation position (encoder IN19DQ)	
Connection	Connector for signals or DRIVE-CLiQ interface (mating connector is not included in the scope of supply) Shaft heights 80 ...132: Terminal box NDE top/power connector Shaft heights 160 ... 225: Terminal box NDE top Shaft height 280: Terminal box NDE right	
Rating plate (adhesive label)	1x glued on the motor 1x supplied loose in the terminal box	
Paint finish	Standard paint finish anthracite RAL 7016	
Options	See Options and Selection and Ordering data	
Approvals, in accordance with	cURus	

1) Radial eccentricity of the shaft end, coaxiality of the centering wheel and axial eccentricity of the mounting flange with respect to the axis of the shaft end.

2) Applicable for "Performance", "High Performance" and "Premium Performance" versions

S/R = Signals/Revolution
DE = Drive End (motor drive side; A side of the motor)
NDE = Non-Drive End (motor fan side; B side of the motor)

Table 3-3 Water cooling

Insulation of the stator winding according to EN 60034–1 (IEC 60034–1)	For a coolant inlet temperature of up to +30 °C Shaft height 80 ... 280: Temperature class 180 (H)[3)]	
Cooling in accordance with EN 60034-6 (IEC 60034-6)	Water cooling Max. Cooling water pressure at inlet: 6 bar connection thread at NDE (for additional data, see Chapter "Mechanical properties of the motors")	
Temperature monitoring	Temperature sensor in the stator winding Shaft heights 180 ... 280: Additional temperature sensor as a standby	
Type in accordance with EN 60034-7 (IEC 60034-7)	Shaft height 80: Shaft heights 100 ... 280:	IM B3, IM B5 IM B3, IM B5, IM B35
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	Shaft heights 80 ... 160: Shaft heights 180 ... 280:	IP65 IP55
Shaft extension at the drive end (DE) in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft or feather key For feather key, full-key or half-key balancing	
Shaft and flange accuracy in accordance with DIN 42955 (IEC 60072-1)[1)]	Shaft heights 80 ... 160: Shaft heights 180 ... 280:	Tolerance R/A (reduced), SPECIAL[2)] Tolerance N (normal)
Vibration magnitudes in accordance with Siemens / EN 60034-14 (IEC 60034-14)	Shaft heights 80 ... 160: Shaft height 180 ... 280:	Level R/A, SPECIAL[2)] Level A
Sound pressure level in accordance with DIN EN ISO 1680, max. Tolerance +3 dB	Shaft heights 80 ... 132:	68 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 r/min
	Shaft height 160:	69 dB at a rated pulse frequency of 4 kHz and a speed range up to 5000 r/min
	Shaft heights 180 and 225:	70 dB at a rated pulse frequency of 2 or 4 kHz and speed ranges: • Shaft height 180 to 5000 r/min • Shaft height 225 to 4500 r/min
	Shaft height 280:	72 dB at a rated pulse frequency of 2 kHz and a speed range up to 3300 r/min
	For additional data, see Chapter "Mechanical properties of the motors"	
Bearing versions and maximum speeds	See Chapter "Mechanical properties of the motors"	

Encoder systems, built-in without DRIVE-CLiQ interface	• Absolute encoder EnDat 2048 S/R (AM2048 S/R encoder) • Incremental encoder sin/cos 1 Vpp 2048 S/R with C and D tracks (encoder IC2048S/R) • Incremental encoder sin/cos 1 Vpp 512 S/R without C and D tracks (encoder IN512S/R) • Incremental encoder sin/cos 1 Vpp 256 S/R without C and D track (encoder IN256S/R) • Incremental encoder HTL 1024 S/R (encoder HTL1024 S/R) • Incremental encoder HTL 2048 S/R (encoder HTL2048 S/R)
Encoder systems, built-in with DRIVE-CLiQ interface	• Absolute encoder 22 bit singleturn + 12 bit multiturn (encoder AM22DQ) • Incremental encoder 22 bit with commutation position (encoder IC22DQ) • Incremental encoder 20 bit without commutation position (encoder IN20DQ) • Incremental encoder 19 bit without commutation position (encoder IN19DQ)
Connection	Connector for signals or DRIVE-CLiQ interface (mating connector is not included in the scope of supply) Shaft heights 80 ...132: Terminal box NDE top/power connector Shaft heights 160 ... 280: Terminal box NDE top
Rating plate (adhesive label)	1x glued on the motor 1x supplied loose in the terminal box
Paint finish	Standard paint finish anthracite RAL 7016
Options	See Options and Selection and Ordering data
Approvals, in accordance with	cURus

1) Radial eccentricity of the shaft end, coaxiality of the centering wheel and axial eccentricity of the mounting flange with respect to the axis of the shaft end.

2) Applicable for "Performance", "High Performance" and "Premium Performance" versions

3) Based on the design/version, the following motors have temperature class 155 (F):
1PH8107-1□F2
1PH8138-2
1PH8107-1□M2
1PH8164
1PH8166
1PH8168

S/R = signals/revolution

DE = Drive End (motor drive side; A side of the motor)

NDE = Non Drive End (motor fan side; B side of the motor)

3.2.3 Classifying environmental conditions according to climate classes

You can classify the environmental conditions for stationary use at weather-protected locations according to standard DIN IEC 60721-3-3. The environmental parameters and their limit values are defined in various classes in this standard.

You can assign the SIMOTICS M-1PH8 main motors to climate class 3K4 with the exception of the environmental parameter "condensation". Condensation is not permissible.

The higher the last number in the climate class 3K☐, the greater the requirements of the motor.

Table 3-4 **Environmental conditions are based on climate class 3K4**

Environmental parameter		Unit	3K4 class
a)	Low air temperature	°C	+ 5
b)	High air temperature	°C	+ 40
c)	Low relative humidity	%	5
d)	High relative humidity	%	95
e)	Low absolute humidity	g/m³	1
f)	High absolute humidity	g/m³	29
g)	Rate of temperature change[1)]	°C/min	0.5
h)	Low air pressure	kPa	70
i)	High air pressure	kPa	106
j)	Solar radiation[3)]	W/m²	700
k)	Thermal radiation	-	[2)]
l)	Movement of the air	m/s	1.0
m)	Condensation	-	Not permissible
n)	Wind-driven precipitation (rain, snow, hail, etc.)	-	-
o)	Water (other than rain)	-	[2)]
p)	Formation of ice	-	-

1) *Averaged over a period of 5 min*

2) *See types of protection*

3) *In Central Europe, the midday sun stands at 60 ° to 65 ° and, in ideal weather conditions, shines with an irradiance of approx. 700 watts/square meter. In winter, the angles are only 13 ° to 18 ° and, even at noon, the irradiance is only approx. 247 watts/square meter.*

You will find additional data on the ambient conditions, such as ambient temperatures or conditions for transport and storage of the motors, in the relevant chapters of this documentation.

3.3 Derating factors

Derating for ambient/coolant temperature

Operation: T = -15 °C bis +40 °C (without restriction)
Under conditions other than those specified above (ambient temperature > 40 °C or installation altitude > 1000 m above sea level), the permissible torque/power reduction must be considered (see Chapter "Ambient/coolant temperature (Page 71)")

Derating for coolant inlet temperature

The motors are designed for operation up to a cooling water inlet temperature of +30 °C, provided that all of the specified motor data is complied with. If the inlet temperature of the cooling water deviates from this, the continuous torque will change (see Chapter "Cooling water inlet temperature (Page 75)").

Derating factors for power and signal cables

The current-carrying capacity of PVC/PUR-insulated copper cables is specified for cable installation types B1, B2, C and E under continuous operating conditions with reference to an ambient air temperature of 40° C. For other ambient temperatures, the corresponding derating factors must be considered (see Chapter "Derating factors for power and signal cables (Page 230)").

3.3.1 Reduction of the max. DC-link voltage

At installation altitudes of 2000 m above sea level or higher, the voltage stress on the motors must be reduced accordingly based on the table "Factors for reducing the maximum DC-link voltage" (reciprocal values from EN 60664-1 Table A. 2).

Table 3-5 Factors for reducing the maximum DC-link voltage

Installation altitude above sea level up to m	Factor
2000	1
3000	0.877
4000	0.775
5000	0.656
6000	0.588
7000	0.513
8000	0.444

As the DC link voltage is reduced, the converter output voltage also decreases. This reduces the working range in the torque-speed diagram.

You will find the torque-speed diagrams in this Chapter "Technical data."

Operation in a vacuum is not permissible because of the low dielectric strength and poor heat dissipation.

3.4 Selection and ordering data

The Article No. supplements specified in the tables below define the ordering logic for 1PH8 motors and apply to induction and synchronous motors.

The Article No. supplements are also in the catalogs. These supplements correspond to the technical selection and ordering data of these catalogs.

Supplementary to the information in the catalogs, the technical selection and ordering data are integrated in Chapter "Technical data and characteristics" of this Configuration Manual.

Depending on the electrical and mechanical configuration, Z options can be appended to the Article No. suffixes.

3.4.1 Article No. suffixes for shaft height 80 to 160

Descriptions			Data position in Article No.																		
			1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
			1	P	H	8																
Shaft height 80							0	8														
Shaft height 100							1	0														
Shaft height 132							1	3														
Shaft height 160							1	6														
Overall length (cannot be selected, determined by the choice of rated power)																						
Induction version											1											
Synchronous version (only shaft height 132 and 160)											2											
Encoder systems for Motors without a DRIVE-CLiQ interface	Without encoder [1]											A								2		
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R) [2]											E								2		
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) [1] [3]											H								2		
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) [1] [4]											J								2		
	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R) [2]											M								2		
	Incremental encoder sin/cos 1 V_{pp} 512 S/R without C and D tracks (encoder IN512S/R) [1] [5] [10]											T								2		
	Incremental encoder sin/cos 1 V_{pp} 256 S/R without C and D tracks (encoder IN256S/R) [1] [10]											C								2		
Encoder systems for Motors with DRIVE-CLiQ interfaces	Absolute encoder 22-bit- singleturn + 12-bit multiturn (encoder AM22DQ) [2]											F								1		
	Incremental encoder 22-bit with commutation position (encoder IC22DQ) [2]											D								1		
	Incremental encoder 20 bit without commutation position (encoder IN20DQ) [1] [5] [10]											U								1		
	Incremental encoder 19-bit without commutation position (encoder IN19DQ) [1] [10]											S								1		
Winding version	Rated speeds (3 AC 380 V to 480 V)	400 r/min, 500 r/min, 600 r/min, 700 r/min											B									
		1000 r/min, 1150 r/min, 1350 r/min, 1500 r/min											D									
		1500 r/min, 1750 r/min, 2000 r/min, 2200 r/min											F									
		2000 r/min, 2300 r/min, 2650 r/min, 2800 r/min											G									
		2500 r/min, 2800 r/min, 3000 r/min											L									
		3000 r/min, 3300 r/min, 3600 r/min, 3900 r/min											M									
		4500 r/min, 5000 r/min, 5500 r/min, 6000 r/min											N									

Descriptions		Data position in Article No.																			
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
	Star-delta connection [1] (3 AC 380 V to 480 V))				1500/4000 r/min, 2000/5000 r/min, 2500/6000 r/min							**S**									
Cooling	Forced ventilation DE -> NDE				(degree of protection IP 55)								**0**								
	Forced ventilation NDE -> DE				(degree of protection IP 55)								**1**								
	Water cooling				(degree of protection IP 65)								**2**								
Type of construction	IM B3 (IM V5, IM V6, IM B6, IM B7, IM B8)													**0**							
	IM B5 (IM V1, IM V3) [14]													**2**							
	IM B35 (IM V15, IM V35) [6]													**3**							
Shaft extension (DE)	**Balancing**																				
Plain shaft	---															**0**					
Fitted key [11]	Full-key															**1**					
Fitted key [11]	Half-key															**2**					
Plain hollow shaft [1] [10] [18]	---															**3**					
Bearings	**Vibration quality acc. to Siemens/EN 60034-14**				**Shaft and flange accuracy**																
Standard with location bearing [15]	R/A				R												**B**				
Standard with location bearing [15]	S/A				R												**C**				
Standard with location bearing [1] [15]	SR/A				R												**D**				
Standard [15]	R/A				R												**G**				
Standard [15]	S/A				R												**H**				
Increased radial forces [15] [17]	R/A				R												**F**				
Performance [7]	SPECIAL/B				SPECIAL												**L**				
High Performance [13]	SPECIAL/B				SPECIAL												**M**				
Advanced Lifetime [8] [15]	S/A				R												**Q**				
Power connection	**Cable entry**				**Signal connection (looking onto DE)**																
Terminal box (top)	Right				DE													**A**			
Terminal box (top)	Left				DE													**B**			
Terminal box (top)	NDE				Left													**C**			
Terminal box (top) [16]	DE				Left													**D**			
Power connector (top) [9] [12]	Right				DE													**E**			
Power connector (top) [9] [12]	Left				DE													**F**			

Descriptions		Data position in Article No.																			
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
Power connector (top) [9) 12)]	NDE				Left													**G**			
Power connector (top) [9) 12)]	DE				Left													**H**			
Version																					
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																			**2**		
With a DRIVE-CLiQ interface																			**1**		
Special version (order codes are required for options)																					**Z**

1) Only possible if the 8th data position is "1" (induction version)

2) Limited to n_{max} = 12,000 r/min

3) Limited to n_{max} = 9000 r/min

4) Limited to n_{max} = 4600 r/min

5) Limited to n_{max} = 15,000 r/min

6) Only possible for shaft height 100, 132, and 160.

7) Only possible if 8th data position is "1" (induction version)
Shaft height 80: Limited to n_{max} = 15,000 r/min
shaft height 100: Limited to n_{max} = 12,000 r/min
shaft height 132: Limited to n_{max} = 10,000 r/min
shaft height 160: Limited to n_{max} = 9000 r/min, not possible if 12th data position is "2" (IM B5)

8) Limited to n_{max} = 5000 r/min, shaft height 132: n_{max} = 4500 r/min, shaft height 160: n_{max} = 4000 r/min

9) For a shaft height of 100, a power connector is only possible up to a maximum stall current of Io = 36 A,
for a shaft height of 132, a power connector is only possible up to a maximum stall current of Io = 85 A,
a power connector is not possible for shaft height 160

10) Only possible if 14th data position: L, M

11) Not possible if 14th data position: M

12) Not possible for motors in a star-delta (wye-delta) circuit if the 10th data position is "S"

13) Only possible if 8th data position is "1" (induction version)
Shaft height 80: Limited to n_{max} = 20,000 r/min
shaft height 100: Limited to n_{max} = 18,000 r/min
shaft height 132: Limited to n_{max} = 15,000 r/min
shaft height 160: Limited to n_{max} = 10,000 r/min, not possible if 12th data position is "2" (IM B5)

14) Not possible with shaft height 160 and 14th data position: L, M

15) Not possible if 9th data position: T, U

16) Not possible with shaft height 160 and 8th data position is "2" or "4" (synchronous version).

17) Limited to shaft height 100: n_{max} = 7000 r/min, shaft height 132: n_{max} = 6500 r/min, shaft height 160: n_{max} = 5300 r/min

18) Only possible for the 9th data position: A, C, and S

3.4.2 Article No. suffixes for SH 80 Premium Performance

Descriptions		Data position in Article No.																		
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
		1	**P**	**H**	**8**																
Shaft height 80						**0**	**8**														
Overall length								**1**													
								3													
								7													
Induction version										**1**											
Encoder systems for motors without a DRIVE-CLiQ interface	Incremental encoder sin/cos 1 V_{pp} 256 S/R without C and D tracks (encoder N256S/R)										**C**								**2**		
Encoder systems for motors with a DRIVE-CLiQ interface	Incremental encoder 19 bit without commutation position (encoder IN19DQ)										**S**								**1**		
Winding version	Rated speeds (3 AC 380 V to 480 V)											**T**									
												U									
												V									
												W									
Cooling	Forced ventilation DE -> NDE	(degree of protection IP 55)											**0**								
	Forced ventilation NDE -> DE	(degree of protection IP 55)											**1**								
	Water cooling	(degree of protection IP 65)											**2**								
Type of construction	IM B5 (IM V1, IM V3)													**2**							
Shaft extension (DE) [1]	**Balancing**																				
Plain shaft	---															**0**					
Plain hollow shaft [2]	---															**3**					
Bearings	**Vibration severity acc. to Siemens/EN 60034-14**	**Shaft and flange accuracy**																			
Premium Performance [3]	SPECIAL/B	SPECIAL															**N**				
Terminal box	**Cable entry**	**Signal connection**				**(looking onto DE)**															
Top	Right	DE																**A**			

Descriptions		**Data position in Article No.**																			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**-**	**8**	**9**	**10**	**11**	**12**	**-**	**13**	**14**	**15**	**16**	**-**	**Z**
Top	Left	DE																**B**			
Top	NDE	Left																**C**			
Top	DE	Left																**D**			
Power connector	**Cable entry**	**Signal connection**				**(looking onto DE)**															
Top	Right	DE																**E**			
Top	Left	DE																**F**			
Top	NDE	Left																**G**			
Top	DE	Left																**H**			
Version																					
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																			**2**		
With a DRIVE-CLiQ interface																			**1**		
Options for SH 80 Premium Performance:																					
Prepared for bearingless rotary unions																					**Y64**
Sealing air connection																					**Q12**
Flange for design IM B5 with 4 x M8 threaded holes																					**Q52**

1) Shaft end 24 mm x 50 mm (d x l)

2) Only possible in combination with option Y64.

3) For cooling the greased bearing (to lengthen bearing replacement intervals) and to protect against penetrating liquid, Option Q12 (sealing air connection) is recommended for the Premium Performance version.

3.4.3 Article No. supplements for SH 132 and 160, synchronous-reluctance

Descriptions			Data position of the order No.																			
			1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
			1	P	H	8																
Shaft height 132							1	3														
Shaft height 160							1	6														
Overall length (cannot be selected, determined by the choice of rated power)																						
Reluctance version Efficiency											5											
Reluctance version Performance											7											
Encoder systems for motors without a DRIVE-CLiQ interface	Without encoder											A								2		
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)											E								2		
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)											H								2		
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)											J								2		
	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D track (encoder IC2048S/R)											M								2		
Encoder systems for motors with a DRIVE-CLiQ interface	Absolute encoder 22 bit singleturn + 12 bit multiturn (encoder AM22DQ)											F								1		
	Incremental encoder 22 bit with commutation position (encoder IC22DQ)											D								1		
Winding version	Rated speeds (3 AC 380 V to 480 V)	1000 r/min, 1150 r/min, 1350 r/min, 1500 r/min (only for forced ventilation)											D									
		1500 r/min, 1750 r/min, 2000 r/min, 2200 r/min											F									
		2000 r/min, 2300 r/min, 2650 r/min, 2800 r/min											G									
Cooling	Forced ventilation, DE-->NDE	(degree of protection IP 55)												0								
	Forced ventilation, NDE-->DE	(degree of protection IP 55)												1								
	Water cooling	(degree of protection IP 65)												2								
Type of construction	IM B3 (IM V5, IM V6, IM B6, IM B7, IM B8)														0							
	IM B5 (IM V1, IM V3)														2							
	IM B35 (IM V15, IM V35)														3							
Shaft extension (DE)	**Balancing**																					
Plain shaft	---																0					
Fitted key	Full-key																1					
Fitted key	Half-key																2					

Descriptions		**Data position of the order No.**																		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**-**	**8**	**9**	**10**	**11**	**12**	**-**	**13**	**14**	**15**	**16**	**-**	**Z**
Bearings	**Vibration severity acc. to Siemens/EN 60034-14**		**Shaft and flange accuracy**																	
Standard with locating bearing	R/A		R														**B**			
Standard with locating bearing	S/A		R														**C**			
Standard with locating bearing	SR/A		R														**D**			
Increased radial forces	R/A		R														**F**			
Power connection	**Cable entry**		**Signal connection**					**(looking onto DE)**												
Terminal box (top)	Right		DE															**A**		
Terminal box (top)	Left		DE															**B**		
Terminal box (top)	NDE		Left															**C**		
Terminal box (top) [1]	DE		Left															**D**		
Version																				
With a DRIVE-CLiQ interface																			**1**	
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																			**2**	
Special version (order codes are required for options)																				**Z**

1) Not possible for gk874 terminal boxes (1PH816 and 1PH8138-xxG2x)

3.4.4 Article No. suffixes for SH 180 to 280

Descriptions			Data position of the order No.																			
			1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
			1	P	H	8																
Shaft height 180							1	8														
Shaft height 225							2	2														
Shaft height 280 (only induction version and water cooling)							2	8														
Overall length (cannot be selected, determined by the choice of rated power)																						
Induction version											1											
Synchronous version											2											
Encoder systems for motors without a DRIVE-CLiQ interface	Without encoder [1]											A								2		
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)											E								2		
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) [1]											H								2		
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) [1] [4]											J								2		
	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D track (encoder IC2048S/R)											M								2		
Encoder systems for motors with a DRIVE-CLiQ interface	Absolute encoder 22 bit singleturn + 12 bit multiturn (encoder AM22DQ)											F								1		
	Incremental encoder 22 bit with commutation position (encoder IC22DQ)											D								1		
Winding version	Rated speeds (3 AC 380 V to 480 V)	400 r/min, 500 r/min, 600 r/min, 700 r/min											B									
		700 r/min, 800 r/min, 1000 r/min, 1100 r/min											C									
		1000 r/min, 1150 r/min, 1350 r/min, 1500 r/min											D									
		1500 r/min, 1750 r/min, 2000 r/min, 2200 r/min											F									
		2500 r/min, 2900 r/min, 3200 (3400) r/min											L									
	Rated speeds (3 AC 690 V) for shaft height 280	400 r/min, 500 r/min											H									
		700 r/min, 800 r/min											K									
		1000 r/min, 1150 r/min											U									
		1500 r/min, 1750 r/min											W									
Cooling	Forced ventilation, DE-->NDE	(degree of protection IP 55)												0								
	Forced ventilation, NDE-->DE	(degree of protection IP 55)												1								
	Water cooling	(degree of protection IP 55)												2								

Descriptions		Data position of the order No.																		
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
	Open-circuit ventilation, DE-->NDE (for induction version only)				(degree of protection IP 23)								**3**								
	Open-circuit ventilation, NDE-->DE (induction version only)												**4**								
Type of construction	**Shaft height 180**		**Shaft height 225**					**Shaft height 280**													
	IM B3 (IM B6, IM B7, IM B8, IM V6)							IM B3 (IM V6)						**0**							
	IM V5							M V5 [9]						**1**							
	IM B5 with A450 flange (IM V3) [5]		IM B5 with A550 flange (IM V3) [6]					IM B5 with A660 flange (IM V3) [7] [9]						**2**							
	IM B35 with A450 flange (IM V35)		IM B35 with A550 flange (IM V35)					IM B35 with A660 flange (IM V35)						**3**							
	IM V15 with A450 flange		IM V15 with A550 flange					IM V15 with A660 flange						**5**							
Shaft extension (DE)	**Balancing**																				
Plain shaft	---															**0**					
Fitted key	Full-key															**1**					
Fitted key	Half-key															**2**					
Bearings	**Vibration severity acc. to Siemens/EN 60034-14**		**Shaft and flange accuracy**																		
Standard	A		N														**A**				
Standard	R/A		R														**B**				
Increased radial forces	A		N														**E**				
Increased radial forces	R/A		R														**F**				
Also possible for shaft heights 180 and 225:																					
Standard	S/A		R														**C**				
Standard [1]	SR/A		R														**D**				
Performance [1] [8]	SR/A		R														**L**				
Power connection	**Cable entry**		**Signal connection**					**(looking onto DE)**													
Terminal box (top)	Right		DE															**A**			
Terminal box (top)	Left		DE															**B**			
Terminal box (top)	NDE		Right															**C**			
Terminal box (top)	DE		Right															**D**			

Descriptions	Data position of the order No.																		
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
Version																				
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																		**2**		
With a DRIVE-CLiQ interface																		**1**		
Special version (order codes are required for options)																				**Z**

1) Only possible if the 8th data position is "1" (induction version)

4) Limited to n_{max} = 4600 r/min

5) Limited to n_{max} = 3000 r/min, not possible if 14th data position is "L" (Performance).

6) Limited to n_{max} = 2500 r/min, not possible if 14th data position is "L" (Performance).

7) Limited to n_{max} = 2000 r/min

8) Only possible with shaft height 180: Limited to n_{max} = 7500 r/min,
not possible if the 12th data position is "2" (IM B5) and the 11th data position is "3" and "4" (open-circuit ventilation)
only possible for shaft height 225: Limited to n_{max} = 6000 r/min,
not possible if the 12th data position is "2" (IM B5) and the 11th data position is "3" and "4" (open-circuit ventilation)

9) Only possible if 14th data position is "A" or "B" (standard bearings)

3.4.5 Article No. suffixes for SH 280

Descriptions		Data position of the order No.																		
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
		1	P	H	8																
Shaft height 280 (forced ventilation and open-circuit ventilation)						2	8														
Overall length (cannot be selected, determined by the choice of rated power)																					
Induction version										1											
Encoder systems for motors without a DRIVE-CLiQ interface	Without encoder										A								2		
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)										E								2		
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)										H								2		
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)										J								2		
	Incremental encoder sin/cos 1 V_{pp}, 2048 S/R with C and D track (encoder IC2048S/R)										M								2		
Encoder systems for motors with a DRIVE-CLiQ interface	Absolute encoder, 22-bit singleturn + 12-bit multiturn (encoder AM22DQ)										F								1		
	Incremental encoder, 22-bit, with commutation position (encoder IC22DQ)										D								1		
External encoder systems	Incremental encoder HTL 1024 S/R POG 22 (Baumer-Hübner), prepared for mounting [1]										G										
	Incremental encoder HTL 1024 S/R POG 10 (Baumer-Hübner), prepared for mounting [2]										K										
Winding version	Rated speeds (3 AC 380 V to 480 V)	400 r/min, 500 r/min, 600 r/min, 700 r/min										B									
		700 r/min, 800 r/min, 1000 r/min, 1100 r/min										C									
		1000 r/min, 1150 r/min, 1350 r/min, 1500 r/min										D									
		1500 r/min, 1750 r/min, 2000 r/min, 2200 r/min										F									
	Rated speeds (690 V 3 AC)	400 r/min, 500 r/min										H									
		700 r/min, 800 r/min										K									
		1000 r/min, 1150 r/min										U									
		1500 r/min, 1750 r/min										W									
Cooling	Forced ventilation	(degree of protection IP 55)											1								
	Forced ventilation	(open-circuit ventilation with degree of protection IP 23)											4								
Type of construction	IM B3 (IM V6)													0							
	IM V5 [6]													1							
	IM B5 with A660 flange (IM V3) [6]													2							
	IM B35 with A660 flange (IM V35)													3							
	IM V15 with A660 flange													5							

Descriptions		**Data position of the order No.**																			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**-**	**8**	**9**	**10**	**11**	**12**	**-**	**13**	**14**	**15**	**16**	**-**	**Z**
Shaft extension (DE)	**Balancing**																				
Smooth shaft (without keyway)	---															**0**					
Fitted key	Full-key															**1**					
Fitted key	Half-key															**2**					
Bearings	**Vibration severity acc. to Siemens/EN 60034-14**	**Shaft and flange accuracy**																			
Standard	A	N															**A**				
Standard	R/A	R															**B**				
Increased radial forces	A	N															**E**				
Increased radial forces	R/A	R															**F**				
Power connection	**Cable entry**	**Signal connection**				**External fan**															
Terminal box NDE right	Bottom	DE																**U**			
						NDE top, air inlet from NDE, air-flow direction NDE-->DE															---
						NDE left, air inlet from NDE, air-flow direction NDE-->DE															**G00**
Terminal box NDE left	Bottom	DE																**V**			
						NDE top, air inlet from NDE, air-flow direction NDE-->DE															---
						NDE right, air inlet from NDE, air-flow direction NDE-->DE															**G02**
Terminal box NDE top	Right	DE																**W**			
						NDE left, air inlet from NDE, air-flow direction NDE-->DE															**G00**
						NDE right, air inlet from NDE, air-flow direction NDE-->DE															**G02**
Terminal box DE top [4]	Right	NDE																**X**			
						NDE top, air inlet from NDE, air-flow direction NDE-->DE [4] [5]															---
						NDE left, air inlet from NDE, air-flow direction NDE-->DE [4]															**G00**
						NDE right, air inlet from NDE, air-flow direction NDE-->DE [4]															**G02**
Version																					
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																			**2**		
With a DRIVE-CLiQ interface																			**1**		
For other versions, see options																					**Z**

1) When ordering, also select option H75

2) When ordering, also select options H56 or G80

4) Only possible if 12th data position is "0" (IM B3) and "1" (IM V5).

5) Only possible for assignments with terminal box 1XB7712-P..

6) Only possible if 14th data position is "A" and "B" (standard bearings); n_{max} limited to 2000 r/min

7) Only possible for the following combinations:

12th data position is "0" or "1" if 15th data position is "W" or "X"

12th data position is "2," "3," or "5" if 15th data position "W"

3.4.6 Article No. supplement for shaft height 80 to 160 + holding brake DE

Descriptions		Data position of the order No.																			
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
		1	P	H	8																
Shaft height 80						0	8														
Shaft height 100						1	0														
Shaft height 132						1	3														
Shaft height 160						1	6														
Overall length (cannot be selected, determined by the choice of rated power)																					
Induction version with holding brake [1]										3											
Synchronous version with holding brake (only shaft heights 132 and 160) [1]										4											
Encoder systems for motors without a DRIVE-CLiQ interface	without encoder [2]										A								2		
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)										E								2		
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) [2]										H								2		
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) [2]										J								2		
	Incremental encoder sin/cos 1 V_{pp}, 2048 S/R with C and D track (encoder IC2048S/R)										M								2		
Encoder systems for motors with a DRIVE-CLiQ interface	Absolute encoder, 22-bit singleturn + 12-bit multiturn (encoder AM22DQ)										F								1		
	Incremental encoder, 22-bit, with commutation position (encoder IC22DQ)										D								1		
Winding version																					
Cooling	Forced ventilation DE -> NDE	(degree of protection IP 55)											0								
	Forced ventilation NDE -> DE	(degree of protection IP 55)											1								
	Water cooling	(degree of protection **IP 55**) [4]											2								
Type of construction	IM B5 (IM V1, IM V3) [5]													2							
	IM B35 (IM V15, IM V35) [8]													3							
Shaft extension (DE)	**Balancing**																				
Smooth shaft (without keyway)	---															0					
Fitted key	Half-key															2					
Bearings	**Vibration severity acc. to**	**Shaft and**																			

Descriptions		Data position of the order No.																							
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
	Siemens/EN 60034-14	**flange accuracy**																			
Standard	A	N															**A**				
Advanced Lifetime	A	N															**P**				
Power connection [6]	**Cable entry**	**Signal connection**				**(looking onto DE)**															
Terminal box (top)	Right	DE																**A**			
Terminal box (top)	Left	DE																**B**			
Terminal box (top)	NDE	Left																**C**			
Terminal box (top) [10]	DE	Left																**D**			
Power connector (top) [3] [7]	Right	DE																**E**			
Power connector (top) [3] [7]	Left	DE																**F**			
Power connector (top) [3] [7]	NDE	Left																**G**			
Power connector (top) [3] [7]	DE	Left																**H**			
Version																					
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																			**2**		
With a DRIVE-CLiQ interface																			**1**		
Brake versions:																					
Brake supply voltage 230 V 1 AC, 50/60 Hz	Holding brake DE																			**U60**	
	Holding brake DE with microswitch																			**U61**	
	Holding brake DE with manual brake release lever																			**U62**	
	Holding brake DE with microswitch and manual brake release lever																			**U63**	
Brake supply voltage 24 V DC	Holding brake DE																			**U65**	
	Holding brake DE with microswitch																			**U66**	
	Holding brake DE with manual brake release lever																			**U67**	
	Holding brake DE with microswitch and manual brake release lever																			**U68**	
Z options that cannot be combined with holding brake DE: K18, V91, M03, M39																					

1) A U option must also be stated in the order to specify the holding brake version.
Shaft height 80: limited to n_{max} = 5000 r/min
Shaft height 100: limited to n_{max} = 5000 r/min
Shaft height 132: limited to n_{max} = 4500 r/min
Shaft height 160: limited to n_{max} = 4000 r/min

2) Only possible if 8th data position is "3" (induction version)

4) With holding brake, degree of protection is limited to IP55.

5) Not possible with shaft height 160.

6) A holding brake can only be connected via a terminal box (top).
7) Power connector for motor only (not with holding brake):
Power connector for shaft height 100 only possible up to a maximum stall current of Io = 36 A.
Power connector for shaft height 132 only possible up to a maximum stall current of Io = 85 A.
Power connector not possible for shaft height 160
8) Not possible for shaft height 80
9) Only possible if 15th data position: A and B
10) Not possible with shaft height 160 and 8th data position is "4" (synchronous version)

3.4.7 Article No. supplement for SH 132 and 160, synchronous-reluctance + holding brake

Descriptions		Data position of the order No.																			
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
		1	P	H	8																
Shaft height 132						1	3														
Shaft height 160						1	6														
Overall length (cannot be selected, determined by the choice of rated power)																					
Reluctance version Efficiency with holding brake										6											
Reluctance version Performance with holding brake										8											
Encoder systems for motors without a DRIVE-CLiQ interface	Without encoder										A								2		
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)										E								2		
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R)										H								2		
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R)										J								2		
	Incremental encoder sin/cos 1 V_{pp}, 2048 S/R with C and D track (encoder IC2048S/R)										M								2		
Encoder systems for motors with a DRIVE-CLiQ interface	Absolute encoder, 22-bit singleturn + 12-bit multiturn (encoder AM22DQ)										F								1		
	Incremental encoder, 22-bit, with commutation position (encoder IC22DQ)										D								1		
Winding version	Rated speeds (3 AC 380 V to 480 V)	1000 r/min, 1150 r/min, 1350 r/min, 1500 r/min (only for forced ventilation)										D									
		1500 r/min, 1750 r/min, 2000 r/min, 2200 r/min										F									
		2000 r/min, 2300 r/min, 2650 r/min, 2800 r/min										G									
Cooling	Forced ventilation DE -> NDE	(degree of protection IP 55)											0								
	Forced ventilation NDE -> DE	(degree of protection IP 55)											1								
	Water cooling	(degree of protection **IP 55**)											2								
Type of construction	IM B5 (IM V1, IM V3)	(not possible for shaft height 160)												2							
	IM B35 (IM V15, IM V35)													3							
Shaft extension (DE)	**Balancing**																				
Smooth shaft (without keyway)	---															0					
Fitted key	Half-key															2					
Bearings	**Vibration severity acc. to**	**Shaft and**																			

Descriptions		**Data position of the order No.**																			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**-**	**8**	**9**	**10**	**11**	**12**	**-**	**13**	**14**	**15**	**16**	**-**	**Z**
	Siemens/EN 60034-14	**flange accuracy**																			
Standard	A	N															**A**				
Power connection	**Cable entry**	**Signal connection**				**(looking onto DE)**															
Terminal box (top)	Right	DE																**A**			
Terminal box (top)	Left	DE																**B**			
Terminal box (top)	NDE	Left																**C**			
Terminal box (top) [1]	DE	Left																**D**			
Version																					
With a DRIVE-CLiQ interface																			**1**		
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																			**2**		
Special version (order codes are required for options)																					**Z**

1) Not possible for gk874 terminal boxes (1PH816 and 1PH8138-xxG2x)

3.4.8 Article No. supplements for SH 180 to 225 + holding brake

Descriptions		Data position of the order No.																	
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
		1	P	H	8																
Shaft height 180						1	8														
Shaft height 225						2	2														
Overall length																					
Induction version with holding brake [1]										3											
Synchronous version with holding brake [1]										4											
Encoder systems for motors without a DRIVE-CLiQ interface	without encoder [2]										A								2		
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)										E								2		
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) [2]										H								2		
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) [2]										J								2		
	Incremental encoder sin/cos 1 V_{pp}, 2048 S/R with C and D track (encoder IC2048S/R)										M								2		
Encoder systems for motors with a DRIVE-CLiQ interface	Absolute encoder, 22-bit singleturn + 12-bit multiturn (encoder AM22DQ)										F								1		
	Incremental encoder, 22-bit, with commutation position (encoder IC22DQ)										D								1		
Winding version																					
Cooling	Forced ventilation, DE-->NDE	(degree of protection IP 55)											0								
	Forced ventilation, NDE-->DE	(degree of protection IP 55)											1								
	Water cooling	(degree of protection IP 55)											2								
	Open-circuit ventilation, NDE-->DE (induction version only)	(degree of protection IP 23)											4								
Type of construction	IM B3 (IM B6, IM B7, IM B8)													0							
Shaft extension (DE)	**Balancing**																				
Fitted key	Half-key															2					
Bearings	**Vibration severity acc. to Siemens/EN 60034-14**	**Shaft and flange accuracy**																			
Standard	A	N															A				
Power connection [3]	**Cable entry**	**Signal connection**	**(looking onto DE)**																		

Descriptions		Data position of the order No.																			
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
Terminal box (top)	Right	DE																**A**			
Terminal box (top)	Left	DE																**B**			
Terminal box (top)	NDE	Right																**C**			
Terminal box (top)	DE	Right																**D**			
Version																					
Without a DRIVE-CLiQ interface, PT1000 temperature sensor in the stator winding																			**2**		
With a DRIVE-CLiQ interface																			**1**		
Brake versions:																					
Brake supply voltage 230 V 1 AC, 50/60 Hz		Holding brake standard with microswitch and manual brake release lever																			**U64**
Brake supply voltage 230 V 1 AC, 50/60 Hz		Holding brake Performance with microswitch and manual brake release lever																			**U70**
Z options that cannot be combined with holding brake DE: K18, K90, L03, V92, M39																					

1) A U option must also be stated in the order to specify the holding brake version.
   Shaft height 180: limited to n_{max} = 3500 r/min
   Shaft height 225: limited to n_{max} = 3100 r/min
2) Only possible if 8th data position is "3" (induction version)
3) A holding brake can only be connected via a brake terminal box (top).

3.4.9 Options

Order code	Option description	For use with motors "✓" = Option possible, "---" = Option not possible		
	When ordering a motor with options, add a -Z to the order number. Specify the order code for every option required. For order codes, avoid repeating the order codes in text form in the order.	**Shaft height 80 to 160**	**Shaft height 180 to 280**	**Shaft height 280 For forced ventilation only (11th data position is "1" or "4")**
A12	Additional PTC thermistor circuit for alarm and trip (only possible for version with terminal box)	✓	✓	✓
A25	Additional temperature sensor as reserve connected to signal terminal strip (only possible for version with terminal box)	✓	Standard	Standard
A72	2 PT100 resistance thermometers for bearing temperature monitoring (DE and NDE)	---	✓	✓

Order code	Option description	For use with motors "✓" = Option possible, "---" = Option not possible		
	When ordering a motor with options, add a -Z to the order number. Specify the order code for every option required. For order codes, avoid repeating the order codes in text form in the order.	**Shaft height 80 to 160**	**Shaft height 180 to 280**	**Shaft height 280 For forced ventilation only (11th data position is "1" or "4")**
B02	Factory test certificate in accordance with EN 10204 2.3 (for motor ordered)	✓	Standard	Standard
B35	Factory test certificate for vibration log	✓	✓ 5)	✓ 5)
B36	Factory test certificate for run-out log	✓	Only for SH 180 and SH 225	---
G00	External fan NDE left, air inlet at NDE (possible if 15th data position is U, W, or X)	---	---	✓
G02	External fan NDE right, air inlet at NDE (possible if 15th data position is V, W, or X)	---	---	✓
G06	External fan DE left, air inlet NDE (possible if 11th position =1 and 15th position = U, V, or W; possible if 11th position =4 and 15th position = W)	---	---	✓
G07	External fan DE left, air inlet DE (possible if 11th position =1 and 15th position = U, V, or W; possible if 11th position =4 and 15th position = W)	---	---	✓
G08	External fan DE right, air inlet NDE (possible if 11th position =1 and 15th position = U, V, or W; possible if 11th position =4 and 15th position = W)	---	---	✓
G09	External fan DE right, air inlet DE (possible if 11th position =1 and 15th position = U, V, or W; possible if 11th position =4 and 15th position = W)	---	---	✓
G11	External fan DE top, air inlet DE (possible if 11th position =1 and 15th position = U, V, or W; possible if 11th position =4 and 15th position = W)	---	---	✓
G14	With external fan (only possible if 11th data position is "1" or "4")	Only for SH 132 and SH 160	✓	✓
G50	Nipple for SPM, with M8 adapter	---	✓	✓
G80	Mounting of a POG 10 incremental encoder supplied by customer (possible if 9th data position is "K")	---	---	✓
H56	Mounting an incremental encoder POG 10 D 1024 (encoder HTL1024S/R) (possible if the 9th data position is "K")	---	---	✓
H75	Mounting of a hollow shaft encoder HOG 22 supplied by the customer (possible if the 9th data position is "G")	---	---	✓
K08	Encoder connection or DRIVE-CLiQ mounted on the opposite side (not possible if 15th data position is "X")	---	✓	✓

Order code	Option description	For use with motors "✓" = Option possible, "---" = Option not possible		
	When ordering a motor with options, add a -Z to the order number. Specify the order code for every option required. For order codes, avoid repeating the order codes in text form in the order.	**Shaft height 80 to 160**	**Shaft height 180 to 280**	**Shaft height 280 For forced ventilation only (11th data position is "1" or "4")**
K09	Terminal box or power connector NDE right	Only for SH 100 [1] to SH 160	---	---
	Terminal box NDE right, cable entry DE, signal connection top (possible if the 15th data position is "A")	---	✓	---
K10	Terminal box or power connector NDE left	Only for SH 100 [1] to SH 160	---	---
	Terminal box NDE left, cable entry DE, signal connection top (possible if the 15th data position is "A")	---	✓	---
K16	Second shaft extension (d x l: 95 mm x 170 mm) (possible if the 9th data position is "A" or "G" and 12th data position is "0" or "3")	---	---	✓
K17	Labyrinth seal DE for Performance version (14th data position "L")	---	Only for SH 180	---
K18	Radial shaft sealing ring DE [2]	✓	✓	---
K40	Regreasing system, DE and NDE	---	Only for SH 180 and SH 225	Standard
K45	AC 230 V anti-condensation heating	---	✓	✓
K69	Prepared for pipe connection NDE right (only possible for forced ventilation, not for G00 to G11)	---	---	✓
K70	Prepared for pipe connection NDE left (only possible for forced ventilation, not for G00 to G11)	---	---	✓
K71	Prepared for pipe connection NDE top (only possible for forced ventilation, not for G00 to G11)	---	---	✓
K80	Axial pipe connection NDE (only possible with forced ventilation)	---	Only for SH 180 and SH 225	Options K69, K70, K71
K83	Rotation of the terminal box through +90 degrees (possible in combination with option K09 or K10 or if the 15th data position is "U", "V" or "W")	---	✓ [4]	✓
K84	Rotation of the terminal box through -90 degrees (possible in combination with option K09 or K10 or if the 15th data position is "U", "V", "W" or "X")	---	✓ [4]	✓
K85	Rotation of the terminal box through +180 degrees (possible in combination with option K09 or K10 or if the 15th data position is "U", "V", "W" or "X")	---	✓	✓

Order code	Option description	For use with motors "✓" = Option possible, "---" = Option not possible		
	When ordering a motor with options, add a -Z to the order number. Specify the order code for every option required. For order codes, avoid repeating the order codes in text form in the order.	**Shaft height 80 to 160**	**Shaft height 180 to 280**	**Shaft height 280 For forced ventilation only (11th data position is "1" or "4")**
K90	Version with flange size A400 (possible if 12th data position is "2", "3" or "5")	---	Only for SH 180	---
L00	Replace terminal box (standard) with the next largest terminal box (note dimension implications in the SPC)	---	✓	✓
L03	Increased resistance to vibration	---	Only for SH 180 and SH 225	---
L12	Condensation drain hole	---	Standard for water cooling	Only if the 11th data position is "1"
L27	NDE bearing with insulated shaft	---	Only for SH 180	Standard
L29	Enhanced corrosion protection for installation in industrial/marine climates	---	---	✓
L72	Shaft made of special steel (note: option results in longer delivery times)	---	---	✓
L74	Fan version in degree of protection IP65 [3)]	✓	---	---
L76	EC fan 3 AC 400 V 50/60 Hz	---	Only for SH 180 and SH 225	---
M03	Version for potentially explosive atmospheres Zone 2	Only for SH 100 to SH 160	---	---
M39	Version for potentially explosive atmospheres Zone 22	Only for SH 100 to SH 160	Only for SH 180 and SH 225	---
M83	Additional back-off thread on motor feet (only possible if 12th data position is "0" or "3")	---	---	✓
P00	Undrilled cable entry plate	---	✓	Not for 1XB7820-P00
P01	Cable entry plate 3 x M63 x 1.5	---	Only for 1XB7700-P02 1XB7712-P03	Only for 1XB7712-P03
P02	Cable entry plate 3 x M75 x 1.5	---	Only for 1XB7712-P03	Only for 1XB7712-P01 1XB7712-P03
P03	Cable entry plate 4 x M75 x 1.5	---	---	Only for 1XB7712-P01

Order code	Option description	For use with motors "✓" = Option possible, "---" = Option not possible		
	When ordering a motor with options, add a -Z to the order number. Specify the order code for every option required. For order codes, avoid repeating the order codes in text form in the order.	**Shaft height 80 to 160**	**Shaft height 180 to 280**	**Shaft height 280 For forced ventilation only (11th data position is "1" or "4")**
P04	Cable entry plate 4 x M63 x 1.5	---	Only for 1XB7712-P03	Only for 1XB7712-P01 1XB7712-P03
Q00	Increase number of grounding terminals in the terminal box	---	---	✓
Q12	Sealing air connection	✓	---	---
Q21	Screw locked with Loctite	---	✓	⇓
Q25	Q25 fan connection NDE or at the top with M16x1.5	Only for SH 100 to SH 160	---	---
Q31	Metal nameplate instead of adhesive label	✓	✓	✓
Q52	Flange for design IM B5 with 4 x M8 threaded holes (only possible when 14th data position is "N")	Only for SH 80	---	---
Q81	Increased bearing preloading (only possible if the 14th data position "B", "C" and "D")	✓	---	---
U60	230 V holding brake	✓	---	---
U61	230 V holding brake with micro-switch	✓	---	---
U62	230 V holding brake with manual brake release lever	✓	---	---
U63	Holding brake standard 230 V with microswitch and manual brake release lever	✓	---	---
U64	Holding brake standard 230 V with microswitch and manual brake release lever	---	Only for SH 180 and SH 225	---
U65	24 V DC holding brake	✓	---	---
U66	24 V DC holding brake with microswitch	✓	---	---
U67	24 V DC holding brake with manual brake release lever	✓	---	---
U68	24 V DC holding brake with micro-switch and manual brake release lever	✓	---	---
U70	Holding brake Performance 230 V with microswitch and manual brake release lever	---	Only for SH 180 and SH 225	---
V90	1PH7-compatible shaft extension (d x l: 42 mm x 110 mm) (reduced radial forces must be observed; only possible if the 8th data position is "1" or "3")	Only for SH 132	---	---
V91	1FT6-compatible shaft extension (d x l: 48 mm x 82 mm) (only possible for 8th data position is "2")	Only for SH 132	---	---
V92	1PH7184-/1PL6184-compatible shaft extension (d x l: 60 mm x 140 mm) (possible if the 8th data position is "1")	---	Only for 1PH8184	---

Order code	Option description	For use with motors "✓" = Option possible, "---" = Option not possible		
	When ordering a motor with options, add a -Z to the order number. Specify the order code for every option required. For order codes, avoid repeating the order codes in text form in the order.	**Shaft height 80 to 160**	**Shaft height 180 to 280**	**Shaft height 280 For forced ventilation only (11th data position is "1" or "4")**
Y64	Hollow shaft prepared for bearingless rotary unions with flange diameter 114H6	✓	---	---
Y82	Extra nameplate with customer specifications (plain text required)	---	✓	✓
Y84	Customer specifications on nameplate (max. 30 characters)	✓	✓	✓
---	**Paint finish anthracite RAL 7016**	Standard	Standard	Standard
X01	Paint finish in RAL 9005 (jet black)	✓	✓	✓
X02	Paint finish in RAL 9001 (cream white)	✓	✓	✓
X03	Paint finish in RAL 6011 (reseda green)	✓	✓	✓
X04	Paint finish in RAL 7032 (pebble gray)	✓	✓	✓
X05	Paint finish in RAL 5015 (sky blue)	✓	✓	✓
X06	Paint finish in RAL 1015 (light ivory)	✓	✓	✓
X08	Paint finish in RAL 9006 (white aluminum)	✓	✓	✓
X11	Paint finish in RAL 6019 (pastel green)	✓	✓	✓
X12	Paint finish in RAL 5010 (gentian blue)	✓	✓	✓
X13	Paint finish in RAL 5024 (pastel blue)	✓	✓	✓
X14	Paint finish in RAL 5017 (traffic blue)	✓	✓	✓
X15	Paint finish in RAL 9010 (pure white)	✓	✓	✓
X16	Paint finish in RAL 6018 (yellow green)	✓	✓	✓
X17	Paint finish in RAL 5014 (pigeon blue)	✓	✓	✓
X18	Paint finish in RAL 9018 (papyrus white)	✓	✓	✓
X19	Paint finish in RAL 2004 (pure orange)	✓	✓	✓
X20	Paint finish in HWS (gray)	✓	✓	✓
X21	Paint finish in RAL 9003 (signal white)	✓	✓	✓
X22	Paint finish in RAL 9002 (gray white)	✓	✓	✓
X23	Paint finish in RAL 5005 (signal blue)	✓	✓	✓
X24	Paint finish in RAL 7001 (sliver gray)	✓	✓	✓
X25	Paint finish in RAL 1000 (green beige)	✓	✓	✓
X26	Paint finish in RAL 6017 (May green)	✓	✓	✓
X27	Paint finish in RAL 9023 (pearl dark gray)	✓	✓	✓
X28	Paint finish in RAL 5009 (azure blue)	✓	✓	✓
X29	Paint finish in RAL 7005 (mouse gray)	✓	✓	✓
X30	Paint finish in RAL 1014 (ivory)	✓	✓	✓
X31	Paint finish in RAL 5007 (brilliant blue)	✓	✓	✓
X44	Paint finish in RAL 1023 (traffic yellow)	✓	✓	✓

Order code	Option description	For use with motors "✓" = Option possible, "---" = Option not possible		
	When ordering a motor with options, add a -Z to the order number. Specify the order code for every option required. For order codes, avoid repeating the order codes in text form in the order.	**Shaft height 80 to 160**	**Shaft height 180 to 280**	**Shaft height 280 For forced ventilation only (11th data position is "1" or "4")**
X50	Paint finish in RAL 3004 (purple red)	✓	✓	✓
X51	Paint finish in RAL 2003 (pastel orange)	✓	✓	✓
X52	Paint finish in RAL 3000 (flame red)	✓	✓	✓
X53	Paint finish in RAL 7035 (light gray)	✓	✓	✓
X54	Paint finish in RAL 7004 (signal gray)	✓	✓	✓
X55	Paint finish in RAL 7038 (agate gray)	✓	✓	✓
X56	Paint finish in RAL 1013 (oyster white)	✓	✓	✓
X57	Paint finish in RAL 5012 (light blue)	✓	✓	✓
X58	Paint finish in RAL 2001 (red orange)	✓	✓	✓
X59	Paint finish in RAL 7030 (stone gray)	✓	✓	✓
X91	Paint finish in RAL 7011 (iron gray)	✓	✓	✓
K24	Primer	Pale green	Red brown	Red brown
K23	Special paint finish "Worldwide" (anthracite RAL 7016)	✓	✓	✓
K23 + X..	Special finish "Worldwide" in another color (X01 to X91)	✓	✓	✓

1) Not possible if 12th data position is "2" (type of construction IM B5)

2) Only recommended if oil spray/mist occasionally gets onto the sealing ring. Radial shaft sealing ring not possible if: 14th data position is "E", "F" and "L", "M"

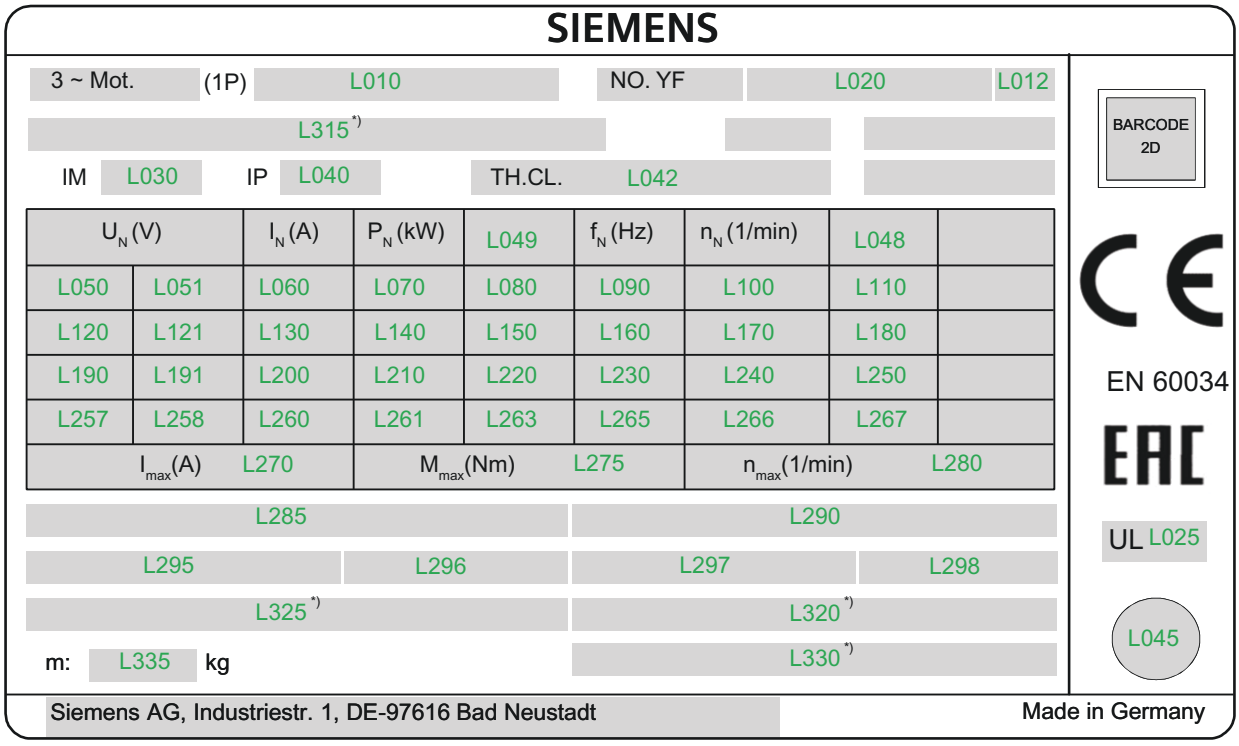
3) Regardless of the degree of protection, for high pollution levels of the ambient air, the fan must be cleaned.

4) Not possible for 1PH822 and terminal box 1XB7712-P03

5) Not possible if the 14th data position is "E" and "F"

3.5 Rating plate data

The nameplate (rating plate) shows the technical specifications for the supplied motor.



*) Some fields may also be empty (options, customer data)

Figure 3-1 Nameplate layout for 1PH808 to 1PH816

Table 3-6 Elements on the rating plate

No.	Description	No.	Description
L010	Article No.	L210	Rated power P_N (3)
L012	Consecutive number	L220	cos φ (3)
L020	Factory serial number	L230	Rated frequency f_N (3)
L025	UL mark	L240	Rated speed n_N (3)
L030	Type of construction	L250	Operating mode (3)
L040	Degree of protection	L257	Rated voltage U_N (4)
L042	Temperature class	L258	Connection method (4)
L045	Balancing code	L260	Rated current I_N (4)
L048	Operating mode	L261	Rated power P_N (4)
L049	for synchronous motors: induced voltage at rated speed V_{IN}	L263	cos φ (4)
	for induction motors: cos φ	L265	Rated frequency f_N (4)
L050	Rated voltage U_N (1)	L266	Rated speed n_N (4)
L051	Connection method (1)	L267	Operating mode (4)
L060	Rated current I_N (1)	L270	Maximum current I_{max}
L070	Rated power P_N (1)	L275	Maximum torque M_{max}

No.	Description	No.	Description
L080	cos φ (1)	L280	Maximum speed n_{max}
L090	Rated frequency f_N (1)	L285	Temperature sensor
L100	Rated speed n_N (1)	L290	Encoder
L110	Operating mode (1)	L295	Cooling method
L120	Rated voltage U_N (2)	L296	Throughput l/min (m^3/s)
L121	Connection method (2)	L297	System pressure
L130	Rated current I_N (2)	L298	Maximum coolant temperature
L140	Rated power P_N (2)	L315	Options (I)
L150	cos φ (2)	L320	Options (II)
L160	Rated frequency f_N (2)	L325	Optional customer information
L170	Rated speed n_N (2)	L330	Anti-condensation heating
L180	Operating mode (2)	L335	Weight
L190	Rated voltage U_N (3)		
L191	Connection method (3)		
L200	Rated current I_N (3)		

The rating plate (type plate) shows the technical specifications for the supplied motor.

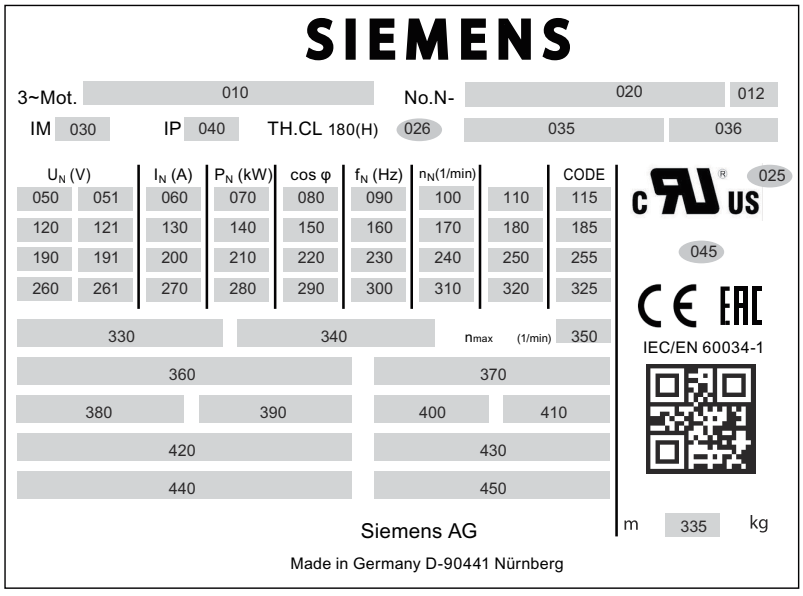


Figure 3-2 Nameplate layout for 1PH818 to 1PH828

Table 3-7 Elements on the rating plate

No.	Description	No.	Description
010	Article No.	200	Rated current I_N (3)
012	Consecutive number, part of serial number	210	Rated power P_N (3)
020	Serial number	220	cos φ (3)
025	UL mark	230	Rated frequency f_N (3)

No.	Description	No.	Description
026	(blank)	240	Rated speed n_N (3)
030	Type of construction	250	Operating mode (3)
035	(blank)	255	Code for operating point 3
036	(blank)	260	Rated voltage U_N (4)
040	Degree of protection	261	Switching mode 4
045	Type of balancing	270	Rated current I_N (4)
050	Rated voltage U_N (1)	280	Rated power P_N (4)
051	Switching mode 1	290	cos φ (4)
060	Rated current I_N (1)	300	Rated frequency f_N (4)
070	Rated power P_N (1)	310	Rated speed n_N (4)
080	cos φ (1)	320	Operating mode (4)
090	Rated frequency f_N (1)	325	Code for operating point 4
100	Rated speed n_N (1)	330	Maximum current I_{MAX}
110	Operating mode (1)	335	Weight
115	Code for operating point 1	340	Maximum torque M_{MAX}
120	Rated voltage U_N (2)	350	Maximum speed n_{MAX}
121	Switching mode 2	360	Temperature sensor
130	Rated current I_N (2)	370	Tachometer/resolver
140	Rated power P_N (2)	380	Cooling method
150	cos φ (2)	390	Throughput l/min (m^3/s)
160	Rated frequency f_N (2)	400	System pressure
170	Rated speed n_N (2)	410	Maximum coolant temperature
180	Operating mode (2)	420	Options (I)
185	Code for operating point 2	430	Options (II)
190	Rated voltage U_N (3)	440	Optional customer information
191	Switching mode 3	450	Anti-condensation heating / dummy

Mechanical properties

4

4.1 Cooling

4.1.1 General

The following table shows an overview of the available variants of cooling system.

Table 4-1 Cooling system variants of 1PH8 motors

Shaft height	Motor type	Forced ventilation	Water cooling
80	Induction	⇓	⇓
100	Induction	⇓	⇓
132	Induction, synchronous-reluctance and synchronous	⇓	⇓
160	Induction, synchronous-reluctance and synchronous	⇓	⇓
180	Induction and synchronous	⇓	⇓
225	Induction and synchronous	⇓	⇓
280	Induction	⇓	⇓

4.1.2 Forced ventilation

When mounting the forced ventilated motor, make sure the motor is well ventilated. Good ventilation is especially important for encapsulated installation. Avoid warm exhaust air being drawn in again. The cooling air must flow in and out without restriction. Avoid accumulated dirt in the cooling ducts as this can reduce the cooling air flow.

All catalog data refer to an ambient temperature of 40 °C and an installation altitude up to 1000 m above sea level.

NOTICE

Thermal damage to temperature-sensitive parts

The motors can have surface temperatures of over +100 °C. Temperature-sensitive parts in contact with the motor or attached to the motor can be damaged. Temperature-sensitive parts include cables and electronic components, for example.

- Never attach temperature-sensitive parts to the motor.
- Ensure that no temperature-sensitive parts are in contact with the motor.

Ambient/coolant temperature

Operation: T = -15 °C to +40 °C (without any restrictions)
Under conditions other than those specified above (ambient temperature > 40 °C or installation altitude > 1000 m above sea level), you must determine the permissible torque/power reduction from the following table. Ambient temperatures and installation altitudes are rounded off to 5 °C or 500 m respectively.

Table 4-2 Factors for reducing the torque/power acc. to EN 60034-6

Installation altitude above sea level	Ambient temperature in ° C			
	40	45	50	55[1)]
1000	1.00	0.96	0.92	0.87
1500	0.97	0.93	0.89	0.84
2000	0.94	0.90	0.86	0.82
2500	0.90	0.86	0.83	0.78
3000	0.86	0.82	0.79	0.75
3500	0.82	0.79	0.75	0.71
4000	0.77	0.74	0.71	0.67

1) Only permitted for the "NDE" ⇒ "DE" direction of air flow

Note

Higher ambient temperatures

For ambient temperatures > 55 °C, contact your local sales partner.

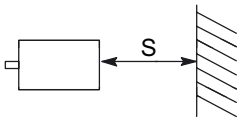
The standard motors are not suitable for use in corrosive atmospheres, atmospheres with a high salt content, or in outdoor applications.

Mounting a fan and minimum clearance to parts and components mounted by the customer

Table 4-3 Fan mounting

Shaft height mm	Fan mounting
80 to 225	NDE axial, can be rotated through 180°
280	NDE radial, different mounting types can be ordered

Table 4-4 Minimum distance S between the air intake/outlet openings and other adjacent components

Shaft height **mm**	**Minimum clearance S** **mm**	
80	30	
100	30	
132	60	
160	80	
180/225	100	
280	120	

Ventilation data and sound pressure levels

Table 4-5 Ventilation data and sound pressure levels

Shaft height **mm**	**Air flow direction**	**Degree of protection**	**Airflow rate, min.** **m³/s**	**Air discharge**	**Sound pressure level L_{pA} (1 m) Motor + operation with an external fan 50 Hz rated load, tolerance +3 dB** **dB**	**Pressure drop (Δp)** **Pa**
80	NDE → DE DE → NDE	IP55	0.02	Axial	70[1)]	95
100	NDE → DE DE → NDE	IP55	0.04			110
132	NDE → DE DE → NDE	IP55	0.09			140
160	NDE → DE DE → NDE	IP55	0.16		73[1)]	200
180	NDE → DE	IP23	0.21		73[2)]	450
	DE → NDE	IP55	0.17			550
225	NDE → DE	IP23	0.33			600
	DE → NDE	IP55	0.31			650
280	NDE → DE	IP23	0.52	Radial	74[2)]	600
	DE → NDE	IP55	0.42			600

1) At a rated pulse frequency of 4 kHz and a speed range up to 5000 r/min
2) At a rated pulse frequency of 2 kHz and speed range
   - Forced ventilation (IP55)
     - Shaft height 180 to 5000 r/min
     - Shaft height 225 to 3500 r/min
     - Shaft height 280 to 3300 r/min
   - Open-circuit ventilation (IP23)
     - Shaft height 180 to 3000 r/min
     - Shaft height 225 to 2000 r/min
     - Shaft height 280 to 2800 r/min

Note

Ambient air

If the ambient air is polluted by particles of dust or similar substances, the preferred air flow direction is NDE → DE.

From shaft height 132 and higher, the motors with air flow direction NDE → DE are optionally available with an air filter (option G14).

Cleaning the cooling air ducts

On air-cooled motors, you must regularly clean the cooling air ducts through which the ambient air flows. The degree of pollution depends on the location of use. Clean the air cooling ducts, for example, with dry, oil-free compressed air.

Motors with pipe connection

1PH8 motors with "Forced ventilation" and shaft heights 180...280 can optionally be ordered with "pipe connection." The external fan, which is normally mounted as standard, is omitted in this version. A molded pipe connection replaces the external fan.

The diameter of the pipe connection is based on the standard DIN EN 1506 or DIN EN 13180. This means that commercially available pipes and molded parts for air-conditioning systems can be used.

Note

Minimum air flow and pressure drop

Pipes and external fans of suitable type and dimensioning must be installed and connected. The required minimum air flow and the pressure drop at the motor must be taken into account for the design and dimensioning.

Table 4-6 Diameter, minimum air flow and pressure drop

Shaft height mm	Diameter mm	Degree of protection	Minimum air quantity m^3/s	Pressure drop Pa
180	300	IP23	0.21	450
		IP55	0.17	550
225	350	IP23	0.33	600
		IP55	0.31	650
280	Adapter required	IP23	0.52	600
		IP55	0.42	600

4.1.3 Water cooling

⚠ WARNING

Defective work on the cooling circuit

Defective work on the cooling circuit can cause injury and/or damage to property.

- Only qualified personnel may assemble, install, and commission the cooling circuit.
- Perform installation or service work on the cooling circuit only when the system is de-energized.

The electrochemical processes that take place in a cooling system must be minimized by choosing the right materials. For this reason, mixed installations, i.e. a combination of different materials, such as copper, brass, iron, or halogenated plastic (PVC hoses and seals), should not be used or should be limited to the absolutely essential minimum.

There are 3 types of cooling circuits:

- Closed cooling circuit
- Semi-open cooling circuit
- Open cooling circuit

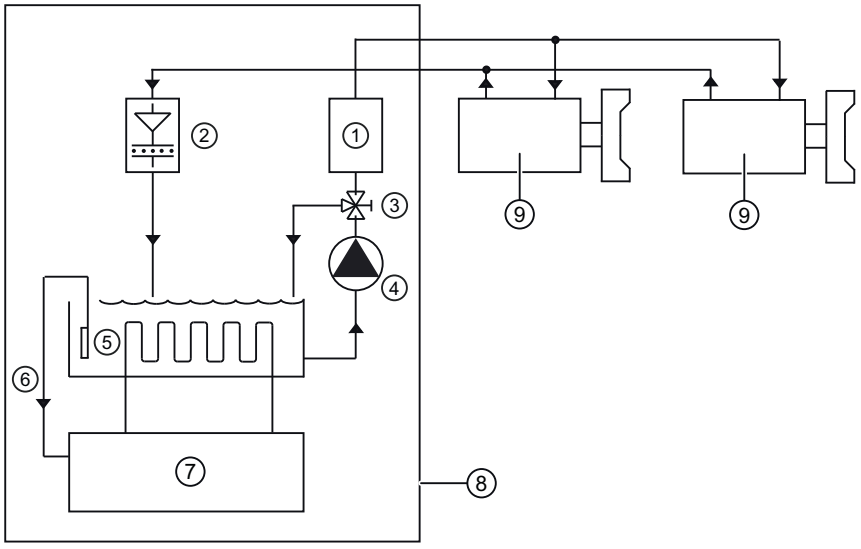
Table 4-7 Description of the various cooling circuits

Definition	Description
Closed cooling circuit	The pressure equalizing vessel is closed (oxygen cannot enter the system) and has a pressure relief valve. The coolant is only routed in the motors and converters as well as the components required to dissipate heat.
Semi-open cooling circuit	Oxygen can only enter the cooling system through the pressure equalization vessel, otherwise the same as "closed cooling circuit."
Open cooling circuit (tower system)	The coolant is cooled in a tower. In this case, there is intensive oxygen contact.

Note

Cooling circuits

Only closed and semi-open cooling circuits are permissible for motors. Converter systems must be connected before the motors in the cooling circuit.



1	Filter [1]	6	Temperature measurement cooling water
2	Flow meter [1]	7	Compressor / cooling unit
3	Pressure relief valve, setting valve flow rate [1]	8	Cooling unit
4	Pump	9	Motor
5	Cooling water tank		

[1] These components are not absolutely necessary.

Figure 4-1 Example of a semi-open cooling circuit

Equipotential bonding

Provide all components in the cooling system (motor, heat exchanger, piping system, pump, pressure equalization tank, etc.) with equipotential bonding. Implement the equipotential bonding using a copper rail or finely stranded copper cable with the appropriate conductor cross-sections.

Note

Installation of the cooling water pipes

Electrically conductive cooling water pipes must not come into contact with live components.

- Ensure adequate insulation.
- Securely fasten the pipe.

Materials used in the motor cooling circuit

The materials used in the cooling circuit must be coordinated with the materials in the motor.

Table 4-8 Materials used in the cooling circuit of the 1PH8 motor

Shaft height	Bearing shield	Pipes in the stator (designation)
80	Cast iron (EN-GJL-200)	Stainless steel
100	Cast iron (EN-GJL-200)	Stainless steel
132	Cast iron (EN-GJL-200)	Stainless steel
160	Cast iron (EN-GJL-200)	Stainless steel
180	-	Stainless steel (V4A)
225	-	Stainless steel (V4A)
280	-	Stainless steel (V4A)

Materials and components in the cooling circuit

The following table lists a wide variety of materials and components which may or may not be used in a cooling circuit.

Table 4-9 Materials and components of a cooling circuit

Material	Used as	Description
Zinc	Pipes, valves and fittings	Use is not permitted.
Brass	Pipes, valves and fittings	Can be used in closed circuits with inhibitor.
Copper	Pipes, valves and fittings	Can be used only in closed circuits with inhibitors in which the heat sink and copper component are separated (e.g. connection hose on devices).
Common steel (e.g. St37)	Pipes	Permissible in closed circuits and semi-open circuits with inhibitors or Antifrogen N, check for oxide formation, inspection window recommended.
Cast steel, cast iron	Pipes, motors	Closed circuit and use of strainers and flushback filters. Fe separator for stainless heat sink.
High-alloy steel, Group 1 (V2A)	Pipes, valves and fittings	Can be used for drinking or municipal water with a chloride content up to <250 ppm, suitable according to definition in Section "Coolant definition".
High-alloy steel, Group 2 (V4A)	Pipes, valves and fittings	Can be used for drinking or municipal water with a chloride content up to <500 ppm, suitable according to definition in Section "Coolant definition".
ABS (**A**crylnitrile**B**utadiene**S**tyrene)	Pipes, valves and fittings	Suitable according to the definition in Section "Coolant definition". Suitable for mixing with inhibitor and/or biocide as well as Antifrogen N.
Installation comprising different materials (mixed installation)	Pipes, valves and fittings	Use is not permitted.

Material	Used as	Description
PVC	Pipes, valves, fittings and hoses	Use is not permitted.
Hoses		Reduce the use of hoses to a minimum (device connection). Must not be used as the main pipe for the whole system. Recommendation: EPDM hoses with an electrical resistance > 10^9 Ω (e.g. Semperflex FKD supplied from Semperit or DEMITTEL; from PE/EPD, supplied from Telle).
Gaskets	Pipes, valves and fittings	Use of Viton, AFM34, EPDM is recommended.
Hose connections	Transition Hose - pipe	Secure with clips conforming to DIN 2817, available e.g. from the Telle company.

The following recommendation applies in order to achieve an optimum motor heatsink (enclosure) lifetime:

- Engineer a closed cooling circuit with cooling unit manufactured out of stainless steel that dissipates the heat through a water-water heat exchanger.
- All other components such as cooling circuit cables and fittings manufactured out of ABS, stainless steel or general construction steel.

Cooling system manufacturers

ait-deutschland GmbH	www.kkt-chillers.com
BKW Kälte-Wärme-Versorgungstechnik GmbH	www.bkw-kuema.de
DELTATHERM Hirmer GmbH	www.deltatherm.de
Glen Dimplex Deutschland GmbH	www.dimplex.de
Helmut Schimpke und Team Industriekühlanlagen GmbH + Co. KG	www.schimpke.org
Hydac System GmbH	www.hydac.com
Hyfra Industriekühlanlagen GmbH	www.hyfra.com
Pfannenberg GmbH	www.pfannenberg.com

Note

Other manufacturers

You can also use equivalent products from other manufacturers.

Responsibility for the properties of third-party products resides with the plant manufacturer.

Consider the following pressure conditions when designing the cooling circuit.

Permissible pressure

- Define the working pressure based on the flow conditions in the supply and return pipes of the cooling circuit.

The maximum permitted pressure in the cooling circuit is 0.6 MPa (6 bar).

Note

If you use a pump that reaches a higher pressure, maintain a maximum pressure of 0.6 MPa by taking appropriate measures (pressure relief valve, pressure control, etc.).

- Design the cooling circuit to have the smallest possible pressure difference between the supply and return pipes so that pumps with a shallow characteristic curve can be used.
- Design the cooling circuit with a self-cleaning filter to avoid blockage and corrosion.

Pressure drop in the motor

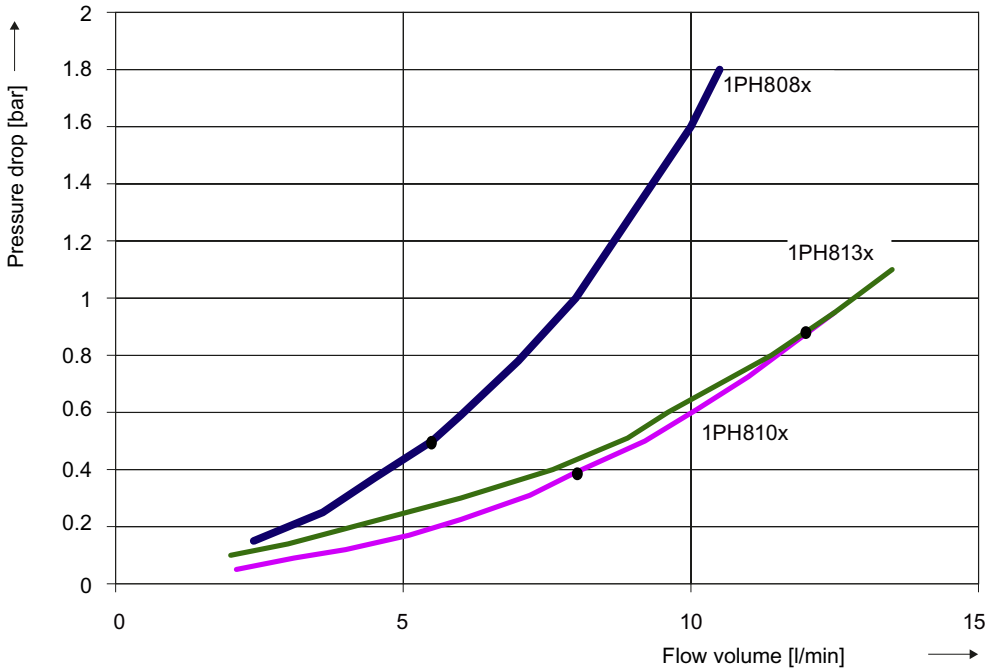


Figure 4-2 Pressure drop in the cooling pipe system, shaft heights 80 to 132

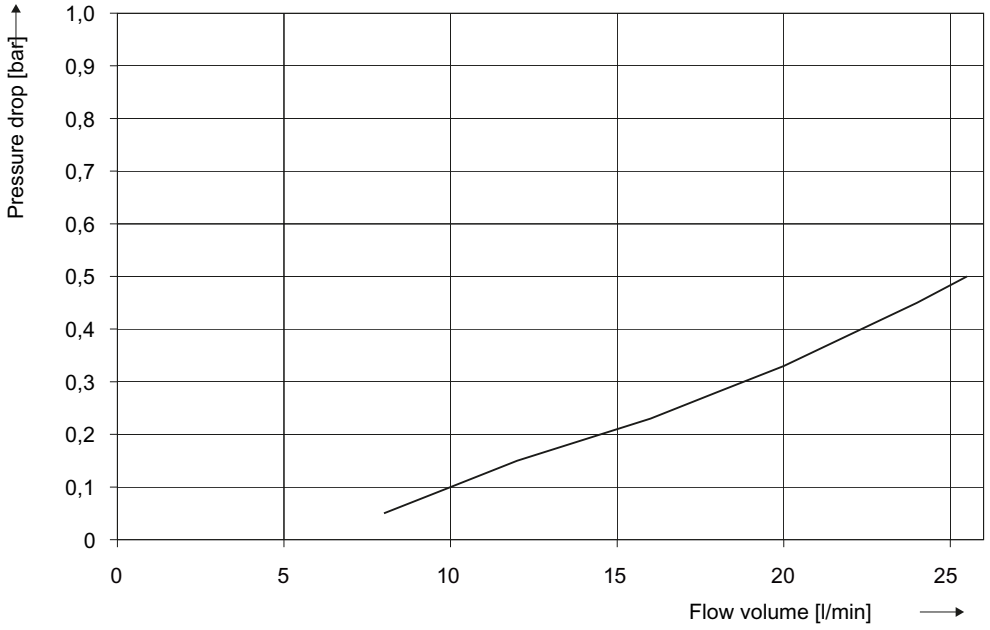


Figure 4-3 Pressure drop in the cooling pipe system, shaft height 160

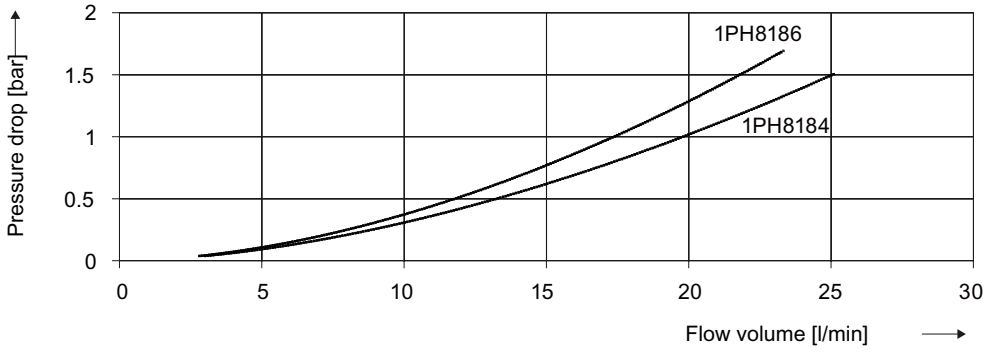


Figure 4-4 Pressure drop in the cooling pipe system, shaft height 180

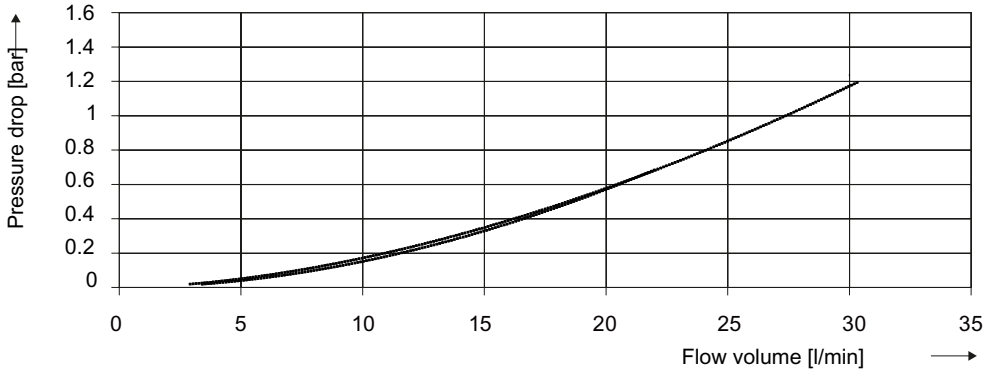


Figure 4-5 Pressure drop in the cooling pipe system, shaft height 225

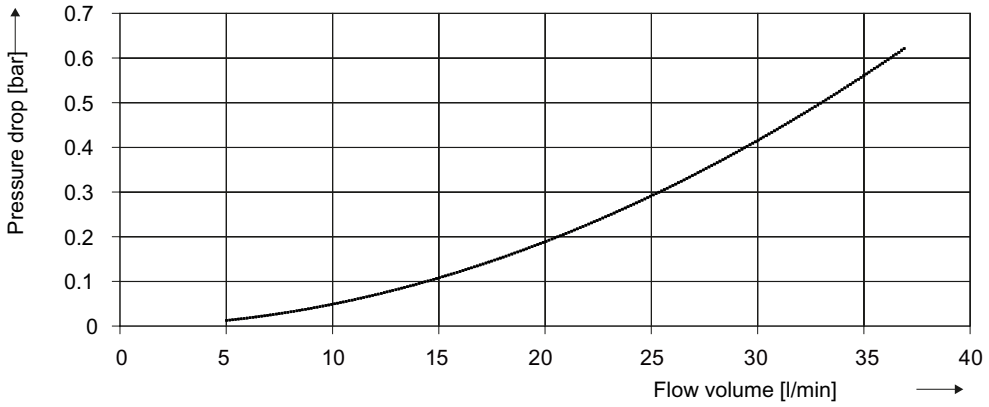


Figure 4-6 Pressure drop in the cooling pipe system, shaft height 280

Note

Ensuring adequate cooling

To ensure adequate cooling, comply with the minimum flow rates specified under Point "Cooling data and sound pressure levels".

Pressure equalization

If various components are connected up in the cooling circuit, it may be necessary to provide pressure equalization.

Note

Arrangement of the reactor element

Flow restrictors must be mounted on the cooling water outlet of the motor or the relevant component!

Avoiding cavitation

During uninterrupted duty, the pressure drop across a converter or motor must not exceed 0.2 MPa (2 bar). Otherwise, the high flow rate results in damage due to cavitation and/or abrasion.

Connecting motors in series

For the following reasons, Siemens only conditionally recommends connecting motors in series:

- The required flow rates of the motors must be approximately the same (< a factor of 2)
- An increase in the cooling water temperature can result in having to derate the second or third motor if the maximum cooling water inlet temperature is exceeded.

Cooling water inlet temperature

Note

Cooling water inlet temperature

Select the cooling water inlet temperature so that condensation does not form on the surface of the motor.

Cooling water temperatures which are lower than the ambient temperature tend to result in increased water condensation. The difference between the cooling water inlet temperature and the ambient temperature depends on the relative air humidity. For instance, 50 % air humidity at an ambient temperature of 40 °C corresponds to a temperature difference of 10 K:
$T_{cool} > T_{ambient}$ – temperature difference

Please note that you must also shut off the flow of cooling water when the motor is not operational for prolonged periods of time.

The motors are designed for operation up to a cooling water inlet temperature of +30 °C, provided that all of the specified motor data is complied with. If the cooling water inlet temperature deviates from this, the continuous torque will change (see table "Derating factors").

Table 4-10 Derating factors

Installation altitude above sea level	Cooling water inlet temperature			
m	≤ 30 °C	35 °C	40 °C	45 °C
1000	1.00	0.95	0.90	0.84
1500	0.97	0.92	0.87	0.81
2000	0.93	0.88	0.84	0.78
2500	0.91	0.86	0.82	0.76
3000	0.89	0.85	0.80	0.75
3500	0.87	0.83	0.78	0.73
4000	0.85	0.81	0.77	0.71

Cooling data and sound pressure levels

The specified values refer to operation at the rated speed with rated torque. The cooling water temperature must be ≤ 30° C.

Table 4-11 Cooling data and sound pressure levels

Shaft height	Flow rate, min. l/min	Pressure drop bar	Sound pressure level L_{pA} (1 m) Motor rated load, tolerance +3 dB dB	Thread connection at NDE Inch
80	6	0.6	68 [1]	G 1/8
100	8	0.4		G 1/4
132	12	0.9		G 3/8
160	15	0.2	69 [1]	G1/2

Shaft height	Flow rate, min. l/min	Pressure drop bar	Sound pressure level L_{pA} (1 m) Motor rated load, tolerance +3 dB dB	Thread connection at NDE Inch
180 (1PH8184)	15	0.6	70 [2]	G 3/8
180 (1PH8186)	15	0.7		G3/8
225 (1PH822.-1) (asynchronous)	20	0.6		G 3/8
225 (1PH822.-2) (synchronous)	25	0.9	70 [3]	G 3/8
280	35	0.6	72 [3]	G 1/2

1) For a rated pulse frequency of 4 kHz and speed range up to 5000 r/min

2) For a rated pulse frequency of 2 kHz or 4 kHz and speed ranges for
SH 180 of up to 5000 r/min
SH 225 up to 4500 r/min

3) For a rated pulse frequency of 2 kHz and speed ranges for
SH 225 of up to 4500 per r/min
SH 280 up to 3300 r/min

Heat loss to be dissipated

The values for the heat loss to be dissipated are specified according to the rated point in Chapter "Technical tables and characteristics."

Water specification

Cooling water quality

The values specified for the cooling water correspond to the requirements for a closed cooling circuit. Not all specified concentrations will occur in the cooling water at the same time.

A filter can be used to ensure smooth operation. The grade of filtration should be no less than 100 µm.

Cooling water inlet temperature

The maximum cooling water inlet temperature is 30 °C (86 °F)

Cooling water specifications

Table 4-12 Cooling water specifications (SH 80 to 160)

Component	Quality of the water used as coolant for motors with stainless steel pipes + cast iron or steel jacket
pH value	6 ... 9
Total hardness	< 170 ppm
Electrical conductivity	< 500 µS/cm
Chloride ions	< 40 ppm, can be achieved by adding deionized water.
Sulfate ions	< 50 ppm

Component	Quality of the water used as coolant for motors with stainless steel pipes + cast iron or steel jacket
Nitrate ions	< 50 ppm
Dissolved solids	< 340 ppm
Maximum particle size	< 100 µm
Operating pressure	< max. 6 bar
Pressure drop at V(N)	< 1 bar
Inlet temperature	< 30 °C
Anti-freeze protection / corrosion protection	20 ... 30 %
NALCO 00GE056 inhibitor	0.2 ... 0.25%

Table 4-13 Cooling water specifications (SH 180 to 280)

Component	Quality of the water used as coolant for motors with stainless steel pipes
pH value	6 ... 9
Total hardness	< 170 ppm
Electrical conductivity	< 2000 µS/cm
Chloride ions	< 250 ppm, can be obtained by adding deionized water.
Sulfate ions	< 240 ppm
Nitrate ions	< 50 ppm
Dissolved solids	< 340 ppm
Maximum particle size	< 100 µm
Operating pressure	< max. 6 bar
Pressure drop at V(N)	< 1 bar
Inlet temperature	< 30 °C
Anti-freeze protection / corrosion protection	20 ... 30 %
NALCO 00GE056 inhibitor	0.2 ... 0.25%

Note

Deionized water (for Cooling water specifications tables)

We recommend using deionized water with reduced conductivity (5 ... 10 µS/cm). If necessary, ask your water utility to provide the values. According to 98/83/EC, drinking water may contain up to 2500 ppm of chloride!

Manufacturers of chemical additives can provide support when analyzing the water that is available on the plant side.

Note

Inhibitor (for Cooling water specifications tables)

The inhibitor is not required if it ensured that the concentration of Antifrogen N is > 20%.

Derating is required for an anti-freeze content of > 30%

Biocide

The risk of corrosion caused by microbes is virtually non-existent in chlorinated drinking water systems.

Closed cooling circuits with soft water are susceptible to microbes.

The following types of microbes are encountered in practice:

- Slime-forming bacteria
- Corrosive bacteria
- Iron-depositing bacteria

The suitability of a biocide depends on the type of microbe.

- Analyze the cooling water for microbes at least once a year.

Necessary biocides can be obtained from the manufacturer, e.g. Nalco. Ask the manufacturer for compatibility with an inhibitor used in your system.

- Dose the biocide as recommended by the manufacturer.

Antifrogen N already acts like a biocide at the minimum concentration of > 20%.

Note

Compatibility of coolant additives

Biocides and Antifrogen N must not be mixed.

There are other manufacturers of chemical additives in the market. You can use equivalent products from other manufacturers. Have the suitability of the third-party products determined.

Other coolants (not water-based)

If you use different cooling media (e.g. oil, cooling lubricant), derating may be necessary in order to comply with the thermal motor limit.

Note

Derating when using other cooling lubricants

Derating is required for water-oil mixtures with more than 10% oil.

To determine the derating, you need the following values of the coolant at a temperature of 30 °C:

Density	ρ / kg/m³
Specific thermal capacitance	c_ρ / J/(kg•K)
Thermal conductivity	λ / W/(K•m)
Kinematic viscosity	v / m²/s
Flow rate	V / l/min

The required derating can be obtained from Technical support.

Please send your enquiry to Technical support.

Manufacturers of chemical additives

Tyforop Chemie GmbH	http://www.tyfo.de
Clariant Produkte Deutschland GmbH (Antifrogen)	https://www.clariant.com
Cimcool Industrial Products Inc	http://www.cimcool.net
FUCHS PETROLUB SE	http://www.fuchs.com
Hebro Chemie GmbH	http://www.hebro-chemie.de
HOUGHTON Deutschland GmbH	http://www.houghton.com
Nalco Water in Germany (Ecolab)	http://www.nalco.com
Schweitzer-Chemie GmbH	http://www.schweitzer-chemie.de

Information regarding third-party products

Note

Recommendation relating to third-party products

This document contains recommendations relating to third-party products. Siemens accepts the fundamental suitability of these third-party products.

You can use equivalent products from other manufacturers.

Siemens does not accept any warranty for the properties of third-party products.

Maintenance and service

Check the level and discoloration or turbidity of the cooling water at least once a year. In addition, every year carefully check as to whether the cooling water still has the permissible specification.

If cooling water has been lost, refill with a previously prepared mixture of deionized water and inhibitor or Antifrogen N.

The motor is connected to the cooling circuit by means of two female threads on the rear of the motor. Which one is the inlet and which one is the outlet can be freely connected.

Coolant connection: See table "Cooling data and sound pressure levels"

The units should be connected with hoses to provide mechanical decoupling (refer to the table "Materials and components of a cooling circuit").

Commissioning

When required, before connecting the motors and converters to the cooling circuit, the pipes should be flushed in order to avoid dirt entering the motors and converters.

After the units have been installed in the plant, the coolant circuit must be commissioned before the electrical systems.

4.2 Degree of protection

Degree of protection designation

The degree of protection designation in accordance with EN 60034-5 (IEC 60034-5) is described using the letters "IP" and two digits (e.g. IP64).

IP = International Protection
1st digit = protection against the ingress of foreign bodies
2nd digit = protection against water

When assigning motors to a specific degree of protection class, a standardized, brief test procedure is applied. This can deviate significantly from the actual ambient conditions where the motor is installed.

Attention must be paid to providing suitable sealing of the motor shaft for the selected degree of protection for the motor.

Note

Suitability of the motor depending on the ambient conditions

Depending on these ambient conditions - such as the chemical properties of dusts or the cooling media used at the installation site - it is only conditionally possible to evaluate the suitability of the motor for the particular environment using the degree of protection (e.g. electrically conductive dusts or aggressive coolant vapors or liquids).

In these cases, the motor must be additionally protected using the appropriate measures.

Note

Liquids that have collected and/or oil jets

Liquid must be prevented from collecting on the motor shaft as well as jets of oil (or are not permissible at all) - even for versions with radial shaft sealing ring.

Degrees of protection

The degrees of protection which are available for the 1PH8 motor series are listed in the following table.

Table 4-14 Description of degrees of protection

Motor	Degree of protection	1st code number		2nd code number
		Touch protection	**Protection against ingress of solid foreign bodies**	
Forced ventilation (open-circuit ventilation)	IP23	Protection against finger contact	Protection against medium-sized, solid foreign bodies above 12 mm ∅	Protection against spray water up to 60° from the vertical
Forced ventilation (surface cooling)	IP55	Full protection against contact	Protection against damaging dust deposits	Splashwater from any direction
Water cooling	IP65	Full protection against contact	Protection against dust	Splashwater from any direction

Note

Routing cables in humid/moist environments

If the motor is mounted in a humid environment, the power and signal cables must be routed as shown in the following figure.

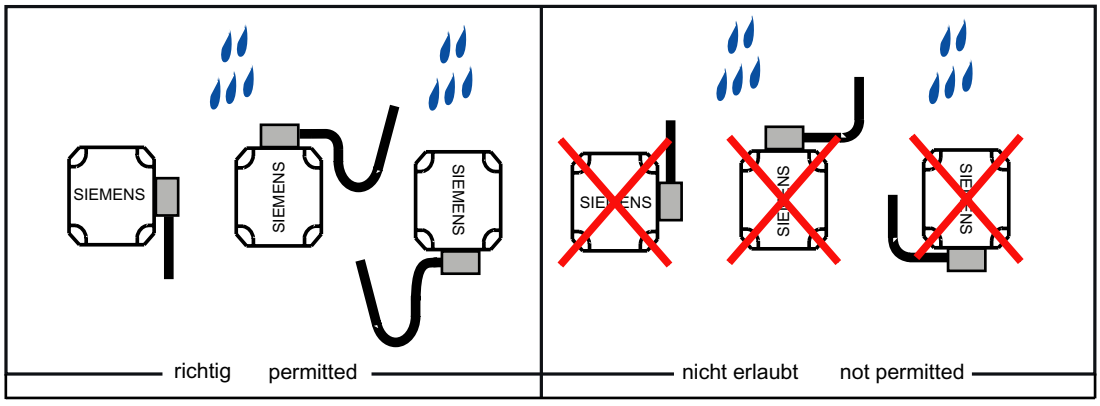
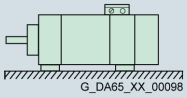
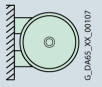
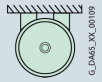
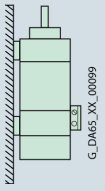
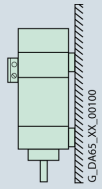
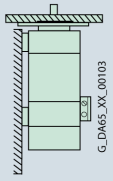
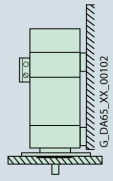
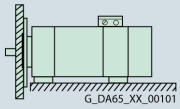
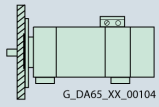
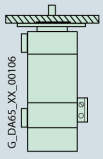
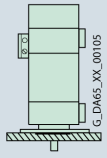


Figure 4-7 Principle of cable routing in a wet/moist environment

4.3 Construction types

For correct motor selection, the following types of construction according to EN 60034-7 (IEC 60034-7) apply:

Types of construction/Mounting positions	Types of construction/Mounting positions
IM B3	**IM B6**
	
IM B7	**IM B8**
	
IM V6	**IM V5**
	
IM V35 [1]	**IM V15** [1]
	
IM B35 [1]	**IM B5, IM B 14**
	
IM V3, IM V19	**IM V1, IM V18**
	

1) Fixing on the flange and feet is necessary.

Figure 4-8 Types of construction

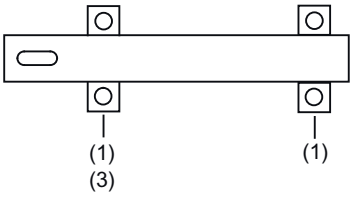
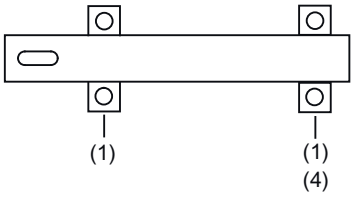
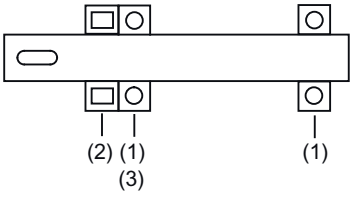
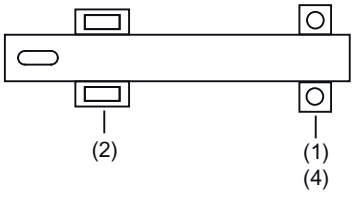
You will find the available types of construction in Chapter "Selection and ordering data."

4.4 Types of bearing

4.4.1 Drive output types and bearing versions

1PH8 motors are suitable for coupling output and belt coupling. The bearing versions and their applications are summarized in the following table.

Table 4-15 Drive output type with the appropriate bearing design

Application	Bearing version	
• Coupling output • Planetary gearboxes, low radial forces	SH 80 to 160 	SH 180 to 280 
• Belt coupling with normal radial force • Pinion output with straight teeth • Belt coupling with increased radial force	SH 100 to 160 	SH 180 to 280 

1) Deep-groove ball bearing

2) Cylindrical-roller bearings (only in versions for increased radial forces - 14th data position = E or F)

3) For the bearing version G or H as a floating bearing (as for 1PH7); all other bearing types have a location bearing at the drive end - 14th data position = A, B, C, D, F, L, M, P, Q, or N

4) Version as a location bearing

Bearing version, maximum speed and bearing change intervals

Table 4-16 Bearing version, maximum speed and bearing change intervals

Shaft height	Bearing design	Maximum speed n_{max} r/min	Average operating speed n_m r/min	Statistical bearing service life L_{10h} h	Recommended bearing replacement interval t_{LW} h		Bearing type for condition monitoring	
					Permanently lubricated	Relubrication	DE	NDE
80	Standard with locating bearing	10,000	≤ 8000	20,000	20,000	-	62207	62207
	Standard	10,000	≤ 6000	20,000	20,000	-	6207	6207
	Performance	15,000	≤ 11,500	12,000	12,000	-	62207	62207
	High Performance	20,000	≤ 13,000	12,000	12,000	-	62207	62207
	Advanced Lifetime	5000	≤ 3500	40,000	40,000	-	62207	62207
100	Standard with locating bearing	9000	≤ 7000	20,000	20,000	-	6308	62208
	Standard	9000	≤ 5000	20,000	20,000	-	6308	6208
	Performance	12,000	≤ 10,500	12,000	12,000	-	62208	62208
	High Performance	18,000	≤ 11,500	12,000	12,000	-	62208	62208
	Advanced Lifetime	5000	≤ 3000	40,000	40,000	-	62210	62208
	Increased radial forces	7000	≤ 2300	20,000	20,000	-	NU208 radial. 6208 axial	62208
132	Standard with locating bearing	8000	≤ 6500	20,000	20,000	-	6310	62210
	Standard	8000	≤ 4500	20,000	20,000	-	6310	6210
	Performance	10,000	≤ 8500	12,000	12,000	-	62210	62210
	High Performance	15,000	≤ 10,000	12,000	12,000	-	62210	62210
	Advanced Lifetime	4500	≤ 2500	40,000	40,000	-	62212	62210
	Increased radial forces	6500	≤ 1800	20,000	20,000	-	NU210 radial. 6210 axial	62210

Shaft height	Bearing design	Maximum speed n_{max} r/min	Average operating speed n_m r/min	Statistical bearing service life L_{10h} h	Recommended bearing replacement interval t_{LW} h		Bearing type for condition monitoring	
					Permanently lubricated	Relubrication	DE	NDE
160	Standard with locating bearing	6500	≤ 5400	20,000	20,000	-	6312	62212
	Standard	6500	≤ 3500	20,000	20,000	-	6312	6212
	Performance	9000	≤ 7000	12,000	12,000	-	62212	62212
	High Performance	10,000	≤ 8000	12,000	12,000	-	62212	62212
	Advanced Lifetime	4000	≤ 2300	40,000	40,000	-	62215	62212
	Increased radial forces	5300	≤ 1500	16,000	16,000	-	NU212 radial. 6212 axial	62212
180	Standard with locating bearing	5000 (3000)[2]	≤ 2000	40,000 (24,000)[1]	20,000	40,000 (24,000)[1]	6214-C3	6214-C3
	Increased radial forces	5000 (3000)[2]	≤ 2000	20,000 (12,000)[1]	12,000	20,000 (12,000)[1]	NU2214-ECP	6214-C3
	Performance	7500	≤ 5000	20,000	12,000	20,000	6214-M/C3	6214-M/C3
225	Standard with locating bearing	4500 (2500)[2]	≤ 1800	40,000 (24,000)[1]	20,000	40,000 (24,000)[1]	6216-C3	6216-C3 (insulated)
	Increased radial forces	4500 (2500)[2]	≤ 1800	20,000 (12,000)[1]	12,000	20,000 (12,000)[1]	NU2216-ECP	6216-C3 (insulated)
	Performance	6000	≤ 4000	20,000	12,000	20,000	6216-C3	6216-C3 (insulated)
280	Standard with locating bearing	3300 (2000)[2]	≤ 1500	40,000 (24,000)[1]	20,000	40,000 (24,000)[1]	6220-C3	6220-C3 (insulated)
	Increased radial forces	3300 (2000)[2]	≤ 1500	20,000 (12,000)[1]	12,000	20,000 (12,000)[1]	NU220-C3	6220-C3 (insulated)

[1] When vertically mounted

[2] For types of construction IM V3, IM B5, and IM V1

You can calculate the average operating speed n_m for alternating bearing load by the following formula:

$$n_m = \frac{n_1 t_1 + n_2 t_2 + \ldots n_i t_i}{100}$$

Formula symbol	Unit	Description
$t_1 \ldots t_n$	%	Time percentage of the bearing load
$n_1 \ldots n_n$	r/min	Operating speed

You therefore calculate an average speed from the different speeds according to their time percentages.

Table 4-17 Recommended bearing change intervals at maximum speed

Shaft height	Bearing version	Maximum speed n_{max} r/min	Statistical bearing service life L_{10h} h	Recommended bearing replacement interval t_{LW} h	
				Permanent lubrication	Relubrication
80	Performance	15,000	8000	8000	-
	High Performance	20,000	8000	8000	-
100	Performance	12,000	8000	8000	-
	High Performance	18,000	8000	8000	-
132	Performance	10,000	8000	8000	-
	High Performance	15,000	8000	8000	-
160	Performance	9000	8000	8000	-
	High Performance	10,000	8000	8000	-

Table 4-18 "Premium Performance" bearing version, maximum speed and bearing change intervals

Shaft height	Maximum speed n_{max} r/min	Average operating speed n_m r/min	Recommended bearing replacement interval t_{LW} h	
			with sealing air (Option Q12)	without sealing air
80	24,000	< 16,000	12,000	
		< 19,200*	10,000	8000
			7205	
		24,000	7000	4000

Speed backlash with:

t1 = 10 min, n1 = 0

t2 = 30 min, n2 = 16,000 r/min

t3 = 60 min, n3 = 24,000 r/min

Note

Difficult operating conditions in operation at n_{max}

Under difficult operating conditions, the bearing replacement intervals t_{LW} are reduced by up to 50 %.

Difficult operating conditions include

- large vibrations and shocks
- frequent reversing operation

Note

Reduced maximum motor speeds

The maximum speeds might be reduced on motors with integrated encoder as a result of mechanical conditions or limitations imposed by signal conditioning capacity.

The reduced maximum speeds can be found in the table "Encoder types for motors with DRIVE-CLiQ" in Chapter Encoder assignment as a function of maximum permissible speeds (Page 164).

Note

Permanently switching on the sealing air

For the "Premium Performance" bearing version, Siemens recommends that the sealing air be permanently switched on during continuous operation at n_{max}. Sealing air connection and conditioning are described in Chapter "Sealing air connection (option Q12) (Page 173)."

4.4.2 Bearing lifetime

The bearing lifetime is limited by material fatigue (fatigue service life) and/or lubrication failure (grease service life). The fatigue lifetime (statistical bearing lifetime L_{10h}) mainly depends the mechanical load. The correlation is shown in the radial force/axial force diagrams. The values are determined according to DIN/ISO 281.

The grease lifetime is mainly dependent on the bearing size, speed, temperature as well as the vibrational load.

The grease lifetime can be extended by especially favorable operating conditions (low or average speed, low bearing temperatures, low radial force or vibration load).

A reduction of the grease lifetime can be expected for difficult operating conditions and when motors are mounted vertically.

Lifetime lubrication (without relubrication)

Note

For lifetime lubrication, the grease lifetime is harmonized with the bearing lifetime L_{10h}.

Bearing change interval (t_{LW})

The recommended bearing change intervals are obtained from the inter-dependencies mentioned above for a specific operating point such as:

- Coupling output or belt coupling
- Coolant temperature up to max. +40 °C (forced ventilation)
- Cooling water inlet temperature up to max. +30 °C (water cooling)
- Complying with the permissible radial and axial forces (refer to Chapter "Radial and axial forces")

- Complying with the maximum permissible speeds (refer to Chapter "Technical data and characteristics")
- The bearing change intervals are reduced for unfavorable operating conditions, for example
  - average speed > than the value specified in Table 4-16
  - continuous operation at n_{max}
  - Vibration and shock load
  - Frequent reversing operation

Note

Replacing the motor bearings

When replacing the motor bearings, we also recommend that encoders with their own bearings are also replaced.

The fatigue life and the grease consumption time are calculated, statistical values and cannot be warranted.

Note

Axial bearing loads for vertical mounting

The increased axial loads imposed on the bearings on vertically mounted motors can reduce the bearing lifetime by almost 50%. This applies to shaft heights 180 to 280 due to the rotor weights.

Relubrication

In motors that can be relubricated, the bearing life can be extended by complying with fixed relubrication intervals.

Depending on the frame size, some restrictions have to be taken into account - e.g. vertical mounting/shaft position.

It is possible to relubricate motors, shaft heights 180 and 225. A lubricating nipple is optionally provided, Code K40.

Relubrication intervals

Relubrication intervals are specified:

- on the lubrication plate of the motor
- in the table "Relubrication intervals"

Note

Longer time periods between delivering and commissioning the motor

For longer periods of time (e.g. longer than 1 relubrication interval) between shipping and commissioning the motor, the bearings must be lubricated. When relubricating, the shaft must be rotated in order to distribute the grease around the bearings (for additional information, see the Operating Instructions).

The values specified in the table below apply to the same conditions as are described above for bearing change intervals:

Table 4-19 Relubrication intervals

Shaft height	Bearing version	Relubrication interval in operating hours[4] h	Quantity of grease for each relubrication operation[1] g	Grease chamber[2] g	Possible number of relubrication intervals[3]
180	Standard	7000	15	80	5
	Increased radial forces	4000	20	80	4
	Performance	4000	15	80	5
225	Standard	7000	30	180	6
	Increased radial forces	4000	40	180	4
	Performance	4000	30	180	6
280	Standard	7000	40	400	10
	Increased radial forces	4000	50	400	8

1) Grease quantity for relubrication for normal conditions (ambient temperature up to 40°C, horizontal mounting.

2) Holding capacity of the grease chamber with precise adherence to the grease quantity for each relubrication interval.

3) Calculated number of re-lubricating intervals; the bearing lifetime is specified statistically by means of the L_{10h} definition.

4) Relubricating intervals must be halved for vertically mounted units.

Note

Adapting relubricating intervals

Unfavorable factors such as the effects of mounting/installation, speed or mechanical loads require that the relubricating intervals are appropriately adapted. Situations such as these require special consideration or must be calculated - and must be engineered according to the limitations and constraints together with the responsible motor plant.

The increased axial loads imposed on the bearings on vertically mounted motors can reduce the bearing lifetime by almost 50%. This applies to shaft heights 180 to 280 due to the rotor weights.

A check which takes into account the relevant boundary conditions must be performed on SH 280 in the relevant motor factory.

4.4.3 NDE bearing with insulated shaft (option L27)

Relevant, additional bearing currents

When compared to a pure sinusoidal supply, the pulsed output voltage of a frequency converter results in additional motor bearing currents. The relevant additional bearing currents are:

- Circulating currents
- EDM currents
- Rotor ground currents

Factors that influence bearing currents

Above a certain magnitude, bearing currents result in localized melting at the bearing rings and rolling assemblies as well as lubricant wear. This reduces the bearing lifetime. Essential influencing factors include:

- Motor speed and associated operating time
- Pulse frequency of the frequency converter
- Grounding relationships between the motor and the connected load

Application for option L27

At speeds 500 r/min, the load due to bearing currents increases significantly. Option L27 is always required if the motor is operated in the speed range between 0 ... 500 r/min for a longer period of time. Without option L27, the total operating time in the speed range 0 ... 500 r/min may be a maximum of 800 h (for an assumed bearing change interval (t_{LW}) of the bearings of 20,000 h).

Table 4-20 Measures that are required for operation in the speed range < 500 r/min

Shaft height	Bearing change interval (t_{LW}) for lifetime lubrication h [1)]	Options that are required	Comment
80 - 160	20,000	-	Due to the experience from the field (in practice) no dangers have been identified due to bearing currents
180		L27	NDE bearing with insulated shaft
225		-	Always NDE bearing with insulated shaft
280		-	Always NDE bearing with insulated shaft

1) Definition, refer to the table "Recommended bearing change intervals"

Motor grounding

In order to avoid rotor ground currents, the motor frame should be well grounded - e.g. by using shielded motor cables. The motor cable shield should be connected at both ends through the largest possible surface area.

For specific applications, the grounding of the motor Z_{hg} can be more unfavorable than the grounding of the connected loads Z_{rg}, e.g. for long motor cables and when the motor is mounted in an insulated fashion. In this case, the capacitive discharge (leakage) current of the motor flows from the motor frame through the motor shaft to the connected load and from there to ground.

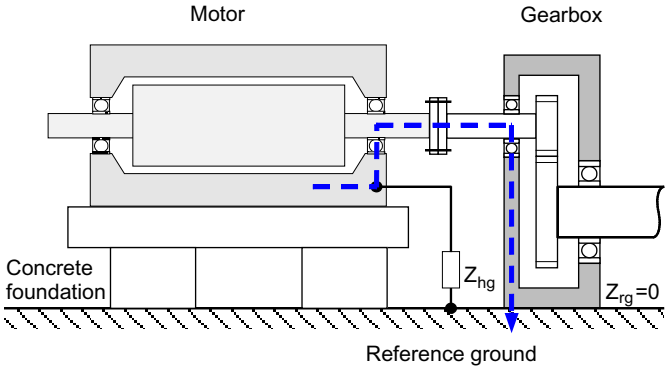


Figure 4-9 Bearing current due to the grounding situation (=rotor ground current)

The rotor ground current should be avoided by using an electrically insulating coupling. If such a coupling cannot be used for mechanical reasons, then the motor frame must be connected to the load through the largest possible surface area. The capacitive discharge (leakage) current then flows from the motor frame to the load and not through the bearings. The connection between the motor frame and load is only effective if it represents an extremely low impedance for the high-frequency discharge (leakage) current. To achieve this, use several flat straps, e.g. grounding straps, metal plates.

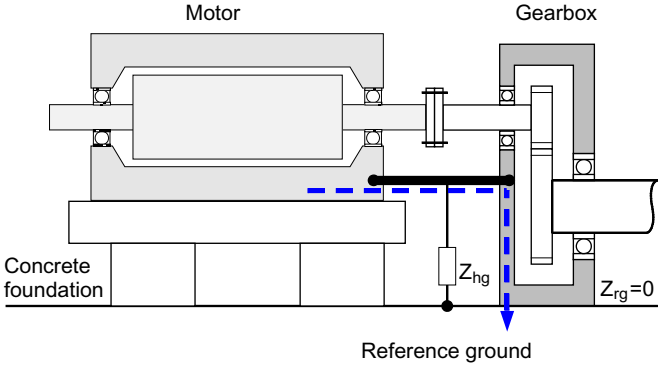


Figure 4-10 Connection between the motor frame and load to avoid rotor ground currents

4.5 Shaft end

The DE shaft end is cylindrical in accordance with DIN 748 Part 3 (IEC 60072-1).

4.6 Mounting of rotating unions on 1PH8 hollow-shaft motors

General information

1PH8 main motors with a hollow shaft (13th position in the Article No.: " 3 ") are designed as main spindle motors for machine tools and machining centers with internal tool cooling. A rotating union is required for the provision of the coolant in the rotating motor shaft. A rotor-supported or, for a motor ordered with option Y64, a bearingless, frame-supported rotating union can be mounted on the NDE shaft extension. In addition to coolant, suitable rotating unions can also transfer oil mist (minimum quantity lubrication), cutting oils or even compressed air at standstill.

Rotor-supported rotating unions consist of the following components:

- Rotor with bearing
- Stator
- Enclosure with cable connections
- Floating-ring shaft seal

Rotor-supported rotating unions are easy to fit and change. They are screwed into the motor shaft via the thread on the rotor. The advantage of these rotating unions is the leading off of the leakage via the housing and the integrated leakage connection.

Bearingless, frame-supported rotating unions are made up of two separate parts, the rotating part with a mechanical seal and the static part with a mechanical seal and supply connection. By eliminating the bearings, higher speeds can be achieved and the rotating union is less sensitive to vibrations and lateral loads. However, an adapter such as is described in Ch. "Suggestion for an adapter for bearingless, frame-supported rotating unions" for installing the rotating union is required.
Installation must be performed very carefully because the sealing surfaces of the mechanical seal are not protected.

The rotating part is bolted into the NDE end of the motor shaft. The static part is mounted on the encoder cover of the motor via an adapter. The adapter must include a facility for draining leakage. The adapter must be designed in such a way that the motor is not flooded by the leakage and the degree of protection of the motor is complied with. It may be necessary to use sealing air.

For use of a bearingless rotating union, the motor must be ordered with option Y64 and the interface on the encoder cover must be located concentrically with respect to the shaft. The mounting conditions stated by the manufacturer of the rotating union must be met.

Depending on the type of rotating unions, the sealing rings may be permanently or temporarily in contact.

Example of a closed seal: DEUBLIN series 1116 and 1108

Example of an opening seal: DEUBLIN series 902 and 1109

With opening seals, the sealing surfaces are separated when there is no coolant pressure, e.g. during a tool change. In this case, coolant runs out of the supply line and out of the motor shaft through the opened seal. This leakage and also the leakage due to wear of the sealing rings must be guided away via the leakage lines.

NOTICE

Motor failure due to incorrectly mounted leakage line

If the leakage line does not lead downward, the leakage can flood the rotating union and the motor. This can result in failure of the rotating union and motor.

To ensure the leakage is led away, the leakage line must always lead downward so that nothing can flow back.

- When mounting, ensure that the leakage line always leads downward.

NOTICE

Axial forces due to coolant pressure

Coolant under high pressure (usually 40 to 90 bar) flows via the mounted rotating union through the sequence of holes in the drive train:

- Rotating union
- Motor
- Spindle
- Tool.

Due to the different hole diameters and the gap, different cross sections (areas) occur along the coolant flow, which can produce axial forces due to the coolant pressure. These can be 4 to 12.7 N/mm^2, depending on the coolant pressure.

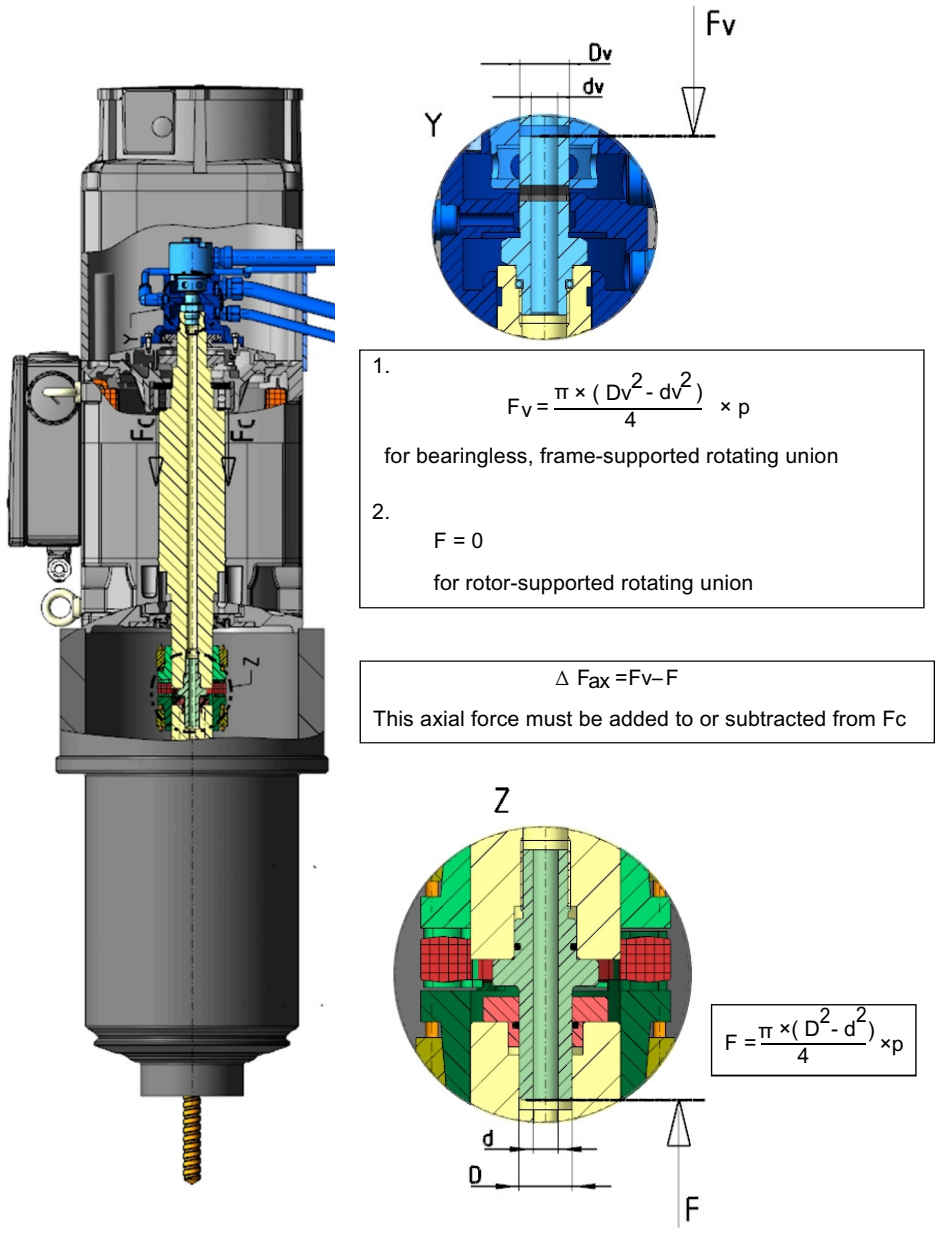


Figure 4-11 Mounting the rotating union

Figure "Mounting the rotating union," illustrates how an axial force arises due to joint pressure, for example, in the gap between the motor shaft (hole bolt) and the spindle shaft. This acts upon the motor shaft against the bearing preloading force F_c. This reduces or even eliminates the preloading force of the motor bearing.
For bearingless, frame-supported rotating unions, axial forces can also arise depending on the internal differing hole diameters. These act against the forces from the joint, so they have a smaller effect on the bearing preloading force. Ensure that the axial forces from the rotating union are greater than those from the joint (see case 1 in the graphic). This has the advantage that the bearing preloading force remains unchanged. The bearing preloading force is important for non-slip running of the motor bearing and must not be eliminated.

This advantage does not apply to rotor-supported rotating unions. It is important to ensure that the preloading force of the motor bearing is not eliminated (see figure "Mounting the rotating union" case 2). The axial force toward the motor must not be in the interval F_{AZ} = F_c +/- 25% for horizontally mounted motors and F_{AZ} = (F_c +/-25%) + FL for vertically mounted motors with the shaft extension pointing downward. For maximum permissible axial forces at the shaft extension, the specifications stated in Chapter "Radial and axial forces" apply. The axial forces that act in the rotating union must be requested from the manufacturer.

Hollow shaft version

Table 4-21 Hollow shaft version

	1PH808□	**1PH810□ ... 1PH816□**
Thread on DE	M12 x 1.25-RH	M16 x 1.5-RH
Centering on DE	∅16H7	∅20H7
Thread on NDE	M12 x 1.25-LH	M16 x 1.5-LH
Centering on NDE	∅14 +0.008/+0.001	∅18 +0.007/-0.003
Through-hole	∅8	∅11.5
Key surface NDE	SW19	SW27

4.6.1 Rotor-supported rotating union

NOTICE
Leaks in the rotating union If there are leaks in the rotating union and the hoses, the motor may be flooded and fail! • Avoid leaks in the rotating union.

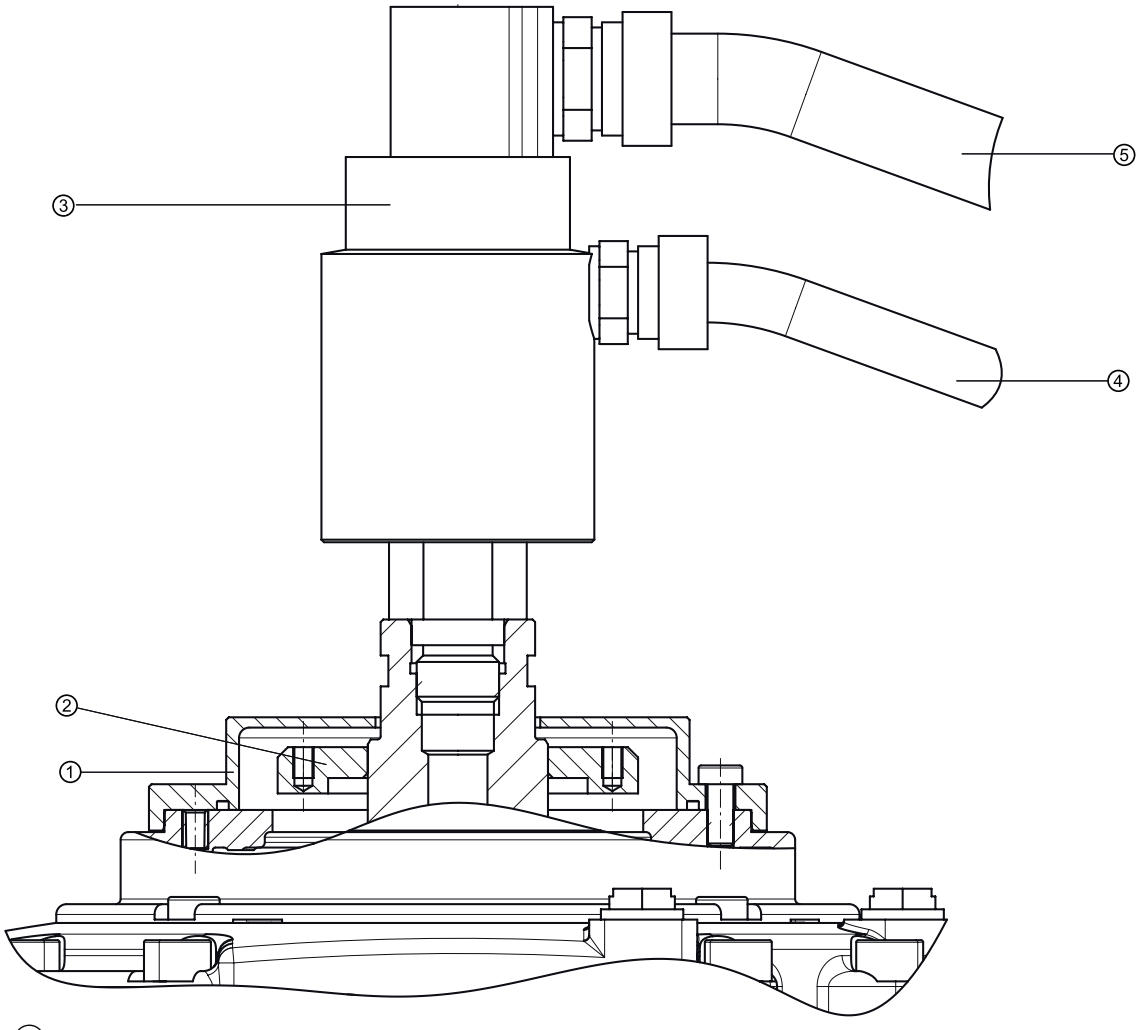
Note the following points when mounting the rotating union:

- When you mount the rotating union, pay attention to special aspects that differ between air-cooled and water-cooled motors.
- When installing the rotating union, observe the manufacturer's data.

Mounting on water-cooled motors

Water-cooled motors have a "2" in the 11th position in the Article No. With water-cooled motors, you can mount the rotating union directly on the motor. Use rotating unions with radial or axial connections.

Mounting rotor-supported rotating union on water-cooled motors



① Sealing cover
② Balancing disk
③ Rotor-supported rotating union, e.g. DEUBLIN 1109-020-188
④ Leakage hose
⑤ Inlet hose

Mounting on air-cooled motors

Air-cooled motors have a "0" or a "1" in the 11th position of the Article No. Air-cooled motors are equipped with an intermediate housing between the motor and the axially mounted fan. The intermediate housing is used to accommodate the rotating union.

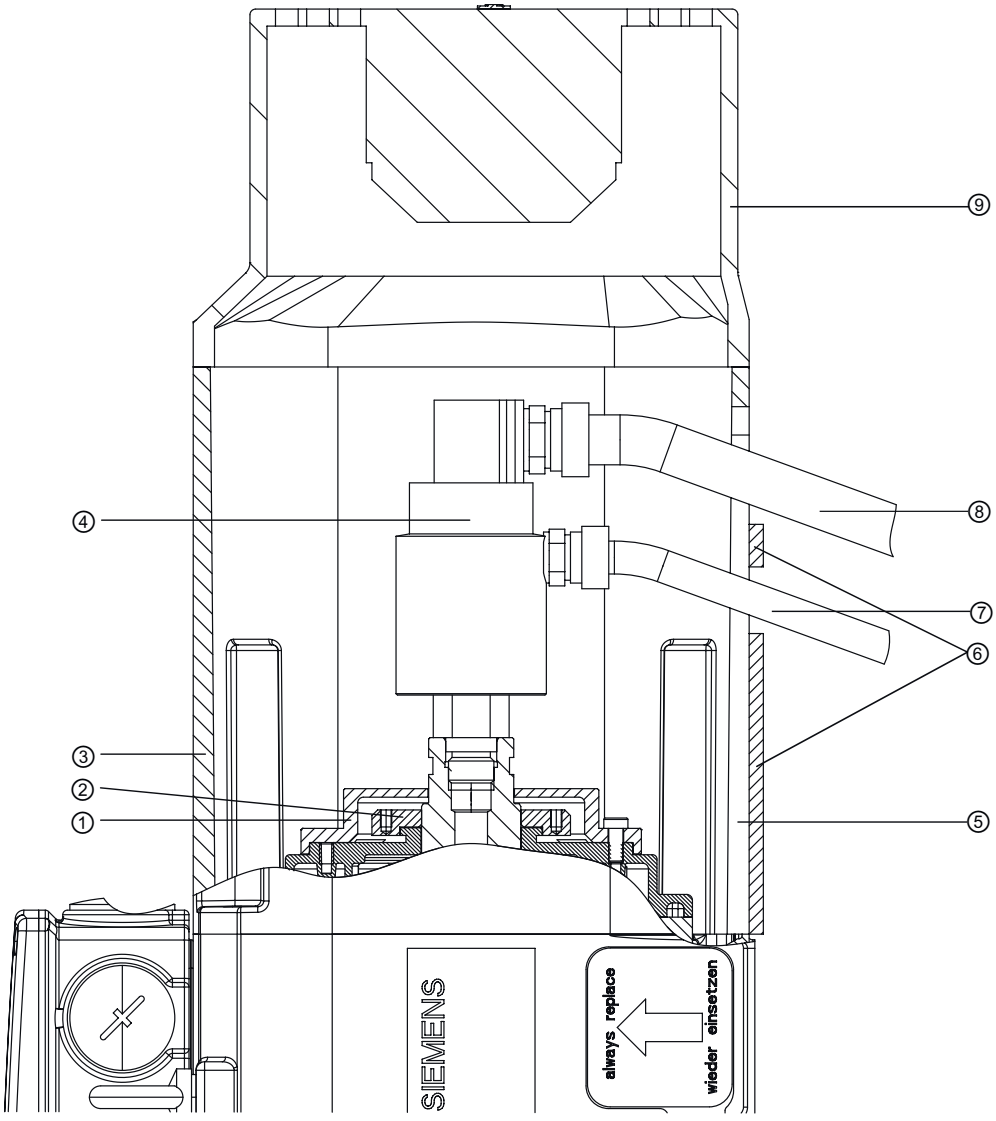
The intermediate housing is suitable for rotating unions with the following dimensions:

- Length up to 120 mm (without rotor connection thread and centering)
- Diameter up to 55 mm

Due to limitations of space, rotating unions with radial connections are advisable for air-cooled motors, e.g. DEUBLIN 1109-020-188.

Rotating unions with axial connections are not suitable!

Mounting rotor-supported rotating unions on air-cooled motors



① Sealing cover
② Balancing disk
③ Intermediate housing
④ Rotor-supported rotating union, e.g. DEUBLIN 1109-020-188
⑤ Cutout
⑥ Cover (openings for connections must be closed again)
⑦ Leakage hose
⑧ Inlet hose
⑨ Fan

Note

When air-cooled motors are connected, only rotating unions with a radial connection are used.

Mounting steps



Note

Mounting steps for air-cooled motors

The mounting steps 1, 11, 12, 13, and 14 are only required for air-cooled motors.

1. Remove the fan and intermediate housing from the motor.
2. If necessary, perform complete balancing of the motor using the exterior balancing disks. To do this, remove the sealing cover.

   Note

   Sealing cover

   - Remount the sealing cover after balancing.
   - The sealing cover is required to comply with the degree of protection.

3. Attach hoses for the inlet and leakage to the rotating union. Use angle elements if necessary.

   Note

   Rotating union to be used

   - Use a rotating union with radial connections.

4. Screw the rotating union into the NDE motor shaft extension. Tighten the rotating union with the correct tightening torque. For this, use the wrench grip surface on the NDE motor shaft extension to hold the other side.
5. Position the rotating union horizontally in such a way that the leakage connection is at the lowest point.
6. Always connect the hose for leakage sloping downward at least 15°.
7. Also connect the hose for the inlet sloping downward.
8. If necessary, provide a ventilation hose for the leakage chamber. It equalizes the negative pressure caused by the fan. Lead the ventilation hose upward.
9. Manually check that the rotor turns easily.
10. Test the mounting under pressure for leaks.
11. Make a burr-free cutout in the intermediate housing for the inlet and leakage hoses.

12. Push the intermediate housing with the cutout over the hoses. Screw the intermediate housing onto the motor. Protect the hoses from mechanical stresses.
13. Screw the fan onto the intermediate housing.
14. Seal the remaining openings between the cutout and the hoses.

4.6.2 Bearingless, frame-supported rotating union

The bearingless frame-supported rotating union cannot be mounted directly on the motor. An adapter is required for the static part of the rotating union. The adapter is not included in the scope of delivery and must be made by the customer to match the rotating union to be used.

Carefully comply with the design notes:

- Match the adapter to hold the static part to the rotating union to be used. To do this, carefully comply with the dimensions of the manufacturer of the rotating union. Implement the adapter as shown in Chapter "Suggestion for an adapter for bearingless, frame-supported rotating unions".
- The gap between the adapter and the NDE shaft extension must be as small as possible in the radial direction (approx. 0.25 mm) and be as long as possible in the axial direction so that coolant that escapes cannot enter the motor. The leakage connections must be as large as possible and must be provided at the lowest point in the leakage chamber. The leakage connection (G3/8") located nearest the static part of the rotating union is for draining leakage away during operation. The second leakage connection (G1/4") is a backup for draining away increased leakage due to faults.

NOTICE
Monitoring the backup line Monitor the flow rate of the backup line to detect any faults in the rotating union in good time, and to protect the motor from flooding. • Make sure that a signal is output in the event of leakage. • Make sure that the system (coolant supply) is switched off in case of a fault.

- Implement the star-shaped drainage openings in the mounting surface to the encoder cover as shown in Chapter "Suggestion for an adapter for bearingless, frame-supported rotating unions" so that liquid cannot penetrate the motor through the labyrinth seal between the encoder cover and the balancing disk. If the motor is mounted vertically, all 6 drainage holes should be opened; if the motor is mounted horizontally, it is enough to open the two lower drainage holes.

Note

Provide a sealing air connection to protect the motor against the penetration of coolant.

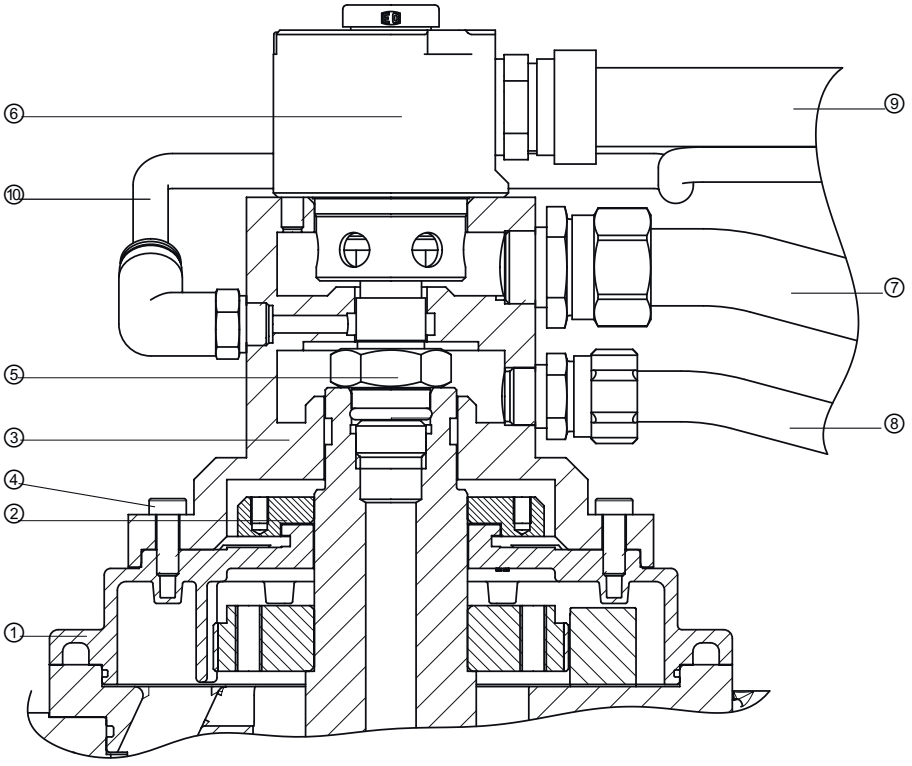
- The diameters and end faces of the adapter for supporting the encoder cover or the static part of the rotating union should be turned in one clamping if possible. For simpler machining, the adapter can be axially split. It is important that the finish-machining of the support diameter and end faces is performed in the assembled condition and in one clamping.

Mounting on water-cooled motors

Water-cooled motors have a "2" in the 11th position of Article No. together with option Y64.

Use rotating unions with radial or axial connections.

Mounting a bearingless rotating union on a water-cooled motor



1 Encoder cover
2 Balancing disk
3 Adapter
4 6 x M5 bolts
5 Rotating part of the rotating union, e.g. DEUBLIN 1129-050-301
6 Static part of the rotating union, e.g. DEUBLIN 1129-050-301
7 Leakage hose (min. internal diam. 12 mm)
8 Leakage hose as backup and for faults
9 Inlet hose
10 Sealing air connection

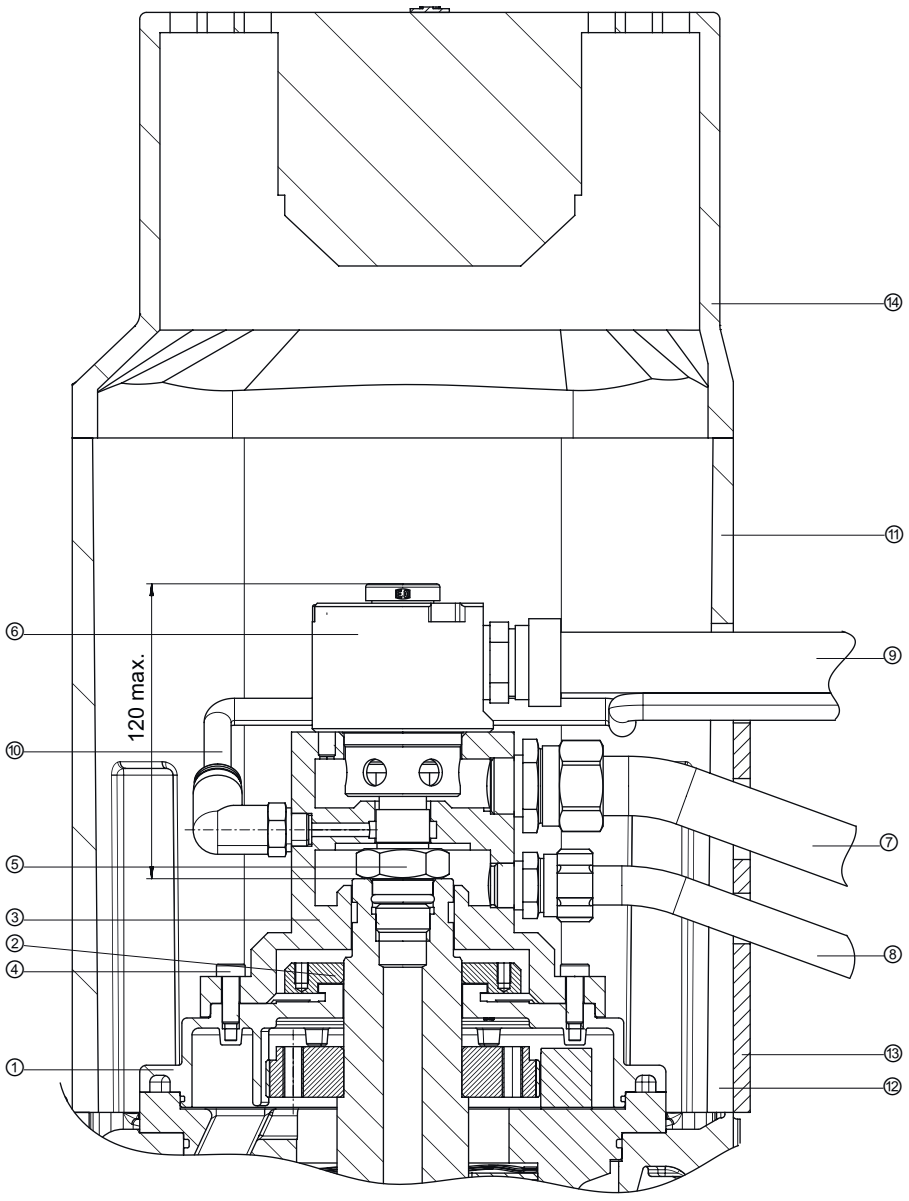
Mounting on air-cooled motors

Air-cooled motors have a "0" or a "1" in the 11th position of Article No. together with option Y64.

Air-cooled motors are equipped with an intermediate housing between the motor and the axially mounted fan. The intermediate housing is used to accommodate the rotating union. It is suitable for rotary glands up to a length (without rotor connection thread and centering) of 120 mm and a diameter of up to 55 mm. Due to space limitations, rotating unions with radial connections are recommended for air-cooled motors, e.g. DEUBLIN 1129-050-301. Rotating unions with axial connections are also possible in short versions, e.g. DEUBLIN 1129-730-731. In this case, a bracket must be used at the axial connection to which the supply hose is connected. The 120 mm dimension must not be exceeded when a bracket is used.

NOTICE
Sealing the remaining holes Seal the remaining holes again between the cutout and the hoses to ensure that motor cooling is still effective.

Mounting of bearingless rotating union on an air-cooled motor



1	Encoder cover	8	Leakage hose as backup and for faults
2	Balancing disk	9	Inlet hose
3	Adapter	10	Sealing air connection
4	6 x M5 bolts	11	Intermediate housing
5	Rotating part of the rotating union, e.g. DEUBLIN 1129-050-301	12	Cutout
6	Static part of the rotating union, e.g. DEUBLIN 1129-050-301	13	Cover (reclose the openings for the connections)
7	Leakage hose (min. internal diam. 12 mm)	14	Fan

Mounting steps

1.
2.

Note

Mounting steps for air-cooled motors

The mounting steps 1, 13, 14, 15, and 16 are only required for air-cooled motors.

1. Disassemble the fan and intermediate housing from the the motor.
2. Removing the sealing cover
3. If necessary, perform complete balancing of the motor with external balancing disks
4. Screw the rotating part of the rotating union into the NDE motor shaft extension and tighten with the appropriate torque (against the wrench grip surface on the NDE motor shaft extension).
5. Mount the adapter for the static part (not included in the scope of delivery) on the encoder cover with 6x M5 screws. Position the adapter in such a way that the leakage connection is at the lowest point (with horizontal mounting).
6. Mount the hoses for leakage and sealing air on the adapter, if necessary using angled elements
7. Mount the hose for the supply to the static part of the rotating union, if necessary using angled elements
8. Screw the static part onto the adapter
9. Always connect the hoses for leakage sloping downward (min. 15°).
10. Also connect the hose for the inlet sloping downward.
11. Manually check that the rotor turns easily.
12. Perform a hydrostatic test for leaks
13. Make a cutout for the inlet and leakage hoses in the intermediate housing.
14. Push the intermediate housing with the inlet over the hoses and screw it to the motor. Protect the hoses from mechanical loads
15. Screw the fan on to the intermediate housing
16. Seal the remaining openings between the cutout and the hoses

4.6.3 Mounting information and instructions

- Do not mount any additional anti-rotation pins on rotor-supported rotating unions
- Never screw pipes directly to the rotating union.
- Always use a hose between the rotating union and the fixed piping. To do this, route the hoses in curves and torsion-free.

- First screw the flexible hoses onto the rotor-supported rotating union. Then screw the rotating union onto the shaft with the specified torque.
- Avoid stressing due to incorrect hose lengths and unsuitable mounting material.
- The rotating union must be easy to turn when mounted.
- Keep rotating unions free of chips and burrs.
- Position the rotating union horizontally in such a way that the leakage connection is at the lowest point.
- Always route the leakage hose downward at at least 15° with a large cross-section.
- If the leakage hose is higher than the leakage connection and the mechanical seal is open, the rotating union and possibly also the motor will be flooded. The motor can fail.
- Also route the inlet hose downward. This causes the coolant to flow back in the supply line when the mechanical seal is open (e.g. tool change or standstill) and not through the motor shaft and the leakage connection.
- Filter the coolant so that no particles or chips can reach the mechanical seal and damage it.

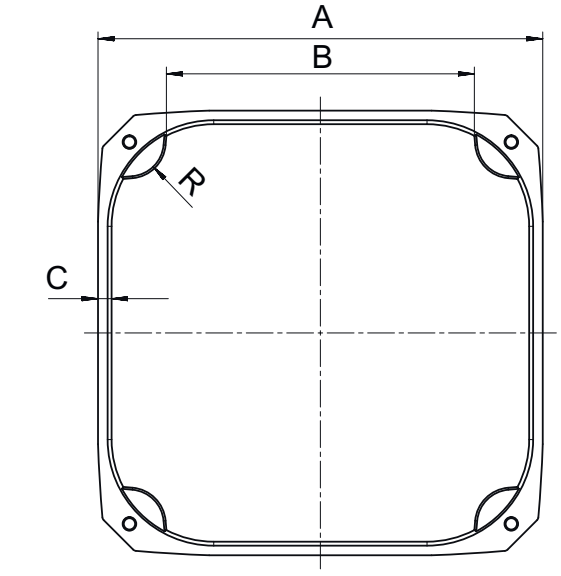
Note

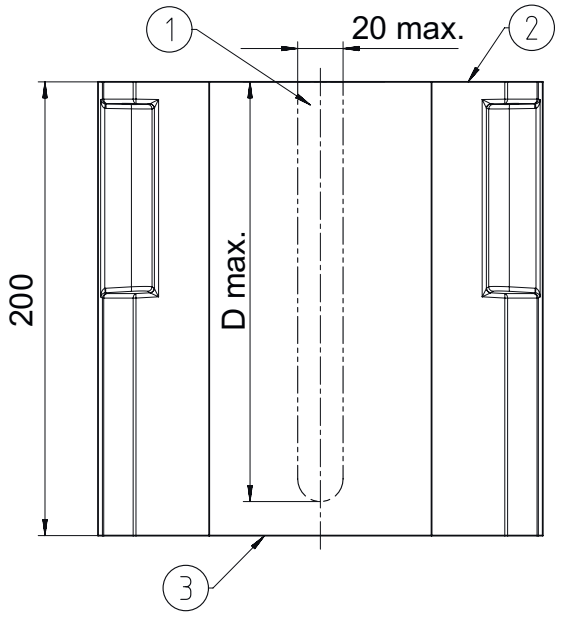
Mounting the rotating union

- During assembly, screw the thread absolutely tightly into the NDE shaft extension. Ensure that no coolant can leak.

- Check the rotating union and hoses regularly for tightness.

Intermediate housing for air-cooled motors





① Cutout for hoses (to be made by the customer)
② Motor side
③ Fan side

Slot dimensions for the intermediate housing

	SH 80	SH100	SH132	SH160
A	155	196	260	314
B	99	133	183	225
C	6	6	7	7
R	16	16	19	19
D	170	185	175	180

4.6.4 Suggestion for an adapter for bearingless, frame-supported rotating unions

Note

Comply with the manufacturer's specifications

Comply with the specifications and instructions provided by the manufacturer when installing the rotating union.

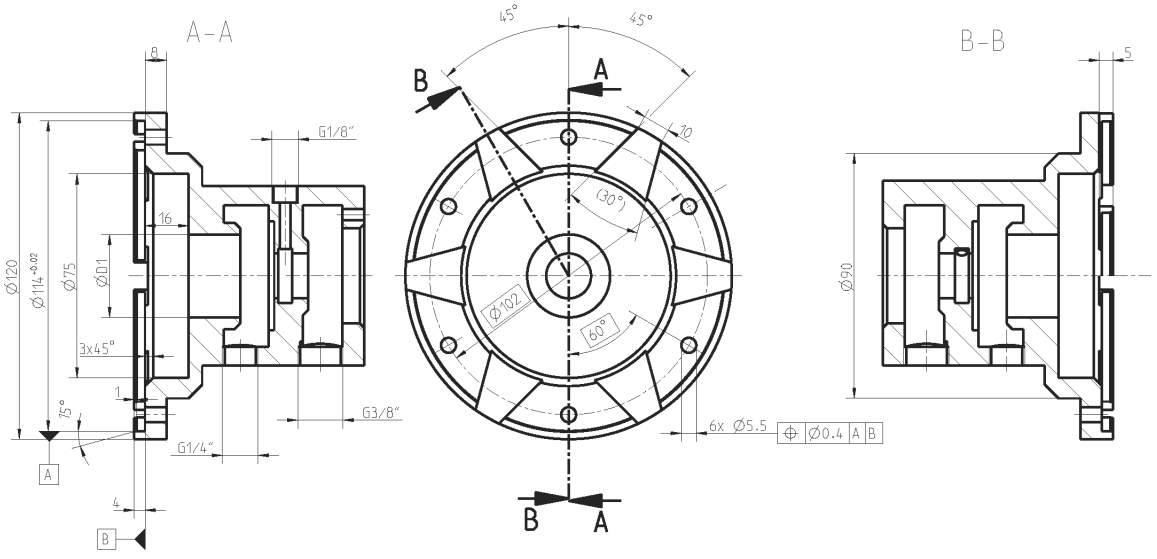


Figure 4-12 Example of the version of an adapter for supporting the static part of a bearingless, frame-supported rotating union

	1PH808.	1PH810.-1PH816.
Diameter D1	Diam. 22.5 H7	Diam. 30.5 H7

4.7 Radial and axial forces

4.7.1 Radial force

Do not exceed specific radial forces in order to guarantee perfect operation.

Never exceed the minimum force for any of the different shaft heights. This minimum force is indicated in the radial force diagrams. The diagrams show the radial force F_R

- At various operating speeds
- As a function of the bearing lifetime

The force diagrams and tables apply to standard shaft ends at the DE. For smaller shaft diameters, only reduced radial forces may be transmitted or none at all.

For force levels going beyond these, contact your local sales partner.

NOTICE
Premature damage to bearings and shaft breakage due to strong radial forces Bearings can be prematurely damaged and shafts may break if force transmission elements apply too much load to the shaft end as a result of radial forces. • When using mechanical transmission elements, ensure that the maximum limit values specified in the radial force diagrams are not exceeded.

NOTICE
Premature damage to bearings due to insufficient radial forces Only for bearings with increased radial force (shaft height 100 to 280): Insufficiently high radial forces can cause the bearings to roll in an undefined fashion. This results in increased bearing wear. • For applications with an extremely low radial force load, ensure that the motor shaft is subject to at least the minimum radial force specified in the diagrams. Where the radial force load is less than the minimum radial force, e.g. on a coupling drive, you must not use the bearings for increased radial force. Use a motor with standard bearings for these applications.

NOTICE
Destruction of bearing seats The motor bearings are designed for operation with radial force. Rotating forces from the process or imbalance > Q 2.5 can destroy the bearing seats. Rotating forces and imbalance can also occur on coupling drives. • Avoid rotating forces and imbalance.

NOTICE

Mechanical destruction of the motor

If the motor supports the higher forces when force/torque boosting elements are used, the flange or the feet of the motor, for example, can be torn off.

- Make sure that the force/torque boosting elements, e.g. gearbox or brakes, absorb the greater forces.
  Examples of remedies:
  - Choose the correct type of construction.
  - Pay attention to correct mechanical mounting of the force/torque boosting elements.

Note

Complying with the belt manufacturer's guidelines

- When dimensioning the radial forces at the shaft extension, ensure that you comply with the regulations of the belt manufacturers.
- Set the belt tension by means of appropriate measuring instruments.

Calculating the total radial force F_R for belt couplings

If the belt manufacturer has not provided precise radial force data, the radial force can be approximately determined using the following formula:

F_R [N] = c · F_U $\qquad$ F_U [N] = 2 · 10^7 · P / (n · D)

Table 4-22 Explanation of the formula abbreviations

Formula abbreviations	Unit	Description
c	--	Pre-tensioning factor: The pre-tensioning factor is an experience value provided by the belt manufacturer. Values as follows: • V-belt: c = 1.5 to 2.5 • Special plastic belts (flat belts), depending on the load type and belt type c = 2.0 to 2.5
F_U	N	Circumferential force
P	kW	Motor output
n	r/min	Motor speed
D	mm	Diameter of belt pulley

4.7.2 Axial force

The axial force acting on the locating bearings comprises the following components:

- Axial force in operation

- Axial forces acting externally on the motor (e.g. gearbox with helical gearing, machining forces through the tool)
- Axial forces from the coolant pressure of the coolant fed through the rotating union

- Force due to spring loading of the bearing

- Where applicable, force exerted by the rotor weight when the motor is vertically mounted

This results in a maximum axial force that is a function of the direction.

⚠ CAUTION

Axial force due to effective hydraulic diameter of the rotating union

Pay attention to the axial force due to the effective hydraulic diameter (area) of the rotating union.

Force = A x p

- Force = F [N]
- A = area [m^2]
- p = coolant pressure [N/m^2]

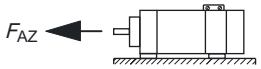
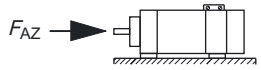
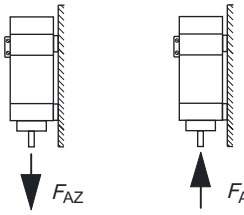
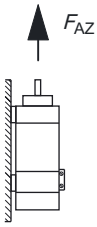
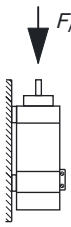
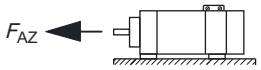
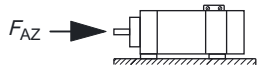
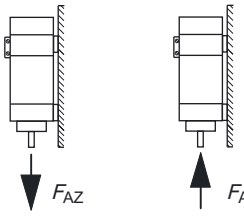
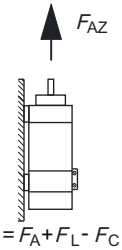
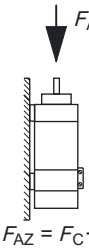
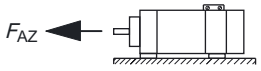
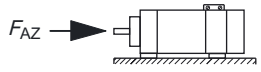
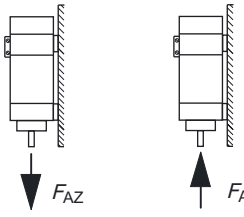
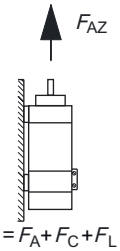
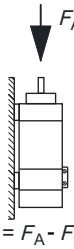
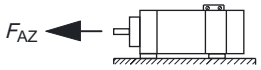
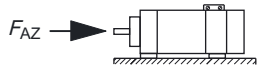
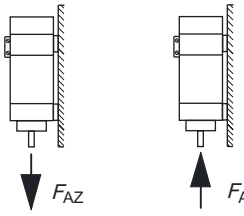
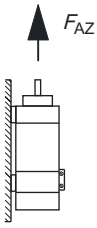
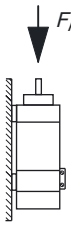
1 bar = 10^5 N/m^2

For axial forces in the direction of the motor, the spring-loading of the bearings can be overcome so that the rotor moves in accordance with the axial bearing play (up to 0.2mm). The permissible axial force F_{AZ} in operation depends on the motor mounting position.

When, for example, helical toothed wheels are used as the drive element, an axial force is exerted on the motor bearings in addition to the radial force. For axial forces in the direction of the motor, the spring-loading of the bearing can be overcome. This must be prevented as otherwise it could reduce the bearing and encoder service life.

The permissible axial force F_{AZ} in operation depends on the motor mounting position (see table "Calculating the permissible axial force").

Table 4-23 Calculating the permissible axial force

Horizontal arrangement	**Shaft end facing downwards**	**Shaft end facing upwards**
SH 80 - SH 160 with bearing version Standard with locating bearing, Performance, High Performance, Advanced Lifetime		
 $F_{AZ} = F_A - F_C$  $F_{AZ} = F_C + F_A$	 $F_{AZ} = F_A - F_L - F_C$ $F_{AZ} = F_L + F_C + F_A$	 $F_{AZ} = F_A + F_L - F_C$  $F_{AZ} = F_C - F_L + F_A$
SH 80 - SH 160 with bearing version Standard		
 $F_{AZ} = F_A - F_C$  $F_{AZ} = F_C$	 $F_{AZ} = F_A - F_L - F_C$ $F_{AZ} = F_L + F_C$	 $F_{AZ} = F_A + F_L - F_C$  $F_{AZ} = F_C - F_L$
SH 180 and SH 225		
 $F_{AZ} = F_A + F_C$  $F_{AZ} = F_A - F_C$	 $F_{AZ} = F_A + F_C - F_L$ $F_{AZ} = F_A - F_C + F_L$	 $F_{AZ} = F_A + F_C + F_L$  $F_{AZ} = F_A - F_L - F_C$
SH 280		
 $F_{AZ} = F_A - F_C$  $F_{AZ} = F_C + F_A$	 $F_{AZ} = F_A - F_L - F_C$ $F_{AZ} = F_L + F_C + F_A$	 $F_{AZ} = F_A + F_L - F_C$  $F_{AZ} = F_C - F_L + F_A$
F_{AZ}	Permissible axial force in operation	
F_A	Permissible axial force as a function of the average operating speed nm in each case, ignoring the preloading force and the force due to the weight of the rotor	
F_C	Pre-loading force	
F_L	Force due to weight of rotor	

4.7.3 Permissible radial and axial forces for 1PH808 Premium Performance

For the Premium Performance version of the 1PH808, the following radial and axial forces of the motor shaft are permissible:

Radial force = 100 N	Axial force = 1400 N
The axial force address comprises:	
Rotating union = 950 N	Preloading F_c = 450 N

Maximum permissible mechanical load

		DE shaft extension	NDE shaft extension
Maximum radial force		100 N	100 N
Maximum radial force	Solid shaft		
	1 Toward the motor	350 N	-
	2 Away from the motor	950 N	-
	Hollow shaft		
	1 Toward the motor	350 N	950 N
	2 Away from the motor	950 N	350 N

4.7.4 Radial and axial force diagrams

Permissible radial forces for SH 80

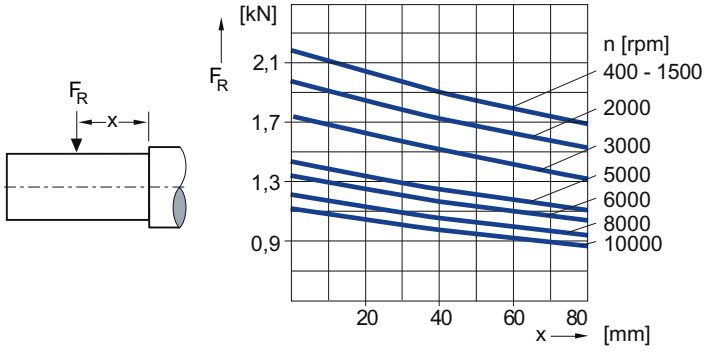


Figure 4-13 SH 80, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

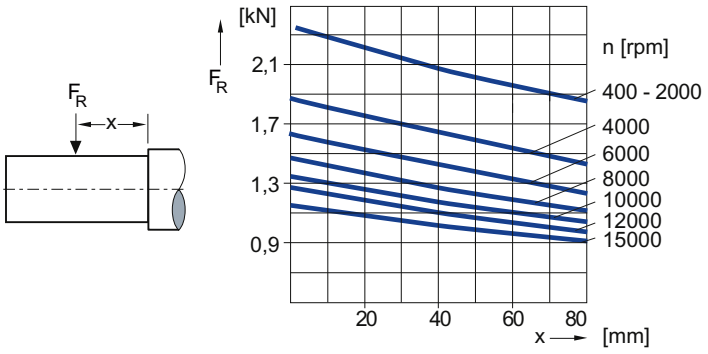


Figure 4-14 SH 80, Performance, High Performance, 12,000 h bearing lifetime

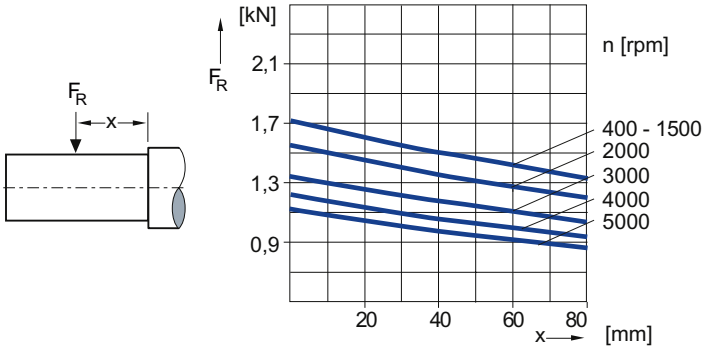


Figure 4-15 SH 80, Advanced Lifetime, 40,000 h bearing lifetime

Permissible radial forces for SH 100

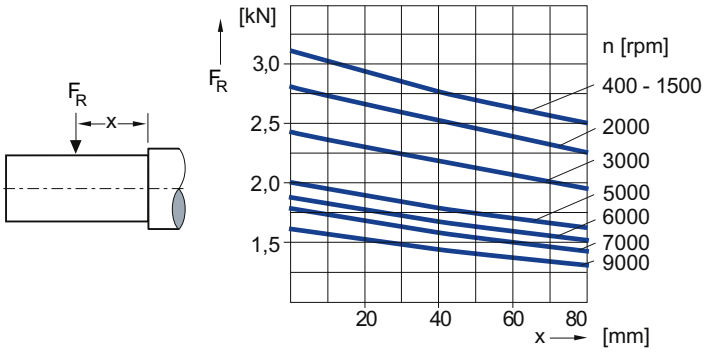


Figure 4-16 SH 100, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

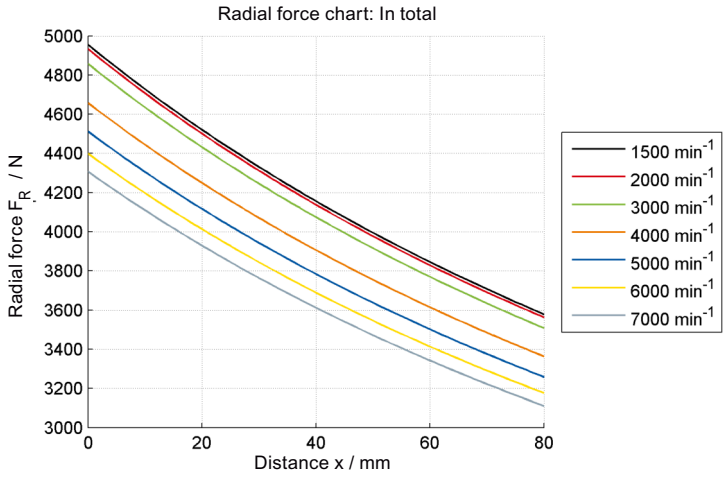


Figure 4-17 SH 100, increased radial force, 20,000 h bearing lifetime, minimum radial force: 0.5 kN

Note

Bearing with increased radial force

The roller bearings used here could sustain damage if they are operated under no load.

Observe the specified minimum radial forces!

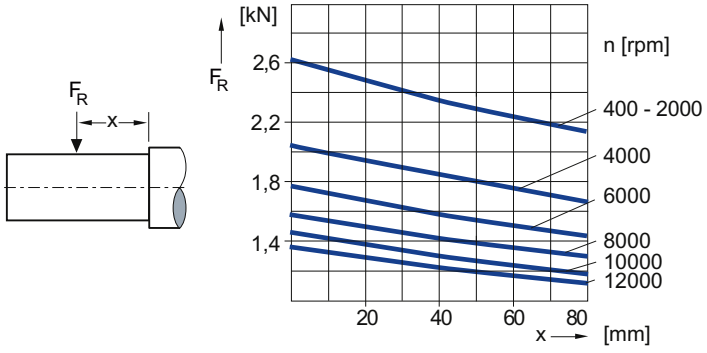


Figure 4-18 SH 100, Performance, 12,000 h bearing lifetime

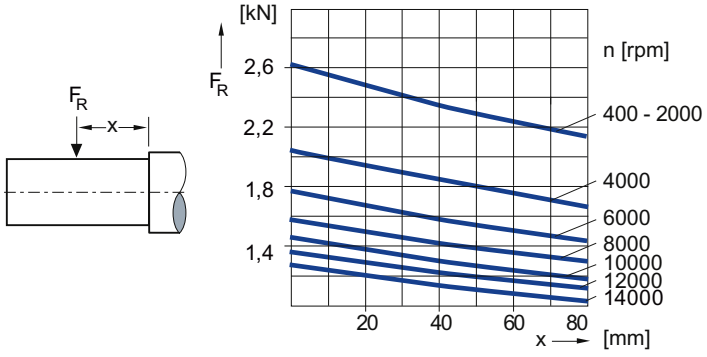


Figure 4-19 SH 100, High Performance, 12,000 h bearing lifetime

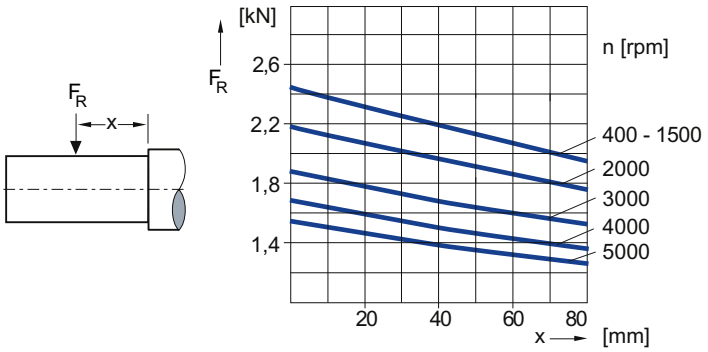


Figure 4-20 SH 100, Advanced Lifetime, 40,000 h bearing lifetime

Permissible radial forces for SH 132

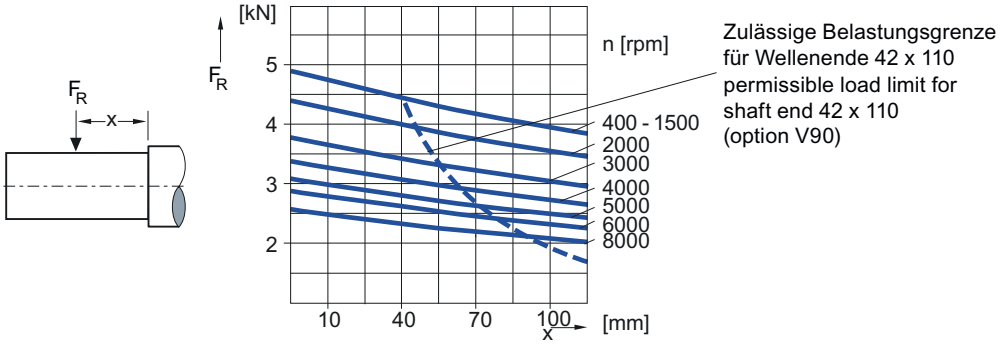


Figure 4-21 SH 132, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

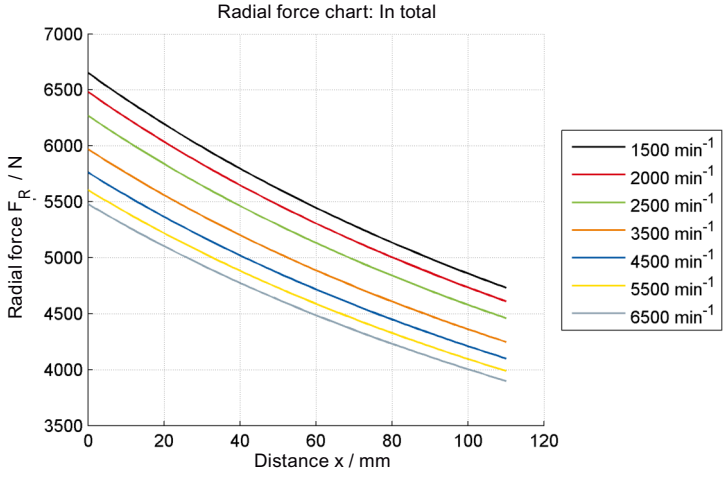


Figure 4-22 SH 132, increased radial force, 20,000 h bearing lifetime, minimum radial force: 0.7 kN

Note

Bearing with increased radial force

The roller bearings used here could sustain damage if they are operated under no load.

Observe the specified minimum radial forces!

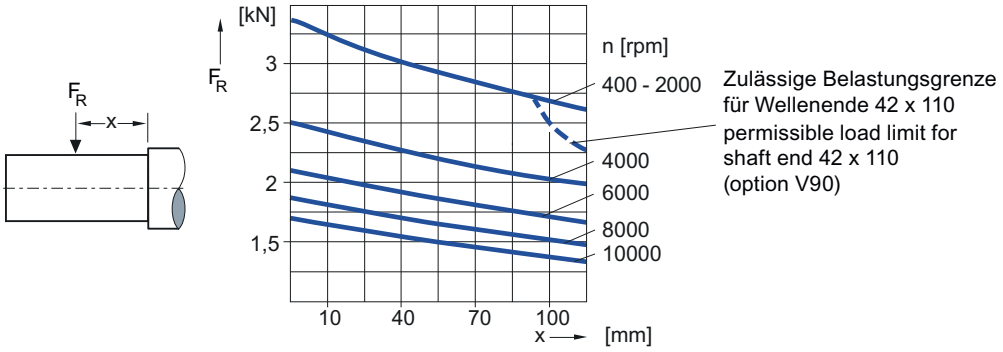


Figure 4-23 SH 132, Performance, 12,000 h bearing lifetime

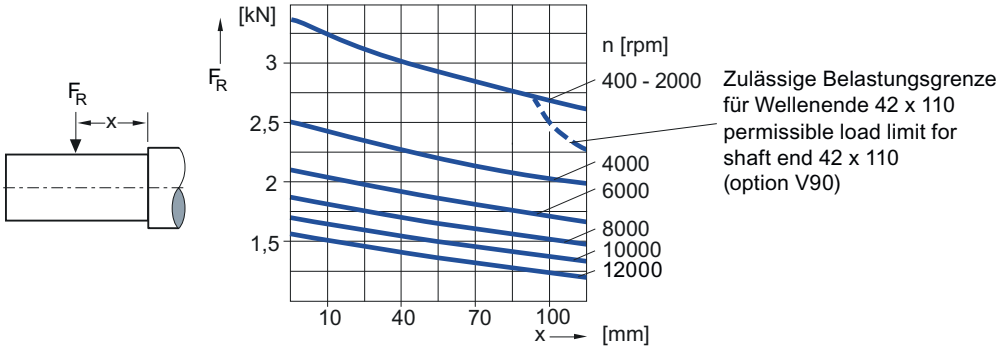


Figure 4-24 SH 132, High Performance, 12,000 h bearing lifetime

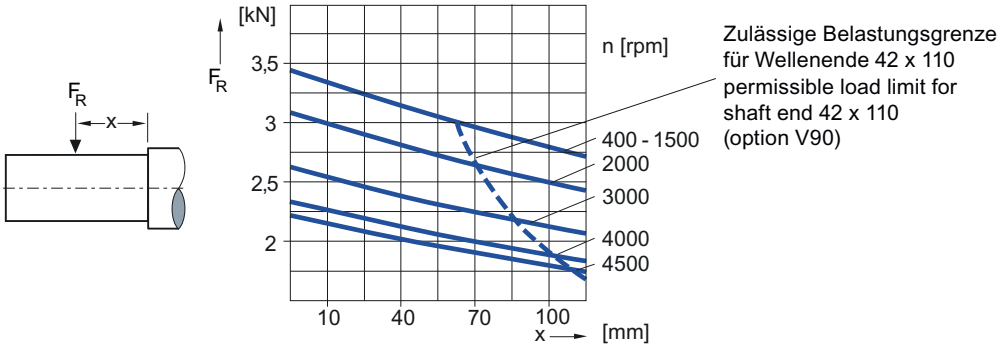


Figure 4-25 SH 132, Advanced Lifetime, 40,000 h bearing lifetime

Permissible radial forces for SH 160

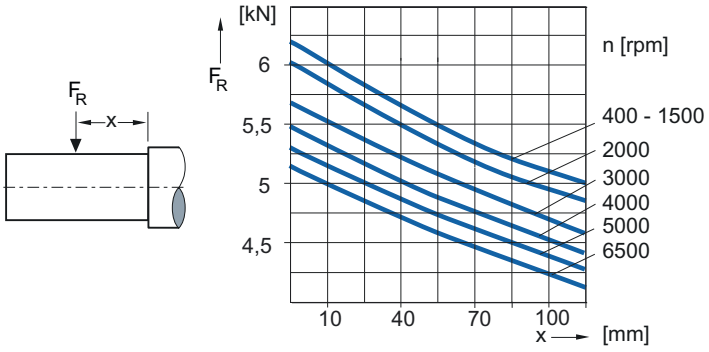


Figure 4-26 SH 160, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

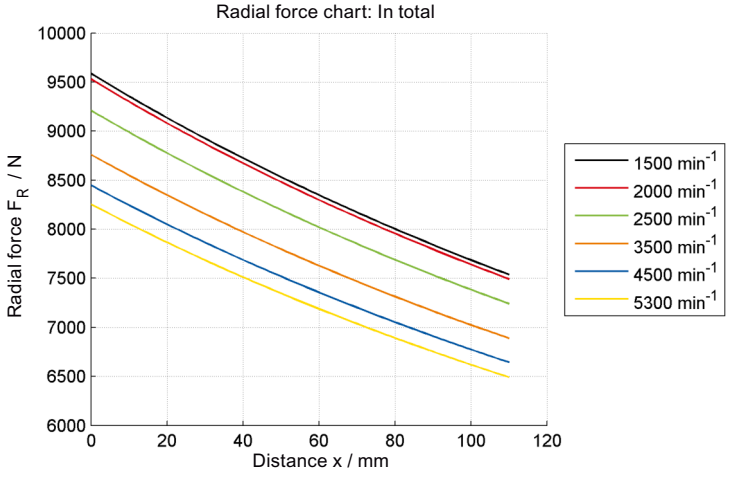


Figure 4-27 SH 160, increased radial force, 16,000 h bearing lifetime, minimum radial force: 1 kN

Note

Bearing with increased radial force

The roller bearings used here could sustain damage if they are operated under no load.

Observe the specified minimum radial forces!

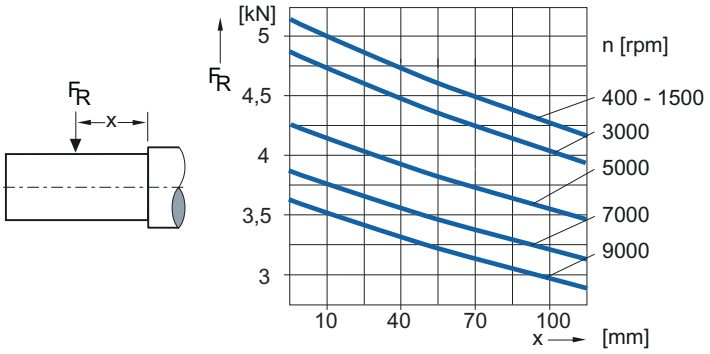


Figure 4-28 SH 160, Performance, 12,000 h bearing lifetime

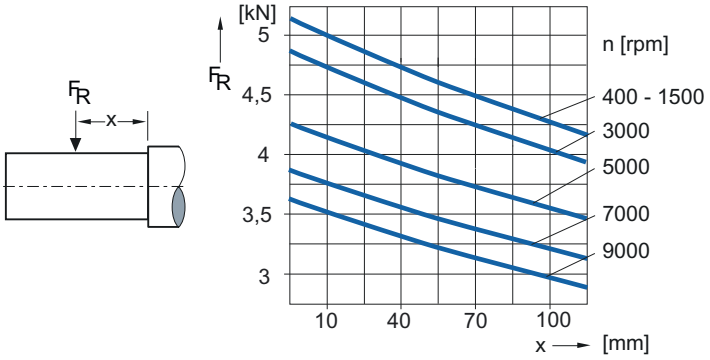


Figure 4-29 SH 160, High Performance, 12,000 h bearing lifetime

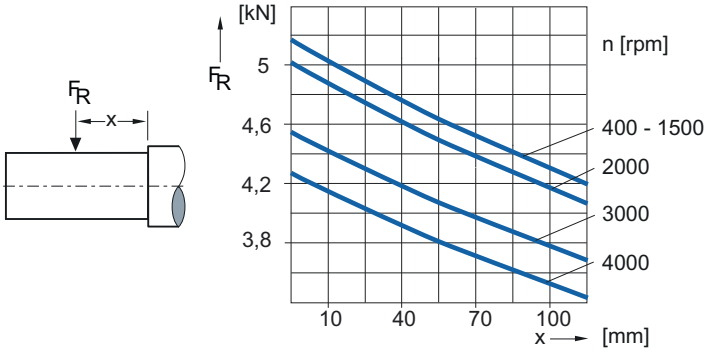


Figure 4-30 SH 160, Advanced Lifetime, 40,000 h bearing lifetime

Permissible radial forces for SH 180

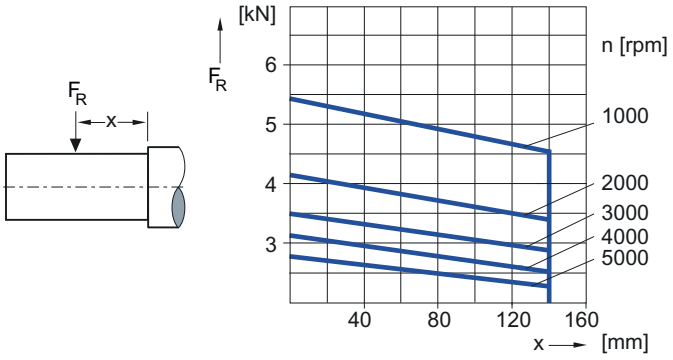


Figure 4-31 SH 180, Standard with locating bearing, 20,000 h bearing lifetime

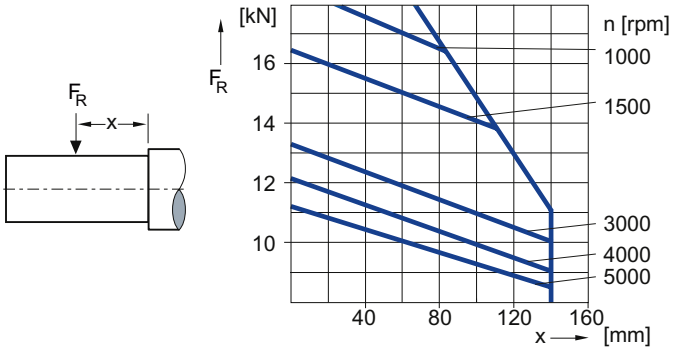


Figure 4-32 SH 180, increased radial force, 12,000 h bearing lifetime, minimum radial force: 4 kN

Note

Bearing with increased radial force

The roller bearings used here could sustain damage if they are operated under no load.

Observe the specified minimum radial forces!

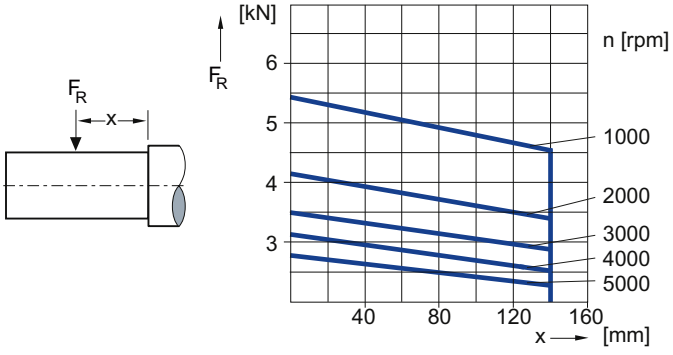


Figure 4-33 SH 180, Performance, 12,000 h bearing lifetime

Permissible radial forces for SH 225

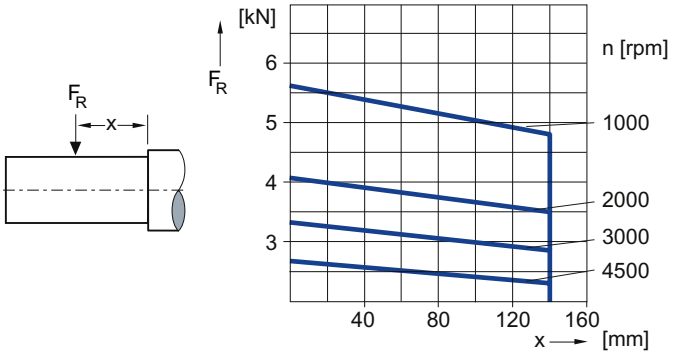


Figure 4-34 SH 225, Standard with locating bearing, 20,000 h bearing lifetime

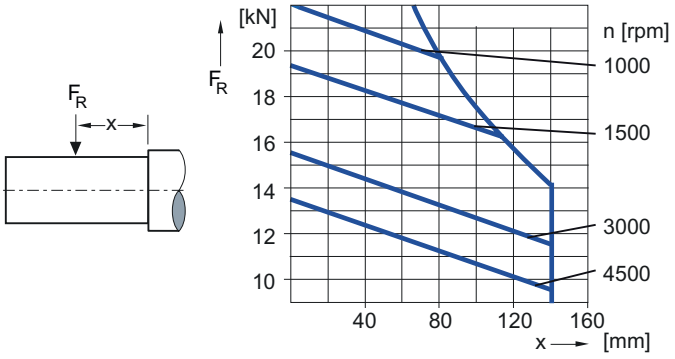


Figure 4-35 SH 225, increased radial force, 12,000 h bearing lifetime, minimum radial force: 5 kN

Note

Bearing with increased radial force

The roller bearings used here could sustain damage if they are operated under no load.

Observe the specified minimum radial forces!

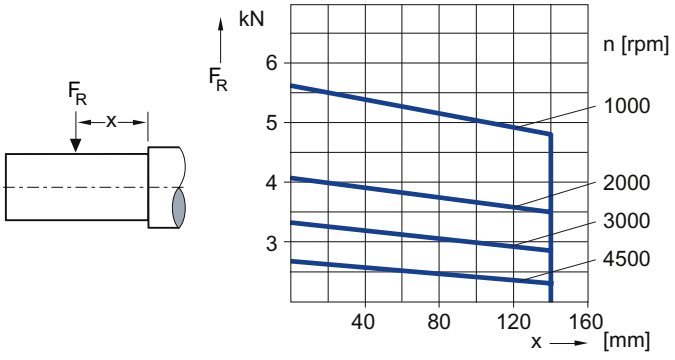


Figure 4-36 SH 225, Performance, 12,000 h bearing lifetime

Permissible radial forces for SH 280

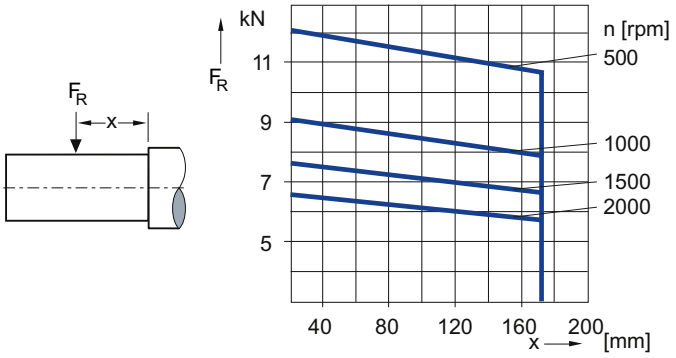


Figure 4-37 SH 280, Standard with locating bearing, 20,000 h bearing lifetime

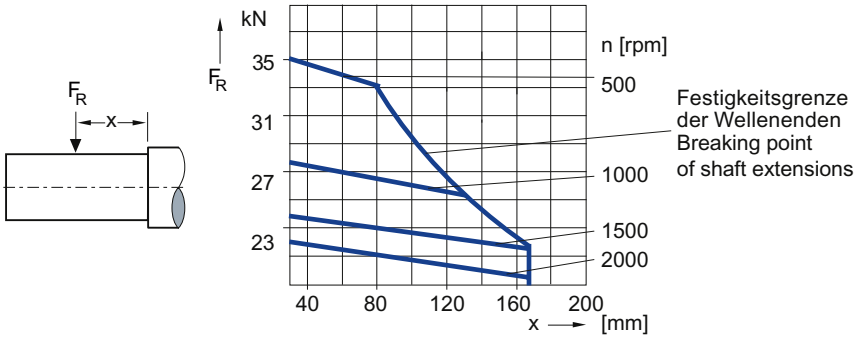


Figure 4-38 SH 280, increased radial force, 12,000 h bearing lifetime,minimum radial force: 9 kN

Note

Bearing with increased radial force

The roller bearings used here could sustain damage if they are operated under no load.

Observe the specified minimum radial forces!

Axial forces

Deep-groove ball bearings can absorb both radial as well as axial forces.

The maximum axial forces F_A as a function of the radial force are shown in the following force diagrams.

The permissible bearing forces are specified without taking into account the force due to spring-loaded bearings, the rotor weight for vertical mounting as well as the direction of the force.

Note

Determining the permissible axial forces

The permissible axial forces at the shaft extension $F_{A\ perm}$ are dependent on the application (mounting, force direction) and must be calculated.

Forces due to the rotor weight and spring-loading forces

Table 4-24 Force due to weight and spring-loading of the rotor

Motor type	Force due to weight F_L N	Force due to spring-loading F_C +/- 25 % N
1PH8081	65	450
1PH8083	90	
1PH8087	115	
1PH8101	120	550
1PH8103	150	
1PH8105	195	
1PH8107	220	
1PH8131	270	900
1PH8133	330	
1PH8135	390	
1PH8137	445	
1PH8138		
1PH8163	600	1200
1PH8164		
1PH8165	715	
1PH8166		
1PH8167	655	
1PH8168		
1PH8184	900	880
1PH8184 (type of construction IM V5, V15)		2300
1PH8186	1150	880
1PH8186 (type of construction IM V5, V15)		2300
1PH8224	1710	880
1PH8226	2160	
1PH8228	2570	
1PH8284	3300	1100
1PH8286	4000	
1PH8288	4700	

Note

For motors, shaft heights 80 to 160, the spring loading of the bearing F_c can be increased by using option Q81. For description of option Q81, see Chapter "Motor components and options".

Permissible axial forces for shaft height 80

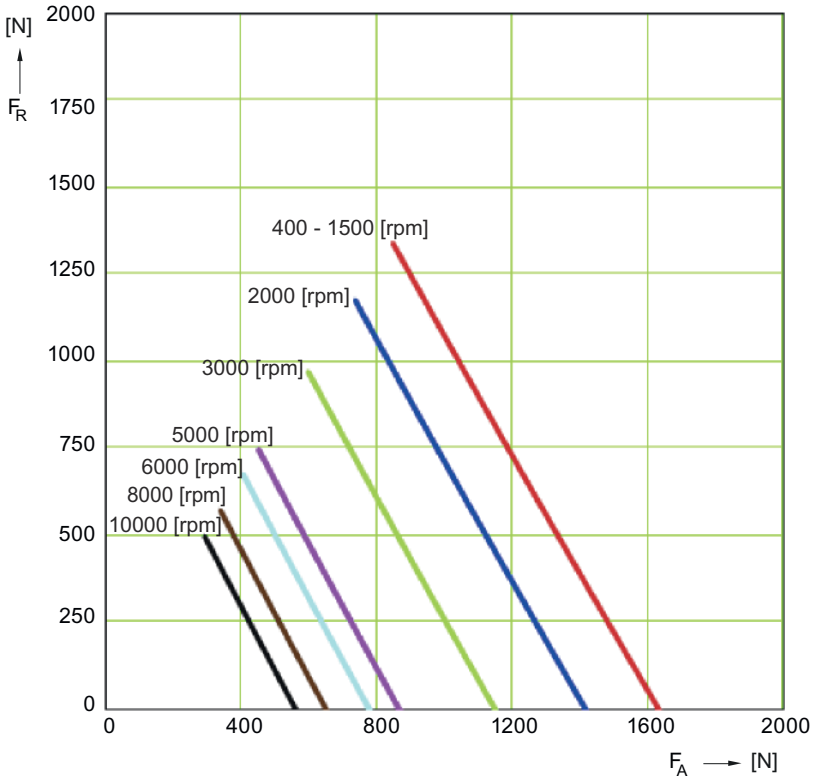


Figure 4-39 SH 80, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

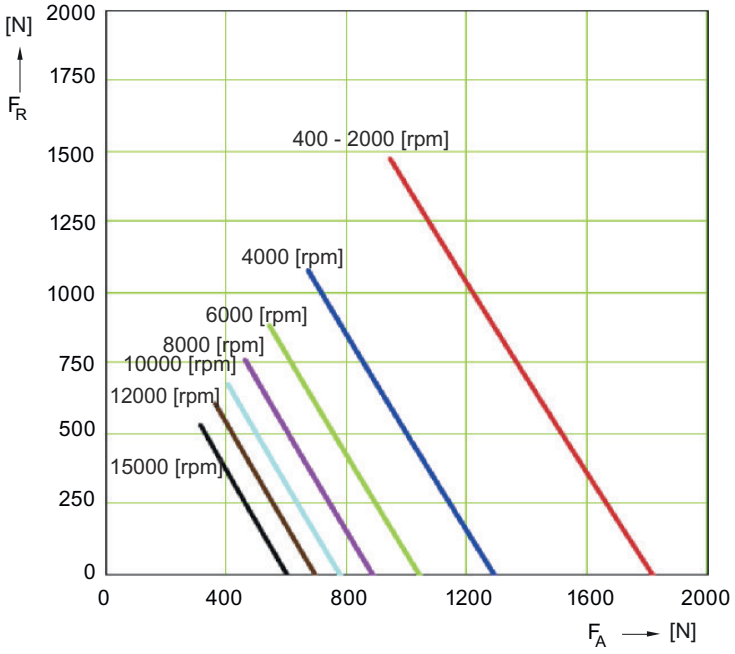


Figure 4-40 SH 80, Performance, High Performance, 12,000 h bearing lifetime

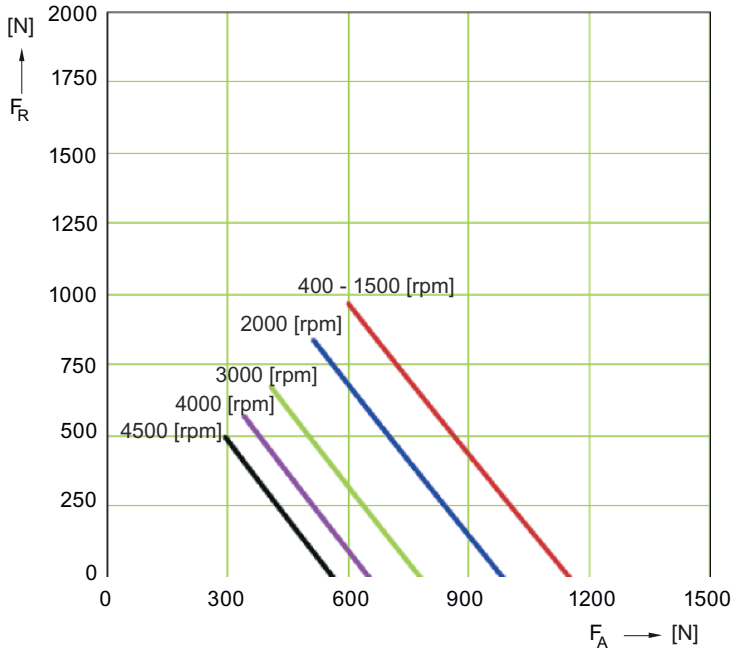


Figure 4-41 SH 80, Advanced Lifetime, 40,000 h bearing lifetime

Permissible axial forces for shaft height 100

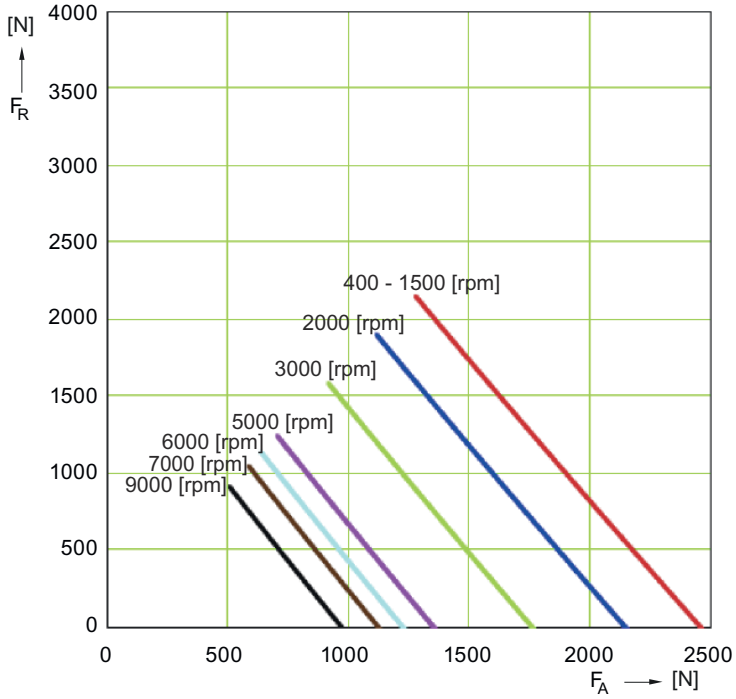


Figure 4-42 SH 100, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

Table 4-25 SH 100, increased radial force, 20,000 h bearing lifetime

Motor type		**Max. permissible axial force as a function of speed**						
1PH810	Speed n r/min	1500	2000	3000	4000	5000	6000	7000
	Axial force F_A N	2100	2050	1950	1850	1750	1700	1650

Note

The permissible axial force is absorbed exclusively by the deep-groove ball bearing of the duplex bearing. The cylindrical roller bearing absorbs the radial force. The axial force F_{AZ} that is permissible during operation is calculated as stated in table "Calculating the permissible axial force (Page 117)."

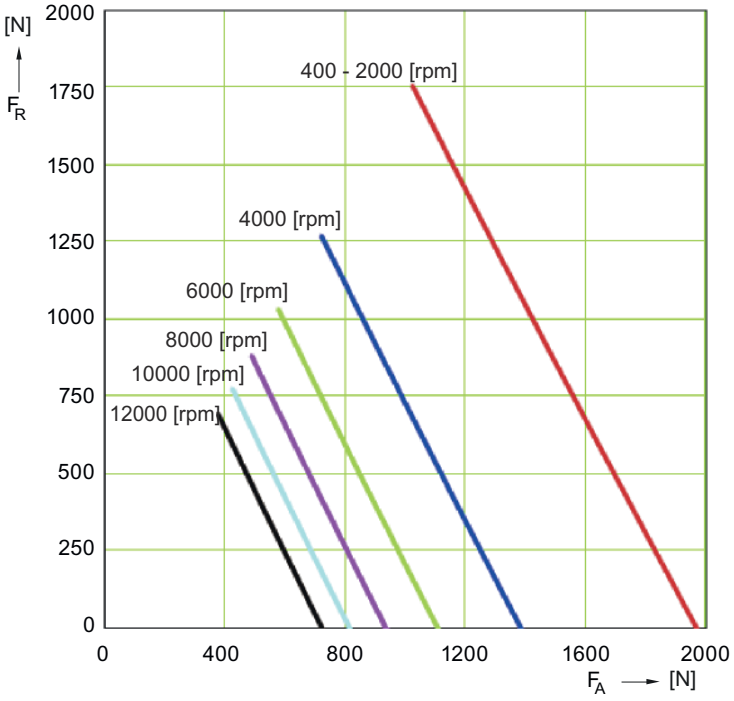


Figure 4-43 SH 100, Performance, 12,000 h bearing lifetime

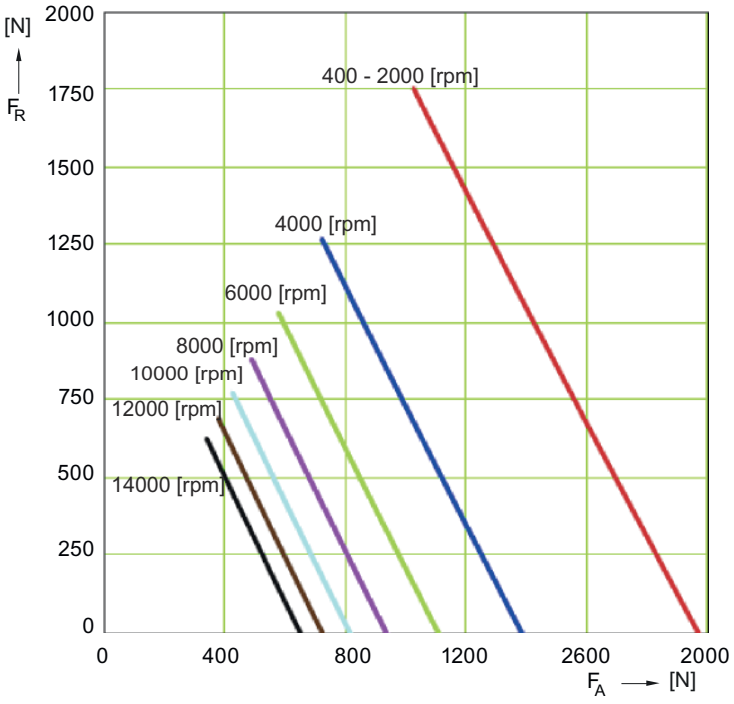


Figure 4-44 SH 100, High Performance, 12,000 h bearing lifetime

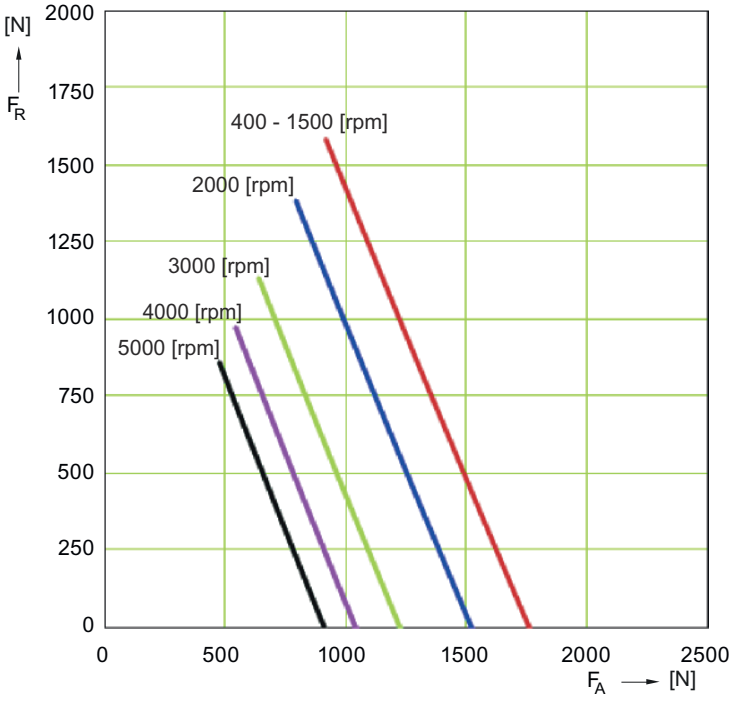


Figure 4-45 SH 100, Advanced Lifetime, 40,000 h bearing lifetime

Permissible axial forces for SH 132

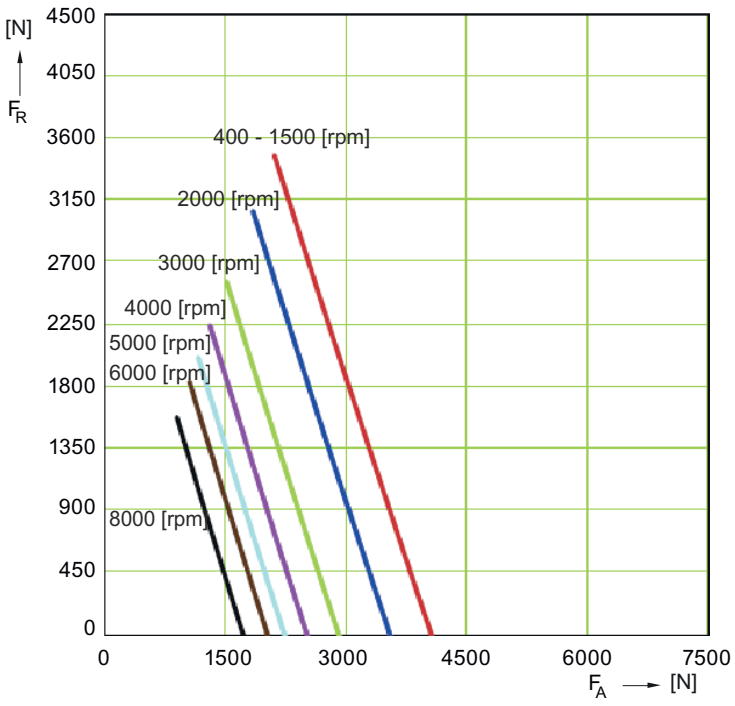


Figure 4-46 SH 132, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

Table 4-26 SH 132, increased radial force, 20,000 h bearing lifetime

Motor type		**Max. permissible axial force as a function of speed**						
1PH813	Speed n r/min	1500	2000	3000	4000	5000	6500	-
	Axial force F_A N	2600	2550	2400	2250	2200	2100	-

Note

The permissible axial force is absorbed exclusively by the deep-groove ball bearing of the duplex bearing. The cylindrical roller bearing absorbs the radial force. The axial force F_{AZ} that is permissible during operation is calculated as stated in table "Calculating the permissible axial force (Page 117)."

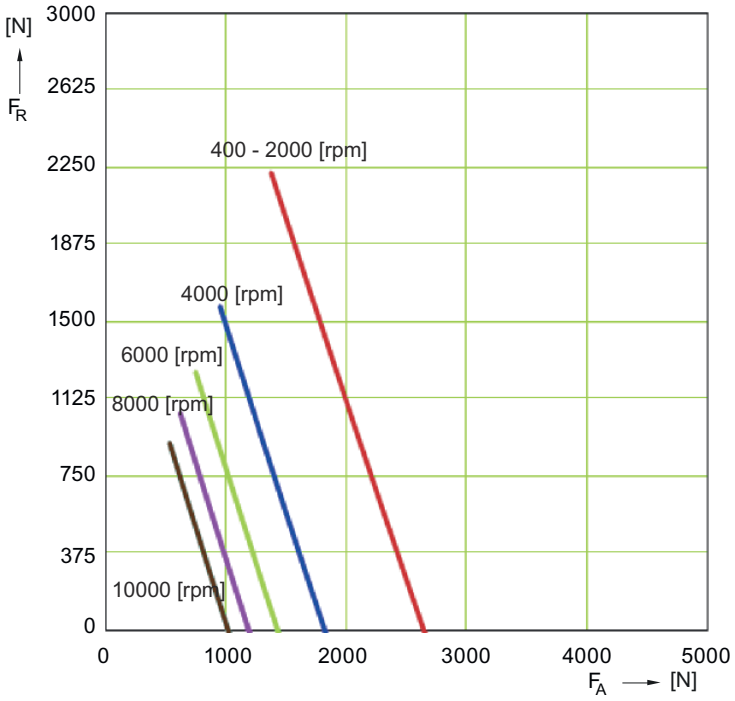


Figure 4-47 SH 132, Performance, 12,000 h bearing lifetime

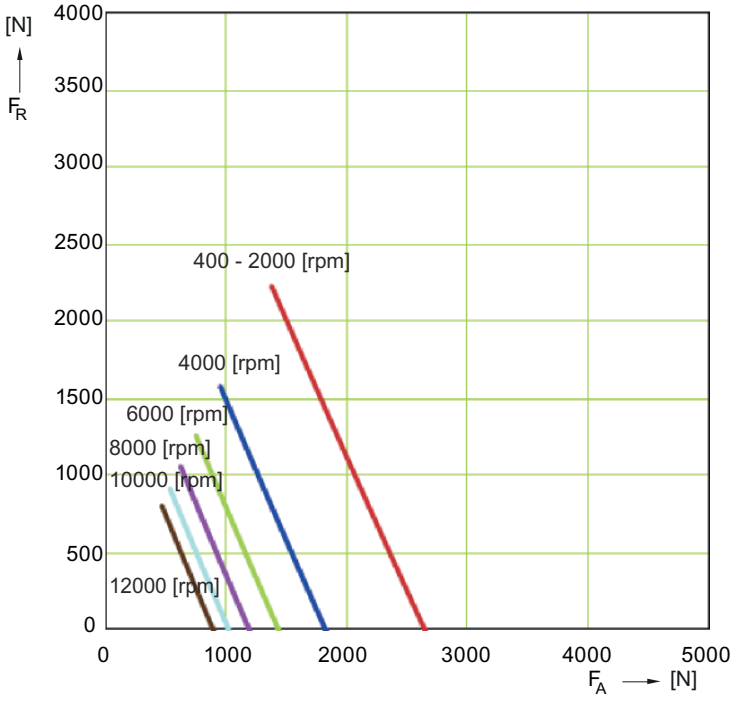


Figure 4-48 SH 132, High Performance, 12,000 h bearing lifetime

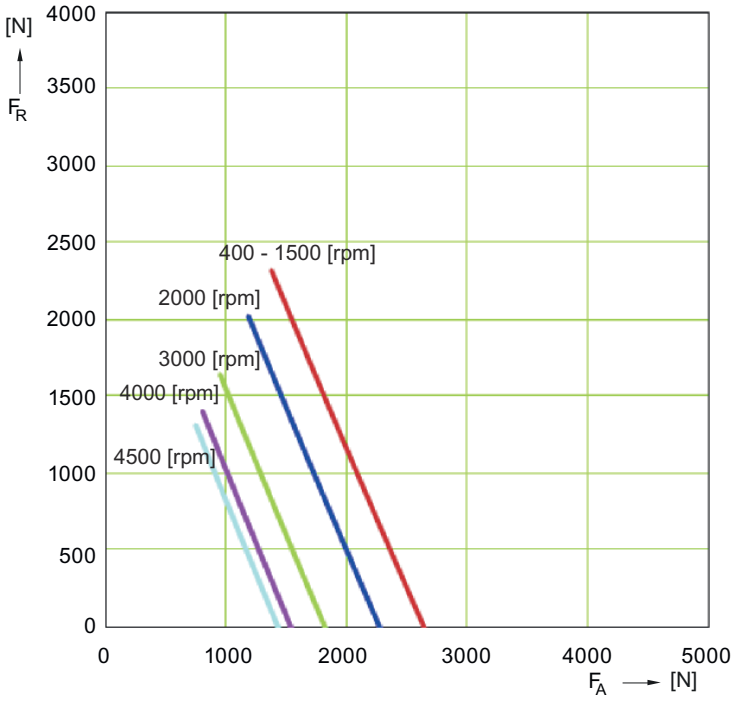


Figure 4-49 SH 132, Advanced Lifetime, 40,000 h bearing lifetime

Permissible axial forces for SH 160

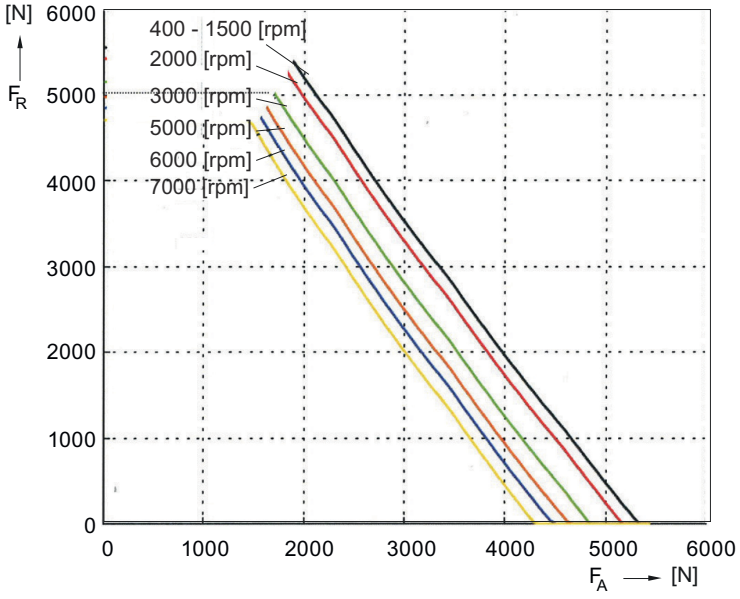


Figure 4-50 SH 160, Standard, and Standard with locating bearing, 20,000 h bearing lifetime

Table 4-27 SH 160, increased radial force, 16,000 h bearing lifetime

Motor type		**Max. permissible axial force as a function of speed**						
1PH816	Speed n r/min	1500	2000	3000	4000	5300	-	-
	Axial force F_A N	4000	3800	3550	3400	3250	-	-

Note

The permissible axial force is absorbed exclusively by the deep-groove ball bearing of the duplex bearing. The cylindrical roller bearing absorbs the radial force. The axial force F_{AZ} that is permissible during operation is calculated as stated in table "Calculating the permissible axial force."

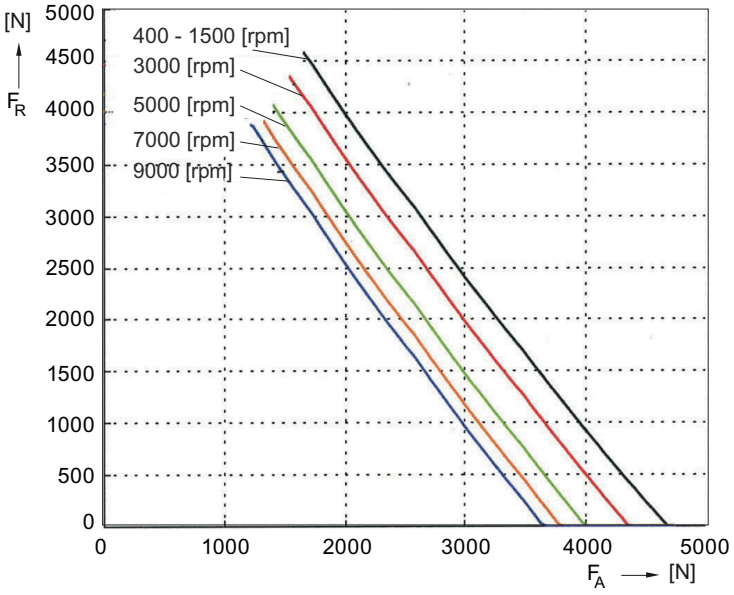


Figure 4-51 SH 160, Performance, 12,000 h bearing lifetime

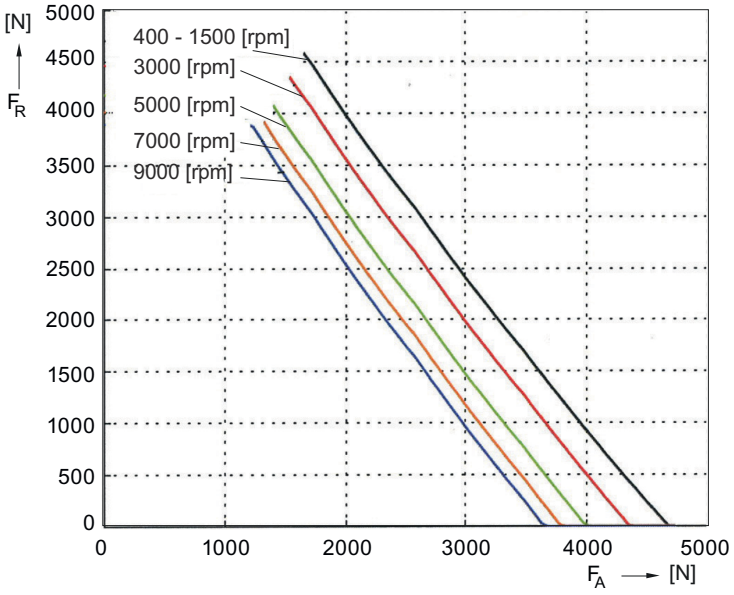


Figure 4-52 SH 160, High Performance, 12,000 h bearing lifetime

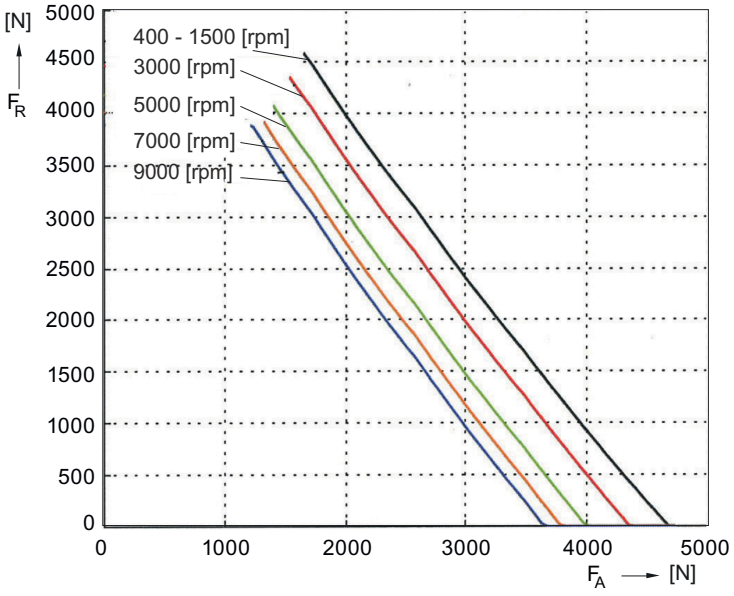


Figure 4-53 SH 160, Performance, 12,000 h bearing lifetime

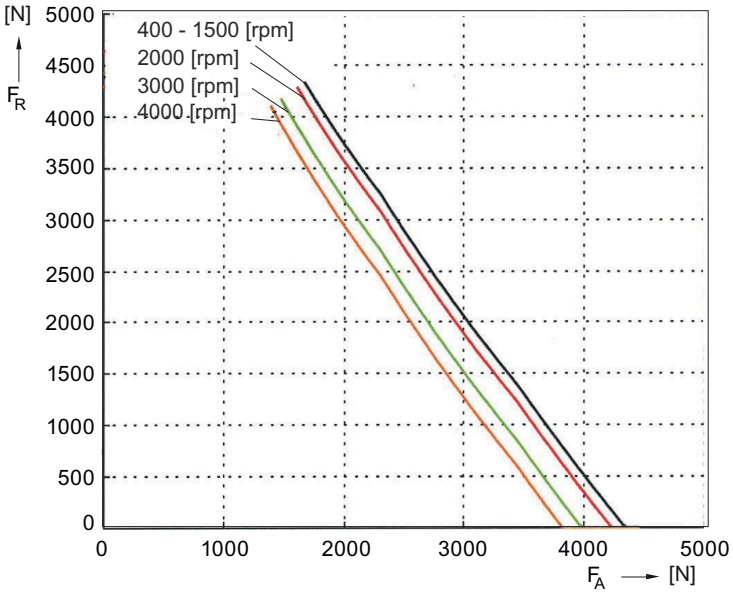


Figure 4-54 SH 160, Advanced Lifetime, 40,000 h bearing lifetime

See also

Axial force (Page 117)

Permissible axial forces for SH 180

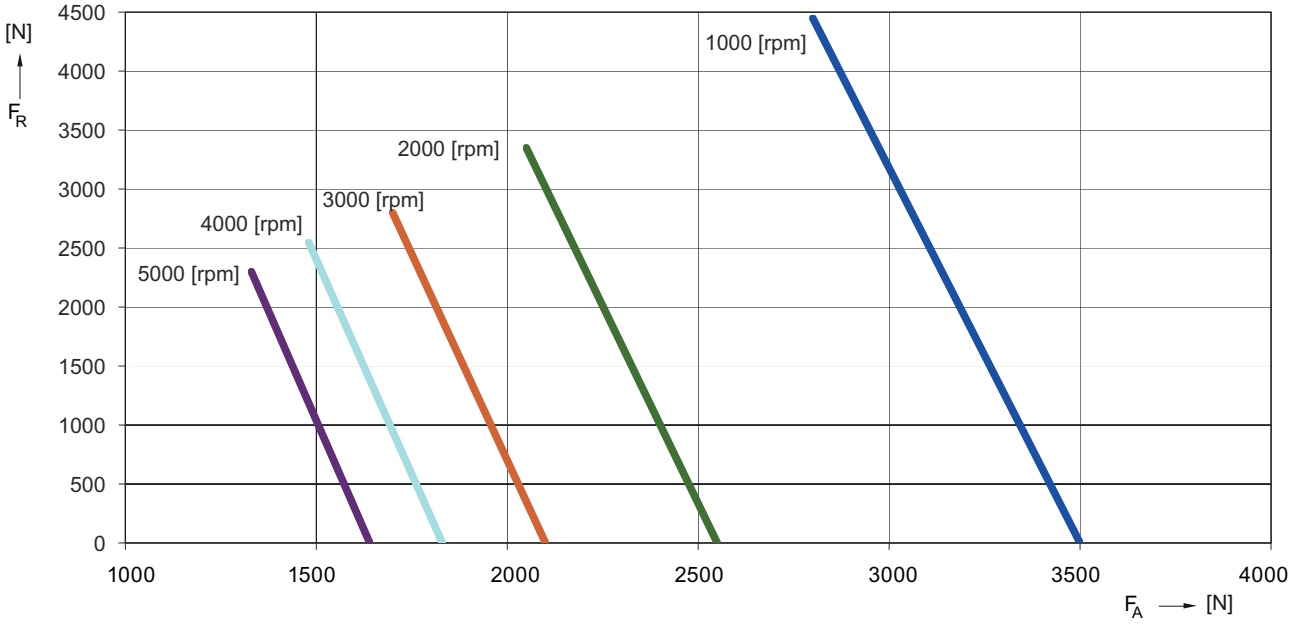


Figure 4-55 SH 180, Standard/Performance, 20,000/12,000 h bearing lifetime

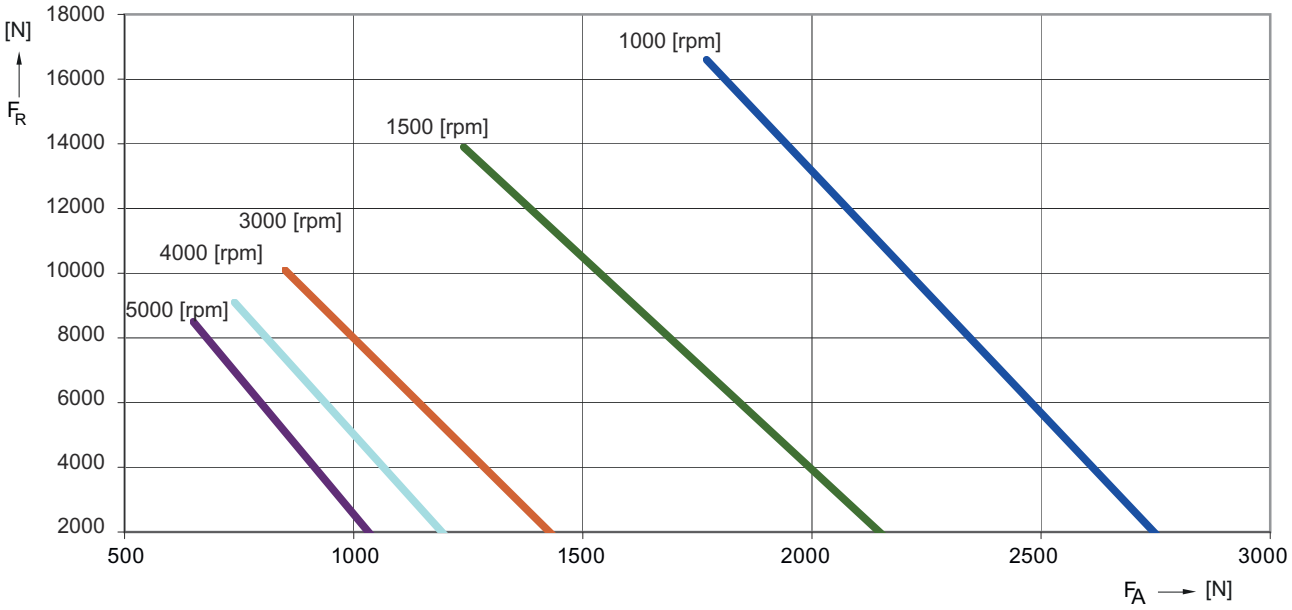


Figure 4-56 SH 180, increased cantilever forces, 12,000 h bearing lifetime

Permissible axial forces for SH 225

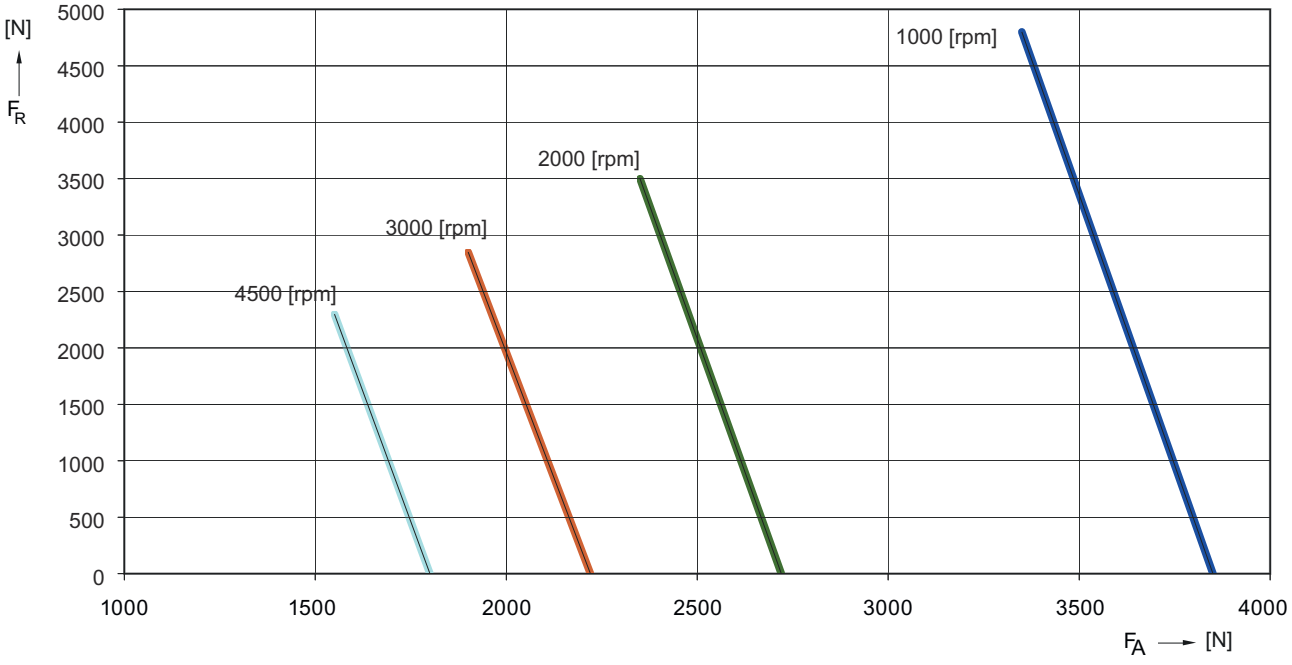


Figure 4-57 SH 225, Standard/Performance, 20,000/12,000 h bearing lifetime

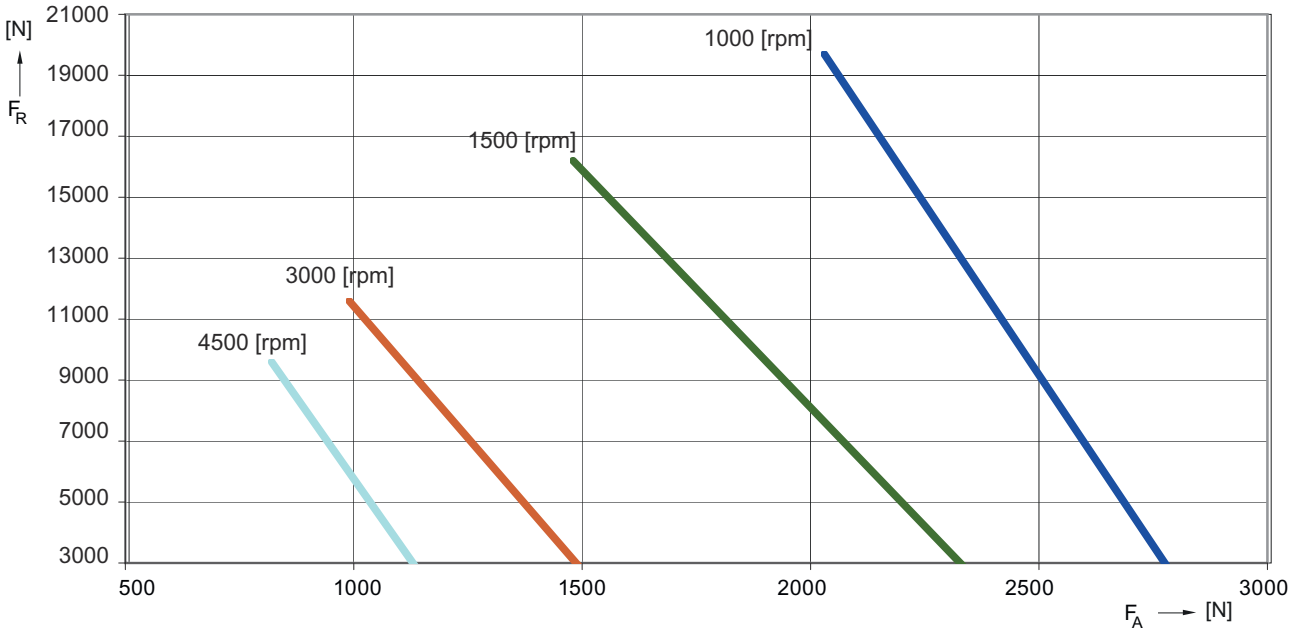


Figure 4-58 SH 225, increased cantilever forces, 12,000 h bearing lifetime

Permissible axial forces for SH 280

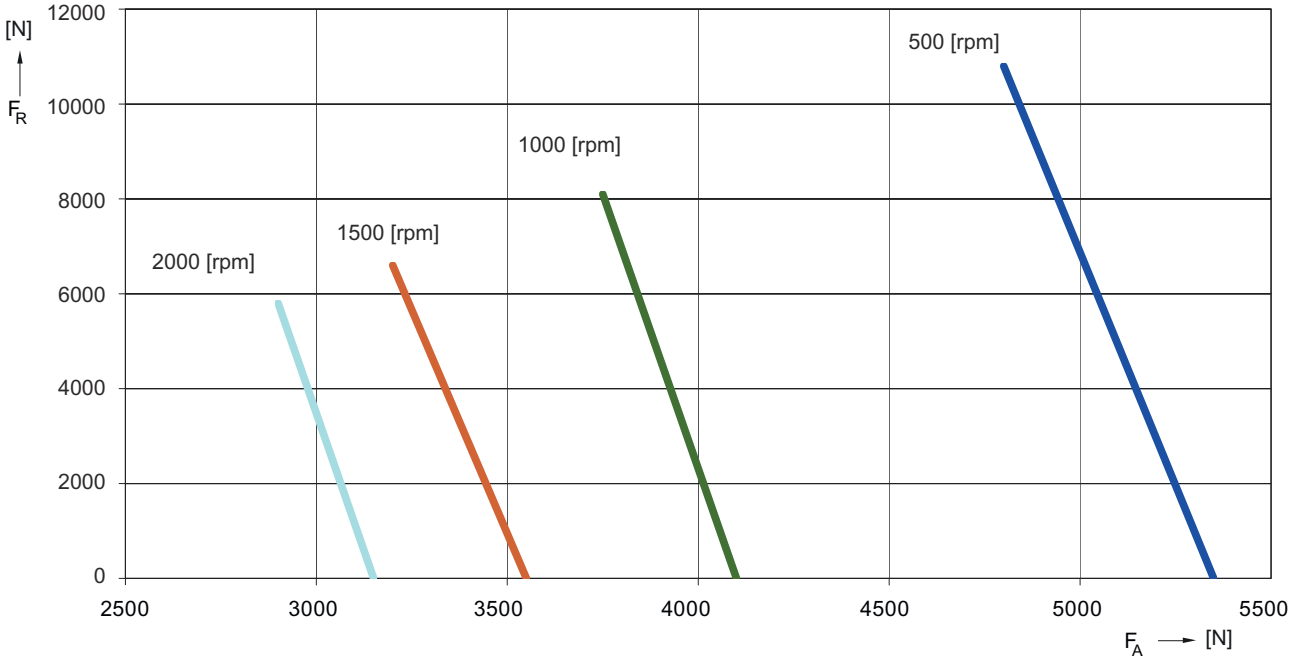


Figure 4-59 SH 280, Standard, 20000 h bearing lifetime

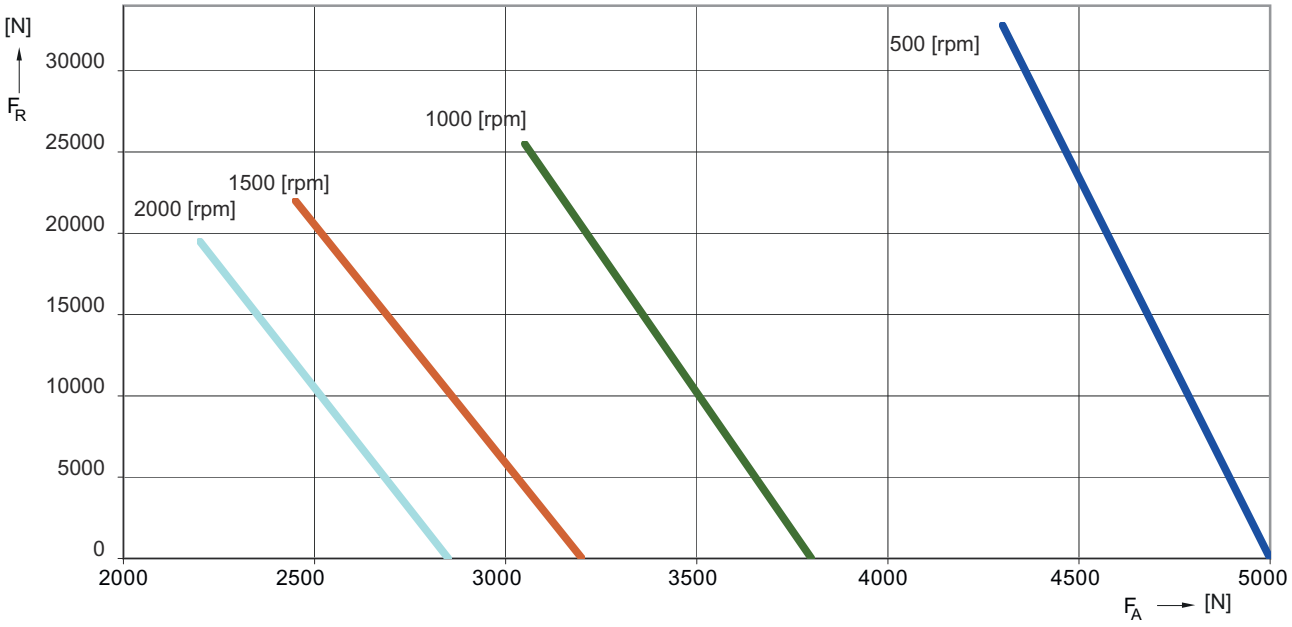


Figure 4-60 SH 280, increased cantilever forces, 12,000 h bearing lifetime

4.8 Radial eccentricity, concentricity and axial eccentricity

The shaft and flange accuracies are always checked in accordance with DIN 42955, IEC 60072. For shaft heights 180, 225 and 280, however, the flange accuracy is checked in accordance with DIN 50347. Data deviating from these values are indicated in the dimension drawings.

Table 4-28 Radial eccentricity tolerance of the shaft to the frame axis (in relation to the cylindrical shaft extensions)

Shaft height	Tolerance level N	Tolerance level R	Tolerance SPECIAL
80	0.05	0.025	0.01
100	0.05	0.025	0.01
132	0.05	0.025	0.01
160	0.06	0.03	0.01
180	0.06	0.03	-
225	0.06	0.03	-
280	0.07	0.035	-

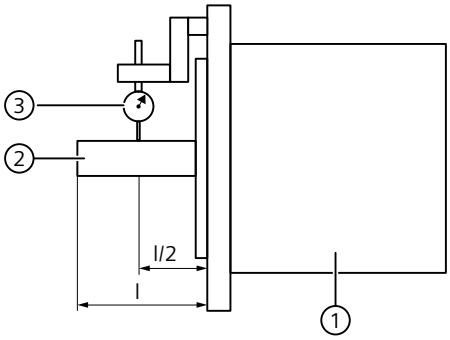


Figure 4-61 Checking the radial eccentricity

Table 4-29 Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis (referred to the centering diameter of the mounting flange)

Shaft height	Tolerance level N	Tolerance level R	Tolerance SPECIAL
80	0.1	0.05	0.03
100	0.1	0.05	0.04
132	0.125	0.063	0.04
160	0.125	0.063	0.04
180	0.125	0.063	-
225	0.125	0.063	-
280	0.16	0.08	-

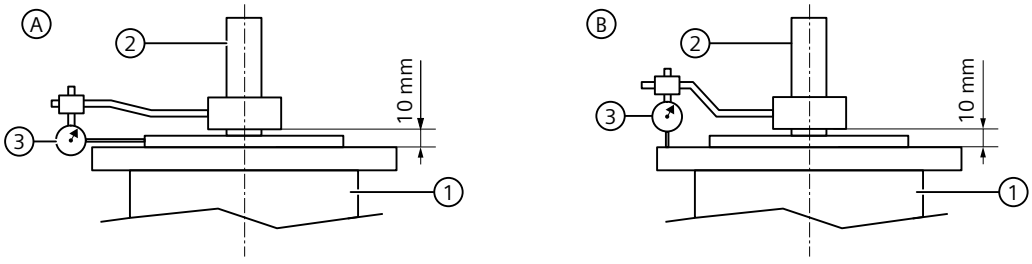


Figure 4-62 Checking the concentricity and axial eccentricity

Note

Acceptance test certificate

The runout, concentricity and axial eccentricity are tested in the Siemens factories as standard. For 1PH8 motors, an acceptance test certificate with the values actual measured can be ordered with option B36.

4.9 Balancing

4.9.1 Requirements

Requirements placed on the process when balancing mounted components - especially belt pulleys

In addition to the balance quality of the motor, the vibration quality of motors with mounted belt pulleys and coupling is essentially determined by the balance quality of the mounted component.

If the motor and mounted component are separately balanced before they are assembled, then the process used to balance the belt pulley or coupling must be adapted to the motor balancing type.

For asynchronous motors, a differentiation should be made between the following balancing types:

- Half-key balancing (an "H" is stamped on the shaft face)
- Full-key balancing (an "F" is stamped on the shaft face)
- Smooth shaft end (no keyway)

The balancing type is coded in the order designation.

Note

Machining the feather key

In the case of a half-key balanced shaft end and short output element, remove if necessary the part of the feather key which protrudes out of the output element and beyond the shaft contour. This is urgently recommended at speeds above 1000 r/min, and where the balance quality must comply with high demands.

For the highest demands placed on the system balance quality, we recommend that motors with smooth shaft (without keyway) are used. For motors balanced with full key, we recommend belt pulleys with two keyways on opposite sides, however, with only one key in the shaft end.

Table 4-30 Requirements placed on the balancing process as a function of the motor balancing type

Balancing equipment/ Process step	Motor Half key balanced	Motor balanced with full key	Motor with plain shaft end
Auxiliary shaft to balance the mounted component	• Auxiliary shaft with keyway • Keyway with the same dimensions as in the motor shaft end • Auxiliary shaft half key balanced	• Auxiliary shaft with keyway • Slot design with the exception of the slot width (as the motor) can be freely selected • Auxiliary shaft full key balanced	• Auxiliary shaft without keyway • If required, use a tapered auxiliary shaft
	• Balance quality of the auxiliary shaft ≤ 10 % of the required balance quality of the component to be mounted to the motor		
Attaching the mounted component to the auxiliary shaft for balancing	• Attached using a key • Key design, dimensions and materials the same as at the motor shaft end	• Attached using a key • Key design, dimensions and material the same as used for the full key balancing of the auxiliary shaft	• Attach the component as far as possible without any play, e.g. using a light press fit on the tapered shaft
Position the mounted component on the auxiliary shaft	• Select a position between the mounted component and the key of the auxiliary shaft so that it is the same when mounted on the actual motor	• No special requirements	
Balance the mounted component	• Two-plane balancing is recommended - i.e. balancing in two planes at both sides of the mounted components at right angles to the axis of rotation		

Special requirements

If special requirements are placed on the smooth running operation of the machine, we recommend that the motor together with the output components is completely balanced. In this case, balancing should be carried out in two planes of the output component.

4.9.2 Balancing 1PH8 motors with "Premium Performance" bearing version

The on-site mechanical system vibration characteristics depend on factors such as the output elements, mounting situation, alignment, installation, and external vibration and can increase the level of motor vibration. Under certain circumstances, the rotor may have to be balanced completely with the output element.

1PH8 motors are supplied with "special" vibration severity. Mounting a coupling element on the shaft extension changes the rotor balancing state. As a consequence, after mounting coupling elements, the rotor must be completely balanced. The following description shows, using an example, the procedure for 1PH8 motors with "Premium Performance" bearing version. You must determine the vibration severity and the position of the imbalance by making the appropriate measurements. You can then remove the imbalance.

Measuring unit required

2-channel vibration measuring unit

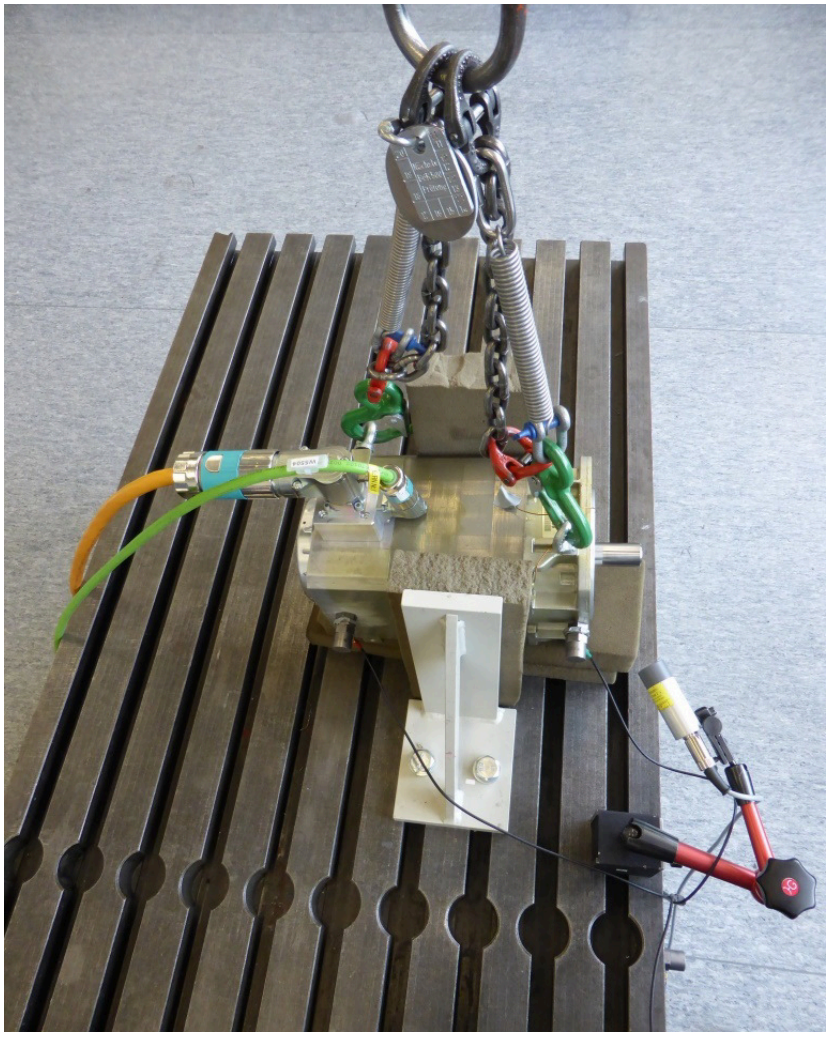
Frequency bandwidth: 10 Hz to 1000 Hz

The measuring unit must be equipped with a function to analyze orders of frequency components. Using this function, you can display the imbalance (1st order vibration component).

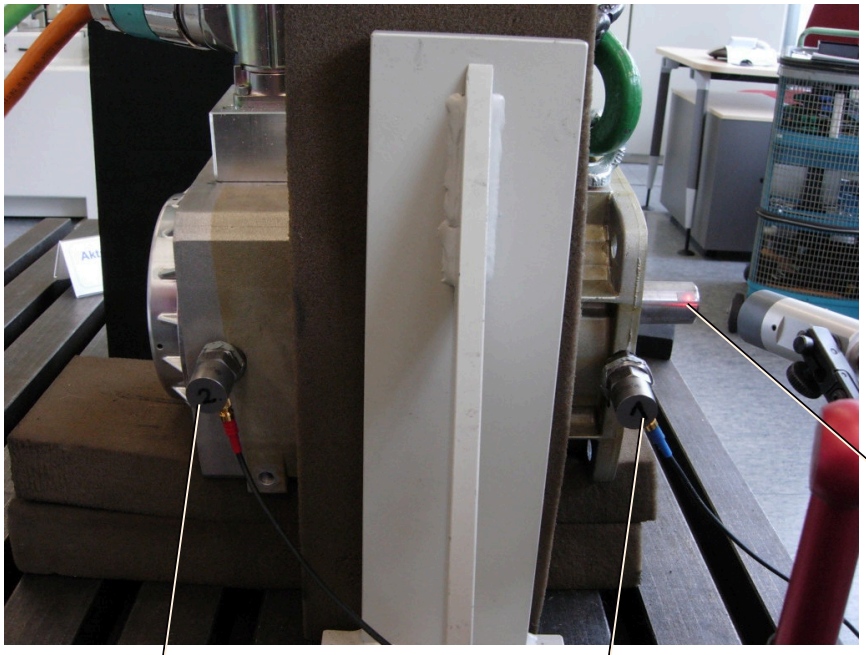
Typical approach

1.
2.

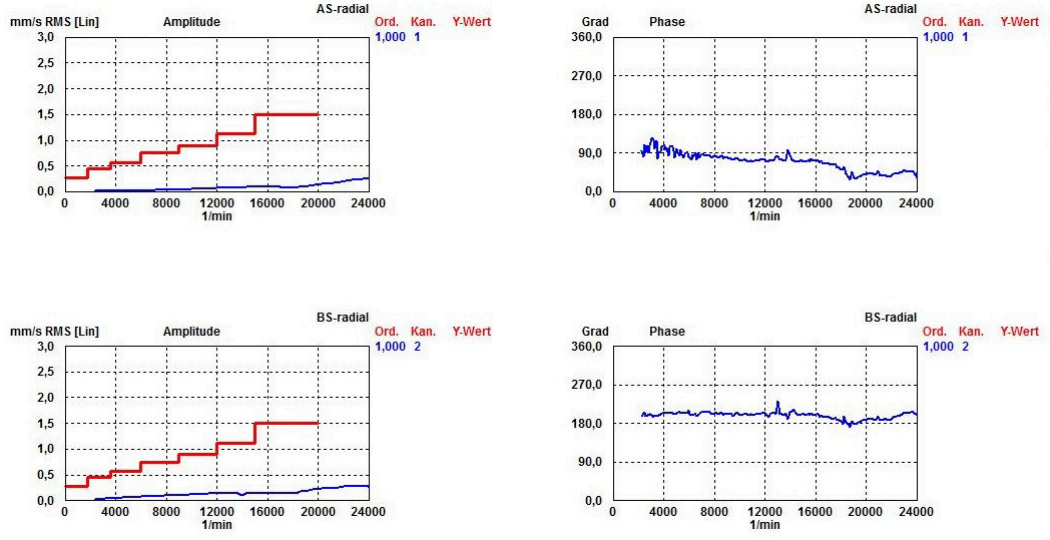
1. Prepare to make the reference measurement. Freely suspend the motor according to IEC 60034-14.
   The natural frequency of the motor-spring system must be less than 3 Hz. As a consequence, use springs that are adapted to the motor mass. The motor must be freely suspended so that the reference measurement can provide a correct measurement result.



2. Make a reference mark on the shaft (DE) for the speed and angle detection.



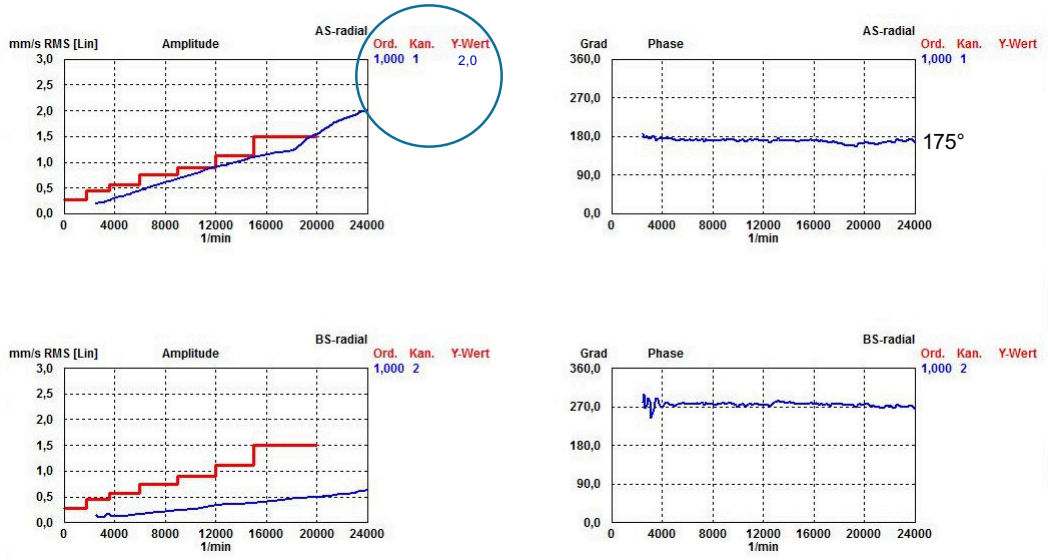
3. Position the measuring sensors: Sensor 1 for the DE, sensor 2 for the NDE.
4. Perform the reference measurement on the freely suspended motor for the DE and the NDE. Measure the absolute value and angular position of the imbalance (1st order).

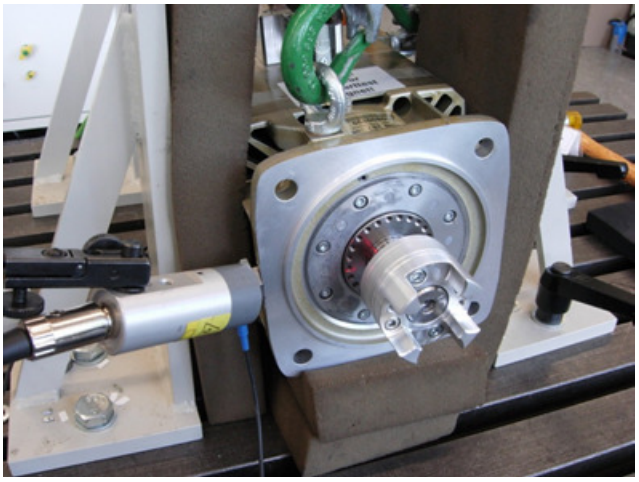


5. Attach the coupling to the shaft extension (DE).

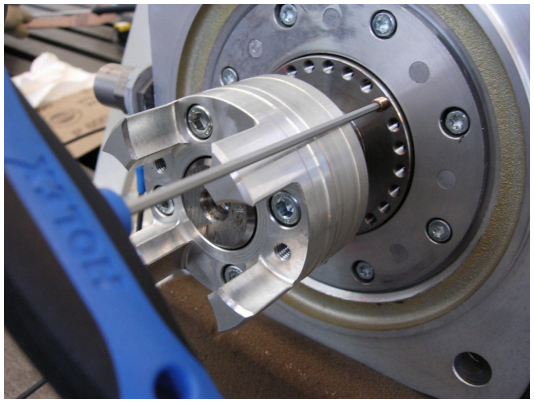
6. Perform the measurement on the coupled motor for the DE and the NDE. Also in this case, measure the absolute value and angular position of the imbalance (1st order).

largest imbalance amount

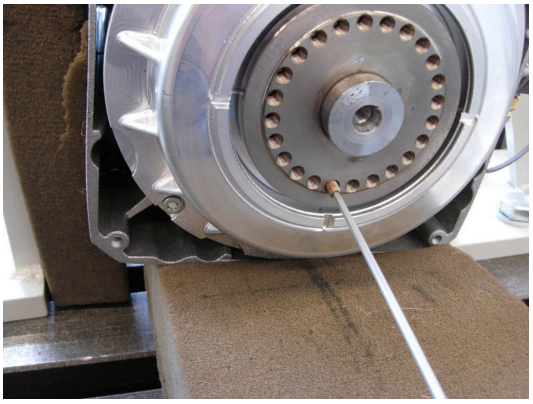




7. Remove the imbalance. To do this, screw one or several balancing screws into the rotor. Start at the side with the highest absolute imbalance. For instance, if you detect an imbalance at the DE at an angle of 175°, then you must screw in a balancing screw on the opposite side at an angle of 355° (175° + 180° = 355°).



Insert balancing screw at the DE



Insert balancing screw at the NDE

8. It may be necessary to repeat Point 6 and Point 7 several times until the imbalance has been completely removed.

4.10 Vibration response

4.10.1 Mounting and mounting instructions

In order to ensure smooth, vibration-free motor operation, a stable foundation design is required, the motor must be precisely aligned, and the components that are to be mounted on the shaft extension must be correctly balanced.

The following mounting instructions must be carefully observed:

- For high-speed machines, we recommend that the complete unit is dynamically balanced after couplings or belt pulleys have been mounted.
- Use suitable equipment when mounting drive elements. Use the thread at the shaft extension.
- Do not apply any shocks or axial pressure to the shaft extension.
- Especially for high-speed motors with flange mounting, it is important that the mounting is stiff in order to locate any natural frequency as high as possible so that it remains above the maximum rotational frequency.

- Thin sheets (shims) can be placed under the motor mounting feet to align the motor and to avoid mechanically stressing the motor. The number of shims used should be kept to a minimum.
- In order to securely mount the motors and reliably and safely transfer the drive torque, bolts with strength class 8.8 according to ISO 898-1 should be used.

Note

Comply with permissible vibration values

All flange-mounted motors must have a stable motor suspension assembly and for high field weakening speeds must be supported using the appropriate feet at the bearing end shield (foot/flange type of construction, also refer to Section "Vibration severity limit values").

Support using feet at the bearing end shield is not required if the following conditions are maintained:

- For flange-mounted motors, there is a stable motor suspension design

- The permissible vibration values according to DIN ISO 10816 are maintained

- The maximum speed is limited (refer to Table "Restricting the maximum speed")

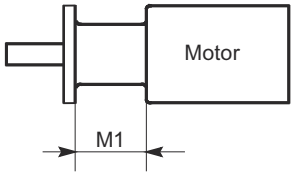
Motors that are mounted, as a result of their type of construction, to the wall using the motor feet, must be fixed in place using an adequately dimensioned positive form fit (e.g. using studs or mounting rails).

When commissioning the motors, it must be ensured that the permissible vibration values according to DIN ISO 10816 are maintained.

Table 4-31 Limiting the maximum speed

Shaft height mm	Max. permissible speed r/min
180	3000
225	2500
280	2000

Table 4-32 Flange mounting with threaded studs and nuts

Shaft height mm	M1 mm	
180	32	
225	45	
280	45	

Note

Flange mounting SH 180 to SH 280

For SH 180 to SH 280, flange mounting is only possible using studs and nuts. Clearance M1 for threading the nut between the motor flange and motor frame according to DIN 42948.

NOTICE
Check the bearing If liquid accumulates at the flange because of vertical or horizontal mounting, the bearing and the bearing grease may be adversely affected. • Prevent liquid from collecting at the flange.

Note

Attaching plastic covers for SH 80 up to SH 160

- With the forced-ventilated versions of shaft heights 80 to 160, before the motor is commissioned you must replace the plastic covers that were removed so that the mounting bolts could be tightened.

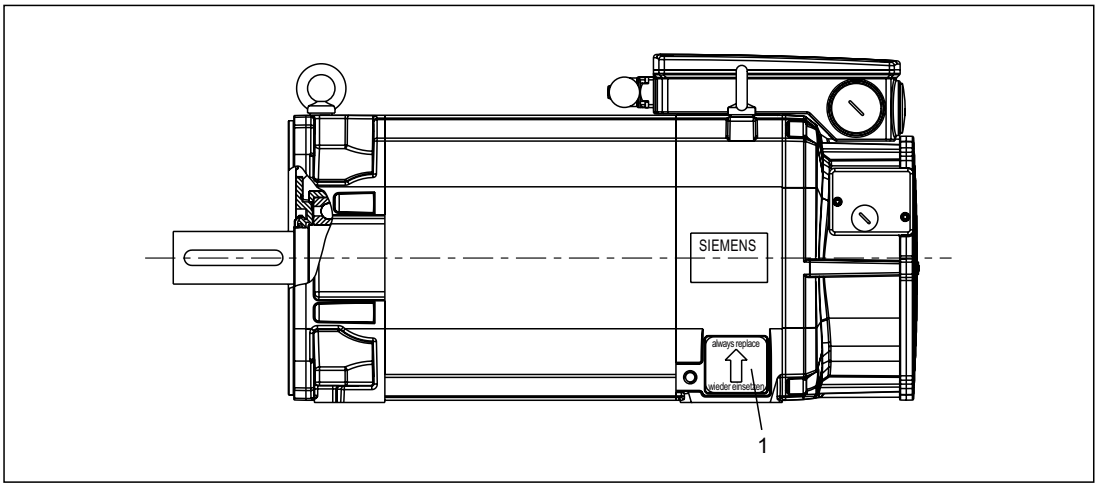


Figure 4-63 Cover for mounting foot

Note

Mounting air-cooled motors

- Air-cooled motors must be mounted in such a way that the cooling air can enter and be discharged without any obstruction (see also Chapter "Cooling").

4.10.2 Natural frequency when mounted

The motor is a system which is capable of vibration at its natural frequency. For all motors, this natural frequency lies above the specified maximum speed.

When the motor is mounted onto a machine, a new system, which is capable of vibration, is created with modified natural frequencies. These can lie within the motor speed range.

This can result in undesirable vibrations in the mechanical drive transmission.

Note

Avoiding natural frequencies when mounting

Motors must be carefully mounted on adequately stiff foundations or bedplates. Additional elasticities of the foundation/bedplates can result in resonance effects of the natural frequency at the operating speed and therefore result in inadmissibly high vibration values.

The magnitude of the natural frequency when the motor is mounted depends on various factors and can be influenced by the following points:

- Mechanical transmission elements (gearboxes, belts, couplings, pinions, etc.)
- Stiffness of the machine design to which the motor is mounted
- Stiffness of the motor in the area around the foot or customer flange
- Motor weight
- Machine weight and the weight of the mechanical system in the vicinity of the motor
- Damping properties of the motor and the driven machine
- Mounting type, mounting position (IM B5, IM B3, IM B35, IM V1, etc.)
- Motor weight distribution, i.e. length, shaft height

4.10.3 Misalignment

To avoid or minimize misalignment, a compensating coupling should be used (see the diagram).

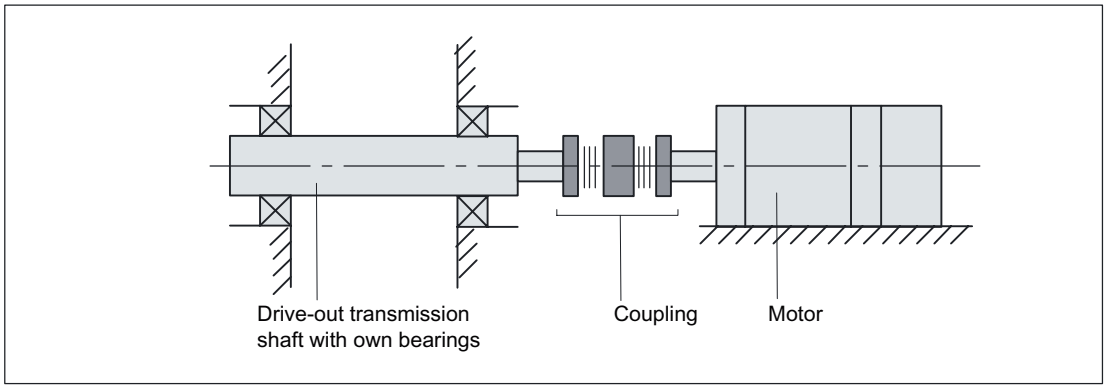


Figure 4-64 Mechanical output transmission shaft with its own bearings and compensating coupling

If possible, the motor should not be directly and rigidly coupled to an output transmission shaft which has its own bearings.

However, if a rigid coupling is absolutely necessary for mechanical design reasons, misalignment deviations must be avoided. In this case, a careful check must be made by making the appropriate measurements.

Vertical and horizontal alignment

The following measures are required to compensate for any radial offset at the coupling and to horizontally adjust the electric motor with respect to the driven load:

- Place shims under the motor feet to position it vertically and to prevent stress in the machine. The number of shims should be kept as low as possible, so use as few thicker shims as possible instead of several thinner shims.
- For horizontal positioning, push the motor sideways on the foundation Pay attention to maintaining the axial position.
- When positioning the motor, ensure that a uniform axial gap is maintained around the coupling. Note on alignment accuracy: Remember to take account of data concerning the alignment accuracy of the driven load and the coupling.

Alignment accuracy

1. Align the motors with coupling output in such a manner that the center lines of the shafts are parallel with no offset. This ensures that no additional forces affect their bearings during operation.
2. Perform the fine adjustments with shims under the entire motor foot.

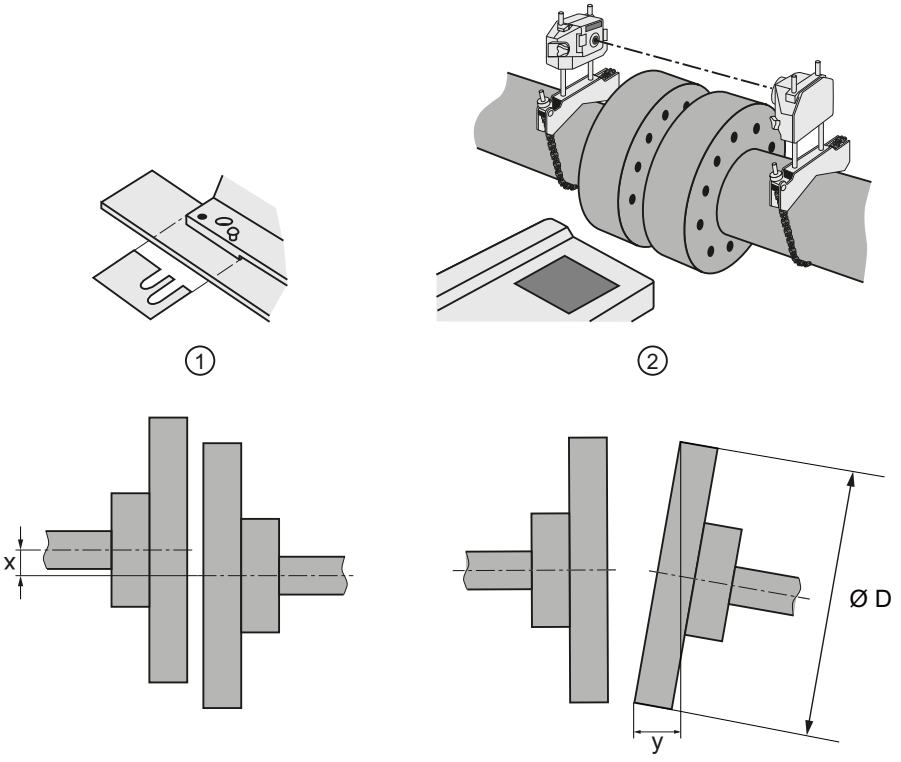


Figure 4-65 Aligning the drive

Table 4-33 Permissible deviations when aligning the motor

Permissible deviations	Radial shaft offset x	Axial shaft offset y
Flexible coupling	0.05 mm	0.05 mm

4.10.4 Flywheels

Flywheels with a high mass, which are rigidly mounted to the end of the motor shaft, modify the vibration characteristics of the motor and shift the critical rotational frequencies of the motor into the lower speed ranges.

The overall system should be precision balanced in order to minimize/avoid exciting vibration, when external masses are directly mounted onto the motor shaft.

Operation in the resonance range must be avoided.

4.10.5 Vibration stressing

The on-site system vibration behavior depends on factors such as the output elements, mounting situation, alignment, installation, and external vibration and can increase the level of vibration on the motor.

Under certain circumstances, the rotor may have to be completely balanced with the output element.

To ensure problem-free operation and a long service life, the vibration values according to ISO 10816 must not be exceeded at the defined measuring points on the motor.

Table 4-34 Maximum permissible radial vibration values for SH 80 to 160[1)]

Vibration frequency	Vibration values
< 6.3 Hz	Vibration amplitude s ≤ 0.16 mm
6.3 ... 250 Hz	Vibration velocity v_{rms} ≤ 4.5 mm/s
> 250 Hz	Vibration acceleration a ≤ 10 m/s^2

Table 4-35 Maximum permissible radial vibration values for SH 180 to 280[1)]

Vibration frequency	Vibration values
< 6.3 Hz	Vibration amplitude s ≤ 0.25 mm
6.3 ... 63 Hz	Vibration velocity v_{rms} ≤ 7.1 mm/s
> 63 Hz	Vibration acceleration a ≤ 4.0 m/s^2

Table 4-36 Maximum permissible axial vibration values for SH 80 to 160[1)]

Vibration velocity	Vibration acceleration
v_{rms} = 4.5 mm/s	a_{peak} = 2.25 m/s²

1) Both values must be maintained simultaneously

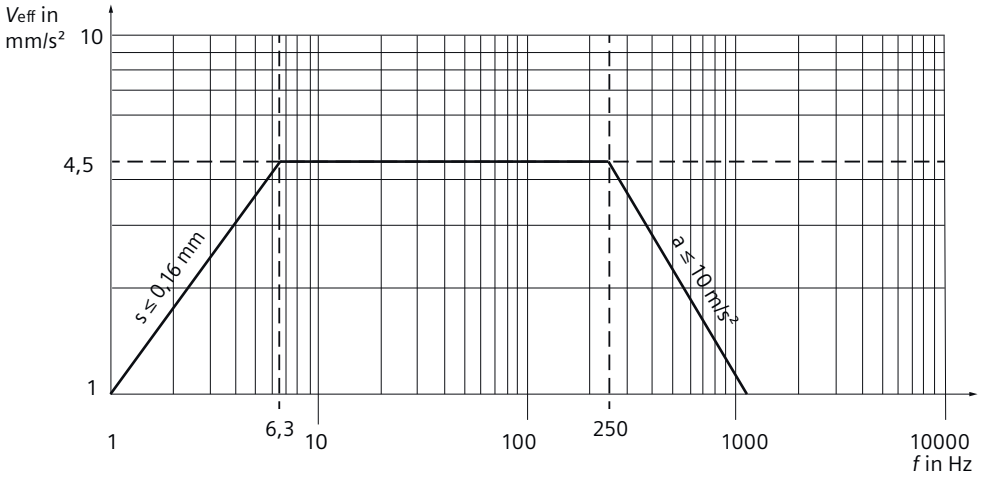


Figure 4-66 Maximum permissible vibration velocity including vibration amplitude and vibration acceleration for SH 80 to 160

Table 4-37 Maximum permissible axial vibration values for SH 180 to 280[1)]

Vibration velocity	Vibration acceleration
v_{rms} = 7.1 mm/s	a_{peak} = 3.55 m/s²

1) Both values must be maintained simultaneously

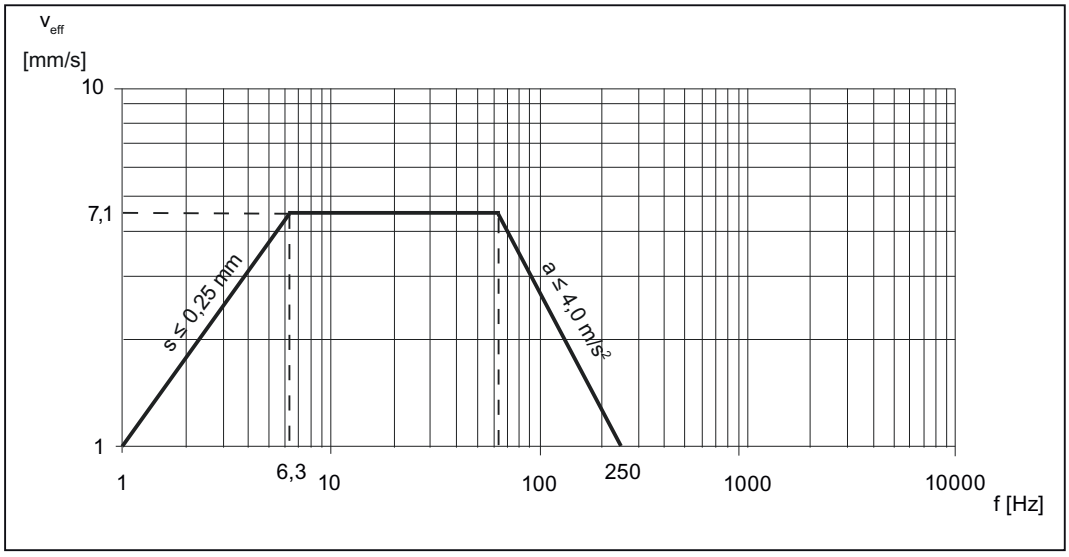


Figure 4-67 Maximum permissible vibration velocity including vibration amplitude and vibration acceleration for SH 180 to 280

To measure the vibration velocity, the measuring equipment must fulfill the requirements of ISO 2954. The vibration acceleration must be measured as a peak value in the time range in a frequency band of 10 to 2000 Hz.

If appreciable vibration excitation in excess of 2000 Hz (e.g. gear teeth meshing frequencies) can be expected, the measurement range must be adapted accordingly. This does not alter the maximum permissible values.

Note

Avoiding continuous operation at natural frequencies

Uninterrupted duty in the natural frequencies of the installed/mounted system should be avoided, as this generally leads to the permissible vibration values being exceeded and the system being damaged. To reduce vibration, flanged-mounted motors can be supported at the NDE.

Note

Measuring vibration values according to the standard

Vibration must be analyzed and measured (measuring points, etc.) according to standard ISO 10816-3.

Note

Increased resistance to vibration

1PH8 motors with shaft heights 180 and 225 and with the option L03 can be used in compliance with certain operating conditions for applications with increased resistance to vibration (see Chapter "Increased resistance to vibration (Page 182)"). Possible applications are, for example, applications such as servo presses.

4.11 Vibration severity grade

The 1PH8 motors conform to vibration severity level A in accordance with EN 60034-14 (IEC 600-34-14). The values indicated refer only to the motor. The system vibration response depends on the conditions at the installation location and can result in higher vibration values at the motor.

Note

Vibration severity limit values

According to the vibration severity limit value diagrams below, the motors operate within the limit values stipulated for versions R, S, SR or SPECIAL over the specified speed range. Furthermore, within the rated speed range, they correspond to vibration severity grades A or B as defined by EN 60034-14 (IEC 600-34-14).

The balance quality depending on the bearing is encoded in the Article No., see Chapter "Selection and ordering data."

As a general rule, high radial force load capacity is not compatible with high speed and high vibration quality. The reason for this is that the different applications require different bearings.

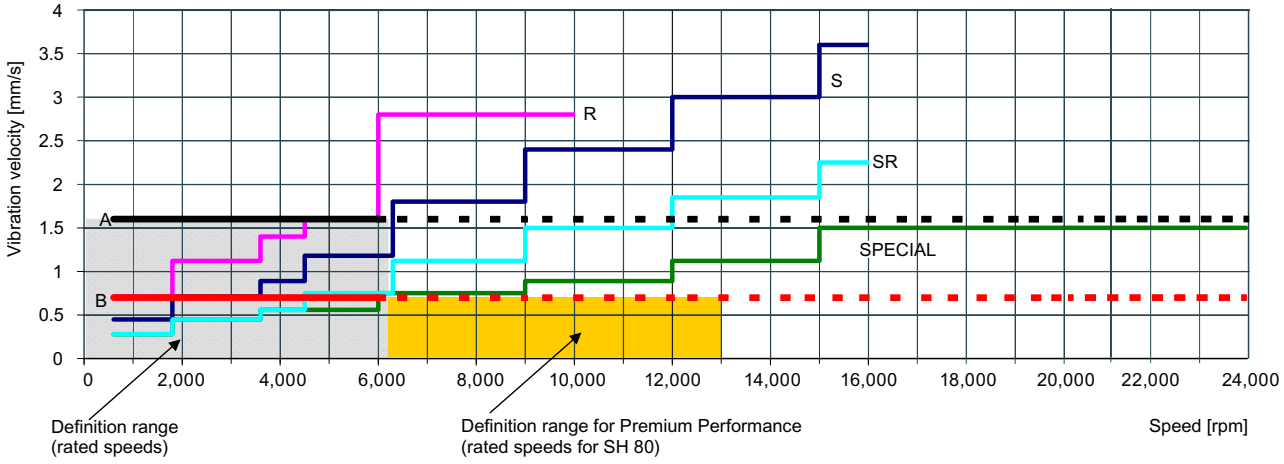


Figure 4-68 Vibration severity limit values for SH 80 to 132

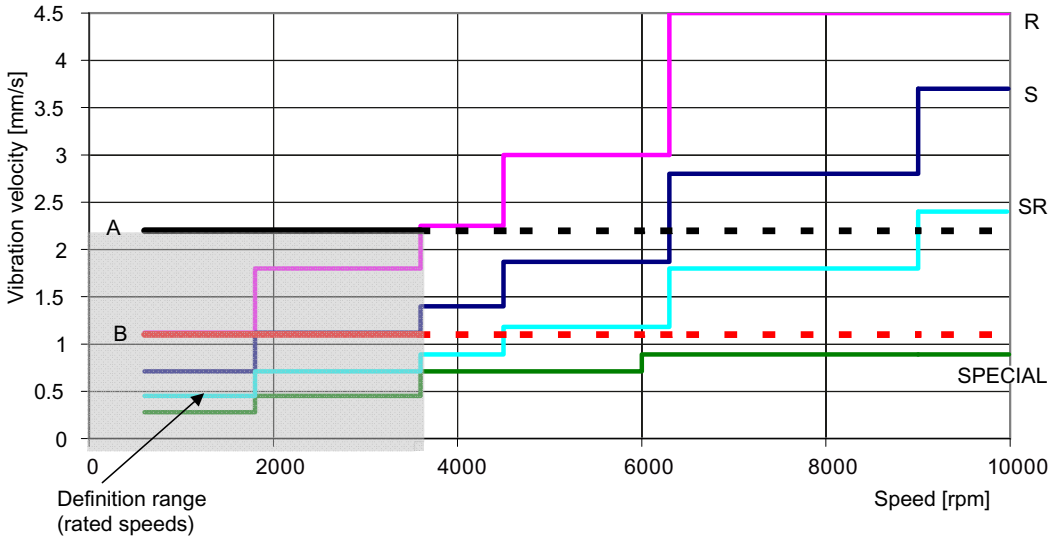


Figure 4-69 Vibration severity limit values for SH 160 to 280

Note

Acceptance test certificate

Compliance with the limits, depending on the vibration severity grade ordered, is ensured in the Siemens factories as standard. For 1PH8 motors, an acceptance test certificate with the vibration velocities actually measured can be ordered with option B35.

4.12 Noise emission

The noise emissions of the 1PH8 depend on the type of cooling and are therefore described in Chapter "Cooling (Page 71)."

Motor components and options

5

5.1 Motor components

5.1.1 Thermal motor protection

A Pt1000 temperature sensor is integrated in the stator winding to monitor the winding temperature. The exact type of temperature sensor is stated on the nameplate.

Table 5-1 Features and technical data

Type	Pt1000
Resistance when cold (20 °C)	Approx. 1090 Ω
Resistance when hot (100 °C)	Approx. 1390 Ω
Connection	Via signal cable
Response temperature [1]	Prewarning < 150 °C Alarm/trip at max. 170 °C ±5 °C

[1] With SH80: Prewarning < 130 °C; Alarm/trip at max. 150 °C ±5 °C

The resistance change is proportional to the winding temperature change. The temperature characteristic is taken into account in the closed-loop control.

The prewarning signal from the evaluation circuit in the SINAMICS drive converter can be externally evaluated.

High short-term overload conditions require additional protective measures as a result of the thermal coupling time of the temperature sensor.

The conductors for the temperature sensor are routed in one cable together with the encoder conductors.

NOTICE
Destruction of the temperature sensor if the insulation resistance is tested improperly. If the test voltage is connected to only one temperature sensor terminal, the temperature sensor will be destroyed. • Short-circuit the ends of the temperature sensor cables before applying the test voltage.

NOTICE
Destruction of the motor for a thermally critical load There is no adequate protection during a thermally critical load, e.g. a high overload at motor standstill. • Take additional protective measures, e.g. an overcurrent relay. • The "thermal motor model i2t monitoring" function must be activated in the converter.

Note

Connector for temperature sensors

The temperature sensor is connected to the signal connector together with the speed encoder signal.

1PH8 motors without an encoder can only be ordered as induction motors. In this case, the temperature sensor is connected to the signal terminal strip in the terminal box. An additional M16 x 1.5 cable entry is provided in the terminal box to establish a connection. For encoderless 1PH8 motors connected using a connector, the temperature sensor is connected to the encoder connector (connector version and assignment the same as for HTL encoders).

The spare temperature sensor (option A25 for shaft heights 80 to 160) and the circuit of PTC thermistors for alarm/trip (option A12) are connected to a signal terminal block in the terminal box.

5.1.2 Encoder

5.1.2.1 Encoder overview

The encoder is encrypted at the 9th position of the motor Article number using the appropriate letters.

Note

Different encoder types for motors with or without DRIVE-CLiQ

The identification letters at the 9th position of the Article No. for the encoder type required is different for motors with and without DRIVE-CLiQ.

Table 5-2 Encoder types for motors without DRIVE-CLiQ

Encoder type	9th position of the Article No.
Without encoder	A
Absolute encoder EnDat 2048 S/R (encoder AM2048S/R)	E
Incremental encoder HTL 1024 S/R (encoder HTL 1024 S/R)	H
Incremental encoder HTL 2048 S/R (encoder HTL 2048 S/R)	J

Encoder type	9th position of the Article No.
Incremental encoder sin/cos 1 Vpp 2048 S/R with C and D tracks (encoder IC 2048 S/R)	M
Incremental encoder sin/cos 1 Vpp 512 S/R without C and D tracks (encoder IN 512 S/R)	T
Incremental encoder sin/cos 1 Vpp 256 S/R without C and D tracks (encoder IN 256 S/R)	C

Table 5-3 Encoder types for motors with DRIVE-CLiQ

Encoder type	9th position of the Article No.
Absolute encoder, 22-bit singleturn + 12-bit multiturn (encoder AM22DQ)	F
Incremental encoder, 22-bit, with commutation position (encoder IC22DQ)	D
Incremental encoder 20-bit without commutation position (encoder N20DQ)	U
Incremental encoder 19-bit without commutation position (encoder IN19DQ)	S
External encoder (only possible for shaft height 280 and forced ventilation)	
Incremental encoder HTL 1024 S/R HOG 22 (Baumer-Hübner) Mounting prepared (additional Z options must be considered)	G
Incremental encoder HTL 1024 pulses/revolution POG 10 (Baumer-Hübner) Mounting prepared (additional Z options must be considered)	K

5.1.2.2 Encoder connection for motors with a DRIVE-CLiQ interface

⚠ WARNING

Danger to life when using an incorrect encoder module

The DRIVE-CLiQ encoder contains motor and encoder-specific data and an electronic type plate. If you use an incorrect DRIVE-CLiQ encoder, this can result in death, severe injury and severe material damage.

- Only use the DRIVE-CLiQ encoder and the electronic type plate for the original motor.
- Do not mount the DRIVE-CLiQ encoder onto other motors.
- Do not replace a DRIVE-CLiQ encoder by a DRIVE-CLiQ encoder belonging to another motor.
- Only appropriately trained Siemens service personnel should replace DRIVE-CLiQ encoders.

NOTICE
Electrostatic discharge Electronic modules contain components that can be destroyed by electrostatic discharge. These modules can be easily destroyed if they are not handled properly. • To protect your equipment against damage, follow the instructions given in the chapter ESD Guidelines.

Motors with DRIVE-CLiQ interface have an internal Sensor Module. This Sensor Module includes an electronic rating plate. This simplifies commissioning for the SINAMICS S110 / S120 drive system, since all the motor parameters are set automatically.

5.1.2.3 Encoder connection for motors without DRIVE-CLiQ (12/17-pole)

Motors without DRIVE-CLiQ are connected using the 12 or 17-pin flange socket by default.

See also

Incremental encoder HTL 1024 S/R or HTL 2048 S/R (Page 167)

5.1.2.4 Encoder assignment as a function of maximum permissible speeds

The following tables show the possible assignments of encoders to the 1PH8 motor series as a function of maximum permissible speeds.

Table 5-4 Encoder types for motors without DRIVE-CLiQ

Encoder type		**Without encoder**	**AM2048 S/R**	**HTL1024 S/R**	**HTL2048 S/R**	**IC2048 S/R**	**IN512 S/R**	**IN256 S/R**
9th data position		**A**	**E**	**H**	**J**	**M**	**T**	**C**
Permissible n_{max} speeds (encoder) in r/min		**-**	**12,000**	**9000**	**4600**	**12,000**	**15,000**	**24,000**
Motor version and bearing system	**n_{max} (motor) r/min**							
1PH808□-1□□□□-□□□2	10,000	✓	✓	✓2)	✓4)	✓	-	-
1PH808□-1□□□□-□L□2	15,000	✓	-	-	-	✓3)	✓	✓
1PH808□-1□□□□-□M□2	20,000	✓	-	-	-	✓3)	✓5)	✓
1PH808□-1□□□□-□N□2	24,000	-	-	-	-	-	-	✓
1PH808□-1□□□□-□Q□2	5000	✓	✓	✓	✓4)	✓	-	-

Encoder type		**Without encoder**	**AM2048 S/R**	**HTL1024 S/R**	**HTL2048 S/R**	**IC2048 S/R**	**IN512 S/R**	**IN256 S/R**
9th data position		**A**	**E**	**H**	**J**	**M**	**T**	**C**
Permissible n_{max} speeds (encoder) in r/min		**-**	**12,000**	**9000**	**4600**	**12,000**	**15,000**	**24,000**
Motor version and bearing system	**n_{max} (motor) r/min**							
1PH810□-1□□□□-□□□2	9000	✓	✓	✓	✓4)	✓	-	-
1PH810□-1□□□□-□L□2	12,000	✓	✓	-	-	✓	✓	✓
1PH810□-1□□□□-□M□2	18,000	✓	-	-	-	✓3)	✓5)	✓
1PH810□-1□□□□-□Q□2	5000	✓	✓	✓	✓4)	✓	-	-
1PH813□-1□□□□-□□□2	8000	✓	✓	✓	✓4)	✓	-	-
1PH813□-1□□□□-□L□2	10,000	✓	✓	-	-	✓	✓	✓
1PH813□-1□□□□-□M□2	15,000	✓	-	-	-	✓3)	✓	✓
1PH813□-1□□□□-□Q□2	4500	✓	✓	✓	✓	✓	-	-
1PH813□-2□□□□-□□□2	4500	-	✓	-	-	✓	-	-
1PH813□-5□□□□-□□□2	6500	✓	✓	✓	✓	✓	-	-
1PH813□-7□□□□-□□□2	6500	✓	✓	✓	✓	✓	-	-
1PH816□-1□□□□-□□□2	6500	✓	✓	✓	✓4)	✓	-	-
1PH816□-1□□□□-□L□2	9000	✓	✓	✓	-	✓	✓	✓
1PH816□-1□□□□-□M□2	10,000	✓	-	-	-	✓	✓	✓
1PH816□-1□□□□-□Q□2	4000	✓	✓	✓	✓	✓	-	-
1PH816□-2□□□□-□□□2	4000	-	✓	-	-	✓	-	-
1PH816□-5□□□□-□□□2	5000	✓	✓	✓	✓	✓	-	-
1PH816□-7□□□□-□□□2	5000	✓	✓	✓	✓	✓	-	-
1PH818□-1□□□□-□□□2	5000	✓	✓	✓	✓4)	✓	-	-
1PH818□-1□□□□-□L□2	7500	✓	✓	✓	-	✓	-	-

Encoder type		**Without encoder**	**AM2048 S/R**	**HTL1024 S/R**	**HTL2048 S/R**	**IC2048 S/R**	**IN512 S/R**	**IN256 S/R**
9th data position		**A**	**E**	**H**	**J**	**M**	**T**	**C**
Permissible n_{max} speeds (encoder) in r/min		**-**	**12,000**	**9000**	**4600**	**12,000**	**15,000**	**24,000**
Motor version and bearing system	**n_{max} (motor) r/min**							
1PH818□-2□□□□-□□□2	3800	-	✓	-	-	✓	-	-
1PH822□-1□□□□-□□□2	4500	✓	✓	✓	✓	✓	-	-
1PH822□-1□□□□-□L□2	6000	✓	✓	✓	-	✓	-	-
1PH822□-2□□□□-□□□2	3500	-	✓	-	-	✓	-	-
1PH828□-1□□□□-□□□2	3300	✓	✓	✓	✓	✓	-	-

✓ Assignment possible

2) Motor/encoder assignment limited to 9000 r/min

3) Motor/encoder assignment limited to 12,000 r/min

4) Motor/encoder assignment limited to 4600 r/min

5) Motor/encoder assignment limited to 15,000 r/min

Table 5-5 Encoder types for motors with DRIVE-CLiQ

Encoder type		**AM22DQ**	**IC22DQ**	**IN20DQ**	**IN19DQ**
9th data position		**F**	**D**	**U**	**S**
Permissible n_{max} speeds (encoder) in r/min		**12,000**	**12,000**	**15,000**	**24,000**
Motor version and bearing system	**n_{max} (motor) r/min**				
1PH808□-1□□□□-□□□1	10,000	✓	✓	-	-
1PH808□-1□□□□-□L□1	15,000	-	✓3)	✓	✓
1PH808□-1□□□□-□M□1	20,000	-	✓3)	✓5)	✓
1PH808□-1□□□□-□N□1	24,000	-	-	-	✓
1PH808□-1□□□□-□Q□1	5000	✓	✓	-	-
1PH810□-1□□□□-□□□1	9000	✓	✓	-	-
1PH810□-1□□□□-□L□1	12,000	✓	✓	✓	✓
1PH810□-1□□□□-□M□1	18,000	-	✓3)	✓5)	✓
1PH810□-1□□□□-□Q□1	5000	✓	✓	-	-
1PH813□-1□□□□-□□□1	8000	✓	✓	-	-
1PH813□-1□□□□-□L□1	10,000	✓	✓	✓	✓
1PH813□-1□□□□-□M□1	15,000	-	✓3)	✓	✓
1PH813□-1□□□□-□Q□1	4500	✓	✓	-	-

Encoder type		**AM22DQ**	**IC22DQ**	**IN20DQ**	**IN19DQ**
9th data position		**F**	**D**	**U**	**S**
Permissible n_{max} speeds (encoder) in r/min		**12,000**	**12,000**	**15,000**	**24,000**
Motor version and bearing system	**n_{max} (motor) r/min**				
1PH813□-2□□□□-□□□1	4500	✓	✓	-	-
1PH813□-5□□□□-□□□1	6500	✓	✓	-	-
1PH813□-7□□□□-□□□1	6500	✓	✓	-	-
1PH816□-1□□□□-□□□1	6500	✓	✓	-	-
1PH816□-1□□□□-□L□1	9000	✓	✓	✓	✓
1PH816□-1□□□□-□M□1	10,000	-	✓	✓	✓
1PH816□-1□□□□-□Q□1	4000	✓	✓	-	-
1PH816□-2□□□□-□□□1	4000	✓	✓	-	-
1PH816□-5□□□□-□□□1	5000	✓	✓	-	-
1PH816□-7□□□□-□□□1	5000	✓	✓	-	-
1PH818□-1□□□□-□□□1	5000	✓	✓	-	-
1PH818□-1□□□□-□L□1	7500	✓	✓	-	-
1PH818□-2□□□□-□□□1	3800	✓	✓	-	-
1PH822□-1□□□□-□□□1	4500	✓	✓	-	-
1PH822□-1□□□□-□L□1	6000	✓	✓	-	-
1PH822□-2□□□□-□□□1	3500	✓	✓	-	-
1PH828□-1□□□□-□□□1	3300	✓	✓	-	-

✓ Assignment possible

3) Motor/encoder assignment limited to 12,000 r/min

5) Motor/encoder assignment limited to 15,000 r/min

5.1.2.5 Incremental encoder HTL 1024 S/R or HTL 2048 S/R

Function

- Speed actual value sensing
- Indirect incremental measuring system for the position control loop
- One zero pulse (reference mark) per revolution

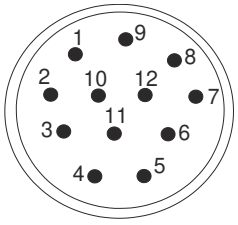
Table 5-6 Properties and technical data

Properties	**Incremental encoder HTL**
Coupling at the NDE	• with SH 80 to 225: Integrated in the motor • with SH 280: Built on to the motor
Operating voltage	+10 ... +30 V
Current consumption	max. 150 mA
Incremental resolution (periods per revolution)	1024 S/R or 2048 S/R

Properties	Incremental encoder HTL
Incremental signals	HTL Track A, track B, Zero pulse and inverted signals
Angular error	±1'
Maximum permissible speeds	• With 1024 S/R: 9000 r/min • With 2048 S/R: 4600 r/min

Connection

Table 5-7 Connection assignment, 12-pin flange-mounted socket

PIN No.	Signal	
1	B*	 When viewing the plug-in side (pins)
2	+1R1	
3	R	
4	R*	
5	A	
6	A*	
7	CTRL TACH	
8	B	
9	not connected	
10	M encoder	
11	-1R2	
12	P encoder	

Cables

Mating connector: 6FX2003-0SU12

Table 5-8 Pre-fabricated cable for SINAMICS:

6FX	□	002	-	2AH00	-	□□□	0
	↓ ↓ 5 MOTION-CONNECT®500 8 MOTION-CONNECT®800					↓↓↓ Length Max. cable lengths: without transfer of inverted signals,150 m with transfer of inverted signals, 300 m	

For other technical data and length code, refer to catalog, Chapter "MOTION-CONNECT connection system"

5.1.2.6 Incremental encoders IC 2048 S/R, IN 512 S/R and IN 256 S/R

Function

- Angular measuring system for the commutation
- Speed actual value sensing
- Indirect incremental measuring system for the position control loop
- One zero pulse (reference mark) per revolution

Properties	Incremental encoder sin/cos 1Vpp
Coupling at the NDE	• with SH 80 to 225: Integrated in the motor • with SH 280: Built on to the motor
Operating voltage	+5 V ±5 %
Current consumption	max. 150 mA
Incremental resolution (periods per revolution)	• 2048 S/R • 512 S/R • 256 S/R
Incremental signals	1 Vpp
Angular error	±40 ", for 256 S/R: ±93 "
Maximum permissible speeds	• With 2048 S/R: 12,000 r/min • With 512 S/R: 15,000 r/min • With 256 S/R: 24,000 r/min

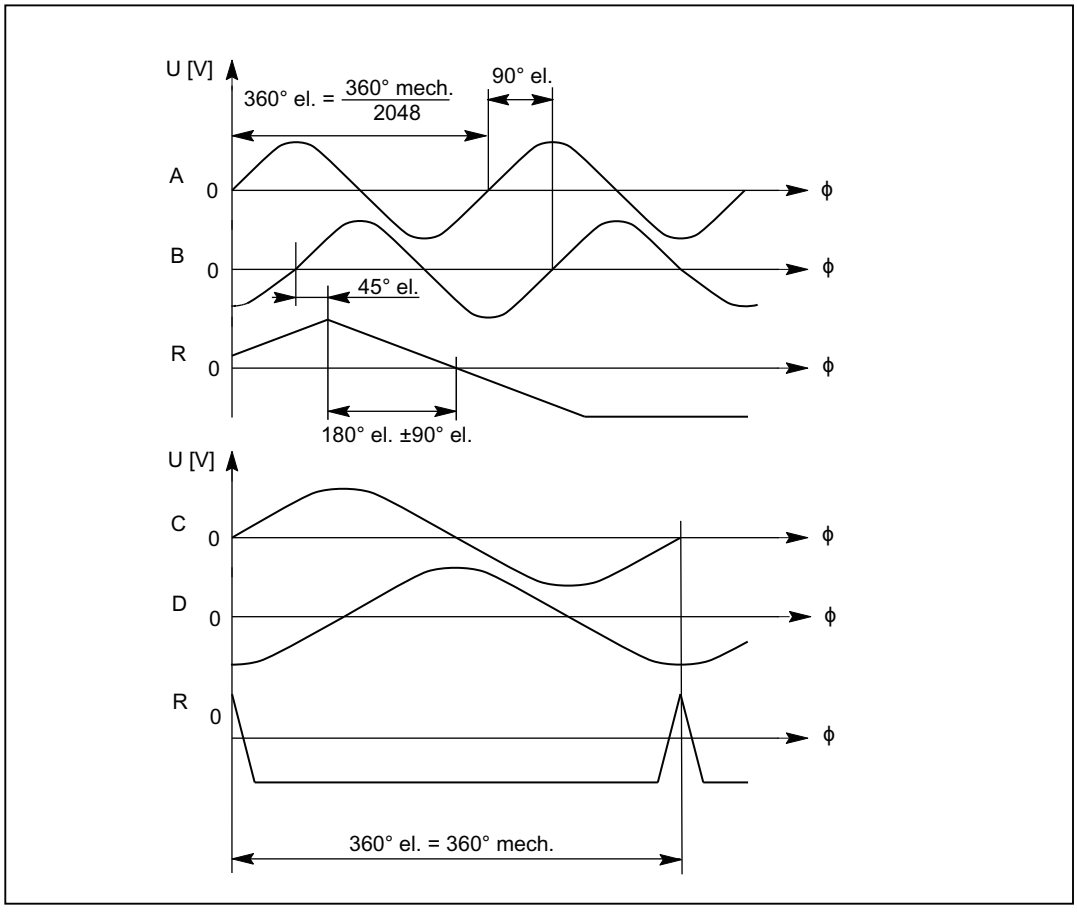
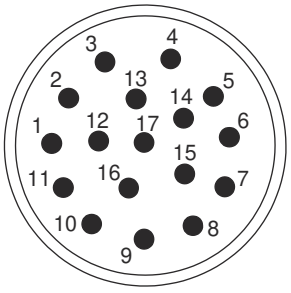


Figure 5-1 Signal sequence and assignment for a positive direction of rotation (clockwise direction of rotation when viewed from the drive end)

Connection

Table 5-9 Connection assignment, 17-pin flange-mounted socket

PIN No.	Signal	
1	A	 When viewing the plug-in side (pins)
2	A*	
3	R	
4	D*	
5	C	
6	C*	
7	M encoder	
8	+1R1	
9	-1R2	
10	P encoder	
11	B	
12	B*	
13	R*	
14	D	
15	0 V sense	
16	5 V sense	
17	not connected	

Cables

Mating connector: 6FX2003-0SU17

Table 5-10 Pre-fabricated cable for SINAMICS

6FX	□	002	-	2CA31	-	□□□	0
	↓ ↓ 5 MOTION-CONNECT®500 8 MOTION-CONNECT®800					↓↓↓ Length Max. cable length 100 m	

For other technical data and length code, refer to catalog, Chapter "MOTION-CONNECT connection system"

5.1.2.7 Absolute encoder AM 2048 S/R

Function

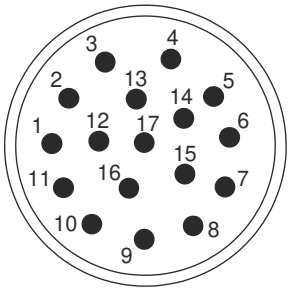
- Angular measuring system for the commutation
- Speed actual value sensing
- Indirect absolute measuring system for the position control loop

Table 5-11 Properties and technical data

Properties	Absolute encoder (EnDat)
Coupling at the NDE	• with SH 80 to 225: Integrated in the motor • with SH 280: Built on to the motor
Operating voltage	+5 V ±5 %
Current consumption	max. 300 mA
Incremental resolution (periods per revolution)	2048 S/R
Absolute resolution (coded revolution)	4096
Incremental signals	1 Vpp
Serial absolute position interface	EnDat
Angular error	±40"
Maximum permissible speeds	With 2048 S/R: 12,000 r/min

Connection

Table 5-12 Connection assignment, 17-pin flange-mounted socket

PIN No.	Signal	
1	A	 When viewing the plug-in side (pins)
2	A*	
3	data	
4	not connected	
5	clock	
6	not connected	
7	M encoder	
8	+1R1	
9	-1R2	
10	P encoder	
11	B	
12	B*	
13	data*	
14	clock*	
15	0 V sense	
16	5 V sense	
17	not connected	

Cables

Mating connector: 6FX2003-0SU17

Table 5-13 Pre-fabricated cable for SINAMICS

6FX	□	002	-	2EQ10	-	□□□	0
	↓ ↓ 5 MOTION-CONNECT®500 8 MOTION-CONNECT®800					↓↓↓ Length Max. cable length 100 m	

For other technical data and length code, refer to catalog, Chapter "MOTION-CONNECT connection system"

5.2 Options

5.2.1 Overview of options

Chapter "Selection and ordering data (Page 39)" contains an overview of which options are available for which shaft heights.

5.2.2 Sealing air connection (option Q12)

Cooling lubricants containing oil capable of creepage, which can also be corrosive, are mainly used for machine tools and transfer machines. For critical applications involving media with extremely high creepage rates, generally degree of protection against water (according to EN 60034-5/IEC 60034-5) alone is not sufficient. To address these particular applications, 1PH8 main motors can be ordered with sealing air connection by specifying option Q12. The sealing air connection can be implemented both when using a terminal box and a power connector.

Note

Improved protection against oils and media that can creep

Sealing air does not increase the IP degree of protection against water. It does, however, improve protection against oils and media that can creep.

Note

This option is only permissible for motors without relubrication.

Note

Increase the pressure for "Premium Performance" bearing version

For the "Premium Performance" bearing version, you must increase the supply pressure to min. 2.0 x 10^5 Pa up to max. 5 x 10^5 Pa.

Conditioning: A Main drives without a shaft sealing ring

Min. inlet temperature (°C)	Ambient temperature
Max. inlet temperature (°C)	40
Max. residual water content (g/m³)	0.12
Max. residual oil content (g/m³)	0.01
Max. residual dust (mg/m³)	0.1
Min. supply pressure (Pa)	2.0 x 10^5
Max. supply pressure (Pa)	3 x 10^5
Particle size for hollow shaft encoder (µm)	< 8
Particle size for optical encoders (µm)	< 3

Conditioning: B Main drives with a shaft sealing ring

Min. inlet temperature (°C)	Ambient temperature
Max. inlet temperature (°C)	40
Max. residual water content (g/m³)	0.12
Max. residual oil content (g/m³)	0.01
Max. residual dust (mg/m³)	0.1
Min. supply pressure (Pa)	0.05 x 10^5
Max. supply pressure (Pa)	0.1 x 10^5
Particle size for hollow shaft encoder (µm)	< 8
Particle size for optical encoders (µm)	< 3

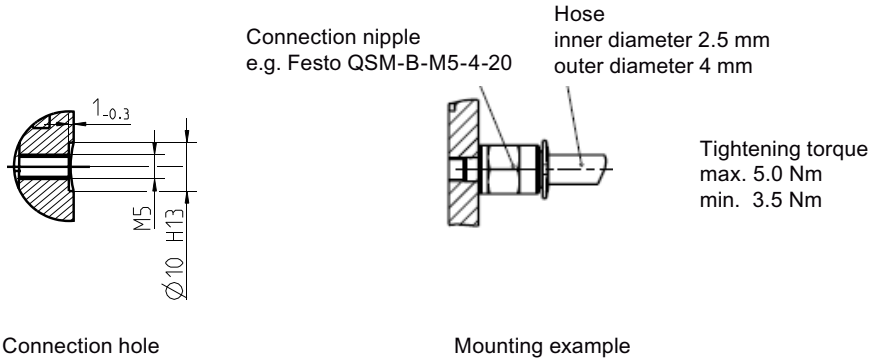


Figure 5-2 Sealing air connection (option Q12)

Necessary sealing air volume

Volume (Nm^3/h) (Nm = standard cubic meter)	Approx. 2.3 (at 2 bar)

Note

The volume data refers to the specified minimum supply pressure. For higher supply pressures, the flow rate increases corresponding to the motor flow resistance.

5.2.3 Protection against explosion (options M03 and M39)

Overview

The 1PH8 motors can be used in hazardous areas if certain operating conditions are met.

Explosion protection zone	Option	Shaft heights
2	M03	SH 100 to SH 160
22	M39	SH 100 to SH 160 SH 180 and SH 225

This intended use in a hazardous area Zone 2 or Zone 22 complies with directives 2014/34/EU and 1999/92/EC – as well as the series of IEC/EN 60079 standards.

Design criteria for shaft heights 100 to 160

Descriptions			(data position in Article No.)																			
			1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
			1	P	H	8																
Shaft height 100							1	0														
Shaft height 132							1	3														
Shaft height 160							1	6														
Overall length (cannot be selected, determined by the choice of rated power)																						
Induction version											1											
Synchronous version (only shaft height 132 and 160)											2											
Encoder systems for motors without a DRIVE-CLiQ interface	Without encoder [1]											A										
	Absolute encoder EnDat 2048 S/R (encoder AM2048S/R) [2]											E										
	Incremental encoder HTL 1024 S/R (encoder HTL1024S/R) [1] [3]											H										
	Incremental encoder HTL 2048 S/R (encoder HTL2048S/R) [1] [4]											J										
	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks (encoder IC2048S/R) [2]											M										
Winding version	Rated speeds (3 AC 380 V to 480 V)	400 r/min, 500 r/min, 600 r/min											B									
		1000 r/min, 1150 r/min, 1350 r/min											D									
		1500 r/min, 1750 r/min, 2000 r/min											F									
		2000 r/min, 2300 r/min, 2650 r/min											G									
Cooling	Forced ventilation NDE -> DE	(degree of protection IP 55)												1								
	Water cooling	(degree of protection IP 55)												2								
Type of construction	IM B3 (IM V5, IM V6)														0							
	IM B5 (IM V1, IM V3)														2							
	IM B35 (IM V15, IM V35) [5]														3							
Shaft extension (DE)	**Balancing**																					
Plain shaft	---																0					
Fitted key	Full-key																1					
Fitted key	Half-key																2					
Bearings	**Vibration severity acc. to Siemens/EN 60034-14**	**Shaft and flange accuracy**																				
Standard with locating bearing	R/A	R																B				
Standard with locating bearing	S/A	R																C				
Standard with location bearing[1]	SR/A	R																D				
Standard	R/A	R																G				

Descriptions		**(data position in Article No.)**																			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**-**	**8**	**9**	**10**	**11**	**12**	**-**	**13**	**14**	**15**	**16**	**-**	**Z**
Standard	S/A	R															**H**				
Advanced Lifetime [6]	S/A	R															**Q**				
Power connection	**Cable entry**	**Signal connection**					**(looking onto DE)**														
Terminal box (top)	Right	DE																**A**			
Terminal box (top)	Left	DE																**B**			
Terminal box (top)	NDE	Left																**C**			
Version																					
Version for potentially explosive atmospheres Zone 2																					**M03**
Version for potentially explosive atmospheres Zone 22																					**M39**
In the version for hazardous areas zone 2 and zone 22, the following options are not possible: A12, A25, G14, K80, L74, Q12, U60, U61, U62, U64, U65, U66, U67, U68, Y64,																					**Z**

1) Only possible if the 8th data position is "1" (induction version)

2) Limited to n_{max} = 12,000 r/min

3) Limited to n_{max} = 9000 r/min

4) Limited to n_{max} = 4600 r/min

5) Only possible for shaft height 100, 132, and 160.

6) Limited to n_{max} = 5000 r/min, shaft height 132: n_{max} = 4500 r/min, shaft height 160: n_{max} = 4000 r/min

Motors for hazardous areas have been released for SINAMICS S120 or SINAMICS G120 converters (version with PM 240). Carefully comply with the following constraints when operating the motors with third-party converters:

- Converters/inverters with pulse width modulation (PWM)
- The pulse clock frequency must be at least 4 kHz
- Converter output voltage according to the following table

Line supply voltage	Line Module (line-side converter/inverter infeed type)	Converter output voltage [1]
3 AC 400 V	Smart Line Module (SLM) unregulated	380 V
	Active Line Module (ALM) regulated	425 V
3 AC 480 V	Smart Line Module (SLM) unregulated	460 V
	Active Line Module (ALM) regulated	500 V

[1] Minimum output voltage required for motor operation in order to achieve data according to the data sheet.

The rated powers for motors for use in hazardous zones are reduced both in S1 and S6 duty in relation to the non-explosion protected version (standard version). The deratings are taken into account in the rating plate data:

Article No.	Version	Derating
1PH8xxx-1xx1x-xxx1-Z, M03, or M39	Induction, forced ventilation	10 %
1PH8xxx-1xx2x-xxx1-Z, M03, or M39	Induction, water cooling	20 %
1PH8xxx-2xx1x-xxx1-Z, M03, or M39	Synchronous, forced ventilation	20 %
1PH8xxx-2xx2x-xxx1-Z, M03, or M39	Synchronous, water cooling	20 %

In hazardous areas of Zone 2 (option M03), for induction motor versions, reduce the permissible maximum speeds (n_{max}):

Article No.	Version	Maximum speed n_{max}
1PH810x-1xxxx-xxx1-Z, M03	Induction	4350 r/min
1PH813x-1xxxx-xxx1-Z, M03	Induction	3000 r/min
1PH816x-1xxxx-xxx1-Z, M03	Induction	2250 r/min

The motors with forced ventilation have newly developed separately driven fans for use in hazardous areas. These are in conformance with the applicable directives and standards. Take the modified dimensions from dimension drawings (SIEMENS Product Configurator).

The supply values for the separately driven fans are specified in the following table:

Article No.	Max. current consumption at		
	3 AC 400 V / 50 Hz (±10 %) **A**	3 AC 400 V / 60 Hz (±10 %) **A**	3 AC 480 V / 60 Hz (±10 %) **A**
1PH810x-1xx1x-xxx1-Z, M03 or M39	0.16	0.13	0.16
1PH813x-1xx1x-xxx1-Z, M03 or M39 1PH813x-2xx1x-xxx1-Z, M03 or M39	0.25	0.22	0.27
1PH816x-1xx1x-xxx1-Z, M03 or M39 1PH816x-2xx1x-xxx1-Z, M03 or M39	0.25	0.22	0.27

Note

All of the separately driven fans are equipped with 3-phase motors.

Operating conditions for shaft heights 100 to 160

When operating SIMOTICS M-1PH8 motors in Zone 2 or Zone 22 hazardous areas, carefully take into consideration the following application conditions:

- Provide specific operating instructions for the motors for when they are used in hazardous areas (see link and documentation in the Intranet/Internet).
- Motor versions for use in hazardous areas are not UL-approved. As a consequence, these motors do not bear the cUR marking.

- Zone 2 (option M03):
  - Marking: II 3 G Ex nA IIB T3 Gc -15 °C ≤ Ta ≤ +40 °C
  - Device group II, category 3G, temperature class T3
  - EN 60079-15: 2010 type of protection "nA" (no sparking)
  - Use in ambient temperatures -15 °C up to +40 °C at installation altitudes up to 1000 m
  - Motors with forced ventilation comply with the requirements for a low risk class with reference to shock resistance tests carried out at the fan housing.
  - Motors, Category 3G, are intended for use in hazardous Zone 2. In hazardous Zone 2, the occurrence of an explosive atmosphere is improbable; however, if it does occur in normal operation, then only very infrequently and only very briefly. A potentially explosive atmosphere can comprise, for example, of air and flammable gases, vapors or mist.
  - According to standard EN 60079-14, the ignition temperature of the potentially explosive gas atmosphere must be higher than 200 °C (temperature class T3).
- Zone 22 (option M39):
  - Marking: II 3D Ex tc IIIB T160 °C Dc IP55 -15 °C ≤ Ta ≤ +40 °C
  - Device group II, category 3D
  - Protection afforded by the enclosure tc, degree of protection IP55
  - EN 60079-31: 2014 Protection afforded by the enclosure
  - Maximum surface temperature 160 °C (according to EN 60079-0: 2012 general requirements)
  - Use in ambient temperatures -15 °C up to +40 °C at installation altitudes up to 1000 m
  - Motors with forced ventilation comply with the requirements for a low risk class with reference to shock resistance tests carried out at the fan housing.
  - Motors, Category 3D, are intended for use in hazardous Zone 22 (non-conductive dust). In hazardous Zone 22, the occurrence of an explosive atmosphere is improbable; however, if it does occur in normal operation, then only very infrequently and only very briefly. The potentially explosive atmosphere comprises a mixture of dust and air.
  - According to standard EN 60079-14, the ignition temperature of a dust cloud must be 50 % higher than the maximum surface temperature of the equipment being used. In this case, the ignition temperature of a dust cloud must be > 240 °C. The minimum ignition temperature of a dust layer with a maximum thickness of 5 mm must be 75 Kelvin higher than the maximum surface temperature of the motor. In this case, the ignition temperature of a dust cloud must be > 235 °C.
- Evaluate the temperature sensor embedded in the motor winding.
- Set the tripping temperature of the sensor to 135 °C.
- Safely and reliably shut down explosion protected separately driven fans when an overload condition occurs. PTC sensors are integrated as standard for overload protection, which must be evaluated according to EN 60079-14. Alternatively, a suitable motor circuit breaker can be used for overload protection.
- The explosion-protected, force-ventilated and water-cooled SIMOTICS M-1PH8 motors have degree of protection IP55.

- Attach the twist protection provided for the signal connector in compliance with regulations.
- Use Ex-certified cable glands for the power connection. Close and seal unused threads using Ex-certified screw plugs.
- The thermal stability of the connecting cables must be at least 80 °C. Plastic-insulated, flexible cables must have the same durability as heavy-duty, rubber-insulated cables. SIEMENS MOTION-CONNECT power and signal cables meet these requirements.
- The motors have a ground connection at the bearing shield/enclosure. Additionally ground the motors at this connection point.
- Belt drives are only permissible if buildup of a static charge is ruled out in the machinery.
- Do not repaint/touch up explosion-proof motors. However, if this is required, then comply with the following requirements:
  - Limit the surface resistance of the paint used: Surface resistance ≤ 1 GΩ for motors belonging to device group III
  - Breakdown voltage ≤ 4 kV for device group III
- Contact Technical Support (Chapter "Introduction") for the correct paint structure.

Note

For more information, please contact Technical Support or your local sales partner.

Design criteria for shaft heights 180 to 225

The motors with option M39 can be selected with the following article number suffix.

1PH818x-1Ax1x-xxx1-Z, Z=M39

1PH818x-1Ex1x-xxx1-Z, Z=M39

1PH818x-1Hx1x-xxx1-Z, Z=M39

1PH818x-1Jx1x-xxx1-Z, Z=M39

1PH818x-1Mx1x-xxx1-Z, Z=M39

1PH822x-1Ax1x-xxx1-Z, Z=M39

1PH822x-1Ex1x-xxx1-Z, Z=M39

1PH822x-1Hx1x-xxx1-Z, Z=M39

1PH822x-1Jx1x-xxx1-Z, Z=M39

1PH822x-1Mx1x-xxx1-Z, Z=M39

The listed motors cannot be supplied with the Performance bearings (14th data position = "L").
1PH8 motors, shaft heights 180 and 225 with option M39 are implemented with insulated NDE bearings as standard.

The supply values for the separately driven fans are specified in the following table:

Article No.	Max. current consumption at		
	3 AC 400 V (±10 %); 50 Hz A	3 AC 400 V (±10 %); 60 Hz A	3 AC 480 V (+5 % / -10 %); 60 Hz A
1PH818□-	0.6	0.65	0.6
1PH822□-	1.6	1.3	1.5

Note

All of the separately driven fans are equipped with 3-phase motors.

Operating conditions for shaft heights 180 and 225

Carefully take into account the following operating conditions when operating motors in a Zone 22 hazardous area:

- Provide specific operating instructions for the motors for when they are used in hazardous areas (see link and documentation in the Intranet/Internet).
- Zone 22 (option M39):
  - Marking: II 3D Ex tc IIIB T155 °C Dc IP55 -15 °C ≤ Ta ≤ +40 °C
  - Device group II, category 3D
  - Protection afforded by the enclosure, tc
  - Maximum surface temperature 155 °C (according to EN 60079-0: 2012 general requirements)
  - Use in ambient temperatures -15 °C up to +40 °C at installation altitudes up to 1000 m
- Evaluate the temperature sensor embedded in the motor winding.
- Safely and reliably shut down explosion protected separately driven fans when an overload condition occurs. PTC sensors are integrated as standard for overload protection, which must be evaluated according to EN 60079-14.
- Attach the twist protection provided for the signal connector in compliance with regulations.
- Use Ex-certified cable glands for the power connection. Close and seal unused threads using Ex-certified screw plugs.
- The thermal stability of the connecting cables must be at least 80 °C. Plastic-insulated, flexible cables must have the same durability as heavy-duty, rubber-insulated cables. SIEMENS MOTION-CONNECT power and signal cables meet these requirements.
- The motors have a ground connection at the bearing shield/enclosure. Additionally ground the motors at this connection point.
- Belt drives are only permissible if buildup of a static charge is ruled out in the machinery.
- Keep the motors free of dust layers > 5 mm.

- The type of construction IM V5 is only permissible with a protective roof (protection from falling parts)
- Do not repaint/touch up explosion-proof motors. However, if this is required, then comply with the following requirements:
  - Limit the surface resistance of the paint used: Surface resistance ≤ 1 GΩ for motors belonging to device group III
  - Breakdown voltage ≤ 4 kV for device group III

Contact Technical Support (Chapter "Introduction") for the correct paint structure.

Note

For more information, please contact Technical Support or your local sales partner.

5.2.4 Increased resistance to vibration (option L03)

Overview

1PH8 motors with shaft heights 180 and 225 and with the option L03 can be used in compliance with certain operating conditions for applications with an increased vibration load. Possible applications, for example on servo presses.

Design criteria for shaft heights 180 and 225

In conjunction with the option L03, the following motors can be selected:

1PH818x-1Ax00-xxx1-Z, Z=L03

1PH818x-1Ax10-xxx1-Z, Z=L03

1PH818x-1Ex00-xxx1-Z, Z=L03

1PH818x-1Ex10-xxx1-Z, Z=L03

1PH818x-1Hx00-xxx1-Z, Z=L03

1PH818x-1Hx10-xxx1-Z, Z=L03

1PH818x-1Jx00-xxx1-Z, Z=L03

1PH818x-1Jx10-xxx1-Z, Z=L03

1PH818x-1Mx00-xxx1-Z, Z=L03

1PH818x-1Mx10-xxx1-Z, Z=L03

1PH818x-2Ex00-xxx1-Z, Z=L03

1PH818x-2Ex10-xxx1-Z, Z=L03

1PH818x-2Mx00-xxx1-Z, Z=L03

1PH818x-2Mx10-xxx1-Z, Z=L03

1PH822x-1Ax00-xxx1-Z, Z=L03

1PH822x-1Ax10-xxx1-Z, Z=L03

1PH822x-1Ex00-xxx1-Z, Z=L03

1PH822x-1Ex10-xxx1-Z, Z=L03

1PH822x-1Hx00-xxx1-Z, Z=L03

1PH822x-1Hx10-xxx1-Z, Z=L03

1PH822x-1Jx00-xxx1-Z, Z=L03

1PH822x-1Jx10-xxx1-Z, Z=L03

1PH822x-1Mx00-xxx1-Z, Z=L03

1PH822x-1Mx10-xxx1-Z, Z=L03

1PH822x-2Ex00-xxx1-Z, Z=L03

1PH822x-2Ex10-xxx1-Z, Z=L03

1PH822x-2Mx00-xxx1-Z, Z=L03

1PH822x-2Mx10-xxx1-Z, Z=L03

Operating conditions of shaft heights 180 and 225

The vibration load that is permissible by default for the 1PH8 main motors is described in Chapter "Vibration response." Take the maximum permissible vibration acceleration rates in conjunction with option L03 from the following table:

Table 5-14 Maximum permissible vibration accelerations

	Standard **SH 180 and SH 225**	**Option L03** **SH 180**	**Option L03** **SH 225**
Vertical	1.0 g	4.0 g	3.5 g
Horizontal	1.0 g	3.5 g	3.2 g
Axial	1.0 g	3.5 g	3.2 g

Vibration acceleration rates (0 peak) in the frequency range from 0 Hz to 1 kHz at the bearings must not exceed the values listed in the table. The position of the measuring points is defined in ISO 10816-1. The customer must pin the 1PH8 motor at the DE and NDE using a cylindrical grooved pin according to ISO 8740. To do this, place the motor down on a metal foundation. For easier removal, do not use blind holes in the foundation for the pinning. Recommendation: Through holes for pressing through the cylindrical grooved pins.

Grooved pins acc. to ISO 8740	**SH 180**	**SH 225**
Grooved pin diameter	5 mm	6 mm

Measures included

- Reinforced version of a DE bearing shield
- Fan unit (EC fan) with upgraded electronic components
- Screws locked with Loctite 270

Otherwise, the statements and regulations in this Configuration Manual apply.

Note

For additional information, please contact Technical Support or your local sales partner.

5.2.5 Holding brake (option)

5.2.5.1 Properties

Operation with holding brake on the SINAMICS S

The SINAMICS S drive system has various types of brake control. A detailed description of the individual functions and corresponding parameter assignment information is provided in the following manuals:

- SINAMICS S120 Function Manual (6SL3097-4AB00-0AP1)
- SINAMICS S120/S150 List Manual (6SL3097-4AP00-0AP3)

Information on the current carrying capacity of the brake outputs/adapters of the individual SINAMICS power units can be found in the corresponding manuals. It may be necessary to control the brake using additional switching elements.

Ensure that the brake data are correctly parameterized in SINAMICS. This is particularly important for the setting values:

- Maximum motor speed (reduced value for the "holding brake" option)
- Opening and closing times of the holding brake
- Moment of inertia of the holding brake

The corresponding setting values are listed for the specific brakes in the "Technical data of the holding brake" table.

Functional principle of the holding brake

A brake can be mounted at the DE side of 1PH8 motors, shaft heights 80, 100, 132, 160, 180 and 225.

These brakes are electromagnetic units for dry-running operation. An electromagnetic field is used to release the brake which is applied using spring force. They function according to the closed-circuit principle, i.e. when in a no-current state, the spring-actuated brake closes and holds the drive. When power is applied to the brake, it is released and the drive is free to rotate.

In the event of a power failure or an Emergency Stop, the drive is braked from its actual speed down to standstill.

Brake connection (must be provided on the system side)

- Alternating voltage 230 VAC, 50 ... 60 Hz
- 24 V DC up to shaft height 160

Ambient temperature

The brake module is designed for an ambient temperature of -5° C to +40° C. At temperatures below -5° C and longer periods without power being applied to the brake, then it cannot be excluded that the friction disk freezes. In this case, contact the manufacturer regarding special measures that are required.

Note

Restricted maximum motor speed for a motor equipped with brake

The maximum speed of a motor with holding brake is limited to the maximum speed of the holding brake (see $n_{max, Br}$ speed specified in the characteristic curves).

Note

Selection and ordering data

The selection and ordering data is contained in the chapter of the same name.

Note

No UL approval for the holding brakes for 1PH8, shaft heights 180 and 225

The holding brakes for motors, shaft heights 180 and 225 are not UL approved. As a consequence, these motors with mounted brake do not have the cUR marking.

Assignment of brakes for shaft heights 180 and 225

The following tables visualize the possible options for shaft heights 180 and 225:

The U64 (standard brake) and U70 (performance brake) options are available for brake selection.

For the winding designs displayed in the 1st brake selection, both the option U64 (standard brake) and the option U70 (performance brake) can be selected.

For the winding designs displayed in the 2nd brake selection, only the option U64 (standard brake) is available.

1st brake selection		Shaft height 180		Shaft height 225		
		Option U64 - 2HPB-30V Option U70 - 4HPB-30V		Option U64 - 2HPB-40V Option U70 - 2HPB-40S		
		Overall length 4	Overall length 6	Overall length 4	Overall length 6	Overall length 8
synchronous	Forced cooling	C, D, F *	-	C, D, F *	C, D, F *	
	Water cooling	L *	-	C, D, F, L *	L *	

1st brake selection		Shaft height 180		Shaft height 225		
		Option U64 - 2HPB-30V Option U70 - 4HPB-30V		Option U64 - 2HPB-40V Option U70 - 2HPB-40S		
		Overall length 4	Overall length 6	Overall length 4	Overall length 6	Overall length 8
asynchronous	Open-circuit ventilation	F, L *	L *	B, C, D, F, L *	F, L *	L *
	Forced cooling	B, C, D, F, L *	B, C, D, F, L *		B, C, D, F, L *	B, C, D, F, L *
	Water cooling	B, C, D, F, L *	L *			L *

***Winding:**
B ≙ 400 r/min, 500 r/min, 600 r/min, 700 r/min
C ≙ 700 r/min, 800 r/min, 1000 r/min, 1100 r/min
D ≙ 1000 r/min, 1150 r/min, 1350 r/min, 1500 r/min
F ≙ 1500 r/min, 1750 r/min, 2000 r/min, 2200 r/min
L ≙ 2500 r/min, 2900 r/min, 3400 r/min

2nd brake selection		Shaft height 180		Shaft height 225	
		Option U64 - 4HPB-30V Option U70 is not possible		Option U64 - 4HPB-40S Option U70 is not possible	
		Overall length 4	Overall length 6	Overall length 6	Overall length 8
synchronous	Forced cooling	-	C, D, F*	-	-
	Water cooling	C, D, F *	C, D, F, L *	C, D, F *	
asynchronous	Open-circuit ventilation	B, C, D *	B, C, D, F *	B, C, D *	B, C, D, F *
	Water cooling	-		-	

***Winding:**
B ≙ 400 r/min, 500 r/min, 600 r/min, 700 r/min
C ≙ 700 r/min, 800 r/min, 1000 r/min, 1100 r/min
D ≙ 1000 r/min, 1150 r/min, 1350 r/min, 1500 r/min
F ≙ 1500 r/min, 1750 r/min, 2000 r/min, 2200 r/min
L ≙ 2500 r/min, 2900 r/min, 3400 r/min

Technical data of the holding brakes

Table 5-15 Technical data of the mounted holding brake (DE) with emergency stop function

Shaft height	80	100	132	160	180	180	225	225
Motor type	1PH808x	1PH810x	1PH813x	1PH816x	1PH818x	1PH818x	1PH822x	1PH822x
Brake type	Size 13	Size 19	Size 24	Size 29	2HPB-30V	4HPB-30V	2HPB-40V	4HPB-40S
Holding torque Nm	29	60...15	140...310	280...500	500	1000	1300	1600
Maximum speed n_{max} r/min	5000	5000	4500	4000	3500	3500	3100	3100

Shaft height	**80**	**100**	**132**	**160**	**180**	**180**	**225**	**225**
Moment of inertia J_B kgm²	0.00093	0.0048	0.0141	0.0266	0.015	0.025	0.058	0.099
Weight m_{Br} kg	10	21	46	66	62	68	126	141
Coil current 230 V AC ±10 % A	0.8	1.0	1.3	1.9	1.4	1.4	1.9	1.9
Coil current, 24 V DC ±10 % A	4.1	4.7	6.9	6.7	-	-	-	-
Permitted single-use operating energy W_E kJ	2.2	7	16	24	79	158	187	275
Total moment of inertia (Emergency Stop) J_{tot} kgm²	0.0174	0.063	0.218	0.456	1.3	1.3	3.9	3.9
Emergency stop speed n r/min	4800	4500	3600	3100	3000	3000	2800	2800
Number of emergency stops z [1]	2000	2000	2000	2000	41	20	11	20
Opening time t_0 ms	150	500	650	750	450	450	550	550
Closing time t_{C1} [2] ms	300 (40)	500 (60)	1000 (100)	1100 (150)	300	250	250	300

[1] Max. 3 switching operations per hour

[2] Closing time at 230 V AC (the time in brackets refers to the closing time for a 24 V DC power supply, and the reduced closing time when using a DC circuit with 230 V AC power supply)

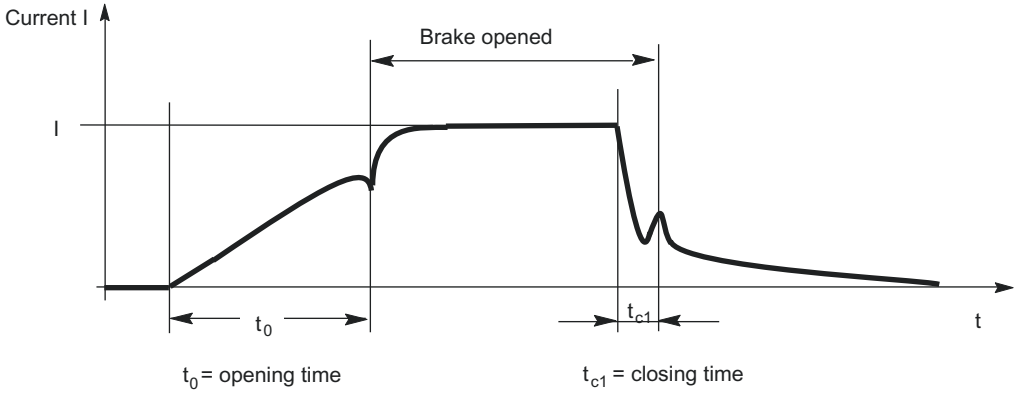


Figure 5-3 Terminology (time) for holding operation

Explanation of terminology in the table

Holding torque Nm: on motors with shaft heights 100 ... 160, the holding torque can be continuously set in the specified value range using an adjusting ring. The dynamic braking torque is approximately 70 % of the set holding torque.

Speed n_{max} r/min: Maximum permissible speed.

Permitted single-use operating energy W_E kJ: Permissible operating energy for an emergency stop,
$W_E = J_{tot}$. x $n^2/182.4 \times 10^{-3}$ (J in kgm^2, n in r/min)

Lifetime operating energy W_{max} MJ: Max. possible switching energy of the brake (for emergency stop) until the brake linings have to be replaced, $W_{max} = W_E \times z$

Number of emergency stops z: The specified number of emergency stops refers to the specified conditions. A conversion can be made for operation under different conditions: Number of EMERGENCY STOPs $z = W_{max}/W_E$

Coil current A: Current to release the brake.

Opening time t_0 ms: Separating time until the brake opens (the specified values refer to the maximum braking torque and at rated voltage).

Closing time t_{C1} ms: Interlocking time until the brake closes according to diagram "Terminology (time) for holding operation." (the values refer to the maximum braking torque and at rated voltage.).

Use for the intended purpose

"Single-disk spring-operated brake control modules" are for mounting on induction or synchronous motors and intended for use in commercial or industrial systems. Use in hazardous areas is absolutely prohibited. The integrated single-disk spring-operated brake (electromagnetically opening system) is designed as holding brake. Occasional Emergency Stop operations are possible.

NOTICE
Irreversible reduction of the braking effect The braking effect can be irreversibly reduced if you do not comply with the permissible number of braking operations per hour and/or the maximum permissible operating energy per hour. Further, this can have a negative impact on the function of the holding brake. • When setting up machines and systems (when using the jog mode), carefully observe the information provided in the Table "Technical data of holding brakes". • You can equip the holding brake with a manual brake release to remove the holding torque.

NOTICE

Inadvertent operation of the holding brake

Material damage can occur if you inadvertently apply or release the holding brake.

- Secure the holding brake against inadvertent operation and misuse. The mechanical manual brake release must be in the center position when not actuated (see the diagram “Spring-actuated single-disk brake module"). Only then is the brake completely closed, and it is ensured that the spring-actuated single-disk brake module can provide its full braking effect.
- You can remove the manual release lever. Strictly observe the specific system-related regulations, e.g. in the crane construction area relating to whether manual brake release is permissible.
- For the rated operating conditions, see DIN VDE 0580: 1994-10. For the degree of protection see DIN VDE 0470, part 1. If deviations exist, coordinate special measures with the manufacturer.

⚠ WARNING

Danger to life if the holding brake is used incorrectly

If you incorrectly use the holding brake, e.g. you use it as safety brake, this can lead to severe accidents involving injury and/or material damage.

- Depending on the particular application, strictly observe the appropriate accident prevention regulations.

Note

Special measures

If you find references to special measures and/or it is necessary to consult the manufacturer, already obtain the manufacturer's advice when you configure the system.

5.2.5.2 Mounted holding brake for SH 80 to SH 160

Properties

The holding brakes for motors, shaft heights 80, 100, 132 and 160 are brake modules (manufactured by Kendrion Binder Magnete) with their own bearings, flange and shaft extension. The dimensions of the flange and shaft extension of the brake module are identical with those of the motor. If a motor is to be equipped with a brake, then a motor version with a flange-type of construction and a smooth shaft (without keyway and key) is used. The shaft of the brake module can then be shrunk onto the motor shaft (thermal technique). It can be released using pressurized oil. The brake module is bolted to the motor flange.

Note

Radial and axial forces

The specifications for the "standard" bearing version apply for the permissible radial and axial forces.

See also

Radial and axial force diagrams (Page 119)

Method of operation

The brake module is an electromagnetic component with integrated electromagnetically opening single-disk spring-operated brake for dry running, in which the braking effect is applied by the spring force and canceled electromagnetically.

If required, the braking effect can also be canceled by an additional mounted manual release. The brake module is a mounted brake, preferably on the DE end shield of electric motors, as built-on unit with bearing supported driver pin shaft.

Structure

The solenoid housing ⑦ with the cast excitation winding ⑥ is used to accommodate the armature ②, the friction disk ③ and the flange ④ that is attached using cylinder head screws. The compression springs in the solenoid housing that are supported via the thrust studs (size 13) on the adjustment ring ⑨, apply a force to the friction disk via the anchor in the axial direction and thus clamp the friction disk between the rigidly mounted flange and the anchor and produce the braking effect (torque). The tangent torque support of the armature against the solenoid housing is performed by the dowel pins.

When a direct voltage is applied to the excitation winding, the resulting electromagnetic force pulls the armature against the force of the compression springs, the friction disk is released and thus the braking effect canceled.

As the brake module represents a self-contained system, no forces are applied externally.

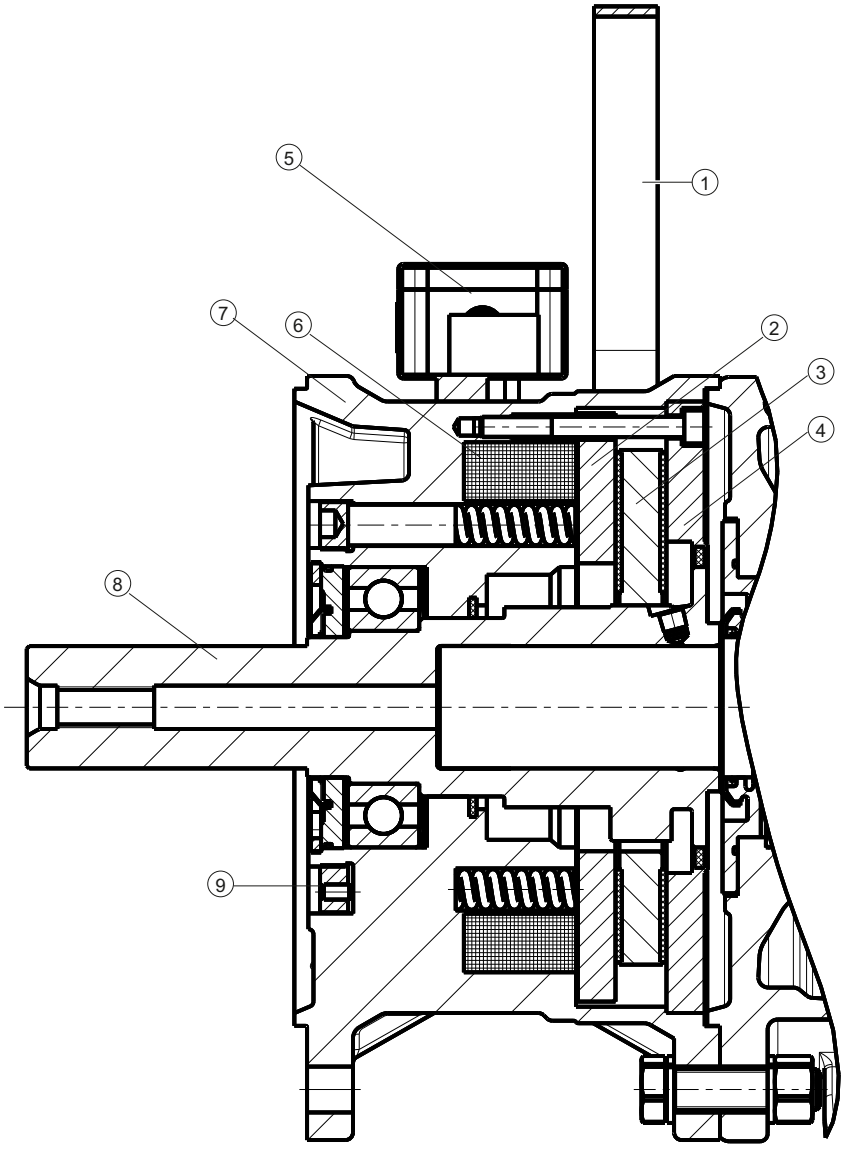
The braking effect of the axial moving friction disk is transmitted to the driver pin shaft ⑧ fixed to the motor shaft via the keyed connection of the internal square socket (sizes 13, 19 and 24) and/or via internal gearing (size 29).

The ball bearing located between the solenoid housing and the driver pin shaft is used to center the brake to the driver pin shaft and therefore to the motor shaft when mounting the brake on the motor flange and also to absorb the transverse forces acting radially on the driver pin shaft.

The ball bearing comes sealed from the factory. As additional protection against pollution and to prevent grease from a defective ball bearing seal reaching the friction disk, a sealing ring is mounted that prevents dirt, grease or oil reaching the area of the friction disk from the outside and abraded particles due to the wear of the friction disk escaping.

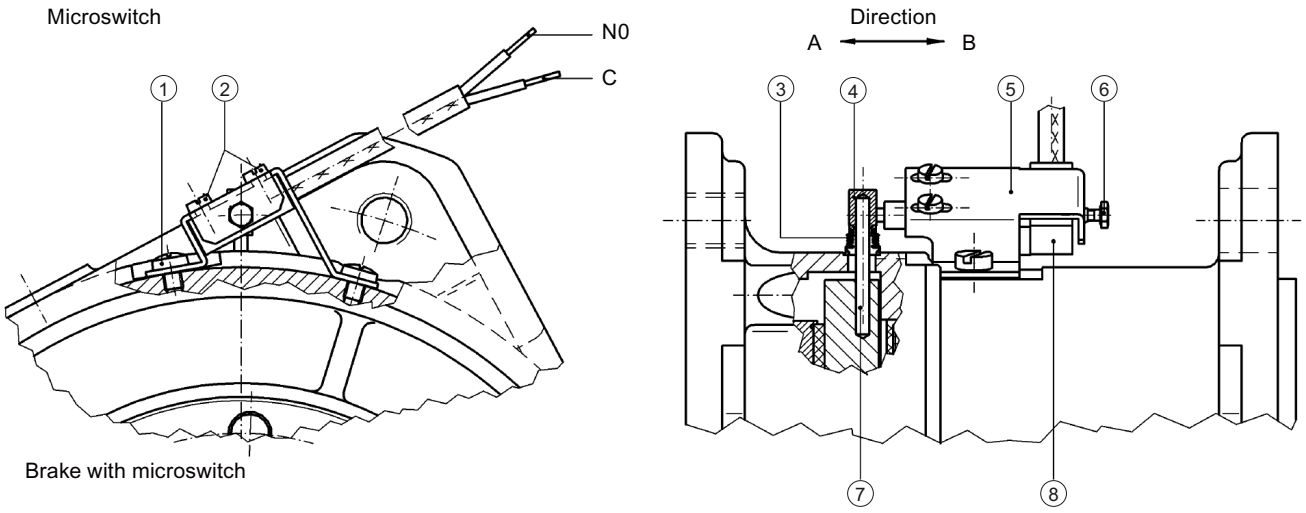
The sealing ring provides the drive-side sealing between the flange and the driver pin shaft. The single-disk spring-operated brake module can be opened mechanically by hand, e.g. in the event of a power failure, via the optional manual release ①. The electrical connection is established directly in the terminal box ⑤.

The transmissible torque of the brake module can be set via the adjustment ring.



① Manual brake release, optional
② Armature
③ Friction disk
④ Flange
⑤ Terminal box
⑥ Winding
⑦ Housing
⑧ Shaft
⑨ Adjustment ring (not for 1PH808)

Figure 5-4 Single-disk spring-operated brake module 77 500...B15



①	Oval head screw (2x)	⑤	Bracket
②	Cylinder head screw (2x)	⑥	Hexagon bolt M2.5x8 (not included in the scope of delivery)
③	Bellows	⑦	Dowel pin
④	Bolt	⑧	Microswitch

Figure 5-5 Microswitch mounting of a single-disk spring-operated brake module 77 500...B15

Electrical connection

⚠ WARNING

Fire hazard and risk of destroying the brake module

The brake module is an electromagnetic component and a DC system. An impermissibly high connection voltage at the brake module can cause the rectifier or the winding to burn. This can block the brake module, causing it to overheat.

If the connection voltage is too low, the magnetic excitation will also be too low, preventing the brake from being released. The brake goes into the brake mechanism although this is not wanted.

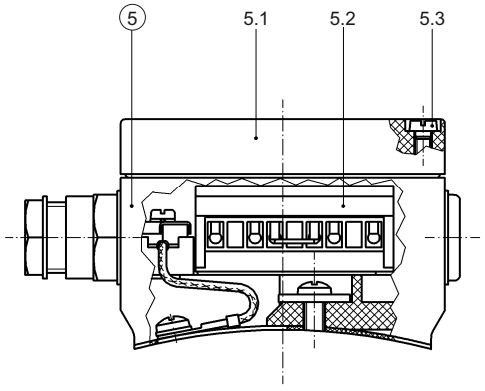
- Make sure that the connection voltage of the brake module remains within the permissible tolerance of +10 % to -10 % of the nominal voltage. Comply with the legal standards for connection to the grid. Pay attention to the correct dimensioning of the cable lengths and conductor cross-sections in the connection cables.

- Check the electrical connection of the holding brake based on the following checklist.

Table 5-16 Checklist for checking the electrical connection of the holding brake

Check	OK
The connection cables are suitable for the type of use and the voltages and currents that occur.	
The connection cables are connected correctly by means of screws, clamps or other equivalent means, so that the electrical connection is maintained permanently.	

Check	OK
Adequately dimensioned connecting cables, torsion, strain and shear relief as well as anti-kink protection are provided for the connection cables.	
The protective conductor (only for protection class I) is connected at the grounding point.	
There is no foreign matter, dirt or moisture in the terminal box.	
Unused cable entries and the terminal box itself are sealed so that the specified degree of protection according to EN 60529 is maintained.	



⑤ Terminal box
5.1 Cover
5.2 Connecting terminal or rectifier
5.3 Fixing screw for cover

Figure 5-6 Holding brake terminal box ⑤ optionally with terminal or rectifier

- Connect the spring-applied single-disk brake module to the direct voltage. Use a rectifier bridge or half-wave rectifier for electrical connection to an AC power system.
- For brakes with integrated rectifiers, you can connect the spring-applied single-disk brake module directly to alternating voltage.
- See the figure for the terminal assignment.
- For brakes with a connecting terminal, you must connect the brake module directly to direct voltage. Connect the customer-specific connection cable to the terminals or to the integrated rectifier. Use a screwed cable gland (M16 x 1.5) for the connection.
- You must remove the cover of the terminal box to connect the individual cores of the connecting cable to the connecting terminals or to the terminals of the integrated rectifier.

Table 5-17 Rectifier for operation on single-phase AC with electrical connection via connection terminal (5.2)

Type	**Method**	**Rated input voltage range U_1 AC (40 ... 60 Hz)**	**Output voltage U_2 DC**	**Max. output current I DC**	
		V	**V**	**R load A**	**L load A**
32 07332B40	Half-wave	0 ... 500 (±10 %)	$U_1 \cdot 0.445$	1.6	2.0

Brakes with integrated rectifiers are either equipped with a half-wave rectifier or with a rectifier bridge.

By appropriately connecting the integrated rectifier, you switch between AC (normal interlocking time t_1) or DC (short interlocking time t_1).

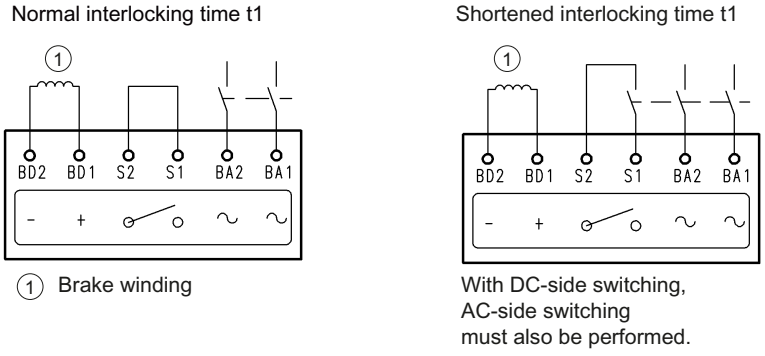


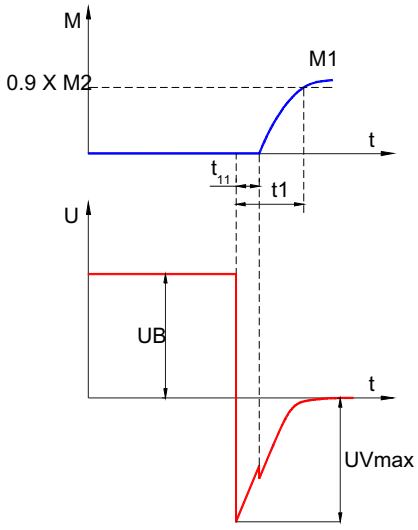
Figure 5-7 Pin assignment of the rectifier

Voltage ripples caused by switched-mode power supplies can cause humming or unintended behavior of the component depending on the size and torque.

The user or the system manufacturer has to ensure proper operation by means of the electrical control.

DC connection

The basic curve of the voltage when the excitation winding (coil) (1.2) is switched off is as follows.



U_B Operating voltage (coil voltage)
U Transient voltage
Figure 5-8 Basic curve of the voltage when turning off the excitation winding

NOTICE
Overvoltages when switching off The voltage peak U_{Vmax} when switching off can reach several 1000 V in the millisecond range without a protective circuit. The excitation winding (coil) (1.2), switching contacts and electronic components can be destroyed. Sparks form at the switch on switch-off. • When it is switched off, the current must therefore be reduced via a snubber circuit. This also limits the voltages. The maximum permissible overvoltage when switching off must not exceed 1500 V.

If Kendrion Binder rectifiers are used, the protective circuit for the internal electronic components and for the excitation winding (coil) (1.2) is integrated. This does not apply

for the external contacts required for the DC-side switching because the galvanic isolation of the external contact is then no longer achieved.

NOTICE
Component damage resulting from a lower voltage Sensitive electronic components (e.g. logic components) and mechanical contact elements can also be damaged by the lower voltage. • Make sure that the voltage does not fall below the specified value, e.g. due to insufficient conductor cross-sections.

AC connection

NOTICE
Impermissible overvoltages If you operate the brake module without a snubber circuit in a circuit on the DC side, impermissible overvoltages can arise. • Use a snubber circuit. • Avoid damage, e.g. due to contact erosion or contact welding of the external contact elements by taking additional protection measures, e.g. varistors or spark suppression elements.

Direct connection to an AC voltage is only possible via a rectifier. Depending on the connection method (DC or AC operation), different interlocking times can be achieved.

- Half-wave rectification
  With half-wave rectification, the coil voltage U_2 is less than the input voltage on the rectifier by a factor of 0.445. Half-wave rectifiers have a high residual ripple which have somewhat shorter switching times compared to the bridge rectification, depending on the module size. The half-wave rectifier is therefore preferable (also because of the smaller coil voltages). However, humming can occur in brake modules of small size.
- DC operation
  With DC-side circuitry of the brake module, an additional auxiliary contact is plugged into the motor contactor, which interrupts the current supply to the brake module on the DC side.

Electrical connection of brake modules with microswitches

Note

Use of microswitches

- Observe the special regulations regarding the permissible use of microswitches, e.g. for lifting gear and crane construction.

⚠ WARNING

Accidental motor starting

In an unsecured motor circuit, the motor can start accidentally when the microswitch is closed. This can result in injury and/or material damage.

- Secure the motor circuit accordingly.

In brake modules with microswitches, the microswitch monitors the operating state of the spring-applied single-disk brake module. The brake module is either open or closed.

- For example, integrate the microswitch into the control circuit for controlling the machine or the motor.

The microswitch prevents the machine or motor from starting against a closed brake module if it is integrated correctly.

When ordering, the microswitch is available as an option. It is not possible to subsequently mount a microswitch.

When the brake module is supplied, the microswitch is adjusted in the factory.

Manual opening of the brake module

⚠ WARNING

Accidental drive acceleration after manually operating the brake control module

If you manually open the spring-applied single-disk brake module, the load torque will accelerate an unbalanced drive. This can result in injury and/or material damage.

- Take special care when inching the brake module open or closed. Make sure that no danger is posed by the load torque.

Examples of situations in which manual operation of the brake module is necessary include

- Maintenance on the machine or the motor
- Failure of the regular power supply during UPS operation

The spring-applied single-disk brake module can be manually opened via an externally mounted mechanical manual brake release (accessory).

If you use a commercially available UPS power supply, e.g. a UPS battery system, the brake module can be opened electrically during a failure of the regular power supply.

- Observe the voltage stated on the nameplate of the brake module when installing a UPS power supply.

Setting of the transmissible torque M_4

Note

Torque M_4

The transmissible torque must not fall below the minimum value M_4 when you adjust the adjustment ring according to table "Change of the transmissible torque."

- Always mark the modified adjustment ring distance E in the base of the solenoid housing pocket using a punch prick.
- Mark the theoretically set transmissible torque M_4 on the nameplate of the motor. The empty field "Optional customer information" on the nameplate is available for this.
- After you have set the transmissible torque M_4, make sure that you secure the adjustment ring with a threaded pin. Comply with the tightening torque of M_A = 3 Nm.
- Turn the adjustment ring in such a way that the threaded pin can be located between the thrust studs. Deviations of the transmissible torque M_4 from -5% to +15% are possible.

The brake module is delivered with the transmissible torque M_4 set to the default value according to the data sheet. You will find the transmissible torque M_4 on the nameplate of the brake module.

Table 5-18 Change of the transmissible torque M_4 [%] for an axial travel path of the adjustment ring by 1 mm; transmissible torque (default value) M_4

	Size 19	**Size 24**	**Size 29**
Change of the transmissible torque ΔM_4/mm %	Approx. 15	Approx. 12	Approx. 14
Transmissible torque (standard value) M_4 Nm	150	310	500

5.2.5.3 Mounted holding brake for SH 180 and SH 225

Properties

For these motors, the brake (manufactured by Stromag) is mounted on the DE end shield. In this case, the motor shaft is extended using a shrunk-on stub shaft. The torque is transmitted through a feather key according to DIN 6885/1. The stub shaft can also be axially secured using a spring washer and a central screw (M20). The holding brake does not have its own bearings. The output forces are therefore absorbed by the motor bearings. Belt pulleys cannot be mounted due to space reasons and also due to the high associated cantilever forces. When selecting the coupling to couple to the motor - brake combination - it should be carefully noted that the shaft extension diameter is larger than the diameter of the motor shaft extension. REVOLEX bolt-type couplings 2LF6337 for shaft height 180 and 2LF6338 for shaft height 225 should be preferably used. Ordering data and dimensions, refer to catalog M 11 or D 81.1.

Note

Radial and axial forces

The specifications for the "standard" bearing version apply for the permissible radial and axial forces.

See also

Radial and axial forces (Page 115)

Design, method of operation and construction features

More information on this can be found in the manufacturer's manual in Appendix "Operating Instructions for the holding brake (Page 261)".

Mechanical release using the manual release bar

By pulling the manual release bar (4) through approx. 30° against the rear side of the brake, the armature disk (10) is pulled axially against the coil form (1) and the friction disk with friction lining (2) is then free.

⚠ WARNING

Incorrect use of the emergency release

If you use the emergency release to maintain operation temporarily, you may damage the brake. This can result in personal injury and damage to property.

- Only ever use the emergency release in an emergency.

Power supply line and electrical connection of the brake

The electrical connection must be made in compliance with the installation regulations (e.g. DIN 92). The power connection provided by the customer is 230 V AC +/- 10%.

The coil is dimensioned for the DC voltage specified on the rating plate (residual ripple < 0.5) and 100% cyclic duration. The continuously permissible voltage change is +6% to -10% of the rated voltage.

To protect the coil or the power supply, a varistor of the appropriate operating voltage range and the required power should be connected to the coil input.

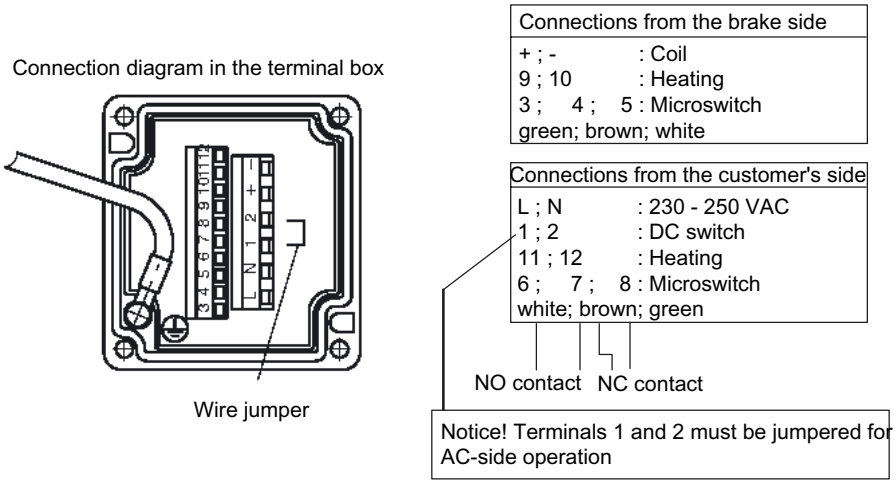


Figure 5-9 Circuit configurations

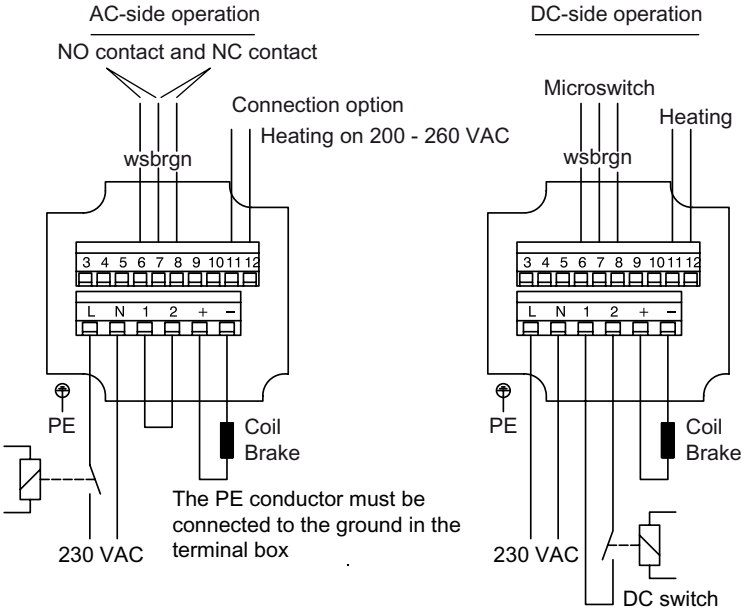


Figure 5-10 Circuit configurations

Version with microswitch

If monitoring of the switching state is required for a brake, a microswitch (28) can be used.

If the armature disk (10) is moved against the coil form (1) through the electromagnetic force of the coil or through the mechanical emergency release, it actuates the microswitch (28) via the grub screw (64).

The microswitch (28) can be integrated as an NC or NO contact in an electrical control or monitoring circuit.

5.2.6 Anti-condensation heating (option K45)

Larger motors are prone to more frequent condensation on the winding caused by the climatic conditions because of the larger surfaces. Condensation can occur, for example, when motors are not operational in a humid environment or if motors are exposed to significant temperature fluctuations. Anti-condensation heaters heat the air in the motor by a few Kelvin above the ambient temperature and thus prevent precipitation inside the motor.

For 1PH8 motors, using option K45, order anti-condensation heating for shaft heights 180, 225 and 280. Option K45 comprises an anti condensation heater attached to the winding overhang with a heating power of 100 W for a supply voltage of 230 V AC (50/60 Hz). The 2 connection ends are routed into the main motor terminal box. Connect this via the auxiliary terminal strip. The connection ends are marked "1HE1" and "1HE2".

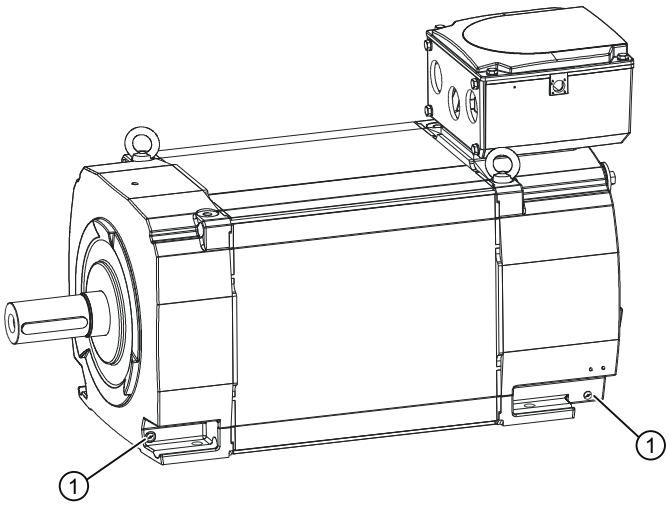
Note:

- For shaft heights 180, 225, 280, the same strip heater is used.
- Do not switch on the anti-condensation heating while the motor is operational.
- The anti-condensation heaters for 1PH8 motors are UL-approved.
- In addition to the anti-condensation heating, for motors with degree of protection IP55, always take into consideration the condensation drain holes (Chapter "Condensation drain hole (option L12)").

5.2.7 Condensation drain hole (option L12)

In larger motors, there is a risk of condensation or accumulation of condensed water inside the motor due to the climatic conditions. Condensation drain holes prevent the accumulation of a damaging quantity of water in the motor. These are frequently used as the primary measure against condensation as they are easy to implement in the design.

For 1PH8 motors, the condensation drain holes are located at the lowest point in the NDE and DE end shields. As a consequence, they are only suitable for horizontal mounting in types of construction IM B3, IM B5 and IM B35. The condensation drain holes for shaft heights 180 and 225 are provided with a special insert (drainage plug); this insert is not required for shaft height 280.



① Water drainage hole

Figure 5-11 1PH8 motor with condensation drain holes

Table 5-19 1PH8 motors with condensation drain holes (optional)

Article No.	Cooling	Degree of protection	Required option	Comment
1PH818x-xxx0 1PH818x-xxx1	Forced ventilation	IP 55	L12	Bearing shield NDE and DE
1PH822x-xxx0 1PH822x-xxx1				
1PH828x-xxx1				
1PH818x-xxx2	Water cooling	IP 55	-	NDE and DE bearing shield (condensation drain hole always included as standard)
1PH822x-xxx2				
1PH828x-xxx2				

Note

- Condensation drain holes are only used in motors with degree of protection IP 55.
  For motors with degree of protection IP 23 (open-circuit ventilation), the open design does not require condensation drain holes. It is not possible that a potentially damaging amount of condensation can collect.
- Anti-condensation heating (see Chapter "Anti-condensation heating") can be used to supplement condensation drain holes.

5.2.8 Higher number of grounding terminals in the terminal box (Q00)

For option Q00 (higher number of grounding terminals in the terminal box), symmetrical power cables with a grounding conductor split into 3 can be connected more easily in the terminal box for high power ratings. For option Q00, the grounding bar in the terminal box has a higher number of terminals.

Table 5-20 Definition of Q00 according to the type of terminal box:

Shaft height SH	Terminal box type	Number of terminals (grounding) standard	Number of terminals (grounding) option Q00
280	1XB7712-P..	4 x M16	12 x M6

Option Q00 has no influence on the dimension drawings, 3D drawings, and electrical configuration. This is the reason that this option is not included in the SIEMENS Product Configurator (SPC) nor in the TST.

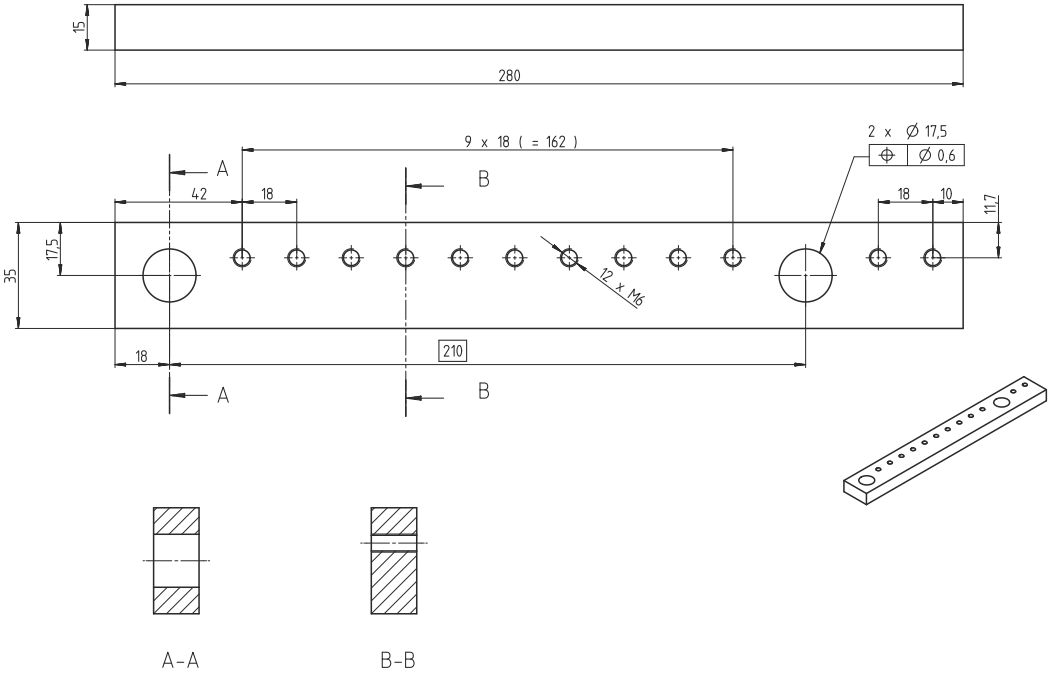


Figure 5-12 Grounding bar with option Q00

5.2.9 Chain of PTC thermistors for alarm and trip (option A12)

Overview

In the 1PH8 motors, in addition to the standard temperature sensor in the stator winding (see Ch. "Thermal motor protection"), a chain of PTC thermistors for alarm and trip can be ordered with option A12.

The chain of PTC thermistors can also monitor the winding temperature. PTC thermistors are thermistors that exhibit a sudden increase in resistance at a certain trigger temperature. The trip units detect this resistance change and signal the trigger temperature. PTC thermistors are standardized in DIN 44081.

Circuit design

Option A12 consists of two chains of PTC thermistors, each with 3 PTC thermistors for alarm and trip. The chain of PTC thermistors is installed in the phase elements on the winding overhang. The temperature difference between alarm and trip is 10 K.

The terminal designations for the two connection ends of the chain of PTC thermistors for alarm are 1TP1 and 1TP2; the terminal designations for the two connection ends of the PTC thermistor circuit for tripping are 2TP1 and 2TP2.

The circuit diagram and the terminal assignments are provided in the terminal box of the 1PH8 motor.

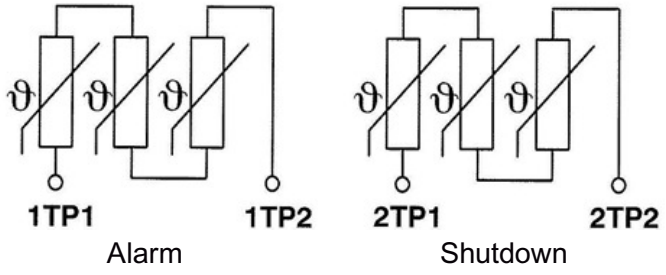


Figure 5-13 Chains of PTC thermistors option A12

Configuration

6

6.1 Configuring software

6.1.1 TST engineering tool (TIA-Selection-Tool)

The TIA Selection Tool (TST) is an engineering tool which supports you when dimensioning the hardware and firmware components required for your drive application.

TST supports the following configuration steps:

- Configuring the power supply
- Designing the motor and gearbox, including calculation of mechanical transmission elements
- Configuring the drive components
- Compiling the required accessories
- Selection of the line-side and motor-side power options

The configuration process produces the following results:

- A bill of materials for the required components (export to Excel)
- Technical specifications of the system
- Characteristic curves
- Statements on line harmonic distortion
- Installation information for the drive and control components
- Energy considerations of the configured drive systems

The TIA Selection Tool can be used both cloud-based and offline.

You can find more information that you can download in the Internet at TST (https://support.industry.siemens.com/cs/ww/en/view/109767888).

6.2 Procedure when engineering

6.2.1 SINAMICS configuring procedure

Motion Control

1PH8 motors are optimized for motion control applications. They execute linear or rotary movements within a defined movement cycle. All movements must be performed in a time-optimized manner. As a result of these considerations, 1PH8 motors must meet the following requirements:

- High dynamic response, e.g. short rise times
- Capable of overload, i.e. high acceleration margin
- Wide control range, i.e. high resolution for precise positioning.

The following table "Configuring procedure" is applicable for induction, synchronous-reluctance and synchronous motors.

General procedure when engineering

The function description of the machine provides the basis when engineering the drive application. The components are selected according to physical interdependencies and the selection process is usually carried out in the following sequence of steps:

Table 6-1 Planning

Step	Description of configuration activity	
1.	Clarification of type of drive	See the next chapter
2.	Definition of supplementary conditions and integration into an automation system	
3.	Definition of the load, calculation of the maximum load torque and selection of the motor	
4.	Selection of the SINAMICS Motor Module	See catalog
5.	Repetition of steps 3 and 4 for additional axes	
6.	Calculation of the required DC link power and selection of the SINAMICS Line Module	
7.	Selection of the line-side options (main switch, fuses, line filters, etc.)	
8.	Specification of the required control performance and selection of the Control Unit, definition of component cabling	
9.	Definition of other system components (e.g. braking resistors)	
10.	Calculation of the current demand of the 24 V DC supply for the components and specification of the power supplies (SITOP devices, Control Supply Modules)	
11.	Selection of the components for the connection system	
12.	Configuration of drive line-up components	
13.	Calculation of the required cable cross sections for power supply and motor connections	
14.	Inclusion of mandatory installation clearances	

Clarification of the type of drive

The motor is selected on the basis of the required torque, which is defined by the application, e.g. traveling drives, hoisting drives, test stands, centrifuges, paper and rolling mill drives, feed drives or main spindle drives. Gearboxes to convert motion or to adapt the motor speed and motor torque to the load conditions must also be considered.

As well as the load torque, which is determined by the application, the following mechanical data is among those required to calculate the torque to be provided by the motor:

- Masses to be moved
- Diameter of the drive wheel
- Leadscrew pitch, gear ratios
- Frictional resistance
- Mechanical efficiency
- Traversing paths
- Maximum velocity
- Maximum acceleration and maximum deceleration
- Cycle time

A basic decision must be made as to whether induction, synchronous-reluctance or synchronous motors should be used.

Synchronous motors are the best choice if it is important to have low envelope dimensions, low rotor moment of inertia and therefore maximum dynamic response ("Servo" control type).

Asynchronous motors can be used to increase maximum speeds in the field-weakening range. Asynchronous motors for higher power ratings are also available.

Synchronous-reluctance motors in the medium power range can represent a good alternative configuration to induction motors if higher power ratings with high efficiencies are required.

The following factors are especially important when engineering a drive application:

- The ambient temperatures and the installation altitude of the motors and drive components.
- Heat dissipation from the motors through forced ventilation or water cooling

The motor-specific limiting characteristics provide the basis for defining the motors.

These define the torque or power characteristic versus the speed and take into account the motor limits based on the DC-link voltage of the Power Module or Motor Module. The DC-link voltage is in turn dependent on the supply voltage and, in the case of torque drives, on the type of Line Module.

Other constraints apply when integrating the drives into an automation environment such as SINUMERIK or SIMOTION.

The motor is selected based on the load which is specified by the application. Different characteristic curves must be used for different load events.

The following operating scenarios have been defined:

- Duty cycle with constant ON period.
- Duty cycles with varying ON period.
- Free duty cycle.

The objective is to identify characteristic torque and speed operating points that can be used as a basis for selecting the motor depending on the load.

6.2.2 Specifying the duty cycle

Duty cycles with constant ON period

For duty cycles with constant ON period, there are specific requirements for the torque characteristic curve as a function of the speed, for example:

M = constant, M ~ n^2, M ~ n or P = constant.

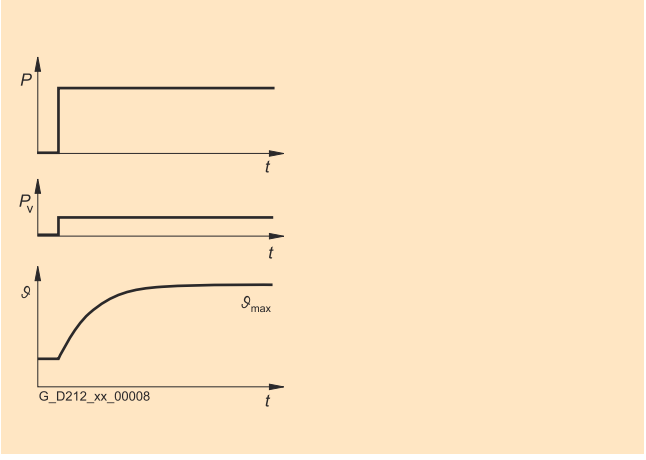


Figure 6-1 S1 duty (continuous operation)

These drives typically operate at a specific operating point. Drives such as these are dimensioned for a base load. The base load torque must lie below the S1 characteristic curve. An overload rating is provided for transient overloads (e.g. during acceleration). The overload current must be calculated relative to the required overload torque. The peak torque must lie below the voltage limiting characteristic.

Duty cycles with varying ON period

As well as continuous duty (S1), standard intermittent duty types (S6) are also defined for duty cycles with varying ON periods. This is a mode of operation consisting of a series of similar cycles, each one comprising one time period with a constant load and one idle time. There is no pause.

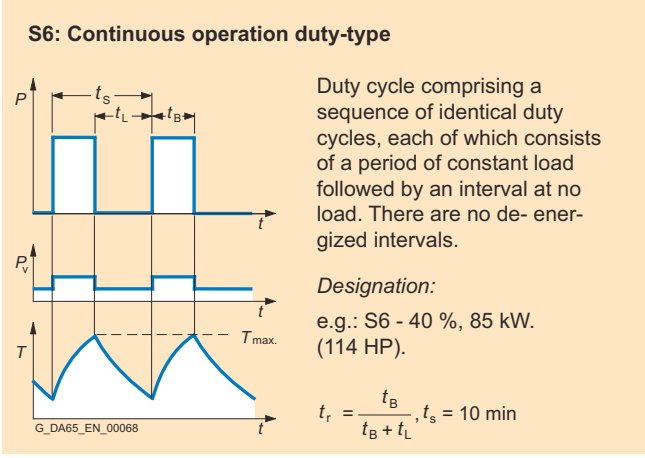


Figure 6-2 S6 duty (continuous duty with intermittent load)

Fixed variables (overload factors) are usually applied for the relative ON period:

- S6 – 60%
- S6 – 40%
- S6 – 25%

The overload factors for the corresponding intermittent duty types (S6) referred to the S1 characteristic (continuous duty) can be found in Chapter "Technical data and characteristics."

For induction motors, in addition to the S1 characteristic, the S6 characteristics are also shown.

see Chapter "Technical data and characteristics" (Page 221)

Note

S3 duty

The overload factors for continuous duty with intermittent load (S6) can also be applied for the S3 intermittent duty types (S3-60%, S3-40% or S3-25%) for 1PH8 motors with forced ventilation or water cooling.

Free duty cycle

A load duty cycle defines the characteristics of the motor speed and the torque with respect to time.

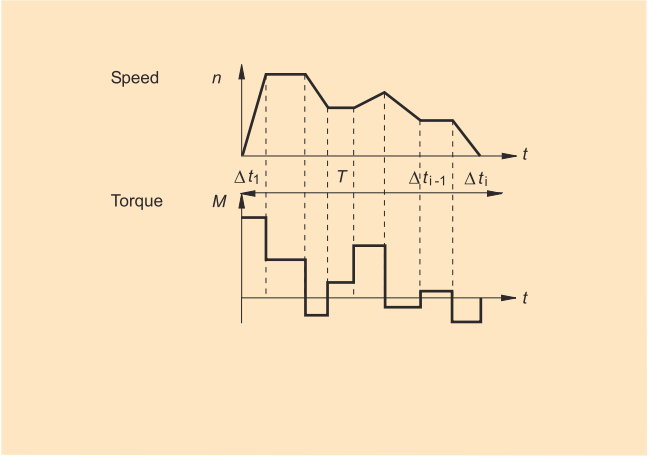


Figure 6-3 Example of a duty cycle

A load torque is specified for each time period. In addition to the load torque, the average load moment of inertia and motor moment of inertia must be taken into account for acceleration. It may be necessary to take into account a frictional torque that opposes the direction of motion.

For gearbox mounting:
In determining the load and acceleration torque required by the motor, the gear ratio and the gear efficiency must be considered. A higher gear ratio increases positioning accuracy in terms of encoder resolution. For any given motor encoder resolution, as the gear ratio increases, so does the resolution of the machine position to be detected.

Note

Duty cycles in the field-weakening range

For duty cycles in the field-weakening range, the drive system must be engineered using the TST engineering tool.

Permissible motor torque

Once the application has been defined and specified, the maximum motor torque is calculated. Generally, the maximum motor torque is required when accelerating. The load torque and the torque required to accelerate the motor are added.

The maximum motor torque is then verified with the limiting characteristic curves of the motors.

The following criteria must be taken into account when selecting the motor:

- The dynamic limits must be adhered to, i.e. all speed-torque points of the relevant load event must lie below the relevant limiting characteristic curve.
- The thermal limits must be adhered to, i.e. the rms motor torque at the average motor speed resulting from the duty cycle must lie below the S1 characteristic curve (continuous duty). The rms value of the motor current within a duty cycle must be less than the rated motor current.
- In the field-weakening range, the permissible motor torque is restricted by the voltage limit characteristic (stability limit).

Note

Rated pulse frequencies

The rated motor data is valid only for 4 kHz (booksize or blocksize Motor Modules) or 2 kHz (chassis motor module). Operation of the motors with rated pulse frequencies < 2 kHz is not permitted!

6.2.3 Selecting induction motors

Characteristic curves for asynchronous motors

Speed-power diagrams P = f(n) and speed-torque diagrams M = f(n) for operation with the SINAMICS converter system are described in the motor characteristics, see Chapter "Technical data and characteristics" (Page 221).

Depending on the motor variant, the S1 characteristic (continuous operation) is available from standstill to rated point with maximum possible thermal torque, or passes through the constant-torque range. The power increases in proportion to speed depending on the available torque.

This is then followed by a constant-power range where the field is weakened (field-weakening range). The field-weakening range is limited by the voltage limit.

For induction motors, in addition to the S1 characteristic, the S6 characteristics are also shown, see Chapter "Technical data and characteristics" (Page 221).

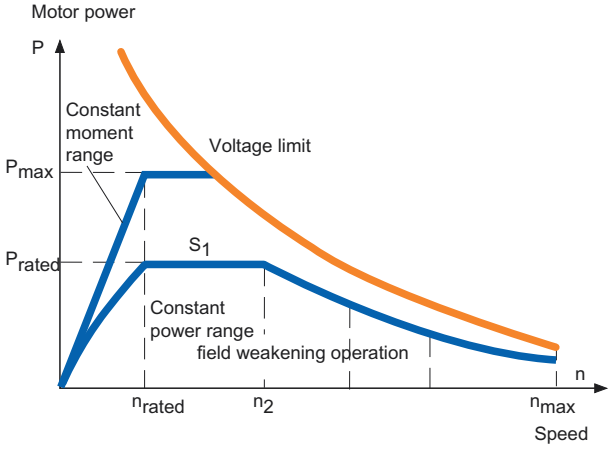


Figure 6-4 Typical speed/power diagram for 1PH8 asynchronous motors

In order that safe, reliable operation is guaranteed even when the line supply voltage fluctuates and the motor parameters vary, a safety margin of at least 10% should always be maintained to the voltage limit at every operating point depending on the type of supply voltage of the Motor Module (inverter) and Infeed Module.

Note

For the configuring of main spindle applications for machine tools, the characteristics for the supply voltage "ALM 400 V" include up to two additional ancillary rated points with which extended field-weakening operation can be configured. In this case, the range of constant power starts at the ancillary rated point and ends at the associated point n_2. The rest of the characteristic is the same as the S1 characteristic in the diagram.

Asynchronous motors have a high overload capacity in the constant power range. The theoretical curve of the maximum permissible overload capacity is shown as a limit in the characteristic diagrams and corresponds to value P_{max}.

6.2.4 Selecting synchronous motors

Characteristic curves for synchronous motors

The S1 characteristic (continuous operation) up to rated point for synchronous motors is similar to the S1 characteristic for asynchronous motors. The S1 characteristic represents the thermally maximum possible continuous torque that can be produced. The S1 power increases with the speed depending on the available torque up to approximately the rated speed.

This is followed by an area with reduced power characterized by increasing iron and friction losses, as well as the increase of negative field voltage with increasing speed due to the constant field of the synchronous rotor.

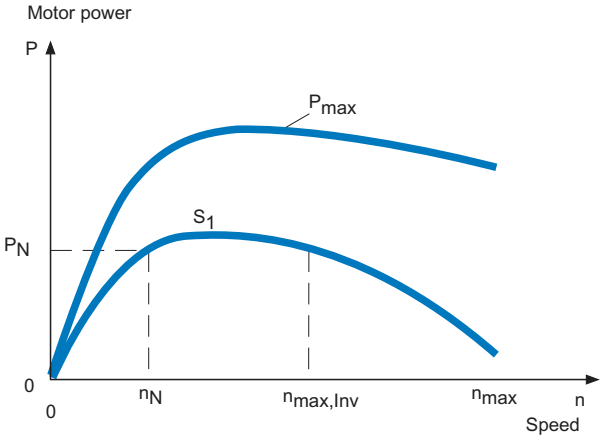


Figure 6-5 Typical speed/power diagram for 1PH8 three-phase synchronous motors

Note

Like those for induction motors, the data sheets for the supply voltage "ALM 400V" include additional ancillary rated points for the configuring of main spindle applications for machine tools. These allow an extended speed range to be configured.

The theoretical curve of the maximum permissible overload capacity is shown as a limit in the characteristic diagrams and corresponds to value P_{max}.

Note

Voltage limitation

A SINAMICS Voltage Protection Module (VPM) is required for operation at speeds of $n_{max,Inv}$ and above. Voltage Protection Modules are available for rated currents up to 200 A.

For further information, please refer to the SINAMICS S120 configuration manuals.

6.2.5 Selecting synchronous-reluctance motors

Characteristics for synchronous-reluctance motors

For synchronous-reluctance motors, the S1 characteristic (uninterrupted duty) has a response similar to that for synchronous motors. The S1 characteristic represents the thermally maximum possible continuous torque that can be produced.

As a result of the very low rotor losses, in the medium speed range, synchronous-reluctance motors have a higher thermal utilization and when compared to induction motors, have a better efficiency class. When configuring, one of two versions can be selected:

- Efficiency (IE3 to IE5)
- Performance (IE2 to IE4)

As a result of the rotor design, a synchronous-reluctance motor has a restricted field-weakening range, and when compared to an induction motor, has a lower maximum mechanical speed.

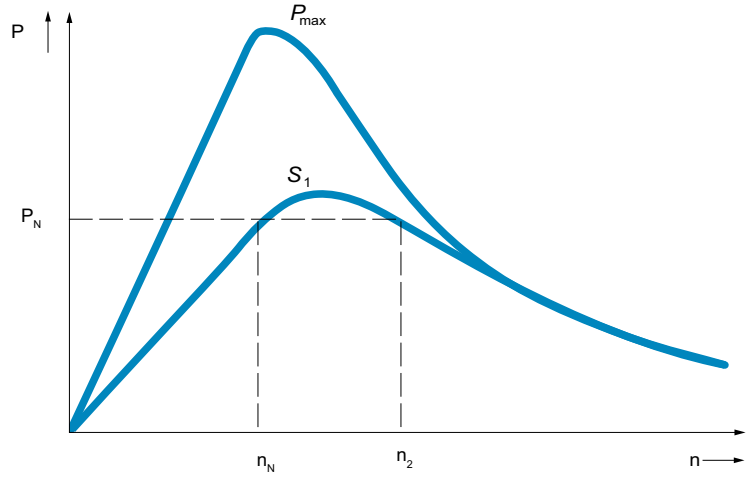


Figure 6-6 Typical speed-power diagram for 1PH8 synchronous-reluctance motors

Note

When configuring the system, the poorer power factor when compared to induction motors must be taken into account. This results in a higher reactive and/or apparent power at the motor terminals, and as a consequence, the converter must be able to provide a somewhat higher current.

6.3 Different rated points for induction motors

All 1PH8 induction motors can be configured based on a total of 4 characteristics and therefore also 4 rated operating points. The rated points are also stamped on the motor nameplate. For correct configuration, the line voltage and the line infeed are relevant for choosing the characteristics and rated points.

Table 6-2 Definition of the characteristics and rated points:

Characteristics order	Converter system	Line voltage	Supply infeed	Remarks
1	SINAMICS	3 AC 400 V	Smart/Basic Line Module (SLM/BLM)	Infeed with uncontrolled Smart/Basic-Mode (converter output voltages up to 380 V)
2	SINAMICS	3 AC 400 V	Active Line Module (ALM)	Infeed with controlled active mode (converter output voltages up to 425 V)
3	SINAMICS	3 AC 480 V	Smart/Basic Line Module (SLM/BLM)	Infeed with uncontrolled Smart/Basic-Mode (converter output voltages up to 460 V)
4	SINAMICS	3 AC 480 V	Active Line Module (ALM)	Infeed with controlled Active Mode (converter output voltages up to 500 V)

Note

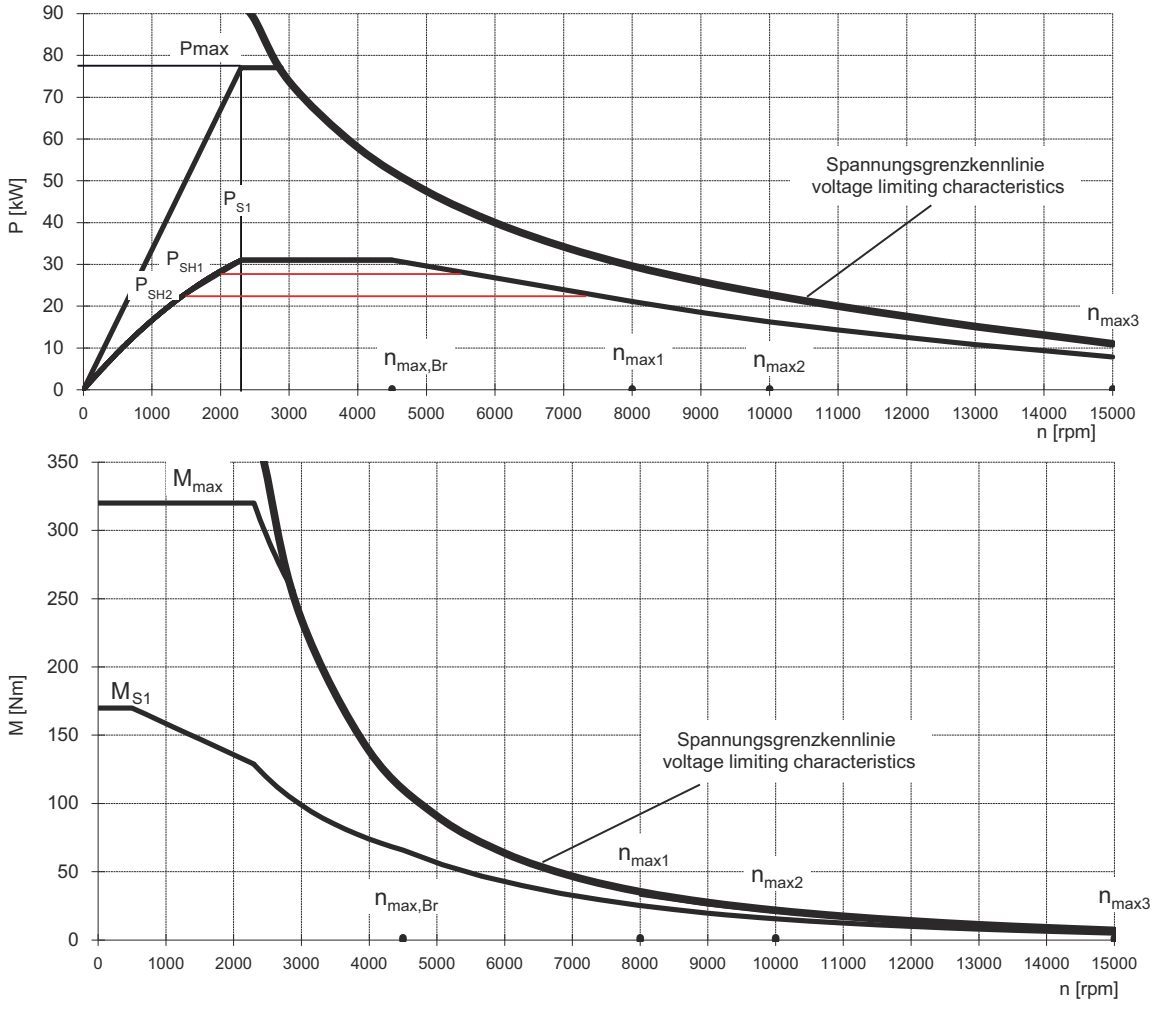
For water-cooled induction motors with shaft heights 180, 225 and 280, the characteristic order "4" is not shown. As a consequence, these motors do not have a fourth rated operating point for "ALM 480 V" on the motor rating plate. When configuring the "ALM 480 V" line infeed, use the data of the characteristic order "3".

Within the characteristic for SINAMICS, 3 AC 400 V, ALM (2nd order, see table), 2 (sometimes also 3) different rated speeds are listed. The rated speeds that are additional to the first rated speed stated are termed ancillary rated points and enable configuration for extended field weakening operation. This type of configuration is often used for main-spindle applications

on machine tools. It is especially important when migrating from old products, such as 1PH4, 1PH7, 1PM4/6 and 1PL6.

Table 6-3 SINAMICS, 3 AC 400 V, Active Line Module, (ALM), 1PH8135-□□G2□

n_{rated} r/min	P_{rated} W	M_{rated} Nm	I_{rated} A	n_{max1} r/min	n_{max2} r/min	n_{max3} r/min	$n_{max, Br}$ r/min	n_2 r/min	M_{max} Nm	I_{max} A	M_0 Nm	I_0 A
2300	31.0	129	61	8000	10,000	15,000	4500	4500	320	148	170	73
2000 1)	29.0	138	64					5250				
1500 1)	23.1	147	63					7300				



1) Ancillary rated point that permits configuration for extended field-weakening operation (e.g. main-spindle application for machine tools). In this case, the range of constant power starts at the ancillary rated point and ends at the associated point n2. The rest of the characteristic is the same as the S1 characteristic in the diagram.

The ancillary rated points have the following advantages for configuration:

- Direct comparability of the power and torque at a rated speed with the old products such as 1PH4, 1PH7, 1PM4/6, and 1PL6. (For the old products, lower rated speeds than for 1PH8 are usually specified.)
- Configuration for an extended field-weakening operation.

Note

For the motor data for SINAMICS, only the rated point is stored. The ancillary rated points cannot be entered; they are only required for better configuration.

Example of migration from 1PH7 to 1PH8:

Motor 1PH7226-__F	Rated operating point for SINAMICS, 3 AC 400 V, ALM	130 kW, 1500 r/min, 828 Nm
Motor 1PH8226-1_F	Rated operating point for SINAMICS, 3 AC 400 V, ALM	135 kW, 1750 r/min, 737 Nm
	Auxiliary rated operating point for SINAMICS, 3 AC 400 V, ALM	130 kW, 1500 r/min, 828 Nm (comparable to 1PH7226-__F)

6.4 Configuration for SINAMICS G

Configuration conditions for 1PH8 induction motors

The 1PH8 induction motors can also be configured for operation on SINAMICS G120, G130, and G150 if certain configuration conditions are met:

- SINAMICS G120 with Power Module PM240-4 (Blocksize) and Control Unit CU240E-2 with firmware release ≥ 4.5 or CU250, vector control (encoderless)
- SINAMICS G130/G150 and Control Unit CU320-2 with firmware version ≥ 4.5, vector control (encoderless or with incremental encoder HTL)
- System restrictions:
- 1PH8 SH 80 to SH 160 Pulse frequency ≥ 4 kHz
- 1PH8 SH 180 to SH 280 Pulse frequency ≥ 2 kHz
- Maximum permissible output frequency for PM240-2: 240 Hz (means n_max = 7000 r/min)
- System classification - characteristics:
  Only the characteristics of 1PH8 can be used for the non-regulated infeed.

Characteristics order	Converter system	Line voltage	Supply infeed	Remarks
1	SINAMICS	400 V 3 AC	Smart/Basic Line Module (SLM/BLM)	Infeed with Smart/Basic Mode non-regulated (converter output voltages up to 380 V)
3	SINAMICS	480 V 3 AC	Smart/Basic Line Module (SLM/BLM)	Infeed with Smart/Basic Mode non-regulated (converter output voltages up to 460 V)

Configuration conditions for 1PH8 synchronous-reluctance motors

1PH8 synchronous-reluctance motors can also be configured for operation on SINAMICS G120, G130 and G150 if certain configuration conditions are met:

- Power Module PM240-4 (Blocksize)
- Control Unit CU240E-2 from firmware V4.7 SP13 HF2

The system classification was shown using specific characteristics, see Chapter "Technical data and characteristics" (Page 221).

6.5 Configuration for 1PH808 Premium Performance

1PH8 motors in the "Premium Performance" variant have been developed specially for spindle drives for "drilling & tapping centers" and are characterized by higher performance data, such as:

- High maximum speeds (24,000 r/min)
- Low intrinsic moment of inertia
- High overload capability

Due to the higher performance data, 1PH8 motors have been harmonized to operate with the SINAMICS S120 Motor Module Booksize, Booksize Combi and the new Booksize Combi Module to facilitate a better configuration.

In the characteristics in Chapter "Technical data and characteristics", in addition to the rated operating point and the necessary pulse frequency, the maximum torques, maximum currents and maximum powers permissible for the specific Motor Module are specified. In this way, different overload requirements can be simply configured. Typical intermittent duties S6-10%, S6-25% and S6-40% for "Drilling & Tapping Center" are also specified in the characteristics.

Table 6-4 Explanation of the symbols in the characteristic curves

Abbreviation	Unit	Description
n_N	r/min	Rated speed
P_N	kW	Rated power
M_N	Nm	Rated torque
I_N	A	Rated current
n_2	r/min	Maximum operating speed in field-weakening range (limits range of constant power)
n_{max}	r/min	Maximum permissible speed for the "Premium Performance" version
I_{max1}	A	Maximum permissible short-time current at M_{max1} for Motor Module Booksize
I_{max2}	A	Maximum permissible short-time current at M_{max2} for Motor Module Booksize Combi
I_{max3}	A	Maximum permissible short-time current at M_{max3} for Motor Module Booksize Combi (upgrade)

M_{max1}	Nm	Maximum permissible short-time torque for Motor Module Booksize
M_{max2}	Nm	Maximum permissible short-time torque for Motor Module Booksize Combi
M_{max3}	Nm	Maximum permissible short-time torque for Motor Module Booksize Combi (upgrade)
P_{max1}	Nm	Maximum permissible short-time power for Motor Module Booksize
P_{max2}	Nm	Maximum permissible short-time power for Motor Module Booksize Combi
P_{max3}	Nm	Maximum permissible short-time power for Motor Module Booksize Combi (upgrade)
f_{cycle}	kHz	Rated pulse frequency

Note

Parameters must be adapted when commissioning

Motors with the "Premium Performance" bearing version are presently not plug & play components. Even after automatically commissioning the motors with DRIVE-CLiQ, the commissioning engineer must adapt the appropriate parameters.

Example: Motors with V and W winding versions (10th position of the Article No.) require an 8 kHz pulse frequency. Presently, this value is not automatically set. Further, for these motors, the current controller must be adapted. These parameters are currently not saved in the DRIVE-CLiQ interface data and must be modified manually by the commissioning engineer. These motors may only be operated with a fast current controller (p1810.11=yes) when connected to the SINAMICS S120 drive system.

Request the commissioning specifications from Technical Support to obtain a precise commissioning procedure (see Chapter "Instructions").

Technical data and characteristics

7

The data sheets and characteristics for the various motor frame sizes are available in SIOS.

Induction motors (https://support.industry.siemens.com/cs/ww/en/view/109808406)

Synchronous motors (https://support.industry.siemens.com/cs/ww/en/view/109808407)

Reluctance motors (https://support.industry.siemens.com/cs/ww/en/view/109808408)

Preparing for use

8

Transportation

Note

Transportation conditions

Comply with the local national regulations for the transportation of motors.

Note

Observing the notes

Observe the information on the original packaging and in the operating instructions when transporting and setting down the motor.

NOTICE
Bearing damage during transport If the customer has already mounted parts, for example coupling, belt pulley, etc., the bearing can be damaged during transport. • In this case, make sure that the customer uses a rotor locking device.

Storage

Note

Storage

If possible, store the motor in its original packaging.

NOTICE
Frost damage to water-cooled motors Water-cooled motors can be damaged by frost • Remove the liquid coolant before storage and blow out the cooling ducts with compressed air.

Preserve the free shaft ends, sealing elements, and flange surfaces with a protective coating.

NOTICE
Seizure damage to bearings If the motors are stored incorrectly, bearing seizure damage can occur, e.g. brineling, as a result of vibration. • Comply with the storage conditions.

Storage conditions

Please observe the warning instructions on the packaging and labels.

Store the motor in a dry, dust-free, and vibration-free indoor storage facility.

Adhere to the following values:

- $v_{rms} < 0.2$ mm/s
- Max. temperatures: -15 °C to 55 °C
- Mean relative humidity < 60 %

Note

Replacing roller bearings

- Even if the motor was stored for more than two years under favorable conditions (i.e. in a dry, dust-free room that is not susceptible to vibration), you must replace the bearings.
- If the motor was stored under unfavorable conditions, you must replace the bearings after approx. 18 months.

Note

Observing the notes

Observe the information in the operating instructions when storing the motor.

Electrical connection

9

9.1 Permissible line system configurations

In combination with the drive system, the motors are generally approved for operation on TN and TT systems with **grounded neutral** and on IT systems.

In operation on IT systems, the occurrence of a first fault between an active part and ground must be signaled by a monitoring device. In accordance with IEC 60364-4-41 it is recommended that the first fault should be eliminated as quickly as practically possible.

In systems with a **grounded external conductor**, an isolating transformer with grounded neutral (secondary side) must be connected between the line supply and the drive system to protect the motor insulation from excessive stress. The majority of TT systems have a grounded external conductor, so in this case an isolating transformer must be used.

9.2 Circuit diagram of the motor

You will find information on the circuit and on connecting the motor winding and the auxiliary equipment (e. g. temperature sensor, anti-condensation heating, etc.) in the circuit diagram. The circuit diagram is in the terminal box for the cable connection.

9.3 System integration

9.3.1 SINAMICS drive I/O

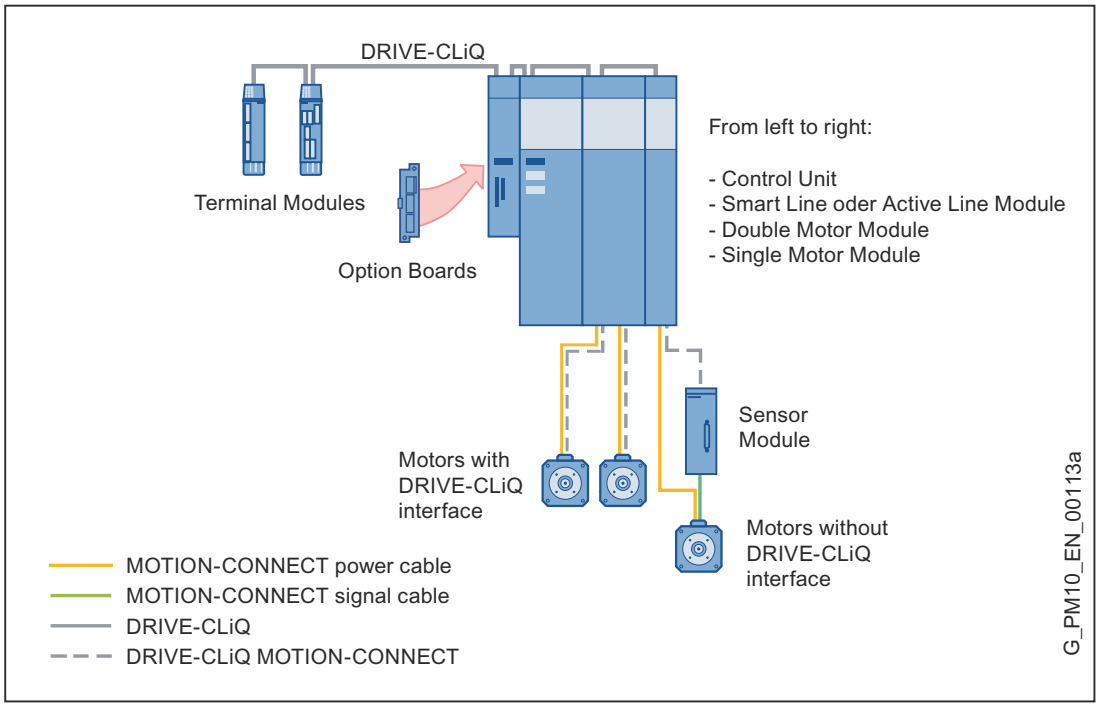


Figure 9-1 SINAMICS S120 system overview

9.3.2 Connecting-up information

Comply with the rating plate data (type plate) and circuit diagram in the terminal box. Use sufficiently dimensioned connection cables.

Note

System compatibility for connection

System compatibility is only guaranteed if shielded power cables are used and the shield is electrically connected through a large surface area to the metal motor terminal box (using metal EMC cable glands) or using a power connector.

Incorporate the shields in the protective grounding concept. Connect open-circuit conductors, conductors that are not used or electrical cables that can be touched to protective ground. If the brake feeder cables in the SIEMENS cable accessories are not used, then connect the brake conductor cores and shields to the cabinet ground. Open-circuit cables result in capacitive charges.

Use EMC cable glands for fixed cable entries. The cable glands are screwed into the threaded holes of the terminal box.

Close and seal any unused threads using a metal screw plug.

Note

Connection with aluminum conductors

Aluminum conductors can also be used for motors with higher powers and currents (e.g. shaft height 280). If you are using aluminum conductors, comply with the following additional points:

- Use only cable lugs that are suitable for connecting aluminum conductors.
- Immediately before inserting the aluminum conductor, remove the oxide layer from the contact areas on the conductor and/or the mating piece, by brushing or filing.
- Then grease the contact areas immediately using neutral Vaseline in order to avoid re-oxidation.

Note

Terminal boxes with aluminum connecting bars

For terminal boxes with aluminum connecting bars (type 1XB7), copper (Cu) cables with copper (Cu) cable lugs can also be connected.

Internal equipotential bonding

The potential equalization between the grounding terminal in the terminal box enclosure and the motor enclosure is established via the terminal box fixing screws. The contact locations underneath the screw/bolt heads are bare and are protected against corrosion.

The standard terminal box cover fixing screws provide adequate equipotential bonding between the terminal box cover and terminal box enclosure.

Note

Higher number of grounding terminals in the terminal box for shaft height 280 (option Q00)

For large transmission powers, symmetrical power cables with a grounding conductor split into 3 are used in some cases. To be able to connect this high number of grounding conductors in the terminal box, with option Q00, for a shaft height 280, a grounding bar with a higher number of terminals can also be mounted, see Chapter "Increased number of grounding terminals in the terminal box (Page 203)".

Shaft height SH	Terminal box Type	Quantity Connecting terminals (Grounding) Standard	Quantity Terminals (grounding) Option Q00
280	1XB7712-P...	4 x M16	12 x M6

Motor and connecting cables

- For the motor cables, use twisted or three-core cables with additional ground conductor. Strip the insulation from the ends of the conductors so that the remaining insulation extends up to the cable lug or terminal.
- Arrange the connecting cables loosely in the terminal box so that the protective conductor has excess length and the insulation of the cable cores cannot be damaged. Ensure that the connecting cables are strain relieved.
- Take special care that the required air clearances are actually maintained:
  - Up to shaft height 160, as a minimum 4.5 mm
  - From shaft height 180, as a minimum 10 mm

Checking/testing after connecting up

- The inside of the terminal box must be clean and free of any cable pieces.
- All of the terminal screws must be tight.
- The minimum air clearances must be strictly maintained.
- The cable entries must be reliably sealed.

- Unused cable entries must be closed and the screw plugs must be screwed tight.
- All the sealing surfaces must be in a perfect condition.

Connecting the ground conductor

The ground conductor cross-section must be in full conformance with the installation regulations, e.g. acc. to IEC/EN 60204-1.

For shaft height 225 and shaft height 280, also connect the grounding conductor to the motor end shield. There is a clamping lug ① for the ground conductor at the designated connection point. This is suitable for connecting multi-conductor cables with cable lugs or ribbon cables with the appropriate conductor terminations.

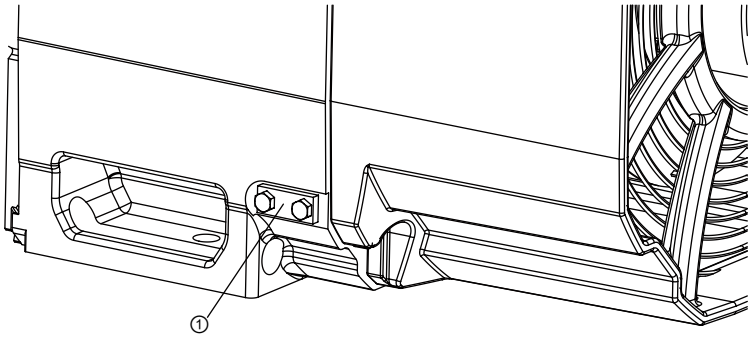


Figure 9-2 Terminal lug for grounding conductor (shaft heights 225 and 280)

When connecting up, ensure that

- the connecting surface is bare and is protected against corrosion using a suitable substance, e.g. acid-free Vaseline
- the flat and spring washers are located under the screw head
- the minimum necessary screw-in depth and the tightening torque for the clamping screw must be maintained

Table 9-1 Screw-in depth and tightening torque

Screw	Penetration depth:	Tightening torque
M8 x 30	> 8 mm	20 Nm

9.3.3 Routing cables in a damp environment

Note

Routing cables in humid/moist environments

If the motor is mounted in a humid environment, the power and signal cables must be routed as shown in the following figure.

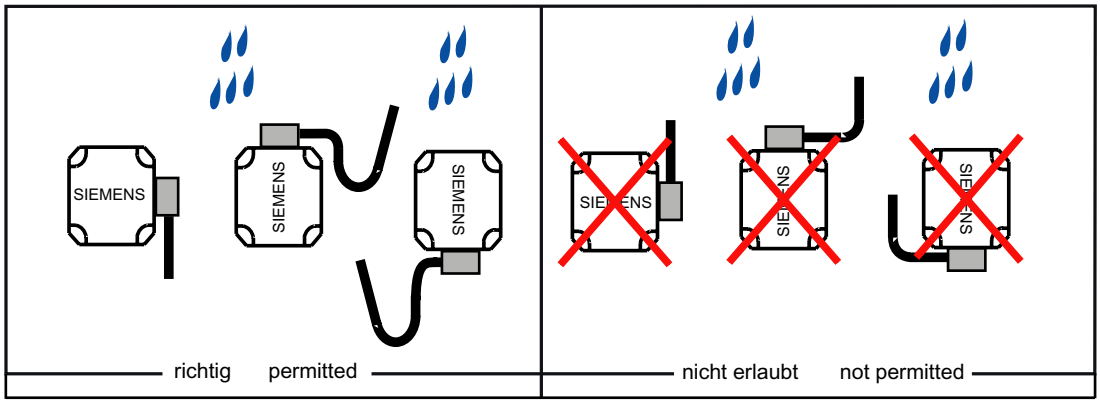


Figure 9-3 Principle of cable routing in a wet/moist environment

9.3.4 Power connection

WARNING

Thermally damaged connecting cables

If connection cables have a conductor cross section that is too small for the application, the connection cables can be thermally damaged. This can result in personal injury and damage to property due to electric shock and fire hazard.

- Carefully observe the current which the motor draws for your particular application! Adequately dimension the connecting cables according to IEC 60204-1 or IEC 60364-5-52.

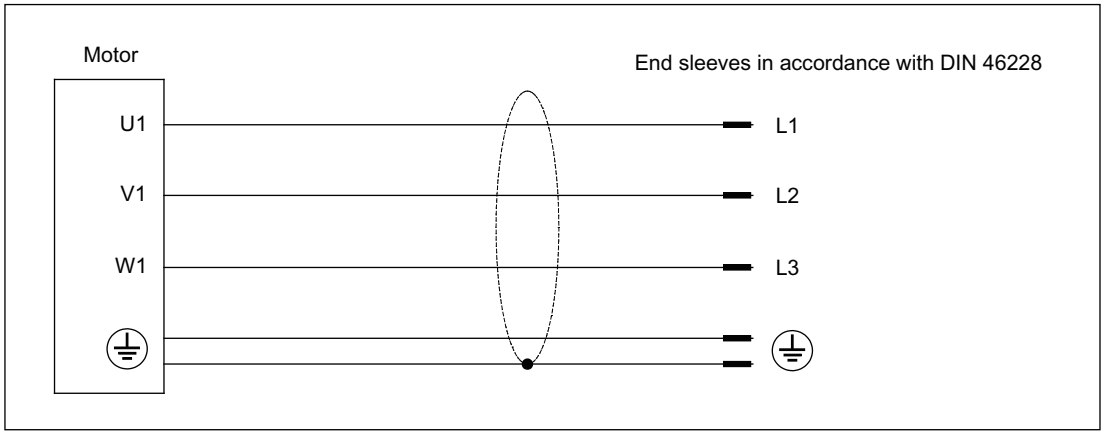


Figure 9-4 Power cable

Terminal box connection

The type designation of the mounted terminal box as well as the details on the power connection for the line supply cables can be taken from the following table. A circuit diagram to connect the motor winding is provided in the terminal box when the motors are shipped.

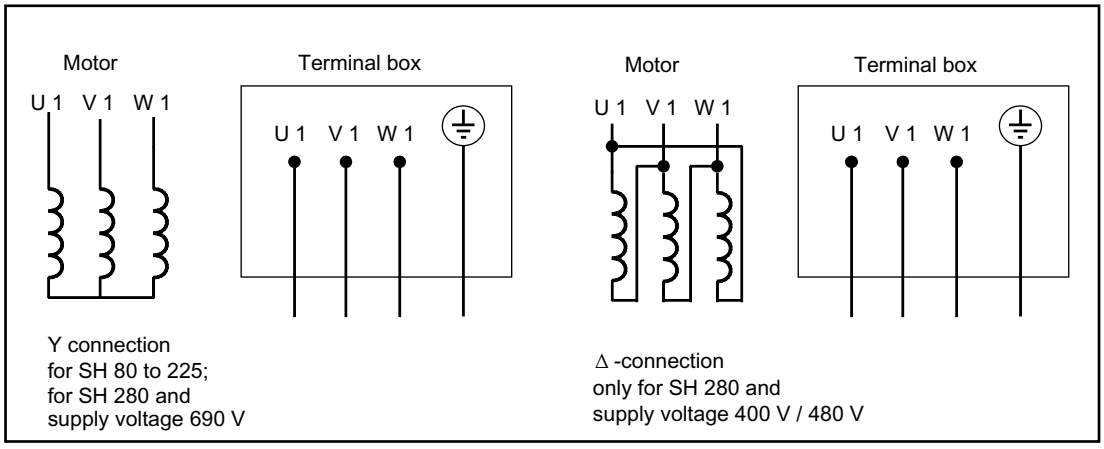


Figure 9-5 Circuit diagram

Note

Connecting temperature sensors and PTC thermistors

The spare temperature sensor (option A25 for shaft heights 80 to 160, standard from shaft height 180 and higher) and the PTC thermistor circuit for alarm/trip (option A12) are connected to a signal terminal block in the terminal box.

Star/delta connection in the terminal box (SH80 to SH160)

The star/delta connection can be implemented using an external contactor circuit or as permanent setting in the terminal box.

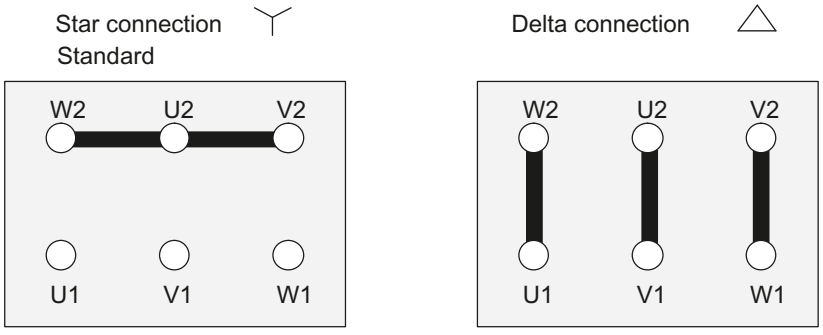


Figure 9-6 Fixed star/delta connection in the terminal box

Current-carrying capacity for power and signal cables

The current carrying capacity of PVC/PUR-insulated copper cables is specified for routing types B1, B2, C and E under continuous operating conditions in the table with reference to an ambient air temperature of 40 °C. For other ambient temperatures, the values must be corrected by the factors from the table of derating factors.

Table 9-2 Cable cross section and current-carrying capacity

Cross section	**Current-carrying capacity rms; AC 50/60 Hz or DC for routing type**			
mm²	**B1** **A**	**B2** **A**	**C** **A**	**E** **A**
Electronics (according to EN 60204-1)				
0.20	-	4.3	4.4	4.4
0.50	-	7.5	7.5	7.8
0.75	-	9	9.5	10
Power (according to EN 60204-1)				
0.75	8.6	8.5	9.8	10.4
1.00	10.3	10.1	11.7	12.4
1.50	13.5	13.1	15.2	16.1
2.50	18.3	17.4	21	22
4	24	23	28	30
6	31	30	36	37
10	44	40	50	52
16	59	54	66	70
25	77	70	84	88
35	96	86	104	110
50	117	103	125	133
70	149	130	160	171
95	180	165	194	207
120	208	179	225	240
Power (according to IEC 60364-5-52)				
150	239[1)]	206[1)]	259[1)]	276[1)]
185	274[1)]	235[1)]	296[1)]	315[1)]
> 185	Values must be taken from the standard			

[1)] Extrapolated values

Table 9-3 Derating factors for power and signal cables

Ambient air temperature **°C**	**Derating factor according to EN 60204-1, Table D1**
30	1.15
35	1.08
40	1.00
45	0.91

Ambient air temperature °C	Derating factor according to EN 60204-1, Table D1
50	0.82
55	0.71
60	0.58

Assignment, terminal boxes and max. cross-sections

Table 9-4 Terminal box data

Terminal box type	Shaft height	Cable entry (power)	Cable entry (external signals)	Outer cable diameter, max. mm [2)]	Number of main terminals	Max. cross-section per terminal mm²	Max. current per terminal A [3)]
gk803	SH80	1 x M25 x 1.5	1 x M16 x 1.5 [1)]	20	Phases: 3 x M5 Grounding: 2 x M5	1 x 10	52
gk806	SH80	1 x M25 x 1.5	1 x M16 x 1.5 [1)]	20	Phases: 6 x M5 Grounding: 2 x M5	1 x 10	52
gk813	SH100	1 x M32 x 1.5	1 x M16 x 1.5 [1)]	24.2	Phases: 3 x M5 Grounding: 2 x M5	1 x 16	70
gk823	SH100	1 x M32 x 1.5	1 x M16 x 1.5 [1)]	24.2	Phases: 3 x M5 Grounding: 2 x M5	1 x 16	70
gk826	SH100	1 x M32 x 1.5	1 x M16 x 1.5 [1)]	24.2	Phases: 6 x M5 Grounding: 2 x M5	1 x 10	52
gk833	SH132	1 x M40 x 1.5	1 x M16 x 1.5 [1)]	32	Phases: 3 x M6 Grounding: 2 x M6	1 x 35	110
gk843	SH132	1 x M50 x 1.5	1 x M16 x 1.5 [1)]	38	Phases: 3 x M6 Grounding: 2 x M6	1 x 50	133
gk846	SH132	1 x M50 x 1.5	1 x M16 x 1.5 [1)]	38	Phases: 6 x M6 Grounding: 2 x M6	1 x 25	88
gk863	SH160	1 x M50 x 1.5	1 x M16 x 1.5 [1)]	38	Phases: 3 x M6 Grounding: 2 x M6	1 x 50	133
gk873	SH160	1 x M63 x 1.5	1 x M16 x 1.5 [1)]	42.6	Phases: 3 x M6 Grounding: 2 x M6	1 x 50	133
gk874	SH160	1 x M63 x 1.5	1 x M16 x 1.5 [1)]	42.6	Phases: 3 x M10 Grounding: 2 x M6	2 x 70	240
1XB7322-P05	SH180 to SH280	2 x M50 x 1.5	1 x M16 x 1.5 [4)]	38	Phases: 3 x M12 Grounding: 4 X M6e	2 x 50	210
1XB7422-P06	SH180 to SH280	2 x M63 x 1.5	1 x M16 x 1.5 [4)]	53	Phases: 3 x M12 Grounding: 4 x M8	2 x 70	270

Terminal box type	Shaft height	Cable entry (power)	Cable entry (external signals)	Outer cable diameter, max. mm [2)]	Number of main terminals	Max. cross-section per terminal mm²	Max. current per terminal A [3)]
1XB7700-P02	SH225 and SH280	3 x M75 x 1.5	1 x M16 x 1.5 [4)]	68	Phases: 3 x 2 x M12 Grounding: 3 x clamping plate	3 x 150	700
1XB7712-P03	SH225 and SH280	4 x M75 x 1.5	1 x M16 x 1.5 [4)]	68	Phases: 3 x 4 x M16 Grounding: 4 x M16	4 x 185	1150

1) M16 x 1.5 thread arranged at 90° angle to signal connection; thread only with options A12, A25 and encoder version A (without encoder)

2) Depending on the version of metric cable gland (based on the MOTION-CONNECT cable type and cable glands from HUGRO or from AGRO)

3) Current-carrying capacity based on EN 60204-1 and IEC 60364-5-52, routing type E

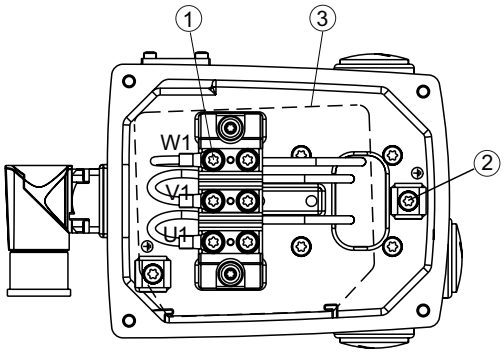
4) M16 x 1.5 thread arranged opposite to the signal connection (lateral to the cable entry plate); thread only for option A12 and encoder version A (without encoder)

Note

Terminal box type 1XB7700-P02

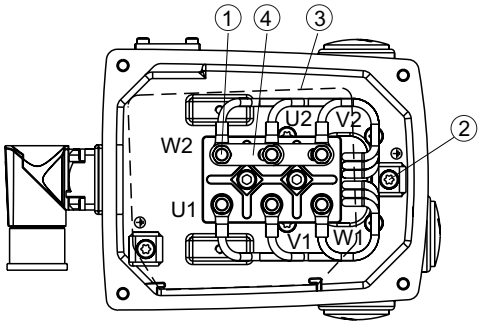
For cable entry, 3 cable glands can only be fit in if cable glands from AGRO or HUGRO are used. Cable glands from Pflitsch or Lapp, for example, are larger and it is not possible to fit 3 of them into the available space.

Terminal box design



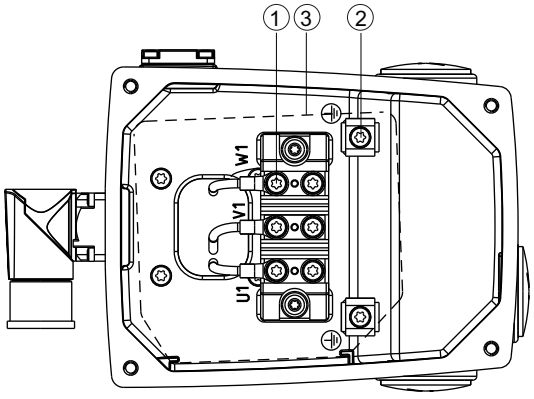
① Terminal screw M5
② Grounding screw M5
③ Insulation strips

Figure 9-7 Terminal box gk803, 3-pole (SH 80)



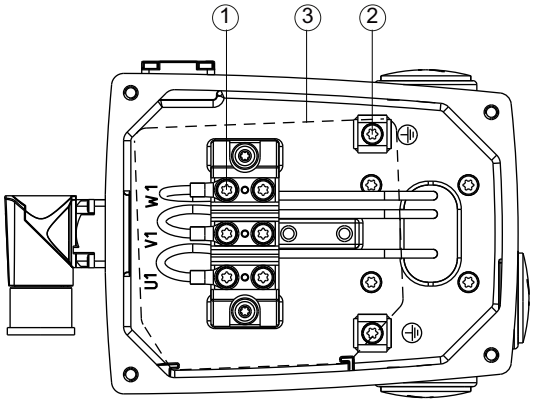
① M5 connecting studs
② Grounding screw M5
③ Insulation strips
④ Jumper

Figure 9-8 Terminal box gk806, 6-pole (SH 80) (can be changed over between star and delta)



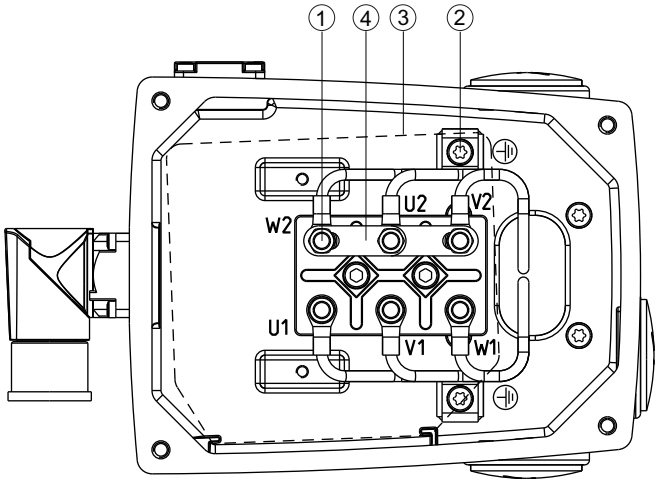
① Terminal screw M5
② Grounding screw M5
③ Insulation strips

Figure 9-9 Terminal box gk813, 3-pole (SH 100)



① Terminal screw M5
② Grounding screw M5
③ Insulation strips

Figure 9-10 Terminal box gk823, 3-pole (SH 100)



① Terminal screw M5
② Grounding screw M5
③ Insulation strips
④ Jumper

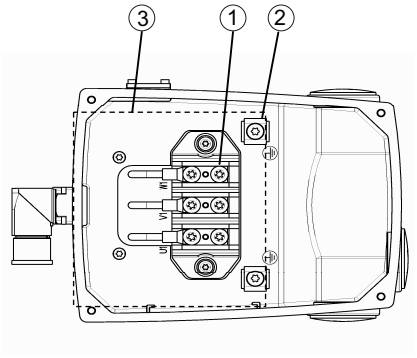
Figure 9-11 Terminal box gk826, 6-pole (SH 100) (can be changed over between star and delta)

Note

Star/delta connection

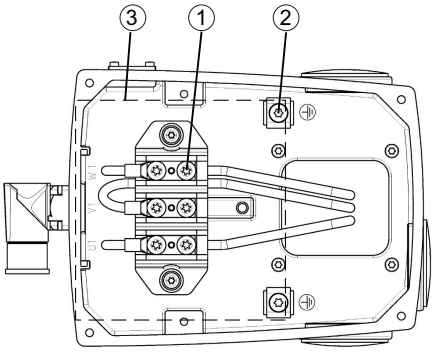
A star/delta connection is implemented using an external contactor circuit or as a fixed configuration in terminal box gk806 for SH 80 and in terminal box gk826 for SH 100.

Standard configuration: Star connection via jumpers



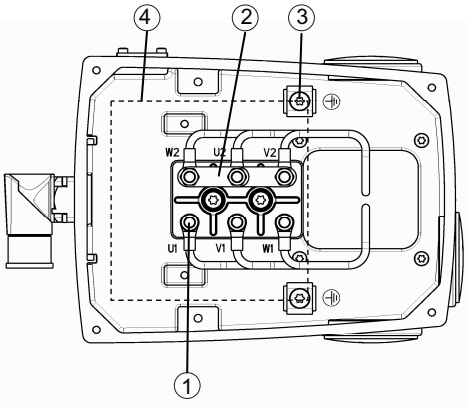
① Terminal screw M6
② M6 grounding screw
③ Insulation strips

Figure 9-12 Terminal box gk833 (SH 132) and gk863 (SH 160), 3-pole



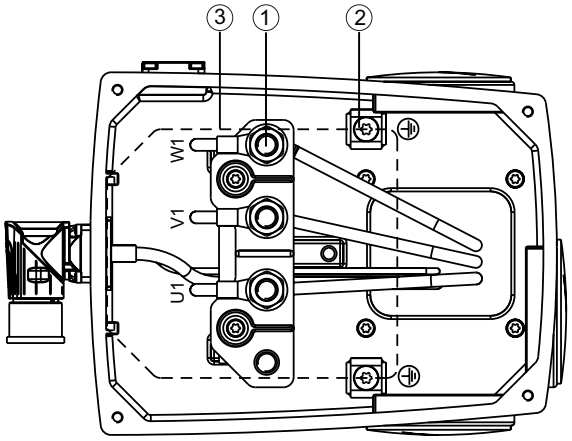
① Terminal screw M6
② M6 grounding screw
③ Insulation strips

Figure 9-13 Terminal box gk843 (SH 132) and gk873 (SH 160), 3-pole



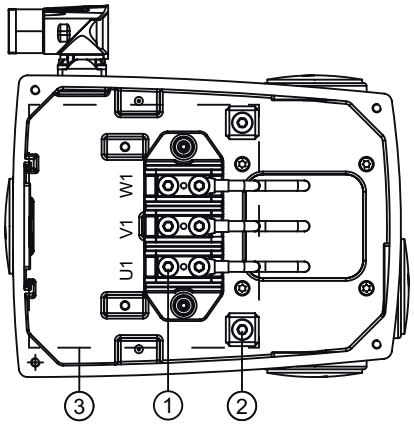
① Terminal stud M6
② Jumper
③ M6 grounding screw
④ Insulation strips

Figure 9-14 Terminal box gk846 (SH 132) and gk876 (SH 160), 6-pole (can be changed over between star and delta)



① Terminal screw M10
② M6 grounding screw
③ Insulation strips

Figure 9-15 Terminal box gk874 (SH 132 and SH 160), 3-pole (only for synchronous motors and synchronous-reluctance motors)



① Connection screw M5 for SH80/100
Connection screw M6 for SH132/160
② Grounding screw M5 for SH80/100
Grounding screw M6 for SH132/160
③ Insulation strips

Figure 9-16 Terminal boxes gk803 (SH 80), gk823 (SH 100), gk843 (SH 132), gk873 (SH 160), 3-pole, cable entry DE (drive end)

Note

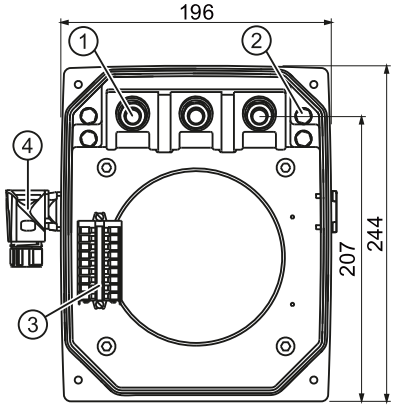
Cable exit direction DE

The motor with the cable exit direction DE has a "D" in the 15th position of the Article No.

Note

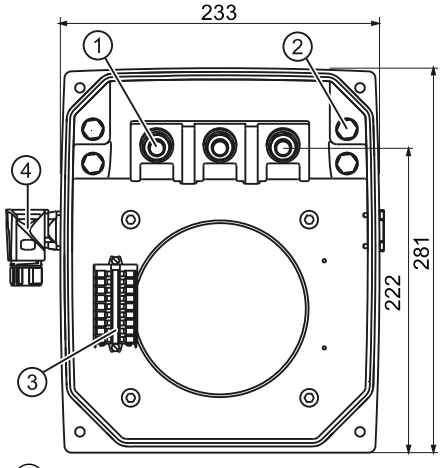
The internal motor cables are mounted on the NDE side on the 3-pole terminal board.

Terminal box gk874 is not possible.



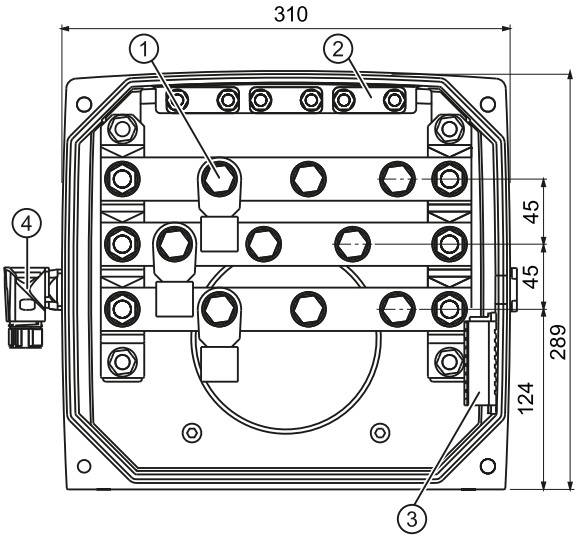
① Main terminal
② Ground terminal
③ Signal connection terminal
④ Signal connection

Figure 9-17 1XB7322-P05 terminal box (SH 180 to SH 280)



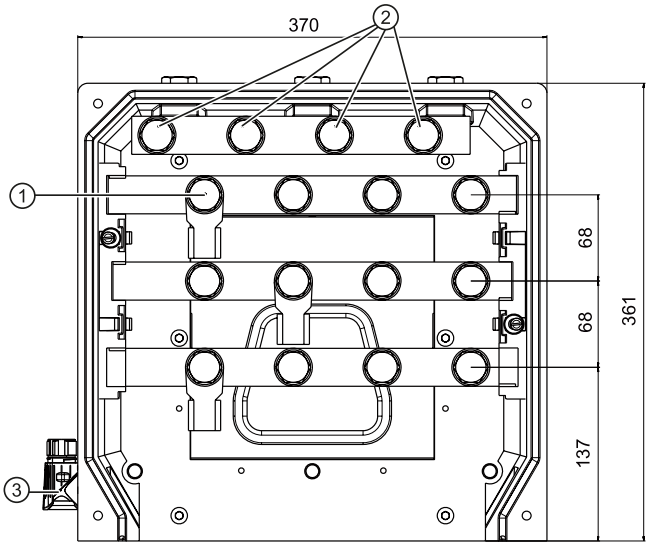
① Main terminal
② Ground terminal
③ Signal connection terminal
④ Signal connection

Figure 9-18 1XB7422-P06 terminal box (SH 180 to SH 280)



① Main terminal
② Ground terminal
③ Signal connection terminal
④ Signal connection

Figure 9-19 1XB7700-P02 terminal box (SH 225 and SH 280)



① Main terminal
② Ground terminal
③ Signal connection terminal

Figure 9-20 1XB7712-P03 terminal box (SH 225 and SH 280)

Note

Signal connection for special orders

The signal connection may differ from the standard layout in the case of special orders.

For the device version without speed encoder, there is an M16 x 1.5 connection thread.

Power connector connection

- Use connector size 1.5.
- Assign the connector as shown in the "Power connector 1.5" diagram. Connect the protective conductor.

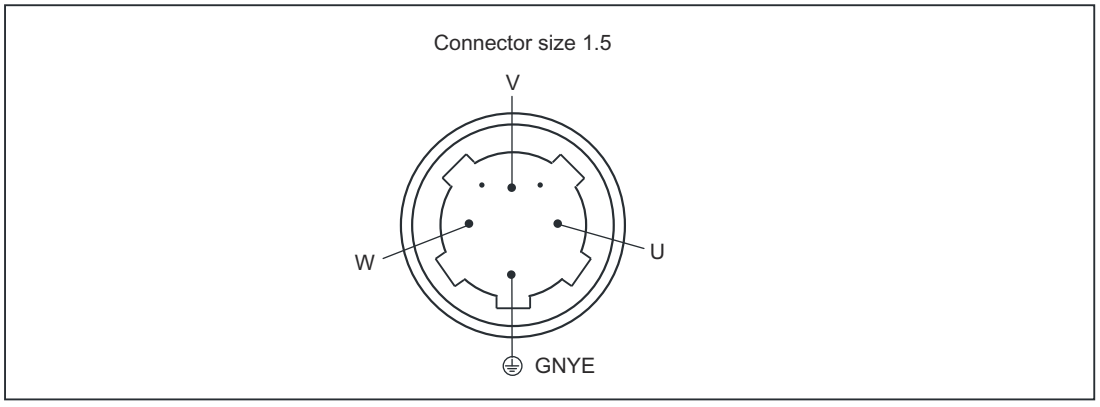


Figure 9-21 Power connector, size 1.5 (view of connector pins)

Connector	Rotation range	Maximum torque
Connector size 1.5	270°	20 Nm

Note

Rotating the connectors

- The permissible rotation range must not be exceeded.
- In order to guarantee the degree of protection, max. 10 revolutions are permissible.
- Connectors should be rotated using the matching mating connector located on the connector thread. Only rotate the Sensor Module by hand. The use of pipe wrenches, hammers, or similar is not permitted.

- Use connector size 3.
- Assign the connector as shown in the "Power connector 3" diagram. Connect the protective conductor.

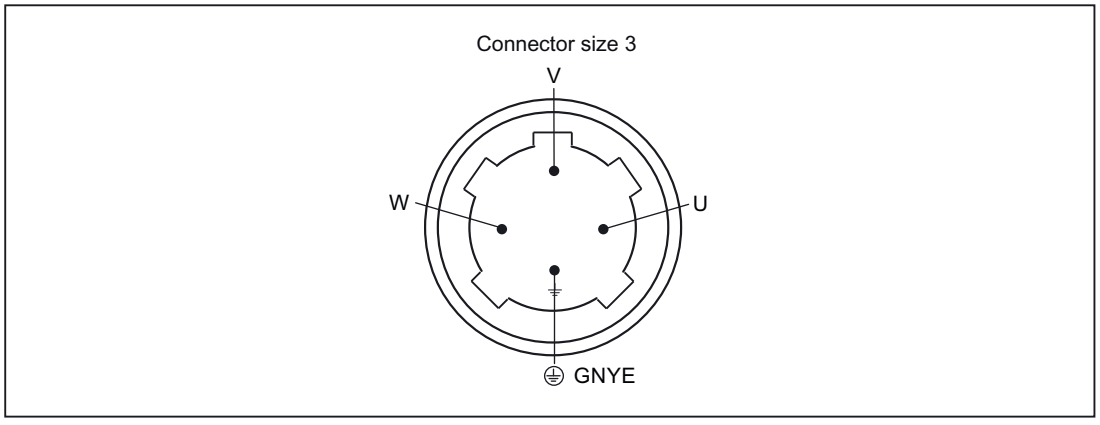


Figure 9-22 Power connector, size 3 (looking onto the connector pins)

Star/delta connection via an external contactor circuit

When induction motors (SH 80 to SH 160) are used, it is possible to select one of the following operating modes:

- Star connection
- Delta connection

Circuit to implement star-delta switchover

For induction motors, all six connection leads of the three winding phases are fed out to be able to select the various operating modes.

The changeover is carried out outside the spindle using switching devices and equipment that are not included with the motor spindle (i.e. these devices are not included in the scope of delivery).

Note

Star/delta connection

When changing over the circuit configuration (star-delta), the appropriate data set for the closed-loop motor control must also be changed-over.

A changeover may only be made when the spindle is in a no-load condition and with the power module pulses inhibited.

For information about the circuit to implement the star-delta changeover, refer to the following diagram and SINAMICS S120 Function Manual (FH1).

Using the star connection

The star connection offers some advantages at low speeds. The maximum torque in the star connection is approximately twice as high as in the delta connection. However, due to the higher reactive power requirement of the star connection, the available torque in the uppermost speed range is significantly restricted. This means that the star connection should only be activated when machining which requires a **high torque in the lower speed range.** An example of such a machining operation is roughing.

Using the delta connection

Although the delta connection provides, in the lower speed range, a lower maximum torque than the star connection, the torque remains available up to high speeds. This means that the delta connection should be activated for **all machining operations which are carried out in the medium and high speed ranges**.

Connection diagram for Y/D changeover

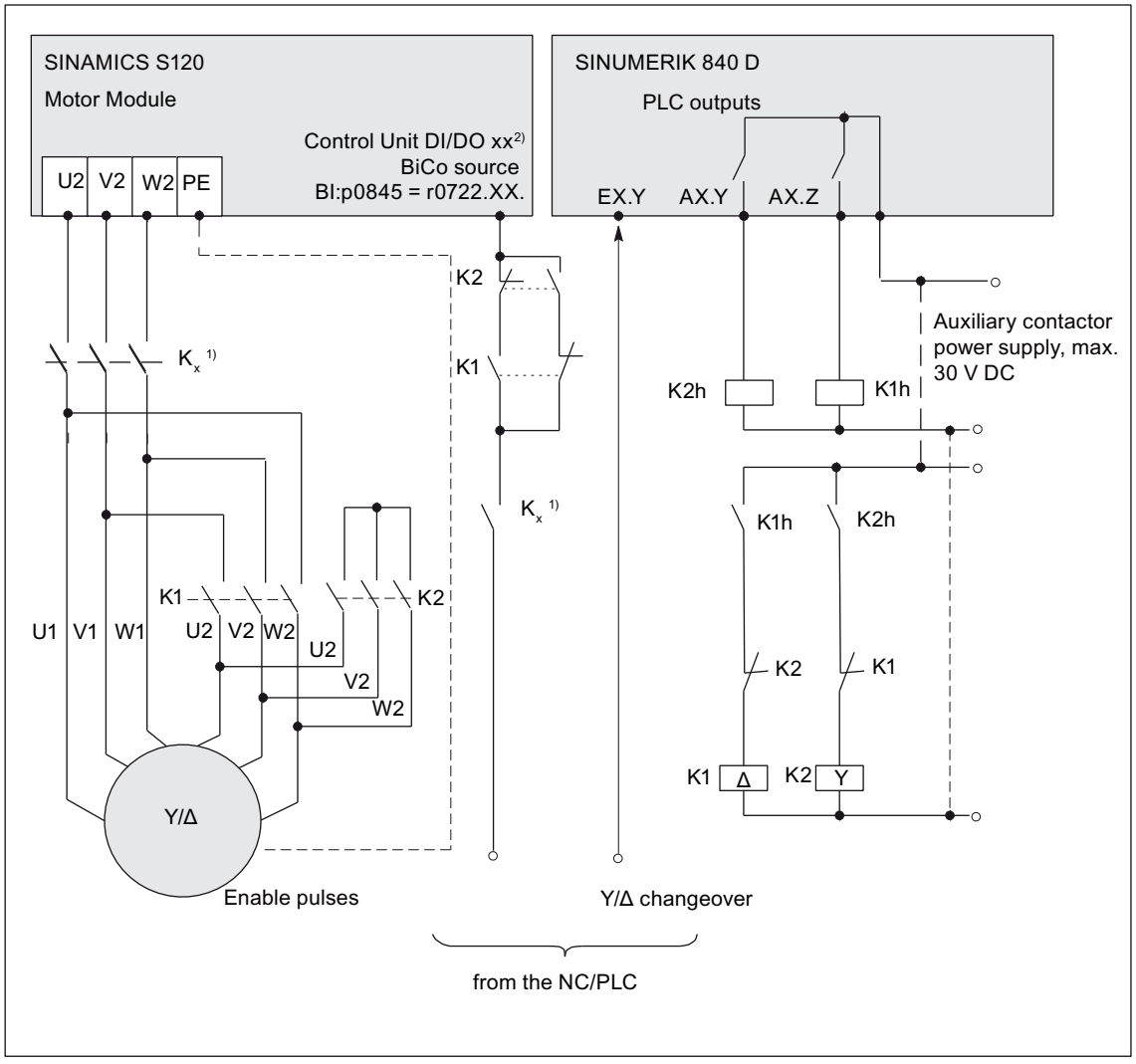


Figure 9-23 Connection diagram for Y/D changeover with SINAMICS

1) Safe operating stop cannot be guaranteed by simply opening K1 and K2. Therefore, for safety reasons there should be electrical isolation provided by contactor K_x. This contactor may only be switched-in the no-current condition, i.e. the pulse enable must be withdrawn 40 ms before the contactor is opened (de-energized).

2) Terminal X3 of the voltage limiting module VPM should be wired to a digital input of the Control Unit on which the assigned 1PH8 motor spindle is also controlled. For the case that several VPMs are used, each terminal must be wired to a separate digital input of the relevant Control Unit.
If an armature short-circuit occurs (terminal X3 has opened), the pulses of the relevant axis must be inhibited. To achieve this, the digital input used is interconnected to the control bit OFF2 (pulse inhibit) via p0845 = r0722.XX.
Further information can be found in the SINAMICS S120 Function Manual.

9.3.5 External fan

Table 9-5 Connected loads for external fans

Shaft height SH	**Fan motor: Maximum current consumption A**			**Air flow direction**
Forced ventilation	**230 V 1 AC/50 Hz (±10 %)**	**230 V 1 AC/60 Hz (±10 %)**	**265 V 1 AC/60 Hz (±10 %)**	
80	0.33	0.25	0.32	NDE --> DE
	0.20	0.16	0.19	DE --> NDE
Forced ventilation	**3-ph. 400 VAC / 50 Hz (±10 %)**	**400 V 3 AC/60 Hz (±10 %)**	**480 V 3 AC/60 Hz (±10 %)**	
100	0.08	0.07	0.11	NDE --> DE
	0.10	0.08	0.11	DE --> NDE
132	0.11	0.13	0.13	NDE --> DE
	0.10	0.12	0.12	DE --> NDE
160	0.16	0.21	0.21	NDE --> DE
	0.16	0.21	0.21	DE --> NDE
Forced ventilation (EC fan) Standard	**1-ph. 200 ... 277 VAC / 50 Hz, 60 Hz (±10 %)**			
180	1.1 ... 1.3			NDE --> DE DE --> NDE
225	2.0 ... 2.3			NDE --> DE DE --> NDE
Forced ventilation (EC fan) Option: L76	**3 AC 380 V ... 480 V (-5 %/+10 %) 50 Hz, 60 Hz (±10 %)**			
180	0.44 ... 0.5			NDE --> DE DE --> NDE
225	0.75 ... 0.9			NDE --> DE DE --> NDE
Forced ventilation (EC fan) Standard	**3 AC 380 V ... 480 V (-5 %/+10 %) 50 Hz, 60 Hz (±10 %)**			
280	0.75 ... 0.9			NDE --> DE DE --> NDE

Note

For EC fans, for shaft height 180 and shaft height 280, as a result of the electronic input circuitry, the current drawn can briefly reach four times the specified current.

Recommended connection

Connect the separately driven fan via the terminal box of the separately driven fan or optionally via a power connector. Implement operation of the fans via the motor circuit breaker. A simple conductor protection is sufficient for the EC fans.

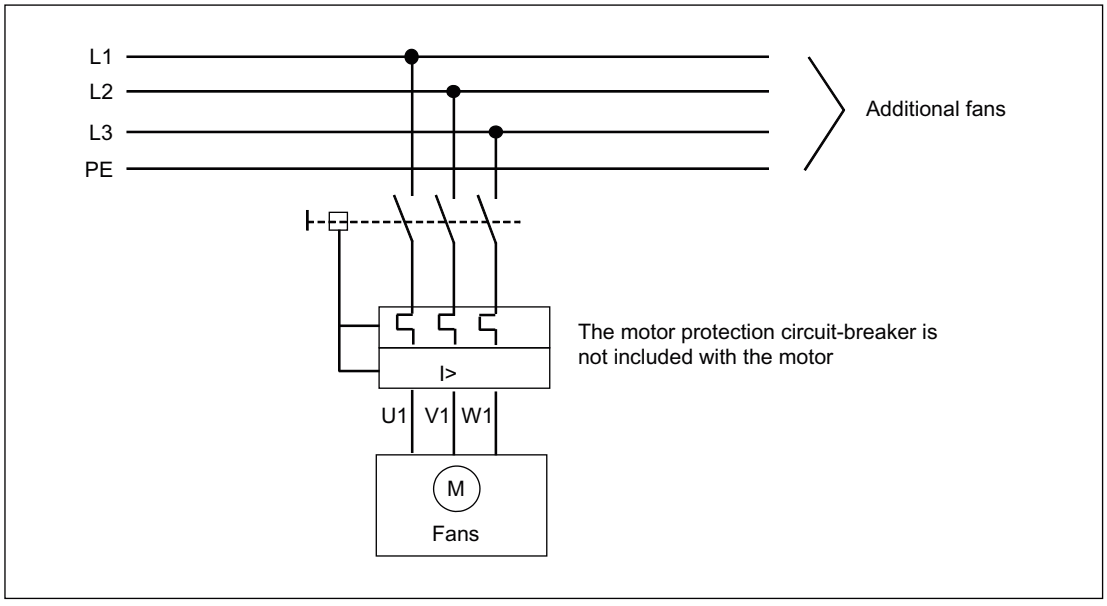


Figure 9-24 Recommended connection

Note

Single-phase fan connection

If you use a 3-pole circuit breaker for a 1-phase fan connection for shaft height 80, then you must connect the 3 current paths in series (see the diagram).

If only one current path would be used, many circuit breakers would trip too early because they often also monitor balanced load or voltage on the 3 line conductors. You must determine whether this circuit is permissible with electronic motor circuit breakers on a case-by-case basis from the product data sheets of the specific manufacturer.

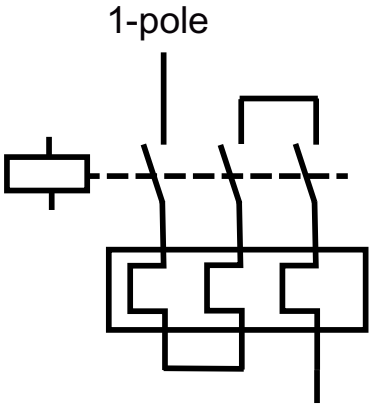


Figure 9-25 Single-phase connection

Connection via the terminal box

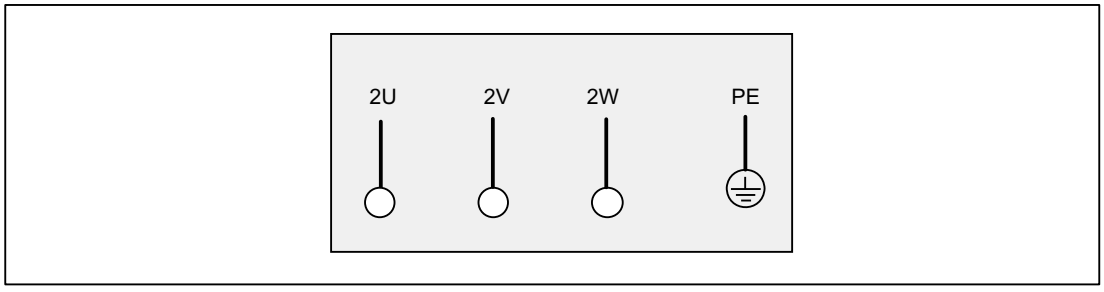


Figure 9-26 Connecting the separately driven fan terminal box, shaft height 100 up to shaft height 160

Connection via the power connector

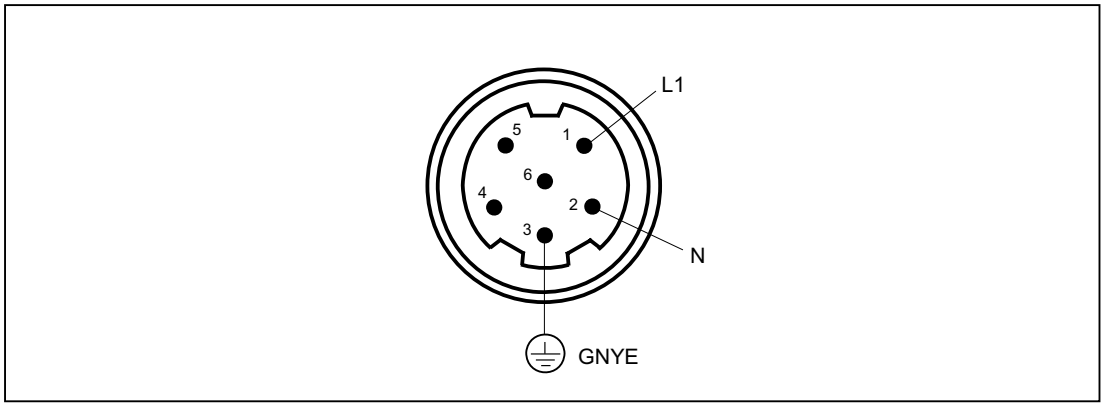


Figure 9-27 Connection, separately driven fan, shaft height 80

Note

For 1PH8 motors, shaft height 80, always switch on the separately driven fan via a power connector, even if the motor power connection is established via a terminal box.

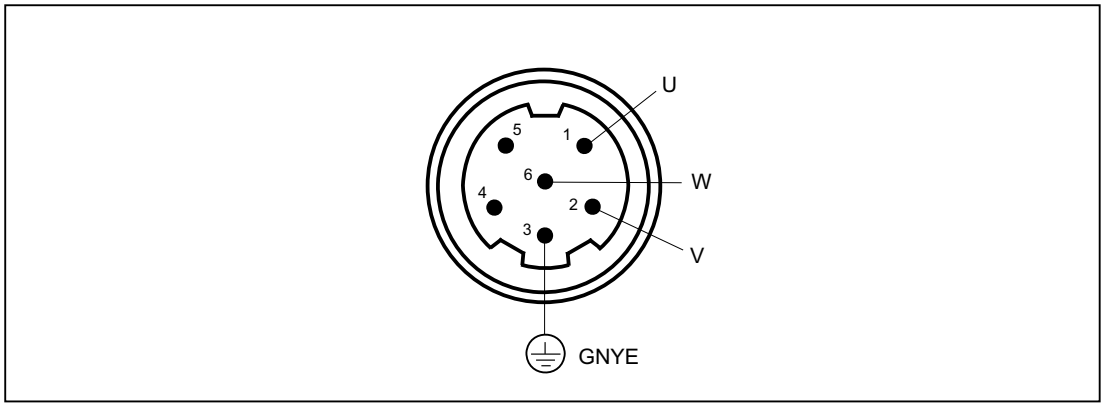


Figure 9-28 Connecting the separately driven fan, shaft height 100 up to shaft height 132

Note

Rotating the connectors

- Do not exceed the permissible rotation range.
- In order to guarantee the degree of protection, max. 10 revolutions are permissible.
- When turning, only use the mating connector that matches the connector thread. Only rotate Sensor Modules by hand. Do not use any tools such as pipe wrench, hammer or similar tool.

Connector	Rotation range	Maximum rotation torque
Connector size 1.0	270°	12 Nm

Note

Scope of delivery

The mating connector is not included in the scope of delivery.

Article number mating connector size 1 (with full thread) 6FX2003-0LU00

Note

Prefabricated cables

Order pre-assembled cables with the following Article No.:
6FX□002-5CG01-□□□0

EC external fan for shaft heights 180 to 280

EC external fans are installed in forced ventilated motors of the 1PH8 series. These are especially designed fan units for this motor series, with a permanently set operating speed.

EC external fans contain high-efficiency electronically commutated motors with permanent magnets. They are speed-controlled by an integrated controller.
The EC external fans meet the general requirements of EN 61800-2 for variable-speed electrical drives and are designed for single-quadrant operation.

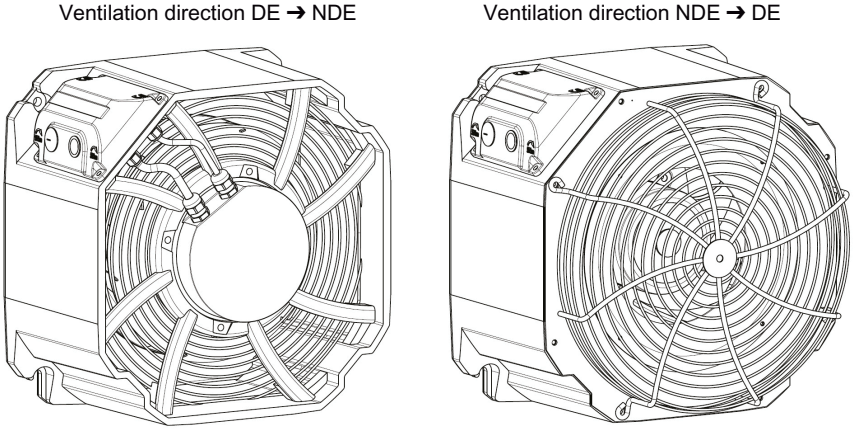


Figure 9-29 EC separately driven fans with air flow direction DE → NDE and air flow direction NDE → DE, shaft height 180 and shaft height 225

External fans with filter unit (option G14)

For the version with air flow direction NDE → DE, you can optionally add a filter unit (option G14). The filter corresponds to DIN EN 779 of filter class G3.

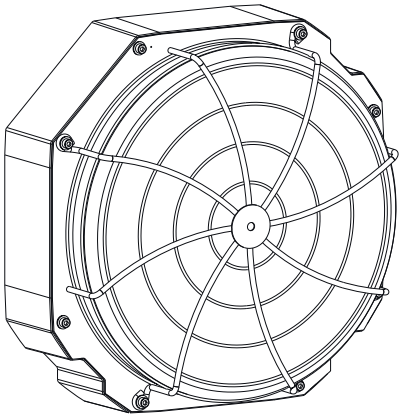


Figure 9-30 EC separately driven fans with air flow direction NDE → DE and filter unit, shaft height 180 and shaft height 225

Connecting a separately driven fan

Connect the separately driven fan in the separately driven fan terminal box. You can rotate the separately driven fan; for shaft heights 180 and 225, through 90° and for shaft height 280, through 180°.

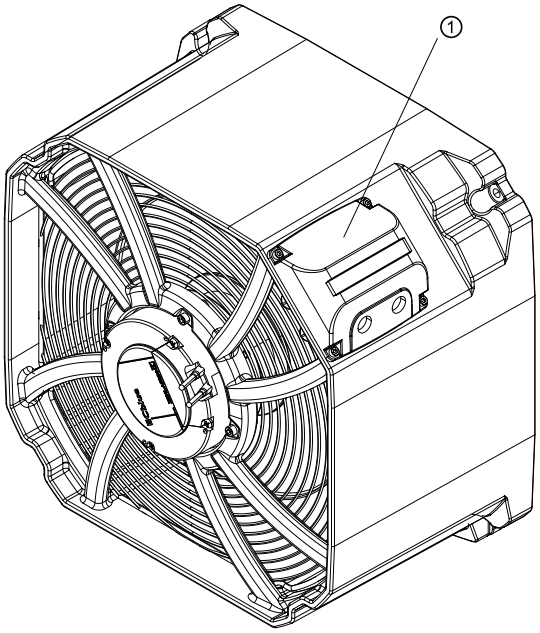


Figure 9-31 Separately driven fan terminal box ① (schematic representation shaft height 180)

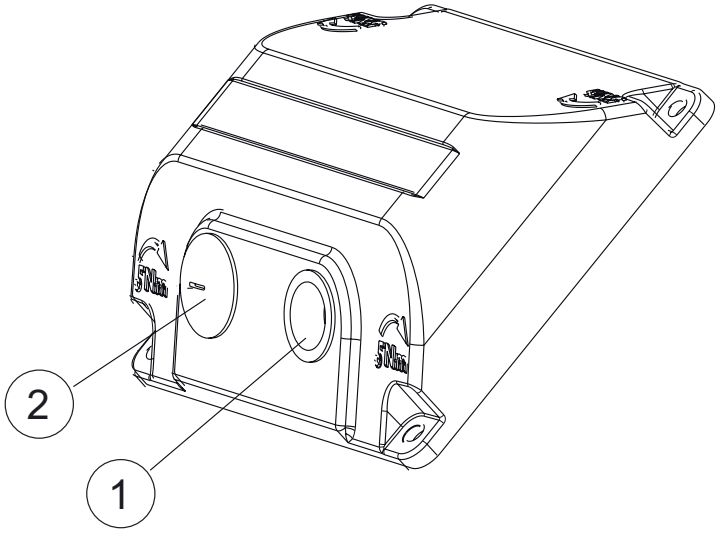
⚠ WARNING

Short-circuit due to standing water, shaft height 180 and shaft height 225

If you rotate the separately driven fan through 90°, it is not permissible that the cable outlet faces upward. Water that accumulates at the cable glands can result in a short circuit.

- Rotate the terminal box cover of the separately driven fan through 180°.

Connection at the terminal box



1 M20 cable entry for line power connection
2 M20 cable entry for control (optional)

Figure 9-32 Cover of the terminal box, shaft height 180 and shaft height 225

In the delivery condition, the two cable entries are sealed.

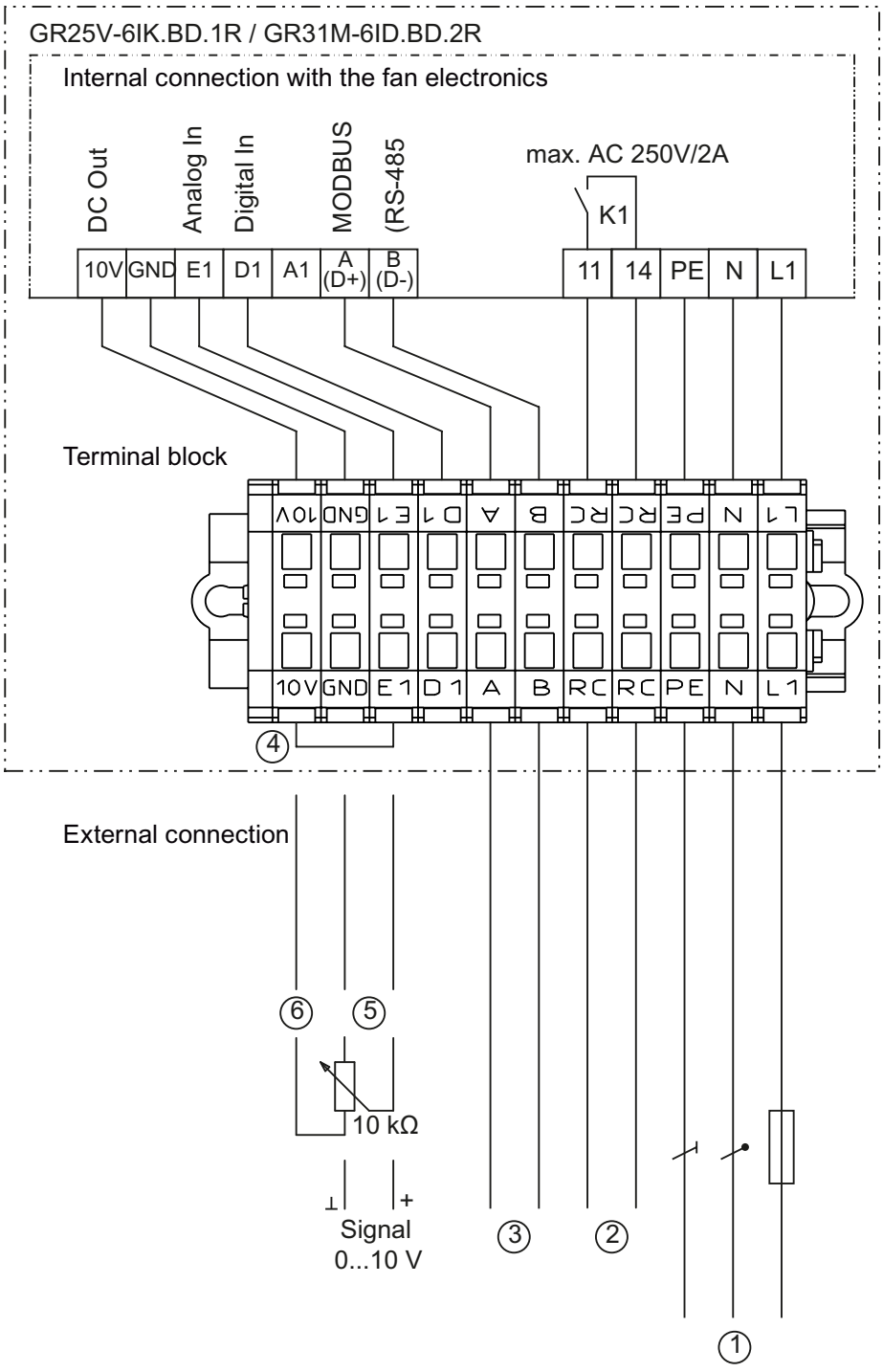
- Cable entry ① is intended for the line supply connection, and is therefore only sealed with a plug.
- Cable entry ② is intended for the optional control connection and is fitted with a screw plug.

Note

Cable gland

The cable glands are not included in the scope of supply. Select suitable cable glands to connect the cable. The general connection instructions must be observed. Ensure that there is permanent leak tightness between the cable gland and the terminal box and cable.

Wiring diagram



1 Line voltage (see Chapter "Terminal box connection")
2 Relay output (K1) for alarm
3 MODBUS (RS-485) interface (only accessible for Siemens Service)
4 Factory-inserted jumper between 10 V and E1 for 100 % operating speed
5 Input for speed setting via 0...10 V signal or potentiometer (Ri > 100 kΩ)

6 10 V DC power supply (I_{max} 50 mA)

Note

Terminal block

The terminal block is led out with spring-loaded terminals. A cable cross-section of 0.08 up to 1.5 mm^2 can be connected to the terminals. A cable cross-section of 1.5 mm^2 is recommended.

Note

Relay output (K1)

An external fault message can be output via the isolated contact of the integrated relay. During operation, the relay picks up, i.e. connections "11" and "14" are jumpered. If a fault occurs, the relay drops out (contact load, max. 250 V AC 2 A).

Note

Factory-inserted jumper between 10 V and E1

When delivered, a jumper is inserted between the "10 V" power supply and analog input "E1." 100 % of the speed is achieved during operation in this way.
After the line voltage has been switched on and after a run up time of approx. 20 seconds, the fan is operated at a constant 100 % speed (rated speed).

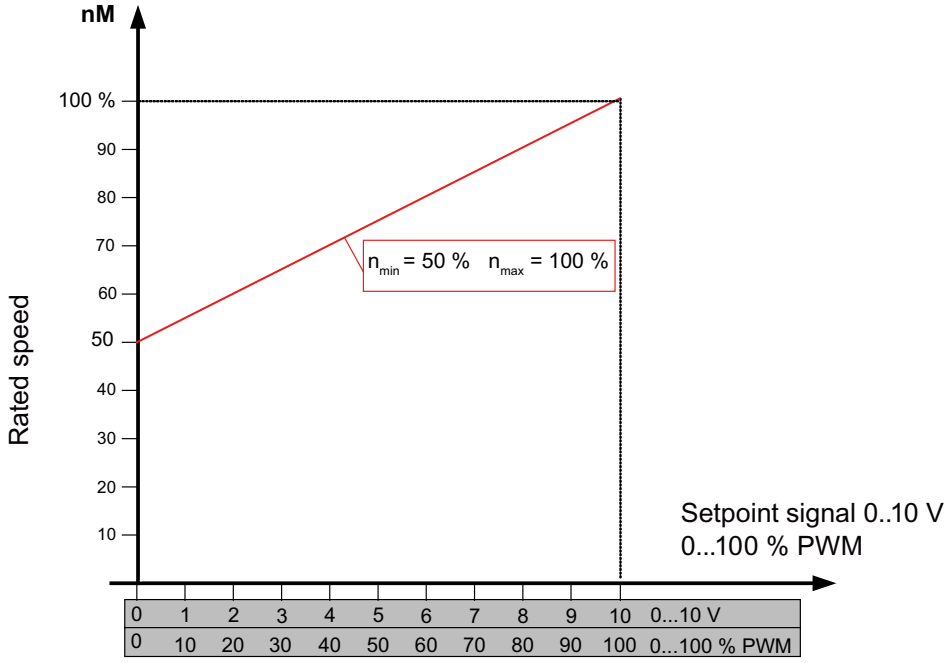
Note

Speed control via setting signal

Adjust the cooling depending on the duty cycle and the utilization level of the 1PH8 motor. Remove the jumper inserted in the factory between "10 V" and "E1". The fan speed can be set in the range 50 ...100 % using a setpoint signal (0...10 V).

Contact Siemens Technical Support for additional information and support.

Diagram of control via an external setting signal



NOTICE
Removing the factory-mounted jumper The 1PH8 motor can overheat if the external EC fan is operated at low fan speeds as a result of the setpoint signal it receives. • Monitor the motor using the integrated temperature sensors. • Integrate the temperature monitoring into the interlocking circuit. **If the company operating the plant or system removes the jumper (which was inserted in the factory), that company becomes responsible for the functional safety of the drive, especially if the safety instructions are not complied with.**

Line connection: Fuse protection

The EC external fans have integrated overload protection, making an external motor protection device (e.g. motor circuit breaker) unnecessary. A simple conductor protection is sufficient.

Simple conductor protection with a fuse or MCB:

Fuse		MCB	Conductor cross section	Conductor cross section
VDE	UL	VDE	mm^2	*AWG
16 A	15 A	C16A	1.5	16

(* AWG = American Wire Gauge)

Residual-current protective device

Only RCDs that are sensitive to universal current (type B or B+) are permissible. Personal protection is not possible if the device is operated with RCDs, as is also the case for converters.

When the power supply of the device is switched on, charging current pulses can occur due to the capacitors. In the integrated EMC filter, this can cause the RCDs to trip instantaneously. We recommend residual-current operated circuit breakers with a tripping threshold of 300 mA and delayed tripping (super-resistant, characteristic K).

Use in IT systems



⚠ WARNING

Risk of electric current

In an IT system, the neutral point of the voltage supply is not grounded. If a short-circuit occurs between a phase (e.g. "L1") and the protective conductor "PE", then the protective conductor is at phase potential.

Under no circumstances may a voltage higher than the specified line voltage of the device be applied between the line connection and the protective conductor "PE".

1-phase EC separately driven fans can be used on an IT line system. On 3-phase IT line systems, follow the bullet points for use During a ground fault of an unused line phase, the potential relative to "PE" must not be higher than the specified line voltage of the device (at neither of the two supply connections).

To ensure fault-free operation on the IT line system, connect the "GND" potential of the control connections to the protective conductor potential.

The following consequences of this connection must be observed for the control connections (except for relay contacts):

1. Only connect using cables that are suitable for the line voltage and environment.

2. Only connect via suitable buffer stages.

9.3.6 Signal connection

DRIVE-CLiQ is the preferred method for connecting the encoder systems to SINAMICS.

Motors with a DRIVE-CLiQ interface can be ordered for this purpose. Motors with a DRIVE-CLiQ interface can be directly connected to the associated motor module via the available MOTION-CONNECT DRIVE-CLiQ cables. The MOTION-CONNECT DRIVE-CLiQ cable is connected to the motor in degree of protection IP67. The DRIVE-CLiQ interface supplies power to the motor encoder via the integrated 24 VDC supply and transfers the motor encoder and temperature signals and the electronic type plate data, e.g. a unique

identification number, rating data (voltage, current, torque) to the control unit. The MOTION-CONNECT DRIVE-CLiQ cable is used universally for connecting the various encoder types. These motors simplify commissioning and diagnostics, as the motor and encoder type are identified automatically.

Encoder connection on motors with DRIVE-CLiQ

Motors with DRIVE-CLiQ interfaces can be directly connected to the corresponding Motor Module via the available MOTION-CONNECT DRIVE-CLiQ cables. This data is transferred directly to the Control Unit.

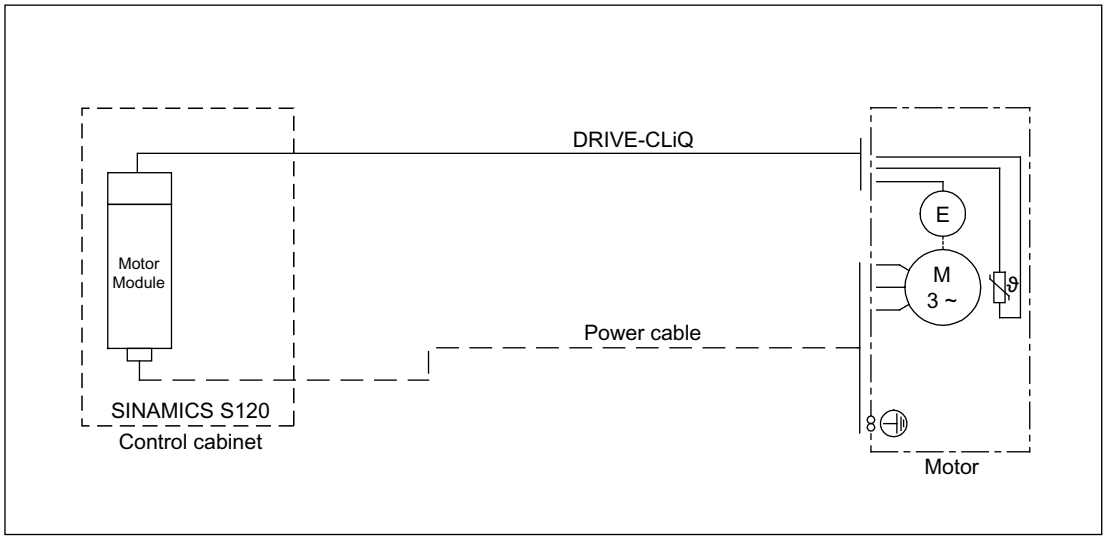


Figure 9-33 Encoder connection on motors with DRIVE-CLiQ

Cables on motors with DRIVE-CLiQ

With DRIVE-CLiQ, the same cable is used for all encoder types. Only pre-assembled cables from Siemens (MOTION-CONNECT) may be used.

Table 9-6 Pre-assembled cable

6FX	☐	002	-	☐DC☐☐	-	☐☐☐	0
	↓					↓↓↓	
	↓					Length	
	5 MOTION-CONNECT®500					max. cable length 100 m	
	8 MOTION-CONNECT®800					max. cable length 50 m	

For other technical data and length code, refer to Catalog, Chapter "MOTION-CONNECT connection system"

Encoder connection on motors without DRIVE-CLiQ

If a motor is not equipped with a DRIVE-CLiQ interface, the speed encoder and temperature sensor are connected via a signal connector.

Motors that are not equipped with DRIVE-CLiQ require a Sensor Module Cabinet-Mounted (SMC) or a Sensor Module External (SME) when operated with SINAMICS S120. The motor is connected to the SMC or the SME via the signal cable. The SMC or SME is connected to the Motor Module via a MOTION-CONNECT DRIVE-CLiQ cable.

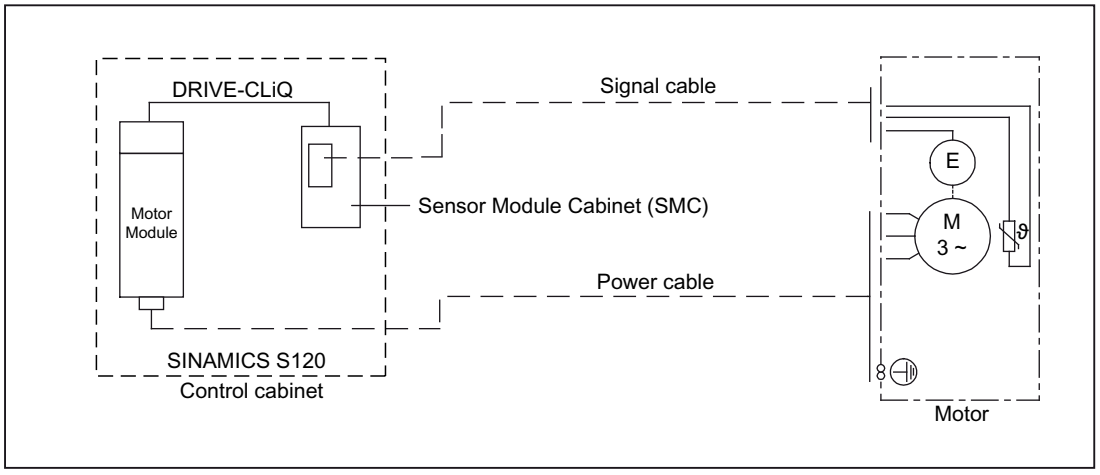


Figure 9-34 Encoder connection on motors without DRIVE-CLiQ

Cables on motors without DRIVE-CLiQ

Prefabricated cables from Siemens (MOTION-CONNECT) must be used. These offer many advantages over self-assembled cables in terms of operational reliability, quality and availability.

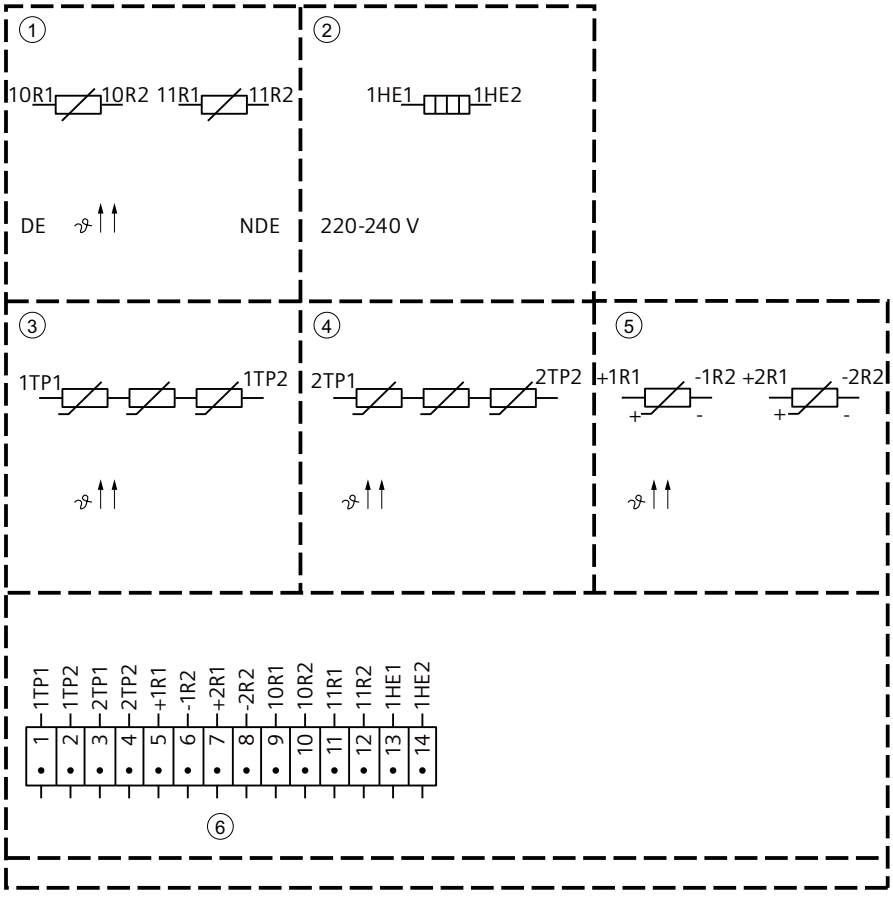
For technical data and length code, see Catalog, Chapter "MOTION-CONNECT connection system".

Maximum assignment of signal terminal strips in the terminal box

The following signals can be connected to the signal terminal strip:

- Temperature sensor (+1R1; -1R2): For an additional reserve temperature sensor, +1R1 and -1R2 are connected to the signal terminal strip and (for motors with encoder) also wired to the signal connector.
- Reserve-temperature sensor (+2R1, -2R2):
  - Shaft height 80-160: Option A25
  - Shaft height 180-280: Standard
- Additional PTC thermistor circuit for alarm and trip (1TP1, 1TP2, 2TP1, 2TP2): Option A12

- Pt100 resistance thermometer to monitor rolling bearings (10R1, 10R2, 11R1, 11R2): Shaft height 180-280: Option A72
- Connection of the anti-condensation heating (1HE1, 1HE2): Shaft height 180-280: Option K45



① Bearing thermometers
② Anti-condensation heating
③ Alarm winding PTC thermistor
④ Shutdown winding PTC thermistor
⑤ Pt1000 winding temperature sensor
⑥ Terminal strip

Figure 9-35 Assignment_signal terminal strip_terminal box

Dimension drawings

10

10.1 SIEMENS Product Configurator

Description

The SIEMENS Product Configurator supports you when configuring your motor and supplies you with important product information.

You will find the following information in the SIEMENS Product Configurator:

- Technical data
- Characteristics
- dimension drawings
- 2D/3D CAD data

Note

The 3D model in the SIEMENS Product Configurator is a simplified representation that does not show every detail.

You can find further information on the Internet at SIEMENS Product Configurator (www.siemens.com/SPC):

Recency of dimensional drawings

Note

Changing motor dimensions

Siemens reserves the right to change the dimensions of the motors as part of mechanical design improvements without prior notice. This means that dimensional drawings can become out of date.

You can request free of charge current dimension drawings from Technical Support or your local sales partner.

Appendix

A

A.1 Operating Instructions for the holding brake

A.1.1 Holding brake operating instructions Stromag 2HPB DE

STROMAG
A REGAL REXNORD BRAND

Zweiflächen-Elektromagnet-Federdruckbremse 2HPB

Dokumenten-Nr.: 449-00242



Montageanleitung

DE

Stromag GmbH

Hansastraße 120
59425 Unna
Tel.: +49 2303 102-0
Fax.: +49 2303 102-201
www.stromag.com
info@stromag.com

Änderungshistorie

Tabelle 1: *Änderungshistorie*

Änderungsstand	Ausgabedatum	Änderungen
Version -	26.11.2019	Neuanlage der Montageanleitung
Version A	06.09.2021	Beschreibung der Optionen erweitert (Kap. 10)
Version B	14.03.2022	Ergänzungen und redaktionelle Änderungen (Kap. 8.1, 8.2, 8.3, 9.1, 9.2, 9.3, 10.3.2, 12)
Version C	22.09.2022	Übernahme Stromag GmbH
Version D	03.07.2023	Ergänzungen und redaktionelle Änderungen (Kap. 3.2, 8.1, 10, 10.4, 10.5,13.1)

Alle Informationen und Abbildungen waren zum Zeitpunkt der Drucklegung auf dem neuesten Stand. Technische Änderungen vorbehalten.

Die Urheberrechte und alle weiteren Schutzrechte an den Inhalten dieser Gebrauchsanleitung verbleiben vollumfänglich bei der Stromag GmbH. Der Nachdruck – auch auszugsweise – ist nur mit unserer vorherigen Zustimmung gestattet.

c 2023 Stromag GmbH

Hansastraße 120
59425 Unna
Deutschland

Telefon: +49 2303 102 0
Telefax: +49 2303 102 201



Wichtig!

Vor Gebrauch sorgfältig lesen!
Zum Nachschlagen aufbewahren!

Inhaltsverzeichnis

1 Grundlegende Hinweise 6
1.1 Zweck dieser Montageanleitung . . . 6
1.2 Aufbau der Montageanleitung . . . 6
1.3 Mitgeltende Unterlagen . . . 7
1.4 Hersteller . . . 7

2 Sicherheitshinweise 7
2.1 Aufbau der Warnhinweise . . . 7
2.1.1 Unterscheidung der Gefährdungsstufen . . . 8
2.1.2 Warnzeichen . . . 9
2.1.3 Persönliche Schutzausrüstung . . . 9
2.2 Voraussetzungen für den sicheren Gebrauch . . . 10
2.3 Verpflichtung des Betreibers . . . 10
2.4 Verpflichtung des Personals . . . 10
2.5 Bestimmungsgemäße Verwendung . . . 11
2.6 Grundsätzliche Sicherheitsanforderungen . . . 12
2.7 Elektromagnetische Verträglichkeit . . . 12

3 Technische Daten 12
3.1 Typschildangaben . . . 12
3.2 Drehmomente, Drehzahl, technische Daten . . . 13
3.3 Bohrungs-und Nutabmessungen, Außenmaße . . . 15
3.4 Einsatzbereich und bestimmungsgemäße Verwendung . . . 15

4 Transport 16
4.1 Verpackung . . . 17
4.2 Zerlegungsgrad . . . 17
4.3 Empfindlichkeit . . . 17
4.4 Lagerung . . . 17
4.5 Lieferumfang . . . 18

5 Aufbau, Wirkungsweise und Konstruktionsmerkmale 18
5.1 Benennung der Einzelteile (Darstellung Baugröße 2HPB45) . . . 18
5.2 Wirkungsweise und Konstruktionsmerkmale der Standardausführung . . . 19
5.3 Mechanische Lüftung mittels Notlüftschrauben . . . 19
5.4 Elektrischer Anschluss . . . 20

6 Montage und Demontage 21
6.1 Montage . . . 22
6.1.1 Direkte Montage . . . 22
6.1.2 Montage mit Demontage . . . 23
6.2 Montagegenauigkeit . . . 24
6.3 Abmessungen, Platzbedarf und Masse . . . 24
6.4 Demontage . . . 24

7 Erst-Inbetriebnahme 25

8 Betrieb 25
8.1 Betriebsbedingungen . . . 25
8.1.1 Haltebetrieb . . . 26
8.1.2 Arbeitsbetrieb . . . 26
8.1.3 Notstoppbetrieb . . . 26

8.2 Einschaltdauer und Schalthäufigkeit . . . 26
8.3 Schutzarten . . . 27
8.4 Störungsabhilfe . . . 28

9 Wartung und Instandhaltung 29
9.1 Pflege- und Kontrollarbeiten . . . 29
9.2 Messung des Luftspaltes . . . 29
9.3 Verschleißnachstellung . . . 30
9.4 Auswechseln der Reibscheibe mit Reibbelag . . . 31
9.5 Kondenswasser ablassen . . . 32
9.6 Kontrollarbeiten nach einem Notstopp . . . 33

10 Varianten und Bezeichnung 33
10.1 Option - elektrische Anschlussmöglichkeiten . . . 34
10.2 Option - Überwachung . . . 35
10.2.1 Induktiver Näherungsschalter . . . 36
10.2.2 Mikroschalter . . . 36
10.3 Option - Zubehör . . . 37
10.3.1 Stillstandsheizung / O-Ring . . . 37
10.3.2 Handhebel- Notlüftung . . . 38
10.4 Option - Oberfläche . . . 40
10.5 Option - Anschluss . . . 41
10.6 Option - Beschaltung . . . 45
10.7 Option - Sonstiges . . . 46

11 Ersatzteilhaltung, Kundendienst 47
11.1 Ersatzteilhaltung . . . 47
11.2 Daten für Ersatzteilbestellung . . . 47
11.3 Kundendienstadresse . . . 47

12 Aufgeführte Normen und Richtlinien 48

13 Anhang 49
13.1 Maßblatt . . . 49

14 Abbildungs- und Tabellenverzeichnis 50

1 Grundlegende Hinweise

In dieser Montageanleitung wird vereinfachend das generische Maskulinum verwendet. Gemeint ist jedoch sowohl männliches als auch weibliches Personal.

1.1 Zweck dieser Montageanleitung

Die Montageanleitung zur Beschreibung der Bremse des Typs 2HPB enthält grundlegende Hinweise, Sicherheitshinweise, technische Daten, eine Funktionsbeschreibung, Angaben zu Transport und Lagerung, De- und Montage, Inbetriebnahme, Betrieb, Fehlersuche und Behebung sowie Angaben zur Ersatzteilhaltung, Kundendienst und Fremddokumentation.

Alle Hinweise und Beschreibungen gelten für die gesamte Lebensdauer der Bremse, einschließlich Beendigung des Betriebs und Entsorgung. Den Hinweisen ist unbedingt Folge zu leisten. Das mit den Arbeiten am Produkt betraute Personal quittiert per Unterschrift, diese Montageanleitung gelesen und verstanden zu haben.

Sämtliche Arbeiten an der Bremse dürfen nur von befähigten Personen ausgeführt werden. Technische Änderungen und Manipulationen sind untersagt.

Diese Montageanleitung ist vom Betreiber, um Anweisungen aufgrund bestehender nationaler Vorschriften zur Unfallverhütung und zum Umweltschutz, zu ergänzen.

1.2 Aufbau der Montageanleitung

Der vorliegenden Montageanleitung ist ein Änderungsverzeichnis vorangestellt. Die Änderungen im Dokument können somit besser nachvollzogen und die Aktualität des Dokumentes dadurch schneller geprüft werden.

Das darauffolgende Inhaltsverzeichnis ist ein Leitfaden der technischen Dokumentation.

Ein Abbildungsverzeichnis, das sich am Ende der Montageanleitung befindet, gibt einen schnellen Überblick über verwendete Abbildungen.

In der vorliegenden Montageanleitung werden folgende Kennzeichen verwendet:

- Handlungsanweisungen und Aufzählungen sind durch einen vorangestellten schwarzen Punkt (•) gekennzeichnet
- Zwischenüberschriften, Hervorhebungen oder Zwischenüberschriften werden durch fettgeschriebenen Text gekennzeichnet
- alle Abbildungen werden durch eine fortlaufende Abbildungsnummer nummeriert
- die in den Abbildungen dargestellten Komponenten oder Bauteile werden durch einen Positionsstrich und einer dazugehörigen Positionsnummer veranschaulicht
- jedem Bauteil / Komponente ist eine spezifische Positionsnummer zugeordnet, die über alle Kapitel hinweg gleich bleibt
- im beschreibenden Text wird das abgebildete Bauteil / Komponente mit einer runden Klammer und Positionsnummer (1) vorgestellt und beschrieben
- jeder Abbildung ist eine Legende mit den abgebildeten Bauteilen / Komponenten und deren Positionsnummer untergeordnet

1.3 Mitgeltende Unterlagen

Die mitgeltenden Dokumente, in Form von Einbauzeichnungen und Datenblättern für das konkrete Erzeugnis, sind ausschließlich für Fachpersonal gedacht. Sie geben Informationen zu speziellen Wartungs-, Reparatur- und Einstelltätigkeiten an den Bremsen.

1.4 Hersteller

Stromag GmbH
Hansastraße 120
59425 Unna

Telefon:	**+49 2303 102 0**
Telefax:	**+49 2303 102 201**
E-Mail:	**info@stromag.com**
Internet:	**www.stromag.com**

2 Sicherheitshinweise

In diesem Kapitel werden grundlegende Sicherheitshinweise und der Aufbau der Warnhinweise erläutert. Diesen Hinweisen ist unbedingt Folge zu leisten, um Gefahren für Menschen und Schäden zu vermeiden. Die Stromag GmbH übernimmt keine Haftung für Schäden, die aus Nichtbeachtung dieser Montageanleitung und speziell der Sicherheitshinweise, resultieren.

2.1 Aufbau der Warnhinweise

Die farbliche Unterscheidung der Warnhinweise wird in Graustufen vorgenommen, um eine eindeutige Trennung auch bei Schwarz-Weiß-Ausdrucken zu ermöglichen. Die Warnhinweise in dieser Montageanleitung sind wie folgt aufgebaut:

Piktogramm	**SIGNALWORT** Art der Gefahr und ihre Quelle Folgen bei Missachtung der Warnhinweise. • Maßnahmen zur Vermeidung der Gefahr.

2.1.1 Unterscheidung der Gefährdungsstufen

Folgende Gefährdungsstufen werden unterschieden:



GEFAHR

Warnt vor unmittelbar drohender Gefahr.
Tod oder schwerste Verletzungen sind die Folge.

- Maßnahmen zur Vermeidung der Gefahr.



WARNUNG

Warnt vor möglicher Gefahr.
Tod oder schwerste Verletzungen sind die Folge.

- Maßnahmen zur Vermeidung der Gefahr.



VORSICHT

Warnt vor möglicher Gefahr.
Mäßige oder geringfügige Verletzungen können die Folge sein.

- Maßnahmen zur Vermeidung der Gefahr.



ACHTUNG

Warnt vor Sachschäden.
Erzeugnis oder Gegenstände in seiner Umgebung können beschädigt werden.

- Maßnahmen zur Vermeidung der schädlichen Situation



HINWEIS

Gibt zusätzlich nützliche Informationen, die den Betrieb des Erzeugnisses vereinfachen und zum Verständnis beitragen

2.1.2 Warnzeichen



Allgemeines Warnzeichen Es findet in Situationen Anwendung, in denen die grafische Darstellung einer einzelnen spezifischen Gefahr nicht möglich ist.



Warnung vor schwebender Last



Warnung vor heißen Oberflächen



Warnung vor elektrischer Spannung



Warnung vor Quetschgefahr

2.1.3 Persönliche Schutzausrüstung



Bruchsichere Schutzbrille mit Seitenschild zum Schutz der Augen bei Montagearbeiten.



ESD-fähige Arbeitsschutzschuhe mit Stahlkappe zum Schutz vor elektrostatischer Entladung und Quetschungen.



ESD-fähige Handschuhe zum Schutz vor elektrostatischer Entladung und Hautverletzungen.



Schutzhelm zum Schutz vor Kopfverletzungen durch herabfallende Werkzeuge oder Werkstücke bei Montage- und Demontagevorgängen und Kranarbeiten.

Das mit Bedienung und Instandhaltung beauftragte Personal muss die Belehrung per Unterschrift quittieren. Personen, deren Reaktionsfähigkeit durch Drogen, Alkohol oder Medikamente beeinflusst ist, dürfen am Erzeugnis NICHT arbeiten, selbst wenn sie über die nötige Qualifikation verfügen.
Das Personal verpflichtet sich weiterhin, Arbeitsschutzbestimmungen und Betriebsanweisungen zu beachten, Zuständigkeiten ordnungsgemäß wahrzunehmen und eine angemessene persönliche Schutzausrüstung (PSA) zu tragen.

Verpflichtungen Fachpersonal

Das Fachpersonal ist aufgrund seiner fachlichen Ausbildung, Kenntnisse und Erfahrung sowie Kenntnis der einschlägigen Normen und Bestimmungen in der Lage die ihm übertragenen Arbeiten auszuführen und mögliche Gefahren selbstständig zu erkennen und zu vermeiden.

2.5 Bestimmungsgemäße Verwendung

Eingrenzung der bestimmungsgemäßen Verwendung

Die Bremse dient dem Verknüpfen und Trennen eines Energieflusses in Form einer Drehmomentübertragung. Es handelt sich um ein nicht verwendungsfertiges, elektromagnetisch betätigtes Gerät, das zur Erfüllung seiner Funktion mit weiteren Komponenten verbunden werden muss. Der Einsatz ist als Bremse nur im Trockenlauf erlaubt.
Vorgesehene Einsatzgebiete sind der industrielle Einsatz im allgemeinen Maschinenbau, Hub- und Fahrantriebe, Fördertechnik, Baumaschinen, sowie alle Anwendungen die eine elektromagnetische Bremse erfordern. Zur bestimmungsgemäßen Verwendung gehört die Einhaltung der vom Hersteller vorgeschriebenen Montage-, Demontage-, lnbetriebnahme- und Instandhaltungsbedingungen.
Eigenmächtige Umbauten und Veränderungen, die die Sicherheit beeinträchtigen, sind ebenso wie der Einsatz fremder Zubehörteile nicht gestattet.
Die Nichtbeachtung dieser Bedingungen oder jeder darüberhinausgehende Gebrauch gilt als nicht bestimmungsgemäß. Für hieraus resultierende Schäden haftet der Hersteller nicht. Das Risiko hierfür trägt allein der Benutzer. Soll die Bremse außerhalb dieses vertraglichen Einsatzbereiches eingesetzt werden, ist der Kundendienst der Stromag GmbH zu Rate zu ziehen, da sonst die Gewährleistung entfällt.



WARNUNG

Sach- und Personenschaden
Das Erzeugnis ist ausschließlich für den Einsatz unter den vorgegebenen technischen Daten nach Kap. 3 und 3.2 und Betriebsbedingungen nach Kap. 8.1 vorgesehen. Zusätzlich gelten für das Erzeugniss die entsprechenden Datenblätter und Einbauzeichnungen die beim Kundendienst abgefragt werden können. Anschrift s. Kap. 11.3

2.6 Grundsätzliche Sicherheitsanforderungen

Anforderungen an die Sicherheit

Das Erzeugnis ist nach dem aktuellen Stand der Technik gebaut und ist betriebssicher. Von diesem Gerät können aber Gefahren ausgehen, wenn es von unausgebildetem Personal unsachgemäßem oder zu nicht bestimmungsgemäßem Gebrauch eingesetzt wird.
Es ist jede Arbeitsweise zu unterlassen, welche die Sicherheit des Erzeugnisses beeinträchtigt. Der Betreiber ist verpflichtet, eintretende Veränderungen an dem Erzeugnis, welche die Sicherheit beeinträchtigen, dem Lieferanten sofort zu melden. Der Anwender ist verpflichtet, das Erzeugnis immer nur in einwandfreien Zustand zu betreiben.

2.7 Elektromagnetische Verträglichkeit

Schutzanforderungen

Gemäß Richtlinie 2014/30/EU ist für den Betrieb von elektrischen Betriebsmitteln die Einhaltung bestimmter Schutzanforderungen vorgeschrieben, damit diese Geräte in ihrer elektromagnetischen Umgebung ohne gegenseitige Beeinträchtigung funktionieren können.

Gefährdungen

Um die Gefährdung von Personen, Haustieren und Gütern durch unmittelbare und mittelbare Einwirkung elektromagnetischer Felder auszuschließen, sind vom Anwender geeignete Maßnahmen zu ergreifen.

Bestimmungsgemäßer Einbau

Maschinenbauer, System- und Anlagenerrichter müssen durch den bestimmungsgemäßen Einbau des Produktes und durch die sachgerechte Installation der zugehörigen Spannungsversorgung für die Einhaltung der Schutzanforderungen aus der Richtlinie 2014/30/EU sorgen.

Druckschrift

Von unserem Kundendienst können Sie als Hilfestellung unsere Druckschrift „EMV-Hinweise“, Nr. 900-00001 anfordern, Anschrift s. Kap. 11.3 .

3 Technische Daten

3.1 Typschildangaben

Folgende Daten befinden sich mindestens auf dem Leistungsschild. Dieses ist am Umfang der Bremse angebracht. Diese Daten müssen mit den Angaben in der Auftragsbestätigung übereinstimmen.

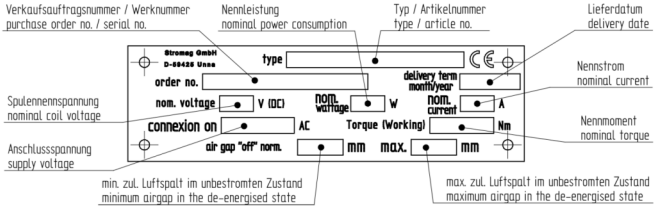


Abbildung 3.1: *Leistungsschild HPB*

3.2 Drehmomente, Drehzahl, technische Daten

Zulässige Drehmomente und technische Daten sind der Tabelle 3.1 zu entnehmen. Von der Tabelle abweichende technische Parameter können beim Hersteller erfragt werden bzw. sind Bestandteil der Auftragsbestätigung. Die Hauptparameter sind auf dem Leistungsschild vermerkt.

Tabelle 3.1: *Technische Daten*

Baugröße Variante	M_{SN} $[Nm]$	$M_{\ddot{U}}$ $[Nm]$	n_0 $[min^{-1}]$	n_{zn} $[min^{-1}]$	U_n* $[VDC]$	P_k $[W]$	Luftspalt $[mm]$ $min./max.$	$Q_{E,zul}$ $[kJ]$	J $[kgm^2]$	m $[kg]$
2 HPB 20 S	80	88	6500	3200	110	107,3	0,5/1,1	**	0,00168	20
2 HPB 20 H	100	110	6500	3200	110	107,3	0,5/1,1	**	0,00168	20
2 HPB 20 V	130	143	6500	3200	110	107,3	0,5/1,1	**	0,00168	20
2 HPB 25 S	130	143	6500	2500	110	83,9	0,6/1,2	**	0,00443	33,8
2 HPB 25 H	160	176	6500	2500	110	83,9	0,6/1,2	**	0,00443	33,8
2 HPB 25 V	200	220	6500	2500	110	83,9	0,6/1,2	**	0,00443	33,8
2 HPB 27 S	200	220	6500	2300	110	125	0,6/1,3	**	0,01232	46,6
2 HPB 27 H	250	275	6500	2300	110	125	0,6/1,3	**	0,01232	46,6
2 HPB 27 V	320	352	6500	2300	110	125	0,6/1,3	**	0,01232	46,6
2 HPB 30 S	320	352	6300	2100	110	151	0,6/1,4	**	0,01451	58,6
2 HPB 30 H	400	440	6300	2100	110	151	0,6/1,4	**	0,01451	58,6
2 HPB 30 V	500	550	6300	2100	110	151	0,6/1,4	**	0,01451	58,6
2 HPB 35 S	500	550	5400	1700	110	150	0,6/1,5	**	0,02668	87,6
2 HPB 35 H	630	693	5400	1700	110	150	0,6/1,5	**	0,02668	87,6
2 HPB 35 V	800	880	5400	1700	110	150	0,6/1,5	**	0,02668	87,6
2 HPB 40 S	800	880	4500	1500	110	212	0,7/1,7	**	0,05810	115,7
2 HPB 40 H	1000	1100	4500	1500	110	212	0,7/1,7	**	0,05810	115,7
2 HPB 40 V	1300	1430	4500	1500	110	212	0,7/1,7	**	0,05810	115,7
2 HPB 45 S	1300	1430	4100	1100	110	320	0,8/2,1	**	0,09256	181,5
2 HPB 45 H	1600	1760	4100	1100	110	320	0,8/2,1	**	0,09256	181,5
2 HPB 45 V	2000	2200	4100	1100	110	320	0,8/2,1	**	0,09256	181,5
2 HPB 55 S	2000	2200	3250	900	110	311	1,0/2,5	**	0,24412	249,3
2 HPB 55 H	2500	2750	3250	900	110	311	1,0/2,5	**	0,24412	249,3
2 HPB 55 V	3200	3520	3250	900	110	311	1,0/2,5	**	0,24412	249,3

* andere Spannungen auf Anfrage
** detailierte Werte siehe Datenblatt (kann beim Kundendienst angefragt werden)

M_{SN}	:	schaltbares Nennmoment bei einer mittleren Reibgeschwindigkeit von $1m/s$ nach DIN VDE 0580 (gilt für Trockenlauf bei öl- und fettfreiem Reibbelag nach dem Einschleifen der Bremse)
$M_{\ddot{U}}$	:	maximal ohne Schlupf übertragbares statisches Moment nach DIN VDE 0580
n_0	:	maximal zulässige Leerlaufdrehzahl
n_{zn}	:	Schaltdrehzahl bei ca. $20m/s$ mittlere Reibgeschwindigkeit
P_k	:	Erregerleistung bei $20°C$
U_n	:	Nennspannung der Spule
$Q_{E,zul}$	:	zulässige Einzelschaltarbeit
J	:	Massenträgheitsmoment der rotierenden Bremsenbauteile
m	:	Masse der Bremse (Standardausführung)
Betriebsart	:	S1, S2, S4-40 % ED
Therm. Klasse	:	155 (F) nach DIN VDE 0580
AC-Steuerung	:	über Gleichrichterbaustein möglich

Gemäß der anwendbaren Rules der Marine-Klassifizierungsgesellschaften (z. B. Det Norske Veritas, American Bureau of Shipping, Loyds Register of Shipping, Buerau Veritas und andere) für Lifting Appliances darf der für die Berechnung des Drehmomentes der Bremse angenommene Reibungskoeffizient μ einen Wert von $0,3$ nicht übersteigen.

Wird die Bremse mit einem entsprechenden Abnahmezerifikat (Type Approval, Case-by-case Approval) für Lifting Appliances bestellt, so gelten vorrangig die rechnerischen Bremsmomente M_{SN} und $M_{\ddot{U}}$ nach Tabelle 3.2. In Tabelle 3.2 sind die Drehmomentwerte unter der limitierenden Annahme $\mu \leq 0,3$ berechnet.

HINWEIS

Jede Bremse wird vor Auslieferung werksseitig eingelaufen und momentengeprüft. Im Auslieferungszustand weist die Bremse ein Bremsmoment M_{SN} und $M_{\ddot{U}}$ nach Tabelle 3.1 auf unabhängig davon, ob der Bremse ein Abnahmezertifikat beiliegt oder nicht. Bei Unklarheiten wenden Sie sich bitte an den technischen Kundendienst (Kontakt siehe Kapitel 11.3).

Tabelle 3.2: *Bremsmomente für Bremsen mit Abnahmen durch Klassifizierungsgesellschaften für Lifting Appliances*

Baugröße Variante	M_{SN} $[Nm]$	$M_{\ddot{U}}$ $[Nm]$
2 HPB 20 S	80	85
2 HPB 20 H	85	85
2 HPB 20 V	85	85
2 HPB 25 S	130	135
2 HPB 25 H	135	135
2 HPB 25 V	135	135
2 HPB 27 S	200	215
2 HPB 27 H	215	215
2 HPB 27 V	215	215
2 HPB 30 S	320	340
2 HPB 30 H	340	340
2 HPB 30 V	340	340
2 HPB 35 S	500	550
2 HPB 35 H	550	550
2 HPB 35 V	550	550
2 HPB 40 S	800	850
2 HPB 40 H	850	850
2 HPB 40 V	850	850
2 HPB 45 S	1300	1350
2 HPB 45 H	1350	1350
2 HPB 45 V	1350	1350
2 HPB 55 S	2000	2150
2 HPB 55 H	2150	2150
2 HPB 55 V	2150	2150

3.3 Bohrungs-und Nutabmessungen, Außenmaße

Die Anschlussmaße sind der Tabelle 13.1 unter Kapitel 13.1 zu entnehmen. Die Passfedernutabmessungen sind entsprechend der DIN 6885-1 ausgeführt.

3.4 Einsatzbereich und bestimmungsgemäße Verwendung

Die Bremse 2HPB kann sowohl als Arbeitsbremse als auch als Haltebremse mit Notstoppfunktion eingesetzt werden. Die maximal zulässigen Belastungen sind dem entsprechenden Bremsendatenblatt zu entnehmen, welches vom Kundendienst (Kontakt siehe Kap. 11.3) bezogen werden kann.

Die Bremse ist für fast alle Arten von Winden, Kranen und industriellen Anwendungen einsetzbar.

- Überflutungs- und seewasserbeständig, mit gutem Schutz in rauen Bedingungen, insbesondere für den Einsatz in Hafen-, Offshore- und Marineanwendungen!
- Für alle Arten von Winden und Kranen.
- Für industrielle Anwendungen oder andere Anwendungen mit höchsten Anforderungen.
- An Hafenkränen, Containerverladeanlagen, für Kranfahr-, Hub- und Katzfahrantriebe

Einsatzbedingungen:

- Elektrische Auslegung der Bremsen nach DIN VDE 0580 in thermischer Klasse 155 (F). Die Bremse entspricht der Richtlinie 2006/95/EG (Niederspannungsrichtlinie). Die Richtlinie 2004/108 EG (EMV) ist durch den Anwender mit Hinweisen des Herstellers sicherzustellen. Die Erzeugnisse weisen entsprechende Kennzeichnung auf.
- Betriebsart: S1,S2, S4 - 40 % ED
- Horizontale Einbaulage. Bei vertikalem Betrieb ist mit dem Hersteller Rücksprache zu halten.
- Die Bremse darf mit der Reibpaarung Stahl/organischer Belag nur im Trockenlauf unter den vorgegebenen Bedingungen gem. Kap. 8.1 und 8.2 eingesetzt werden. Ferner sind die vom Hersteller vorgeschriebenen Montage-, Demontage-, Inbetriebnahme- und Installationsbedingungen einzuhalten. Die Nichtbeachtung dieser Bedingungen oder jeder darüber hinausgehende Gebrauch gilt als nicht bestimmungsgemäß. Für hieraus resultierende Schäden haftet der Hersteller nicht, das Risiko hierfür trägt allein der Benutzer.
- Soll die Bremse außerhalb dieses vertraglichen Einsatzbereiches eingesetzt werden, so ist der Kundendienst der Stromag GmbH zu Rate zu ziehen, (Anschrift siehe Kap. 11.3).

4 Transport

Der Transport darf nur mit geeigneten Hebezeugen, Flurförderfahrzeugen und Anschlagmitteln mit ausreichender Tragfähigkeit durchgeführt werden. Des Weiteren ist auf Symbole auf den Packstücken zu achten.



GEFAHR

Lebensgefahr unter schwebene Lasten.
Beim Heben, Senken und Schwenken von Lasten besteht Lebensgefahr durch herabfallende oder sich unkontrolliert bewegende Teile.

- Niemals unter schwebende Lasten treten.
- Angaben zu den vorgesehenen Anschlagpunkten beachten.
- Anschlagmittel nicht an hervorstehenden Maschinenteilen oder Ösen angebauter Bauteile anschlagen.
- Anschlagmittel nicht an Bohrungen / Gewindebohrungen anschlagen.
- Auf sicheren Sitz der Anschlagmittel achten.
- Nur geeignete Hebezeuge und Anschlagmittel mit ausreichender Tragkraft verwenden.
- Keine angerissenen oder angescheuerten Seile und Gurte verwenden.
- Seile und Gurte nicht an scharfen Kanten und Ecken anlegen, nicht knoten, nicht verdrehen.

Für den direkten Transport oder die Montage der Bremse sind im Spulenkörper (1) Gewindebohrungen zum Befestigen von Ringschrauben vorgesehen (siehe Abbildung 4.1).

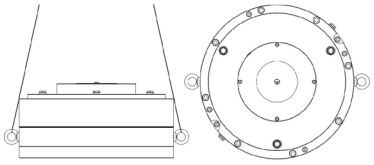


Abbildung 4.1: *Transport und Montage mittels Ringschrauben*



WARNUNG

Verletzungsgefahr
Unsachgemäße Verwendung der Transportgewinde kann zu schwersten Verletzungen führen.

- Diese Bohrungen dürfen ***nicht*** für den Transport und Einbau des Aggregates (Motor mit angebauter Kupplung) verwendet werden.
- Der Transport der Bremse an anderen als an den dafür vorgesehenden Anschlagpunkten ist ***nicht*** gestattet.

4.1 Verpackung

Die Verpackungsart entspricht den in der Auftragsbestätigung angegebenen Vereinbarungen mit dem Besteller. Falls keine Verpackungsart vereinbart wurde, richtet sich diese nach dem Transportweg. Die auf der Verpackung angebrachten Bildzeichen sind zu beachten.

4.2 Zerlegungsgrad

Die Bremsen werden fertig montiert und eingestellt geliefert. Das Ritzel (4) ist lose beigelegt. Sollte eine Handlüftung (40) benötigt werden, ist diese lose beigelegt und muss montiert werden.

4.3 Empfindlichkeit

Die Bildung von Kondenswasser auf Grund großer Temperaturschwankungen ist zu vermeiden.

Beim Transport sind Schäden durch Stöße und Schläge zu vermeiden. Hierbei muss besonders auf die ausgeführten Anschlusskabel geachtet werden.

4.4 Lagerung

Zwischenlagerung



ACHTUNG

Beschädigung von Bauteilen und Funktionsbeeinträchtigungen.
Unsachgemäße Lagerung kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Nicht im Freien aufbewahren
- Trocken und staubfrei lagern
- Keinen aggressiven Medien aussetzen
- Lagertemperatur: +10 °C bis +30 °C, keine schnellen Temperaturschwankungen
- Der Ort muss mäßig gelüftet und trocken sein.
  Maximale relative Luftfeuchtigkeit: 65%
- Bei einer Lagerung länger als 3 Monate regelmäßig den allgemeinen Zustand aller Teile und der Verpackung kontrollieren
- Falls erforderlich, die Konservierung auffrischen oder erneuern



HINWEIS

Beachten Sie auf den Packstücken angebrachte Vorschriften zur Lagerung, die über die hier genannten Anforderungen hinausgehen.

Soll die Bremse zwischengelagert werden, so ist ein zusätzlicher Korrosionsschutz vorzunehmen. Angaben hierzu erhalten Sie von unserem Kundendienst (Anschrift s. Kap. 11.3).

Die **Zwischenlagerungsvorschrift 449-00023** erhalten Sie von unserem Kundendienst.

Bei Nichtbeachtung der in diesem Kapitel aufgeführten Hinweise erlischt die Gewährleistung durch die Firma Stromag GmbH. Bei Fragen wenden Sie sich bitte an den Kundendienst (Anschrift s. Kap. 11.3).

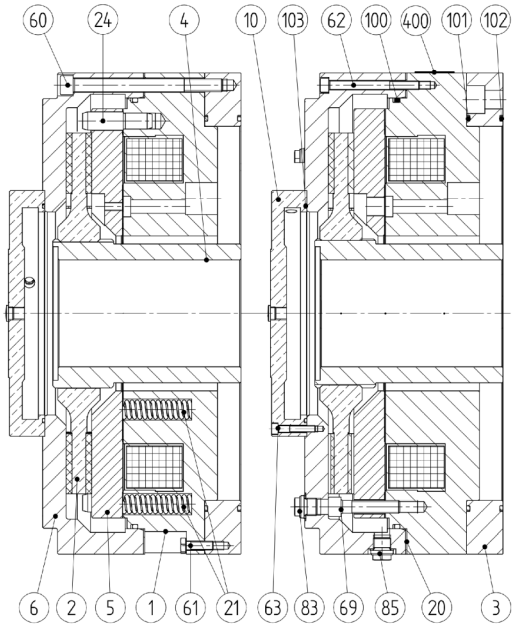
Die außen liegenden Teile bestehen aus seewasserbeständigem Aluminium und aus Stahl mit einem geeignetem Oberflächenschutz.

4.5 Lieferumfang

Die Vollständigkeit der Lieferung ist beim Empfang an Hand der Packliste zu überprüfen ist. Eventuelle Transportschäden und/oder fehlende Teile sind sofort schriftlich zu melden.

5 Aufbau, Wirkungsweise und Konstruktionsmerkmale

5.1 Benennung der Einzelteile (Darstellung Baugröße 2HPB45)



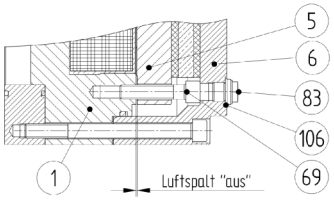
1	Spulenkörper mit Spule	60	Schraube für Bremsdeckel - Flansch
2	Reibscheibe mit Reibbelag	61	Schraube für Spulenkörper - Flansch
3	Kundenanschlussflansch	62	Schraube für Bremsdeckel - Spulenkörper
4	Ritzel	63	Schraube für Tachoflansch - Bremsdeckel
5	Ankerscheibe	69	Notlüftschraube
6	Bremsdeckel	83	Verschlussschraube für Notlüftung
10	Tachoflansch	85	Verschlussschraube für Luftspaltmessung
20	Beilage	100	Rundring Spulenkörper - Bremsdeckel
21	Druckfedern	101	Rundring Spulenkörper - Flansch
24	Stehbolzen	102	Rundring Flansch -Motor
		103	Rundring Tachoflansch - Bremsdeckel
		400	Leistungsschild

Abbildung 5.1: *Schnittdarstellung 2HPB45, Einzelteile sind mit Positionsnummern beschriftet*

5.2 Wirkungsweise und Konstruktionsmerkmale der Standardausführung

Die Bremse **2HPB** ist eine federbelastete Elektromagnet-Zweiflächenbremse, die im elektrisch spannungsfreien Zustand bremst und elektromagnetisch lüftet. Der Bremsentyp **2HPB** erfüllt höchste Anforderungen an Dauerfestigkeit, Robustheit und Seewasserbeständigkeit. Bau und Prüfung der Bremsen erfolgen nach DIN VDE 0580. Das Anschrauben der Bremse an einen Motor oder ein anderes Maschinenteil erfolgt mittels Zylinderschrauben. Im Spulenkörper befindet sich eine Spule, die mit einer Kunstharzmasse der thermischen Klasse 155 (F, max. Grenztemperatur 155 °C) fest vergossen ist.
Bei elektrisch spannungsfreier Spule drücken die Druckfedern (21) die Ankerscheibe (5) axial gegen die Reibscheibe mit Reibbelag (2). Diese wird so zwischen der verdrehgesicherten Ankerscheibe (5) und dem Bremsdeckel (6) eingespannt und damit am Umlauf gehindert. Die Bremswirkung wird von der verzahnten Reibscheibe mit Reibbelag (2) über das Ritzel (4) und eine Passfeder auf die Welle übertragen. Wird die Spule an eine Nenn-Gleichspannung entsprechend der Leistungsschildangaben (400) angeschlossen, so wird die Ankerscheibe (5) durch die Elektromagnetkraft gegen die Federkraft an den Spulenkörper (1) gezogen. Die Reibscheibe mit Reibbelag (2) wird somit frei und die Bremswirkung aufgehoben. Die Bremse ist gelüftet.

5.3 Mechanische Lüftung mittels Notlüftschrauben



1	Spulenkörper mit Spule	69	Schraube zur mechanischen Lüftung
5	Ankerscheibe	83	Verschlussschraube für die axiale Notlüftung
6	Bremsdeckel	106	Dichtring

Abbildung 5.2: *Notlüftung mit Schrauben*

Zum mechanischen Lüften der Bremse im Havariefall oder zur Einjustierung der Anlage dienen die Schrauben (69) (2 Schrauben bei Baugröße HPB 20, 3 Schrauben bei Baugröße HPB 25 bis 45, 4 Schrauben bei Baugröße HPB 55). Um den Lüftvorgang durchzuführen, sind zunächst die Verschlussschrauben (83) aus dem Bremsdeckel (6) herauszudrehen. In den freiwerdenden Öffnungen sind die Notlüftschrauben (69) mit einem Innensechskantschlüssel erreichbar. Die Lüftung erfolgt durch gleichmäßiges wechselseitiges Rechtsdrehen der Schrauben bis zum Aufheben der Bremswirkung.



WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Die Notlüftung ist selbsthemmend und muss für den Normalbetrieb unbedingt in die Ausgangsposition zurückgedreht werden, d.h. die Schrauben (69) werden entgegen dem Uhrzeigersinn bis zum Anschlag an den Bremsdeckel (6) zurückgedreht. Dann sind die Verschlussschrauben (83) wieder in den Bremsdeckel (6) zu schrauben. Es ist darauf zu achten, dass die Dichtringe (106) ebenfalls wieder eingebaut werden. Nur so ist der bestimmungsgemäße Betrieb und die ***die Dichtheit*** in vollem Umfang gewährleistet.

Die Notlüftung darf nicht für die Aufrechterhaltung eines provisorischen Betriebes genutzt werden!! Für die Funktionsprüfung eines optional verbauten Schalters, darf die Notlüftung nicht verwendet werden!!

5.4 Elektrischer Anschluss

Hinweise zum elektrischen Anschluss



GEFAHR

Gefahr durch Elektrizität.
An elektrischen Einrichtungen sind schwere bis tödliche Stromschläge möglich.

- Der elektrische Anschluss der Federdruckbremse darf nur durch Fachpersonal erfolgen, das im Umgang mit elektrischen Gefährdungen geschult ist.
- Arbeiten nur an spannungsfrei geschalteten elektrischen Komponenten durchführen
- Spannungsquelle gegen Wiedereinschalten sichern und kennzeichnen
- Spannungsfreiheit feststellen
- Erden und kurzschließen
- Benachbarte unter Spannung stehende berührbare Teile abdecken oder abschranken



WARNUNG

Verbrennungsgefahr.
Spule, Spulenkörper und angrenzende Bauteile können durch eine längere Einschaltdauer der Spule sowie durch Reibungswärme heiße Oberflächen haben. Der Bremsdeckel (6) kann insbesondere durch Reibwärme heiße Oberflächen verursachen.

- Bremsenbauteile und angrenzende Bauteile abkühlen lassen
- Feste Schutzhandschuhe gegen Berühren heißer Oberflächen tragen.

Der elektrische Anschluss muss unter Beachtung der Installationsvorschriften vorgenommen werden (z.B. DIN VDE 0129-507). Die Spule ist für die auf dem Leistungsschild angegebene Gleichspannung (Restwelligkeit <0,5) und 100% ED ausgelegt. Die dauernd zulässige Spannungsänderung beträgt ***+6%*** bis ***-10%*** der Nennspannung. Zum Schutz der Spule bzw. des Netzteiles ist es zweckmäßig den Spuleneingang mit einem Varistor des entsprechenden Betriebsspannungsbereiches und der erforderlichen Leistung zu beschalten. Informationen dazu erhalten sie von unserem Kundendienst, Anschrift s. Kap. 11.3 .

6 Montage und Demontage

Montage- und Demontagehinweise

WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Durch den Einsatz nicht geeigneter Schrauben und Passfedern können sich Teile lösen, weggeschleudert werden und schwere Verletzungen oder Tod verursachen.

- Nur Schrauben und Passfedern in der vorgeschriebenen Größe und Festigkeit verwenden
- Anziehdrehmoment beachten
- Vorgeschriebene Schraubensicherungsmittel verwenden

ACHTUNG

Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Alle Befestigungsschrauben so anziehen, dass ein Verkanten verhindert wird
- Bei der Montage keine unangemessene Gewalt ausüben
- Lage des elektrischen Anschlusses beachten

HINWEIS

Die Bremse darf nur von autorisiertem, ausgebildetem und eingewiesenem Personal bedient, gewartet und instand gesetzt werden. Dieses Personal muss die komplette Montageanleitung gelesen, verstanden und eine spezielle Unterweisung über auftretende Gefahren erhalten haben.

Die jeweilige Einbauzeichnung enthält eine Tabelle mit alle verwendeten Schrauben und den Anziehdrehmomenten. Werden zur Schraubensicherung Flüssigkunststoffe eingesetzt, sind meist höhere Anziehdrehmomente erforderlich. Hierzu sind die Herstellerangaben maßgebend. Die Demontage erfolgt in umgekehrter Reihenfolge zur Montage. Alle Warn- und Sicherheitshinweise sind zu berücksichtigen.

Anzugsmomente Schrauben/ tightening torque screws

Pos.	Bezeichnung/ designation	Material/ material	Anzugsmoment/ tightening torque
60	M12x140	A2-70	74 Nm
61	M8x70	A2-70	21,4 Nm
62	M8x85	A2-70	21,4 Nm
63	M6x35	A2-70	8,8 Nm

Abbildung 6.1: *Beispiel Anziehdrehmomente*

6.1 Montage

Einzelteile mit Positionsangaben siehe Kap. 5.1

6.1.1 Direkte Montage

Für den Anbau der Bremse an den Antrieb ist je nach Flanschausführung eine Demontage der Bremse erforderlich.
Sind die Befestigungspunkte am Kundenanschlussflansch (3) im Auslieferungszustand zugänglich ist für die Montage der Bremse ein Demontage des Flansches (3) nicht erforderlich (siehe Abbildung 6.2). Zur Vereinfachung der Ausrichtung von Reibscheibe (2) zu Ritzel (4) kann der Tachoflansch (10) während der Montage entfernt werden. Dieser ist mit Schrauben (63) am Bremsdeckel befestigt (siehe Abbildung 5.1).

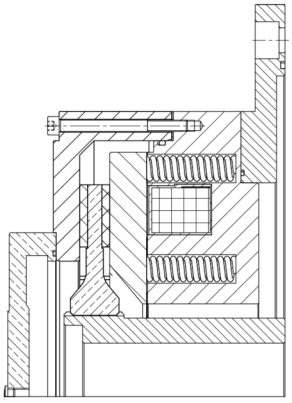


Abbildung 6.2: *Montage ohne Demontage*

- Kontrolle der Anschlussmaße auf Übereinstimmung mit der Bremse.
- Evtl. vorhandener Transport- oder Lagerschutz, sowie Grat- und Schlagstellen sind zu entfernen.
- Kontrolle der Stirnlaufabweichung der Anflanschfläche zur abbremsenden Welle (Toleranzklasse N nach DIN 42955 sollte nicht überschritten werden.)
- Welle und Passfeder mit Montagepaste leicht fetten, Ritzel (4) aufziehen und axial sichern.
- Bremse mit passenden Anschlagmitteln (Schäkel oder dgl.) vorsichtig über das Ritzel (4) führen und durch Drehen der Welle oder Schwenken der Bremse die Verzahnung des Ritzels in die Gegenverzahnung der Reibscheibe mit Reibbelag (2) einführen. Dabei ist darauf zu achten, dass die Reibscheibe mit Reibbelag (2) und das Ritzel (4) sich zentrieren. (Reibscheibe mit Reibbelag (2) wird zur Endabnahme der Bremse bereits vorzentriert).
- Bremse lagegerecht mit passenden Schrauben am Motorflansch befestigen und sicher. Der elektrische Anschluss muss unter Beachtung der jeweiligen Installationsvorschriften vom Fachpersonal vorgenommen werden.
- Gegebenenfalls demontierten Tachoflansch (10) lagegerecht mit Schrauben (63) befestigen und mit dem auf der Zeichnung angegebenen Drehmoment anziehen.



ACHTUNG

Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Bei allen Anbauarbeiten ist darauf zu achten, dass alle Dichtringe und Dichtungen ordnungsgemäß in den dafür vorgesehenen Positionen liegen.

Keine Gewalt ausüben! **Nicht verkanten!** **Lage des Kabels beachten!**

6.1.2 Montage mit Demontage

Sind die Befestigungspunkte am Kundenanschlussflansch (3) im Auslieferungszustand **nicht** zugänglich ist für die Montage der Bremse eine Demontage des Flansches (3) erforderlich (siehe Abbildung 6.3) Zur Vereinfachung der Ausrichtung von Reibscheibe (2) zum Ritzel (4) kann der Tachoflansch (10) während der Montage entfernt werden. Dieser ist mit Schrauben (63) am Bremsdeckel befestigt.

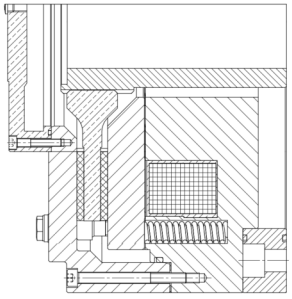


Abbildung 6.3: *Montage mit Demontage*

- Kontrolle der Anschlussmaße auf Übereinstimmung mit der Bremse.
  Evtl. vorhandener Transport- oder Lagerschutz, sowie Grat- und Schlagstellen sind zu entfernen.
- Kontrolle der Stirnlaufabweichung der Anflanschfläche zur abbremsenden Welle (Toleranzklasse N nach DIN 42955 sollte nicht überschritten werden.)
- Schrauben (60) und Schrauben (61) entfernen.
  Die rot markierten Schrauben (62) dürfen nicht entfernt werden. Ist die Markierung durch roten Lack nicht gegeben, so ist die Schraubenposition durch zusätzliche Zentrierungen am Bremsdeckel markiert.
- mit passenden Anschlagmitteln (Schäkel oder dgl.) vorsichtig Flansch (3) und Bremse trennen. Dabei Dicht- und Zentrierflächen nicht beschädigen.
- Flansch (3) lagegerecht mit passenden Schrauben am Motorflansch befestigen und sicher.
  Welle und Passfeder mit Montagepaste leicht fetten, Ritzel (4) aufziehen und axial sichern.
- Bremse mit passenden Anschlagmitteln (Schäkel oder dgl.) vorsichtig über das Ritzel (4) führen und durch Drehen der Welle oder Schwenken der Bremse die Verzahnung des Ritzels in die Gegenverzahnung der Reibscheibe mit Reibbelag (2) einführen. Dabei ist darauf zu achten, dass die Reibscheibe mit Reibbelag (2) und das Ritzel (4) sich zentrieren. (Reibscheibe mit Reibbelag (2) wird zur Endabnahme der Bremse bereits vorzentriert).
- Bremse lagegerecht mit passenden Schrauben am Motorflansch befestigen und sichern. Der elektrische Anschluss muss unter Beachtung der jeweiligen Installationsvorschriften vom Fachpersonal vorgenommen werden.
- Gegebenenfalls demontierten Tachoflansch (10) lagegerecht mit Schrauben (63) befestigen und mit dem auf der Zeichnung angegebenen Drehmoment anziehen.



ACHTUNG

Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

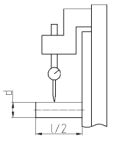
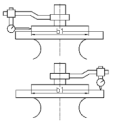
- Bei allen Anbauarbeiten ist darauf zu achten, dass alle Dichtringe und Dichtungen ordnungsgemäß in den dafür vorgesehenen Positionen liegen.

Keine Gewalt ausüben! **Nicht verkanten!** **Lage des Kabels beachten!**

6.2 Montagegenauigkeit

Der Rundlauf des Wellenstücks, auf dem das Ritzel (4) befestigt ist, sowie Koaxialität und Planlauf des Befestigungsflansches müssen der Toleranzklasse „N“ der DIN 42955 entsprechen.

Tabelle 6.1: *Montagegenauigkeit*

Rundlauf des Wellenendes	Durchmesser des Wellenendes d in mm	Rundlauftoleranz $N(norm.)$ in mm	
	über 18 bis 30	0,04	
	über 30 bis 50	0,05	
	über 50 bis 80	0,06	
	über 80 bis 120	0,07	
	über 120 bis 180	0,08	
Koaxialität und Planlauf des Befestigungsflansches	Zentrierdurchmesser Befestigungsflansch in mm	Koaxialitäts- und Planlauftoleranz in mm	
	über 100 bis 230	0,1	
	über 230 bis 450	0,125	
	über 450 bis 800	0,16	

6.3 Abmessungen, Platzbedarf und Masse

Die verbindlichen Abmessungen, die Masse sowie weitere technische Daten sind der für den jeweiligen Auftrag verbindlichen Maßzeichnung zu entnehmen. Diese kann von unserem Kundendienst angefordert werden, Anschrift s. Kap. 11.3.

6.4 Demontage

Für den Abbau gelten prinzipiell die gleichen Hinweise und Vorschriften wie für den Anbau. Die Reihenfolge ist umgekehrt.



GEFAHR

Schäden durch unsachgemäße Demontage
Tod oder schwerste Verletzungen sind die Folge.

- Überprüfen, dass die Bremse lastfrei ist.
- Bremse elektrisch spannungsfrei schalten.
- Mit Anschlagmitteln sichern, dann abbauen!

7 Erst-Inbetriebnahme

Einzelteile mit Positionsangaben je nach Ausführung siehe Kap. 5.1

Vor der Erst- Inbetriebnahme sind folgende Prüfmaßnahmen erforderlich:

- Die elektrischen Anschlusswerte auf dem Typschild (400), s. Kap. 3.1, müssen mit denen vor Ort übereinstimmen
- Die Bremse muss unbeschädigt sein, d. h. sie darf keine Schäden durch Transport, Lagerung usw. aufweisen
- Die vorgeschriebenen Betriebsbedingungen (Kap. 8.1) müssen mit denen vor Ort übereinstimmen
- Die mechanische Notlüftung gem. Kap. 5.3 darf nicht aktiv sein.
- Um die elektrische Funktion der Bremse zu überprüfen, sind einige elektrische Lüftvorgänge durchzuführen.

8 Betrieb



HINWEIS

Unabhängig von den nachfolgenden Hinweisen gelten für den Betrieb der Bremse in jedem Fall die am Einsatzort gesetzlich vorgeschriebenen Sicherheits- und Unfallverhütungsvorschriften. Der Anwender hat für die Einhaltung dieser Vorschriften zu sorgen.



WARNUNG

Verbrennungsgefahr.
Spule, Spulenkörper und angrenzende Bauteile können durch eine längere Einschaltdauer der Spule sowie durch Reibungswärme heiße Oberflächen haben. Der Bremsdeckel (6) kann insbesondere durch Reibwärme heiße Oberflächen verursachen.
Vor Reparatur- und Wartungsarbeiten:

- Bremsenbauteile und angrenzende Bauteile abkühlen lassen
- Feste Schutzhandschuhe gegen Berühren heißer Oberflächen tragen.

8.1 Betriebsbedingungen

Die Betriebsbedingungen, die für einen störungsfreien Betrieb der Bremse einzuhalten sind, werden nachfolgend aufgeführt:

- Die Umgebungstemperatur darf $-30\,^{\circ}C$ nicht unter- und $+50\,^{\circ}C$ nicht überschreiten.
- Bei höheren und/oder tieferen Temperaturen wenden Sie sich bitte an unseren Kundendienst (Kap. 11.3).
- Wenn die Bremse mit einem Abnahmezertifikat einer Marine-Klassifizierungsgesellschaft bestellt wird, können davon abweichende zulässige Umgebungstemperaturen gelten. In diesem Fall wenden Sie sich bitte an unseren Kundendienst (Kontakt siehe Kap. 11.3).

8.1.1 Haltebetrieb

Das Anhalten des mit der Bremse verbundenen Antriebsstranges erfolgt im Haltebetrieb durch den drehzahlgeregelten Elektromotor oder funktional vergleichbaren Einrichtungen. Erst nach dem Abbremsen bis zum Stillstand fällt die Federdruckbremse ein und hält den Antrieb im stromlosen Zustand fest.

8.1.2 Arbeitsbetrieb

Im Arbeitsbetrieb wird die Bremse für die Verzögerung des Antriebes bis zum Stillstand verwendet. Die maximal zulässigen Belastungen sind dem Bremsendatenblatt zu entnehmen.

8.1.3 Notstoppbetrieb

Im Vergleich zum Arbeitsbetrieb wird ein Notstopp dadurch charakterisiert, dass die sich aus der Bremsung des Antriebes durch die elektromagnetische Federdruckbremse resultierende Beanspruchung an der oberen Grenze der mechanischen und/oder thermischen Belastbarkeit der Bremse befindet.



HINWEIS

Eine Bremsung unter Last (z. B. innerhalb des Arbeitsbetriebes oder beim Notstopp) ist mit einem Verschleiß der Reibflächen verbunden, wodurch die Lebensdauer der Bremse reduziert wird.



ACHTUNG

Eine Überschreitung der vertraglich vereinbarten Grenzwerte beim Betrieb der Bremse kann zu einer Beschädigung der Bremse und zu einer Funktionsbeeinträchtigung führen.

- Die maximal zulässigen Belastungen können dem Datenblatt der Bremse entnommen werden. Dieses kann beim Kundendienst angefragt werden.
- Es wird eine Auslegungsberechnung für die vorhandenen Lastfälle durch die Stromag GmbH empfohlen.



ACHTUNG

Notstopps dürfen nicht unmittelbar hintereinander erfolgen, um eine Beschädigung der Bremse zu vermeiden.

- Nach jedem Notstopp sind Kontrollarbeiten gemäß Kap. 9.6 durchzuführen!

8.2 Einschaltdauer und Schalthäufigkeit

Die Auslegung und die zulässige Beanspruchung der Bremsen nach Bremsmoment, Drehzahl und Schaltleistung gehen aus den technischen Daten (siehe Kap. 3) dem Maßblatt (siehe Kap. 13.1), sowie den jeweiligem Datenblatt hervor. Die Überschreitung dieser Werte sollte unbedingt mit dem Hersteller abgestimmt werden.

8.3 Schutzarten

Die Bremse entspricht, vollständig montiert und unter Beachtung der Hinweise angebaut, in der Grundversion (siehe Abbildung 8.1) der Schutzart IP 67 nach DIN EN 60529 (VDE 0470-1) und DIN EN 60034-5 (VDE 0530-5).

Bei Verwendung von Original Zubehör der Stromag GmbH wie z.B. Kabelverschraubungen bleibt die Schutzart erhalten, das Gleiche gilt, wenn Drehzahlgeber (mindestens IP 67) über mit Rundring abgedichtete Flanschverschraubung fest mit dem Deckel verbunden sind.

Bei Ausführung mit Klemmenkasten entspricht die Bremse der Schutzart IP 66!

Abdichtungen von durchgehenden Wellen mittels Wellendichtring senken die Schutzart je nach Ausführung. Hier ist Rücksprache mit dem Hersteller erforderlich.

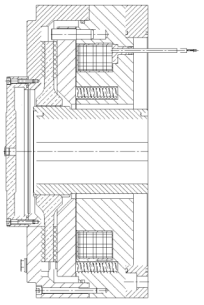


Abbildung 8.1: *Schnitt 2HPB*

HINWEIS

Die Kontaktflächen der Bremse zum Motor oder zu einem angebauten Tachogenerator sind mit geeigneten Abdichtmitteln zu versehen (z.B. Hylomar oder Dichtring), um die Schutzart zu garantieren. Vom Anwender ist ein Dichtelement auf der Welle anzuordnen, so dass das Eindringen von Fett und Öl vom Motorlager her in die Bremse verhindert wird.

8.4 Störungsabhilfe

Störungen	Mögliche Ursachen	Erforderliche Maßnahmen
Bremswirkung nicht ausreichend	Reibflächen nicht fettfrei	Reibscheibe mit Reibbelag (2) auswechseln und Gegenreibflächen reinigen
	max. Luftspalt durch Reibbelagverschleiß überschritten	Bremse nachstellen (Kap. 9.3) ggf. Reibscheibe mit Reibbelag (2) austauschen
	Bremse nicht vollständig eingelaufen	Bremse einlaufen lassen
	Bremse wurde überlastet	Bremse wechseln
	Federbruch	Abbau der Bremse, Rücksprache mit Hersteller
Bremswirkung nicht vorhanden	Mechanische Handlüftung wurde betätigt und nicht zurückgestellt	Beachte Kap. 5.3
Bremse lüftet nicht	max. Luftspalt durch Reibbelagverschleiß überschritten	Bremse nachstellen (Kap. 9.3) ggf. Reibscheibe mit Reibbelag (2) austauschen
	Reibscheibe m. Reibbelag (2) sitzt auf Ritzel (4) fest	Reibscheibe m. Reibbelag (2) und Ritzel (4) austauschen (Kap. 9.4)
	Ankerscheibe (5) verzogen	Bremse austauschen (Kap. 6)
	Spulenspannung zu gering	Gleichspannungsversorgung prüfen
	Spule defekt	Bremse austauschen (Kap. 6)
	Zuleitung defekt	Zuleitung erneuern
	Klemmstellen locker	Klemmstellen anziehen
	Fremdkörper im Luftspalt (z.B. Federbruch)	Abbau der Bremse, Rücksprache mit Hersteller
Bei Option Schalter:	Ankerscheibe wurde nicht gegen die Stirnfläche des Spulenkörpers gezogen z. B. durch:	Bremse nachstellen (Kap. 9.3) ggf. Reibscheibe mit Reibbelag (2) austauschen
keine Schalterfunktion	•Überschreitung des zulässigen Luftspaltes	Einstellung Schalter überprüfen unter Beachtung der Einstellvorschrift
	•Fremdkörper im Luftspalt	Bremse demontieren und reinigen Einstellung Schalter überprüfen unter Beachtung der Einstellvorschrift
		Abbau der Bremse, Rücksprache mit Hersteller

9 Wartung und Instandhaltung

9.1 Pflege- und Kontrollarbeiten

HINWEIS

Bei Wartungs- und Inspektionsarbeiten ist Kap. 2 (Sicherheitshinweise) zu beachten. Zusätzlich zu den nachfolgenden Hinweisen gelten die am Einsatzort gesetzlich vorgeschriebenen Sicherheits- und Unfallverhütungsvorschriften.

Der Betreiber ist verpflichtet, diese Vorschriften einzuhalten.

Auf Grund der unterschiedlichen Betriebsverhältnisse kann im Voraus nicht festgelegt werden, wie oft eine Verschleißkontrolle, Inspektion, Wartung und Instandsetzung erforderlich ist. Höhere Belastungen der Bremse (z.B. durch Drehmoment, Drehzahl, Schalthäufigkeit, Umgebungstemperatur usw.) erfordern kürzere Wartungsintervalle. Daher ist zunächst die Bremse hinsichtlich Sicherheit und Verschleiß zu beobachten und die Wartungsintervalle sind auf Grund der gewonnenen Erkenntnisse anzupassen.

Tritt Reibbelagverschleiß auf, so wird der Luftspalt größer. Je nach Beanspruchung der Bremse muss deshalb der Luftspalt von Zeit zu Zeit überprüft werden. Dies erfolgt durch eine Messung des Luftspaltes gemäß Kap. 9.2. Hat der Luftspalt seinen Maximalwert nach Tabelle 3.1 erreicht, so ist eine Verschleißnachstellung gemäß Kap. 9.3 durchzuführen.

Durch auftretenden Reibbelagverschleiß der bauartbedingt in größeren Mengen anfallen kann ist eine regelmäßige Reinigung der Bremse empfehlenswert. Öffnungen zur Luftspaltmessung können dabei zum Absaugen von losem Reibbelagabrieb verwendet werden. Zusätzlich lässt sich dabei mittels Druckluft die Bremse ohne weitere Demontage von Reibbelagabrieb befreien.

Im Zuge der Kontroll- oder Wartungsarbeiten sind die mechanischen Bauteile der Bremse mindestens durch eine Sichtprüfung auf Beschädigungen zu untersuchen. Die einwandfreie Funktion des Schiebsitzes der Passverzahnungsverbindung zwischen Ritzel (4) und Reibscheibe (2) ist zu überprüfen.

WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Wird die Verschleißnachstellung nicht rechtzeitig durchgeführt, so ist sowohl die Übertragung des Nennmomentes als auch die Lüftung der Bremse nicht gewährleistet. Dies kann zu schwere Verletzungen oder Tod führen.

- Regelmäßige Kontrollintervalle festlegen
- Regelmäßige Wartungsintervalle festlegen

9.2 Messung des Luftspaltes

Der Luftspalt zwischen Spulenkörper (1) und Ankerscheibe (5) kann nur gemessen werden, wenn die Spule keine elektrische Spannung anliegt. Der Luftspalt muss an zwei Stellen am Umfang, 180° gegenüberliegend, gemessen werden. Dazu sind die zwei Verschlussschrauben (83) zu entfernen. Durch die dann frei werdende Gewindebohrung im Bremsdeckel (6) kann mittels einer Fühlerlehre der Luftspalt zwischen Spulenkörper (1) und Ankerscheibe (5) gemessen werden. **Es ist unbedingt darauf zu achten, dass die Fühlerlehren nur in den äußeren Bereich zw. Spulenkörper und Ankerscheibe geschoben wird und nicht über den Rezess der Ankerscheibenpolfläche hinaus.** Der Luftspalt muss zwischen „Aus min“ und „Aus max“ (siehe Tabelle 3.1) liegen. Nach der Messung sind die Bohrungen mit den Verschlussschrauben (83) und den zugehörigen Dichtringen (106) wieder zu verschließen.

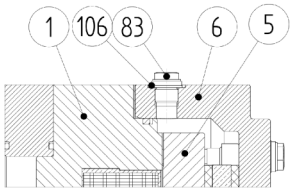


Abbildung 9.1: *Luftspaltmessung 2HPB*

9.3 Verschleißnachstellung

Wird bei den Bremsen der Luftspalt „Aus max“nach Tabelle 3.1 erreicht, ist eine Nachstellung des Luftspaltes vorzunehmen.



GEFAHR

Schäden durch unsachgemäße Demontage
Tod oder schwerste Verletzungen sind die Folge.

- Überprüfen, dass die Bremse lastfrei ist.
- Bremse elektrisch spannungsfrei schalten.



GEFAHR

Schäden durch schlagartige Entspannung der Druckfedern
Tod oder schwerste Verletzungen sind die Folge. Spulenkörper und Ankerscheibe stehen unter der Axialkraft der Druckfedern! Es besteht Gefahr durch herumfliegende Teile bei schlagartiger Entspannung der Druckfedern.



ACHTUNG

Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Beim Zusammenbau der Bremse bzw. beim Austausch der Reibscheibe mit Reibbelag ist sorgfältig darauf zu achten, dass die Bremsbeläge nicht mit Fett in Berührung kommen. Sind fettige Stoffe vorhanden, können sie mit geeigneten Entfettungsmitteln entfernt werden.
- ***Niemals Benzin oder Petroleum verwenden!***
- Sollte eine solche Nachstellung des Luftspaltes schon einmal erfolgt sein, dann muss eine neue Reibscheibe mit Reibbelag (2), siehe Kap. 9.4, eingebaut werden. Dabei ist aber die Beilage (20) wieder einzusetzen.
- Bei allen Anbauarbeiten ist darauf zu achten, dass alle Dichtringe und Dichtungen ordnungsgemäß in den dafür vorgesehenen Positionen liegen.

Es ist wie folgt vorzugehen:

- Bremse nach Kap. 5.3 mechanisch notlüften
- Schrauben (60) und (62) entfernen
- Den Bremsdeckel(6) vom Spulenkörper (1) demontieren. Dabei darauf achten, dass die Ankerscheibe (5) nicht beschädigt wird
- Beilage (20) entfernen und im umgekehrten Sinne den Bremsdeckel (6), lagegerecht, wieder auf dem Spulenkörper (1) montieren
- Schrauben (60) und (62) mit dem auf der Zeichnung angegebenem Anzugsdrehmoment anziehen
- Mechanische Notlüftung der Bremse gemäß Kap. 5.3 entfernen
- Messung des Luftspaltes nach Kap. 9.2 durchführen
- Kontrolle der Bremse auf einwandfreie Schaltfunktion

9.4 Auswechseln der Reibscheibe mit Reibbelag

Es ist wie folgt vorzugehen:



GEFAHR

Schäden durch unsachgemäße Demontage
Tod oder schwerste Verletzungen sind die Folge.

- Überprüfen, dass die Bremse lastfrei ist.
- Bremse elektrisch spannungsfrei schalten.



GEFAHR

Schäden durch schlagartige Entspannung der Druckfedern
Tod oder schwerste Verletzungen sind die Folge. Spulenkörper und Ankerscheibe stehen unter der Axialkraft der Druckfedern! Es besteht Gefahr durch herumfliegende Teile bei schlagartiger Entspannung der Druckfedern.

- Bremse nach Kap. 5.3 mechanisch notlüften
- Schrauben (60) und (62) entfernen
- Den Bremsdeckel(6) vom Spulenkörper (1) demontieren. Dabei darauf achten, dass die Ankerscheibe (5) nicht beschädigt wird
- Abnahme der Reibscheibe mit Reibbelag (2) vom Ritzel (4)
- Bremse säubern
- eine neue Reibscheibe mit Reibbelag (2) auf Verzahnung des Ritzels (4) aufschieben
- Beilage (20) einsetzen
- im umgekehrten Sinne den Bremsdeckel (6), lagegerecht, wieder auf dem Spulenkörper (1) montieren

- Schrauben (60) und (62) mit dem auf der Zeichnung angegebenem Anzugsdrehmoment anziehen
- Mechanische Notlüftung der Bremse gemäß Kap. 5.3 entfernen
- Messung des Luftspaltes nach Kap. 9.2 durchführen
- Kontrolle der Bremse auf einwandfreie Schaltfunktion

WARNUNG

mangelhafte Inbetriebnahme kann zu Schäden und Funktionsbeeinträchtigungen führen
Neue Reibbeläge übertragen nicht sofort das volle Bremsmoment

- es sind einige kontrollierte Bremsungen als Einlaufvorgang durchzuführen.

9.5 Kondenswasser ablassen

Kondenswasser bildet sich aufgrund großer Temperaturschwankungen und steht immer im Zusammenhang mit der Oberflächentemperatur eines Bauteils, der Raumlufttemperatur und der relativen Luftfeuchte. Daher muss in regelmäßigen Abständen in Abhängigkeit der klimatischen Verhältnisse das angesammelte Kondenswasser abgelassen werden. Dafür ist eine Kondenswasserablassschraube (83) (siehe Abbildung 9.2) vorgesehen.

WARNUNG

Nach jedem Kondenswasserablassen muss der Dichtring (106) wieder eingebaut werden.

Bei horizontaler Einbaulage ist wie folgt vorzugehen (siehe Abbildung 9.2). Bei vertikaler Einbaulage ist je nach Ausführung indviduell vorzugehen.

- Kondenswasserablassschraube (83) herausdrehen und die dazugehörige Dichtung (106) abnehmen
- Kondenswasser ablassen
- Kondenswasserablassschraube (83) mit Dichtung (106) einsetzen und festdrehen

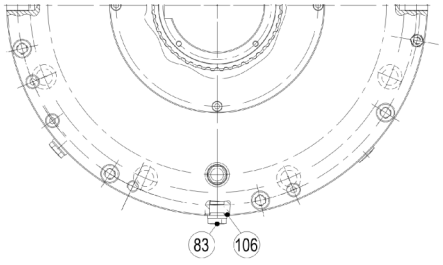


Abbildung 9.2: *Kondenswasser ablassen*

9.6 Kontrollarbeiten nach einem Notstopp

Nach einem gemäß Kapitel 8.1.3 beschriebenen Notstopp sind folgende Kontrollarbeiten durchzuführen, um einen sicheren Weiterbetrieb der Bremse zu gewährleisten.



WARNUNG

Verbrennungsgefahr durch heiße Bremsenbauteile!

- Bremse vor den Kontrollarbeiten auf Umgebungstemperatur abkühlen lassen

- Luftspalt der abgekühlten Bremse gemäß Kapitel 9.2 überprüfen.
- Ist der maximal zulässige Luftspalt erreicht, ist die Bremse gemäß Kapitel 9.3 bzw. Kapitel 9.4 instandzusetzen.
- Bei der Demontage der Bremse sind die mechanischen Bauteile mindestens durch eine Sichtprüfung auf Beschädigungen zu untersuchen und gegebenenfalls durch Originalersatzteile zu erneuern.

10 Varianten und Bezeichnung

Die Bremsen vom Typ HPB werden mit einem definierten Bezeichnungsschlüssel beschrieben. Im ersten Teil der Bezeichnung (1 , 2 , 3 und 4) werden Typ und Baugröße der Bremse benannt. Im zweiten Bezeichnungsteil (5 , 6 und 7) wird der Kundenanschluss beschrieben, während im letzten Teil (8) die weiteren Optionen durch eine 7-stellige Buchstabenkombination dargestellt werden.

Bezeichnungsschlüssel (Beispiel Standardausführung):

2	**HPB**	**45**	**S**	**-**	**110V**	**100H7**	**A450**	**-**	**A O O O G O O**
1	2	3	4		5	6	7		8

1	Anzahl der Reibflächen	**2** oder **4**
2	Baureihe	**HPB** („**H**igh **P**erformance **B**rake“)
3	Baugröße	min. Außendurchmesser **a** [**mm**] / **10** (siehe Maßtabelle Kap. 13.1)
4	Bremsmomentvariante	**S** - standard, **H** - hoch oder **V** - sehr hoch (siehe Tabelle 3.1)
5	Nennspannung Spule	**110 V** DC oder nach Kundenwunsch
6	Borungsdurchmesser Ritzel	nach Kundenwunsch oder **NOPI** - ohne Ritzel
7	Anschlussflansch	nach DIN 42948 (EN 50347) oder **NOFL** - ohne Flansch
8	Optionen	siehe nachfolgende Kapitel

10.1 Option - elektrische Anschlussmöglichkeiten

In der Kategorie 1 (**X**XXXXXX) der 7-stelligen Optionbeschreibung wird der elektrische Anschluss festgelegt.

Tabelle 10.1: *Kategorie 1: elektrische Anschlussmöglichkeiten*

Funktion/ option	Code
Leitungen axial/ cable axial	**A**
Leitungen radial/ cable radial	**R**
Klemmenkasten m. Klemme/ terminal box with clamp	**K**
Klemmenkasten m. SSG/ terminal box with quick switching rectifier	**S**
Klemmenkasten m. GR/ terminal box with rectifier	**G**
Klemmenkasten m. Klemme + GR/ terminal box with clamp + rectifier	**B**
Kundenspezifisch/ customized	**C**

Standardmäßig ist die axiale Kabelausführung (**A**) vorgesehen.

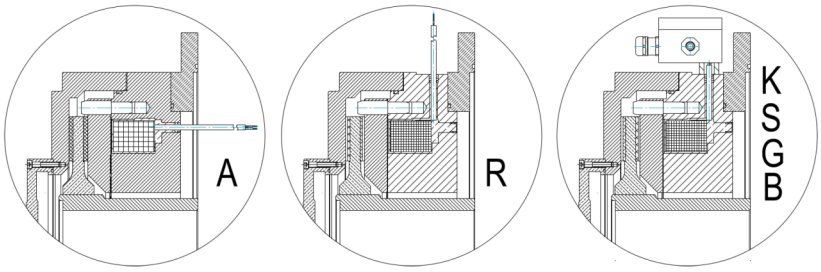


Abbildung 10.1: *Kategorie 1: A-R-K-S-G-B*

Innerhalb des Klemmenkasten sind verschiedene Optionen möglich, z. B.:

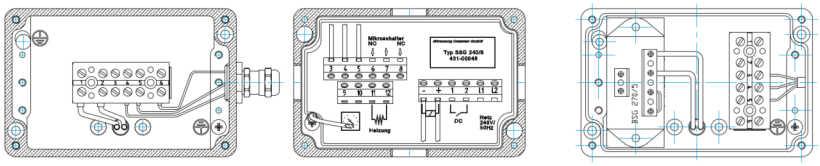


Abbildung 10.2: *Kategorie 1: K-S-B*

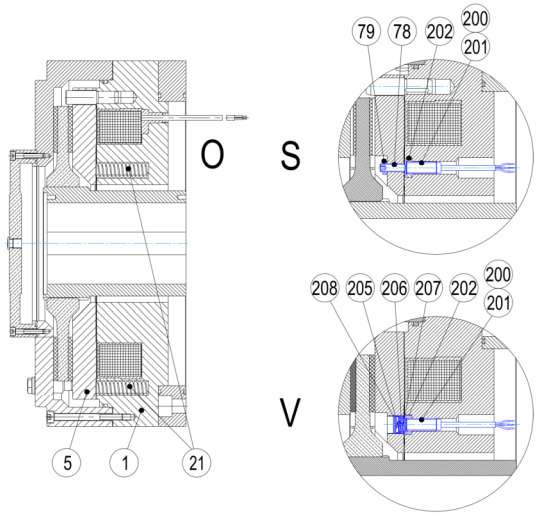
Es gelten die Hinweise nach Kapitel 5.4.

10.2 Option - Überwachung

In der Kategorie 2 (X**X**XXXXX) der 7-stelligen Optionsbeschreibung wird die Überwachung der Bremse festgelegt.

Tabelle 10.2: *Kategorie 2: Überwachung*

Funktion/ option	Code
ohne Zustandsüberwachung/ without monitoring	**O**
Schaltzustandskontrolle (SZK) mit ind. Schalter/ state of operation via inductive switch	**S**
2x SZK mit ind. Schalter/ 2x state of operation via inductive switch	**R**
Verschleißkontrolle (VK) mit ind. Schalter/ wear state via inductive switch	**V**
SZK + VK mit ind. Schalter/ state of operation + wear state via inductive switch	**A**
SZK mit Mikroschalter/ state of operation via microswitch	**P**
2x SZK mit Mikroschalter/ 2x state of operation via mircroswitch	**Q**
SZK + VK mit mikroschalter/ state of operation + wear state via microswitch	**B**
SZK m. ind. Sch., VK mit Mikrosch./ state of op. via microswitch, wear state via ind. switch	**D**
Kundenspezifisch/ customized	**C**



1	Spulenkörper mit Spule	201	induktiver Schalter
5	Ankerscheibe	202	Rundmutter Gewindering
21	Druckfeder	205	Rückstellfeder Verschleißkontrolle
78	Gewindestift	206	Buchse Verschleißkontrolle
79	Sechskantmutter	207	Kolben Verschleißkontrolle
200	Mikroschalter	208	Deckel Verschleißkontrolle

Abbildung 10.3: *Kategorie 2: O-S-V*

10.2.1 Induktiver Näherungsschalter

Der Näherungsschalter ist ein berührungslos und somit verschleißfrei arbeitender Grenztaster. Seine Betätigung erfolgt durch ein Metall, das innerhalb des Schaltabstandes vor die aktive Detektorfläche gebracht wird. Der induktive Näherungsschalter (201) besitzt wie in Abbildung 10.4 dargestellt ein zylindrisches Metallgehäuse mit Außengewinde. Das Schaltelement besitzt einen PNP-Ausgang und fungiert als Schließer siehe Abbildung 10.5.

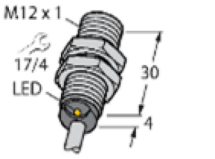


Abbildung 10.4: *Induktiver Näherungsschalter*

Wird die axial bewegliche Ankerscheibe (5) durch die Magnetkraft gegen den Spulenkörper gezogen, wird der zum Einstellen des Schaltpunktes dienende Gewindestift (78) vom induktiven Näherungschalter (201) detektiert und der Schalter geschlossen. Ist die Bremse spannungslos, drücken die Federn (21) die Ankerscheibe (5) vom Spulenkörper, wodurch ein Luftspalt zwischen Ankerscheibe und Spulenkörper entsteht. Wenn der Luftspalt so groß ist, dass der in der Ankerscheibe befindliche Kolben (207) aus dem Schaltabstand des induktiven Näherungschalters (201) herausgetragen wird, ist die Verschleißgrenze der Bremse erreicht und der Schalter öffnet.

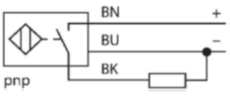


Abbildung 10.5: *Anschlussbild*

10.2.2 Mikroschalter

Der Mikroschalter (200), Abbildung 10.6, besteht aus einem zylindrischen Gehäuse mit Außengewinde, indem ein Sprungschalter als Wechsler nach Abbildung 10.7 mit folgenden Anschlussmöglichkeiten untergebracht ist.

(c) und (no) = Schließer
(c) und (nc) = Öffner
(c) common ground (nc) normally closed (no) normally open



Abbildung 10.6: *Mikroschalter*

Wenn die Überwachung des Schalt- oder des Verschleißzustandes in einer HPB erforderlich ist, wird wie in Abbildung 10.3 dargestellt der Schalter (200) im Spulenkörper (1) fixiert. Dazu wird die Rundmutter (202) auf den Schalter geschraubt und beide in die entsprechende Einsenkung des Spulenkörpers gebracht und eingeklebt. Wird die axial bewegliche Ankerscheibe (5) durch die Magnetkraft gegen den Spulenkörper gezogen, wird der Mikroschalter (200) betätigt.



Abbildung 10.7: *Anschlussbild Mikroschalter*

Detailierte Informationen zu den Schaltern sind der **Montageanleitung 449-00254** zu entnehmen. Diese erhalten Sie von unserem Kundendienst (Kontaktdaten s. Kapitel 11.3).

10.3 Option - Zubehör

In der Kategorie 3 (XX**X**XXXX) der 7-stelligen Optionsbeschreibung wird Zubehör und dessen Kombinationsmöglichkeiten festgelegt.

Tabelle 10.3: *Kategorie 3: Zubehör*

Funktion/ option	Code
ohne Extras mit O-Ring/ without extras with O-ring	**O**
ohne O-Ring/ without customer seal ring	**W**
ohne O-ring, ohne Bef.-schr./ without customer seal ring and fixing screws	**P**
Anticondensationsheizung (HZ)/ anticondensation heating	**H**
HZ ohne O-Ring/ with anticondensation heating, without seal ring	**R**
Handlüftung (HL)/ with hand release	**N**
HL ohne O-ring/ with hand release, without O-ring	**M**
HZ + HL/ with anticondensation heating and hand release	**B**
HZ + HL ohne O-ring/ with anticondensation heating and hand release, without O-ring	**S**
Kundenspezifisch/ customized	**C**

10.3.1 Stillstandsheizung / O-Ring

Bei hohen zu erwartenden Temperaturschwankungen kann eine Stillstandheizung zur Vermeidung von Kondenswasser vorgesehen werden. Die Zuleitung wird mit der Spulenanschlussleitung gemeinsam ausgeführt. Kundenseitig kann die Bremse mit oder ohne O-Ring ausgeliefert werden. Standardmäßig wird die Bremse mit O-Ring geliefert.

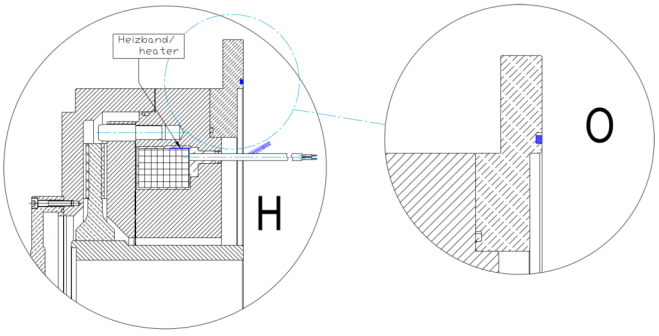


Abbildung 10.8: *Kategorie 3: H-O*

10.3.2 Handhebel- Notlüftung

Die Bremse 2HPB kann mit einer Handhebel-Notlüftung ausgestattet werden, mit der sie im Notfall, z.B. bei Ausfall der elektrischen Spannungsversorgung, von Hand gelüftet werden kann. Durch Ziehen des Handlüftbügels (41) um ca. 30° gegen die Rückseite der Bremse (siehe Abbildung 10.9) wird die Ankerscheibe (5) axial gegen den Spulenkörper (1) gedrückt und die Reibscheiben mit Reibbelag (2) freigestellt.

Diese Handhebel-Notlüftung ist mit einer Arretierung versehen, mit der der Handlüftsmechanismus im nicht betätigten Zustand wie folgt arretiert werden kann. Die Griffstange (41) wird gegen den Anschlagbügel (42) gedrückt. Dabei rastet die Griffstange (41) im Federclip (43) ein und wird in ihrer Lage gesichert.

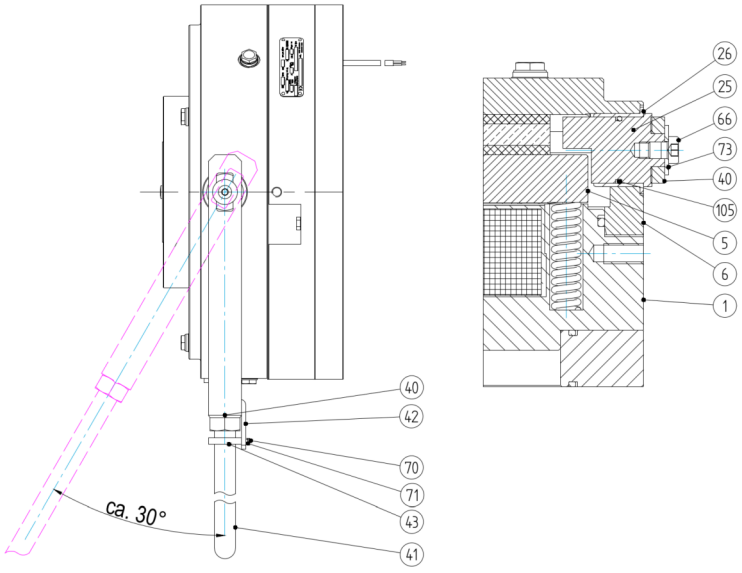


Abbildung 10.9: *Handlüftung 4HPB*

HINWEIS

Es handelt sich hierbei um federkraftbetätigte Bremsen, die bei einem Ausfall der elektrischen Spannungsversorgung einfallen. Während der Nutzung der Handhebel-Notlüftung wird das Federkraftsystem außer Kraft gesetzt. Wir empfehlen diese Art der Notlüftung nicht.



WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Die Notlüftung darf nicht für die Aufrechterhaltung eines provisorischen Betriebes genutzt werden!



WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Für die Funktionsprüfung eines optional verbauten Näherungsschalters (mechanisch oder induktiv), darf die Notlüftung nicht verwendet werden!



GEFAHR

Gefahr schwerer Sach- und Personenschäden.
Tod oder schwerste Verletzungen sind die Folge.
Der Luftspalt "Aus max" darf nicht überschritten werden, da sonst die Übertragung des Nennmomentes nicht gewährleistet ist.

10.4 Option - Oberfläche

In der Kategorie 4 (XXX**X**XXX) der 7-stelligen Optionsbeschreibung wird die Oberflächenbeschaffenheit der Bremse festgelegt.

Tabelle 10.4: *Kategorie 4: Oberfläche*

Funktion/ option	Code
ohne Lackierung/ without painting	**O**
Lackierung - grundiert/ primed	**G**
Lackierung - Standard/ standard painting	**L**
Lackierung - Sonder/ special painting	**S**
Kundenspezifisch/ customized	**C**

Innerhalb der gesamten HPB-Baureihe sind **alle äußeren Stahlbauteile standardmäßig mit einem speziellen nichtmetallischen Oberflächenschutz versehen**, der vor Korrosion durch die Luftfeuchtigkeit und vor galvanischer Korrosion im Kontaktbereich mit anderen Metallen schützt. Äußere Bauteile, die nicht aus Stahl bestehen, sind aus einer seewasserbeständigen Aluminumlegierung gefertigt oder bestehen aus nichtrostendem Edelstahl.

Für den Einsatz der Bremse in anspruchsvollen, maritimen Umgebungsbedingungen, wie sie im Hafen oder Off-shore vorherrschen, wird zusätzlich eine geeignete Lackierung benötigt. Wir empfehlen ein Lacksystem nach Wahl des Kunden zu verwenden, welches mindestens aus einer geeigneten Haftgrundierung und einem seewasserbeständigen Decklack besteht. Bevor die Haftgrundierung aufgebracht wird, müssen alle Oberflächen sauber und frei von Fett oder anderen Verunreinigungen sein. Die außenliegenden Oberflächen der Bremse haben eine geeignete Oberflächenrauhigkeit, um der Grundierung Haftung zu bieten.

Wir empfehlen die Bremse erst zu Lackieren, nachdem diese an den Motor angebaut wurde. Dadurch wird die Anschlussfläche zwischen Motor- und Bremsenflansch mit dem kompletten Farbschichtsystem der Lackierung abgedeckt und somit ausreichend vor Korrosion geschützt.

Wird eine eine grundierte Ausführung (**G**) bestellt, wird die Bremse im Zusammenbau (siehe Abbildung 10.10) mit einer Schichtdicke von 40 μm bis 80 μm lackiert. Bei den Ausführungen mit Farbschicht (**L**), (**S**) wird zusätzlich ein Decklack mit einer Schichtdicke von 40 μm bis 80 μm aufgebracht.

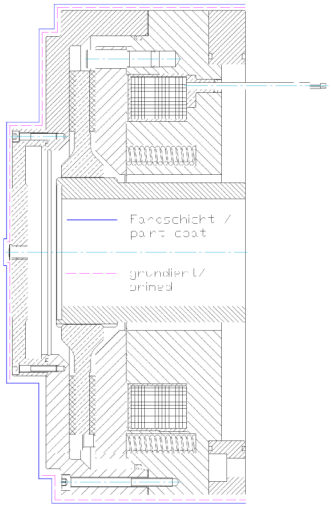


Abbildung 10.10: *Standard-Farbschichtsystem (**L**)*

HINWEIS

Es ist zu Beachten, das Beschädigungen der Lackschicht durch Montage und Wartungsarbeiten, einer Nachbehandlung bedürfen. Eine Überprüfung der Oberfläche nach der Montage und Wartung wird daher empfohlen.

10.5 Option - Anschluss

In der Kategorie 5 (XXXX**X**XX) der 7-stelligen Optionsbeschreibung werden die Tachoflanschoptionen festgelegt.

Tabelle 10.5: *Kategorie 5: (Encoder-) Anschluss*

Funktion/ option	Code
ohne Tachoflansch/ without tachoflange	**O**
Tachoflansch geschlossen/ tachoflange closed	**G**
Tachoflansch für Encoder Type POG 10/ tachoflange for encoder type POG 10	**E**
Tachoflansch für Wellendichtring/ tachoflange with shaft seal ring	**W**
Encoderanschluss mit Ausgleichskupplung/ encoder connect. via coupling	**K**
Blechplatte/ closing plate	**B**
Encoderanschluss Hoyer/ encoder connection Hoyer	**H**
Kundenspezifisch/ customized	**C**

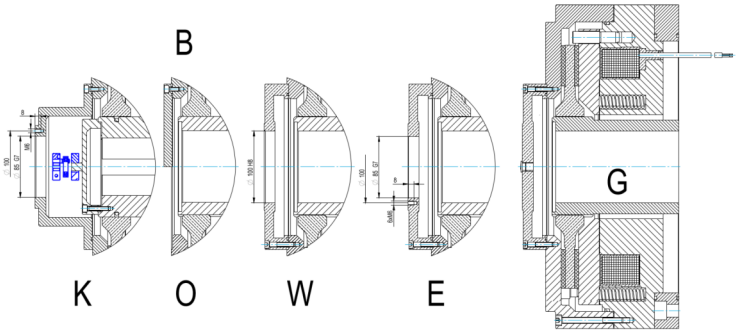


Abbildung 10.11: *Kategorie 5: K-O-B-W-E-G*

Die „Controlflex“ der Firma Schmidt-Kupplung GmbH ist eine speziell für den Anschluss mechanischer Drehgeber entwickelte Ausgleichkupplung nach dem Prinzip des Parallelkurbelgetriebes.



Abbildung 10.12: *Controlflex*

Die Ausgleichskupplung Controlflex wird **standardmäßig in einer axial trennbaren Ausführung** verwendet. Für die Montage des Encoders an die Bremse ist wie folgt vorzugehen:

- Die gesamte Ausgleichskupplung (602) so auf die Encoderwelle schieben, dass der Abstand zwischen der Planfläche des Encoderflansches und der Kupplungsnabe 25 mm beträgt (siehe Abbildung 10.13).
- Die Feststellschraube der auf der Encoderwelle befindlichen Klemmnabe mit einem Innensechskant-Werkzeug (Schlüsselweite 3 mm) mit einem Anzugsmoment von 3 Nm festschrauben.
- Durch Drehen der Encoderwelle die Ausgleichskupplung (602) so ausrichten, dass die Feststellschraube der anderen Klemmnabe beim Anflanschen des Encoders an den Tachoflansch (10) durch die radiale Zugangsbohrung im Tachoflansch erreichbar ist.

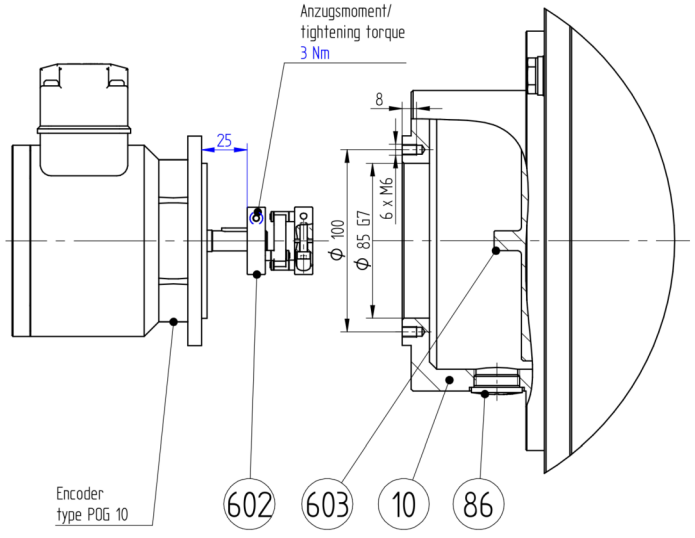


Abbildung 10.13: *Montage der Ausgleichskupplung an den Drehgeber*

- Die Verschlusschraube (86) aus dem Tachoflansch (10) entfernen.
- Den Encoder mit Kupplung (602) in den Tachoflansch (10) einführen und die freie Nabe der Kupplung über den Wellenzapfen des Ritzeladapters (603) schieben (siehe Abbildung 10.14).
- Die Feststellschaube der Klemmnabe über die radiale Zugangsbohrung des Tachoflansches (10) mit einem geeigneten Innensechskant-Werkzeug (Schlüsselweite 3 mm) mit einem Anzugsmoment von 3 Nm festschrauben (siehe Abbildung 10.14).
- Die Bohrung wieder mit der Verschlussschraube (86) verschließen.

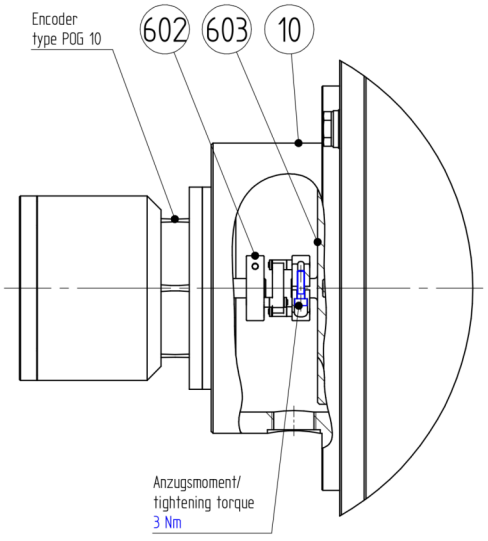


Abbildung 10.14: *Montage des Drehgebers mit Kupplung an die Bremse*

Bei der Verschleißnachstellung, dem Auswechseln der Verschleißteile oder anderen Wartungs- und Instandhaltungsmaßnahmen gemäß Kapitel 9 ist es erforderlich vor der Demontage des Bremsdeckels (6) den Encoder samt Ausgleichskupplung (602) zu demontieren.

Um den Drehgeber von der Bremse zu trennen, ist wie folgt vorzugehen:

- Die Befestigungsschrauben des Encoders lösen und den Encoder vorsichtig aus der Bremse ziehen.
- Den Tachoflansch (10) durch Herausdrehen der Befestigungsschrauben (63) lösen und von der Bremse trennen.
- Die am Zapfen des Ritzeladapters (603) verbliebene Klemmnabe der Ausgleichskupplung durch Losdrehen der Feststellschraube lösen und vom Zapfen schieben.
- Diese Klemmnabe wieder mit der auf der Encoderwelle befindlichen Kupplungshälfte verbinden. Dazu die zwei Zylinderstifte der Nabe in die entsprechenden Bohrungen des elastischen Mittelstückes stecken.

HINWEIS

Beim Wiederzusammensetzen der Kupplungshälften der teilbaren Controlflex-Ausgleichkupplung ist darauf zu achten, dass die zwei Bolzen jeder Nabe vollständig in die entsprechenden zwei Bohrungen des elastischen Mittelelements gesteckt werden, bevor der Encoder wieder an die Bremse montiert werden kann.

- Den Tachoflansch (10) wieder an den Bremsdeckel (6) montieren. Die Schrauben (63) sind mit dem auf der Bremsenzeichnung angegebenen Drehmoment anzuziehen. **Der O-Ring (103) darf bei der Montage des Tachoflansches nicht beschädigt werden!**
- Der Encoder inklusive Ausgleichskupplung kann nun wieder wie oben beschrieben an die Bremse angebracht werden.

Für spezielle Anwendungen kann die Controlflex-Ausgleichskupplung in einer axial nicht trennbaren Version bestellt werden. Der Drehgeber mit nichttrennbarer Ausgleichskupplung ist in der selben oben beschriebenen Weise an die Bremse zu montieren wie die trennbare Variante. Die Demontage muss jedoch anders erfolgen, sonst wird die nichttrennbare Ausgleichskupplung beschädigt.

Um den Drehgeber mit nichttrennbarer Controlflex von der Bremse zu demontieren, ist wie folgt vorzugehen:

- Die Verschlussschraube (86) des Tachoflansches (10) herausdrehen.
- Die Welle, auf der das Ritzel (4) der Bremse sitzt, drehen, bis die Feststellschraube der ritzelseitigen Klemmnabe der Ausgleichskupplung (602) über die Zugangsbohrung im Tachoflansch (10) erreichbar ist (vgl. Abbilding 10.14).
- Die Feststellschraube mit einem geeigneten Innensechskantschlüssel (Schlüsselweite 3 mm) losdrehen.
- Die Befestigungsschrauben des Encoders lösen und diesen vorsichtig aus der Bremse herausziehen.
- Die Wiedermontage des Encoders erfolgt wie oben erläutert.

HINWEIS

Für die beschriebene Demontage des Encoders mit nichttrennbarer Controlflex ist es notwendig die Welle um mindestens 180° drehen zu können. Wenn dies durch die Gegebenheiten des Antriebssystems bzw. der Maschine, in der die Bremse verbaut ist, nicht möglich ist, muss die Bremse mit einer axial teilbaren Variante der Controlflex-Ausgleichskupplung (siehe Abbildung 10.12) bestellt werden.

Wir empfehlen die teilbare Controlflex zu verwenden (Standard-Variante).

10.6 Option - Beschaltung

In der Kategorie 6 (XXXXX**X**XX) der 7-stelligen Optionsbeschreibung wird mitgeliefertes elektrisches Zubehör der Bremse festgelegt.

Tabelle 10.6: *Kategorie 6: Beschaltung*

Funktion/ option	Code
ohne elektrisches Zubehör/ without electrical accessories	**O**
Klemmenkasten lose/ terminal box loose	**L**
SSG lose/ quick switching rectifier loose	**S**
SSG auf Blech lose/ quick switching rectifier on sheet metal loose	**B**
GR lose/ rectifier loose	**G**
Zusatzheizung im Tachoflansch/ additional heating in tachoflange	**H**
Kundenspezifisch/ customized	**C**

Detailierte Informationen zu mitgeliefertem Zubehör sind der jeweiligen Maßzeichnung der Bremse zu entnehmen.

10.7 Option - Sonstiges

In der Kategorie 7 (XXXXXX**X**) der 7-stelligen Optionsbeschreibung werden sonstige Optionen der Bremse festgelegt.

Tabelle 10.7: *Kategorie 7: Sonstiges*

Funktion/ option	Code
ohne weitere Anforderungen, Horizontalbetrieb/ no additional requirements, horizontal operation	**O**
Vertikalbetrieb/ vertical operation	**V**
Einzelabnahme einer Marine-Klassifikationsgesellschaft/ case-by-case certification of marine classification society	**E**
Kundenspezifisch/ customized	C

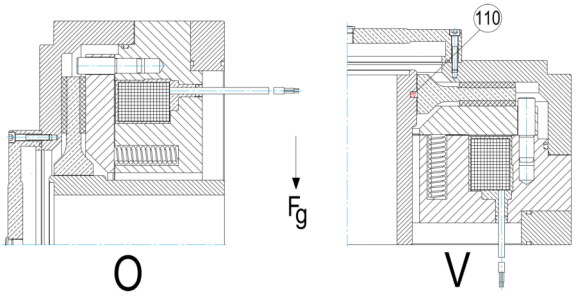


Abbildung 10.15: *Kategorie 7: O-V*

Bremsen der HPB-Baureihe sind standardmäßig für den horizontalen Einsatz vorbereitet (Einbaulage gemäß Abbildung 10.15 Ausführung **O**). In dieser Ausführung laufen sich die Reibflächen im gelüfteten Zustand frei. Für den Einsatz der Bremse in vertikaler Einbaulage ist mit dem Hersteller Rücksprache zu halten. In Abhängigkeit von Baugröße, Anwendung und räumlicher Orientierung sind in der vertikalen Ausführung (**V**) alternative Bauteile zu verwenden, um eine Restreibung an den Reibflächen im gelüfteten Zustand weitestgehend auszuschließen. Durch die Eigenmasse der Bauteile werden diese im vertikalen Aufbau Richtung Spulenkörper bzw. Bremsdeckel gezogen.

Um dem Eigengewicht der Reibscheibe entgegenzuwirken wird im Ritzel ein Rundring (110) montiert. Die Klemmwirkung des Rundringes (110) hebt das Eigengewicht der Reibscheibe auf, hindert sie aber nicht an ihrer axialen Bewegung auf dem Ritzel beim Zuschalten der Bremse. Für die Montage empfehlen wir den Rundring (110) leicht mit Fett (z.B. MoS_2) einzufetten. Diese Ausführung ist nur für den Betrieb der Bremse zulässig, wenn die Schwerkraft F_g in die in Abbildung 10.15 dargestellte Richtung zur Bremse Ausführung (V) zeigt.

HINWEIS

Bei horizontaler Einbaulage ist der Rundring(110) zu entfernen, da die Schwerkraftwirkung auf die Reibscheiben nicht vorhanden ist.

11 Ersatzteilhaltung, Kundendienst

11.1 Ersatzteilhaltung

Eine Bevorratung der wichtigsten Ersatz- und Verschleißteile ist eine wichtige Voraussetzung für die ständige Funktions- und Einsatzbereitschaft der Bremse. Verschleißteile sind Reibscheibe mit Reibbelag (2), Ankerscheibe (5), und Bremsdeckel (6) (Positionsangabe siehe Kap. 5.1).

Nur für die von uns gelieferten Originalersatzteile übernehmen wir eine Gewährleistung. Wir machen ausdrücklich darauf aufmerksam, dass der Einbau und/oder die Verwendung nicht von uns gelieferter Originalersatzteile die konstruktiv vorgegebenen Eigenschaften der Bremse negativ verändern und dadurch die aktive und/oder passive Sicherheit beeinträchtigen kann. Für Schäden, die durch die Verwendung von **Nicht**-Originalersatzteilen und -Zubehör entstehen, ist jede Gewährleistung seitens der Stromag GmbH ausgeschlossen.

Bitte beachten Sie, dass für Eigen- und Fremdteile oft besondere Fertigungs- und Lieferspezifikationen bestehen und wir Ihnen stets Ersatzteile nach dem neuesten technischen Stand und nach den neuesten gesetzlichen Vorschriften anbieten.

11.2 Daten für Ersatzteilbestellung

Es sind folgende Angaben erforderlich, die sich unter anderem auf dem Leistungsschild befinden:
(siehe Kap.3.1)

- Baureihe und Größe der Bremse
- Artikelcode
- Position und Benennung des Ersatzteils (siehe Kap. 5.1)
- Stückzahl

11.3 Kundendienstadresse

Unsere Anschrift für den Kundendienst und Ersatzteilvertrieb lautet:

Stromag GmbH
Hansastraße 120
59425 Unna

Telefon: +49 2303 102 0
E-Mail: info@stromag.com

Benötigen Sie einen Kundendienst-Monteur, so wenden Sie sich bitte unter obiger Adresse an unsere Abteilung "Customer Care".

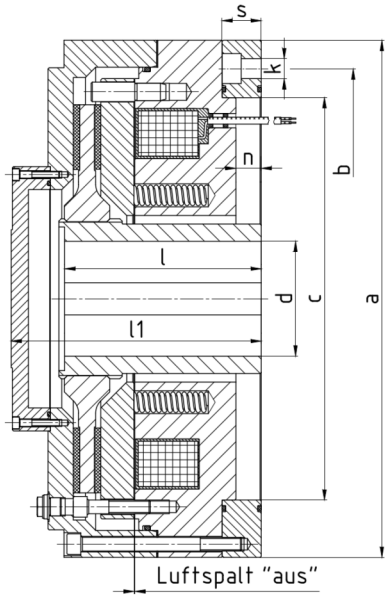
12 Aufgeführte Normen und Richtlinien

DIN 6885-1	Passfedern
DIN EN 60529 (VDE 0470-1)	Schutzarten durch Gehäuse (IP-Code)
DIN EN 50347	Drehstromasynchronmotoren für den Allgemeingebrauch mit standardisierten Abmessungen und Leistungen
DIN 42955	Rundlauf der Wellenenden, Koaxialität und Planlauf der Flansche umlaufender elektrischer Maschinen
DIN EN 60092-507 (VDE 0129-507)	Elektrische Anlagen auf Schiffen - Teil 507: Yachten
DIN EN 60034-5 (VDE 0530-5)	Drehende elektrische Maschinen - Teil 5: Schutzarten aufgrund der Gesamtkonstruktion von drehenden Maschinen
DIN VDE 0580	Elektromagnetische Geräte und Komponenten - Allgemeine Bestimmungen
2004/108 EG	Elektromagnetische Verträglichkeit
2006/95 EG	Niederspannungsrichtlinie

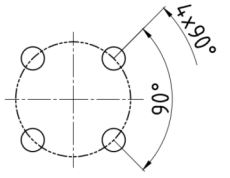
Die aufgeführten Normen und Richtlinien entsprechen dem jeweils gültigen Stand zum Zeitpunkt der Veröffentlichung dieses Dokumentes.

13 Anhang

13.1 Maßblatt



Anordnung der Bohrungen k und k1 bis Flanschgröße FF 350 nach DIN EN 50347 (A400 nach DIN 42948)



Anordnung der Bohrungen k und k1 ab Flanschgröße FF 400 nach DIN EN 50347 (A450 nach DIN 42948)

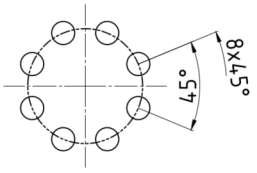


Tabelle 13.1: *Maßtabelle (alle Maße in mm)*

Bremsengröße	2HPB	20	25	27	30	35	40	45	55
Aussendurchmesser	*a*	200	250	275 (300)	300	350	400	450	550
Lochkreisdurchmesser	*b*	165	215	265	265	300	350	400	500
Zentrierdurchmesser	*cH7*	130	180	230	230	250	300	350	450
Gesamtlaenge	*l1*	129	144	166	171	183	195	217,5	229
Nenn-Luftspalt	*min*	0,5	0,6	0,6	0,6	0,6	0,7	0,8	1,0
	max	1,1	1,2	1,3	1,4	1,5	1,7	2,1	2,5
Ritzellaenge	*l*	96	110	117	117	142	142	171	171
max Ritzelbohrung	*dH7*	38	48	55	55	60	95	100	120
Zentrierlaenge	*n*	16	17	21	21	20	22,5	21	17
Flanschbreite	*s*	21	22	26	26	30	31	34	37
Bohrung	*k*	11	13,5	13,5	13,5	17,5	17,5	17,5	17,5
Flansch	*min*	A200	A250	A300	A300	A350	A400	A450	A550
Luftspalt im	*min*	0,4	0,5	0,5	0,5	0,5	0,6	0,7	0,9
Auslieferungszustand	*max**	0,7	0,8	0,9	0,9	1,0	1,1	1,3	1,6

∗ entspricht einer Verschleißreserve von min. 60% bezogen auf den min. und max. Nenn-Luftspalt nach dem Einschleifen der Bremse

14 Abbildungs- und Tabellenverzeichnis

Abbildungsverzeichnis

3.1 Leistungsschild HPB . . . 12
4.1 Transport und Montage mittels Ringschrauben . . . 16
5.1 Schnittdarstellung 2HPB45, Einzelteile sind mit Positionsnummern beschriftet . . . 18
5.2 Notlüftung mit Schrauben . . . 19
6.1 Beispiel Anziehdrehmomente . . . 21
6.2 Montage ohne Demontage . . . 22
6.3 Montage mit Demontage . . . 23
8.1 Schnitt 2HPB . . . 27
9.1 Luftspaltmessung 2HPB . . . 30
9.2 Kondenswasser ablassen . . . 32
10.1 Kategorie 1: A-R-K-S-G-B . . . 34
10.2 Kategorie 1: K-S-B . . . 34
10.3 Kategorie 2: O-S-V . . . 35
10.4 Induktiver Näherungsschalter . . . 36
10.5 Anschlussbild . . . 36
10.6 Mikroschalter . . . 36
10.7 Anschlussbild Mikroschalter . . . 36
10.8 Kategorie 3: H-O . . . 37
10.9 Handlüftung 4HPB . . . 38
10.10Standard-Farbschichtsystem (**L**) . . . 40
10.11Kategorie 5: K-O-B-W-E-G . . . 41
10.12Controlflex . . . 41
10.13Montage der Ausgleichskupplung an den Drehgeber . . . 42
10.14Montage des Drehgebers mit Kupplung an die Bremse . . . 43
10.15Kategorie 7: O-V . . . 46

Tabellenverzeichnis

1 Änderungshistorie . . . 2
3.1 Technische Daten . . . 13
3.2 Bremsmomente für Bremsen mit Abnahmen durch Klassifizierungsgesellschaften für Lifting Appliances . . . 14
6.1 Montagegenauigkeit . . . 24
10.1 Kategorie 1: elektrische Anschlussmöglichkeiten . . . 34
10.2 Kategorie 2: Überwachung . . . 35
10.3 Kategorie 3: Zubehör . . . 37
10.4 Kategorie 4: Oberfläche . . . 40
10.5 Kategorie 5: (Encoder-) Anschluss . . . 41
10.6 Kategorie 6: Beschaltung . . . 45
10.7 Kategorie 7: Sonstiges . . . 46
13.1 Maßtabelle (alle Maße in mm) . . . 49

A.1.2 Holding brake operating instructions Stromag 2HPB EN

STROMAG
A REGAL REXNORD BRAND

Electromagnetic Double-Face Spring-Applied Brake 2HPB

Document no.: 449-00242



Mounting Instructions

EN

Stromag GmbH

Hansastraße 120
59425 Unna
Tel.: +49 2303 102-0
Fax.: +49 2303 102-201
www.stromag.com
info@stromag.com

Revision history

Table 1: *Revision history*

Revised on	Issued on	Revisions
Version -	13.05.2020	Mounting instructions version 1
Version A	08.09.2021	Description of the options extended (Secton 10)
Version B	14.03.2022	Additions and editorial changes (Sections 8.1, 8.2, 8.3, 9.1, 9.2, 9.3, 10.3.2, 12)
Version C	22.09.2022	Acquisition Stromag GmbH
Version D	03.07.2023	Additions and editorial changes (Sections 3.2, 8.1, 10, 10.4, 10.5,13.1)

All details and figures corresponded to the latest information at the time of printing.
Subject to technical modifications without prior notice.

All copyrights and other protective rights to the contents of these instructions for use remain unrestrictedly the property of Stromag GmbH. No part of this publication may be reproduced without our prior consent.

© 2023 Stromag GmbH

Hansastraße 120
59425 Unna
Germany

Telephone: +49 2303 102 0
Telefax: +49 2303 102 201



IMPORTANT!

Read carefully before use!
Keep within easy reach for future reference!

Contents

1 Basics **6**
1.1 Purpose of these mounting instructions . . . 6
1.2 Layout of these mounting instructions . . . 6
1.3 Other applicable documents . . . 7
1.4 Manufacturer . . . 7

2 Safety guidelines **7**
2.1 Layout of warnings . . . 7
2.1.1 The various danger levels . . . 8
2.1.2 Warning symbols . . . 9
2.1.3 Personal protective equipment . . . 9
2.2 Conditions for safe use . . . 10
2.3 The owner's obligations . . . 10
2.4 The personnel's obligations . . . 10
2.5 Intended use . . . 11
2.6 Basic safety requirements . . . 12
2.7 Electromagnetic compatibility . . . 12

3 Technical data **12**
3.1 Rating plate details . . . 12
3.2 Torques, speed, technical data . . . 13
3.3 Bore and keyway dimensions, external measurements . . . 15
3.4 Scope of operation and intended use . . . 15

4 Transportation **16**
4.1 Packaging . . . 16
4.2 Pre-mounting condition . . . 17
4.3 Sensitivity . . . 17
4.4 Storage . . . 17
4.5 Scope of delivery . . . 17

5 Set up, mode of operation, and construction characteristics **18**
5.1 Designation of individual components (size 2HPB45 depicted) . . . 18
5.2 Mode of operation and construction characteristics of the standard version . . . 19
5.3 Mechanical release in the form of emergency release screws . . . 19
5.4 Electrical connection . . . 20

6 Mounting and removal **21**
6.1 Mounting . . . 22
6.1.1 Direct mounting . . . 22
6.1.2 Mounting with prior removal . . . 23
6.2 Mounting accuracy . . . 24
6.3 Measurements, space requirements, and mass . . . 24
6.4 Removal . . . 24

7 Initial setting into service **25**

8 Operation **25**
8.1 Operating conditions . . . 25
8.1.1 Holding operation . . . 25
8.1.2 Working operation . . . 26
8.1.3 Emergency stop . . . 26

8.2 Duty cycle, switching frequency . . . 26
8.3 Protection classes . . . 27
8.4 Trouble shooting . . . 28

9 Maintenance 29
9.1 Care and inspections . . . 29
9.2 Measuring the air gap . . . 29
9.3 Readjusting for wear . . . 30
9.4 Replacing the friction disc with friction lining . . . 31
9.5 Drain off condensate . . . 32
9.6 Inspections after emergency stop . . . 33

10 Variants and designation 33
10.1 Option - electrical connection . . . 34
10.2 Option - monitoring . . . 35
10.2.1 Inductive proximity switch . . . 36
10.2.2 Microswitch . . . 36
10.3 Option - accessories . . . 37
10.3.1 Anticondensation heater / O-ring . . . 37
10.3.2 Manual emergency release lever . . . 38
10.4 Option - surface . . . 40
10.5 Option - connections . . . 41
10.6 Option - electrical accessories . . . 45
10.7 Option - miscellaneous . . . 46

11 Spare parts stocking, customer services 47
11.1 Spare parts stocking . . . 47
11.2 Data for the ordering of spare parts . . . 47
11.3 Address of customer services . . . 47

12 Listed standards and regulations 48

13 Annex 49
13.1 Dimensional drawing . . . 49

14 List of Figures and Tables 50

1 Basics

For easier reading, the male forms are used throughout these mounting instructions. These male forms, however, also apply to female personnel.

1.1 Purpose of these mounting instructions

These mounting instructions describing the 2HPB type brake contain basic information, safety instructions, technical data, a description of operations, and details on transport, storage, mounting and removal, commissioning, operation, troubleshooting, spare parts stocking, customer services, and third party documentation.

All of the contained information and descriptions apply throughout the service life of the brake, including its decommissioning and disposal. The instructions must be followed without fail. The personnel assigned to work on the product must acknowledge with their signature that they have read and understood these mounting instructions.

All work on the brake must be performed by authorised personnel only. There must be no modifications or manipulations on the product.

The owner of the product must supplement these mounting instructions with the regulations from the applicable national accident prevention and environmental protection legislature.

1.2 Layout of these mounting instructions

These mounting instructions have been prefaced with a revision list. This is to simplify understanding of the revisions made to this document and therefore verification of the document's latest wording.

The following table of contents serves as a guide through the technical documentation.

The table of figures concluding these mounting instructions provides a quick overview of the included figures.

These mounting instructions make use of the following symbols:

- actions and lists are highlighted with a leading black bullet (•)
- intermediate headings and highlighted information are depicted in **bold text**
- all figures are numbered consecutively
- the components and parts depicted in the figures are assigned item numbers with joining lines
- every part and component has been assigned a specific item number that remains unchanged throughout these instructions
- the descriptive text introduces each part and component in the figures with their item numbers (1) in round brackets
- each figure is accompanied by a legend with the depicted parts and components and their item numbers.

1.3 Other applicable documents

The other applicable documents in the form of installation drawings and data sheets for the actual product are intended solely for qualified personnel. These provide details on the maintenance, repair, and configuration work specific to the brakes.

1.4 Manufacturer

Stromag GmbH
Hansastraße 120
59425 Unna
GERMANY

Telephone:	**+49 2303 102 0**
Telefax:	**+49 2303 102 201**
E-Mail:	**info@stromag.com**
Internet:	**www.stromag.com**

2 Safety guidelines

This section provides basic safety instructions and explains the layout of warnings. These instructions must be followed without exception if there is to be no danger to persons and property. Stromag accepts no liability for any damage incurred as a result of failure to observe these mounting instructions and specifically the section on safety.

2.1 Layout of warnings

The warnings are rendered in differentiating shades of grey. This aids in their identification on black and white printouts as well. These mounting instructions employ the following layout for the warnings:

pictogramm

SIGNAL WORD

Type of danger and its source
Consequences of failure to observe the warnings

- Measures to eliminate the danger.

2.1.1 The various danger levels

Dangers are divided into the following levels:



DANGER

This warns of imminent danger.
The consequences are death or the most grievous injuries.

- Measures to eliminate the danger.



WARNING

This warns of potential danger.
The consequences are death or the most grievous injuries.

- Measures to eliminate the danger.



CAUTION

This warns of potential danger.
The consequences may be injuries of slight to medium severity.

- Measures to eliminate the danger.



IMPORTANT

This warns of damage to property.
Damage may be caused to the product or objects in its vicinity.

- Measures to eliminate the danger situation



NOTE

This provides additional useful tips that simplify and explain the product's operation

2.1.2 Warning symbols



General warning symbol: This applies in situations that cannot be portrayed as a symbol for a single, specific danger.



Warning – suspended loads



Warning – hot surfaces



Warning – electric voltage



Warning – danger of crushing

2.1.3 Personal protective equipment



Shatterproof goggles with side visor that protect the eyes during mounting work.



ESD proof safety shoes with steel cap that protect against electrostatic discharge and crushing injuries.



ESD proof gloves that protect against electrostatic discharge and skin injuries.



Hard hat that protects the head from falling objects or workpieces during mounting, removal, and crane work.

2.2 Conditions for safe use

Definition of safe use:

All work required for the intended use of the brake must be performed with care if there are to be no accidents, injuries, or damage. Stromag GmbH accepts no liability for any damage and/or injuries incurred as a result of failure to observe this!

PPE

Any additional safety instructions issued by the owner must be observed. Personal protective equipment (PPE) must be worn during all work. All work on the brake is subject to all of the national accident prevention regulations.

Also applying:

- the brake may be used for the intended purpose only
- the brake must be in perfect technical condition
- the brake may be operated only when all of the safety equipment is fully functional
- the warnings and safety instructions defined in these mounting instructions must be observed without fail
- failure to observe the warnings and safety instructions may lead to death, grievous injury, and damage to the brake
- the instructions issued by the work safety officers must be followed without exception
- all safety instructions and warnings affixed to the brake must be observed and kept in legible condition
- the operator stand and all access paths must be kept clear of tools, auxiliaries, and other objects

2.3 The owner's obligations

Obligations of the owner

The owner is obliged to verify at regular intervals that his personnel work with safety awareness. The owner is obliged to assess the hazards of working at the machine in his purview and to derive therefrom operating instructions. The owner appoints a member of personnel responsible for the safe operation of the machine and the coordination of all work on and at the machine. The owner is obliged to employ only original spare parts and upgrades and/or to consult Stromag before retrofitting and replacing parts. In all events, the operation is subject to the local safety and accident prevention regulations. The owner must ensure adherence to the regulations.

2.4 The personnel's obligations

Obligations of the personnel

Each person in the user's factory dealing with the transport, mounting, commissioning, use, and removal of the product must have read and understood all of the operating instructions, in particular the safety guidelines.
Stromag accepts no liability for any damage or malfunctions incurred as a result of failure to observe the mounting instructions. The personnel assigned to operate and service the machine must confirm with their signature that they have received instruction. Persons under the influence of drugs, alcohol, or medication

may NOT work at or on the product, even when they are adequately qualified.
Furthermore, the personnel is obliged to observe the work safety provisions and operating instructions, to fulfil their responsibilities with all the due care, and to wear appropriate personal protective equipment (PPE).

Qualified personnel's obligations

On the strength of their technical training, knowhow, experience, and knowledge of the pertinent standards and provisions, qualified personnel are in a position to perform their assigned work and to identify and prevent potential dangers on their own account.

2.5 Intended use

Limitations of intended use

The brake is designed to connect and disconnect an energy flow in the form of transferred torque. It is an electromagnetically actuated device that is not provided ready for use. In other words, it must be connected to further components before it can fulfil its function. Its use as a brake is permitted only for dry running. Intended applications are its industrial use in general machine construction, hoisting and traversing drives, conveyor installations, building machinery, and all purposes requiring an electromagnetic brake. Intended use extends to the observance of mounting, removal, commissioning, and maintenance conditions prescribed by the manufacturer.
The user may not carry out any unauthorised conversions or changes which could impede safety, nor may he use any components or accessories from other manufacturers.
Failure to comply with these conditions or any use other than those described herein will be deemed not in accordance with the specification. The manufacturer accepts no liability for any damage incurred as a result; the risk is borne exclusively by the user. If the brake is to be used outside of this contractual field of applications, contact Stromag customer services for further details. Failing to do so will render the warranty void.



WARNING

Damage and injuries
The product has been designed exclusively for uses within the technical data listed under Sections 3 and 3.2 and under the operating conditions described in Section 8.1. Also applying to the product are its data sheets and installation drawings that can be obtained from customer services. See Section 11.3 for the address.

2.6 Basic safety requirements

Safety requirements

The product has been built according to the state of the art and operates safely. This device may pose dangers, however, when used by untrained persons incorrectly or in violation of its intended purpose.
Make sure not to operate the product in such a way that its safety might be impeded. The owner is obliged to notify the supplier immediately of any changes to the product that might impede the safety. The user is obliged to operate the product only when it is in perfect working condition.

2.7 Electromagnetic compatibility

Protective requirements

Directive 2014/30/EU stipulates that the operation of electrical equipment must adhere to certain protective requirements if this equipment is to function properly in its electromagnetic environment without mutual interference.

Hazards

In order to eliminate the direct and indirect effects posed by electromagnetic fields to persons, pets, and property, the user must implement suitable measures.

Intended installation

Machine builders and system and plant fitters must safeguard adherence to the protective requirements under Directive 2014/30/EU by installing the product and its power supply in accordance with its intended use.

Printed publication

For your assistance, you may request from our customer services our publication “EMV-Hinweise” (“EMC instructions”), no. 900-00001 (see Section 11.3 for the address).

3 Technical data

3.1 Rating plate details

The rating plate presents the following data. This is attached to the brake's circumference. These specifications must agree with the details in the order acknowledgement.

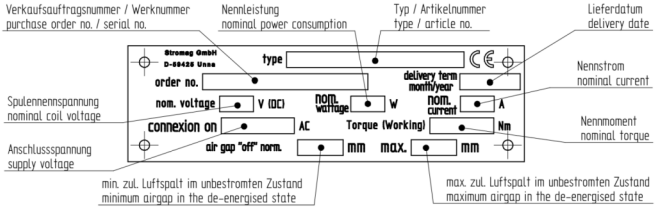


Figure 3.1: *rating plate 2HPB*

3.2 Torques, speed, technical data

Admissible torques and other technical data are given in Table 3.1. Any technical parameters deviating from the values given in the table may be requested from the manufacturer or form part of the order acknowledgement. The main parameters listed on the rating plate.

Table 3.1: *Technical data*

Size Variant	M_{SN} $[Nm]$	$M_{\ddot{U}}$ $[Nm]$	n_0 $[rpm]$	n_{zn} $[rpm]$	U_n* $[VDC]$	P_k $[W]$	Air gap $[mm]$ $min./max.$	$Q_{E,zul}$ $[kJ]$	J $[kgm^2]$	m $[kg]$
2 HPB 20 S	80	88	6500	3200	110	107,3	0,5/1,1	**	0,00168	20
2 HPB 20 H	100	110	6500	3200	110	107,3	0,5/1,1	**	0,00168	20
2 HPB 20 V	130	143	6500	3200	110	107,3	0,5/1,1	**	0,00168	20
2 HPB 25 S	130	143	6500	2500	110	83,9	0,6/1,2	**	0,00443	33,8
2 HPB 25 H	160	176	6500	2500	110	83,9	0,6/1,2	**	0,00443	33,8
2 HPB 25 V	200	220	6500	2500	110	83,9	0,6/1,2	**	0,00443	33,8
2 HPB 27 S	200	220	6500	2300	110	125	0,6/1,3	**	0,01232	46,6
2 HPB 27 H	250	275	6500	2300	110	125	0,6/1,3	**	0,01232	46,6
2 HPB 27 V	320	352	6500	2300	110	125	0,6/1,3	**	0,01232	46,6
2 HPB 30 S	320	352	6300	2100	110	151	0,6/1,4	**	0,01451	58,6
2 HPB 30 H	400	440	6300	2100	110	151	0,6/1,4	**	0,01451	58,6
2 HPB 30 V	500	550	6300	2100	110	151	0,6/1,4	**	0,01451	58,6
2 HPB 35 S	500	550	5400	1700	110	150	0,6/1,5	**	0,02668	87,6
2 HPB 35 H	630	693	5400	1700	110	150	0,6/1,5	**	0,02668	87,6
2 HPB 35 V	800	880	5400	1700	110	150	0,6/1,5	**	0,02668	87,6
2 HPB 40 S	800	880	4500	1500	110	212	0,7/1,7	**	0,05810	115,7
2 HPB 40 H	1000	1100	4500	1500	110	212	0,7/1,7	**	0,05810	115,7
2 HPB 40 V	1300	1430	4500	1500	110	212	0,7/1,7	**	0,05810	115,7
2 HPB 45 S	1300	1430	4100	1100	110	320	0,8/2,1	**	0,09256	181,5
2 HPB 45 H	1600	1760	4100	1100	110	320	0,8/2,1	**	0,09256	181,5
2 HPB 45 V	2000	2200	4100	1100	110	320	0,8/2,1	**	0,09256	181,5
2 HPB 55 S	2000	2200	3250	900	110	311	1,0/2,5	**	0,24412	249,3
2 HPB 55 H	2500	2750	3250	900	110	311	1,0/2,5	**	0,24412	249,3
2 HPB 55 V	3200	3520	3250	900	110	311	1,0/2,5	**	0,24412	249,3

* Other voltages on request
** See data sheet for detailed values (can be requested from customer care)

M_{SN}	:	switchable nominal torque at average friction speed of $1m/s$ according to DIN VDE 0580 (applies to dry running on oil- and grease-free friction lining after run in)
$M_{\ddot{U}}$	:	maximum static torque (moment of adhesion) according to DIN VDE 0580
n_0	:	maximum idling speed
n_{zn}	:	switching speed (revolutions) at average friction speed of approx. $20m/s$
P_k	:	electrical power consumption at 20 °C
$Q_{E,zul}$	:	maximum permitted single switching work
J	:	mass moment of inertia of the rotating brake parts
m	:	mass of the brake (standard version)
mode of operation	:	S1, S2, S4-40% I.O.
thermal class	:	155 (F) in accordance with DIN VDE 0580
AC-control	:	via rectifier

According to the applicable rules of the marine classification societies (e. g. Det Norske Veritas, American Bureau of Shipping, Loyds Register of Shipping, Buerau Veritas and others) for Lifting Appliances, the coefficient of friction μ assumed for the calculation of the torque of the brake shall not exceed a value of 0.3.

If the brake is ordered with an approval certificate (Type Approval, Case-by-Case Approval) for Lifting Appliances, the calculated braking torques M_{SN} and $M_{\ddot{U}}$ according to Table 3.2 apply with priority. In Table 3.2 the torque values are calculated under the limiting assumption $\mu \leq 0.3$.



NOTE

Each brake is run in and torque-tested at the factory before delivery. As delivered, the brake has a braking torque M_{SN} and $M_{\ddot{U}}$ according to Table 3.1, regardless of whether an approval certificate is enclosed with the brake or not. If you are unsure, please contact the customer care (contact information see Section 11.3).

Table 3.2: *Torque ratings for brakes with approval by classification societys for Lifting Appliances*

Size Variant	M_{SN} $[Nm]$	$M_{\ddot{U}}$ $[Nm]$
2 HPB 20 S	80	85
2 HPB 20 H	85	85
2 HPB 20 V	85	85
2 HPB 25 S	130	135
2 HPB 25 H	135	135
2 HPB 25 V	135	135
2 HPB 27 S	200	215
2 HPB 27 H	215	215
2 HPB 27 V	215	215
2 HPB 30 S	320	340
2 HPB 30 H	340	340
2 HPB 30 V	340	340
2 HPB 35 S	500	550
2 HPB 35 H	550	550
2 HPB 35 V	550	550
2 HPB 40 S	800	850
2 HPB 40 H	850	850
2 HPB 40 V	850	850
2 HPB 45 S	1300	1350
2 HPB 45 H	1350	1350
2 HPB 45 V	1350	1350
2 HPB 55 S	2000	2150
2 HPB 55 H	2150	2150
2 HPB 55 V	2150	2150

3.3 Bore and keyway dimensions, external measurements

The connecting dimensions can be taken from Table 13.1 under Section 13.1. The fitting key dimensions comply with DIN 6885-1.

3.4 Scope of operation and intended use

The 2HPB can be used both as a working brake and as a holding brake with emergency stop function. The maximum permissible loads can be found in the corresponding brake data sheet, which can be obtained from customer service (contact information see Section 11.3).

The brake is suitable for virtually all winch, crane, and industrial application types.

- Flood and seawater resistant, good protection under rough conditions, specifically suitable for harbour, offshore, and marine applications!
- For all winch and crane types.
- For industrial and other applications fulfilling the highest demands
- On wharf cranes, container transportation plant, for crane traversing, hoisting, and trolley traversing drives

Conditions of application:

- Electrical design of brakes in accordance with DIN VDE 0580 in thermal class 155 (F). The brake corresponds to Directive 2006/95/EC (Low Voltage Directive). The user must consult the manufacturer's instructions for safeguarding compliance with EMC Directive 2004/108/EC. The products are marked accordingly.
- Mode of operation: S1, S2, S4 - 40% duty cycle
- Horizontal installation. Vertical operation only after consultation with manufacturer.
- With the friction pairing steel / organic friction lining the brake may only be used for dry running under the conditions described in Sections 8.1 and 8.2. In addition, compliance with the mounting, removal, commissioning, and installation conditions specified by the manufacturer must be ensured. Failure to observe these conditions or any use beyond this will be deemed use not in accordance with the specification. The manufacturer accepts no liability for any such use; the risk is borne by the user alone.
- If the brake is to be used outside of this contractual range of applications, contact Stromag GmbH for further details (see Section 11.3 for contact information).

4 Transportation

The product may be transported only with suitable hoisting gear, industrial trucks, and sling gear of adequate load bearing capacity. In addition, the symbols on packages must be heeded.



DANGER

Danger of death under suspended loads.
Raising, lowering, and slewing loads poses a danger of death from falling parts or parts moving out of control.

- Never move under suspended loads.
- Note the specifications of the provided load fastening points.
- Do not secure sling gear to projecting machine parts or lugs on attached components.
- Do not attach sling gear to drilled/tapped holes.
- Make sure that the sling gear is seated securely.
- Use only suitable hoisting and sling gear of adequate load bearing capacity.
- Do not use ropes or belts with incipient tears or abrasions.
- Do not knot, twist, or place ropes or belts over sharp edges or corners.

Threaded holes have been provided in the coil body (1) for eyebolts to transport directly and mount the brake (see Figure 4.1).

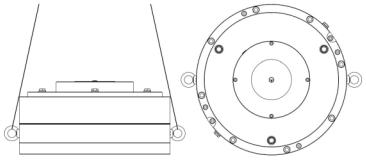


Figure 4.1: *Transporting and mounting by means of eyebolts*



WARNING

Danger of injury
Using the transport threads for any purpose other than the one intended may lead to grievous injury.

- These holes may ***not*** be used to transport or install the assembly (motor with attached coupling).
- The brake may ***not*** be transported at any fastening point other than those provided for this purpose.

4.1 Packaging

The packaging type complies with the agreements confirmed by the ordering party and specified in the order acknowledgement. If there is no agreement on the packaging type, the type selected must be appropriate for the transportation route. Ensure compliance with the symbols attached to the packaging.

4.2 Pre-mounting condition

The brakes are delivered as preassembled and configured units. The pinion (4) is included separately. If ordered, the manual release (40) is included separately and must be installed.

4.3 Sensitivity

Condensation as a result of temperature fluctuations must be avoided.

Make sure to avoid damage as a result of shocks or impacts during transportation. Special care should be exercised with regard to the delivered connecting cables.

4.4 Storage

Interim storage



IMPORTANT

Damage to components and malfunctions.
Incorrect storage may cause damage and malfunctions.

- Do not store out of doors
- Story in a dry environment free of dust
- Do not expose to aggressive media
- Storage temperature: +10 °C to +30 °C, no abrupt temperature fluctuations
- The environment must be aired moderately and dry.
  Maximum relative air humidity: 65%
- Examine regularly the general condition of all parts and the packaging during storage periods longer than three months
- If necessary, reapply or replace the preservation agents



NOTE

Note on the packaged units any affixed storage regulations beyond those herein.

If the brake is to be put into interim storage, it must be provided with additional corrosion protection. Details can be requested from our customer services (see Section 11.3 for the address).

The interim **storage regulation 449-00023** can be obtained from our customer services.

Failure to observe the instructions in this section will render void the warranty granted by Stromag GmbH. Please direct any questions to customer services (see Section 11.3 for the address).

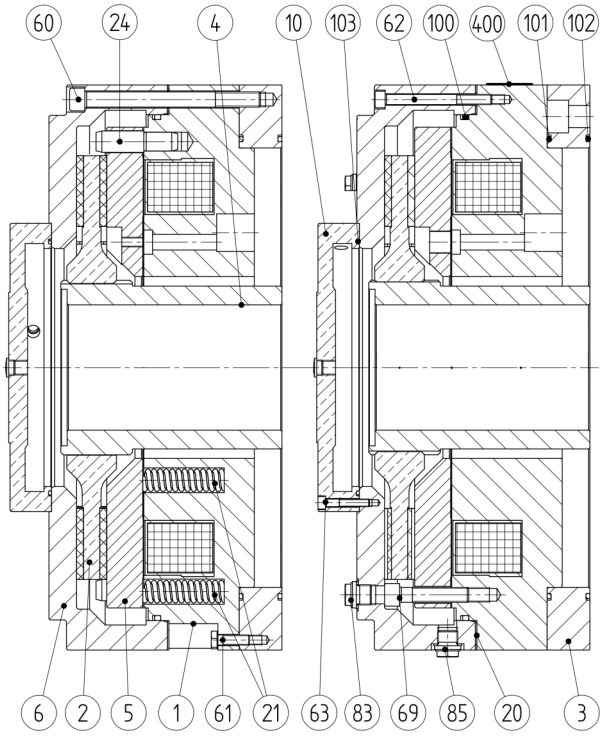
The external parts consist of seawater resistant aluminium and of steel provided with suitable surface protection.

4.5 Scope of delivery

On receipt, the completeness of the delivery must be checked against the packing list. Any transport damage and/or missing parts must be reported immediately in writing.

5 Set up, mode of operation, and construction characteristics

5.1 Designation of individual components (size 2HPB45 depicted)



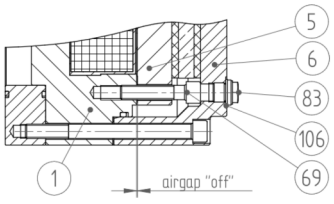
1	Coil body with coil	60	Screw for brake cover to flange
2	Friction disc with friction lining	61	Screw for coil body to flange
3	Customer's connecting flange	62	Screw for brake cover to coil body
4	Pinion	63	Screw for tacho flange to brake cover
5	Armature disc	69	Emergency release screw
6	Brake cover	83	Screw plug for emergency release
10	Tacho flange	85	Screw plug for air gap measuring
20	Shim	100	Sealing ring between coil body and brake cover
21	Pressure springs	101	Sealing ring between coil body and flange
24	Stud	102	Sealing ring between flange and motor
		103	Sealing ring between tacho flange and brake cover
		400	Rating plate

Figure 5.1: *Section through a 2HPB45, parts labelled with item numbers*

5.2 Mode of operation and construction characteristics of the standard version

The **2HPB** brake is a spring loaded electromagnetic double-face brake which brakes without voltage and is released electromagnetically. The **2HPB** brake type fulfils the highest requirements for durability, robustness, and seawater resistance. The brakes are built and tested in compliance with DIN VDE 0580. The brake is secured to the motor or any other machine part with cylinder screws. The coil body contains a coil which is potted with a synthetic resin compound in accordance with thermal class 155 (F, max limit of temperature 155 °C).
When there is no voltage across the coils, the pressure springs (21) press the armature disc (5) axially against the friction disc with friction lining (2). This is then firmly clamped between the torsion-protected armature disc (5) and the brake cover (6) and thus prevented from rotating. The braking effect is transmitted to the shaft from the toothed friction disc with friction lining (2) via the pinion (4) and a feather key. When the coil is connected to a direct voltage as specified on the rating plate (400), the electromagnetic force will draw the armature disc (5) to the coil body (1) against the spring force. The friction disc with friction lining (2) is released, the braking effect is cancelled, and the brake is released.

5.3 Mechanical release in the form of emergency release screws



1	Coil body with coil	69	Screw for mechanical release
5	Armature disc	83	Screw plug for emergency axial release
6	Brake cover	106	Sealing ring

Figure 5.2: *Emergency release screws*

In emergencies or for system adjustments, the screws (69) (two screws for size HPB 20, three screws for size HPB 25 to 45, four screws for size HPB 55) are used to release the brake mechanically. To release the brake, first unscrew the plugs (83) out of the brake cover (6). The emergency release screws (69) can now be accessed with an Allen key through the revealed openings. To release the brake, rotate the screws clockwise a little in turn until the braking effect is cancelled.



WARNING

Danger of serious injury and damage.
The emergency release is self locking, and you must not fail to turn it back to its initial position for normal operations. To do so, turn the screws (69) anticlockwise to the stop on the brake cover (6). Now insert the screw plugs (83) back in the brake cover (6). Make sure that the O-rings (106) are also installed. Only then can the product operate as intended with the ***full tightness.***

Manual emergency release must not be used to maintain temporary operation! The emergency release may not be used to test the functions of an optional switch!

5.4 Electrical connection

Notes on electrical connection



DANGER

Danger from electricity.
Electrical equipment can cause servious to fatal electric shock.

- Only qualified personnel trained to identify and circumvent electrical hazards may make the electrical connections on the spring actuated brake.
- Work may be performed on electrical components only when disconnected from their power sources
- Secure the voltage source against reactivation, and tag this
- Verify that there is no voltage across the equipment
- Earth and short circuit
- Cover or cordon off all adjacent live parts that can be contacted



WARNING

Danger of burns.
The coil, coil body, and neighbouring components may have hot surfaces after a protracted period of coil operation and as a result of friction heat. The brake cover (6) can present hot surfaces specifically from friction heat.

- Leave brake and adjacent components to cool
- Wear strong protective gloves to prevent contact with hot surfaces.

Make sure that the electrical connection is performed by expert personnel taking into account the installation regulations (such as DIN VDE 0129-507). The coil has been designed for 100% duty factor and connection to the D.C. supply specified on the rating plate (residual ripple <0.5). The permanently admissible voltage change is ***+6% to −10%*** of the nominal voltage. One convenient solution for protecting the coil and power unit takes the form of a correspondingly dimensioned varistor (operating voltage and power) connected to the coil input. Details can be requested from our customer services (see Section 11.3 for the address).

6 Mounting and removal

Mounting and removal instructions

WARNING

Danger of serious injury and damage.
Unsuitable screws and keys may cause parts to detach and fly out, with the risk of grievous injury or death.

- Use only screws and keys of the specified size and strength
- Note the wrench torques
- Use the prescribed bolt locks

IMPORTANT

Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

- All of the fastening screws must tightened in a manner preventing jamming
- Do not use excessive force when mounting
- Note the location of the electrical connection

NOTE

Only authorised, trained, and instructed personnel may operate, service, and repair the brake. These personnel must have read and understood all of the mounting instructions and have received specific instruction in the potential risks.

Each installation drawing includes a table of all the screws used and their tightening torques. Most screw locks in the form of liquid synthetics require higher wrench torques. Please observe the manufacturer's specifications. Proceed in reverse order to remove the mounted component. All warnings and safety instructions must be observed.

Anzugsmomente Schrauben/ tightening torque screws			
Pos.	Bezeichnung/ designation	Material/ material	Anzugsmoment/ tightening torque
60	M12x140	A2-70	74 Nm
61	M8x70	A2-70	21,4 Nm
62	M8x85	A2-70	21,4 Nm
63	M6x35	A2-70	8,8 Nm

Figure 6.1: *Example tightening torques*

6.1 Mounting

See Section 5.1 for each of the parts with item no.

6.1.1 Direct mounting

Depending on the flange type, the brake may have to be removed before it is mounting on the drive.
If the fastening points are accessible on the customer's connecting flange (3) in the delivered state, the flange does not need to be removed before the brake can be attached (Figure 6.2). During mounting, the tacho flange (10) can be removed. The friction disc (2) can then be aligned more easily to the pinion (4). This has been secured to the brake cover with screws (63) (Figure 5.1).

- Check that the connecting dimensions agree with the brake's specifications.
- Remove all transportation and storage protection devices, burr, and impact damage.
- Check face runout of the flange mounting surface relative to the shaft to be braked (tolerance class N in accordance with DIN 42955 should not be exceeded).

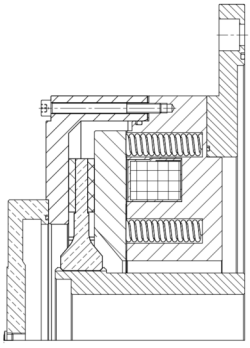


Figure 6.2: *Mounting without prior removal*

- Apply a small amount of grease to the shaft and feather key, fit the pinion (4), and secure them in their axial positions.
- Using suitable sling gear, shackles, or similar, manoeuvre the brake carefully over the pinion (4). By turning the shaft or swivelling the brake, engage the teeth on the pinion in the teeth on the friction disc with friction lining (2). In doing so, make sure that the friction disc with friction lining (2) and the pinion (4) assume their central positions. (The friction disc with friction lining [2] has been centred beforehand for the brake's final acceptance.)
- Use suitable screws to secure the brake at its correct position on the motor flange. Make sure that the electrical connection is performed by expert personnel taking into account the pertinent installation regulations.
- If necessary, use screws (63) to secure the removed tacho flange (10) at its correct position, and tighten it with the torque specified on the drawing.



IMPORTANT

Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

- When attaching the components, make sure that all O rings and gaskets are installed properly at their designated positions.

Do not use force! **Do not jam!** **Note the length of the cable!**

6.1.2 Mounting with prior removal

If the fastening points are not accessible on the customer's connecting flange (3) in the delivered state, the flange (3) must be removed before the brake can be attached (Figure 6.3). During mounting, the tacho flange (10) can be removed. The friction disc (2) can then be aligned more easily to the pinion (4). This has been secured to the brake cover with screws (63).

- Check that the connecting dimensions agree with the brake's specifications. Remove all transportation and storage protection devices, burr, and impact damage.
- Check face runout of the flange mounting surface relative to the shaft to be braked (tolerance class N in accordance with DIN 42955 should not be exceeded).

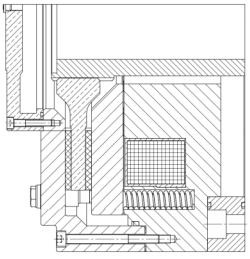


Figure 6.3: *Mounting with prior removal*

- Remove the screws (60) and (61).
  The screws marked red (62) may not be removed. If there are no red markings, the screw position is marked with additional centrings on the brake cover.
- Using suitable sling gear, shackles, or similar, separate carefully the flange (3) and brake. Make sure that there can be no damage to the seal and centring faces.
- Use suitable screws to secure the flange (3) at its correct position on the motor flange.
  Apply a small amount of grease to the shaft and feather key, fit the pinion (4), and secure them in their axial positions.
- Using suitable sling gear, shackles, or similar, manoeuvre the brake carefully over the pinion (4). By turning the shaft or swivelling the brake, engage the teeth on the pinion in the teeth on the friction disc with friction lining (2). In doing so, make sure that the friction disc with friction lining (2) and the pinion (4) assume their central positions. (The friction disc with friction lining [2] has been centred beforehand for the brake's final acceptance.)
- Use suitable screws to secure the brake at its correct position on the motor flange. Make sure that the electrical connection is performed by expert personnel taking into account the pertinent installation regulations.
- If necessary, use screws (63) to secure the removed tacho flange (10) at its correct position, and tighten it with the torque specified on the drawing.



IMPORTANT

Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

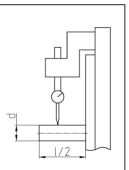
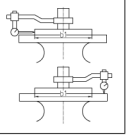
- When attaching the components, make sure that all O rings and gaskets are installed properly at their designated positions.

Do not use force! **Do not jam!** **Note the length of the cable!**

6.2 Mounting accuracy

The concentricity of the shaft section bearing the pinion (4), and the coaxiality and true running of the mounting flange must comply with DIN 42955 tolerance class "N" .

Table 6.1: *mounting accuracy*

concentric run of the shaft	diameter of the cylindric shaft end d in mm	concentric run $N(norm.)$ in mm	
	above 30 up to 50 above 50 up to 80 above 80 up to 120 above 120 up to 180	0.05 0.06 0.07 0.08	
coaxiality and concentric run of the mounting flange	mounting flange centering diameter in mm	coaxiality and concentric run in mm	
	above 100 up to 230 above 230 up to 450 above 450 up to 800	0.1 0.125 0.16	

6.3 Measurements, space requirements, and mass

The binding measurements, the mass (weight), and other technical data must be taken from the dimensional drawing binding for the order. This may be requested from our customer services (see Section 11.3 for the address).

6.4 Removal

Removal is subject to the same instructions and regulations as mounting. Carry out the operations in inverse order of succession.



DANGER

Incorrect removal can cause damage
The consequences are death or the most grievous injuries.

- Verify that the brake is free of torque.
- Disconnect the brake from its power source.
- First secure with sling gear, then remove!

7 Initial setting into service

See Section 5.1 for each version's individual parts with item no.

Commissioning requires the following prior test measures:

- The electric loads listed on the rating plate (400; see Section 3.1) must agree with those on site.
- The brake must be undamaged, i.e. it may not exhibit any damage from transport, storage, etc.
- The prescribed operating conditions (Section 8.1) must agree with those on site
- The mechanical emergency release as defined under Section 5.3 may not be active.
- Testing the brake's electrical operation involves a number of electrical releases.

8 Operation



NOTE

Notwithstanding any instructions given below, operation of the brake must always comply with local mandatory safety and accident prevention rules. Compliance with these rules must be ensured by the user.



WARNING

Danger of burns.
The coil, coil body, and neighbouring components may have hot surfaces after a protracted period of coil operation and as a result of friction heat. The brake cover (6) can present hot surfaces specifically from friction heat. Before all repair and maintenance work:

- Leave brake and adjacent components to cool
- Wear strong protective gloves to prevent contact with hot surfaces.

8.1 Operating conditions

The operating conditions to be maintained for a faultless operation of the brake are given below:

- The operating temperature should not be below $-30\,^{\circ}C$ and not above $+50\,^{\circ}C$.
- In the case of higher and/or lower ambient temperatures, please contact our customer services (see Section 11.3).
- If the brake is ordered with an approval certificate of a marine classification society, different permissible ambient temperatures may apply. In this case, please contact our customer care (see Section 11.3 for contact information).

8.1.1 Holding operation

The drive connected to the brake is stopped in holding mode by the speed-controlled electric motor or functionally comparable devices. Only after braking to a standstill does the spring-applied brake engage and hold the drive in the de-energised state.

8.1.2 Working operation

In working mode, the brake is used to decelerate the drive until it comes to a standstill. The maximum permissible loads can be found in the brake data sheet.

8.1.3 Emergency stop

In comparison to working operation, an emergency stop is characterized by the fact that the stress caused by the braking of the drive is at the upper limit of the mechanical and/or thermal load capacity of the brake.



NOTE

Breaking under load (e. g. due to working mode or emergency stop) causes wear of the friction surfaces, that reduces the service life of the brake.



IMPORTANT

Exceeding the contractually agreed limit values when operating the brake can damage the brake and impair its function.

- The maximum permissible loads can be found in the brake data sheet.
- A design calculation for the existing load cases by Stromag GmbH is recommended.



IMPORTANT

Emergency stops must not be made in immediate succession to avoid damaging the brake.

- After each emergency stop, inspections must be carried out according to Section 9.6.

8.2 Duty cycle, switching frequency

The design as well as admissible loads on brakes as per braking torque, speed, and switching capacity are given under “Technical data” (see Section 3), the dimensional drawing (attachment), and their data sheet. If any of these data are exceeded consult the manufacturer.

8.3 Protection classes

Fully mounted and properly installed, the basic version of the brake (see Figure 8.1) complies with IP 67 as defined under DIN EN 60529 (VDE 0470-1) and DIN EN 60034-5 (VDE 0530-5).

This protection class is maintained when original Stromag accessories are used, e.g. cable glands. The same applies when rpm encoders (IP 67) are secured firmly to the cover via flange connection fitted with a sealing ring.

In the variant with terminal box, the brake complies with IP 66!

Sealing rings on through shafts compromise the protection class to an extent that varies from version to version. The manufacturer must be consulted.

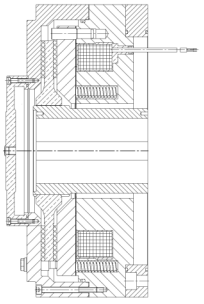


Figure 8.1: *Section through 2HPB*

NOTE

The brake maintains its protection class when its faces contacting the motor or an attached tacho generator are provided with suitable sealants (e.g. Hylomar or sealing ring). The user must provide a sealing element on the shaft that prevents grease and oil penetration into the brake from the motor bearing.

8.4 Trouble shooting

Fault	Possible causes	Remedy
Insufficient braking effect	Friction surfaces are not free from grease	Replace friction disc with friction lining (2), and clean mating friction surfaces
	Max air gap exceeded due to wear of friction lining	Readjust brake (Section 9.3) If necessary, replace friction disc with friction lining (2)
	Brake not completely run-in	Let brake run in
	Brake has been overloaded	Replace brake
	Spring rupture	Remove brake; consult manufacturer
No braking effect	Manual mechanical release actuated but not returned	Note Section 5.3
Brake does not release	Max air gap exceeded due to wear of friction lining	Readjust brake (Section 9.3) If necessary, replace friction disc with friction lining (2)
	Friction disc with friction lining (2) seized on pinion (4)	Replace friction disc with friction lining (2) and pinion(4) (Section 9.4)
	Armature disc (5) distorted	Replace brake (Section 6)
	Coil connecting voltage too low	Check DC voltage supply
	Coil defective	Replace brake (Section 6)
	Feed line defective	Renew feed line
	Contact points loose	Re-tighten contact points
	Foreign body in air gap (e.g. spring rupture)	Remove brake; consult manufacturer
With optional switch:	Armature disc was not drawn against the coil body's face, e.g. as a result of:	Readjust brake (Section 9.3) If necessary, replace friction disc with friction lining (2)
No switch function	•Admissible air gap exceeded	Check the switch settings against the setup instructions
	•Foreign body in air gap	Remove and clean brake Check the switch settings against the setup instructions
		Remove brake; consult manufacturer

9 Maintenance

9.1 Care and inspections

NOTE

Make sure to comply with Section 2 "Safety guidelines" during all maintenance and inspection work. Applying in addition to the following instructions are the safety and accident prevention regulations in force at the site of use.

The owner is obliged to observe these regulations.

As the brakes work under varying operation conditions, it is not possible to pre-define wear check, inspection maintenance and repair intervals. Higher loads on the brakes (e.g. as a result of torque, speed, switching frequency, ambient temperature etc.) require shorter maintenance intervals. Therefore it is first of all necessary to observe the brake with regard to safety and wear, and then adapt the maintenance intervals in accordance with the observation made.

Wear on the friction lining will result in a wider air gap. Therefore, depending on the load of the brake, the air gap must be checked from time to time. This can take the form of measurements on the air gap as set down under Section 9.2. If the air gap exceeds its maximum value in Table 3.1, then the air gap must be readjusted as set down under Section 9.3.

The friction linings are subject to heavy wear and may generate large deposits. Regular cleaning of the brake is therefore recommended. The apertures for air gap measurements may then be used to vacuum off loose deposits abraded from the friction linings. Also, compressed air may be applied to clear the brake of friction lining deposits without prior removal.

In the course of inspection or maintenance work, the mechanical components of the brake must be inspected for damage at least by visual inspection. Check the proper function of the sliding between the involute spline joint of the pinion (15) and the friction disc (2).

WARNING

Danger of serious injury and damage.
If the wear re-adjustment is not carried out early enough, both the transmission of the rated load torque and the release of the brake will not be ensured. This may cause death or grievous injury.

- Set down regular inspection intervals
- Set down regular maintenance intervals

9.2 Measuring the air gap

The air gap between the coil body (1) and armature disc (5) can be measured only when there is no voltage across the coil. Measure the air gap at two places on the circumference, 180° opposite to each other. To do so, remove the two screw plugs (83). By inserting a feeler gauge through the threaded bore now lying free in the brake cover (6), you can measure the air gap between the coil body (1) and armature disc (5). **It is essential to ensure that the feeler gauges are only pushed into the outer area between the coil body and the armature disk and not beyond the recess of the armature disk pole surface.** The airgap must lie between „off min" and „off max" (Table 3.1). After measuring, reseal the bores with the screw plugs (83) and their sealing rings (106).

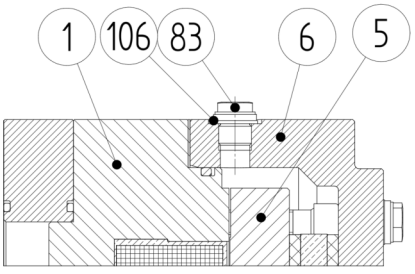


Figure 9.1: *Measuring the air gap on the 2HPB*

9.3 Readjusting for wear

On reaching „off max“ in Table 3.1, the brakes' air gap must be readjusted. This involves the following procedure according to Figure 5.1:



DANGER

Incorrect removal can cause damage
The consequences are death or the most grievous injuries.

- Verify that the brake is free of torque.
- Disconnect the brake from its power source.



DANGER

A sudden release of the pressure springs can cause damage
The consequences are death or the most grievous injuries.
The coil body and armature disc are under the axial force of the pressure springs! Flying parts may pose a risk when the pressure springs unbend suddenly.

- Perform a mechanical emergency release on the brake as described in Section 5.3
- Remove the screws (60) and (62)
- Remove the brake cover (6) on the coil body (1) In doing so, be careful not to damage the armature disc (5)
- Remove the shim (20), and again mount (in reverse order) the brake cover (6) at its correct position on the coil body (1)
- Tighten the screws (60) and (62) with the torque specified on the drawing
- Remove the mechanical emergency release on the brake as described in Section 5.3
- Measure the air gap as described in Section 9.2; Check that the brake switches properly.



IMPORTANT

Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

- When assembling the brake or replacing the friction disc with friction lining, take great care not to contaminate the brake lining with grease. Any greasy substances can be removed with suitable degreasing agents. ***Never use petrol or paraffin!***
- If the air gap has already been adjusted previously in this manner, then a new friction disc with friction lining (2) must be installed as described in Section 9.4. This time, though, the shim (20) must be put back.
- When attaching the components, make sure that all O rings and gaskets are installed properly at their designated positions.

9.4 Replacing the friction disc with friction lining



DANGER

Incorrect removal can cause damage
The consequences are death or the most grievous injuries.

- Verify that the brake is free of torque.
- Disconnect the brake from its power source.



DANGER

A sudden release of the pressure springs can cause damage
The consequences are death or the most grievous injuries.
The coil body and armature disc are under the axial force of the pressure springs! Flying parts may pose a risk when the pressure springs unbend suddenly.

- Perform a mechanical emergency release on the brake as described in Section 5.3
- Remove the screws (60) and (62)
- Remove the brake cover (6) on the coil body (1) In doing so, be careful not to damage the armature disc (5)
- Take the friction disc with friction lining (2) off the pinion (4).
- Clean brake
- Manoeuvre a new friction disc with friction lining (2) over the teeth on the pinion (4).
- Insert the shim (20).
- Again mount (in reverse order) the brake cover (6) at its correct position on the coil body (1)
- Tighten the screws (60) and (62) with the torque specified on the drawing

- Remove the mechanical emergency release on the brake as described in Section 5.3
- Measure the air gap as described in Section 9.2
- Check that the brake switches properly.

WARNING

Incorrect commissioning may cause damage and malfunctions
New friction linings need some time before they can transfer the full braking torque.

- They must first be run in with a number of controlled brakings.

9.5 Drain off condensate

Large temperature fluctuations give rise to condensation, which is also affected by the component's surface temperature, the ambient temperature, and the relative air humidity. As a result, the collecting condensate must be drained off at regular intervals depending on the ambient conditions. Provided for this purpose is a condensate drain screw (see Figure 9.2).

WARNING

After every condensate drain, the sealing ring (106) must be reinstalled.

On horizontal installations, proceed as follows (see Figure 9.2). The procedure for vertical installations varies from version to version.

- Remove the condensate drain screw (83), and remove its seal (106).
- Drain off condensate
- Fit the seal (106) to the condensate drain screw (83), and insert and tighten this

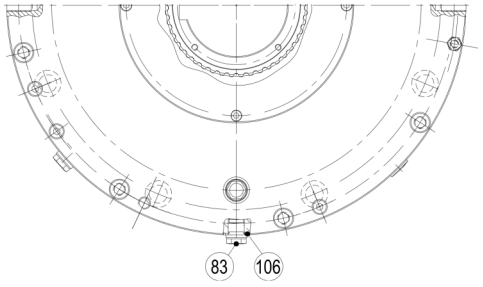


Figure 9.2: *2HPB drain plug*

9.6 Inspections after emergency stop

After an emergency stop described in Section 8.1.3, the following inspection work has to be carried out to ensure a safe continued operation of the brake.



WARNING

Risk of burns from hot brake components!

- Allow the brake to cool down to ambient temperature before performing the inspection work.

- Check the airgap of the cooled down brake as described in Section 9.2.
- If the maximum permitted airgap is reached, maintenance work according to Section 9.3 or Section 9.4 have to be done.
- When dismantling the brake, the mechanical components must at least be visually inspected for damage and, if necessary, replaced with original spare parts.

10 Variants and designation

The brakes of type HPB are described with a defined designation key. The first part of the designation (①, ②, ③ and ④) names the type and size of the brake. In the second designation part (⑤, ⑥ and ⑦), the customer connection is described, while in the last part (⑧) the other options are represented by a 7-digit letter combination.

Designation key (example of standard brake version):

2	**HPB**	**45**	**S**	**-**	**110V**	**100H7**	**A450**	**-**	**A O O O G O O**
①	②	③	④		⑤	⑥	⑦		⑧

①	number of friction surfaces	**2** or **4**
②	series	**HPB** ("**H**igh **P**erformance **B**rake")
③	size	min. outer diameter **a** [**mm**] / **10** (see dimensional drawing Section 13.1)
④	torque variant	**S** - standard, **H** - high or **V** - very high (see Table 3.1)
⑤	nominal coil voltage	**110 V** DC or customized
⑥	bore diameter of pinion	customized or **NOPI** - no pinion
⑦	motor connection flange	acc. to DIN 42948 (EN 50347) or **NOFL** - no flange
⑧	options	see following sections

10.1 Option - electrical connection

Category 1 (**X**XXXXXX) of the seven-letter description defines the electrical connection for this option.

Table 10.1: *Category 1 - electrical connection*

Funktion/ option	Code
Leitungen axial/ cable axial	**A**
Leitungen radial/ cable radial	**R**
Klemmenkasten m. Klemme/ terminal box with clamp	**K**
Klemmenkasten m. SSG/ terminal box with quick switching rectifier	**S**
Klemmenkasten m. GR/ terminal box with rectifier	**G**
Klemmenkasten m. Klemme + GR/ terminal box with clamp + rectifier	**B**
Kundenspezifisch/ customized	**C**

The axial cable version (**A**) is standard.

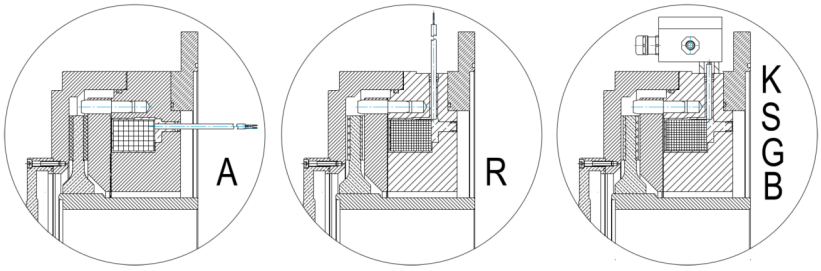


Figure 10.1: *Category 1: A-R-K-S-G-B*

There are a number of options for the terminal box.

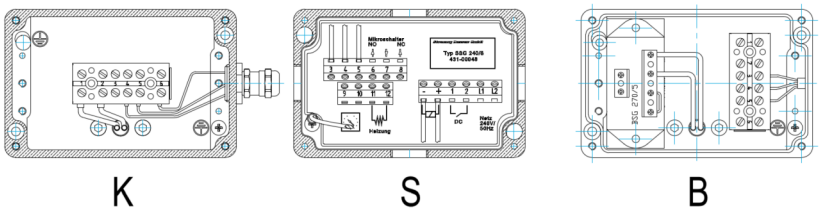


Figure 10.2: *Category 1: K-S-B*

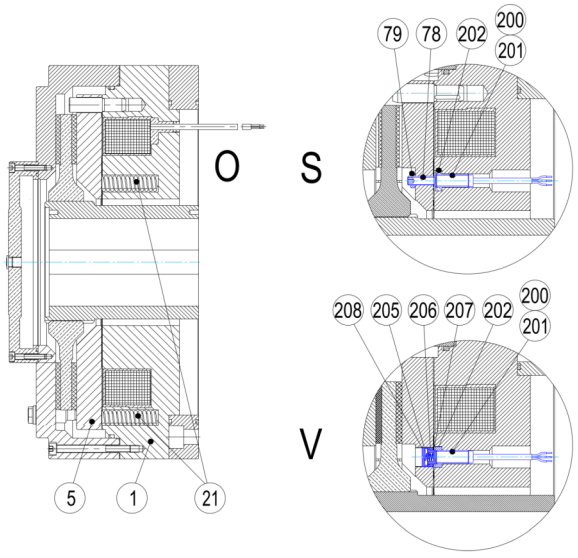
Please consult here Section 5.4.

10.2 Option - monitoring

Category 2 (X**X**XXXXX) of the seven-letter description defines the brake monitoring for this option.

Table 10.2: *Category 2: monitoring options*

Funktion/ option	Code
ohne Zustandsüberwachung/ without monitoring	**O**
Schaltzustandskontrolle (SZK) mit ind. Schalter/ state of operation via inductive switch	**S**
2x SZK mit ind. Schalter/ 2x state of operation via inductive switch	**R**
Verschleißkontrolle (VK) mit ind. Schalter/ wear state via inductive switch	**V**
SZK + VK mit ind. Schalter/ state of operation + wear state via inductive switch	**A**
SZK mit Mikroschalter/ state of operation via microswitch	**P**
2x SZK mit Mikroschalter/ 2x state of operation via mircroswitch	**Q**
SZK + VK mit mikroschalter/ state of operation + wear state via microswitch	**B**
SZK m. ind. Sch., VK mit Mikrosch./ state of op. via microswitch, wear state via ind. switch	**D**
Kundenspezifisch/ customized	**C**



1	Coil body with coil	201	Inductive proximity switch
5	Armature disc	202	Round nut for ring nut
21	Pressure spring	205	Return spring for wear detection
78	Threaded pin	206	Bush for wear detection
79	Hexagon nut	207	Piston for wear detection
200	Microswitch	208	Cover for wear detection

Figure 10.3: *Category 2: O-S-V*

10.2.1 Inductive proximity switch

The proximity switch is a noncontacting, and therefore wear-free, limit switch. It is actuated by means of a metal placed inside the switching distance and ahead of the active detector face. As depicted in Figure 10.4, the inductive proximity switch (201) is fitted with a cylindrical metal housing presenting an external thread. The switching element features a PNP output and operates as a normally open (NO) contact (see Figure 10.5).

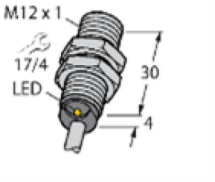


Figure 10.4: *Inductive switch*

When, under magnetic force, the axially moving armature disc (5) is drawn against the coil body, the inductive switch (201) detects the threaded pin (78) used to set the switch point, and the switch is closed. When there is no voltage across the brake, the springs (21) press the armature disc (5) away from the coil body, giving rise to an air gap between these two. When this air gap has grown to an extent causing the piston (207) in the armature disc to advance out of the switching distance set for the inductive switch (201), the brake has reached its wear limit, and the switch opens.

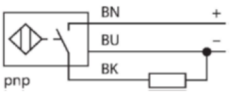


Figure 10.5: *Connecting diagram*

10.2.2 Microswitch

The microswitch (200), see Figure 10.6, consists of a cylindrical housing with external thread. In this housing is a snap switch that functions as a changeover (Figure 10.7) with the following contacts:
(c) and (no) = make contact
(c) and (nc) = break contact
(c) common ground (nc) normally closed (no) normally open



Figure 10.6: *Microswitch*

If the switch or wear state must be monitored in an HPB, the switch (200) is fixed in place in the coil body (1) as shown in Figure 10.3. This involves screwing the ring nut (202) on the switch (201), and then inserting and gluing the two in the recess provided on the coil body (1). When pulled by magnetic force towards the coil body, the axially traversing armature disc (5) actuates the microswitch (200).



Figure 10.7: *Microswitch connecting diagram*

Switch details can be taken from the **mounting instructions 449-00254**. You can request these from our customer care (see Section 11.3 for contact information).

10.3 Option - accessories

Category 3 (XX**X**XXXX) of the seven-letter description defines the accessories and their combinations for this option.

Table 10.3: *Category 3: accessories*

Funktion/ option	Code
ohne Extras mit O-Ring/ without extras with O-ring	**O**
ohne O-Ring/ without customer seal ring	**W**
ohne O-ring, ohne Bef.-schr./ without customer seal ring and fixing screws	**P**
Anticondensationsheizung (HZ)/ anticondensation heating	**H**
HZ ohne O-Ring/ with anticondensation heating, without seal ring	**R**
Handlüftung (HL)/ with hand release	**N**
HL ohne O-ring/ with hand release, without O-ring	**M**
HZ + HL/ with anticondensation heating and hand release	**B**
HZ + HL ohne O-ring/ with anticondensation heating and hand release, without O-ring	**S**
Kundenspezifisch/ customized	**C**

10.3.1 Anticondensation heater / O-ring

When large temperature fluctuations are expected, an anticondensation heater may be provided. The supply line is routed together with the coil connecting line.
The brake may be delivered to the customer with or without an O-ring. The standard brake delivery is with O-ring.

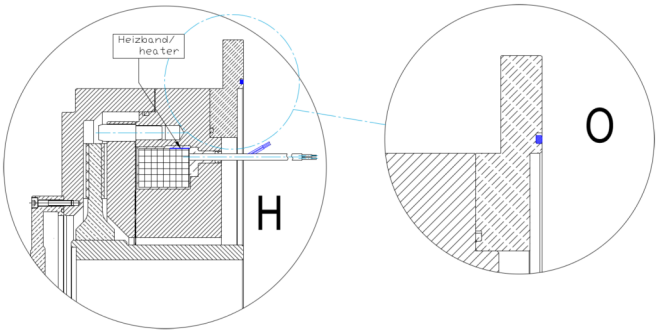


Figure 10.8: *Category 3: H-O*

10.3.2 Manual emergency release lever

The brake can be fitted with a manual emergency release lever that releases it in the event of an emergency, e.g. on power failure. Pulling the manual release stirrup (41) by about 30° towards the rear side of the brake (see Figure 10.9) presses the armature disc (5) axially against the coil body (1). The friction disc with the friction lining (2) can then move freely.

This manual emergency release lever is also self locking, which secures the unactuated mechanism as follows. The rod (41) is pressed against the stop stirrup (42). The rod (41) then engages in the spring clip (43) where it is locked in position.

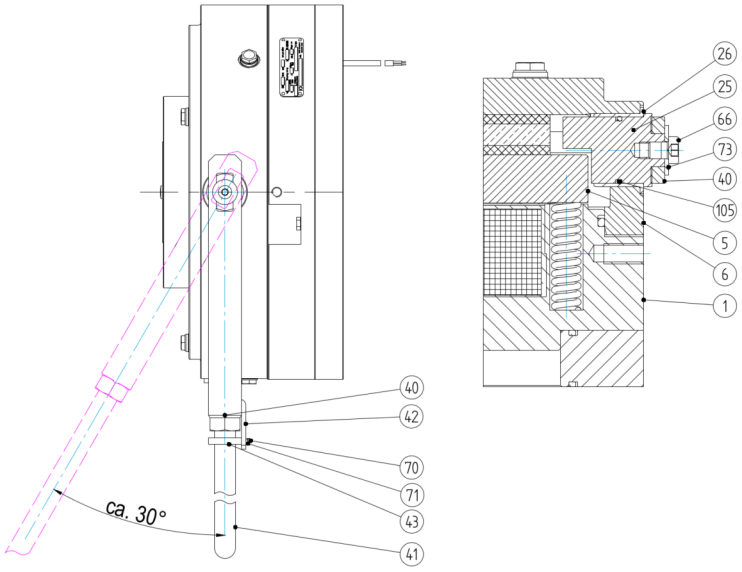


Figure 10.9: *Manual release 2HPB*

NOTE

These are spring actuated brakes that engage in the event of electrical power failure. Using the manual emergency release lever disables the spring system. We do not recommend this manner of manual emergency release.



WARNING

Danger of serious injury and damage.
Manual emergency release must not be used to maintain temporary operation!



WARNING

Danger of serious injury and damage.
The manual emergency release may not be used to test the functions of an optional switch!



DANGER

Danger of serious injury and damage.
The consequences are death or the most grievous injuries.
The air gap "OFF max" may not be exceeded. Otherwise, the rated torque might not be transferred.

10.4 Option - surface

Category 4 (XXX**X**XXX) of the seven-letter description defines the brake's surface finish for this option.

Table 10.4: *Category 4 - surface*

Funktion/ option	Code
ohne Lackierung/ without painting	**O**
Lackierung - grundiert/ primed	**G**
Lackierung - Standard/ standard painting	**L**
Lackierung - Sonder/ special painting	**S**
Kundenspezifisch/ Customized	**C**

As standard for the entire HPB series **all external steel parts are provided with a special non-metallic surface protection** that prevents corrosion due to moisture or galvanic corrosion to non-steel metals. External components that are not made of steel are made of seawater-resistant aluminium or high-grade stainless steel.

However, for harsh, maritime environmental conditions such as off-shore or in harbour a suitable painting is additionally required. We recommend a paint system of the customer's choice, consisting of at least a primer and a seawater-resistant topcoat. Before applying the primer, all surfaces must be clean and free of grease or other contaminants. The external surfaces of the brake have sufficient surface roughness to provide adhesion for the primer.

We recommend that the brake shall be painted after mounting to the motor so that the interface between brake and motor flange is painted over with all layers and thus properly secured against corrosion.

When assembled, the primed version (**G**) is coated to a thickness of 40 μm to 80 μm. Painted versions (**L**), (**S**) are coated with an additional topcoat layer of 40 μm to 80 μm thickness (see Figure 10.10).

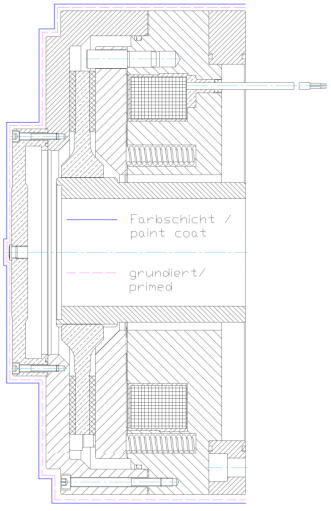


Figure 10.10: *Standard painting (**L**)*

NOTE

Damage to the paint caused by mounting or maintenance work must be repaired. The recommended procedure is to examine the surface after mounting and maintenance.

10.5 Option - connections

Category 5 (XXXX**X**XX) of the seven-letter description defines the tacho flange options for this option.

Table 10.5: *Category 5: (encoder) connection*

Funktion/ option	Code
ohne Tachoflansch/ without tachoflange	**O**
Tachoflansch geschlossen/ tachoflange closed	**G**
Tachoflansch für Encoder Type POG 10/ tachoflange for encoder type POG 10	**E**
Tachoflansch für Wellendichtring/ tachoflange with shaft seal ring	**W**
Encoderanschluss mit Ausgleichskupplung/ encoder connect. via coupling	**K**
Blechplatte/ closing plate	**B**
Encoderanschluss Hoyer/ encoder connection Hoyer	**H**
Kundenspezifisch/ customized	**C**

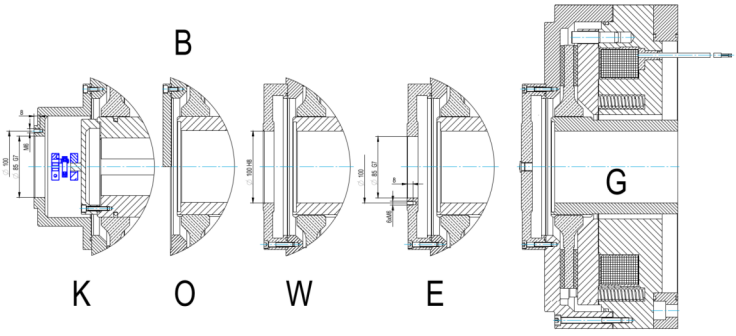


Figure 10.11: *Category 5: K-O-B-W-E-G*

"Controlflex" by Schmidt-Kupplung GmbH is a compensating coupling (based on parallel crankgears) developed specifically for connection to mechanical rotary encoders.



Figure 10.12: *Controlflex*

The Controlflex compensating coupling is used **as standard** in an **axially separable** installation. To mount the encoder on the brake, proceed as follows.

- Push the complete coupling (602) on the encoder shaft to a distance of 25 mm between the encoder flange's plane face and the coupling hub (see Figure 10.13).
- Use a 3 mm Allen key to apply a tightening torque of 3 Nm to the fixing screw in the encoder shaft's clamping hub.
- By rotating the encoder shaft, align the coupling (602) so that the fixing screw in the other clamping hub can be engaged through the radial access hole in the tacho flange (10) when the encoder is flanged to this.

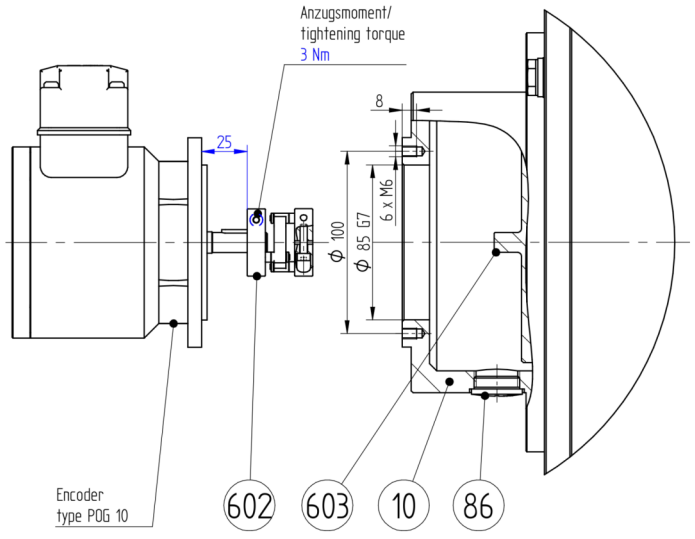


Figure 10.13: *Mounting the compensating coupling on the rotary encoder*

- Remove the screw plug (86) from the tacho flange (10).
- Insert the encoder with the coupling (602) into the tacho flange (10), and push the coupling's free hub over the journal of the pinion adapter (603) as shown in Figure 10.14.
- Use a suitable 3 mm Allen key to apply a tightening torque of 3 Nm to the fixing screw in the clamping hub above the radial access hole in the tacho flange (10) as depicted in Figure 10.14.
- Again, seal the hole with the screw plug (86).

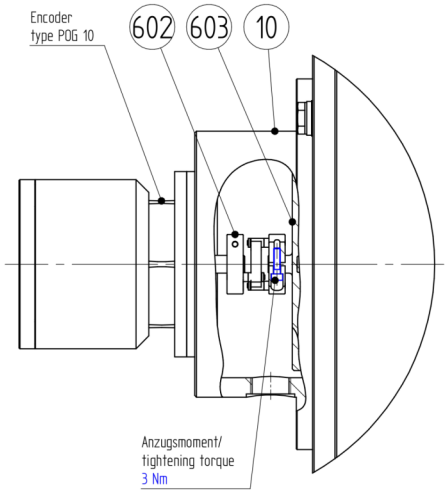


Figure 10.14: *Mounting the rotary encoder with coupling on the brake*

Before readjusting for wear, replacing wearing parts, or performing any other of the care and maintenance work mentioned in Section 9, you must first remove the encoder together with the compensating coupling (602) before removing the brake cover (6).

To disconnect the rotary encoder from the brake, proceed as follows.

- Remove the fastening screws of the encoder and pull it out of the brake carefully.
- Detach the tacho flange (10) from the brake by removing the fastening screws (63), .
- By loosening its fixing screw, detach and pull the other clamping hub of the coupling off the pinion adapter's journal (603).
- Reconnect this clamping hub to the coupling half on the encoder shaft. To do so, insert the hub's two cylindrical pins into their holes in the flexible centre piece.

NOTE

When reconnecting the two halves of the separable Controlflex compensating coupling, make sure that the two pins on each hub are engaged fully in their two holes in the flexible centre element. Otherwise the encoder cannot be mounted back on the brake.

- Attach the tacho flange (10) to the brake cover again and fasten the screws (63) by applying the appropriate tightening torque. **Take care to not damage the O-ring (103)!**
- The encoder inclusive the compensating coupling is mounted back on the brake as explained above.

For special applications the Controlflex compensating coupling can be utilised in an inseparable axial installation. The encoder with inseparable Controlflex coupling is mounted on the brake in the same manner as the separable one but the dismantling must be carried out differently, otherwise the inseparable Controlflex will be damaged.

To disconnect the encoder with inseperable Controlflex, proceed as follows.

- Remove the screw plug (86) out of the tacho flange (10).
- Rotate the shaft contacting the brake pinion (4) until the fixing screw in the compensating coupling's (602) pinion-side clamping hub can be reached through the access hole in the tacho flange (10) as depicted in Figure 10.14.
- Use a suitable 3 mm Allen key to loosen the fixing screw.
- Remove the fixing screws of the encoder and detach the encoder from the tachoflange (10).
- The encoder inclusive the compensating coupling is mounted back on the Brake as explained above.



NOTE

To detach the encoder with inseparable Controlflex you must be able to rotate the motor shaft through at least 180°. If this is not possible owing to the configuration of the machine or drive system incorporating the brake, then the brake must be ordered with an axially separable version of the Controlflex compensating coupling (see Figure 10.12). We recommend to use the separable Controlflex (standard variant).

10.6 Option - electrical accessories

Category 6 (XXXXX**X**X) of the seven-letter description defines the brake's electrical accessories delivered separately for this option.

Table 10.6: *Category 6: electrical accessories*

Funktion/ option	Code
ohne elektrisches Zubehör/ without electrical accessories	**O**
Klemmenkasten lose/ terminal box loose	**L**
SSG lose/ quick switching rectifier loose	**S**
SSG auf Blech lose/ quick switching rectifier on sheet metal loose	**B**
GR lose/ rectifier loose	**G**
Zusatzheizung im Tachoflansch/ additional heating in tachoflange	**H**
Kundenspezifisch/ customized	**C**

Details on the separately delivered accessories can be taken from the brake's dimensional drawing.

10.7 Option - miscellaneous

Category 7 (XXXXXX**X**) of the seven-letter description defines the brake's other options for this option.

Table 10.7: *Category 7: miscellaneous*

Funktion/ option	Code
ohne weitere Anforderungen, Horizontalbetrieb/ no additional requirements, horizontal operation	**O**
Vertikalbetrieb/ vertical operation	**V**
Einzelabnahme einer Marine-Klassifikationsgesellschaft/ case-by-case certification of marine classification society	**E**
Kundenspezifisch/ customized	**C**

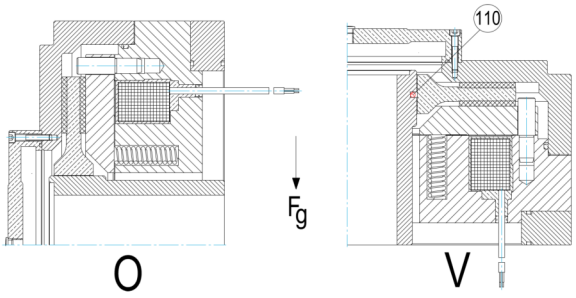


Figure 10.15: *Category 7: O-V*

HPB series brakes have been prepared for horizontal installations. Installed position see Figure 10.15 for version (**O**). In this version, the friction surfaces run freely when released. For the use of the brake in vertical installation position, consult the manufacturer. Depending on the size and application and in according to Figure (10.15)), the vertical brake version (**V**) must be fitted with alternative components that minimise residual friction on the friction surfaces when these are released. The mass of the vertically installed components draws them towards the coil body. The pinion is fitted with a sealing ring (110) that serve to counteract the deadweight of the friction disc (2). The clamping effects from these sealing ring (110) balance out the deadweight of the friction disc (2), but do not prevent them from moving axially on the pinion when the brake is switched in. We recommend applying a thin coat of grease, e.g. MoS_2, to the sealing ring (110) before fitting it.

NOTE

In horizontal installations, the sealing ring (110) must be removed because there are then no effects of gravity on the friction discs.

11 Spare parts stocking, customer services

11.1 Spare parts stocking

Stocking of spare and parts subject to wear is an important precondition for a permanent reliable functioning of the brake. Wearing parts are friction disc with friction lining (2), armature disc (5), brake cover (6), and pinion (4) (see Section 5.1 for item numbers).

Warranty will be provided only for the original spare parts supplied by us. We expressly state that the installation or use of spare parts other than the original ones supplied by us will negatively affect the design characteristics of the brake and thus have an impact on active and/or passive safety. Stromag GmbH shall have no warranty obligations for any damage caused by the use of spare parts or accessories other than the original ones supplied by us.

Please bear in mind that often particular manufacturing and delivery specifications exist for parts manufactured by us or bought from others, and that we offer spare parts to the up-dated technical conditions and the up-dated legal prescriptions.

11.2 Data for the ordering of spare parts

The following details that can also be found on the rating plate are needed: (see Section 3.1)

- Series and size of brake
- Article code
- Spare part no. (Pos.) and name (see Section 5.1)
- Number of pieces

11.3 Address of customer services

This is our address for customer service and spare parts distribution:

Stromag GmbH
Hansastraße 120
59425 Unna

Telefon: +49 2303 102 0
E-Mail: info@stromag.com

If you require a service engineer, please contact our “Customer Care” at the above address.

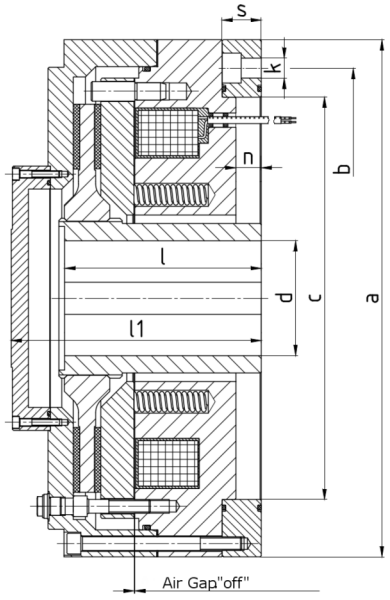
12 Listed standards and regulations

DIN 6885-1	Fitting keys
DIN EN 60529 (VDE 0470-1)	Degrees of protection provided by enclosures (IP Code)
DIN EN 50347	General purpose three-phase induction motors having standard dimensions and outputs
DIN 42955	Concentricity of shaft ends, co-axial and true running of fastening flanges of rotating electrical machines
DIN EN 60092-507 (VDE 0129-507)	Electrical installations in ships - Part 507: Pleasure craft
DIN EN 60034-5 (VDE 0530-5)	Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code)
DIN VDE 0580	Electromagnetic devices and components - General specifications
2004/108 EG	Electromagnetic compatibility
2006/95 EG	Low Voltage Directive

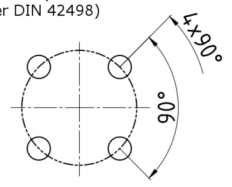
The listed standards and regulations comply with the current version at the time of publication of this document.

13 Annex

13.1 Dimensional drawing



Arrangement of drilled holes k and k1 for flange sizes up to FF 350 as defined under DIN EN 50347 (A400 as defined under DIN 42498)



Arrangement of drilled holes k and k1 for flange sizes up to FF 400 as defined under DIN EN 50347 (A450 as defined under DIN 42498)

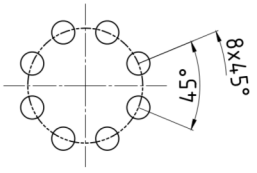


Table 13.1: *Dimensional drawing (dimensions in mm)*

brake size	2HPB	20	25	27	30	35	40	45	55
outer diameter	*a*	200	250	275 (300)	300	350	400	450	550
pitch circle diameter	*b*	165	215	265	265	300	350	400	500
centring diameter	*cH7*	130	180	230	230	250	300	350	450
overall length	*l1*	129	144	166	171	183	195	217,5	229
nominal air gap	*min*	0.5	0.6	0.6	0.6	0.6	0.7	0.8	1.0
	max	1.1	1.2	1.3	1.4	1.5	1.7	2.1	2.5
pinion length	*l*	96	110	117	117	142	142	171	171
max pinion bore	*dH7*	38	48	55	55	60	95	100	120
centring length	*n*	16	17	21	21	20	22.5	21	17
flange width	*s*	21	22	26	26	30	31	34	37
drilled hole	*k*	11	13.5	13.5	13.5	17.5	17.5	17.5	17.5
flange	*min*	A200	A250	A300	A300	A350	A400	A450	A550
airgap as delivered	*min*	0.4	0.5	0.5	0.5	0.5	0.6	0.7	0.9
	*max**	0.7	0.8	0.9	0.9	1.0	1.1	1.3	1.6

∗ final wear backup after run-in of the brake is at least 60% of the permissible wear regarding the min. and max. nominal air gap

14 List of Figures and Tables

List of Figures

3.1 rating plate 2HPB . . . 12
4.1 Transporting and mounting by means of eyebolts . . . 16
5.1 Section through a 2HPB45, parts labelled with item numbers . . . 18
5.2 Emergency release screws . . . 19
6.1 Example tightening torques . . . 21
6.2 Mounting without prior removal . . . 22
6.3 Mounting with prior removal . . . 23
8.1 Section through 2HPB . . . 27
9.1 Measuring the air gap on the 2HPB . . . 30
9.2 2HPB drain plug . . . 32
10.1 Category 1: A-R-K-S-G-B . . . 34
10.2 Category 1: K-S-B . . . 34
10.3 Category 2: O-S-V . . . 35
10.4 Inductive switch . . . 36
10.5 Connecting diagram . . . 36
10.6 Microswitch . . . 36
10.7 Microswitch connecting diagram . . . 36
10.8 Category 3: H-O . . . 37
10.9 Manual release 2HPB . . . 38
10.10Standard painting (**L**) . . . 40
10.11Category 5: K-O-B-W-E-G . . . 41
10.12Controlflex . . . 41
10.13Mounting the compensating coupling on the rotary encoder . . . 42
10.14Mounting the rotary encoder with coupling on the brake . . . 43
10.15Category 7: O-V . . . 46

List of Tables

1 Revision history . . . 2
3.1 Technical data . . . 13
3.2 Torque ratings for brakes with approval by classification societys for Lifting Appliances . . . 14
6.1 mounting accuracy . . . 24
10.1 Category 1 - electrical connection . . . 34
10.2 Category 2: monitoring options . . . 35
10.3 Category 3: accessories . . . 37
10.4 Category 4 - surface . . . 40
10.5 Category 5: (encoder) connection . . . 41
10.6 Category 6: electrical accessories . . . 45
10.7 Category 7: miscellaneous . . . 46
13.1 Dimensional drawing (dimensions in mm) . . . 49

A.1.3 Holding brake operating instructions Stromag 4HPB DE

STROMAG
A REGAL REXNORD BRAND

Electromagnetic Four-Face Spring-Applied Brake 4HPB

Document no.: 449-00243



Mounting Instructions

EN

Stromag GmbH

Hansastraße 120
59425 Unna
Tel.: +49 2303 102-0
Fax.: +49 2303 102-201
www.stromag.com
info@stromag.com

Revision history

Table 1: *Revision history*

Revised on	Issued on	Revisions
Version -	18.03.2021	Mounting instructions initial version
Version A	14.03.2022	Additions to encoder mounting (Section 10.5)
Version B	14.03.2022	Additions and editorial changes (Sections 4, 8.1, 8.2, 8.3, 9.1, 9.2, 9.3, 10.3.2, 12)
Version C	06.10.2022	Acquisition Stromag GmbH
Version D	03.07.2023	Additions and editorial changes (Sections 3.2, 8.1, 10, 10.4, 10.5,13.1)

All details and figures corresponded to the latest information at the time of printing.
Subject to technical modifications without prior notice.

All copyrights and other protective rights to the contents of these instructions for use remain unrestrictedly the property of Stromag GmbH. No part of this publication may be reproduced without our prior consent.

© 2023 Stromag GmbH

Hansastraße 120
59425 Unna
Germany

Telephone: +49 2303 102 0
Telefax: +49 2303 102 201



IMPORTANT!

Read carefully before use!
Keep within easy reach for future reference!

Contents

1 Basics **6**
1.1 Purpose of these mounting instructions . . . 6
1.2 Layout of these mounting instructions . . . 6
1.3 Other applicable documents . . . 7
1.4 Manufacturer . . . 7

2 Safety guidelines **7**
2.1 Layout of warnings . . . 7
2.1.1 The various danger levels . . . 8
2.1.2 Warning symbols . . . 9
2.1.3 Personal protective equipment . . . 9
2.2 Conditions for safe use . . . 10
2.3 The owner's obligations . . . 10
2.4 The personnel's obligations . . . 10
2.5 Intended use . . . 11
2.6 Basic safety requirements . . . 12
2.7 Electromagnetic compatibility . . . 12

3 Technical data **12**
3.1 Rating plate details . . . 12
3.2 Torques, speed, technical data . . . 13
3.3 Bore and keyway dimensions, external measurements . . . 15
3.4 Scope of operation and intended use . . . 15

4 Transportation **16**
4.1 Packaging . . . 17
4.2 Pre-mounting condition . . . 17
4.3 Sensitivity . . . 17
4.4 Storage . . . 17
4.5 Scope of delivery . . . 18

5 Set up, mode of operation, and construction characteristics **18**
5.1 Designation of individual components (size 4HPB45 depicted) . . . 18
5.2 Mode of operation and construction characteristics of the standard version . . . 19
5.3 Mechanical release in the form of emergency release screws . . . 19
5.4 Electrical connection . . . 20

6 Mounting and removal **21**
6.1 Mounting . . . 22
6.1.1 Direct mounting . . . 22
6.1.2 Mounting with prior removal . . . 23
6.2 Mounting accuracy . . . 24
6.3 Measurements, space requirements, and mass . . . 24
6.4 Removal . . . 24

7 Initial setting into service **25**

8 Operation **25**
8.1 Operating conditions . . . 25
8.1.1 Holding operation . . . 25
8.1.2 Working operation . . . 26
8.1.3 Emergency stop . . . 26

8.2 Duty cycle, switching frequency . . . 26
8.3 Protection classes . . . 27
8.4 Trouble shooting . . . 28

9 Maintenance 29
9.1 Care and inspections . . . 29
9.2 Measuring the air gap . . . 29
9.3 Readjusting for wear . . . 30
9.3.1 Readjusting for wear on the standard version . . . 31
9.3.2 Readjusting for wear on the optional vertical application . . . 31
9.4 Replacing the friction disc with friction lining . . . 33
9.5 Drain off condensate . . . 34
9.6 Inspections after emergency stop . . . 35

10 Variants and designation 36
10.1 Option - electrical connection . . . 37
10.2 Option - monitoring . . . 38
10.2.1 Inductive proximity switch . . . 39
10.2.2 Microswitch . . . 39
10.3 Option - accessories . . . 40
10.3.1 Anticondensation heater / O-ring . . . 40
10.3.2 Manual emergency release lever . . . 41
10.4 Option - surface . . . 43
10.5 Option - (encoder) connection . . . 44
10.6 Option - electrical accessories . . . 48
10.7 Option - miscellaneous . . . 49

11 Spare parts stocking, customer services 53
11.1 Spare parts stocking . . . 53
11.2 Data for the ordering of spare parts . . . 53
11.3 Address of customer services . . . 53

12 Listed standards and regulations 54

13 Annex 55
13.1 Dimensional drawing . . . 55

14 List of Figures and Tables 56

1 Basics

For easier reading, the male forms are used throughout these mounting instructions. These male forms, however, also apply to female personnel.

1.1 Purpose of these mounting instructions

These mounting instructions describing the 4HPB type brake contain basic information, safety instructions, technical data, a description of operations, and details on transport, storage, mounting and removal, commissioning, operation, troubleshooting, spare parts stocking, customer services, and third party documentation.

All of the contained information and descriptions apply throughout the service life of the brake, including its decommissioning and disposal. The instructions must be followed without fail. The personnel assigned to work on the product must acknowledge with their signature that they have read and understood these mounting instructions.

All work on the brake must be performed by authorised personnel only. There must be no modifications or manipulations on the product.

The owner of the product must supplement these mounting instructions with the regulations from the applicable national accident prevention and environmental protection legislature.

1.2 Layout of these mounting instructions

These mounting instructions have been prefaced with a revision list. This is to simplify understanding of the revisions made to this document and therefore verification of the document's latest wording.

The following table of contents serves as a guide through the technical documentation.

The table of figures concluding these mounting instructions provides a quick overview of the included figures.

These mounting instructions make use of the following symbols:

- actions and lists are highlighted with a leading black bullet (•)
- intermediate headings and highlighted information are depicted in **bold text**
- all figures are numbered consecutively
- the components and parts depicted in the figures are assigned item numbers with joining lines
- every part and component has been assigned a specific item number that remains unchanged throughout these instructions
- the descriptive text introduces each part and component in the figures with their item numbers (1) in round brackets
- each figure is accompanied by a legend with the depicted parts and components and their item numbers.

1.3 Other applicable documents

The other applicable documents in the form of installation drawings and data sheets for the actual product are intended solely for qualified personnel. These provide details on the maintenance, repair, and configuration work specific to the brakes.

1.4 Manufacturer

Stromag GmbH
Hansastraße 120
59425 Unna
GERMANY

Telephone:	**+49 2303 102 0**
Telefax:	**+49 2303 102 201**
E-Mail:	**info@stromag.com**
Internet:	**www.stromag.com**

2 Safety guidelines

This section provides basic safety instructions and explains the layout of warnings. These instructions must be followed without exception if there is to be no danger to persons and property. Stromag accepts no liability for any damage incurred as a result of failure to observe these mounting instructions and specifically the section on safety.

2.1 Layout of warnings

The warnings are rendered in differentiating shades of grey. This aids in their identification on black and white printouts as well. These mounting instructions employ the following layout for the warnings:

pictogramm

SIGNAL WORD

Type of danger and its source
Consequences of failure to observe the warnings

- Measures to eliminate the danger.

1.3 Other applicable documents

The other applicable documents in the form of installation drawings and data sheets for the actual product are intended solely for qualified personnel. These provide details on the maintenance, repair, and configuration work specific to the brakes.

1.4 Manufacturer

Stromag GmbH
Hansastraße 120
59425 Unna
GERMANY

Telephone:	**+49 2303 102 0**
Telefax:	**+49 2303 102 201**
E-Mail:	**info@stromag.com**
Internet:	**www.stromag.com**

2 Safety guidelines

This section provides basic safety instructions and explains the layout of warnings. These instructions must be followed without exception if there is to be no danger to persons and property. Stromag accepts no liability for any damage incurred as a result of failure to observe these mounting instructions and specifically the section on safety.

2.1 Layout of warnings

The warnings are rendered in differentiating shades of grey. This aids in their identification on black and white printouts as well. These mounting instructions employ the following layout for the warnings:

pictogramm

SIGNAL WORD

Type of danger and its source
Consequences of failure to observe the warnings

- Measures to eliminate the danger.

2.1.1 The various danger levels

Dangers are divided into the following levels:



DANGER

This warns of imminent danger.
The consequences are death or the most grievous injuries.

- Measures to eliminate the danger.



WARNING

This warns of potential danger.
The consequences are death or the most grievous injuries.

- Measures to eliminate the danger.



CAUTION

This warns of potential danger.
The consequences may be injuries of slight to medium severity.

- Measures to eliminate the danger.



IMPORTANT

This warns of damage to property.
Damage may be caused to the product or objects in its vicinity.

- Measures to eliminate the danger situation



NOTE

This provides additional useful tips that simplify and explain the product's operation

2.1.2 Warning symbols

	General warning symbol: This applies in situations that cannot be portrayed as a symbol for a single, specific danger.
	Warning – suspended loads
	Warning – hot surfaces
	Warning – electric voltage
	Warning – danger of crushing

2.1.3 Personal protective equipment

	Shatterproof goggles with side visor that protect the eyes during mounting work.
	ESD proof safety shoes with steel cap that protect against electrostatic discharge and crushing injuries.
	ESD proof gloves that protect against electrostatic discharge and skin injuries.
	Hard hat that protects the head from falling objects or workpieces during mounting, removal, and crane work.

2.2 Conditions for safe use

Definition of safe use:

All work required for the intended use of the brake must be performed with care if there are to be no accidents, injuries, or damage. Stromag GmbH accepts no liability for any damage and/or injuries incurred as a result of failure to observe this!

PPE

Any additional safety instructions issued by the owner must be observed. Personal protective equipment (PPE) must be worn during all work. All work on the brake is subject to all of the national accident prevention regulations.

Also applying:

- the brake may be used for the intended purpose only
- the brake must be in perfect technical condition
- the brake may be operated only when all of the safety equipment is fully functional
- the warnings and safety instructions defined in these mounting instructions must be observed without fail
- failure to observe the warnings and safety instructions may lead to death, grievous injury, and damage to the brake
- the instructions issued by the work safety officers must be followed without exception
- all safety instructions and warnings affixed to the brake must be observed and kept in legible condition
- the operator stand and all access paths must be kept clear of tools, auxiliaries, and other objects

2.3 The owner's obligations

Obligations of the owner

The owner is obliged to verify at regular intervals that his personnel work with safety awareness. The owner is obliged to assess the hazards of working at the machine in his purview and to derive therefrom operating instructions. The owner appoints a member of personnel responsible for the safe operation of the machine and the coordination of all work on and at the machine. The owner is obliged to employ only original spare parts and upgrades and/or to consult Stromag before retrofitting and replacing parts. In all events, the operation is subject to the local safety and accident prevention regulations. The owner must ensure adherence to the regulations.

2.4 The personnel's obligations

Obligations of the personnel

Each person in the user's factory dealing with the transport, mounting, commissioning, use, and removal of the product must have read and understood all of the operating instructions, in particular the safety guidelines.
Stromag accepts no liability for any damage or malfunctions incurred as a result of failure to observe the mounting instructions. The personnel assigned to operate and service the machine must confirm with their signature that they have received instruction. Persons under the influence of drugs, alcohol, or medication

may NOT work at or on the product, even when they are adequately qualified.
Furthermore, the personnel is obliged to observe the work safety provisions and operating instructions, to fulfil their responsibilities with all the due care, and to wear appropriate personal protective equipment (PPE).

Qualified personnel's obligations

On the strength of their technical training, knowhow, experience, and knowledge of the pertinent standards and provisions, qualified personnel are in a position to perform their assigned work and to identify and prevent potential dangers on their own account.

2.5 Intended use

Limitations of intended use

The brake is designed to connect and disconnect an energy flow in the form of transferred torque. It is an electromagnetically actuated device that is not provided ready for use. In other words, it must be connected to further components before it can fulfil its function. Its use as a brake is permitted only for dry running. Intended applications are its industrial use in general machine construction, hoisting and traversing drives, conveyor installations, building machinery, and all purposes requiring an electromagnetic brake. Intended use extends to the observance of mounting, removal, commissioning, and maintenance conditions prescribed by the manufacturer.
The user may not carry out any unauthorised conversions or changes which could impede safety, nor may he use any components or accessories from other manufacturers.
Failure to comply with these conditions or any use other than those described herein will be deemed not in accordance with the specification. The manufacturer accepts no liability for any damage incurred as a result; the risk is borne exclusively by the user. If the brake is to be used outside of this contractual field of applications, contact Stromag customer services for further details. Failing to do so will render the warranty void.



WARNING

Damage and injuries
The product has been designed exclusively for uses within the technical data listed under Sections 3 and 3.2 and under the operating conditions described in Section 8.1. Also applying to the product are its data sheets and installation drawings that can be obtained from customer services. See Section 11.3 for the address.

2.6 Basic safety requirements

Safety requirements

The product has been built according to the state of the art and operates safely. This device may pose dangers, however, when used by untrained persons incorrectly or in violation of its intended purpose.
Make sure not to operate the product in such a way that its safety might be impeded. The owner is obliged to notify the supplier immediately of any changes to the product that might impede the safety. The user is obliged to operate the product only when it is in perfect working condition.

2.7 Electromagnetic compatibility

Protective requirements

Directive 2014/30/EU stipulates that the operation of electrical equipment must adhere to certain protective requirements if this equipment is to function properly in its electromagnetic environment without mutual interference.

Hazards

In order to eliminate the direct and indirect effects posed by electromagnetic fields to persons, pets, and property, the user must implement suitable measures.

Intended installation

Machine builders and system and plant fitters must safeguard adherence to the protective requirements under Directive 2014/30/EU by installing the product and its power supply in accordance with its intended use.

Printed publication

For your assistance, you may request from our customer services our publication “EMV-Hinweise” (“EMC instructions”), no. 900-00001 (see Section 11.3 for the address).

3 Technical data

3.1 Rating plate details

The rating plate presents the following data. This is attached to the brake’s circumference. These specifications must agree with the details in the order acknowledgement.

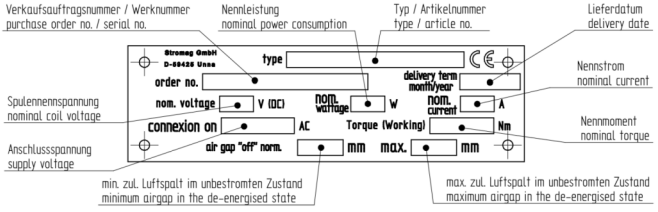


Figure 3.1: *rating plate 4HPB*

3.2 Torques, speed, technical data

Admissible torques and other technical data are given in Table 3.1. Any technical parameters deviating from the values given in the table may be requested from the manufacturer or form part of the order acknowledgement. The main parameters listed on the rating plate.

Table 3.1: *Technical data*

Size Variant	M_{SN} $[Nm]$	$M_{\ddot{U}}$ $[Nm]$	n_0 $[rpm]$	n_{zn} $[rpm]$	U_n* $[VDC]$	P_k $[W]$	Air gap $[mm]$ $min./max.$	$Q_{E,zul}$ $[kJ]$	J $[kgm^2]$	m $[kg]$
4 HPB 20 S	160	176	6500	3200	110	107,3	0,5/1,1	**	0,0029	21,3
4 HPB 20 H	200	220	6500	3200	110	107,3	0,5/1,1	**	0,0029	21,3
4 HPB 20 V	260	286	6500	3200	110	107,3	0,5/1,1	**	0,0029	21,3
4 HPB 25 S	260	286	6500	2500	110	83,9	0,6/1,2	**	0,0074	36,9
4 HPB 25 H	320	352	6500	2500	110	83,9	0,6/1,2	**	0,0074	36,9
4 HPB 25 V	400	440	6500	2500	110	83,9	0,6/1,2	**	0,0074	36,9
4 HPB 27 S	400	440	6500	2300	110	125	0,6/1,3	**	0,0209	51,2
4 HPB 27 H	500	550	6500	2300	110	125	0,6/1,3	**	0,0209	51,2
4 HPB 27 V	640	704	6500	2300	110	125	0,6/1,3	**	0,0209	51,2
4 HPB 30 S	640	704	6300	2100	110	151	0,6/1,4	**	0,0246	63,9
4 HPB 30 H	800	880	6300	2100	110	151	0,6/1,4	**	0,0246	63,9
4 HPB 30 V	1000	1100	6300	2100	110	151	0,6/1,4	**	0,0246	63,9
4 HPB 35 S	1000	1100	5400	1700	110	150	0,6/1,5	**	0,0453	94,9
4 HPB 35 H	1300	1430	5400	1700	110	150	0,6/1,5	**	0,0453	94,9
4 HPB 35 V	1600	1760	5400	1700	110	150	0,6/1,5	**	0,0453	94,9
4 HPB 40 S	1600	1760	4500	1500	110	212	0,7/1,7	**	0,0988	132,6
4 HPB 40 H	2000	2200	4500	1500	110	212	0,7/1,7	**	0,0988	132,6
4 HPB 40 V	2600	2860	4500	1500	110	212	0,7/1,7	**	0,0988	132,6
4 HPB 45 S	2600	2860	4100	1100	110	320	0,8/2,1	**	0,1573	204,4
4 HPB 45 H	3200	3520	4100	1100	110	320	0,8/2,1	**	0,1573	204,4
4 HPB 45 V	4000	4400	4100	1100	110	320	0,8/2,1	**	0,1573	204,4
4 HPB 55 S	4000	4400	3250	900	110	311	1,0/2,5	**	0,4149	280,2
4 HPB 55 H	5000	5500	3250	900	110	311	1,0/2,5	**	0,4149	280,2
4 HPB 55 V	6400	7040	3250	900	110	311	1,0/2,5	**	0,4149	280,2

* Other voltages on request
** See data sheet for detailed values (can be requested from customer care)

M_{SN}	:	switchable nominal torque at average friction speed of $1\,m/s$ according to DIN VDE 0580 (applies to dry running on oil- and grease-free friction lining after run in)
$M_{\ddot{U}}$	:	maximum static torque (moment of adhesion) according to DIN VDE 0580
n_0	:	maximum idling speed
n_{zn}	:	switching speed (revolutions) at average friction speed of approx. $20\,m/s$
P_k	:	electrical power consumption at 20 °C
$Q_{E,zul}$	:	maximum permitted single switching work
J	:	mass moment of inertia of the rotating brake parts
m	:	mass of the brake (standard version)
mode of operation	:	S1, S2, S4-40% I.O.
thermal class	:	155 (F) in accordance with DIN VDE 0580
AC-control	:	via rectifier

According to the applicable rules of the marine classification societies (e. g. Det Norske Veritas, American Bureau of Shipping, Loyds Register of Shipping, Buerau Veritas and others) for Lifting Appliances, the coefficient of friction μ assumed for the calculation of the torque of the brake shall not exceed a value of 0.3.

If the brake is ordered with an approval certificate (Type Approval, Case-by-Case Approval) for Lifting Appliances, the calculated braking torques M_{SN} and $M_{\ddot{U}}$ according to Table 3.2 apply with priority. In Table 3.2 the torque values are calculated under the limiting assumption $\mu \leq 0.3$.

NOTE

Each brake is run in and torque-tested at the factory before delivery. As delivered, the brake has a braking torque M_{SN} and $M_{\ddot{U}}$ according to Table 3.1, regardless of whether an approval certificate is enclosed with the brake or not. If you are unsure, please contact the customer care (contact information see Section 11.3).

Table 3.2: *Torque ratings for brakes with approval by classification societys for Lifting Appliances*

Size Variant	M_{SN} [Nm]	$M_{\ddot{U}}$ [Nm]
4 HPB 20 S	160	170
4 HPB 20 H	170	170
4 HPB 20 V	170	170
4 HPB 25 S	260	270
4 HPB 25 H	270	270
4 HPB 25 V	270	270
4 HPB 27 S	400	430
4 HPB 27 H	430	430
4 HPB 27 V	430	430
4 HPB 30 S	640	680
4 HPB 30 H	680	680
4 HPB 30 V	680	680
4 HPB 35 S	1000	1100
4 HPB 35 H	1100	1100
4 HPB 35 V	1100	1100
4 HPB 40 S	1600	1700
4 HPB 40 H	1700	1700
4 HPB 40 V	1700	1700
4 HPB 45 S	2600	2700
4 HPB 45 H	2700	2700
4 HPB 45 V	2700	2700
4 HPB 55 S	4000	4250
4 HPB 55 H	4250	4250
4 HPB 55 V	4250	4250

3.3 Bore and keyway dimensions, external measurements

The connecting dimensions can be taken from Table 13.1 under Section 13.1. The fitting key dimensions comply with DIN 6885-1.

3.4 Scope of operation and intended use

The 4HPB can be used both as a working brake and as a holding brake with emergency stop function. The maximum permissible loads can be found in the corresponding brake data sheet, which can be obtained from customer service (contact information see Section 11.3).

The brake is suitable for virtually all winch, crane, and industrial application types.

- Flood and seawater resistant, good protection under rough conditions, specifically suitable for harbour, offshore, and marine applications!
- For all winch and crane types.
- For industrial and other applications fulfilling the highest demands
- On wharf cranes, container transportation plant, for crane traversing, hoisting, and trolley traversing drives

Conditions of application

- Electrical design of brakes in accordance with DIN VDE 0580 in thermal class 155 (F). The brake corresponds to Directive 2006/95/EC (Low Voltage Directive). The user must consult the manufacturer's instructions for safeguarding compliance with EMC Directive 2004/108/EC. The products are marked accordingly.
- Mode of operation: S1,S2, S4 - 40 % duty cycle
- Horizontal installation. Vertical operation only after consultation with manufacturer.
- With the friction pairing steel / organic friction lining the brake may only be used for dry running under the conditions described in Sections 8.1 and 8.2. In addition, compliance with the mounting, removal, commissioning, and installation conditions specified by the manufacturer must be ensured. Failure to observe these conditions or any use beyond this will be deemed use not in accordance with the specification. The manufacturer accepts no liability for any such use; the risk is borne by the user alone.
- If the brake is to be used outside of this contractual range of applications, contact Stromag GmbH for further details (see Section 11.3 for contact information).

4 Transportation

The product may be transported only with suitable hoisting gear, industrial trucks, and sling gear of adequate load bearing capacity. In addition, the symbols on packages must be heeded.



DANGER

Danger of death under suspended loads.
Raising, lowering, and slewing loads poses a danger of death from falling parts or parts moving out of control.

- Never move under suspended loads.
- Note the specifications of the provided load fastening points.
- Do not secure sling gear to projecting machine parts or lugs on attached components.
- Do not attach sling gear to drilled/tapped holes.
- Make sure that the sling gear is seated securely.
- Use only suitable hoisting and sling gear of adequate load bearing capacity.
- Do not use ropes or belts with incipient tears or abrasions.
- Do not knot, twist, or place ropes or belts over sharp edges or corners.

Threaded holes have been provided in the coil body (1) and from size 25 in the brake cover (6) for the use of eyebolts to transport directly and mount the brake (see Figure 4.1).

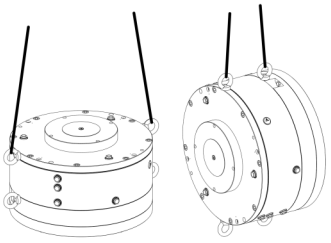


Figure 4.1: *Transporting and mounting by means of eyebolts*



WARNING

Danger of injury
Using the transport threads for any purpose other than the one intended may lead to grievous injury.

- These holes may ***not*** be used to transport or install the assembly (motor with attached coupling).
- The brake may ***not*** be transported at any fastening point other than those provided for this purpose.

4.1 Packaging

The packaging type complies with the agreements confirmed by the ordering party and specified in the order acknowledgement. If there is no agreement on the packaging type, the type selected must be appropriate for the transportation route. Ensure compliance with the symbols attached to the packaging.

4.2 Pre-mounting condition

The brakes are delivered as preassembled and configured units. The pinion (4) is included separately. If ordered, the manual release (40) is included separately and must be installed.

4.3 Sensitivity

Condensation as a result of temperature fluctuations must be avoided.

Make sure to avoid damage as a result of shocks or impacts during transportation. Special care should be exercised with regard to the delivered connecting cables.

4.4 Storage

Interim storage



IMPORTANT

Damage to components and malfunctions.
Incorrect storage may cause damage and malfunctions.

- Do not store out of doors
- Story in a dry environment free of dust
- Do not expose to aggressive media
- Storage temperature: +10 °C bis +30 °C, no abrupt temperature fluctuations
- The environment must be aired moderately and dry.
  Maximum relative air humidity: 65%
- Examine regularly the general condition of all parts and the packaging during storage periods longer than three months
- If necessary, reapply or replace the preservation agents



NOTE

Note on the packaged units any affixed storage regulations beyond those herein.

If the brake is to be put into interim storage, it must be provided with additional corrosion protection. Details can be requested from our customer services (see Section 11.3 for the address).

The interim **storage regulation 449-00023** can be obtained from our customer services.

Failure to observe the instructions in this section will render void the warranty granted by Stromag GmbH. Please direct any questions to customer services (see Section 11.3 for the address).

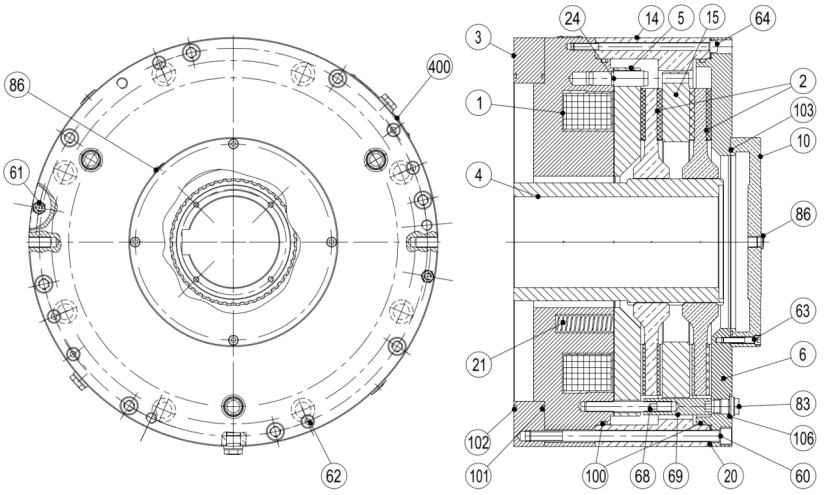
The external parts consist of seawater resistant aluminium and of steel provided with suitable surface protection.

4.5 Scope of delivery

On receipt, the completeness of the delivery must be checked against the packing list. Any transport damage and/or missing parts must be reported immediately in writing.

5 Set up, mode of operation, and construction characteristics

5.1 Designation of individual components (size 4HPB45 depicted)



1	Coil body with coil	60	Screw for brake cover to flange
2	Friction disc with friction lining	61	Screw for coil body to flange
3	Customer's connecting flange	62	Screw for brake cover to coil body
4	Pinion	63	Screw for tacho flange to brake cover
5	Armature disc	64	Screw for bush to coil body
6	Brake cover	68	Threaded pin for manual emergency release
10	Tacho flange	69	Emergency release screw
14	Bush	83	Screw plug for emergency release
15	Brake disc	85	Screw plug for air gap measuring
20	Shim	86	Screw plug for tacho flange
21	Pressure springs	100	Sealing ring between coil body/ bush and brake cover/ bush
24	Stud	101	Sealing ring between coil body and flange
		102	Sealing ring between flange and motor
		103	Sealing ring between tacho flange and brake cover
		106	Sealing ring
		400	Rating plate

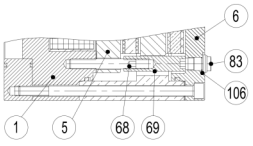
Figure 5.1: *Section through a 4HPB45, parts labelled with item numbers*

5.2 Mode of operation and construction characteristics of the standard version

The **4HPB** brake is a spring loaded electromagnetic four-face brake which brakes without voltage and is released electromagnetically. The **4HPB** brake type with its high degree of protection fulfils the highest requirements for durability, robustness, and seawater resistance. The brakes are built and tested in compliance with DIN VDE 0580. The brake is secured to the motor or any other machine part with cylinder screws. The coil body contains a coil which is potted with a synthetic resin compound in accordance with thermal class 155 (F, max limit of temperature 155 °C).

When there is no voltage across the coil, the pressure springs (21) press the armature disc (5) axially against the friction system consisting of two friction discs with friction lining (2) and an intermediate brake disc that can move axially (15). This system is clamped between the torsion-protected armature disc (5) and the brake cover (6) and thus the friction discs with friction lining (2) prevented from rotating. The braking effect is transmitted to the shaft from the toothed friction discs with friction lining (2) via the pinion (4) and a feather key. When the coil is connected to a direct voltage as specified on the rating plate (400), the electromagnetic force will draw the armature disc (5) to the coil body (1) against the spring force. The friction discs with friction lining (2) are released, the braking effect is cancelled, and the brake is released.

5.3 Mechanical release in the form of emergency release screws



1	Coil body with coil	68	Threaded pin for emergency release
5	Armature disc	69	Screw for emergency release
6	Brake cover	83	Screw plug for emergency release
		106	Sealing ring

Figure 5.2: *Emergency release screws*

In emergencies or for system adjustments, the screws (69) (two screws for size HPB 20, three screws for size HPB 25 to 45, four screws for size HPB 55) are used to release the brake mechanically. To release the brake, first unscrew the plugs (83) out of the brake cover (6). The emergency release screws (69) can now be accessed with an Allen key through the revealed openings. To release the brake, rotate the screws clockwise a little in turn until the braking effect is cancelled.



WARNING

Danger of serious injury and damage.
The emergency release is self locking, and you must not fail to turn it back to its initial position for normal operations. To do so, turn the screws (69) anticlockwise to the stop on the brake cover (6). Now insert the screw plugs (83) back in the brake cover (6). Make sure that the sealing rings (106) are also installed. Only then can the product operate as intended with the full **tightness**.
Manual emergency release must not be used to maintain temporary operation! The emergency release may not be used to test the functions of an optional switch!

5.4 Electrical connection

Notes on electrical connection



DANGER

Danger from electricity.
Electrical equipment can cause serious to fatal electric shock.

- Only qualified personnel trained to identify and circumvent electrical hazards may make the electrical connections on the spring actuated brake.
- Work may be performed on electrical components only when disconnected from their power sources
- Secure the voltage source against reactivation, and tag this
- Verify that there is no voltage across the equipment
- Earth and short circuit
- Cover or cordon off all adjacent live parts that can be contacted



WARNING

Danger of burns.
The coil, coil body, and neighbouring components may have hot surfaces after a protracted period of coil operation and as a result of friction heat. The brake cover (6) can present hot surfaces specifically from friction heat.

- Leave brake and adjacent components to cool
- Wear strong protective gloves to prevent contact with hot surfaces.

Make sure that the electrical connection is performed by expert personnel taking into account the installation regulations (such as DIN VDE 0129-507). The coil has been designed for 100% duty factor and connection to the D.C. supply specified on the rating plate (residual ripple <0.5). The permanently admissible voltage change is ***+6% to −10%*** of the nominal voltage. One convenient solution for protecting the coil and power unit takes the form of a correspondingly dimensioned varistor (operating voltage and power) connected to the coil input. Details can be requested from our customer services (see Section 11.3 for the address).

6 Mounting and removal

Mounting and removal instructions



WARNING

Danger of serious injury and damage.
Unsuitable screws and keys may cause parts to detach and fly out, with the risk of grievous injury or death.

- Use only screws and keys of the specified size and strength
- Note the wrench torques
- Use the prescribed bolt locks



IMPORTANT

Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

- All of the fastening screws must tightened in a manner preventing jamming.
- Do not use excessive force when mounting.
- Note the location of the electrical connection.



NOTE

Only authorised, trained, and instructed personnel may operate, service, and repair the brake. These personnel must have read and understood all of the mounting instructions and have received specific instruction in the potential risks.

Each installation drawing includes a table of all the screws used and their tightening torques. Most screw locks in the form of liquid synthetics require higher wrench torques. Please observe the manufacturer's specifications. Proceed in reverse order to remove the mounted component. All warnings and safety instructions must be observed.

Anzugsmomente Schrauben/ tightening torque screws			
Pos.	Bezeichnung/ designation	Material/ material	Anzugsmoment/ tightening torque
60	M12x140	A2-70	74 Nm
61	M8x70	A2-70	21,4 Nm
62	M8x85	A2-70	21,4 Nm
63	M6x35	A2-70	8,8 Nm

Figure 6.1: *Example tightening torques*

6.1 Mounting

See Section 5.1 for each of the parts with item no.
Consult Section 10.7 for the optional vertical application.

6.1.1 Direct mounting

Depending on the flange type, the brake may have to be removed before it is mounting on the drive.
If the fastening points are accessible on the customer's connecting flange (3) in the delivered state, the flange does not need to be removed before the brake can be attached (see Figure 6.2). During mounting, the tacho flange (10) can be removed. The friction discs (2) can then be aligned more easily to the pinion (4). This has been secured to the brake cover with screws (63).

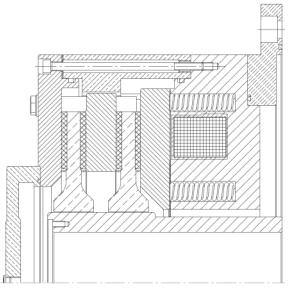


Figure 6.2: *Mounting without prior removal*

- Check that the connecting dimensions agree with the brake's specifications.
- Remove all transportation and storage protection devices, burr, and impact damage.
- Check face runout of the flange mounting surface relative to the shaft to be braked (tolerance class N in accordance with DIN 42955 should not be exceeded).
- Apply a small amount of grease to the shaft and feather key, fit the pinion (4), and secure them in their axial positions.
- Using suitable sling gear, shackles, or similar, manoeuvre the brake carefully over the pinion (4). By turning the shaft or swivelling the brake, engage the teeth on the pinion in the teeth on the friction discs with friction lining (2). In doing so, make sure that the friction discs with friction lining (2) and the pinion (4) assume their central positions. (The friction discs with friction lining (2) have been centred beforehand for the brake's final acceptance.)
- Use suitable screws to secure the brake at its correct position on the motor flange. Make sure that the electrical connection is performed by expert personnel taking into account the pertinent installation regulations.
- If necessary, use screws (63) to secure the removed tacho flange (10) at its correct position, and tighten it with the torque specified on the drawing.

Caution!

Do not use force! **Do not jam!** **Note the length of the cable!**



IMPORTANT

Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

- When attaching the components, make sure that all O-rings and gaskets are installed properly at their designated positions.

6.1.2 Mounting with prior removal

If the fastening points are **not** accessible on the customer's connecting flange (3) in the delivered state, the flange (3) must be removed before the brake can be attached (Abbildung 6.3). During mounting, the tacho flange (10) can be removed. The friction discs (2) can then be aligned more easily to the pinion (4). This has been secured to the brake cover with screws (63).

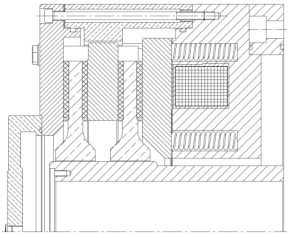


Figure 6.3: *Mounting with prior removal*

- Check that the connecting dimensions agree with the brake's specifications.
- Remove all transportation and storage protection devices, burr, and impact damage.
- Check face runout of the flange mounting surface relative to the shaft to be braked (tolerance class N in accordance with DIN 42955 should not be exceeded).
- The screws marked red (62) may not be removed. If there are no red markings, the screw position is marked with additional centrings on the brake cover.
- Remove the screws (60) and (61).
- Using suitable sling gear, shackles, or similar, separate carefully the flange (3) and brake. Make sure that there can be no damage to the seal and centring faces.
- Use suitable screws to secure the flange (3) at its correct position on the motor flange.
- Apply a small amount of grease to the shaft and feather key, fit the pinion (4), and secure them in their axial positions.
- Using suitable sling gear, shackles, or similar, manoeuvre the brake carefully over the pinion (4). By turning the shaft or swivelling the brake, engage the teeth on the pinion in the teeth on the friction discs with friction lining (2). In doing so, make sure that the friction discs with friction lining (2) and the pinion (4) assume their central positions. (The friction discs with friction lining [2] have been centred beforehand for the brake's final acceptance.)
- Use suitable screws to secure the brake at its correct position on the motor flange. Make sure that the electrical connection is performed by expert personnel taking into account the pertinent installation regulations.

Caution!

Do not use force! **Do not jam!** **Note the length of the cable!**



IMPORTANT

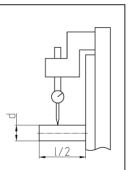
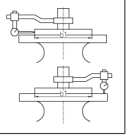
Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

- When attaching the components, make sure that all O rings and gaskets are installed properly at their designated positions.

6.2 Mounting accuracy

The concentricity of the shaft section bearing the pinion (4), and the coaxiality and true running of the mounting flange must comply with DIN 42955 tolerance class „N“ .

Table 6.1: *mounting accuracy*

concentric run of the shaft	diameter of the cylindric shaft end d in mm	concentric run $N(norm.)$ in mm	
	above 30 up to 50	0.05	
	above 50 up to 80	0.06	
	above 80 up to 120	0.07	
	above 120 up to 180	0.08	
coaxiality and concentric run of the mounting flange	mounting flange centering diameter in mm	coaxiality and concentric run in mm	
	above 100 up to 230	0.1	
	above 230 up to 450	0.125	
	above 450 up to 800	0.16	

6.3 Measurements, space requirements, and mass

The binding measurements, the mass (weight), and other technical data must be taken from the dimensional drawing binding for the order. This may be requested from our customer services (see Section 11.3 for the address).

6.4 Removal

Removal is subject to the same instructions and regulations as mounting. Carry out the operations in inverse order of succession.



DANGER

Incorrect removal can cause damage
The consequences are death or the most grievous injuries.

- Verify that the brake is free of torque.
- Disconnect the brake from its power source.
- First secure with sling gear, then remove!

7 Initial setting into service

See Section 5.1 for each version's individual parts with item no.

Commissioning requires the following prior test measures:

- The electric loads listed on the rating plate (400; see Section 3.1) must agree with those on site.
- The brake must be undamaged, i.e. it may not exhibit any damage from transport, storage, etc.
- The prescribed operating conditions (Section 8.1) must agree with those on site
- The mechanical emergency release as defined under Section 5.3 may not be active.
- Testing the brake's electrical operation involves a number of electrical releases.

8 Operation



NOTE

Notwithstanding any instructions given below, operation of the brake must always comply with local mandatory safety and accident prevention rules. Compliance with these rules must be ensured by the user.



WARNING

Danger of burns.
The coil, coil body, and neighbouring components may have hot surfaces after a protracted period of coil operation and as a result of friction heat. The brake cover (6) can present hot surfaces specifically from friction heat. Before all repair and maintenance work:

- Leave brake and adjacent components to cool
- Wear strong protective gloves to prevent contact with hot surfaces.

8.1 Operating conditions

The operating conditions to be maintained for a faultless operation of the brake are given below:

- The operating temperature should not be below $-30\,^{\circ}C$ and not above $+50\,^{\circ}C$.
- In the case of higher and/or lower ambient temperatures, please contact our customer services (see Section 11.3).
- If the brake is ordered with an approval certificate of a marine classification society, different permissible ambient temperatures may apply. In this case, please contact our customer care (see Section 11.3 for contact information).

8.1.1 Holding operation

The drive connected to the brake is stopped in holding mode by the speed-controlled electric motor or functionally comparable devices. Only after braking to a standstill does the spring-applied brake engage and hold the drive in the de-energised state.

8.1.2 Working operation

In working mode, the brake is used to decelerate the drive until it comes to a standstill. The maximum permissible loads can be found in the brake data sheet.

8.1.3 Emergency stop

In comparison to working operation, an emergency stop is characterized by the fact that the stress caused by the braking of the drive is at the upper limit of the mechanical and/or thermal load capacity of the brake.



NOTE

Breaking under load causes wear of the friction surfaces, that reduces the service life of the brake.



IMPORTANT

Exceeding the contractually agreed limit values when operating the brake can damage the brake and impair its function.

- The maximum permissible loads can be found in the brake data sheet.
- A design calculation for the existing load cases by Stromag GmbH is recommended.



IMPORTANT

Emergency stops must not be made in immediate succession to avoid damaging the brake.

- After each emergency stop, inspections must be carried out according to Section 9.6.

8.2 Duty cycle, switching frequency

The design as well as admissible loads on brakes as per braking torque, speed, and switching capacity are given under “Technical data” (see Section 3), the dimensional drawing (attachment), and their data sheet. If any of these data are exceeded consult the manufacturer.

8.3 Protection classes

Fully mounted and properly installed, the basic version of the brake (see Figure 8.1) complies with IP 67 as defined under DIN EN 60529 (VDE 0470-1) and DIN EN 60034-5 (VDE 0530-5).

This protection class is maintained when original Stromag accessories are used, e.g. cable glands. The same applies when rpm encoders (IP 67) are secured firmly to the cover via flange connection fitted with a sealing ring.

In the variant with terminal box, the brake complies with IP 66!

Sealing rings on through shafts compromise the protection class to an extent that varies from version to version. The manufacturer must be consulted.

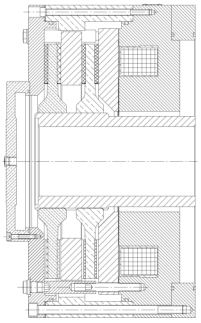


Figure 8.1: *Section through 4HPB*

NOTE

The brake maintains its protection class when its faces contacting the motor or an attached tacho generator are provided with suitable sealants (e.g. Hylomar or sealing ring). The user must provide a sealing element on the shaft that prevents grease and oil penetration into the brake from the motor bearing.

8.4 Trouble shooting

Fault	Possible causes	Remedy
Insufficient braking effect	Friction surfaces are not free from grease	Replace friction discs with friction lining (2)
	Max air gap exceeded due to wear of friction lining	Readjust brake (Section 9.3); if necessary, replace friction discs with friction lining (2)
	Brake not completely run-in	Let brake run in
	Brake has been overloaded	Replace brake
	Spring rupture	Remove brake; consult manufacturer
No braking effect	Manual mechanical release actuated but not returned	Note Section 10.3.2
Brake does not release	Max air gap exceeded due to wear of friction lining	Readjust brake (Section 9.3); if necessary, replace friction discs with friction lining (2)
	Friction discs with friction lining (2) seized on pinion (4)	Replace friction discs with friction lining (2) and pinion (4) (Section 9.4)
	Armature disc (5) distorted	Replace brake (Section 6)
	Coil connecting voltage too low	Check DC voltage supply
	Coil defective	Replace brake (Section 6)
	Feed line defective	Renew feed line
	Contact points loose	Re-tighten contact points
	Foreign body in air gap (e.g. spring rupture)	Remove brake; consult manufacturer
With optional switch:	Armature disc was not drawn on the coil body's face, e.g. as a result of:	Readjust brake (Section 9.3); if necessary, replace friction discs with friction lining (2)
No switched state shown	•Admissible air gap exceeded	Check the switch settings against the setup instructions
	•Foreign body in air gap	Remove brake, and check microswitch settings against the setup instructions
		Remove brake; consult manufacturer

9 Maintenance

9.1 Care and inspections



NOTE

Make sure to comply with Section 2 "Safety guidelines" during all maintenance and inspection work. Applying in addition to the following instructions are the safety and accident prevention regulations in force at the site of use.

The owner is obliged to observe these regulations.

As the brakes work under varying operation conditions, it is not possible to pre-define wear check, inspection maintenance and repair intervals. Higher loads on the brakes (e.g. as a result of torque, speed, switching frequency, ambient temperature etc.) require shorter maintenance intervals. Therefore it is first of all necessary to observe the brake with regard to safety and wear, and then adapt the maintenance intervals in accordance with the observation made.

Wear on the friction lining will result in a wider air gap. Therefore, depending on the load of the brake, the air gap must be checked from time to time. This can take the form of measurements on the air gap as set down under Section 9.2. If the air gap exceeds its maximum value in Table 3.1, then the air gap must be readjusted as set down under Section 9.3.

The friction linings are subject to heavy wear and may generate large deposits. Regular cleaning of the brake is therefore recommended. The apertures for air gap measurements may then be used to vacuum off loose deposits abraded from the friction linings. Also, compressed air may be applied to clear the brake of friction lining deposits without prior removal.

In the course of inspection or maintenance work, the mechanical components of the brake must be inspected for damage at least by visual inspection. Check the proper function of the sliding between the involute spline joint of the pinion (4) and the friction discs (2).



WARNING

Danger of serious injury and damage.
If the wear re-adjustment is not carried out early enough, both the transmission of the rated load torque and the release of the brake will not be ensured. This may cause death or grievous injury.

- Set down regular inspection intervals
- Set down regular maintenance intervals

9.2 Measuring the air gap

The air gap between the coil body (1) and armature disc (5) can be measured only when there is no voltage across the coil. Measure the air gap at two places on the circumference, 180° opposite to each other. To do so, remove the two screw plugs (83). By inserting a feeler gauge through the threaded bore now lying free in the bush (14), you can measure the air gap between the coil body (1) and armature disc (5). **It is essential to ensure that the feeler gauges are only pushed into the outer area between the coil body and the armature disk and not beyond the recess of the armature disk pole surface.** The airgap must lie between „off min" und „off max" (Table 3.1). After measuring, reseal the bores with the screw plugs (83) and their sealing rings (106).

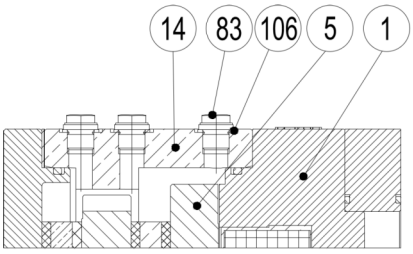


Figure 9.1: *Measuring the air gap on the 4HPB*

9.3 Readjusting for wear

On reaching „off max“ in Table 3.1, the brakes' air gap must be readjusted.

DANGER

Incorrect removal can cause damage
The consequences are death or the most grievous injuries.

- Verify that the brake is free of torque.
- Disconnect the brake from its power source.

DANGER

A sudden release of the pressure springs can cause damage
The consequences are death or the most grievous injuries.
The coil body and armature disc are under the axial force of the pressure springs! Flying parts may pose a risk when the pressure springs unbend suddenly.

IMPORTANT

Incorrect mounting may cause injury and damage.
Incorrect mounting may cause damage and malfunctions.

- When assembling the brake or replacing the friction disc with friction lining, take great care not to contaminate the brake lining with grease. Any greasy substances can be removed with suitable degreasing agents.
  Never use petrol or paraffin!
- If the air gap has already been adjusted previously in this manner, then new friction discs with friction lining (2) must be installed as described in Section 9.4. This time, though, the shim (20) must be put back.
- When attaching the components, make sure that all O-rings and gaskets are installed properly at their designated positions.

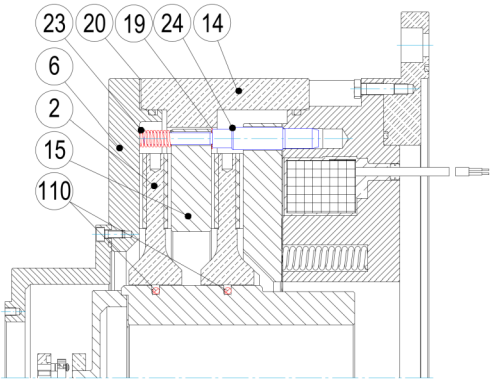
9.3.1 Readjusting for wear on the standard version

This involves the following procedure for the standard version according to Figure 5.1:

- Perform a mechanical emergency release on the brake as described in Section 5.3
- Remove the screws (60) and (62)
- Remove the brake cover (6) on the bush (14). Removal aids are provided in the form of 3 threaded holes on the brake cover, which can be used to press off this cover. The tachoflange (10) need not be removed.
- Remove the shim (20), and clean the accessible components, specifically the seal faces
- Again mount (in reverse order) the brake cover (6) at its correct position on the bush (14);
- Tighten the screws (60) and (62) with the torque specified on the drawing
- Remove the mechanical emergency release on the brake as described in Section 5.3
- Measure the air gap as described in Section 9.2; Check that the brake switches properly

9.3.2 Readjusting for wear on the optional vertical application

If the brake is equipped for vertical operation, the standard version is completed with additional parts pictured in Figure 9.2.



2	Friction disc with friction lining	19	Shim for studs
6	Brake cover	20	Shim
14	Bush	23	Return spring
15	Brake disc	24	Stud bolt
		110	Sealing rings

Figure 9.2: *Section through the optional vertical 4HPB45, parts labelled with item numbers*

To readjust for wear on the optional vertical application, proceed as follows:

- Perform a mechanical emergency release on the brake as described in Section 5.3
- Remove the screws (60) and (62), see Figure 5.1
- Remove the brake cover (6) from the bush (14). Removal aids are provided in the form of threaded holes on the brake cover which can be used to press off this cover. Also any attachments, e.g. encoders, must first be removed
- Remove the shim (20), and clean the accessible components, specifically the seal faces
- Remove the return springs (23)
- Mark the installed position of the friction disc (2), and remove this without using force. Removal aids are provided in the form of threaded holes on the brake disc (15), which can be used to press this off.
- Mark the installed position of the brake disc (15), remove this and the shims (19), and clean the accessible parts
- Check the clearance between the friction disc (2) and the shoulder of the stud bolts (24)
  Heed the warning below and Figure 9.3!

WARNING

When readjusting the brake and replacing the friction discs (2), make sure that the friction disc (2) between the armature disc (5) and the centre brake disc (15) can move without hindrance. As shown in Fig 9.3, use a straightedge at two points to check the air gap between the friction disc and the support face on the centre brake disc (15). The gap around the circumference must be set to 0.1 mm – 0.2 mm. Adjustments can be made with shims (19).

- All of the armature disc must be released, i.e. it must lie against the coil body

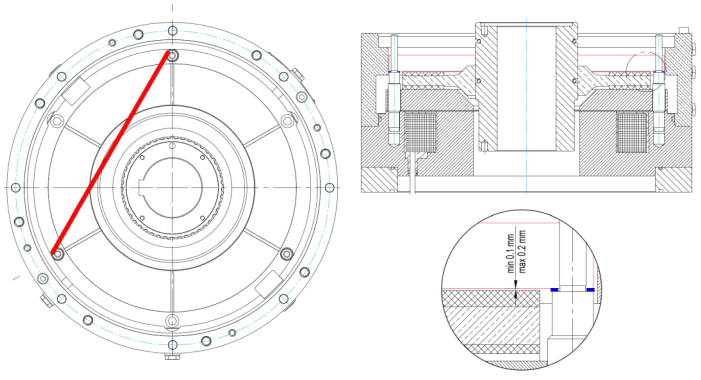


Figure 9.3: *Measurements on the vertical 4HPB*

- Mount the brake disc (15), noting its marked installation position
- Mount the friction disc (2), noting its marked installation position and by following the instructions in Figure 10.18 and Section 10.7
- Insert the return springs (23)
- Again mount the brake cover (6) at its correct position on the bush (14); the shim (20) is not needed
- Tighten the screws (60) and (62) with the torque specified on the dimensional drawing of the brake
- Remove the mechanical emergency release on the brake as described in Section 5.3
- Measure the air gap as described in Section 9.2
- Check that the brake switches properly
- Check that the friction disc with friction lining (2) can move without hindrance

9.4 Replacing the friction disc with friction lining

This involves the following procedure according to Figures 5.1 and 9.2:



DANGER

Incorrect removal can cause damage
The consequences are death or the most grievous injuries.

- Verify that the brake is free of torque.
- Disconnect the brake from its power source.



DANGER

A sudden release of the pressure springs can cause damage
The consequences are death or the most grievous injuries.
The coil body and armature disc are under the axial force of the pressure springs! Flying parts may pose a risk when the pressure springs unbend suddenly.

- Perform a mechanical emergency release on the brake as described in Section 5.3
- Remove the screws (60) and (62)
- Remove the brake cover (6) from the bush (14). Removal aids are provided in the form of 3 threaded holes on the brake cover, which can be used to press off this cover. Also any attachments, e.g. encoders, must first be removed
- Remove the return springs (23), if fitted
- Remove the first of the two friction discs (2). Removal aids are provided in the form of threaded holes on the brake disc (15), which can be used to press this off.
- Mark the installed position of the brake disc (15), and remove this
- Remove the second of the two friction discs (2)
- For easier accessibility, you may also remove the bush (14); to do so, loosen the screws (64)

- Clean the brake, and check for damage
- For the optional vertical function, replace and grease the sealing rings (110)
- Mount the new friction disc (2), noting its marked installation position and by following the instructions in Figure 10.18 and Section 10.7
- Mount the brake disc (15) at its correct position, and for the optional vertical function, insert the shims (19)
- Mount the new friction disc (2), noting its marked installation position and by following the instructions in Figure 10.18 and Section 10.7
- For the optional vertical function, insert the return springs (23)
- Again mount the brake cover (6) at its correct position on the bush (14)
- Tighten the screws (60) and (62) with the torque specified on the drawing
- Remove the mechanical emergency release on the brake as described in Section 5.3
- Measure the air gap as described in Section 9.2
- Check that the brake switches properly
- Check that the friction disc with friction lining (2) can move without hindrance



WARNING

Incorrect commissioning may cause damage and malfunctions
New friction linings need some time before they can transfer the full braking torque

- They must first be run in with a number of controlled brakings.

9.5 Drain off condensate

Large temperature fluctuations give rise to condensation, which is also affected by the component's surface temperature, the ambient temperature, and the relative air humidity. As a result, the collecting condensate must be drained off at regular intervals depending on the ambient conditions. Provided for this purpose is a condensate drain screw (see Figure 9.4).



WARNING

After every condensate drain, the sealing ring (106) must be reinstalled.

On horizontal installations, proceed as follows (see Figure 9.4). The procedure for vertical installations varies from version to version.

- Remove the condensate drain screw (83), and remove its seal (106).
- Drain off condensate
- Fit the seal (106) to the condensate drain screw (83), and insert and tighten this

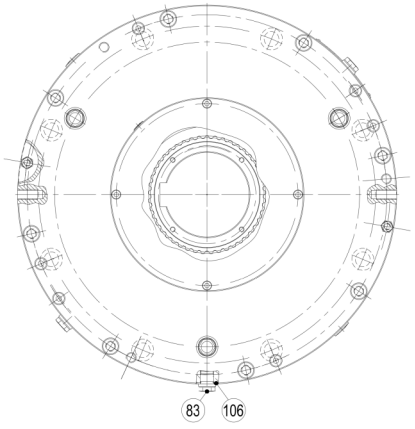


Figure 9.4: *4HPB drain plug*

9.6 Inspections after emergency stop

After an emergency stop described in Section 8.1.3, the following inspection work has to be carried out to ensure a safe continued operation of the brake.



WARNING

Risk of burns from hot brake components!

- Allow the brake to cool down to ambient temperature before performing the inspection work.

- Check the airgap of the cooled down brake as described in Section 9.2.
- If the maximum permitted airgap is reached, maintenance work according to Section 9.3 or Section 9.4 have to be done.
- When dismantling the brake, the mechanical components must at least be visually inspected for damage and, if necessary, replaced with original spare parts.

10 Variants and designation

The brakes of type HPB are described with a defined designation key. The first part of the designation (①, ②, ③ and ④) names the type and size of the brake. In the second designation part (⑤, ⑥ and ⑦), the customer connection is described, while in the last part (⑧) the other options are represented by a 7-digit letter combination.

Designation key (example of standard brake version):

4	HPB	45	S	-	110V	100H7	A450	-	A O O O G O O
①	②	③	④		⑤	⑥	⑦		⑧

①	number of friction surfaces	**2** or **4**
②	series	**HPB** ("**H**igh **P**erformance **B**rake")
③	size	min. outer diameter **a [mm] / 10** (see dimensional drawing Section 13.1)
④	torque variant	**S** - standard, **H** - high or **V** - very high (see Table 3.1)
⑤	nominal coil voltage	**110 V** DC or customized
⑥	bore diameter of pinion	customized or **NOPI** - no pinion
⑦	motor connection flange	acc. to DIN 42948 (EN 50347) or **NOFL** - no flange
⑧	options	see following sections

10.1 Option - electrical connection

Category 1 (**X**XXXXXX) of the seven-letter description defines the electrical connection for this option.

Table 10.1: *Category 1: electrical connection*

Funktion/ option	Code
Leitungen axial/ cable axial	**A**
Leitungen radial/ cable radial	**R**
Klemmenkasten m. Klemme/ terminal box with clamp	**K**
Klemmenkasten m. SSG/ terminal box with quick switching rectifier	**S**
Klemmenkasten m. GR/ terminal box with rectifier	**G**
Klemmenkasten m. Klemme + GR/ terminal box with clamp + rectifier	**B**
Kundenspezifisch/ customized	**C**

The axial cable version (**A**) is standard.

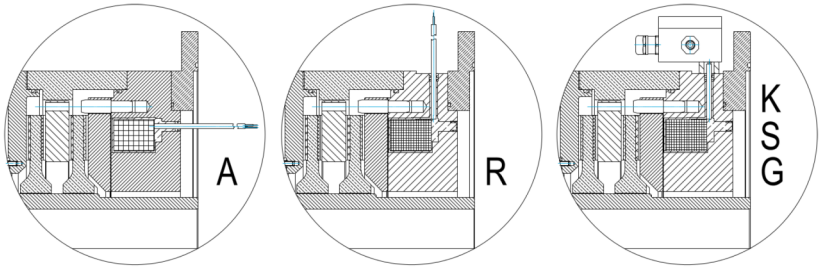


Figure 10.1: *Category 1: A-R-K-S-G-B*

There are a number of options for the terminal box.

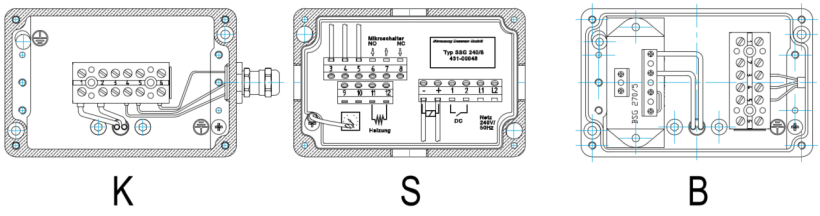


Figure 10.2: *Category 1: K-S-B*

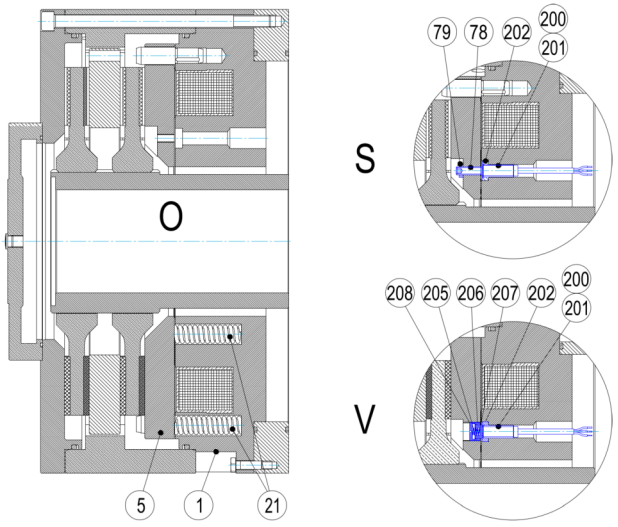
Please consult here Section 5.4.

10.2 Option - monitoring

Category 2 (XXXXXXX) of the seven-letter description defines the brake monitoring for this option.

Table 10.2: *Category 2: monitoring*

Funktion/ option	Code
ohne Zustandsüberwachung/ without monitoring	**O**
Schaltzustandskontrolle (SZK) mit ind. Schalter/ state of operation via inductive switch	**S**
2x SZK mit ind. Schalter/ 2x state of operation via inductive switch	**R**
Verschleißkontrolle (VK) mit ind. Schalter/ wear state via inductive switch	**V**
SZK + VK mit ind. Schalter/ state of operation + wear state via inductive switch	**A**
SZK mit Mikroschalter/ state of operation via microswitch	**P**
2x SZK mit Mikroschalter/ 2x state of operation via mircroswitch	**Q**
SZK + VK mit mikroschalter/ state of operation + wear state via microswitch	**B**
SZK m. ind. Sch., VK mit Mikrosch./ state of op. via microswitch, wear state via ind. switch	**D**
Kundenspezifisch/ customized	**C**



1	Coil body with coil	201	Inductive proximity switch
5	Armature disc	202	Round nut for ring nut
21	Pressure spring	205	Return spring for wear detection
78	Threaded pin	206	Bush for wear detection
79	Hexagon nut	207	Piston for wear detection
200	Microswitch	208	Cover for wear detection

Figure 10.3: *Category 2: O-S-V*

10.2.1 Inductive proximity switch

The proximity switch is a noncontacting, and therefore wear-free limit switch. It is actuated by means of a metal placed inside the switching distance and ahead of the active detector face. As depicted in Figure 10.4, the inductive proximity switch (201) is fitted with a cylindrical metal housing presenting an external thread. The switching element features a PNP output and operates as a normally open (NO) contact (see Figure 10.5).

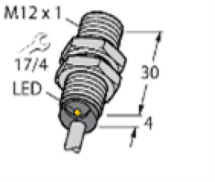


Figure 10.4: *Inductive switch*

When, under magnetic force, the axially moving armature disc (5) is drawn against the coil body, the inductive switch (201) detects the threaded pin (78) used to set the switch point, and the switch is closed. When there is no voltage across the brake, the springs (21) press the armature disc (5) away from the coil body, giving rise to an air gap between these two. When this air gap has grown to an extent causing the piston (207) in the armature disc to advance out of the switching distance set for the inductive switch (201), the brake has reached its wear limit, and the switch opens.

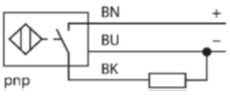


Figure 10.5: *Connecting diagram*

10.2.2 Microswitch

The microswitch (200), see Figure 10.6, consists of a cylindrical housing with external thread. In this housing is a snap switch that functions as a changeover (see Figure 10.7) with the following contacts:
(c) and (no) = make contact
(c) and (nc) = break contact
(c) common ground (nc) normally closed (no) normally open



Figure 10.6: *Microswitch*

If the switch or wear state must be monitored in an HPB, the switch (200) is fixed in place in the coil body (1) as shown in Figure 10.3. This involves screwing the ring nut (202) on the switch (201), and then inserting and gluing the two in the recess provided on the coil body (1). When pulled by magnetic force towards the coil body, the axially traversing armature disc (5) actuates the microswitch (200).



Figure 10.7: *Microswitch connecting diagram*

Switch details can be taken from the **mounting instructions 449-00254**. You can request these from our customer care (see Section 11.3 for the address).

10.3 Option - accessories

Category 3 (XX**X**XXXX) of the seven-letter description defines the accessories and their combinations for this option.

Table 10.3: *Category 3: accessories*

Funktion/ option	Code
ohne Extras mit O-Ring/ without extras with O-ring	**O**
ohne O-Ring/ without customer seal ring	**W**
ohne O-ring, ohne Bef.-schr./ without customer seal ring and fixing screws	**P**
Anticondensationsheizung (HZ)/ anticondensation heating	**H**
HZ ohne O-Ring/ with anticondensation heating, without seal ring	**R**
Handlüftung (HL)/ with hand release	**N**
HL ohne O-ring/ with hand release, without O-ring	**M**
HZ + HL/ with anticondensation heating and hand release	**B**
HZ + HL ohne O-ring/ with anticondensation heating and hand release, without O-ring	**S**
Kundenspezifisch/ customized	**C**

10.3.1 Anticondensation heater / O-ring

When large temperature fluctuations are expected, an anticondensation heater may be provided. The supply line is routed together with the coil connecting line.
The brake may be delivered to the customer with or without an O-ring. The standard brake delivery is with O-ring.

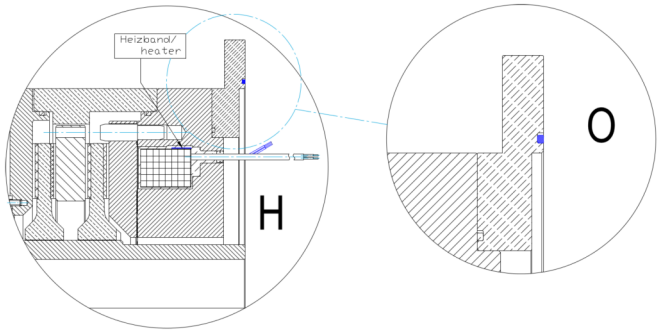


Figure 10.8: *Category 3: H-O*

10.3.2 Manual emergency release lever

The brake can be fitted with a manual emergency release lever that releases it in the event of an emergency, e.g. on power failure. Pulling the manual release stirrup (41) by about 30° towards the rear side of the brake (see Figure 10.9) presses the armature disc (5) axially against the coil body (1). The friction discs with the friction lining (2) can then move freely.

This manual emergency release lever is also self locking, which secures the unactuated mechanism as follows. The rod (41) is pressed against the stop stirrup (42). The rod (41) then engages in the spring clip (43), where it is locked in position.

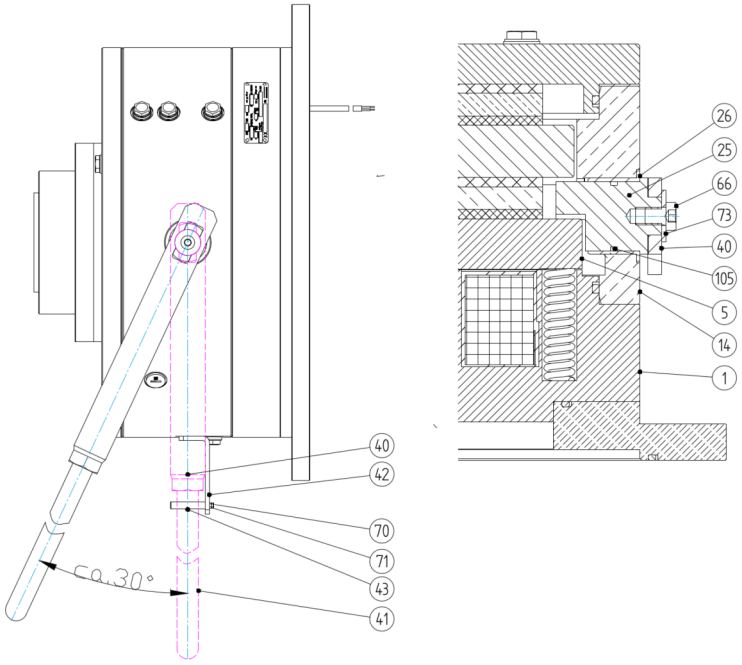


Figure 10.9: *Manual release 4HPB*

NOTE

These are spring actuated brakes that engage in the event of electrical power failure. Using the manual emergency release lever disables the spring system. We do not recommend this manner of manual emergency release.

STROMAG
A REGAL REXNORD BRAND

4HPB
mounting instructions

Electromagnetic Four-Face
Spring-Applied Brake



WARNING

Danger of serious injury and damage.
Manual emergency release must not be used to maintain temporary operation!



WARNING

Danger of serious injury and damage.
The manual emergency release may not be used to test the functions of an optional switch!



DANGER

Danger of serious injury and damage.
The consequences are death or the most grievous injuries.
The air gap "OFF max" may not be exceeded. Otherwise, the rated torque might not be transferred.

10.4 Option - surface

Category 4 (XXX**X**XXX) of the seven-letter description defines the brake's surface finish for this option.

Table 10.4: *Category 4: surface*

Funktion/ option	Code
ohne Lackierung/ without painting	**O**
Lackierung - grundiert/ primed	**G**
Lackierung - Standard/ standard painting	**L**
Lackierung - Sonder/ special painting	**S**
Kundenspezifisch/ Customized	**C**

As standard for the entire HPB series **all external steel parts are provided with a special non-metallic surface protection** that prevents corrosion due to moisture or galvanic corrosion to non-steel metals. External components that are not made of steel are made of seawater-resistant aluminium or high-grade stainless steel.

However, for harsh, maritime environmental conditions such as off-shore or in harbour a suitable painting is additionally required. We recommend a paint system of the customer's choice, consisting of at least a primer and a seawater-resistant topcoat. Before applying the primer, all surfaces must be clean and free of grease or other contaminants. The external surfaces of the brake have sufficient surface roughness to provide adhesion for the primer.

We recommend that the brake shall be painted after mounting to the motor so that the interface between brake and motor flange is painted over with all layers and thus properly secured against corrosion.

When assembled, the primed version (**G**) is coated to a thickness of 40 μm to 80 μm. Painted versions (**L**), (**S**) are coated with an additional topcoat layer of 40 μm to 80 μm thickness (see Figure 10.10).

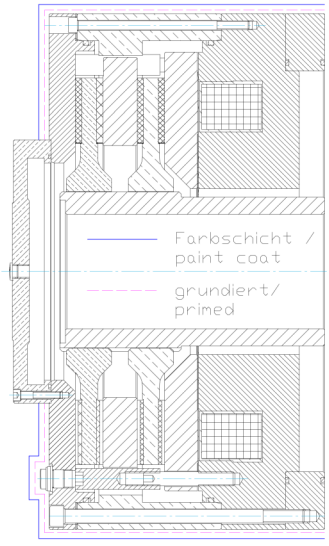


Figure 10.10: *Standard painting (**L**)*

NOTE

Damage to the paint caused by mounting or maintenance work must be repaired. The recommended procedure is to examine the surface after mounting and maintenance.

10.5 Option - (encoder) connection

Category 5 (XXXX**X**XX) of the seven-letter description defines the tacho flange options for this option.

Table 10.5: *Category 5: connections*

Funktion/ option	Code
ohne Tachoflansch/ without tachoflange	**O**
Tachoflansch geschlossen/ tachoflange closed	**G**
Tachoflansch für Encoder Type POG 10/ tachoflange for encoder type POG 10	**E**
Tachoflansch für Wellendichtring/ tachoflange with shaft seal ring	**W**
Encoderanschluss mit Ausgleichskupplung/ encoder connect. via coupling	**K**
Blechplatte/ closing plate	**B**
Encoderanschluss Hoyer/ encoder connection Hoyer	**H**
Kundenspezifisch/ customized	**C**

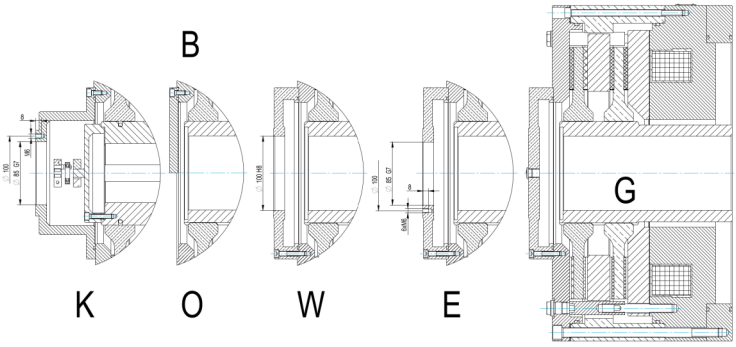


Figure 10.11: *Category 5: K-O-B-W-E-G*

"Controlflex" by Schmidt-Kupplung GmbH is a compensating coupling (based on parallel crankgears) developed specifically for connection to mechanical rotary encoders.



Figure 10.12: *Controlflex*

The Controlflex compensating coupling is used **as standard** in an **axially separable** installation. To mount the encoder on the brake, proceed as follows.

- Push the complete coupling (602) on the encoder shaft to a distance of 25 mm between the encoder flange's plane face and the coupling hub (see Figure 10.13).
- Use a 3 mm Allen key to apply a tightening torque of 3 Nm to the fixing screw in the encoder shaft's clamping hub.
- By rotating the encoder shaft, align the coupling (602) so that the fixing screw in the other clamping hub can be engaged through the radial access hole in the tacho flange (10) when the encoder is flanged to this.

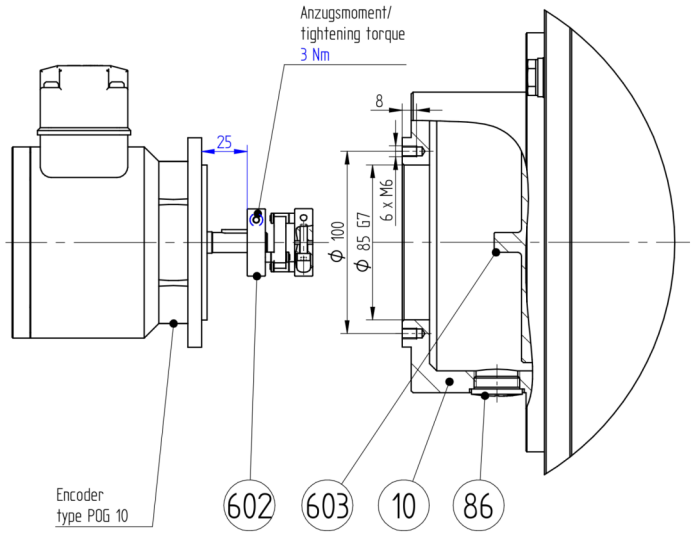


Figure 10.13: *Mounting the compensating coupling on the rotary encoder*

- Remove the screw plug (86) from the tacho flange (10).
- Insert the encoder with the coupling (602) into the tacho flange (10), and push the coupling's free hub over the journal of the pinion adapter (603) as shown in Figure 10.14.
- Use a suitable 3 mm Allen key to apply a tightening torque of 3 Nm to the fixing screw in the clamping hub above the radial access hole in the tacho flange (10) as depicted in Figure 10.14.
- Again, seal the hole with the screw plug (86).

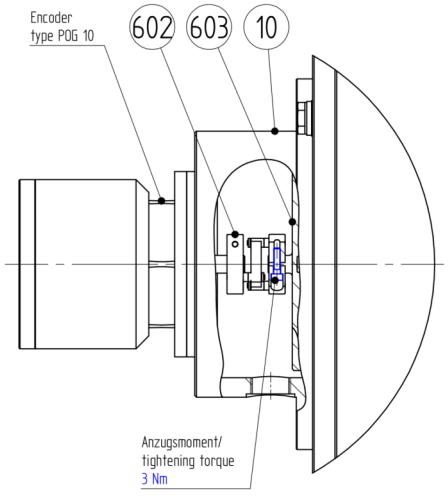


Figure 10.14: *Mounting the rotary encoder with coupling on the brake*

Before readjusting for wear, replacing wearing parts, or performing any other of the care and maintenance work mentioned in Section 9, you must first remove the encoder together with the compensating coupling (602) before removing the brake cover (6).

To disconnect the rotary encoder from the brake, proceed as follows.

- Remove the fastening screws of the encoder and pull it out of the brake carefully.
- Detach the tacho flange (10) from the brake by removing the fastening screws (63), .
- By loosening its fixing screw, detach and pull the other clamping hub of the coupling off the pinion adapter's journal (603).
- Reconnect this clamping hub to the coupling half on the encoder shaft. To do so, insert the hub's two cylindrical pins into their holes in the flexible centre piece.

NOTE

When reconnecting the two halves of the separable Controlflex compensating coupling, make sure that the two pins on each hub are engaged fully in their two holes in the flexible centre element. Otherwise the encoder cannot be mounted back on the brake.

- Attach the tacho flange (10) to the brake cover again and fasten the screws (63) by applying the appropriate tightening torque. **Take care to not damage the O-ring (103)!**
- The encoder inclusive the compensating coupling is mounted back on the brake as explained above.

STROMAG
A REGAL REXNORD BRAND

4HPB
mounting instructions

Electromagnetic Four-Face
Spring-Applied Brake

For special applications the Controlflex compensating coupling can be utilised in an inseparable axial installation. The encoder with inseparable Controlflex coupling is mounted on the brake in the same manner as the separable one but the dismantling must be carried out differently, otherwise the inseparable Controlflex will be damaged.

To disconnect the encoder with inseperable Controlflex, proceed as follows.

- Remove the screw plug (86) out of the tacho flange (10).
- Rotate the shaft contacting the brake pinion (4) until the fixing screw in the compensating coupling's (602) pinion-side clamping hub can be reached through the access hole in the tacho flange (10) as depicted in Figure 10.14.
- Use a suitable 3 mm Allen key to loosen the fixing screw.
- Remove the fixing screws of the encoder and detach the encoder from the tachoflange (10).
- The encoder inclusive the compensating coupling is mounted back on the Brake as explained above.



NOTE

To detach the encoder with inseparable Controlflex you must be able to rotate the motor shaft through at least 180°. If this is not possible owing to the configuration of the machine or drive system incorporating the brake, then the brake must be ordered with an axially separable version of the Controlflex compensating coupling (see Figure 10.12). We recommend to use the separable Controlflex (standard variant).

Stromag GmbH
Hansastraße 120
59425 Unna
www.stromag.com

449-00243
Version: D
03.07.2023

10.6 Option - electrical accessories

Category 6 (XXXXX**X**X) of the seven-letter description defines the brake's accessories delivered separately for this option.

Table 10.6: *Category 6: electrical accessories*

Funktion/ option	Code
ohne elektrisches Zubehör/ without electrical accessories	**O**
Klemmenkasten lose/ terminal box loose	**L**
SSG lose/ quick switching rectifier loose	**S**
SSG auf Blech lose/ quick switching rectifier on sheet metal loose	**B**
GR lose/ rectifier loose	**G**
Zusatzheizung im Tachoflansch/ additional heating in tachoflange	**H**
Kundenspezifisch/ customized	**C**

Details on the accessories delivered separately can be taken from the brake's dimensional drawings.

10.7 Option - miscellaneous

Category 7 (XXXXXX**X**) of the seven-letter description defines the brake's other options for this option.

Table 10.7: *Category 7: miscellaneous*

Funktion/ option	Code
ohne weitere Anforderungen, Horizontalbetrieb/ no additional requirements, horizontal operation	**O**
Vertikalbetrieb/ vertical operation	**V**
Einzelabnahme einer Marine-Klassifikationsgesellschaft/ case-by-case certification of marine classification society	**E**
Kundenspezifisch/ customized	**C**

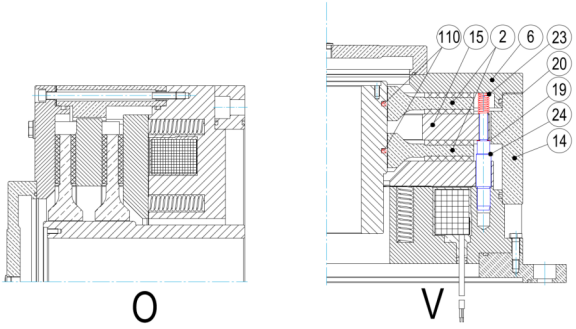


Figure 10.15: *Category 7: O-V*

HPB series brakes have been prepared for horizontal installations. Installed position (Figure 10.15) for version (**O**). In this version, the friction surfaces run freely when released. When installed vertically (Figure 10.15)), the (**V**) brake version must be fitted with alternative components that minimise residual friction on the friction surfaces when these are released. The mass of the vertically installed components draws them towards the coil body. A stud (24) fitted with a stop is used to define the position of the centre brake disc (15) in the released state. The pressure spring (23) always moves the centre brake disc (15) into its defined position. The released brake therefore provides adequate leeway for the two friction discs (2). The pinion is fitted with sealing rings (110) that serve to counteract the deadweight of the friction discs (2). The clamping effects from these sealing rings (110) balance out the deadweight of the friction discs (2), but do not prevent them from moving axially on the pinion when the brake is switched in. We recommend applying a thin coat of grease, e. g. MoS_2, to the sealing rings (110) before fitting them.

NOTE

In horizontal installations, these sealing rings (110) must be removed because there are then no effects of gravity on the friction discs.

Additional requirements apply when the brake (see Section 6.1)is to be mounted on a vertical installation. The sealing rings (110) can be seated properly only when the friction discs (2) are mounted separately. The brake must be prepared for mounting as follows:

- Align the brake vertically; protect the lines against damage
- Perform an emergency release on the brake as described in Section 5.3
- Remove the screws (60) and (62); see Section 5.1
- Remove the brake cover (6) on the bush (14). Removal aids are provided in the form of threaded holes on the brake cover, which can be used to press off this cover.
- Remove the shim (20)
- The tacho flange need not be removed
- Remove the first friction disc (2), and mark on it its alignment and position as a mounting aid.
- Remove the spring (23) for the return system
- Remove the centre brake disc (15), and mark on it its position as a mounting aid.
- Remove the second friction disc (2), and mark on it its alignment and position as a mounting aid.

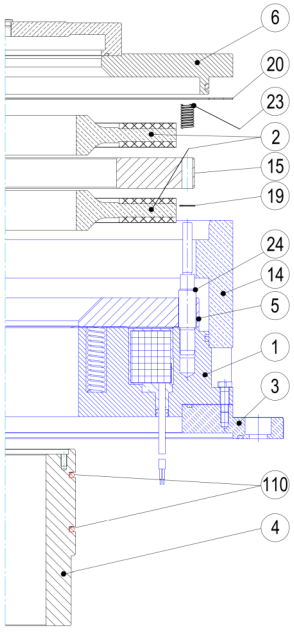


Figure 10.16: *Preparing for vertical mounting*

Depending on its design, the connecting flange provided by the customer (3) may have to be detached from the coil body. In this case, see Section 6.1.

After the preparatory work, the brake can be mounted on the drive. This involves the following procedure (see Figure 10.16).

- Check that the connecting dimensions agree with the brake's specifications
- Remove all transportation and storage protection devices, burr, and impact damage.
- Check face runout of the flange mounting surface relative to the shaft to be braked (tolerance class N in accordance with DIN 42955 should not be exceeded).
- Check and, if necessary, clean the pinion (4)
- Apply a small amount of grease to the shaft and feather key, fit the pinion (4), and secure them in their axial positions.
- Use suitable screws to secure the flange (3) at its correct position on the motor flange
- Using suitable sling gear, shackles, or similar, manoeuvre the main brake preassembly with the coil body preassembly carefully over the pinion (4). Position the preassemblies at their correct locations

on the flange (3), and secure them axially with screws (61). Make sure that the electrical connection is performed by expert personnel taking into account the pertinent installation regulations.

- Apply a thin film of grease (e. g. MoS_2) to the sealing ring (110), and position it in the groove on the coil body side.
- Position the matching friction disc at its correct location on the pinion's teeth, and then push the friction disc (2) up to the armature disc (5). To overcome the resistance of the preloaded sealing ring (110), we recommend the use of equipment that can advance the friction disc (2) uniformly to its end position. Figure 10.18 presents an example.



WARNING

When readjusting the brake and replacing the friction discs (2), make sure that the friction disc (2) between the armature disc (5) and the centre brake disc (15) can move without hindrance. As shown in Figure 10.17, use a straightedge at two points to check the air gap between the friction disc and the support face on the centre brake disc (15). The gap around the circumference must be set to 0.1 mm – 0.2 mm. Adjustments can be made with shims (19).

- All of the armature disc must be released, i.e. it must lie against the coil body

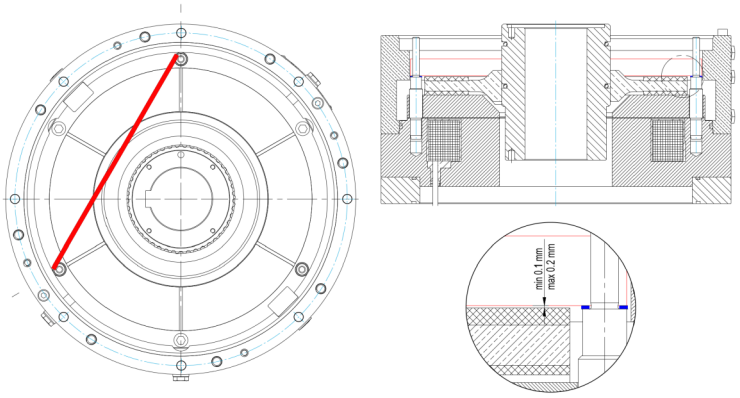


Figure 10.17: *Measurements on the vertical 4HPB*

- Position the centre brake disc (15) at its correct location, making sure that the shims (19) are fitted over the stud (24).
- Apply a thin film of grease (e. g. MoS_2) to the sealing ring (110), and position it in the front groove.
- Position the matching friction disc at its correct location on the pinion's teeth, and then push the friction disc (2) up to the centre brake disc (15). To overcome the resistance of the preloaded sealing ring (110), we recommend the use of equipment that can advance the friction disc (2) uniformly to its end position. Fig 10.18presents an example.

- Place the return springs (23) on the stud (24)
- Insert the shim (20) at its correct position
- Again mount the brake cover (6) at its correct position on the bush (14)
- Tighten the screws (60) and (62) with the torque specified on the drawing
- Remove the mechanical emergency release on the brake as described in Section 5.3
- Measure the air gap as described in Section 9.2
- Check that the brake switches properly
- Again, check the air gap after 3 electrical switchings.

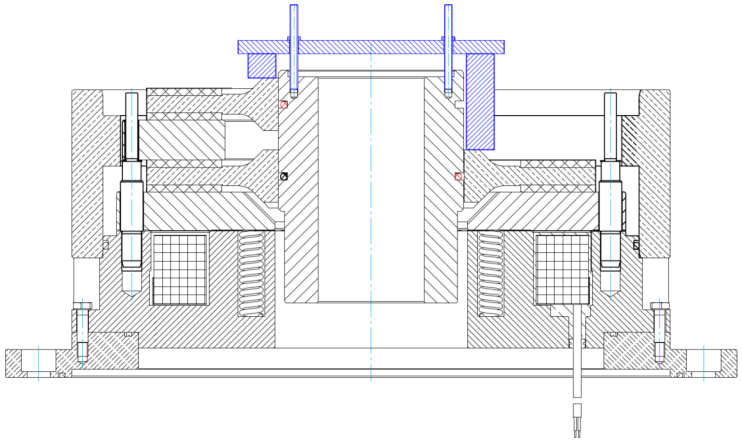


Figure 10.18: *Mounting device for vertical installations*

11 Spare parts stocking, customer services

11.1 Spare parts stocking

Stocking of spare and parts subject to wear is an important precondition for a permanent reliable functioning of the brake. Wearing parts are friction disc with friction lining (2), armature disc (5), and brake cover (6) (see Section 5.1 for item numbers).

Warranty will be provided only for the original spare parts supplied by us. We expressly state that the installation or use of spare parts other than the original ones supplied by us will negatively affect the design characteristics of the brake and thus have an impact on active and/or passive safety. Stromag GmbH shall have no warranty obligations for any damage caused by the use of spare parts or accessories other than the original ones supplied by us.

Please bear in mind that often particular manufacturing and delivery specifications exist for parts manufactured by us or bought from others, and that we offer spare parts to the up-dated technical conditions and the up-dated legal prescriptions.

11.2 Data for the ordering of spare parts

The following details that can also be found on the rating plate are needed: (see Section 3.1)

- Series and size of brake
- Article code
- Spare part no. and name (see Section 5.1)
- Number of pieces

11.3 Address of customer services

This is our address for customer service and spare parts distribution:

Stromag GmbH
Hansastraße 120
59425 Unna
GERMANY

Telephone:	**+49 2303 102 0**
Telefax:	**+49 2303 102 201**
E-Mail:	**info@stromag.com**
Internet:	**www.stromag.com**

If you require a service engineer, please contact our “Customer Care” at the above address.

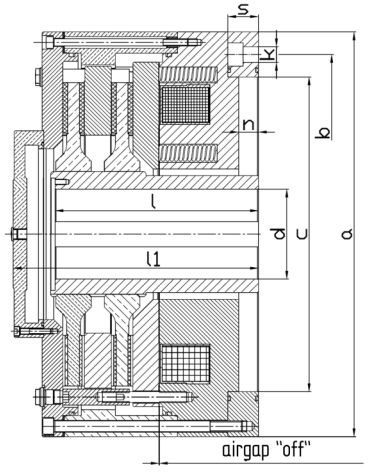
12 Listed standards and regulations

DIN 6885-1	Fitting keys
DIN EN 60529 (VDE 0470-1)	Degrees of protection provided by enclosures (IP Code)
DIN EN 50347	General purpose three-phase induction motors having standard dimensions and outputs
DIN 42955	Concentricity of shaft ends, co-axial and true running of fastening flanges of rotating electrical machines
DIN EN 60092-507 (VDE 0129-507)	Electrical installations in ships - Part 507: Pleasure craft
DIN EN 60034-5 (VDE 0530-5)	Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code)
DIN VDE 0580	Electromagnetic devices and components - General specifications
2004/108 EG	Electromagnetic compatibility
2006/95 EG	Low Voltage Directive

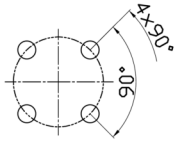
The listed standards and regulations comply with the current version at the time of publication of this document.

13 Annex

13.1 Dimensional drawing



Arrangement of drilled holes k and k1 for flange sizes up to FF 350 according to EN 50347 (comply with A400 according to DIN 42498)



Arrangement of drilled holes k and k1 for flange sizes greater than FF 400 according to EN 50347 (comply with A450 according to DIN 42498)

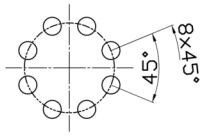


Table 13.1: *Dimensional drawing (dimensions in mm)*

brake size	4HPB	20	25	27	30	35	40	45	55
outer diameter	*a*	200	250	275 (300)	300	350	400	450	550
pitch circle diameter	*b*	165	215	265	265	300	350	400	500
centring diameter	*cH7*	130	180	230	230	250	300	350	450
overall length	*l1*	166	172	200	206	224	241	273	288
nominal air gap	*min*	0.5	0.6	0.6	0.6	0.6	0.7	0.8	1.0
	max	1.1	1.2	1.3	1.4	1.5	1.7	2.1	2.5
pinion length	*l*	118	138	150	150	183	187	226	230
max pinion bore	*dH7*	38	48	55	55	60	95	100	120
centering length	*n*	16	17	21	21	20	22.5	22	17
flange width	*s*	21	22	26	26	30	31	34	37
drilled hole	*k*	11	13.5	13.5	13.5	17.5	17.5	17.5	17.5
flange	*min*	A200	A250	A300	A300	A350	A400	A450	A550
airgap as delivered	*min*	0.4	0.5	0.5	0.5	0.5	0.6	0.65	0.9
	*max**	0.7	0.8	0.9	0.9	1.0	1.1	1.3	1.6

∗ final wear backup after run-in of the brake is at least 60% of the permissible wear regarding the min. and max. nominal air gap

14 List of Figures and Tables

List of Figures

3.1 rating plate 4HPB . . . 12
4.1 Transporting and mounting by means of eyebolts . . . 16
5.1 Section through a 4HPB45, parts labelled with item numbers . . . 18
5.2 Emergency release screws . . . 19
6.1 Example tightening torques . . . 21
6.2 Mounting without prior removal . . . 22
6.3 Mounting with prior removal . . . 23
8.1 Section through 4HPB . . . 27
9.1 Measuring the air gap on the 4HPB . . . 30
9.2 Section through the optional vertical 4HPB45, parts labelled with item numbers . . . 31
9.3 Measurements on the vertical 4HPB . . . 32
9.4 4HPB drain plug . . . 35
10.1 Category 1: A-R-K-S-G-B . . . 37
10.2 Category 1: K-S-B . . . 37
10.3 Category 2: O-S-V . . . 38
10.4 Inductive switch . . . 39
10.5 Connecting diagram . . . 39
10.6 Microswitch . . . 39
10.7 Microswitch connecting diagram . . . 39
10.8 Category 3: H-O . . . 40
10.9 Manual release 4HPB . . . 41
10.10 Standard painting (**L**) . . . 43
10.11 Category 5: K-O-B-W-E-G . . . 44
10.12 Controlflex . . . 44
10.13 Mounting the compensating coupling on the rotary encoder . . . 45
10.14 Mounting the rotary encoder with coupling on the brake . . . 46
10.15 Category 7: O-V . . . 49
10.16 Preparing for vertical mounting . . . 50
10.17 Measurements on the vertical 4HPB . . . 51
10.18 Mounting device for vertical installations . . . 52

List of Tables

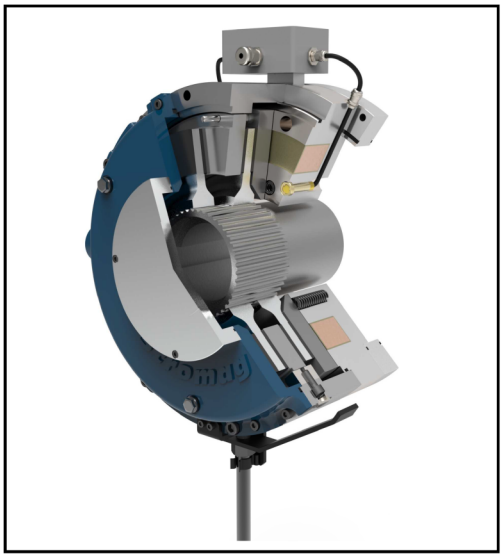
1 Revision history . . . 2
3.1 Technical data . . . 13
3.2 Torque ratings for brakes with approval by classification societys for Lifting Appliances . . . 14
6.1 mounting accuracy . . . 24
10.1 Category 1: electrical connection . . . 37
10.2 Category 2: monitoring . . . 38
10.3 Category 3: accessories . . . 40
10.4 Category 4: surface . . . 43
10.5 Category 5: connections . . . 44
10.6 Category 6: electrical accessories . . . 48
10.7 Category 7: miscellaneous . . . 49
13.1 Dimensional drawing (dimensions in mm) . . . 55

A.1.4 Holding brake operating instructions Stromag 4HPB EN

STROMAG
A REGAL REXNORD BRAND

Vierflächen-Elektromagnet-Federdruckbremse 4HPB

Dokumenten-Nr.: 449-00243



Montageanleitung

DE

Stromag GmbH

Hansastraße 120
59425 Unna
Tel.: +49 2303 102-0
Fax.: +49 2303 102-201
www.stromag.com
info@stromag.com

Änderungshistorie

Tabelle 1: *Änderungshistorie*

Änderungsstand	Ausgabedatum	Änderungen
Version -	07.10.2020	Neuanlage der Montageanleitung
Version A	12.03.2021	Ergänzungen zur Encodermontage (Kap. 10.5)
Version B	14.03.2022	Ergänzungen und redaktionelle Änderungen (Kap. 4, 8.1, 8.2, 8.3, 9.1, 9.2, 9.3, 10.3.2, 12)
Version C	06.10.2022	Übernahme Stromag GmbH
Version D	03.07.2023	Ergänzungen und redaktionelle Änderungen (Kap. 3.2, 8.1, 10, 10.4, 10.5,13.1)

Alle Informationen und Abbildungen waren zum Zeitpunkt der Drucklegung auf dem neuesten Stand. Technische Änderungen vorbehalten.

Die Urheberrechte und alle weiteren Schutzrechte an den Inhalten dieser Gebrauchsanleitung verbleiben vollumfänglich bei der Stromag GmbH. Der Nachdruck – auch auszugsweise – ist nur mit unserer vorherigen Zustimmung gestattet.

© 2023 Stromag GmbH

Hansastraße 120
59425 Unna
Deutschland

Telefon: +49 2303 102 0
Telefax: +49 2303 102 201



Wichtig!

Vor Gebrauch sorgfältig lesen!
Zum Nachschlagen aufbewahren!

Inhaltsverzeichnis

1 Grundlegende Hinweise 6
1.1 Zweck dieser Montageanleitung . . . 6
1.2 Aufbau der Montageanleitung . . . 6
1.3 Mitgeltende Unterlagen . . . 7
1.4 Hersteller . . . 7

2 Sicherheitshinweise 7
2.1 Aufbau der Warnhinweise . . . 7
2.1.1 Unterscheidung der Gefährdungsstufen . . . 8
2.1.2 Warnzeichen . . . 9
2.1.3 Persönliche Schutzausrüstung . . . 9
2.2 Voraussetzungen für den sicheren Gebrauch . . . 10
2.3 Verpflichtung des Betreibers . . . 10
2.4 Verpflichtung des Personals . . . 10
2.5 Bestimmungsgemäße Verwendung . . . 11
2.6 Grundsätzliche Sicherheitsanforderungen . . . 12
2.7 Elektromagnetische Verträglichkeit . . . 12

3 Technische Daten 12
3.1 Typschildangaben . . . 12
3.2 Drehmomente, Drehzahl, technische Daten . . . 13
3.3 Bohrungs-und Nutabmessungen, Außenmaße . . . 15
3.4 Einsatzbereich und bestimmungsgemäße Verwendung . . . 15

4 Transport 16
4.1 Verpackung . . . 17
4.2 Zerlegungsgrad . . . 17
4.3 Empfindlichkeit . . . 17
4.4 Lagerung . . . 17
4.5 Lieferumfang . . . 18

5 Aufbau, Wirkungsweise und Konstruktionsmerkmale 18
5.1 Benennung der Einzelteile (Darstellung Baugröße 4HPB45) . . . 18
5.2 Wirkungsweise und Konstruktionsmerkmale der Standardausführung . . . 19
5.3 Mechanische Lüftung mittels Notlüftschrauben . . . 19
5.4 Elektrischer Anschluss . . . 20

6 Montage und Demontage 21
6.1 Montage . . . 22
6.1.1 Direkte Montage . . . 22
6.1.2 Montage mit Demontage . . . 23
6.2 Montagegenauigkeit . . . 24
6.3 Abmessungen, Platzbedarf und Masse . . . 24
6.4 Demontage . . . 24

7 Erst-Inbetriebnahme 25

8 Betrieb 25
8.1 Betriebsbedingungen . . . 26
8.1.1 Haltebetrieb . . . 26
8.1.2 Arbeitsbetrieb . . . 26
8.1.3 Notstoppbetrieb . . . 26

8.2 Einschaltdauer und Schalthäufigkeit . . . 26
8.3 Schutzarten . . . 27
8.4 Störungsabhilfe . . . 28

9 Wartung und Instandhaltung 29
9.1 Pflege- und Kontrollarbeiten . . . 29
9.2 Messung des Luftspaltes . . . 29
9.3 Verschleißnachstellung . . . 30
9.3.1 Verschleißnachstellung Standardausführung . . . 31
9.3.2 Verschleißnachstellung bei optionaler Vertikalausführung . . . 31
9.4 Auswechseln der Reibscheibe mit Reibbelag . . . 33
9.5 Kondenswasser ablassen . . . 34
9.6 Kontrollarbeiten nach einem Notstopp . . . 35

10 Varianten und Bezeichnung 36
10.1 Option - elektrische Anschlussmöglichkeiten . . . 37
10.2 Option - Überwachung . . . 38
10.2.1 Induktiver Näherungsschalter . . . 39
10.2.2 Mikroschalter . . . 39
10.3 Option - Zubehör . . . 40
10.3.1 Stillstandsheizung / O-Ring . . . 40
10.3.2 Handhebel- Notlüftung . . . 41
10.4 Option - Oberfläche . . . 43
10.5 Option - Anschluss . . . 44
10.6 Option - Beschaltung . . . 48
10.7 Option - Sonstiges . . . 49

11 Ersatzteilhaltung, Kundendienst 53
11.1 Ersatzteilhaltung . . . 53
11.2 Daten für Ersatzteilbestellung . . . 53
11.3 Kundendienstadresse . . . 53

12 Aufgeführte Normen und Richtlinien 54

13 Anhang 55
13.1 Maßblatt . . . 55

14 Abbildungs- und Tabellenverzeichnis 56

1 Grundlegende Hinweise

In dieser Montageanleitung wird vereinfachend das generische Maskulinum verwendet. Gemeint ist jedoch sowohl männliches als auch weibliches Personal.

1.1 Zweck dieser Montageanleitung

Die Montageanleitung zur Beschreibung der Bremse des Typs 4HPB enthält grundlegende Hinweise, Sicherheitshinweise, technische Daten, eine Funktionsbeschreibung, Angaben zu Transport und Lagerung, De- und Montage, Inbetriebnahme, Betrieb, Fehlersuche und Behebung sowie Angaben zur Ersatzteilhaltung, Kundendienst und Fremddokumentation.

Alle Hinweise und Beschreibungen gelten für die gesamte Lebensdauer der Bremse, einschließlich Beendigung des Betriebs und Entsorgung. Den Hinweisen ist unbedingt Folge zu leisten. Das mit den Arbeiten am Produkt betraute Personal quittiert per Unterschrift, diese Montageanleitung gelesen und verstanden zu haben.

Sämtliche Arbeiten an der Bremse dürfen nur von befähigten Personen ausgeführt werden. Technische Änderungen und Manipulationen sind untersagt.

Diese Montageanleitung ist vom Betreiber, um Anweisungen aufgrund bestehender nationaler Vorschriften zur Unfallverhütung und zum Umweltschutz, zu ergänzen.

1.2 Aufbau der Montageanleitung

Der vorliegenden Montageanleitung ist ein Änderungsverzeichnis vorangestellt. Die Änderungen im Dokument können somit besser nachvollzogen und die Aktualität des Dokumentes dadurch schneller geprüft werden.

Das darauffolgende Inhaltsverzeichnis ist ein Leitfaden der technischen Dokumentation.

Ein Abbildungsverzeichnis, das sich am Ende der Montageanleitung befindet, gibt einen schnellen Überblick über verwendete Abbildungen.

In der vorliegenden Montageanleitung werden folgende Kennzeichen verwendet:

- Handlungsanweisungen und Aufzählungen sind durch einen vorangestellten schwarzen Punkt (•) gekennzeichnet
- Zwischenüberschriften oder Hervorhebungen werden durch fettgeschriebenen Text gekennzeichnet
- alle Abbildungen werden durch eine fortlaufende Abbildungsnummer nummeriert
- die in den Abbildungen dargestellten Komponenten oder Bauteile werden durch einen Positionsstrich und einer dazugehörigen Positionsnummer veranschaulicht
- jedem Bauteil / Komponente ist eine spezifische Positionsnummer zugeordnet, die über alle Kapitel hinweg gleich bleibt
- im beschreibenden Text wird das abgebildete Bauteil / Komponente mit einer runden Klammer und Positionsnummer (1) vorgestellt und beschrieben
- jeder Abbildung ist eine Legende mit den abgebildeten Bauteilen / Komponenten und deren Positionsnummer untergeordnet

1.3 Mitgeltende Unterlagen

Die mitgeltenden Dokumente in Form von Einbauzeichnungen und Datenblättern für das konkrete Erzeugnis sind ausschließlich für Fachpersonal gedacht. Sie geben Informationen zu speziellen Wartungs-, Reparatur- und Einstelltätigkeiten an den Bremsen.

1.4 Hersteller

Stromag GmbH
Hansastraße 120
59425 Unna

Telefon:	**+49 2303 102 0**
Telefax:	**+49 2303 102 201**
E-Mail:	**info@stromag.com**
Internet:	**www.stromag.com**

2 Sicherheitshinweise

In diesem Kapitel werden grundlegende Sicherheitshinweise und der Aufbau der Warnhinweise erläutert. Diesen Hinweisen ist unbedingt Folge zu leisten, um Gefahren für Menschen und Schäden zu vermeiden. Die Stromag GmbH übernimmt keine Haftung für Schäden, die aus Nichtbeachtung dieser Montageanleitung und speziell der Sicherheitshinweise, resultieren.

2.1 Aufbau der Warnhinweise

Die farbliche Unterscheidung der Warnhinweise wird in Graustufen vorgenommen, um eine eindeutige Trennung auch bei Schwarz-Weiß-Ausdrucken zu ermöglichen. Die Warnhinweise in dieser Montageanleitung sind wie folgt aufgebaut:

Piktogramm	**SIGNALWORT** Art der Gefahr und ihre Quelle Folgen bei Missachtung der Warnhinweise. • Maßnahmen zur Vermeidung der Gefahr.

2.1.1 Unterscheidung der Gefährdungsstufen

Folgende Gefährdungsstufen werden unterschieden:



GEFAHR

Warnt vor unmittelbar drohender Gefahr.
Tod oder schwerste Verletzungen sind die Folge.

- Maßnahmen zur Vermeidung der Gefahr.



WARNUNG

Warnt vor möglicher Gefahr.
Tod oder schwerste Verletzungen sind die Folge.

- Maßnahmen zur Vermeidung der Gefahr.



VORSICHT

Warnt vor möglicher Gefahr.
Mäßige oder geringfügige Verletzungen können die Folge sein.

- Maßnahmen zur Vermeidung der Gefahr.



ACHTUNG

Warnt vor Sachschäden.
Erzeugnis oder Gegenstände in seiner Umgebung können beschädigt werden.

- Maßnahmen zur Vermeidung der schädlichen Situation



HINWEIS

Gibt zusätzlich nützliche Informationen, die den Betrieb des Erzeugnisses vereinfachen und zum Verständnis beitragen

2.1.2 Warnzeichen



Allgemeines Warnzeichen Es findet in Situationen Anwendung, in denen die grafische Darstellung einer einzelnen spezifischen Gefahr nicht möglich ist.



Warnung vor schwebender Last



Warnung vor heißen Oberflächen



Warnung vor elektrischer Spannung



Warnung vor Quetschgefahr

2.1.3 Persönliche Schutzausrüstung



Bruchsichere Schutzbrille mit Seitenschild zum Schutz der Augen bei Montagearbeiten.



ESD-fähige Arbeitsschutzschuhe mit Stahlkappe zum Schutz vor elektrostatischer Entladung und Quetschungen.



ESD-fähige Handschuhe zum Schutz vor elektrostatischer Entladung und Hautverletzungen.



Schutzhelm zum Schutz vor Kopfverletzungen durch herabfallende Werkzeuge oder Werkstücke bei Montage- und Demontagevorgängen und Kranarbeiten.

2.2 Voraussetzungen für den sicheren Gebrauch

Definition sicherer Gebrauch:

Bei allen für den bestimmungsgemäßen Gebrauch der Bremse nötigen Tätigkeiten ist Vorsicht geboten, um Unfälle, Personenschäden und Sachschäden zu vermeiden. Bei Nichtbeachtung übernimmt die Stromag GmbH keine Haftung für eventuelle Sach- und/oder Personenschäden!

PSA

Zusätzliche Sicherheitshinweise des Betreibers sind einzuhalten. Bei der Arbeit ist eine persönliche Schutzausrüstung (PSA) zu tragen. Für alle Arbeiten an der Bremse gelten alle landesspezifischen Unfallverhütungsvorschriften.

Außerdem gilt:

- die Bremse darf nur für den bestimmungsgemäßen Gebrauch eingesetzt werden
- die Bremse muss in technisch einwandfreiem Zustand sein
- die Bremse darf nur betrieben werden, wenn alle Sicherheitseinrichtungen voll funktionsfähig sind
- den in dieser Montageanleitung definierten Warn- und Sicherheitshinweisen ist unbedingt Folge zu leisten
- ein Nichtbefolgen der Warn- und Sicherheitshinweise kann zu Tod, schwersten Verletzungen und Schäden der Bremse führen
- den Weisungen des mit dem Arbeitsschutz beauftragten Personals ist unbedingt Folge zu leisten
- alle Sicherheits- und Warnhinweise der Bremse sind in lesbarem Zustand zu halten und zu beachten
- Bedienerplatz und Zugänge sind von Werkzeugen, Hilfsmitteln und anderen Gegenständen freizuhalten

2.3 Verpflichtung des Betreibers

Betreiberverpflichtungen

Der Betreiber verpflichtet sich, das sicherheitsbewusste Arbeiten des Personals in regelmäßigen Abständen zu überprüfen. Der Betreiber verpflichtet sich, eine Gefährdungsbeurteilung der Arbeitsplätze an der Maschine in seinem Verantwortungsbereich durchführen und daraus Betriebsanweisungen abzuleiten. Der Betreiber benennt einen Verantwortlichen, der für den sicheren Betrieb der Maschine und die Koordination aller Arbeiten an der Maschine verantwortlich ist. Der Betreiber verpflichtet sich, nur Original-Ersatzteile und Original-Aufrüstteile einzusetzen oder vor dem Nachrüsten und Ersetzen Rücksprache mit Stromag GmbH zu halten. Für den Betrieb gelten in jedem Fall die örtlichen Sicherheits- und Unfallverhütungsvorschriften. Der Betreiber hat für die Einhaltung der Vorschriften zu sorgen.

2.4 Verpflichtung des Personals

Verpflichtungen Bedienpersonal

Jede Person, die im Betrieb des Anwenders mit Transport, Montage, Inbetriebnahme, Verwendung und Demontage des Erzeugnisses befasst ist, muss die komplette Montageanleitung und besonders die Sicherheitshinweise gelesen und verstanden haben.
Für Schäden und Betriebsstörungen, die sich aus der Nichtbeachtung der Montageanleitung ergeben, übernimmt die Stromag GmbH keine Haftung

Das mit Bedienung und Instandhaltung beauftragte Personal muss die Belehrung per Unterschrift quittieren. Personen, deren Reaktionsfähigkeit durch Drogen, Alkohol oder Medikamente beeinflusst ist, dürfen am Erzeugnis NICHT arbeiten, selbst wenn sie über die nötige Qualifikation verfügen.
Das Personal verpflichtet sich weiterhin, Arbeitsschutzbestimmungen und Betriebsanweisungen zu beachten, Zuständigkeiten ordnungsgemäß wahrzunehmen und eine angemessene persönliche Schutzausrüstung (PSA) zu tragen.

Verpflichtungen Fachpersonal

Das Fachpersonal ist aufgrund seiner fachlichen Ausbildung, Kenntnisse und Erfahrung sowie Kenntnis der einschlägigen Normen und Bestimmungen in der Lage die ihm übertragenen Arbeiten auszuführen und mögliche Gefahren selbstständig zu erkennen und zu vermeiden.

2.5 Bestimmungsgemäße Verwendung

Eingrenzung der bestimmungsgemäßen Verwendung

Die Bremse dient dem Verknüpfen und Trennen eines Energieflusses in Form einer Drehmomentübertragung. Es handelt sich um ein nicht verwendungsfertiges, elektromagnetisch betätigtes Gerät, das zur Erfüllung seiner Funktion mit weiteren Komponenten verbunden werden muss. Der Einsatz ist als Bremse nur im Trockenlauf erlaubt.
Vorgesehene Einsatzgebiete sind der industrielle Einsatz im allgemeinen Maschinenbau, Hub- und Fahrantriebe, Fördertechnik, Baumaschinen, sowie alle Anwendungen die eine elektromagnetische Bremse erfordern. Zur bestimmungsgemäßen Verwendung gehört die Einhaltung der vom Hersteller vorgeschriebenen Montage-, Demontage-, Inbetriebnahme- und Instandhaltungsbedingungen.
Eigenmächtige Umbauten und Veränderungen, die die Sicherheit beeinträchtigen, sind ebenso wie der Einsatz fremder Zubehörteile nicht gestattet.
Die Nichtbeachtung dieser Bedingungen oder jeder darüberhinausgehende Gebrauch gilt als nicht bestimmungsgemäß. Für hieraus resultierende Schäden haftet der Hersteller nicht. Das Risiko hierfür trägt allein der Benutzer. Soll die Bremse außerhalb dieses vertraglichen Einsatzbereiches eingesetzt werden, ist der Kundendienst der Stromag GmbH zu Rate zu ziehen, da sonst die Gewährleistung entfällt.



WARNUNG

Sach- und Personenschaden
Das Erzeugnis ist ausschließlich für den Einsatz unter den vorgegebenen technischen Daten nach Kap. 3 und 3.2 und Betriebsbedingungen nach Kap. 8.1 vorgesehen. Zusätzlich gelten für das Erzeugniss die entsprechenden Datenblätter und Einbauzeichnungen die beim Kundendienst abgefragt werden können. Anschrift s. Kap. 11.3

2.6 Grundsätzliche Sicherheitsanforderungen

Anforderungen an die Sicherheit

Das Erzeugnis ist nach dem aktuellen Stand der Technik gebaut und ist betriebssicher. Von diesem Gerät können aber Gefahren ausgehen, wenn es von unausgebildetem Personal unsachgemäßem oder zu nicht bestimmungsgemäßem Gebrauch eingesetzt wird.
Es ist jede Arbeitsweise zu unterlassen, welche die Sicherheit des Erzeugnisses beeinträchtigt. Der Betreiber ist verpflichtet, eintretende Veränderungen an dem Erzeugnis, welche die Sicherheit beeinträchtigen, dem Lieferanten sofort zu melden. Der Anwender ist verpflichtet, das Erzeugnis immer nur in einwandfreien Zustand zu betreiben.

2.7 Elektromagnetische Verträglichkeit

Schutzanforderungen

Gemäß Richtlinie 2014/30/EU ist für den Betrieb von elektrischen Betriebsmitteln die Einhaltung bestimmter Schutzanforderungen vorgeschrieben, damit diese Geräte in ihrer elektromagnetischen Umgebung ohne gegenseitige Beeinträchtigung funktionieren können.

Gefährdungen

Um die Gefährdung von Personen, Haustieren und Gütern durch unmittelbare und mittelbare Einwirkung elektromagnetischer Felder auszuschließen, sind vom Anwender geeignete Maßnahmen zu ergreifen.

Bestimmungsgemäßer Einbau

Maschinenbauer, System- und Anlagenerrichter müssen durch den bestimmungsgemäßen Einbau des Produktes und durch die sachgerechte Installation der zugehörigen Spannungsversorgung für die Einhaltung der Schutzanforderungen aus der Richtlinie 2014/30/EU sorgen.

Druckschrift

Von unserem Kundendienst können Sie als Hilfestellung unsere Druckschrift „EMV-Hinweise“, Nr. 900-00001 anfordern, Anschrift s. Kap. 11.3 .

3 Technische Daten

3.1 Typschildangaben

Folgende Daten befinden sich auf dem Leistungsschild. Dieses ist am Umfang der Bremse angebracht. Diese Daten müssen mit den Angaben in der Auftragsbestätigung übereinstimmen.

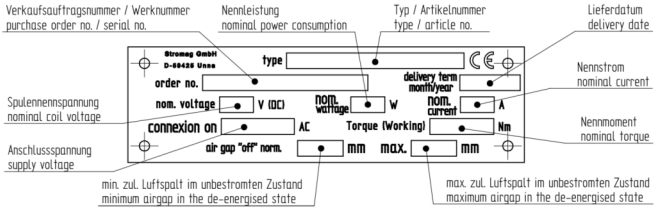


Abbildung 3.1: *Leistungsschild 4HPB*

3.2 Drehmomente, Drehzahl, technische Daten

Zulässige Drehmomente und technische Daten sind der Tabelle 3.1 zu entnehmen. Von der Tabelle abweichende technische Parameter können beim Hersteller erfragt werden bzw. sind Bestandteil der Auftragsbestätigung. Die Hauptparameter sind auf dem Leistungsschild vermerkt.

Tabelle 3.1: *technische Daten*

Baugröße Variante	M_{SN} $[Nm]$	$M_{\ddot{U}}$ $[Nm]$	n_0 $[min^{-1}]$	n_{zn} $[min^{-1}]$	U_n* $[VDC]$	P_k $[W]$	Luftspalt $[mm]$ $min./max.$	$Q_{E,zul}$ $[kJ]$	J $[kgm^2]$	m $[kg]$
4 HPB 20 S	160	176	6500	3200	110	107,3	0,5/1,1	**	0,0029	21,3
4 HPB 20 H	200	220	6500	3200	110	107,3	0,5/1,1	**	0,0029	21,3
4 HPB 20 V	260	286	6500	3200	110	107,3	0,5/1,1	**	0,0029	21,3
4 HPB 25 S	260	286	6500	2500	110	83,9	0,6/1,2	**	0,0074	36,9
4 HPB 25 H	320	352	6500	2500	110	83,9	0,6/1,2	**	0,0074	36,9
4 HPB 25 V	400	440	6500	2500	110	83,9	0,6/1,2	**	0,0074	36,9
4 HPB 27 S	400	440	6500	2300	110	125	0,6/1,3	**	0,0209	51,2
4 HPB 27 H	500	550	6500	2300	110	125	0,6/1,3	**	0,0209	51,2
4 HPB 27 V	640	704	6500	2300	110	125	0,6/1,3	**	0,0209	51,2
4 HPB 30 S	640	704	6300	2100	110	151	0,6/1,4	**	0,0246	63,9
4 HPB 30 H	800	880	6300	2100	110	151	0,6/1,4	**	0,0246	63,9
4 HPB 30 V	1000	1100	6300	2100	110	151	0,6/1,4	**	0,0246	63,9
4 HPB 35 S	1000	1100	5400	1700	110	150	0,6/1,5	**	0,0453	94,9
4 HPB 35 H	1300	1430	5400	1700	110	150	0,6/1,5	**	0,0453	94,9
4 HPB 35 V	1600	1760	5400	1700	110	150	0,6/1,5	**	0,0453	94,9
4 HPB 40 S	1600	1760	4500	1500	110	212	0,7/1,7	**	0,0988	132,6
4 HPB 40 H	2000	2200	4500	1500	110	212	0,7/1,7	**	0,0988	132,6
4 HPB 40 V	2600	2860	4500	1500	110	212	0,7/1,7	**	0,0988	132,6
4 HPB 45 S	2600	2860	4100	1100	110	320	0,8/2,1	**	0,1573	204,4
4 HPB 45 H	3200	3520	4100	1100	110	320	0,8/2,1	**	0,1573	204,4
4 HPB 45 V	4000	4400	4100	1100	110	320	0,8/2,1	**	0,1573	204,4
4 HPB 55 S	4000	4400	3250	900	110	311	1,0/2,5	**	0,4149	280,2
4 HPB 55 H	5000	5500	3250	900	110	311	1,0/2,5	**	0,4149	280,2
4 HPB 55 V	6400	7040	3250	900	110	311	1,0/2,5	**	0,4149	280,2

* andere Spannungen auf Anfrage
** detaillierte Werte siehe Datenblatt (kann beim Kundendienst angefragt werden)

M_{SN}	:	schaltbares Nennmoment bei einer mittleren Reibgeschwindigkeit von $1\,m/s$ nach DIN VDE 0580 (gilt für Trockenlauf bei öl- und fettfreiem Reibbelag nach dem Einschleifen der Bremse)
$M_{\ddot{U}}$	:	maximal ohne Schlupf übertragbares statisches Moment nach DIN VDE 0580
n_0	:	maximal zulässige Leerlaufdrehzahl
n_{zn}	:	Schaltdrehzahl bei ca. $20\,m/s$ mittlere Reibgeschwindigkeit
P_k	:	Erregerleistung bei 20 °C
U_n	:	Nennspannung der Spule
$Q_{E,zul}$	:	zulässige Einzelschaltarbeit
J	:	Massenträgheitsmoment der rotierenden Bremsenbauteile
m	:	Masse der Bremse (Standardausführung)
Betriebsart	:	S1, S2, S4-40 % ED
Therm. Klasse	:	155 (F) nach DIN VDE 0580
AC-Steuerung	:	über Gleichrichterbaustein möglich

Gemäß der anwendbaren Rules der Marine-Klassifizierungsgesellschaften (z. B. Det Norske Veritas, American Bureau of Shipping, Loyds Register of Shipping, Buerau Veritas und andere) für Lifting Appliances darf der für die Berechnung des Drehmomentes der Bremse angenommene Reibungskoeffizient μ einen Wert von $0,3$ nicht übersteigen.

Wird die Bremse mit einem entsprechenden Abnahmezerifikat (Type Approval, Case-by-case Approval) für Lifting Appliances bestellt, so gelten vorrangig die rechnerischen Bremsmomente M_{SN} und $M_{\ddot{U}}$ nach Tabelle 3.2. In Tabelle 3.2 sind die Drehmomentwerte unter der limitierenden Annahme $\mu \leq 0,3$ berechnet.

HINWEIS

Jede Bremse wird vor Auslieferung werksseitig eingelaufen und momentengeprüft. Im Auslieferungszustand weist die Bremse ein Bremsmoment M_{SN} und $M_{\ddot{U}}$ nach Tabelle 3.1 auf unabhängig davon, ob der Bremse ein Abnahmezertifikat beiliegt oder nicht. Bei Unklarheiten wenden Sie sich bitte an den technischen Kundendienst (Kontakt siehe Kapitel 11.3).

Tabelle 3.2: *Bremsmomente für Bremsen mit Abnahmen durch Klassifizierungsgesellschaften für Lifting Appliances*

Baugröße Variante	M_{SN} $[Nm]$	$M_{\ddot{U}}$ $[Nm]$
4 HPB 20 S	160	170
4 HPB 20 H	170	170
4 HPB 20 V	170	170
4 HPB 25 S	260	270
4 HPB 25 H	270	270
4 HPB 25 V	270	270
4 HPB 27 S	400	430
4 HPB 27 H	430	430
4 HPB 27 V	430	430
4 HPB 30 S	640	680
4 HPB 30 H	680	680
4 HPB 30 V	680	680
4 HPB 35 S	1000	1100
4 HPB 35 H	1100	1100
4 HPB 35 V	1100	1100
4 HPB 40 S	1600	1700
4 HPB 40 H	1700	1700
4 HPB 40 V	1700	1700
4 HPB 45 S	2600	2700
4 HPB 45 H	2700	2700
4 HPB 45 V	2700	2700
4 HPB 55 S	4000	4250
4 HPB 55 H	4250	4250
4 HPB 55 V	4250	4250

3.3 Bohrungs-und Nutabmessungen, Außenmaße

Die Anschlussmaße sind der Tabelle 13.1 unter Kapitel 13.1 zu entnehmen. Die Passfedernutabmessungen sind entsprechend DIN 6885-1 ausgeführt.

3.4 Einsatzbereich und bestimmungsgemäße Verwendung

Die Bremse 4HPB kann sowohl als Arbeitsbremse als auch als Haltebremse mit Notstoppfunktion eingesetzt werden. Die maximal zulässigen Belastungen sind dem entsprechenden Bremsendatenblatt zu entnehmen, welches vom Kundendienst (Kontakt siehe Kap. 11.3) bezogen werden kann.

Die Bremse ist für fast alle Arten von Winden, Kranen und industriellen Anwendungen einsetzbar.

- Überflutungs- und seewasserbeständig, mit gutem Schutz in rauen Bedingungen, insbesondere für den Hafen-, Offshore- und Marineanwendungen!
- Für alle Arten von Winden und Kranen.
- Für industrielle Anwendungen oder andere Anwendungen mit höchsten Anforderungen.
- An Hafenkränen, Containerverladeanlagen, für Kranfahr-, Hub- und Katzfahrantriebe

Einsatzbedingungen:

- Elektrische Auslegung der Bremsen nach DIN VDE 0580 in thermischer Klasse 155 (F). Die Bremse entspricht der Richtlinie 2006/95/EG (Niederspannungsrichtlinie). Die Richtlinie 2004/108 EG (EMV) ist durch den Anwender mit Hinweisen des Herstellers sicherzustellen. Die Erzeugnisse weisen entsprechende Kennzeichnung auf.
- Betriebsart: S1,S2, S4 - 40 % ED
- Horizontale Einbaulage. Bei vertikalem Betrieb ist mit dem Hersteller Rücksprache zu halten.
- Die Bremse darf mit der Reibpaarung Stahl/organischer Belag nur im Trockenlauf unter den vorgegebenen Bedingungen gem. Kap. 8.1 und 8.2 eingesetzt werden. Ferner sind die vom Hersteller vorgeschriebenen Montage-, Demontage-, Inbetriebnahme- und Installationsbedingungen einzuhalten. Die Nichtbeachtung dieser Bedingungen oder jeder darüber hinausgehende Gebrauch gilt als nicht bestimmungsgemäß. Für hieraus resultierende Schäden haftet der Hersteller nicht, das Risiko hierfür trägt allein der Benutzer.
- Soll die Bremse außerhalb dieses vertraglichen Einsatzbereiches eingesetzt werden, so ist der Kundendienst der Stromag GmbH zu Rate zu ziehen (Anschrift siehe Kap. 11.3).

4 Transport

Der Transport darf nur mit geeigneten Hebezeugen, Flurförderfahrzeugen und Anschlagmitteln mit ausreichender Tragfähigkeit durchgeführt werden. Des Weiteren ist auf Symbole auf den Packstücken zu achten.



GEFAHR

Lebensgefahr unter schwebene Lasten.
Beim Heben, Senken und Schwenken von Lasten besteht Lebensgefahr durch herabfallende oder sich unkontrolliert bewegende Teile.

- Niemals unter schwebende Lasten treten.
- Angaben zu den vorgesehenen Anschlagpunkten beachten.
- Anschlagmittel nicht an hervorstehenden Maschinenteilen oder Ösen angebauter Bauteile anschlagen.
- Anschlagmittel nicht an Bohrungen / Gewindebohrungen anschlagen.
- Auf sicheren Sitz der Anschlagmittel achten.
- Nur geeignete Hebezeuge und Anschlagmittel mit ausreichender Tragkraft verwenden.
- Keine angerissenen oder angescheuerten Seile und Riemen verwenden.
- Seile und Gurte nicht an scharfen Kanten und Ecken anlegen, nicht knoten, nicht verdrehen.

Für den direkten Transport oder die Montage der Bremse sind im Spulenkörper (1) und zusätzlich ab der Baugröße 25 im Bremsdeckel (6) Gewindebohrungen zum Befestigen von Ringschrauben vorgesehen (siehe Abbildung 4.1).

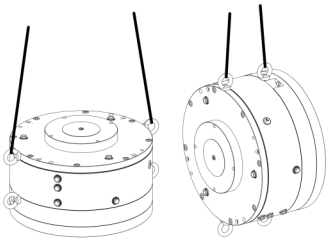


Abbildung 4.1: *Transport und Montage mittels Ringschrauben*



WARNUNG

Verletzungsgefahr
Unsachgemäße Verwendung der Transportgewinde kann zu schwersten Verletzungen führen.

- Diese Bohrungen dürfen ***nicht*** für den Transport und Einbau des Aggregates (Motor mit angebauter Bremse) verwendet werden.

4.1 Verpackung

Die Verpackungsart entspricht den in der Auftragsbestätigung angegebenen Vereinbarungen mit dem Besteller. Falls keine Verpackungsart vereinbart wurde, richtet sich diese nach dem Transportweg. Die auf der Verpackung angebrachten Bildzeichen sind zu beachten.

4.2 Zerlegungsgrad

Die Bremsen werden fertig montiert und eingestellt geliefert. Das Ritzel (4) ist lose beigelegt. Sollte eine Handlüftung (40) benötigt werden, ist diese lose beigelegt und muss montiert werden. Weitere Losteile sind der jeweiligen Maßzeichnung zu entnehmen.

4.3 Empfindlichkeit

Die Bildung von Kondenswasser auf Grund großer Temperaturschwankungen ist zu vermeiden. Beim Transport sind Schäden durch Stöße und Schläge zu vermeiden. Hierbei muss besonders auf die ausgeführten Anschlusskabel geachtet werden.

4.4 Lagerung

Zwischenlagerung



ACHTUNG

Beschädigung von Bauteilen und Funktionsbeeinträchtigungen.
Unsachgemäße Lagerung kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Nicht im Freien aufbewahren
- Trocken und staubfrei lagern
- Keinen aggressiven Medien aussetzen
- Lagertemperatur: +10 °C bis +30 °C, keine schnellen Temperaturschwankungen
- Der Ort muss mäßig gelüftet und trocken sein. Maximale relative Luftfeuchtigkeit: 65%
- Bei einer Lagerung länger als 3 Monate regelmäßig den allgemeinen Zustand aller Teile und der Verpackung kontrollieren
- Falls erforderlich, die Konservierung auffrischen oder erneuern



HINWEIS

Beachten Sie auf den Packstücken angebrachte Vorschriften zur Lagerung, die über die hier genannten Anforderungen hinausgehen.

Soll die Bremse zwischengelagert werden, so ist ein zusätzlicher Korrosionsschutz vorzunehmen. Angaben hierzu erhalten Sie von unserem Kundendienst, Anschrift s. Kap. 11.3 .
Die **Zwischenlagerungsvorschrift 449-00023** erhalten Sie von unserem Kundendienst.

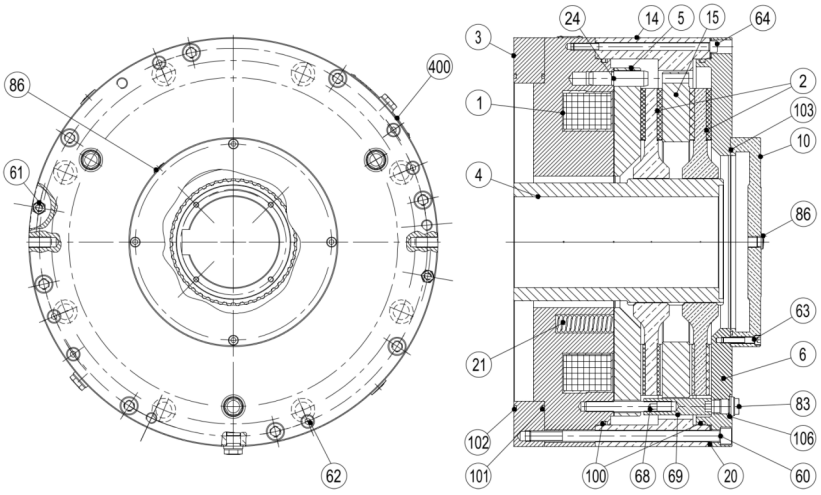
Bei Nichtbeachtung der in diesem Kapitel aufgeführten Hinweise erlischt die Gewährleistung durch die Stromag GmbH. Bei Fragen wenden Sie sich bitte an den Kundendienst (Anschrift s. Kap. 11.3).
Die außen liegenden Teile bestehen aus seewasserbeständigem Aluminium und aus Stahl mit einem Oberflächenschutz durch Gasnitrocarburieren.

4.5 Lieferumfang

Die Vollständigkeit der Lieferung ist beim Empfang an Hand der Packliste zu überprüfen ist. Eventuelle Transportschäden und/oder fehlende Teile sind sofort schriftlich zu melden.

5 Aufbau, Wirkungsweise und Konstruktionsmerkmale

5.1 Benennung der Einzelteile (Darstellung Baugröße 4HPB45)



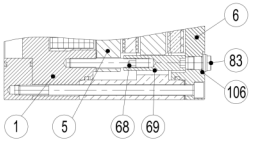
1	Spulenkörper mit Spule	60	Schraube für Bremsdeckel - Flansch
2	Reibscheibe mit Reibbelag	61	Schraube für Spulenkörper - Flansch
3	Kundenanschlussflansch	62	Schraube für Bremsdeckel - Spulenkörper
4	Ritzel	63	Schraube für Tachoflansch - Bremsdeckel
5	Ankerscheibe	64	Schraube für Buchse - Spulenkörper
6	Bremsdeckel	68	Gewindestift Notlüftung
10	Tachoflansch	69	Notlüftschraube
14	Buchse	83	Verschlussschraube für Notlüftung
15	Bremsscheibe	85	Verschlussschraube für Luftspaltmessung
20	Beilage	86	Verschlussschraube für Tachoflansch
21	Druckfedern	100	Rundring Spulenkörper/Buchse - Bremsdeckel/Buchse
24	Stehbolzen	101	Rundring Spulenkörper - Flansch
		102	Rundring Flansch - Motor
		103	Rundring Tachoflansch - Bremsdeckel
		106	Dichtring
		400	Leistungsschild

Abbildung 5.1: *Schnittdarstellung 4HPB45, Einzelteile sind mit Positionsnummern beschriftet*

5.2 Wirkungsweise und Konstruktionsmerkmale der Standardausführung

Die Bremse **4HPB** ist eine federbelastete Elektromagnet-Vierflächenbremse, die im elektrisch spannungsfreien Zustand bremst und elektromagnetisch lüftet. Der Bremsentyp **4HPB** erfüllt höchste Anforderungen an Dauerfestigkeit, Robustheit und Seewasserbeständigkeit. Bau und Prüfung der Bremsen erfolgen nach DIN VDE 0580. Das Anschrauben der Bremse an einen Motor oder ein anderes Maschinenteil erfolgt mittels Zylinderschrauben. Im Spulenkörper befindet sich eine Spule, die mit einer Kunstharzmasse der thermischen Klasse 155 (F, max. Grenztemperatur 155 °C) fest vergossen ist.
Bei elektrisch spannungsfreier Spule drücken die Druckfedern (21) die Ankerscheibe (5) axial gegen das Reibsystem bestehend aus zwei Reibscheiben mit Reibbelag (2) und einer dazwischen positionierten axial beweglichen Bremsscheibe (15). Dieses System wird zwischen der verdrehgesicherten Ankerscheibe (5) und dem Bremsdeckel (6) eingespannt und die Reibscheiben mit Reibbelag (2) damit am Umlauf gehindert. Die Bremswirkung wird von den verzahnten Reibscheiben mit Reibbelag (2) über das Ritzel (4) und eine Passfeder auf die Welle übertragen. Wird die Spule an eine Nenn-Gleichspannung entsprechend der Leistungsschildangaben (400) angeschlossen, so wird die Ankerscheibe (5) durch die Elektromagnetkraft gegen die Federkraft an den Spulenkörper (1) gezogen. Die Reibscheiben mit Reibbelag (2) werden somit frei und die Bremswirkung aufgehoben. Die Bremse ist gelüftet.

5.3 Mechanische Lüftung mittels Notlüftschrauben



1	Spulenkörper mit Spule	69	Schraube zur mechanischen Lüftung
5	Ankerscheibe	83	Verschlussschraube für die axiale Notlüftung
6	Bremsdeckel	106	Dichtring
68	Gewindestift Notlüftung		

Abbildung 5.2: *Notlüftung mit Schrauben*

Zum mechanischen Lüften der Bremse im Havariefall oder zur Einjustierung der Anlage dienen die Schrauben (69) (2 Schrauben bei Baugröße HPB 20, 3 Schrauben bei Baugröße HPB 25 bis 45, 4 Schrauben bei Baugröße HPB 55). Um den Lüftvorgang durchzuführen, sind zunächst die Verschlussschrauben (83) aus dem Bremsdeckel (6) herauszudrehen. In den freiwerdenden Öffnungen sind die Notlüftschrauben (69) mit einem Innensechskantschlüssel erreichbar. Die Lüftung erfolgt durch gleichmäßiges wechselseitiges Rechtsdrehen der Schrauben bis zum Aufheben der Bremswirkung.



WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Die Notlüftung ist selbsthemmend und muss für den Normalbetrieb unbedingt in die Ausgangsposition zurückgedreht werden, d.h. die Schrauben (69) werden entgegen dem Uhrzeigersinn bis zum Anschlag an den Bremsdeckel (6) zurückgedreht. Dann sind die Verschlussschrauben (83) wieder in den Bremsdeckel (6) zu schrauben. Es ist darauf zu achten, dass die Dichtringe (106) ebenfalls wieder eingebaut werden. Nur so ist der bestimmungsgemäße Betrieb und die ***die Dichtheit*** in vollem Umfang gewährleistet.
Die Notlüftung darf nicht für die Aufrechterhaltung eines provisorischen Betriebes genutzt werden!! Für die Funktionsprüfung eines optional verbauten Schalters, darf die Notlüftung nicht verwendet werden!!

5.4 Elektrischer Anschluss

Hinweise zum elektrischen Anschluss



GEFAHR

Gefahr durch Elektrizität.
An elektrischen Einrichtungen sind schwere bis tödliche Stromschläge möglich.

- Der elektrische Anschluss der Federdruckbremse darf nur durch Fachpersonal erfolgen, das im Umgang mit elektrischen Gefährdungen geschult ist.
- Arbeiten nur an spannungsfrei geschalteten elektrischen Komponenten durchführen
- Spannungsquelle gegen Wiedereinschalten sichern und kennzeichnen
- Spannungsfreiheit feststellen
- Erden und kurzschließen
- Benachbarte unter Spannung stehende berührbare Teile abdecken oder abschranken



WARNUNG

Verbrennungsgefahr.
Spule, Spulenkörper und angrenzende Bauteile können durch eine längere Einschaltdauer der Spule sowie durch Reibungswärme heiße Oberflächen haben. Der Bremsdeckel (6) kann insbesondere durch Reibwärme heiße Oberflächen verursachen.

- Bremsenbauteile und angrenzende Bauteile abkühlen lassen
- Feste Schutzhandschuhe gegen Berühren heißer Oberflächen tragen.

Der elektrische Anschluss muss unter Beachtung der Installationsvorschriften vorgenommen werden (z.B. DIN VDE 0129-507). Die Spule ist für die auf dem Leistungsschild angegebene Gleichspannung (Restwelligkeit <0,5) und 100% ED ausgelegt. Die dauernd zulässige Spannungsänderung beträgt ***+ 6%*** bis ***- 10%*** der Nennspannung. Zum Schutz der Spule bzw. des Netzteiles ist es zweckmäßig den Spuleneingang mit einem Varistor des entsprechenden Betriebsspannungsbereiches und der erforderlichen Leistung zu beschalten.

6 Montage und Demontage

Montage- und Demontagehinweise

WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Durch den Einsatz nicht geeigneter Schrauben und Passfedern können sich Teile lösen, weggeschleudert werden und schwere Verletzungen oder Tod verursachen.

- Nur Schrauben und Passfedern in der vorgeschriebenen Größe und Festigkeit verwenden
- Anziehdrehmoment beachten
- Vorgeschriebene Schraubensicherungsmittel verwenden

ACHTUNG

Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Alle Befestigungsschrauben so anziehen, dass ein Verkanten verhindert wird
- Bei der Montage keine unangemessene Gewalt ausüben
- Lage des elektrischen Anschlusses beachten

HINWEIS

Die Bremse darf nur von autorisiertem, ausgebildetem und eingewiesenem Personal bedient, gewartet und instand gesetzt werden. Dieses Personal muss die komplette Montageanleitung gelesen, verstanden und eine spezielle Unterweisung über auftretende Gefahren erhalten haben.

Die jeweilige Einbauzeichnung enthält eine Tabelle mit allen verwendeten Schrauben und den Anziehdrehmomenten. Werden zur Schraubensicherung Flüssigkunststoffe eingesetzt, sind meist höhere Anziehdrehmomente erforderlich. Hierzu sind die Herstellerangaben maßgebend. Die Demontage erfolgt in umgekehrter Reihenfolge zur Montage. Alle Warn- und Sicherheitshinweise sind zu berücksichtigen.

Anzugsmomente Schrauben/ tightening torque screws			
Pos.	Bezeichnung/ designation	Material/ material	Anzugsmoment/ tightening torque
60	M12x140	A2-70	74 Nm
61	M8x70	A2-70	21,4 Nm
62	M8x85	A2-70	21,4 Nm
63	M6x35	A2-70	8,8 Nm

Abbildung 6.1: *Beispiel Anziehdrehmomente*

6.1 Montage

Einzelteile mit Positionsangaben siehe Kap. 5.1
Bei optionaler Vertikal-Anwendung Kap. 10.7 beachten.

6.1.1 Direkte Montage

Für den Anbau der Bremse an den Antrieb ist je nach Flanschausführung eine Demontage der Bremse erforderlich. Sind die Befestigungspunkte am Kundenanschlussflansch (3) im Auslieferungszustand zugänglich ist für die Montage der Bremse eine Demontage des Flansches (3) nicht erforderlich (siehe Abbildung 6.2). Zur Vereinfachung der Ausrichtung von Reibscheiben (2) zu Ritzel (4) kann der Tachoflansch (10) während der Montage entfernt werden. Dieser ist mit Schrauben (63) am Bremsdeckel befestigt.

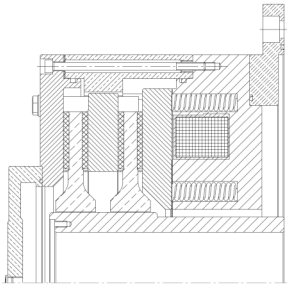


Abbildung 6.2: *Montage ohne Demontage*

- Kontrolle der Anschlussmaße auf Übereinstimmung mit der Bremse.
- Evtl. vorhandener Transport- oder Lagerschutz, sowie Grat- und Schlagstellen sind zu entfernen.
- Kontrolle der Stirnlaufabweichung der Anflanschfläche zur abbremsenden Welle (Toleranzklasse N nach DIN 42955 sollte nicht überschritten werden.)
- Welle und Passfeder mit Montagepaste leicht fetten, Ritzel (4) aufziehen und axial sichern.
- Bremse mit passenden Anschlagmitteln (Schäkel oder dgl.) vorsichtig über das Ritzel (4) führen und durch Drehen der Welle oder Schwenken der Bremse die Verzahnung des Ritzels in die Gegenverzahnung der Reibscheiben mit Reibbelag (2) einführen. Dabei ist darauf zu achten, dass die Reibscheiben mit Reibbelag (2) und das Ritzel (4) sich zentrieren. (Reibscheiben mit Reibbelag (2) werden zur Endabnahme der Bremse bereits vorzentriert).
- Bremse lagegerecht mit passenden Schrauben am Motorflansch befestigen und sichern. Der elektrische Anschluss muss unter Beachtung der jeweiligen Installationsvorschriften vom Fachpersonal vorgenommen werden.
- Gegebenenfalls demontierten Tachoflansch (10) lagegerecht mit Schrauben (63) befestigen und mit dem auf der Zeichnung angegebenen Drehmoment anziehen.

Achtung!

Keine Gewalt ausüben! **Nicht verkanten!** **Lage des Kabels beachten!**

ACHTUNG

Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Bei allen Anbauarbeiten ist darauf zu achten, dass alle Dichtringe und Dichtungen ordnungsgemäß in den dafür vorgesehenen Positionen liegen.

6.1.2 Montage mit Demontage

Sind die Befestigungspunkte am Kundenanschlussflansch (3) im Auslieferungszustand **nicht** zugänglich ist für die Montage der Bremse eine Demontage des Flansches (3) erforderlich. (Abbildung 6.3). Zur Vereinfachung der Ausrichtung von Reibscheiben (2) zu Ritzel (4) kann der Tachoflansch (10) während der Montage entfernt werden. Dieser ist mit Schrauben (63) am Bremsdeckel befestigt.

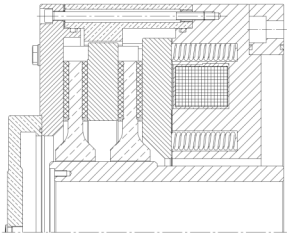


Abbildung 6.3: *Montage mit Demontage*

- Kontrolle der Anschlussmaße auf Übereinstimmung mit der Bremse.
- Evtl. vorhandener Transport- oder Lagerschutz, sowie Grat- und Schlagstellen sind zu entfernen.
- Kontrolle der Stirnlaufabweichung der Anflanschfläche zur abbremsenden Welle (Toleranzklasse N nach DIN 42955 sollte nicht überschritten werden.)
- Die rot markierten Schrauben (62) dürfen nicht entfernt werden. Ist die Markierung durch roten Lack nicht gegeben, so ist die Schraubenposition durch zusätzliche Zertrierungen am Bremsdeckel markiert.
- Schrauben (60) und Schrauben (61) entfernen.
- mit passenden Anschlagmitteln (Schäkel oder dgl.) vorsichtig Flansch (3) und Bremse trennen. Dabei Dicht- und Zentrierflächen nicht beschädigen.
- Flansch (3) lagegerecht mit passenden Schrauben am Motorflansch befestigen und sichern.
- Welle und Passfeder mit Montagepaste leicht fetten, Ritzel (4) aufziehen und axial sichern.
- Bremse mit passenden Anschlagmitteln (Schäkel oder dgl.) vorsichtig über das Ritzel (4) führen und durch Drehen der Welle oder Schwenken der Bremse die Verzahnung des Ritzels in die Gegenverzahnung der Reibscheiben mit Reibbelag (2) einführen. Dabei ist darauf zu achten, dass die Reibscheiben mit Reibbelag (2) und das Ritzel (4) sich zentrieren. (Reibscheiben mit Reibbelag (2) werden zur Endabnahme der Bremse bereits vorzentriert).
- Bremse lagegerecht mit passenden Schrauben am Motorflansch befestigen und sichern. Der elektrische Anschluss muss unter Beachtung der jeweiligen Installationsvorschriften vom Fachpersonal vorgenommen werden.

Achtung!

Keine Gewalt ausüben! **Nicht verkanten!** **Lage des Kabels beachten!**

ACHTUNG

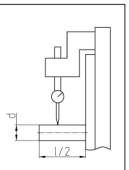
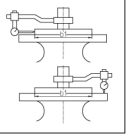
Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Bei allen Anbauarbeiten ist darauf zu achten, dass alle Dichtringe und Dichtungen ordnungsgemäß in den dafür vorgesehenen Positionen liegen.

6.2 Montagegenauigkeit

Der Rundlauf des Wellenstücks, auf dem das Ritzel (4) befestigt ist, sowie Koaxialität und Planlauf des Befestigungsflansches müssen der Toleranzklasse „N“ der DIN 42955 entsprechen.

Tabelle 6.1: *Montagegenauigkeit*

Rundlauf des Wellenendes	Durchmesser des Wellenendes d in mm	Rundlauftoleranz $N(norm.)$ in mm	
	über 18 bis 30	0,04	
	über 30 bis 50	0,05	
	über 50 bis 80	0,06	
	über 80 bis 120	0,07	
	über 120 bis 180	0,08	
Koaxialität und Planlauf des Befestigungsflansches	Zentrierdurchmesser Befestigungsflansch in mm	Koaxialitäts- und Planlauftoleranz in mm	
	über 100 bis 230	0,1	
	über 230 bis 450	0,125	
	über 450 bis 800	0,16	

6.3 Abmessungen, Platzbedarf und Masse

Die verbindlichen Abmessungen, die Masse (Gewicht) sowie weitere technische Daten sind der, für den jeweiligen Auftrag verbindlichen Maßzeichnung, zu entnehmen. Diese kann von unserem Kundendienst angefordert werden (Kontaktdaten siehe Kapitel 11.3).

6.4 Demontage

Für den Abbau gelten im Prinzip die gleichen Hinweise und Vorschriften wie für den Anbau. Die Reihenfolge ist umgekehrt.



GEFAHR

Schäden durch unsachgemäße Demontage
Tod oder schwerste Verletzungen sind die Folge.

- Überprüfen, dass die Bremse lastfrei ist.
- Bremse elektrisch spannungsfrei schalten.
- mit Anschlagmitteln sichern, dann abbauen!

7 Erst-Inbetriebnahme

Einzelteile mit Positionsangaben je nach Ausführung siehe Kap. 5.1

Vor der Erst- Inbetriebnahme sind folgende Prüfmaßnahmen erforderlich:

- Die elektrischen Anschlusswerte auf dem Typschild (400), s. Kapitel 3.1, müssen mit denen vor Ort übereinstimmen
- Die Bremse muss unbeschädigt sein, d.h. sie darf keine Schäden durch Transport, Lagerung usw. aufweisen
- Die vorgeschriebenen Betriebsbedingungen (Kap. 8.1) müssen mit denen vor Ort übereinstimmen
- Die mechanische Notlüftung gem. Kap. 5.3 darf nicht aktiv sein.
- Um die elektrische Funktion der Bremse zu überprüfen, sind einige elektrische Lüftvorgänge durchzuführen.

8 Betrieb



HINWEIS

Unabhängig von den nachfolgenden Hinweisen gelten für den Betrieb der Bremse in jedem Fall die am Einsatzort gesetzlich vorgeschriebenen Sicherheits- und Unfallverhütungsvorschriften. Der Anwender hat für die Einhaltung dieser Vorschriften zu sorgen.



WARNUNG

Verbrennungsgefahr.
Spule, Spulenkörper und angrenzende Bauteile können durch eine längere Einschaltdauer der Spule sowie durch Reibungswärme heiße Oberflächen haben. Der Bremsdeckel (6) kann insbesondere durch Reibwärme heiße Oberflächen aufweisen.
Vor Reparatur- und Wartungsarbeiten:

- Bremsenbauteile und angrenzende Bauteile abkühlen lassen
- Feste Schutzhandschuhe gegen Berühren heißer Oberflächen tragen.

8.1 Betriebsbedingungen

Die Betriebsbedingungen, die für einen störungsfreien Betrieb der Bremse einzuhalten sind, werden nachfolgend aufgeführt:

- Die Umgebungstemperatur darf $-30°C$ nicht unter- und $+50°C$ nicht überschreiten.
- Bei höheren und/oder tieferen Temperaturen wenden Sie sich bitte an unseren Kundendienst (Kap. 11.3).
- Wenn die Bremse mit einem Abnahmezertifikat einer Marine-Klassifizierungsgesellschaft bestellt wird, können davon abweichende zulässige Umgebungstemperaturen gelten. In diesem Fall wenden Sie sich bitte an unseren Kundendienst (Kontakt siehe Kap. 11.3).

8.1.1 Haltebetrieb

Das Anhalten des mit der Bremse verbundenen Antriebsstranges erfolgt im Haltebetrieb durch den drehzahlgeregelten Elektromotor oder funktional vergleichbaren Einrichtungen. Erst nach dem Abbremsen bis zum Stillstand fällt die Federdruckbremse ein und hält den Antrieb im stromlosen Zustand fest.

8.1.2 Arbeitsbetrieb

Im Arbeitsbetrieb wird die Bremse für die Verzögerung des Antriebes bis zum Stillstand verwendet. Die maximal zulässigen Belastungen sind dem Bremsendatenblatt zu entnehmen.

8.1.3 Notstoppbetrieb

Im Vergleich zum Arbeitsbetrieb wird ein Notstopp dadurch charakterisiert, dass die sich aus der Bremsung des Antriebes durch die elektromagnetische Federdruckbremse resultierende Beanspruchung an der oberen Grenze der mechanischen und/oder thermischen Belastbarkeit der Bremse befindet.



HINWEIS

Eine Bremsung unter Last ist mit einem Verschleiß der Reibflächen verbunden, wodurch die Lebensdauer der Bremse reduziert wird.



ACHTUNG

Eine Überschreitung der vertraglich vereinbarten Grenzwerte beim Betrieb der Bremse kann zu einer Beschädigung der Bremse und zu einer Funktionsbeeinträchtigung führen.

- Die maximal zulässigen Belastungen können dem Datenblatt der Bremse entnommen werden.
- Es wird eine Auslegungsberechnung für die vorhandenen Lastfälle durch die Stromag GmbH empfohlen.

8.2 Einschaltdauer und Schalthäufigkeit

Die Auslegung und die zulässige Beanspruchung der Bremsen nach Bremsmoment, Drehzahl und Schaltleistung gehen aus den technischen Daten (siehe Kap. 3), dem Maßblatt (Anhang) sowie dem jeweiligen Datenblatt hervor. Die Überschreitung dieser Werte sollte unbedingt mit dem Hersteller abgestimmt werden.

ACHTUNG

Notstopps dürfen nicht unmittelbar hintereinander erfolgen, um eine Beschädigung der Bremse zu vermeiden.

- Nach jedem Notstopp sind Kontrollarbeiten gemäß Kap. 9.6 durchzuführen!

8.3 Schutzarten

Die Bremse entspricht, vollständig montiert und unter Beachtung der Hinweise angebaut, in der Grundversion (siehe Abbildung 8.1) der Schutzart IP 67 nach DIN EN 60529 (VDE 0470-1) und DIN EN 60034-5 (VDE 0530-5).

Bei Verwendung von Original Zubehör der Stromag GmbH wie z.B. Kabelverschraubungen bleibt die Schutzart erhalten, das Gleiche gilt, wenn ein Drehzahlgeber (mindestens IP 67) mit einer Rundring abgedichteten Flanschverschraubung fest mit dem Deckel verbunden ist.

Bei Ausführung mit Klemmenkasten entspricht die Bremse der Schutzart IP 66!

Abdichtungen von durchgehenden Wellen mittels Wellendichtring senken die Schutzart je nach Ausführung. Hier ist Rücksprache mit dem Hersteller erforderlich.

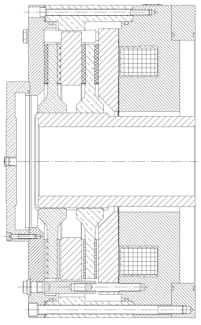


Abbildung 8.1: *Schnitt 4HPB*

HINWEIS

Die Kontaktflächen der Bremse zum Motor oder zu einem angebauten Tachogenerator sind mit geeigneten Abdichtmitteln zu versehen (z.B. Dichtring, Flächendichtung, Dichtmittel), um die Schutzart zu garantieren. Vom Anwender ist ein Dichtelement auf der Welle anzuordnen, so dass das Eindringen von Fett und Öl vom Motorlager her in die Bremse verhindert wird.

8.4 Störungsabhilfe

Störungen	Mögliche Ursachen	Erforderliche Maßnahmen
Bremswirkung nicht ausreichend	Reibflächen nicht fettfrei	Reibscheiben mit Reibbelag (2) auswechseln
	max. Luftspalt durch Reibbelagverschleiß überschritten	Bremse nachstellen (Kap. 9.3) ggf. Reibscheiben mit Reibbelag (2) austauschen
	Bremse nicht vollständig eingelaufen	Bremse einlaufen lassen
	Bremse wurde überlastet	Bremse wechseln
	Federbruch	Abbau der Bremse, Rücksprache mit Hersteller
Bremswirkung nicht vorhanden	Mechanische Handlüftung wurde betätigt und nicht zurückgestellt	Beachte Kap. 10.3.2
Bremse lüftet nicht	max. Luftspalt durch Reibbelagverschleiß überschritten	Bremse nachstellen (Kap. 9.3) ggf. Reibscheiben mit Reibbelag (2) austauschen
	Reibscheiben m. Reibbelag (2) sitzen auf Ritzel (4) fest	Reibscheiben m. Reibbelag (2) und Ritzel (4) austauschen (Kap. 9.4)
	Ankerscheibe (5) verzogen	Bremse austauschen (Kap. 6)
	Spulenspannung zu gering	Gleichspannungsversorgung prüfen
	Spule defekt	Bremse austauschen (Kap. 6)
	Zuleitung defekt	Zuleitung erneuern
	Klemmstellen locker	Klemmstellen anziehen
	Fremdkörper im Luftspalt (z.B. Federbruch)	Abbau der Bremse, Rücksprache mit Hersteller
Bei Option Schalter:	Ankerscheibe wurde nicht gegen die Stirnfläche des Spulenkörpers gezogen z. B. durch:	Bremse nachstellen (Kap. 9.3) ggf. Reibscheiben mit Reibbelag (2) austauschen
keine Schaltzustandanzeige	•Überschreitung des zulässigen Luftspaltes	Einstellung Schalter überprüfen unter Beachtung der Einstellvorschrift
	•Fremdkörper im Luftspalt	Bremse demontieren und reinigen Einstellung Mikroschalter überprüfen unter Beachtung der Einstellvorschrift
		Abbau der Bremse, Rücksprache mit Hersteller

9 Wartung und Instandhaltung

9.1 Pflege- und Kontrollarbeiten



HINWEIS

Bei Wartungs- und Inspektionsarbeiten ist Kap. 2 (Sicherheitshinweise) zu beachten. Zusätzlich zu den nachfolgenden Hinweisen gelten die am Einsatzort gesetzlich vorgeschriebenen Sicherheits- und Unfallverhütungsvorschriften.

Der Betreiber ist verpflichtet, diese Vorschriften einzuhalten.

Auf Grund der unterschiedlichen Betriebsverhältnisse kann im Voraus nicht festgelegt werden, wie oft eine Verschleißkontrolle, Inspektion, Wartung und Instandsetzung erforderlich ist. Höhere Belastungen der Bremse (z.B. durch Drehmoment, Drehzahl, Schalthäufigkeit, Umgebungstemperatur usw.) erfordern kürzere Wartungsintervalle. Daher ist zunächst die Bremse hinsichtlich Sicherheit und Verschleiß zu beobachten und die Wartungsintervalle sind auf Grund der gewonnenen Erkenntnisse anzupassen.

Tritt Reibbelagverschleiß auf, so wird der Luftspalt größer. Je nach Beanspruchung der Bremse muss deshalb der Luftspalt von Zeit zu Zeit überprüft werden. Dies erfolgt durch eine Messung des Luftspaltes gemäß Kap. 9.2. Hat der Luftspalt seinen Maximalwert nach Tabelle 3.1 erreicht, so ist eine Verschleißnachstellung gemäß Kap. 9.3 durchzuführen.

Durch auftretenden Reibbelagverschleiß, der bauartbedingt in größeren Mengen anfallen kann, ist eine regelmäßige Reinigung der Bremse empfehlenswert. Öffnungen zur Luftspaltmessung können dabei zum Absaugen von losem Reibbelagabrieb verwendet werden. Zusätzlich lässt sich dabei mittels Druckluft die Bremse ohne weitere Demontage von Reibbelagabrieb befreien.

Im Zuge der Kontroll- oder Wartungsarbeiten sind die mechanischen Bauteile der Bremse mindestens durch eine Sichtprüfung auf Beschädigungen zu untersuchen. Die einwandfreie Funktion des Schiebsitzes der Passverzahnungsverbindung zwischen Ritzel (4) und Reibscheibe (2) ist zu überprüfen.



WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Wird die Verschleißnachstellung nicht rechtzeitig durchgeführt, so ist sowohl die Übertragung des Nennmomentes als auch die Lüftung der Bremse nicht gewährleistet. Dies kann zu schwere Verletzungen oder Tod führen.

- Regelmäßige Kontrollintervalle festlegen
- Regelmäßige Wartungsintervalle festlegen

9.2 Messung des Luftspaltes

Der Luftspalt zwischen Spulenkörper (1) und Ankerscheibe (5) kann nur gemessen werden, wenn die Spule keine elektrische Spannung anliegt. Der Luftspalt muss an zwei Stellen am Umfang, 180° gegenüberliegend, gemessen werden. Dazu sind die zwei Verschlussschrauben (83) zu entfernen. Durch die dann frei werdende Gewindebohrung in der Buchse (14) kann mittels einer Fühlerlehre der Luftspalt zwischen Spulenkörper (1) und Ankerscheibe (5) gemessen werden. **Es ist unbedingt darauf zu achten, dass die Fühlerlehren nur in den äußeren Bereich zw. Spulenkörper und Ankerscheibe geschoben wird und nicht über den Rezess der Ankerscheibenpolfläche hinaus.** Der Luftspalt muss zwischen „Aus min“ und „Aus max“ (siehe Tabelle 3.1) liegen. Nach der Messung sind die Bohrungen wieder mit den Verschlussschrauben (83) und den zugehörigen Dichtringen (106) zu verschließen.

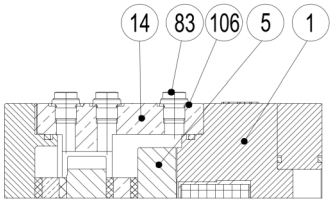


Abbildung 9.1: *Luftspaltmessung 4HPB*

9.3 Verschleißnachstellung

Wird bei den Bremsen der Luftspalt „Aus max“nach Tabelle 3.1 erreicht, ist eine Nachstellung des Luftspaltes vorzunehmen.



GEFAHR

Schäden durch unsachgemäße Demontage
Tod oder schwerste Verletzungen sind die Folge.

- Überprüfen, dass die Bremse lastfrei ist.
- Bremse elektrisch spannungsfrei schalten.



GEFAHR

Schäden durch schlagartige Entspannung der Druckfedern
Tod oder schwerste Verletzungen sind die Folge. Spulenkörper und Ankerscheibe stehen unter der Axialkraft der Druckfedern! Es besteht Gefahr durch herumfliegende Teile bei schlagartiger Entspannung der Druckfedern.



ACHTUNG

Sach- und Personenschäden durch fehlerhafte Montage.
Fehlerhafte Montage kann zu Schäden und Funktionsbeeinträchtigungen führen.

- Beim Zusammenbau der Bremse bzw. beim Austausch der Reibscheiben mit Reibbelag ist sorgfältig darauf zu achten, dass die Bremsbeläge nicht mit Fett in Berührung kommen. Sind fettige Stoffe vorhanden, können sie mit geeigneten Entfettungsmitteln entfernt werden.
- ***Niemals Benzin oder Petroleum verwenden!***
- Sollte eine solche Nachstellung des Luftspaltes schon einmal erfolgt sein, dann müssen neue Reibscheiben mit Reibbelag (2), siehe Kap. 9.4, eingebaut werden. Dabei ist jedoch die Beilage (20) wieder einzusetzen.
- Bei allen Anbauarbeiten ist darauf zu achten, dass alle Dichtringe und Dichtungen ordnungsgemäß in den dafür vorgesehenen Positionen liegen.

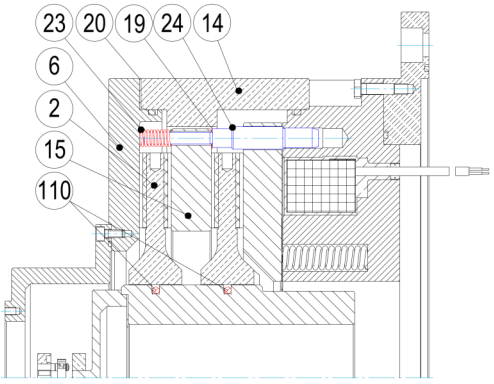
9.3.1 Verschleißnachstellung Standardausführung

Bei Standardausführung (siehe Abbildung 5.1) ist wie folgt vorzugehen:

- Bremse nach Kap. 5.3 mechanisch notlüften
- Schrauben (60) und (62) entfernen
- Den Bremsdeckel(6) von der Buchse (14) demontieren. Als Demontagehilfe sind am Bremsdeckel 3 Gewindebohrungen vorgesesehen die als Abdrückgewinde verwendet werden können. Eine Demontage des Tachoflansches(10) ist nicht erforderlich.
- Beilage (20) entfernen und zugängliche Bauteile, insbesondere Dichtflächen, reinigen
- im umgekehrten Sinne den Bremsdeckel (6), lagegerecht, wieder auf der Buchse (14) montieren
- Schrauben (60) und (62) mit dem auf der Zeichnung angegebenem Anzugsdrehmoment anziehen
- Mechanische Notlüftung der Bremse gemäß Kap. 5.3 entfernen
- Messung des Luftspaltes nach Kap. 9.2 durchführen
- Kontrolle der Bremse auf einwandfreie Schaltfunktion

9.3.2 Verschleißnachstellung bei optionaler Vertikalausführung

Bei der Vertikalausführung ist die Standardbremse um die in Abbildung 9.2 dargestellten und mit Positionsnummern versehenden Bauteile ergänzt.



2	Reibscheibe mit Reibbelag	19	Beilage
6	Bremsdeckel	20	Beilage
14	Buchse	23	Rückstellfeder
15	Bremsscheibe	24	Stehbolzen
		110	Rundringe

Abbildung 9.2: *Schnittdarstellung - Vertikaloption 4HPB45, Einzelteile sind mit Positionsnummern beschriftet*

Für die Verschleißnachstellung ist wie folgt vorzugehen:

- Bremse nach Kap. 5.3 mechanisch notlüften
- Schrauben (60) und (62) entfernen (Standardbauteile siehe Abbildung 5.1)
- Den Bremsdeckel(6) von der Buchse (14) demontieren. Als Demontagehilfe sind am Bremsdeckel 2 Gewindebohrungen vorgesehen die als Abdrückgewinde verwendet werden können. Gegebenenfalls sind im Vorfeld Anbauten wie z.B. Encoder zu Demontieren
- Beilage (20) entfernen und zugängliche Bauteile, insbesondere Dichtflächen, reinigen
- Rückstellfedern (23) entfernen
- die Einbaulage der Reibscheibe (2) markieren und diese ohne Gewaltanwendung demontieren
  Als Demontagehilfe sind an der Bremsscheibe (15) Gewindebohrungen vorgesehen, die als Abdrückgewinde verwendet werden können.
- die Einbaulage der Bremsscheibe (15) markieren, Bremsscheibe (15) und Beilagen (19) entfernen und zugängliche Bauteile reinigen
- Spiel zwischen Reibscheibe (2) und dem Absatz der Stehbolzen (24) überprüfen.
  Beachte nachfolgenden Warnhinweis und Abbildung 9.3 !

WARNUNG

Bei der Nachstellung der Bremse sowie dem Austausch der Reibscheiben (2) ist die Freigängigkeit der Reibscheibe (2), die sich zwischen Ankerscheibe(5) und mittlerer Bremsscheibe(15) befindet, zu gewährleisten. Gemäß Abb. 9.3 ist der Luftspalt zwischen Reibfläche und dem Absatz des Stehbolzens (24) mittels Haarlineal über je zwei Punkte zu überprüfen. Es muss umlaufend ein Spalt zwischen 0,1 mm und 0,2 mm eingestellt werden. Ein Ausgleich kann mit den Beilagen (19) vorgenommen werden.
Die Ankerscheibe muss dabei vollständig gelüftet sein, d. h. am Spulenkörper anliegen.

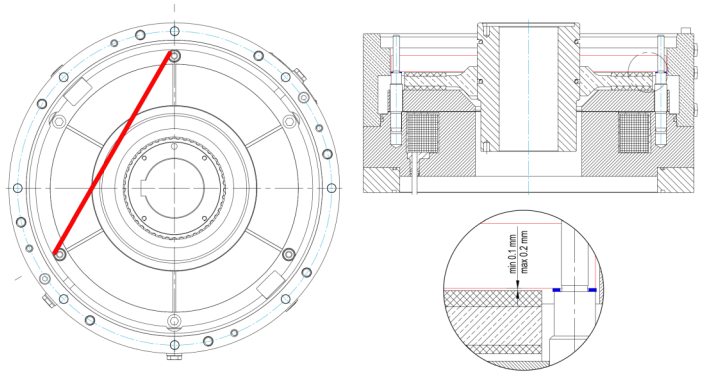


Abbildung 9.3: *Messung-vertikal-4HPB*

- Bremscheibe (15) unter Beachtung der Einbaulage montieren
- Reibscheibe (2) unter Beachtung der Einbaulage und Hinweisen gemäß Abb. 10.18 und Kap. 10.7 montieren
- Rückstellfedern (23) einsetzen
- den Bremsdeckel (6), lagegerecht, wieder auf der Buchse (14) montieren; Beilage (20) entfällt
- Schrauben (60) und (62) mit dem auf der Zeichnung angegebenem Anzugsdrehmoment anziehen
- Mechanische Notlüftung der Bremse gemäß Kap. 5.3 entfernen
- Messung des Luftspaltes nach Kap. 9.2 durchführen
- Kontrolle der Bremse auf einwandfreie Schaltfunktion
- Kontrolle der Freigängigkeit Reibscheibe mit Reibbelag (2)

9.4 Auswechseln der Reibscheibe mit Reibbelag

Es ist nach Abbildung 5.1 und Abbildung 9.2 wie folgt vorzugehen:



GEFAHR

Schäden durch unsachgemäße Demontage
Tod oder schwerste Verletzungen sind die Folge.

- Überprüfen, dass die Bremse lastfrei ist.
- Bremse elektrisch spannungsfrei schalten.



GEFAHR

Schäden durch schlagartige Entspannung der Druckfedern
Tod oder schwerste Verletzungen sind die Folge. Spulenkörper und Ankerscheibe stehen unter der Axialkraft der Druckfedern! Es besteht Gefahr durch herumfliegende Teile bei schlagartiger Entspannung der Druckfedern.

- Bremse nach Kap. 5.3 mechanisch notlüften
- Schrauben (60) und (62) entfernen
- Den Bremsdeckel(6) von der Buchse (14) demontieren. Als Demontagehilfe sind am Bremsdeckel 3 Gewindebohrungen vorgesesehen die als Abdrückgewinde verwendet werden können. Gegebenenfall sind im Vorfeld Anbauten wie z.B. Encoder zu demontieren
- wenn vorhanden Rückstellfedern (23) entfernen
- erste der beiden Reibscheiben (2) demontieren, als Demontagehilfe sind an der Bremsscheibe (15) Gewindebohrungen vorgesehen, die als Abdrückgewinde verwendet werden können.
- Bremsscheibe (15) Einbaulage markieren, Bremsscheibe (15) entfernen
- zweite der beiden Reibscheiben (2) demontieren

- zur besseren Zugänglichkeit kann wenn erforderlich die Buchse (14) demontiert werden, dazu Schrauben (64) lösen
- Bremse säubern und auf Schäden kontrolieren
- bei optionaler Vertikalfunktion Rundringe (110) austauschen und fetten
- neue Reibscheibe (2) unter Beachtung der Einbaulage und Hinweisen gemäß Abb. 10.18 und Kap. 10.7 montieren
- Bremsscheibe (15) lagegerecht montieren, dabei bei optionaler Vertikalfunktion die Beilagen (19) einsetzen
- neue Reibscheibe (2) unter Beachtung der Einbaulage und Hinweisen gemäß Abb. 10.18 und Kap. 10.7 montieren
- bei optionaler Vertikalfunktion Rückstellfedern (23) einsetzen
- den Bremsdeckel (6), lagegerecht, wieder auf der Buchse (14) montieren
- Schrauben (60) und (62) mit dem auf der Zeichnung angegebenem Anzugsdrehmoment anziehen
- Mechanische Notlüftung der Bremse gemäß Kap. 5.3 entfernen
- Messung des Luftspaltes nach Kap. 9.2 durchführen
- Kontrolle der Bremse auf einwandfreie Schaltfunktion
- Kontrolle der Freigängigkeit Reibscheibe mit Reibbelag (2)



WARNUNG

mangelhafte Inbetriebnahme kann zu Schäden und Funktionsbeeinträchtigungen führen
Neue Reibbeläge übertragen nicht sofort das volle Bremsmoment

- es sind einige kontrollierte Bremsungen als Einlaufvorgang durchzuführen.

9.5 Kondenswasser ablassen

Kondenswasser bildet sich aufgrund großer Temperaturschwankungen und steht immer im Zusammenhang mit der Oberflächentemperatur eines Bauteils, der Raumlufttemperatur und der relativen Luftfeuchte. Daher muss in regelmäßigen Abständen in Abhängigkeit der klimatischen Verhältnisse das angesammelte Kondenswasser abgelassen werden. Dafür ist eine Kondenswasserablassschraube (83) (siehe Abbildung 9.4) vorgesehen.



WARNUNG

Nach jedem Kondenswasserablassen muss der Dichtring (106) wieder eingebaut werden.

Bei horizontaler Einbaulage ist wie folgt vorzugehen (siehe Abbildung 9.4). Bei vertikaler Einbaulage ist je nach Ausführung indviduell vorzugehen.

- Kondenswasserablassschraube (83) herausdrehen und die dazugehörige Dichtung (106) abnehmen
- Kondenswasser ablassen
- Kondenswasserablassschraube (83) mit neuer Dichtung (106) einsetzen und festdrehen

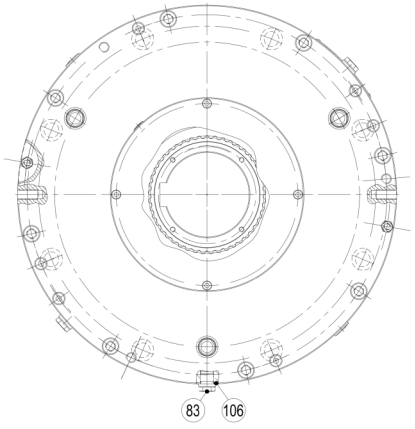


Abbildung 9.4: *Kondenswasser 4HPB*

9.6 Kontrollarbeiten nach einem Notstopp

Nach einem gemäß Kapitel 8.1.3 beschriebenen Notstopp sind folgende Kontrollarbeiten durchzuführen, um einen sicheren Weiterbetrieb der Bremse zu gewährleisten.



WARNUNG

Verbrennungsgefahr durch heiße Bremsenbauteile!

- Bremse vor den Kontrollarbeiten auf Umgebungstemperatur abkühlen lassen

- Luftspalt der abgekühlten Bremse gemäß Kapitel 9.2 überprüfen.
- Ist der maximal zulässige Luftspalt erreicht, Bremse gemäß Kapitel 9.3 bzw. Kapitel 9.4 instandsetzen.
- Bei der Demontage der Bremse sind die mechanischen Bauteile mindestens durch eine Sichtprüfung auf Beschädigungen zu untersuchen und gegebenenfalls durch Originalersatzteile zu erneuern.

10 Varianten und Bezeichnung

Die Bremsen vom Typ HPB werden mit einem definierten Bezeichnungsschlüssel beschrieben. Im ersten Teil der Bezeichnung (①, ②, ③ und ④) werden Typ und Baugröße der Bremse benannt. Im zweiten Bezeichnungsteil (⑤, ⑥ und ⑦) wird der Kundenanschluss beschrieben, während im letzten Teil (⑧) die weiteren Optionen durch eine 7-stellige Buchstabenkombination dargestellt werden.

Bezeichnungsschlüssel (Beispiel Standardausführung):

4	HPB	45	S	-	110V	100H7	A450	-	A O O O G O O
①	②	③	④		⑤	⑥	⑦		⑧

①	Anzahl der Reibflächen	**2** oder **4**
②	Baureihe	**HPB** („**H**igh **P**erformance **B**rake“)
③	Baugröße	min. Außendurchmesser **a** [**mm**] / **10** (siehe Maßtabelle Kap. 13.1)
④	Bremsmomentvariante	**S** - standard, **H** - hoch oder **V** - sehr hoch (siehe Tabelle 3.1)
⑤	Nennspannung Spule	**110 V** DC oder nach Kundenwunsch
⑥	Borungsdurchmesser Ritzel	nach Kundenwunsch oder **NOPI** - ohne Ritzel
⑦	Anschlussflansch	nach DIN 42948 (EN 50347) oder **NOFL** - ohne Flansch
⑧	Optionen	siehe nachfolgende Kapitel

10.1 Option - elektrische Anschlussmöglichkeiten

In der Kategorie 1 (**X**XXXXXX) der 7-stelligen Optionbeschreibung wird der elektrische Anschluss festgelegt.

Tabelle 10.1: *Kategorie 1: elektrische Anschlussmöglichkeiten*

Funktion/ option	Code
Leitungen axial/ cable axial	**A**
Leitungen radial/ cable radial	**R**
Klemmenkasten m. Klemme/ terminal box with clamp	**K**
Klemmenkasten m. SSG/ terminal box with quick switching rectifier	**S**
Klemmenkasten m. GR/ terminal box with rectifier	**G**
Klemmenkasten m. Klemme + GR/ terminal box with clamp + rectifier	**B**
Kundenspezifisch/ customized	**C**

Standardmäßig ist die axiale Kabelausführung (**A**) vorgesehen.

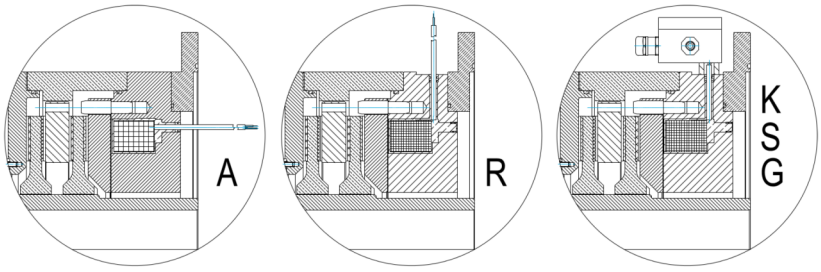


Abbildung 10.1: *Kategorie 1: A-R-K-S-G-B*

Innerhalb des Klemmenkasten sind verschiedene Optionen möglich, z. B.:

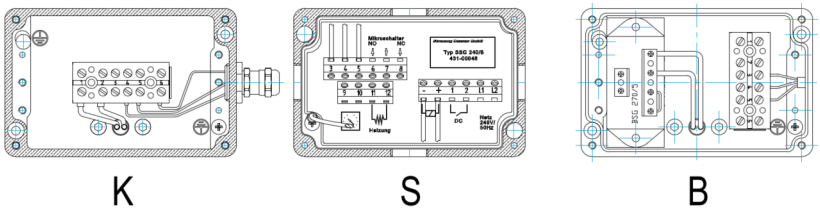


Abbildung 10.2: *Kategorie 1: K-S-B*

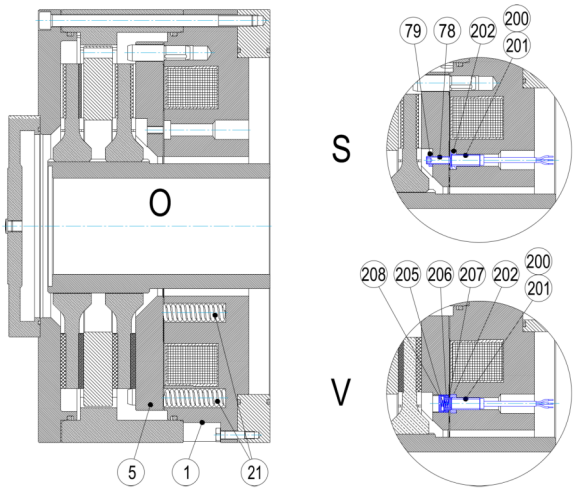
Es gelten die Hinweise nach Kapitel 5.4.

10.2 Option - Überwachung

In der Kategorie 2 (X**X**XXXXX) der 7-stelligen Optionsbeschreibung wird die Überwachung der Bremse festgelegt.

Tabelle 10.2: *Kategorie 2: Überwachung*

Funktion/ option	Code
ohne Zustandsüberwachung/ without monitoring	**O**
Schaltzustandskontrolle (SZK) mit ind. Schalter/ state of operation via inductive switch	**S**
2x SZK mit ind. Schalter/ 2x state of operation via inductive switch	**R**
Verschleißkontrolle (VK) mit ind. Schalter/ wear state via inductive switch	**V**
SZK + VK mit ind. Schalter/ state of operation + wear state via inductive switch	**A**
SZK mit Mikroschalter/ state of operation via microswitch	**P**
2x SZK mit Mikroschalter/ 2x state of operation via mircroswitch	**Q**
SZK + VK mit mikroschalter/ state of operation + wear state via microswitch	**B**
SZK m. ind. Sch., VK mit Mikrosch./ state of op. via microswitch, wear state via ind. switch	**D**
Kundenspezifisch/ customized	**C**



1	Spulenkörper mit Spule	201	induktiver Schalter
5	Ankerscheibe	202	Rundmutter Gewindering
21	Druckfeder	205	Rückstellfeder Verschleißkontrolle
78	Gewindestift	206	Buchse Verschleißkontrolle
79	Sechskantmutter	207	Kolben Verschleißkontrolle
200	Mikroschalter	208	Deckel Verschleißkontrolle

Abbildung 10.3: *Kategorie 2: O-S-V*

10.2.1 Induktiver Näherungsschalter

Der Näherungsschalter ist ein berührungslos und somit verschleißfrei arbeitender Grenztaster. Seine Betätigung erfolgt durch ein Metall, das innerhalb des Schaltabstandes vor die aktive Detektorfläche gebracht wird. Der induktive Näherungsschalter (201) besitzt wie in Abbildung 10.4 dargestellt ein zylindrisches Metallgehäuse mit Außengewinde. Das Schaltelement besitzt einen PNP-Ausgang und fungiert als Schließer siehe Abbildung 10.5.

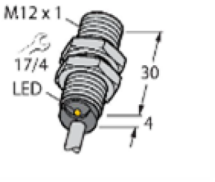


Abbildung 10.4: *Induktiver Näherungsschalter*

Wird die axial bewegliche Ankerscheibe (5) durch die Magnetkraft gegen den Spulenkörper gezogen, wird der zum Einstellen des Schaltpunktes dienende Gewindestift (78) vom induktiven Näherungsschalter (201) detektiert und der Schalter geschlossen. Ist die Bremse spannungslos, drücken die Federn (21) die Ankerscheibe (5) vom Spulenkörper, wodurch ein Luftspalt zwischen Ankerscheibe und Spulenkörper entsteht. Wenn der Luftspalt so groß ist, dass der in der Ankerscheibe befindliche Kolben (207) aus dem Schaltabstand des induktiven Näherungsschalters (201) herausgetragen wird, ist die Verschleißgrenze der Bremse erreicht und der Schalter öffnet.

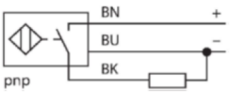


Abbildung 10.5: *Anschlussbild*

10.2.2 Mikroschalter

Der Mikroschalter (200), Abbildung 10.6, besteht aus einem zylindrischen Gehäuse mit Außengewinde, in dem ein Sprungschalter als Wechsler Abbildung 10.7 mit folgenden Anschlussmöglichkeiten untergebracht ist.
(c) und (no) = Schließer
(c) und (nc) = Öffner
(c) common ground (nc) normally closed (no) normally open



Abbildung 10.6: *Mikroschalter*

Wenn die Überwachung des Schalt- oder des Verschleißzustandes in einer HPB erforderlich ist, wird wie in Abbildung 10.3 dargestellt der Schalter (200) im Spulenkörper (1) fixiert. Dazu wird die Rundmutter (202) auf den Schalter (201) geschraubt und beide wie in dargestellt in die entsprechende Einsenkung des Spulenkörpers gebracht und eingeklebt. Wird die axial bewegliche Ankerscheibe (5) durch die Magnetkraft gegen den Spulenkörper gezogen, betätigt sie den Mikroschalter (200).



Abbildung 10.7: *Anschlussbild Mikroschalter*

Detailierte Informationen zu den Schaltern sind der **Montageanleitung 449-00254** zu entnehmen. Diese erhalten Sie von unserem Kundendienst (Kontaktdaten s. Kapitel 11.3).

10.3 Option - Zubehör

In der Kategorie 3 (XX**X**XXXX) der 7-stelligen Optionsbeschreibung wird Zubehör und dessen Kombinationsmöglichkeiten festgelegt.

Tabelle 10.3: *Kategorie 3: Zubehör*

Funktion/ option	Code
ohne Extras mit O-Ring/ without extras with O-ring	**O**
ohne O-Ring/ without customer seal ring	**W**
ohne O-ring, ohne Bef.-schr./ without customer seal ring and fixing screws	**P**
Anticondensationsheizung (HZ)/ anticondensation heating	**H**
HZ ohne O-Ring/ with anticondensation heating, without seal ring	**R**
Handlüftung (HL)/ with hand release	**N**
HL ohne O-ring/ with hand release, without O-ring	**M**
HZ + HL/ with anticondensation heating and hand release	**B**
HZ + HL ohne O-ring/ with anticondensation heating and hand release, without O-ring	**S**
Kundenspezifisch/ customized	**C**

10.3.1 Stillstandsheizung / O-Ring

Bei hohen zu erwartenden Temperaturschwankungen kann eine Stillstandheizung zur Vermeidung von Kondenswasser vorgesehen werden. Die Zuleitung wird mit der Spulenanschlussleitung gemeinsam ausgeführt. Kundenseitig kann die Bremse mit oder ohne O-Ring ausgeliefert werden. Standardmäßig wird die Bremse mit O-Ring geliefert.

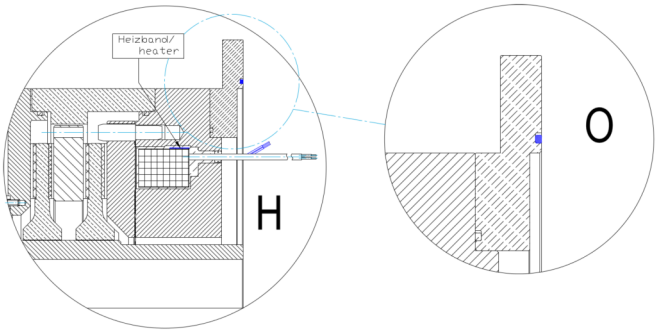


Abbildung 10.8: *Kategorie 3: H-O*

10.3.2 Handhebel- Notlüftung

Die Bremse 4HPB kann mit einer Handhebel-Notlüftung ausgestattet werden, mit der sie im Notfall, z.B. bei Ausfall der elektrischen Spannungsversorgung, von Hand gelüftet werden kann. Durch Ziehen des Handlüftbügels (41) um ca. 30° gegen die Rückseite der Bremse (siehe Abbildung 10.9) wird die Ankerscheibe (5) axial gegen den Spulenkörper (1) gedrückt und die Reibscheiben mit Reibbelag (2) freigestellt.

Diese Handhebel-Notlüftung ist mit einer Arretierung versehen, mit der der Handlüftsmechanismus im nicht betätigten Zustand wie folgt arretiert werden kann. Die Griffstange (41) wird gegen den Anschlagbügel (42) gedrückt. Dabei rastet die Griffstange (41) im Federclip (43) ein und wird in ihrer Lage gesichert.

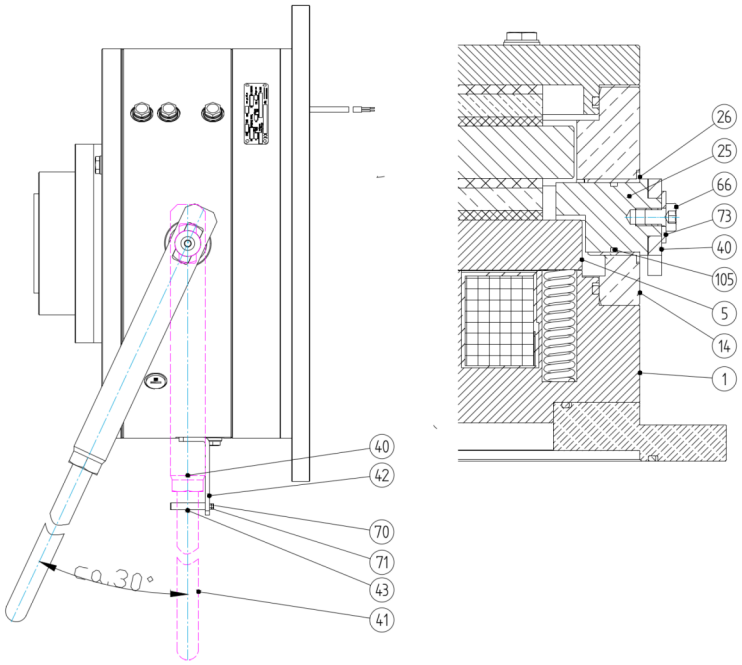


Abbildung 10.9: *Handlüftung 4HPB*

HINWEIS

Es handelt sich hierbei um federkraftbetätigte Bremsen, die bei einem Ausfall der elektrischen Spannungsversorgung einfallen. Während der Nutzung der Handhebel-Notlüftung wird das Federkraftsystem außer Kraft gesetzt. Wir empfehlen diese Art der Notlüftung nicht.



WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Die Notlüftung darf nicht für die Aufrechterhaltung eines provisorischen Betriebes genutzt werden!!



WARNUNG

Gefahr schwerer Sach- und Personenschäden.
Für die Funktionsprüfung eines optional verbauten Näherungsschalters (mechanisch oder induktiv) darf die Notlüftung nicht verwendet werden!!



GEFAHR

Gefahr schwerer Sach- und Personenschäden.
Tod oder schwerste Verletzungen sind die Folge.
Der Luftspalt "Aus max" darf nicht überschritten werden, da sonst die Übertragung des Nennmomentes nicht gewährleistet ist.

10.4 Option - Oberfläche

In der Kategorie 4 (XXX**X**XXX) der 7-stelligen Optionsbeschreibung wird die Oberflächenbeschaffenheit der Bremse festgelegt.

Tabelle 10.4: *Kategorie 4: Oberfläche*

Funktion/ option	Code
ohne Lackierung/ without painting	**O**
Lackierung - grundiert/ primed	**G**
Lackierung - Standard/ standard painting	**L**
Lackierung - Sonder/ special painting	**S**
Kundenspezifisch/ customized	**C**

Innerhalb der gesamten HPB-Baureihe sind **alle äußeren Stahlbauteile standardmäßig mit einem speziellen nichtmetallischen Oberflächenschutz versehen**, der vor Korrosion durch die Luftfeuchtigkeit und vor galvanischer Korrosion im Kontaktbereich mit anderen Metallen schützt. Äußere Bauteile, die nicht aus Stahl bestehen, sind aus einer seewasserbeständigen Aluminumlegierung gefertigt oder bestehen aus nichtrostendem Edelstahl.

Für den Einsatz der Bremse in anspruchsvollen, maritimen Umgebungsbedingungen, wie sie im Hafen oder Off-shore vorherrschen, wird zusätzlich eine geeignete Lackierung benötigt. Wir empfehlen ein Lacksystem nach Wahl des Kunden zu verwenden, welches mindestens aus einer geeigneten Haftgrundierung und einem seewasserbeständigen Decklack besteht. Bevor die Haftgrundierung aufgebracht wird, müssen alle Oberflächen sauber und frei von Fett oder anderen Verunreinigungen sein. Die außenliegenden Oberflächen der Bremse haben eine geeignete Oberflächenrauhigkeit, um der Grundierung Haftung zu bieten.

Wir empfehlen die Bremse erst zu Lackieren, nachdem diese an den Motor angebaut wurde. Dadurch wird die Anschlussfläche zwischen Motor- und Bremsenflansch mit dem kompletten Farbschichtsystem der Lackierung abgedeckt und somit ausreichend vor Korrosion geschützt.

Wird eine eine grundierte Ausführung (**G**) bestellt, wird die Bremse im Zusammenbau (siehe Abbildung 10.10) mit einer Schichtdicke von 40 μm bis 80 μm lackiert. Bei den Ausführungen mit Farbschicht (**L**), (**S**) wird zusätzlich ein Decklack mit einer Schichtdicke von 40 μm bis 80 μm aufgebracht.

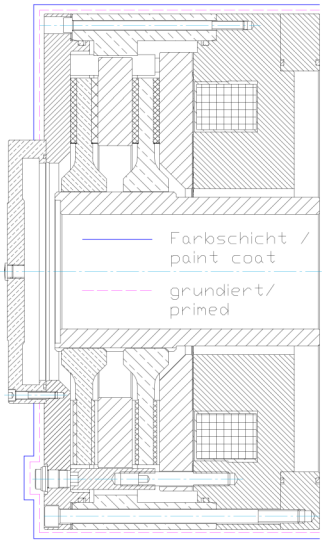


Abbildung 10.10: *Standard-Farbschichtsystem (**L**)*

HINWEIS

Es ist zu Beachten, das Beschädigungen der Lackschicht durch Montage und Wartungsarbeiten, einer Nachbehandlung bedürfen. Eine Überprüfung der Oberfläche nach der Montage und Wartung wird daher empfohlen.

10.5 Option - Anschluss

In der Kategorie 5 (XXXX**X**XX) der 7-stelligen Optionsbeschreibung werden die Tachoflanschoptionen festgelegt.

Tabelle 10.5: *Kategorie 5: Anschluss*

Funktion/ option	Code
ohne Tachoflansch/ without tachoflange	**O**
Tachoflansch geschlossen/ tachoflange closed	**G**
Tachoflansch für Encoder Type POG 10/ tachoflange for encoder type POG 10	**E**
Tachoflansch für Wellendichtring/ tachoflange with shaft seal ring	**W**
Encoderanschluss mit Ausgleichskupplung/ encoder connect. via coupling	**K**
Blechplatte/ closing plate	**B**
Encoderanschluss Hoyer/ encoder connection Hoyer	**H**
Kundenspezifisch/ customized	**C**

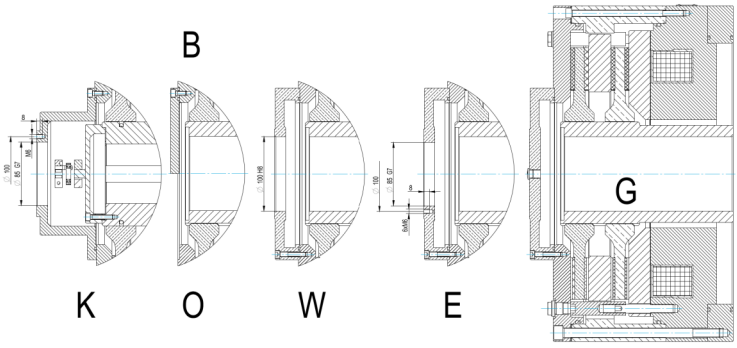


Abbildung 10.11: *Kategorie 5: K-O-B-W-E-G*

Die „Controlflex“ der Firma Schmidt-Kupplung GmbH ist eine speziell für den Anschluss mechanischer Drehgeber entwickelte Ausgleichkupplung nach dem Prinzip des Parallelkurbelgetriebes.



Abbildung 10.12: *Controlflex*

Die Ausgleichskupplung Controlflex wird **standardmäßig in einer axial trennbaren Ausführung** verwendet. Für die Montage des Encoders an die Bremse ist wie folgt vorzugehen:

- Die gesamte Ausgleichskupplung (602) so auf die Encoderwelle schieben, dass der Abstand zwischen der Planfläche des Encoderflansches und der Kupplungsnabe 25 mm beträgt (siehe Abbildung 10.13).
- Die Feststellschraube der auf der Encoderwelle befindlichen Klemmnabe mit einem Innensechskant-Werkzeug (Schlüsselweite 3 mm) mit einem Anzugsmoment von 3 Nm festschrauben.
- Durch Drehen der Encoderwelle die Ausgleichskupplung (602) so ausrichten, dass die Feststellschraube der anderen Klemmnabe beim Anflanschen des Encoders an den Tachoflansch (10) durch die radiale Zugangsbohrung im Tachoflansch erreichbar ist.

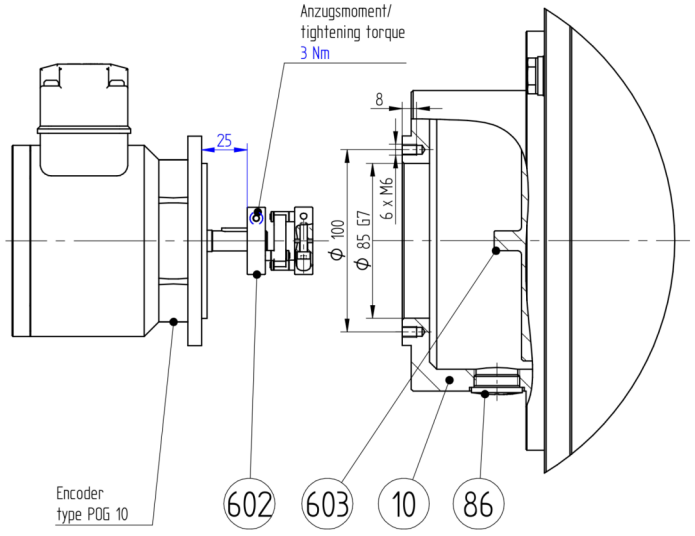


Abbildung 10.13: *Montage der Ausgleichskupplung an den Drehgeber*

- Die Verschlusschraube (86) aus dem Tachoflansch (10) entfernen.
- Den Encoder mit Kupplung (602) in den Tachoflansch (10) einführen und die freie Nabe der Kupplung über den Wellenzapfen des Ritzeladapters (603) schieben (siehe Abbildung 10.14).
- Die Feststellschaube der Klemmnabe über die radiale Zugangsbohrung des Tachoflansches (10) mit einem geeigneten Innensechskant-Werkzeug (Schlüsselweite 3 mm) mit einem Anzugsmoment von 3 Nm festschrauben (siehe Abbildung 10.14).
- Die Bohrung wieder mit der Verschlussschraube (86) verschließen.

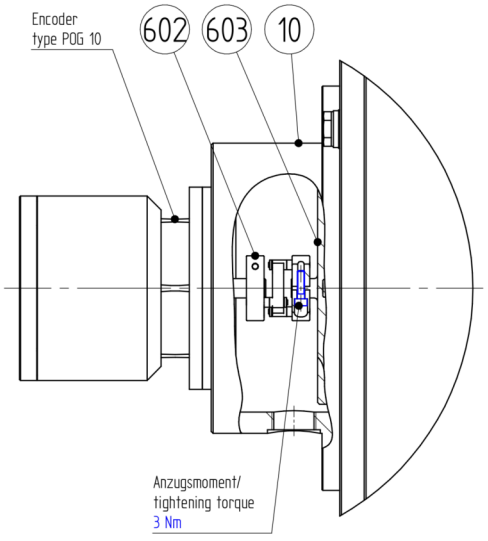


Abbildung 10.14: *Montage des Drehgebers mit Kupplung an die Bremse*

Bei der Verschleißnachstellung, dem Auswechseln der Verschleißteile oder anderen Wartungs- und Instandhaltungsmaßnahmen gemäß Kapitel 9 ist es erforderlich vor der Demontage des Bremsdeckels (6) den Encoder samt Ausgleichskupplung (602) zu demontieren.

Um den Drehgeber von der Bremse zu trennen, ist wie folgt vorzugehen:

- Die Befestigungsschrauben des Encoders lösen und den Encoder vorsichtig aus der Bremse ziehen.
- Den Tachoflansch (10) durch Herausdrehen der Befestigungsschrauben (63) lösen und von der Bremse trennen.
- Die am Zapfen des Ritzeladapters (603) verbliebene Klemmnabe der Ausgleichskupplung durch Losdrehen der Feststellschraube lösen und vom Zapfen schieben.
- Diese Klemmnabe wieder mit der auf der Encoderwelle befindlichen Kupplungshälfte verbinden. Dazu die zwei Zylinderstifte der Nabe in die entsprechenden Bohrungen des elastischen Mittelstückes stecken.

HINWEIS

Beim Wiederzusammensetzen der Kupplungshälften der teilbaren Controlflex-Ausgleichkupplung ist darauf zu achten, dass die zwei Bolzen jeder Nabe vollständig in die entsprechenden zwei Bohrungen des elastischen Mittelelements gesteckt werden, bevor der Encoder wieder an die Bremse montiert werden kann.

- Den Tachoflansch (10) wieder an den Bremsdeckel (6) montieren. Die Schrauben (63) sind mit dem auf der Bremsenzeichnung angegebenen Drehmoment anzuziehen. **Der O-Ring (103) darf bei der Montage des Tachoflansches nicht beschädigt werden!**
- Der Encoder inklusive Ausgleichskupplung kann nun wieder wie oben beschrieben an die Bremse angebracht werden.

Für spezielle Anwendungen kann die Controlflex-Ausgleichskupplung in einer axial nicht trennbaren Version bestellt werden. Der Drehgeber mit nichttrennbarer Ausgleichskupplung ist in der selben oben beschriebenen Weise an die Bremse zu montieren wie die trennbare Variante. Die Demontage muss jedoch anders erfolgen, sonst wird die nichttrennbare Ausgleichskupplung beschädigt.

Um den Drehgeber mit nichttrennbarer Controlflex von der Bremse zu demontieren, ist wie folgt vorzugehen:

- Die Verschlussschraube (86) des Tachoflansches (10) herausdrehen.
- Die Welle, auf der das Ritzel (4) der Bremse sitzt, drehen, bis die Feststellschraube der ritzelseitigen Klemmnabe der Ausgleichskupplung (602) über die Zugangsbohrung im Tachoflansch (10) erreichbar ist (vgl. Abbilding 10.14).
- Die Feststellschraube mit einem geeigneten Innensechskantschlüssel (Schlüsselweite 3 mm) losdrehen.
- Die Befestigungsschrauben des Encoders lösen und diesen vorsichtig aus der Bremse herausziehen.
- Die Wiedermontage des Encoders erfolgt wie oben erläutert.



HINWEIS

Für die beschriebene Demontage des Encoders mit nichttrennbarer Controlflex ist es notwendig die Welle um mindestens 180° drehen zu können. Wenn dies durch die Gegebenheiten des Antriebssystems bzw. der Maschine, in der die Bremse verbaut ist, nicht möglich ist, muss die Bremse mit einer axial teilbaren Variante der Controlflex-Ausgleichskupplung (siehe Abbildung 10.12) bestellt werden.

Wir empfehlen die teilbare Controlflex zu verwenden (Standard-Variante).

10.6 Option - Beschaltung

In der Kategorie 6 (XXXXX**X**X) der 7-stelligen Optionsbeschreibung wird lose mitgeliefertes Zubehör der Bremse festgelegt.

Tabelle 10.6: *Kategorie 6: Beschaltung*

Funktion/ option	Code
ohne elektrisches Zubehör/ without electrical accessories	**O**
Klemmenkasten lose/ terminal box loose	**L**
SSG lose/ quick switching rectifier loose	**S**
SSG auf Blech lose/ quick switching rectifier on sheet metal loose	**B**
GR lose/ rectifier loose	**G**
Zusatzheizung im Tachoflansch/ additional heating in tachoflange	**H**
Kundenspezifisch/ customized	**C**

Detailierte Informationen zu lose mitgeliefertem Zubehör sind der jeweiligen Maßzeichnung der Bremse zu entnehmen.

10.7 Option - Sonstiges

In der Kategorie 7 (XXXXXX**X**) der 7-stelligen Optionsbeschreibung werden sonstige Optionen der Bremse festgelegt.

Tabelle 10.7: *Kategorie 7: Sonstiges*

Funktion/ option	Code
ohne weitere Anforderungen, Horizontalbetrieb/ no additional requirements, horizontal operation	**O**
Vertikalbetrieb/ vertical operation	**V**
Einzelabnahme einer Marine-Klassifikationsgesellschaft/ case-by-case certification of marine classification society	**E**
Kundenspezifisch/ customized	**C**

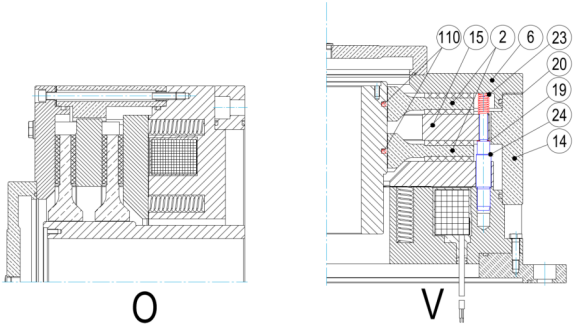


Abbildung 10.15: *Kategorie 7: O-V*

Bremsen der HPB-Baureihe sind standardmäßig für den horizontalen Einsatz vorbereitet (Einbaulage gemäß Abbildung 10.15 Ausführung **O**). In dieser Ausführung laufen sich die Reibflächen im gelüfteten Zustand frei. Für den Einsatz der Bremse in vertikaler Einbaulage sind gemäß (Abbildung 10.15) Ausführung (**V**) alternative Bauteile zu verwenden um eine Restreibung an den Reibflächen im gelüfteten Zustand weitestgehend auszuschließen. Durch die Eigenmasse der Bauteile werden diese im vertikalen Aufbau Richtung Spulenkörper gezogen. Für eine definierte Position der mittleren Bremsscheibe (15) im gelüfteten Zustand sorgt ein Stehbolzen (24) mit Anschlag. Durch die Druckfeder (23) wird die mittlere Bremsscheibe (15) immer in ihre definierte Lage bewegt. Damit ist bei gelüfteter Bremse ausreichend Spiel für die beiden Reibscheiben (2). Um dem Eigengewicht der Reibscheiben (2) entgegenzuwirken werden im Ritzel Rundringe (110) montiert. Die Klemmwirkung der Rundringe (110) hebt das Eigengewicht der Reibscheiben (2) auf, hindert sie aber nicht an ihrer axialen Bewegung auf dem Ritzel beim Zuschalten der Bremse. Für die Montage empfehlen wir die Rundringe (110) leicht mit Fett (z. B. MoS_2) zu benetzen.

HINWEIS

Bei horizontaler Einbaulage sind die Rundringe (110) und Rückstellfedern (23) zu entfernen, da die Schwerkraftwirkung auf die Reibscheiben nicht vorhanden ist.

Für die Montage der Bremse (siehe Kapitel 6.1) gelten für den vertikalen Aufbau zusätzliche Anforderungen.

Für den funktionsgerechten Sitz der Rundringe (110) ist es erforderlich die Reibscheiben (2) separat zu montieren. Die Bremse ist zur Montage wie folgt vorzubereiten:

- Bremse vertikal ausrichten; Leitungen vor Beschädigungen schützen
- Bremse gemäß Kapitel 5.3 notlüften
- Schrauben (60) und Schrauben (62) entfernen, siehe Kapitel 5.1
- Den Bremsdeckel (6) von der Buchse (14) demontieren. Als Demontagehilfe sind am Bremsdeckel Gewindebohrungen vorgesehen die als Abdrückgewinde verwendet werden können.
- Beilage (20) entfernen
- der Tachoflansch muss nicht demontiert werden
- erste Reibscheibe (2) entnehmen, Ausrichtung der Reibscheibe und Position auf dieser markieren um sie bei der Montage positions- und lagegerecht zu montieren.
- Feder (23) für Rückstellsystem entfernen
- mittlere Bremsscheibe (15) entnehmen und Position auf dieser markieren um sie bei der Montage positions- und lagegerecht zu montieren.
- zweite Reibscheibe (2) entnehmen, Ausrichtung der Reibscheibe und Position auf dieser markieren um sie bei der Montage positions- und lagegerecht zu montieren.

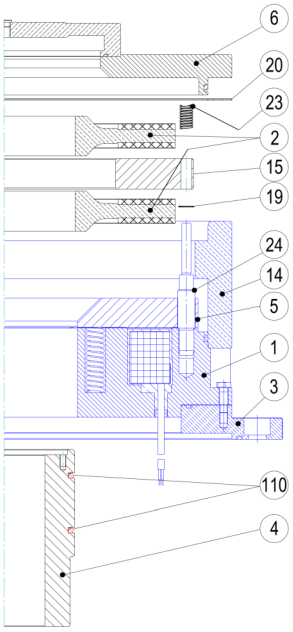


Abbildung 10.16: *Montage Vorbereitung Vertikal*

Je nach Ausführung des Kundenanschlussflansches (3) ist dieser vom Spulenkörper zu trennen. Dazu siehe Kapitel 6.1.

Nach Abschluss der vorbereitenden Arbeiten kann die Bremse am Antrieb montiert werden. Dazu ist gemäß (Abbildung 10.16) wie folgt vorzugehen:

- Kontrolle der Anschlussmaße auf Übereinstimmung mit der Bremse
- Evtl. verhandenen Transport- oder Lagerschutz, sowie Grat- und Schlagstellen sind zu entfernen.
- Kontrolle der Stirnlaufabweichung der Anflanschfläche zur abbremsenden Welle (Toleranzklasse N nach DIN 42955 sollte nicht überschritten werden.
- Ritzel (4) auf einwandfreien sauberen Zustand prüfen, gegebenenfalls reinigen
- Welle und Passfeder mit Montagepaste leicht fetten, Ritzel (4) aufziehen und axial sichern.
- Flansch (3) lagegerecht mit passenden Schrauben am Motorflasch befestigen und sichern

- Bremsenhauptbaugruppe mit Spulenkörpergruppe (1) mit passenden Anschlagmitteln (Schäkel oder dgl.) vorsichtig über das Ritzel (4) führen. Die Baugruppen lagegerecht auf dem Flansch (3) positionieren und mit Schrauben (61) axial sichern. Der elektrische Anschluss muss unter der Beachtung der jeweiligen Installationsvorschriften vom Fachpersonal vorgenommen werden.
- Rundring (110) leicht fetten (z.B. MoS_2) und in der spulenkörperseitigen Nut positionieren.
- passende Reibscheibe lagegerecht auf der Verzahnung des Ritzels positionieren, anschließend die Reibscheibe (2) bis an die Ankerscheibe (5) schieben. Um den Wiederstand des Rundringes (110), der aus der gewünschten Vorspannung resultiert, zu überwinden empfehlen wir die Verwendung einer Vorrichtung mit welcher die Reibscheibe (2) gleichmäßig bis in ihrer Endlage gedrückt werden kann. Ein Beispiel zeigt Abbildung 10.18

WARNUNG

Bei der Nachstellung der Bremse sowie dem Austausch der Reibscheiben (2) ist die Freigängigkeit der Reibscheibe(2), die sich zwischen Ankerscheibe (5) und mittlerer Bremsscheibe (15) befindet, zu gewährleisten. Gemäß Abb. 10.17 ist der Luftspalt zwischen Reibfläche und der Auflagefäche der mittleren Bremscheibe (15) mittels Haarlineal über je zwei Punkte zu überprüfen. Es muss umlaufend ein Spalt zwischen 0,1 mm und 0,2 mm eingestellt werden. Ein Ausgleich kann mit den Beilagen (19) vorgenommen werden.

- die Ankerscheibe muss dabei vollständig gelüftet sein, d. h. am Spulenkörper anliegen

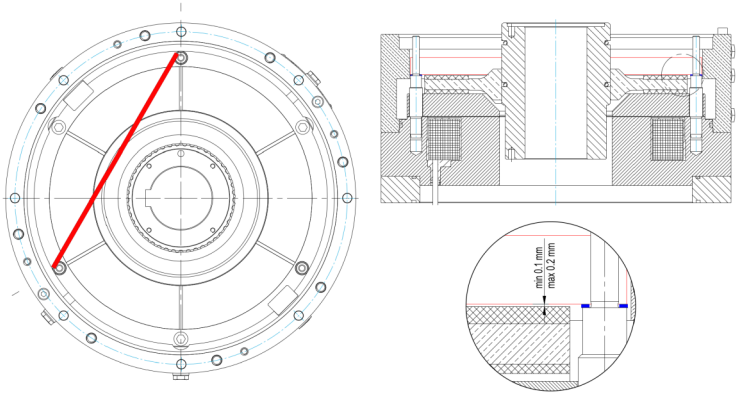


Abbildung 10.17: *Messung-vertikal-4HPB*

- mittlere Bremsscheibe (15) lagerecht montieren, es ist darauf zu achten, dass die Beilagen (19) auf den Stehbolzen (24) montiert sind.
- Rundring (110) leicht fetten (z.B. MoS_2) und in der vorderen Nut positionieren.

- passende Reibscheibe lagegerecht auf der Verzahnung des Ritzels positionieren, anschließend die Reibscheibe (2) bis an die mittlere Bremsscheibe (15) schieben. Um den Widerstand des Rundringes (110), der aus der gewünschten Vorspannung resultiert, zu überwinden empfehlen wir die Verwendung einer Vorrichtung, mit welcher die Reibscheibe (2) gleichmäßig bis in ihrer Endlage gedrückt werden kann. Ein Beispiel zeigt Abb. 10.18.
- Federn (23) für Rückstellung auf Stehbolzen (24) platzieren
- Beilage (20) lagegerecht einlegen
- Bremsdeckel (6) lagegerecht wieder auf Buchse (14) montieren
- Schrauben (60) und Schrauben (62) mit dem auf der Zeichnung angegebenen Anzugsmoment anziehen
- Mechanische Notlfüftung der Bremse gemäß Kap. 5.3 entfernen
- Messung des Luftspaltes nach Kapitel 9.2 durchführen
- Kontrolle der Bremse auf einwandfreie Schaltfunktion
- erneute Luftspaltkontrolle nach 3 elektrischen Schaltungen durchführen.

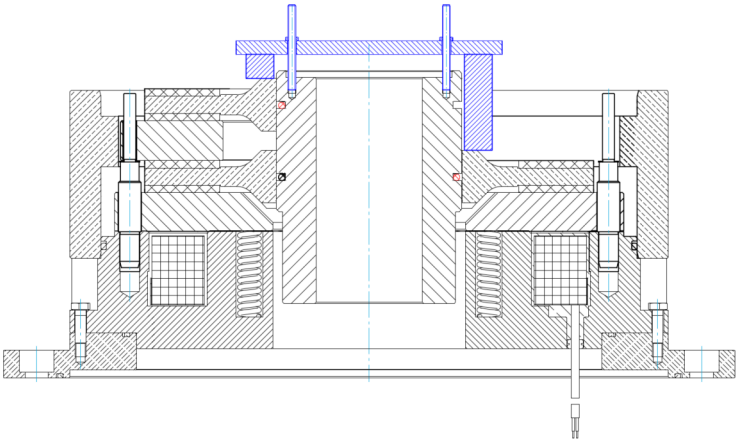


Abbildung 10.18: *Montagevorrichtung Vertikal*

11 Ersatzteilhaltung, Kundendienst

11.1 Ersatzteilhaltung

Eine Bevorratung der wichtigsten Ersatz- und Verschleißteile ist eine wichtige Voraussetzung für die ständige Funktions- und Einsatzbereitschaft der Bremse. Verschleißteile sind Reibscheibe mit Reibbelag (2), Ankerscheibe (5), und Bremsdeckel (6) (Positionsangabe siehe Kap. 5.1).

Nur für die von uns gelieferten Originalersatzteile übernehmen wir eine Gewährleistung. Wir machen ausdrücklich darauf aufmerksam, dass der Einbau und/oder die Verwendung nicht von uns gelieferter Originalersatzteile die konstruktiv vorgegebenen Eigenschaften der Bremse negativ verändern und dadurch die aktive und/oder passive Sicherheit beeinträchtigen kann. Für Schäden, die durch die Verwendung von **Nicht**-Originalersatzteilen und -Zubehör entstehen, ist jede Gewährleistung seitens der Stromag GmbH ausgeschlossen.

Bitte beachten Sie, dass für Eigen- und Fremdteile oft besondere Fertigungs- und Lieferspezifikationen bestehen und wir Ihnen stets Ersatzteile nach dem neuesten technischen Stand und nach den neuesten gesetzlichen Vorschriften anbieten.

11.2 Daten für Ersatzteilbestellung

Es sind folgende Angaben erforderlich:

- Baureihe und Größe der Bremse
- Artikelcode
- Position und Benennung des Ersatzteils (siehe Kap. 5.1)
- Stückzahl

11.3 Kundendienstadresse

Stromag GmbH
Hansastraße 120
59425 Unna

Telefon: +49 2303 102 0
E-Mail: info@stromag.com

Benötigen Sie einen Kundendienst-Monteur, so wenden Sie sich bitte unter obiger Adresse an unsere Abteilung "Customer Care".

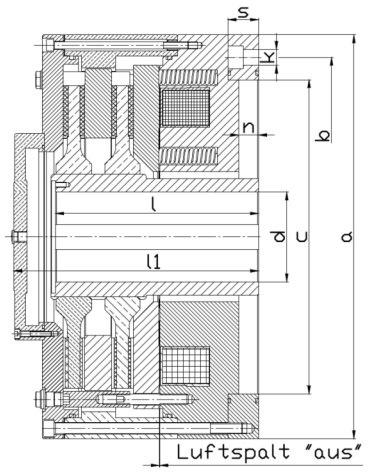
12 Aufgeführte Normen und Richtlinien

DIN 6885-1	Passfedern
DIN EN 60529 (VDE 0470-1)	Schutzarten durch Gehäuse (IP-Code)
DIN EN 50347	Drehstromasynchronmotoren für den Allgemeingebrauch mit standardisierten Abmessungen und Leistungen
DIN 42955	Rundlauf der Wellenenden, Koaxialität und Planlauf der Flansche umlaufender elektrischer Maschinen
DIN EN 60092-507 (VDE 0129-507)	Elektrische Anlagen auf Schiffen - Teil 507: Yachten
DIN EN 60034-5 (VDE 0530-5)	Drehende elektrische Maschinen - Teil 5: Schutzarten aufgrund der Gesamtkonstruktion von drehenden Maschinen
DIN VDE 0580	Elektromagnetische Geräte und Komponenten - Allgemeine Bestimmungen
2004/108 EG	Elektromagnetische Verträglichkeit
2006/95 EG	Niederspannungsrichtlinie

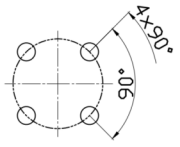
Die aufgeführten Normen und Richtlinien entsprechen dem jeweils gültigen Stand zum Zeitpunkt der Veröffentlichung dieses Dokumentes.

13 Anhang

13.1 Maßblatt



Anordnung der Bohrungen k und k1 bis Flanschgröße FF 350 nach DIN EN 50347 (A400 nach DIN 42948)



Anordnung der Bohrungen k und k1 ab Flanschgröße FF 400 nach DIN EN 50347 (A450 nach DIN 42948)

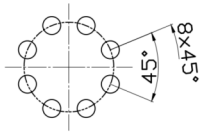


Tabelle 13.1: *Maßtabelle (alle Maße in mm)*

Bremsengröße	4HPB	20	25	27	30	35	40	45	55
Aussendurchmesser	*a*	200	250	275 (300)	300	350	400	450	550
Lochkreisdurchmesser	*b*	165	215	265	265	300	350	400	500
Zentrierdurchmesser	*cH7*	130	180	230	230	250	300	350	450
Gesamtlaenge	*l1*	166	172	200	206	224	241	273	288
Nenn-Luftspalt	*min*	0,5	0,6	0,6	0,6	0,6	0,7	0,8	1,0
	max	1,1	1,2	1,3	1,4	1,5	1,7	2,1	2,5
Ritzellaenge	*l*	118	138	150	150	183	187	226	230
max Ritzelbohrung	*dH7*	38	48	55	55	60	95	100	120
Zentrierlaenge	*n*	16	17	21	21	20	22,5	22	17
Flanschbreite	*s*	21	22	26	26	30	31	34	37
Bohrung	*k*	11	13,5	13,5	13,5	17,5	17,5	17,5	17,5
Flansch	*min*	A200	A250	A300	A300	A350	A400	A450	A550
Luftspalt im	*min*	0,4	0,5	0,5	0,5	0,5	0,6	0,65	0,9
Auslieferungszustand	*max**	0,7	0,8	0,9	0,9	1,0	1,1	1,3	1,6

∗ entspricht einer Verschleißreserve von mindestens 60% bezogen auf den min. und max. Nenn-Luftspalt nach dem Einschleifen der Bremse

14 Abbildungs- und Tabellenverzeichnis

Abbildungsverzeichnis

3.1 Leistungsschild 4HPB . . . 12
4.1 Transport und Montage mittels Ringschrauben . . . 16
5.1 Schnittdarstellung 4HPB45, Einzelteile sind mit Positionsnummern beschriftet . . . 18
5.2 Notlüftung mit Schrauben . . . 19
6.1 Beispiel Anziehdrehmomente . . . 21
6.2 Montage ohne Demontage . . . 22
6.3 Montage mit Demontage . . . 23
8.1 Schnitt 4HPB . . . 27
9.1 Luftspaltmessung 4HPB . . . 30
9.2 Schnittdarstellung - Vertikaloption 4HPB45, Einzelteile sind mit Positionsnummern beschriftet 31
9.3 Messung-vertikal-4HPB . . . 32
9.4 Kondenswasser 4HPB . . . 35
10.1 Kategorie 1: A-R-K-S-G-B . . . 37
10.2 Kategorie 1: K-S-B . . . 37
10.3 Kategorie 2: O-S-V . . . 38
10.4 Induktiver Näherungsschalter . . . 39
10.5 Anschlussbild . . . 39
10.6 Mikroschalter . . . 39
10.7 Anschlussbild Mikroschalter . . . 39
10.8 Kategorie 3: H-O . . . 40
10.9 Handlüftung 4HPB . . . 41
10.10 Standard-Farbschichtsystem (**L**) . . . 43
10.11 Kategorie 5: K-O-B-W-E-G . . . 44
10.12 Controlflex . . . 44
10.13 Montage der Ausgleichskupplung an den Drehgeber . . . 45
10.14 Montage des Drehgebers mit Kupplung an die Bremse . . . 46
10.15 Kategorie 7: O-V . . . 49
10.16 Montage Vorbereitung Vertikal . . . 50
10.17 Messung-vertikal-4HPB . . . 51
10.18 Montagevorrichtung Vertikal . . . 52

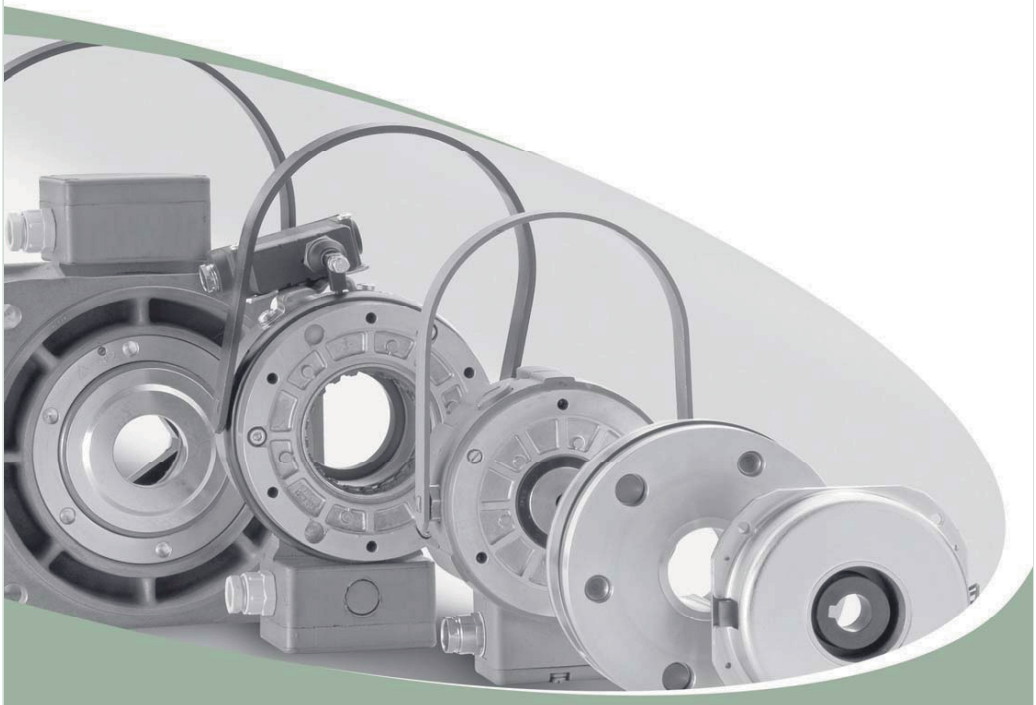
Tabellenverzeichnis

1 Änderungshistorie . . . 2
3.1 technische Daten . . . 13
3.2 Bremsmomente für Bremsen mit Abnahmen durch Klassifizierungsgesellschaften für Lifting Appliances . . . 14
6.1 Montagegenauigkeit . . . 24
10.1 Kategorie 1: elektrische Anschlussmöglichkeiten . . . 37
10.2 Kategorie 2: Überwachung . . . 38
10.3 Kategorie 3: Zubehör . . . 40
10.4 Kategorie 4: Oberfläche . . . 43
10.5 Kategorie 5: Anschluss . . . 44
10.6 Kategorie 6: Beschaltung . . . 48
10.7 Kategorie 7: Sonstiges . . . 49
13.1 Maßtabelle (alle Maße in mm) . . . 55

KENDRION

WE MAGNETISE THE WORLD

INDUSTRIAL DRIVE SYSTEMS



MODULE LINE

Operating Instructions 77 500..B..

Spring-applied single-disc brake module

Types: 77 50013B16 77 50019B15
77 50024B15 77 50029B15

BINDER

KENDRION
WE MAGNETISE THE WORLD

INDUSTRIAL DRIVE SYSTEMS

Contents

1. General information ... 3
1.1 Introduction ... 3
1.2 Standards and directives ... 3
1.3 Manufacturer's liability ... 3
1.4 Declaration of Incorporation (in accordance with Annex II, part 1, Section B of Machinery Directive 2006/42/EC) ... 4
2. Safety ... 5
2.1 Safety and warning symbols / Safety information ... 5
2.2 Intended use ... 5
2.3 General safety information ... 6
2.3.1 Installation ... 6
2.3.2 Start-up ... 6
2.3.3 Operation ... 6
2.3.4 Maintenance and repair ... 7
3. Emissions ... 7
3.1 Noise ... 7
3.2 Heat ... 7
3.3 Electromagnetic compatibility ... 7
4. Product description ... 10
4.1 Operating principle ... 10
4.2 Design ... 10
5. Installation ... 12
5.1 Mechanical installation ... 12
5.1.1 Brake shaft (13) installation ... 12
5.1.2 Mounting the brake module to the motor ... 13
5.2 Installation of accessories (not applicable to the brake shaft (13)) ... 14
5.3 Electrical connection and operation ... 15
5.3.1 DC power supply ... 17
5.3.2 AC power supply ... 17
5.3.3 Electrical connection of brake modules with microswitch (27) ... 18
5.4 Set-up and start-up ... 18
5.4.1 Manual brake release ... 19
5.5 M_4 transmissible torque adjustments ... 20
6. Maintenance ... 21
6.1 Checks and service ... 21
6.2 Brake module removal from motor and replacement of component parts ... 22
6.3 Microswitch (27) adjustment (only applicable to brake modules with microswitch (27)) ... 23
6.4 Brake shaft (13) removal ... 24
7. Motor design ... 25
8. Driven components, balancing ... 26
9. Condition at delivery ... 26
10. Troubleshooting ... 27
11. Definitions ... 28
12. Technical specifications ... 28
13. Revision history ... 29

Document information:

Issued by: Kendrion (Villingen) GmbH
Division: Industrial Drive Systems
Replacement for document: -
Replaces the issue dated: 2 July 2012
Type of document: Translation of German operating instructions BA 77 500..B..
Document status: Released
Designation of document: BA 77 500..B.. Englisch

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

1. General information

1.1 Introduction

These Operating Instructions describe the operating principle and features of Kendrion Binder spring-applied single-disc brake modules type 77 500..B...
The safety information provided in this manual must be strictly observed during the set-up of the machine (e.g. motor) and during the start-up, operation and maintenance of the spring-applied brake module.
Should any queries arise with respect to torques, torque variations, installation position, wear, wear reserve, switching work, break-in conditions, release range, ambient conditions and the like, please contact Kendrion Binder and ask for clarification before starting to use the brake.
Kendrion Binder spring-applied single-disc brake modules type 77 500..B.. are not ready-to-use devices, but are intended to be incorporated into or assembled with other equipment. Consequently, these brakes will be referred to as components in the following sections. The output side of the spring-applied single-disc brake modules has the same fitting dimensions as the motor end shield. As a result, the brakes are designed as fail-safe holding brakes with emergency stop function for attachment to electric motors.

1.2 Standards and directives

The state-of-the-art spring-applied brakes have been designed, built and tested in accordance with the requirements of DIN VDE 0580 concerning electromagnetic devices and components. Being classified as "electromagnetic components", spring-applied single-disc brake modules are not subject to the Low Voltage Directive and must not bear a CE mark of conformity. The user is required to employ suitable switching devices and controls to ensure use of the brakes in accordance with EMC Directive 2004/108/EC.

1.3 Manufacturer's liability

The manufacturer will not assume any responsibility for damage caused by failure to use the products in accordance with their intended use or by failure to observe safety information and other instructions provided in this manual. The information in this manual was correct and up-to-date before going to print. The information contained herein shall not entitle users to raise claims with respect to components purchased at an earlier date.

KENDRION
WE MAGNETISE THE WORLD

INDUSTRIAL DRIVE SYSTEMS

1.4 Declaration of Incorporation
(in accordance with Annex II, part 1, Section B of Machinery Directive 2006/42/EC)

We hereby declare that the products below comply with the essential health and safety requirements specified in Annex I of Machinery Directive 2006/42/EC:

Annex I General Principles, Annex I Sections 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.5.1

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Machinery Directive 2006/42/EC. The relevant technical documentation required for the partly completed machinery has been compiled in accordance with Annex VII, part B of Machinery Directive 2006/42/EC. The manufacturer undertakes to submit an electronic copy of the relevant technical documentation compiled for the partly completed machinery if reasonably requested by national authorities.

Standards and directives:

EN 60529	Enclosure protection ratings
DIN VDE 0580	Electromagnetic devices and components

Products: Electromagnetically released spring-applied single-disc brake module
77 50013B16
77 50019B15
77 50024B15
77 50029B15

Manufacturer:
Kendrion (Villingen) GmbH
Industrial Drive Systems
Wilhelm-Binder-Straße 4-6
78048 Villingen-Schwenningen
Germany

Person authorized to compile the documentation:
Dr Uwe Gnauert
Kendrion (Villingen) GmbH
Industrial Drive Systems
Wilhelm-Binder-Straße 4-6
78048 Villingen-Schwenningen
Germany

Kendrion (Villingen) GmbH
Industrial Drive Systems

Villingen
12 Dec. 2013

Authorized signatory: .....
(Dr Uwe Gnauert)
(Head of Development at IDS)

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

2. Safety

2.1 Safety and warning symbols / Safety information

Personal injury or equipment damage			
Symbol / Signal word		**Warns against ...**	**Potential risks and hazards**
	Danger	imminent personal injury	fatal accidents or serious injury
	Warning	potential risk of serious personal injury	fatal accidents or serious injury
	Caution	potential risk of personal injury	minor injury
	Attention	potential risk of equipment damage	damage to components or other equipment
Information			
Symbol / Signal word		**Provides information on …**	
	Note	the safe use and operation of the product	

The brakes described in these Operating Instructions have been designed and built on the basis of an analysis of hazards and in accordance with the requirements of the applicable harmonized standards and technical specifications. They correspond to the state of the art and provide maximum safety. However, safety hazards can only be avoided if the user of the equipment takes adequate precautions and makes sure that safety instructions are strictly adhered to. It is the duty of the user of the machine to plan these measures and to check their implementation.

The user is required to ensure that:

- the brakes are only used in accordance with their intended use (see "Product description" section).
- the brakes are in perfect working order and checked at regular intervals.
- a complete copy of these Operating Instructions is kept available at the place of use of the brakes at all times.
- all applicable local and machinery-specific regulations and requirements are followed.
- start-up, maintenance and repair work is only done by authorized and suitably qualified personnel.
- such personnel are kept informed on all relevant occupational safety and environmental protection issues and familiar with these Operating Instructions and with the safety information contained herein.
- brake functionality is not interfered with by an external magnetic field.

2.2 Intended use

The brake modules described in these Operating Instructions are intended to be assembled with electric machines, in particular electric motors, for use on industrial equipment. Operation in potentially explosive or firedamp atmospheres is not allowed. The brake modules must be used in accordance with the operating requirements detailed in this manual. The rated power limits specified herein must not be exceeded. Use of the brake modules as service brakes or safety brakes is not permitted.

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

2.3 General safety information

Brakes fitted to motors feature hazardous live components and rotating parts and may exhibit hot surfaces.
Any work associated with the transport, connection, start-up and periodical maintenance of the brakes must be carried out by authorized and qualified specialist personnel (in accordance with VDE 0105; IEC 364). Failure to observe safety, operating and maintenance instructions may cause serious personal injury and severe damage to the equipment. Whenever special measures are required in accordance with the instructions contained herein, such measures should be agreed with the brake manufacturer before the machinery into which the brake is to be incorporated is set up.
Should any queries arise with respect to torques, torque variations, installation positions, wear, wear reserve, switching work, break-in conditions, release range, ambient conditions and the like, please contact Kendrion Binder and ask for clarification before using the brake.
Retrofitting or modification work to be carried out on the brake is subject to the approval from Kendrion Binder.
Accident prevention regulations applying to the specific field of application of the brake must be strictly observed.
The brakes described in this manual are not designed for use as "safety brakes". This means that torque reductions caused by factors beyond the user's control cannot be excluded.

2.3.1 Installation

When connecting the brakes described in these Operating Instructions check that the voltage and voltage type comply with the specifications on the rating plate. Sufficient heat dissipation must be ensured when the brake is fitted to or incorporated into other equipment.
Adequate precautions must be taken to avoid overvoltage during disconnection or voltage peaks. The magnetic field of the products may cause interference outside the brake or even feedback to the brake in case of adverse installation conditions. Should you have queries concerning mounting and fitting conditions, please contact the brake manufacturer and ask for clarification.

Adequate safety measures (DIN VDE 0848, part 4; DIN 31000/VDE 1000; DIN VDE 0100, part 0420) must be taken by the brake user to avoid hazards to persons or damage to equipment caused by:

- direct or indirect effects of electromagnetic fields,
- heated components,
- moving parts.

2.3.2 Start-up

The brakes must not be started up when:

- power supply cables/wires or connections are damaged.
- the solenoid housing or coil sheath is damaged.
- other defects are suspected.

2.3.3 Operation

Make sure that live components such as plug contacts or the field coil are not exposed to water.
The brake cable connections must not be crushed, squeezed or exposed to mechanical loads.
Check that the friction surfaces of the friction elements are not contaminated with grease, oil or other fluids to avoid substantial torque reduction. Bear in mind that the original torque cannot be restored even if the friction surfaces are cleaned after contact with fluids.
The gradual brake wear towards the end of the brake service life may cause an approximately 10% torque reduction. This must be taken into consideration in the set-up of the machine or overall system.
Due to the diverse ambient conditions in which the brakes may be used, always check that the brake module is in perfect working order before start-up.
Torque reductions cannot be excluded if the brake module is used for applications where only minimum friction work is required. In such cases, the user should ensure that the brake occasionally performs sufficient friction work.

Note!

The maximum air gap s_{max} (see Table 28/1: air gap s_{nom} and s_{max}) must not be exceeded throughout the entire brake module service life. (Please refer to Section 6 “Maintenance” for details.)

2.3.4 Maintenance and repair

Repair work must only be carried out by qualified specialist personnel (definition to IEC 364). Failure to perform repairs according to requirements may cause serious personal injury or equipment damage.
Make sure that no voltage is applied to the brakes when carrying out maintenance work.

3. Emissions

3.1 Noise

The spring-applied single-disc brake module produces switching noise during engagement and release. The noise level is determined by the installation conditions, circuitry and air gap. Depending on the mounting position, operating conditions and state of the friction surfaces, audible vibrations (squealing) may be produced during braking.

3.2 Heat

Braking operations and gradual heating of the field coil cause the solenoid housing temperature to increase substantially. Under adverse conditions, the surface temperature may rise to well over 100°C.

Caution!

Risk of burns in case of contact with hot surfaces! Suitable covers and hand guards must be installed to provide protection against accidental contact.

3.3 Electromagnetic compatibility

As required by the German Electromagnetic Compatibility Act (EMVG), electromagnetic compatibility must be guaranteed to ensure immunity to external electromagnetic fields and conducted interference.
Furthermore, the emission of electromagnetic fields and line-conducted interference during brake operation must be minimized. Since the brake features depend on the circuitry and operation, a declaration of conformity with the applicable EMC standard can only be furnished for the wiring type, but not for a specific brake.
The spring-applied single-disc brake modules type 77 500..B.. are designed for industrial applications to which the following EMC standards apply: Generic Immunity Standard EN 61000-6-2 and Generic Emission Standard EN 61000-6-3 / EN 61000-6-4.
Other applications may be subject to different generic standards which must be considered by the manufacturer of the overall system. The requirements in terms of electromagnetic compatibility of devices and components are determined by basic standards derived from the generic standards. Brake wiring recommendations will be provided in the following sections to ensure compliance with the individual basic standards that are relevant for industrial use of the brake and some other applications.
For additional information on electromagnetic compatibility, especially with respect to the recommended electronic rectifiers specified in Section 5.3, please refer to the applicable data sheets.

Immunity according to EN 61000-4:

EN 61000-4-2 Electrostatic discharge:
The spring-applied single-disc brake modules comply at least with severity level 3 without requiring additional measures. The recommended rectifiers specified in Section 5.3 conform to severity level 3 without additional measures.

EN 61000-4-3 Electromagnetic fields:
The spring-applied single-disc brake modules comply at least with severity level 3 without requiring additional measures. The recommended rectifiers conform to severity level 3 without additional measures.

EN 61000-4-4 Fast transients (burst):
The spring-applied single-disc brake modules comply at least with severity level 3 without requiring additional measures. The recommended rectifiers conform to severity level 3.

EN 61000-4-5 Surge:
The spring-applied single-disc brake modules comply at least with severity level 3 without requiring additional measures. The recommended rectifiers conform to severity level 3.

EN 61000-4-9 Pulse magnetic fields, EN 61000-4-10 Damped oscillatory magnetic fields:
Since the operating magnetic fields of the electromagnetic brakes are stronger many times over than interference fields, the brake function will remain unaffected. The spring-applied single-disc brake modules comply at least with severity level 4. The recommended rectifiers conform at least to severity level 3.

EN 61000-4-11 Voltage dips, short interruptions, and short supply voltage variations:

a) Voltage interruptions:
Spring-applied single-disc brake modules that comply with the requirements of DIN VDE 0580 are de-energized after the specified switching times at the latest. The switching time depends on the control and mains conditions (e.g. generator effect of running down motors). Voltage interruptions of shorter duration than the response delay specified by DIN VDE 0580 will not cause any malfunctions. The user must ensure that any consequential damage is avoided (e.g. motor start-up before the brake has been released caused by phase failure in the case of two-phase energized motors or by the slipping of an electromagnetically engaged system due to torque drop). The functional reliability of the electromagnetic brake and its electronic accessories remains unaffected provided that the aforementioned consequential damage is avoided.

b) Voltage dips and short supply voltage variations:
Electromagnetically released systems:
Voltage dips and supply voltage variations to below 60% of the rated voltage and lasting longer than the response delay specified by DIN VDE 0580 may cause the brake to be de-energized temporarily. Consequential damage as described under a) above must be avoided by the user by taking adequate precautions.
Electromagnetically engaged systems:
Voltage dips and supply voltage variations to below the minimum tolerance threshold will cause torque reductions. The user is required to take adequate precautions to avoid consequential damage.

Radio interference suppression in accordance with EN 55011:
The brake modules and the recommended electronic rectifiers are classified as Group 1 equipment in accordance with EN 55011. As far as the emissions from this equipment are concerned, one distinguishes between field guided radiated interference and line-conducted interference.

a) Radiated interference:
When operated with DC voltage or rectified 50/60 Hz AC voltage, all brakes comply with the limit values applicable to Class B equipment.

b) Conducted interference:
When connected to a DC power source, the electromagnetic brakes meet the limit values applicable to Class A equipment. If the brakes are connected to a 50/60 Hz AC power source and equipped with electronic rectifiers or other electronic controls, interference suppression measures as shown in Fig. 9/1 must be taken to ensure compliance with the limit values applicable to Class A equipment.

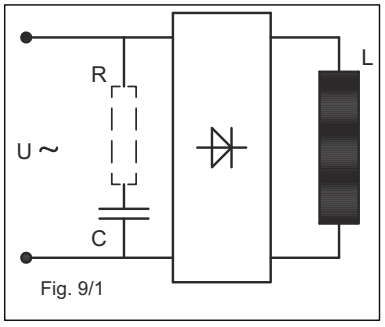


Fig. 9/1

Interference suppression capacitors should be used which must be dimensioned to suit the connection data of the electromagnetic components and the specific mains conditions. The recommended rectifiers specified in Section 5.3 are CE mark certified in accordance with the EMC Directive. They have built-in interference suppression components and comply at least with the requirements of EN 55011 for Class A equipment, unless otherwise specified in the specification sheets. When brakes are used with the specified rectifiers or with other types of rectifiers, the recommended values listed in Table 9/1 should be observed.
Interference suppression components should be installed as close as possible to the consumer. Interference caused during switching operations of the electromagnetic component is generally attributable to the inductive load.
Where necessary, assemblies designed to limit the disconnection voltage (e.g. anti-parallel diode) or voltage limiting components (e.g. varistors, suppressor diodes, resistance diodes and the like) can be installed. However, such components will inevitably change the switching times of the brake and increase the generated noise level. The rectifiers specified in Section 5.3 are equipped with free-wheel diodes and/or varistors to limit the disconnection voltage.
In case of DC side switching, a varistor rated for the type-specific maximum operating voltage and connected in parallel with the field coil (1.2) limits the peak voltage to the values specified in Table 9/2.

Note!

If the brake is used in connection with other electronic accessories, the user is responsible to ensure compliance with EMC requirements. Compliance with applicable standards concerning the design and operation of components, sub-assemblies or equipment employed shall not relieve the user and manufacturer of the overall system from their obligation to furnish proof of conformity of the overall system with such standards.

Rectifier type	Rated input voltage range U_1/VAC (40-60 Hz)	DC at L-load (ADC)	Capacitor (nF/VAC)
Half-wave rectifier 32 07332B40	up to 500 (⊠10%)	up to 2.0	no additional interference suppression measures required

Table 9/1

Max. rectifier operating voltage (VAC)	Recommended disconnection voltage for DC side switching (V)
250	700

Table 9/2

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

4. Product description

4.1 Operating principle

The brake module is an electromagnetic component with built-in electromagnetically released spring-applied single-disc brake designed to operate dry. The braking effect is produced by the spring force and neutralized electromagnetically. The brake module with ball bearing supported brake shaft should preferably be mounted to the A-face end shield of electric motors. The brake can also be equipped with an optional hand release so that it can be released manually.

4.2 Design

The solenoid housing (1.1) with the encapsulated field coil (1.2) accommodates the armature (2), friction disc (4) and flange (3). The flange is fixed by means of the cheese head screws (10). The compression springs (7) located in the solenoid housing (1.1) are supported on the adjusting ring (9) and solenoid housing (1.1) by the studs (8) (size 13 brakes: compression springs (7) only). These compression springs generate an axial force that is transmitted to the friction disc (4) through the armature (2). As a result, the friction disc (4) is clamped between the firmly fixed flange (3) and the armature (2) and the braking effect (torque) is produced. Straight pins (5) are provided which act as tangential torque supports for the armature (2) relative to the solenoid housing (1.1).
When DC voltage is applied to the field coil (1.2), the electromagnetic force thus generated causes the armature (2) to be attracted, overcoming the force of the compression springs (7). The friction disc (4) is thus released and the braking effect is neutralized.
As the brake module is a closed system, no forces are transmitted outwards away from the brake. Transmission of the braking force from the axially moveable friction disc (4) to the brake shaft (13) is achieved through the form-fit connection of the square socket in the friction disc with the brake shaft (13), with the brake shaft being rigidly connected with the motor shaft. This applies to size 13, 19 and 24 brakes. When a size 29 brake is used, the friction disc is connected with the brake shaft by means of the teeth provided on the disc and shaft. The ball bearing (15) located between the solenoid housing (1.1) and brake shaft (13) ensures that the brake can be centred relative to the brake shaft (13) and motor shaft when it is mounted to the motor flange. The bearing also absorbs transverse forces that act radially on the brake shaft (13). The ball bearing is factory-sealed.
An additional sealing ring (6) is provided which protects the friction disc (4) against dirt, grease or oil ingress in case the factory-installed ball bearing sealing rings are damaged and ensures that abrasive grit and dust produced by the friction disc cannot escape.
On the drive side, the flange (3) and brake shaft (13) are sealed by the sealing ring (11). The optional hand release (24) allows the spring-applied single-disc brake module to be released manually (e.g. in case of power failure). The brake must be connected directly to the terminals in the connector box (19).
The transmissible torque of the brake module can be changed with the adjusting ring (9). Rubber bolts (18) and an O-ring (26) are provided to reduce the noise and vibration produced by the friction disc (4).

Key to Fig. 11/1:

1.1	Solenoid housing	15	Ball bearing
1.2	Field coil	16	Circlip
2	Armature	17	Screw plug [1]
3	Flange	18	Rubber bolt [2]
4	Friction disc	19	Connector box
5	Straight pin	20	Feather key
6	Sealing ring		
7	Compression spring	22	Sealing washer
8	Stud (not used in size 13 brakes)	23	Cover (2 x arranged at 180°) [3]
9	Adjusting ring (not used in size 13 brakes)	24	Hand release (accessories)
10	Cheese head screw	25	Set screw [1]
11	Sealing ring	26	O-ring [4]
12	Disc	E	Adjusting ring clearance
13	Brake shaft	A	Contact surface motor side
14	Spring washer	B	Contact surface brake shaft (13)

[1] bonded with Loctite 243; installed in brake shaft (13)
[2] accessories for size 19 and 24 brakes; included as standard parts of friction disc (4) in size 13 brakes
[3] only used in brakes without hand release (24)
[4] only in size 29 brakes

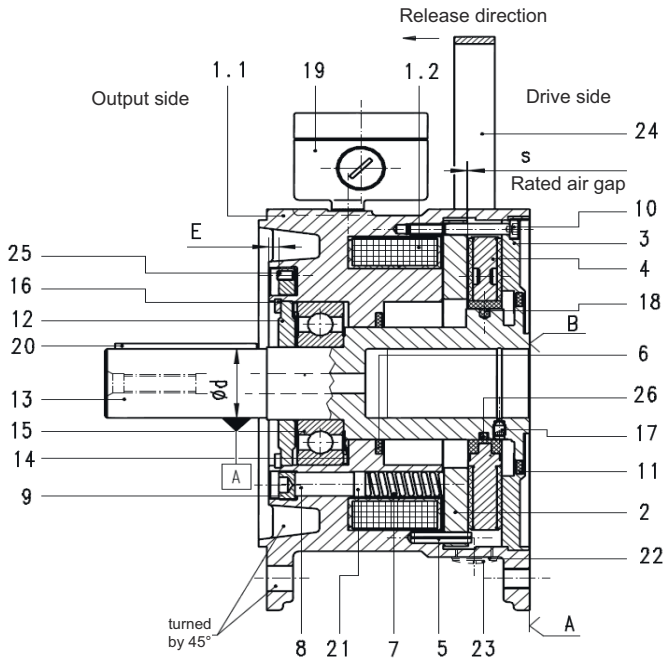


Fig. 11/1: Spring-applied single-disc brake module 77 500..B15

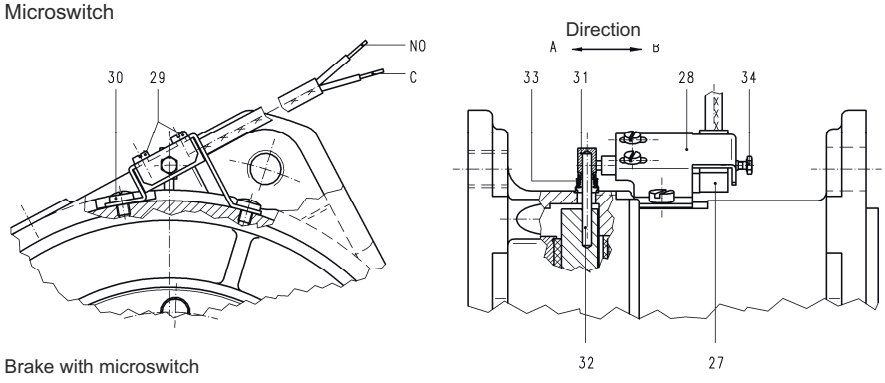


Fig. 11/2: Microswitch installation on spring-applied single-disc brake module 77 500..B15

Key to Fig. 11/2:

27	Microswitch	31	Stud
28	Strap	32	Straight pin
29	Cheese head screw (2x)	33	Bellows
30	Oval head screw (2x)	34	Hexagon head cap screw M2.5x8 (not supplied)

5. Installation

Attention!

Every time the spring-applied single-disc brake module is reassembled, the fixing screws and cheese head screws (10) must be tightened to the M_A tightening torques specified in Table 13/1 and Table 22/1. The adjusting ring (9) must be secured with the set screw (25) (tightening torque M_A = 3 Nm). Loctite 243 must be applied to the set screw (25). When maintenance work is carried out on the connector box (19) (see Section 5.3), the cheese head screws (19.3) must be tightened to M_A = 1.6 Nm when installing the cover (19.1) with the connector box (19). Damage to the seal between the connector box (19) and cover (19.1) must be avoided.

5.1 Mechanical installation

5.1.1 Brake shaft (13) installation

The press-fit connection of the brake shaft (13) with the motor shaft provides reliable transmission of the brake torque. An additional form-fit connection in the form of a feather key, for example, is not allowed. The motor shaft must not have a feather key groove.

Attention!

The fits and surface roughness required for the motor shaft must be chosen by the brake user according to the adjusted transmissible brake torque and must be suitable to ensure reliable transmission of the generated brake torques.

1. Before heating the brake shaft (13), make sure that both the brake shaft (13) and the motor shaft end are dry and free from grease and that the following parts have been removed:
   screw plug (17) – any brake size,
   rubber bolts (18) (accessories) – sizes 19 + 24,
   O-ring (26) (accessories) – size 29.
2. Check the position of the motor shaft contact shoulder relative to the contact surface of the brake on the motor flange and correct it by installing shim rings, if necessary. The permitted tolerance is ⊠ 0.5 mm.
3. Before mounting the brake shaft (13), check the radial runout on the motor shaft end and mark the maximum runout angle on the front face of the motor shaft.
4. After completion of the above operations, the brake shaft (13) must be evenly heated in an electric oven or by means of an inductive heating system until it has reached a temperature of 280°C to 300°C. Once heated, the brake shaft (13) must be slipped onto the motor shaft end until it touches the contact shoulder and secured in axial direction until is has cooled down. Make sure that the brake shaft (13) is mounted in such a way that the radial runout mark is offset by 180° relative to the runout mark on the motor shaft.
5. After the brake shaft has cooled down, screw the screw plug (17) into the brake shaft (13) and secure it with Loctite type 222. This applies to all brake sizes.
6. When rubber bolts (18) are used (size 19 and 24 brakes), insert the bolts (18) into the bores provided in the brake shaft (13) (see Fig. 11/1) after the shaft has cooled down.
7. When using a size 29 brake, insert the O-ring (26) into the groove in the brake shaft (13) (see Fig. 11/1).
8. If rubber bolts (18) (size 19 + 24 brakes) or an O-ring (26) (size 29 brakes) are used, check that they are correctly positioned (rubber bolts (18): rounded end pointing outwards in the bores of the brake shaft (13) square socket; O-ring (26): located in the groove near the brake shaft teeth).
9. During brake mounting, apply talc to the projecting surface of the rubber bolts (18) or O-ring (26) to reduce slip-on forces.

5.1.2 Mounting the brake module to the motor

Attention!

The friction surfaces of the friction disc (4), the guide surfaces of the square socket (size 13, 19, 24 brakes) or the teeth of the friction disc (4) (size 29 brakes) must be free from grease or oil. Do not use any lubricant to improve the axial guide properties of the friction disc (4) and make sure to avoid damage to the sealing rings (6 and 11).

1. Mount the brake module in vertical position with the motor shaft pointing upwards.
2. Close the oil supply bore in the brake shaft (13) with the screw plug (17). Apply Loctite 222.
3. Mount the brake module to the motor by slipping it onto the brake shaft (13) until it makes contact with the motor flange. Ensure that the brake is parallel to the motor shaft and that a form-fit connection is established between the brake shaft (13) and the square socket (size 13, 19, 24 brakes) or with the internal teeth (size 29 brakes) of the friction disc (4).
4. The friction disc (4) is factory-centred in the spring-applied single-disc brake module to ensure easy installation.
5. Slightly tighten the fixing screws after having taken the preliminary assembly steps described above. Ensure that the brake is released electromagnetically after the spring-applied single-disc brake module has been connected (see Section 5.3).
6. Manual brake release by means of an attached hand release (24), for example, is not allowed. To complete brake mounting, use the ball bearing set (accessories).
7. The spring washers (14) must be placed into the solenoid housing (1.1) as shown in Fig. 11/1. Size 13 and 19 brakes require only one spring washer each, whereas size 24 and 29 brakes must be equipped with two spring washers.

Attention!

The brake shaft and ball bearing must not be exposed to any axial shocks. The disc (12) is essential to the correct operation of the brake module and must only be replaced by an original spare part.

8. In order to install the ball bearing (15), pressure must be evenly applied both to the inner and outer rings of the bearing (15) to force it onto the motor shaft until it touches the shaft shoulder of the brake shaft (13). The necessary pressure is generated through a mounting sleeve and the thread provided at the front end of the brake shaft (13).
9. The solenoid housing (1.1) is thus centred through the ball bearing. Proceed to install the disc (12) and circlip (16).

Attention!

The M_A tightening torque (Table 13/1) specified for the fixing screws must be strictly observed. The screws must be tightened evenly in diametrically opposite sequence.

10. Tighten the fixing screws to the M_A tightening torques specified in Table 13/1.

	Size			
	13	19	24	29
M_A tightening torque (fixing screws) [Nm]	42	70	165	165

Table 13/1: M_A tightening torques for fixing screws

5.2 Installation of accessories (not applicable to the brake shaft (13))

Hand release (24) (only applicable to retrofitted hand release):

1. Remove the two covers (23) located opposite each other on the circumference of the solenoid housing (1.1) (see Fig. 14/1).
2. Screw the cams (24.1) with the threaded bush into the bores of the covers (23), making sure they are correctly positioned (see figure to the right). Apply Loctite 243 to secure the cams.
3. Insert the hand release lever (24.2) into the square socket provided in the cams (24.1). The hand release can be operated by pushing the lever (24.2) in one direction (see Fig. 14/1).
4. The mechanical release forces F required to release the brake and the maximum permitted release forces (actuation forces) F_{max} are specified in Table 14/1. The release forces F are based on the highest transmissible (standard) torque (see "Technical specifications").

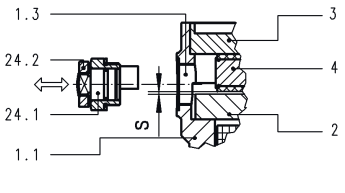


Fig. 14/1: Hand release and air gap control

Key to Fig. 14/1:

1.1	Solenoid housing	4	Friction disc
1.3	Bore for air gap measurement	24.1	Cam (complete)
2	Armature	24.2	Hand release lever
3	Flange	s	Air gap

	Size			
	13	19	24	29
Threaded bush tightening torque M_A [Nm]	20	26	35	35
Release force F [Nm]	80	130	200	240
Max. permitted release force (actuation force) F_{max} [N]	120	180	280	330

Table 14/1: Release force F, max. permitted release force (actuation force) F_{max} of hand release (24), M_A tightening torque of threaded bush of cams (24.1)

Warning!

Check that the mechanical hand release (24) is in a central position (see Fig. 11/1) when not in use. This is crucial to ensure reliable brake engagement. Otherwise, the full braking effect of the spring-applied single-disc brake module may not be reached. In this case, the machine (e.g. motor) must be stopped immediately and must not be restarted until correct operation of the hand release (24) and automatic return of the hand release lever in its central position (see Fig. 11/1) has been ensured.

Caution!

The brake torque can be neutralized manually by means of an attached hand release (24). Consequently, the brake must be mounted in such a way that any unintentional actuation of the hand release (24), e.g. by removing the hand release lever, is excluded.

Note!

Machinery-specific regulations and requirements (e.g. for hoists, cranes and elevators) must be observed when using brakes with hand release (24).

Ball bearing set (ball bearing (15), spring washer (14), circlip (16)):

The ball bearing set is required as a second bearing for the motor shaft. The complete ball bearing set must be installed as described in Section 5.1.1.

Rubber bolts (18) (size 19 and 24 brakes), O-ring (26) (size 29 brakes):

To reduce the noise produced by the brake module during operation, rubber bolts (18) (size 19 and 24 brakes) or an O-ring (26) (size 29 brakes) can be installed in the brake shaft (13) as described in Section 5.1.1.

5.3 Electrical connection and operation

Warning!

The brake module is a DC operated system. Permanent voltage variations on the power source of the electromagnetic brake must be limited to +/-10% of the rated voltage.

The following checks must be carried out when connecting the brake:

- Check that the connecting cables are suitable for the intended use and for the voltage and amperage of the brake.
- Check that the connecting cables are secured with screws, clamps or other suitable fixtures to avoid interruptions in the power supply.
- Check that the connecting cables are long enough for the intended use and that suitable torsion, strain and shear relief features as well as bending protections are provided.
- Check that the PE conductor (only for protection class I) is connected to the earthing point.
- Check that no foreign matter, dirt or humidity is trapped inside the terminal box.
- Check that unused cable entries and the terminal box are suitably sealed to ensure compliance with the protection class requirements to EN 60529.

The spring-applied single-disc brake module must be supplied with DC voltage.
Connection to an AC power source is via a half-wave rectifier (19.2). Brakes equipped with a built-in rectifier (19.2) can be connected directly to the AC power source. The contact assignment is shown in Fig. 16/1.
Brakes equipped with connecting terminal (19.2) must be connected directly to DC voltage. The customer-specific connecting cable must be connected to the terminal (19.2) or built-in rectifier (19.2) by means of a cable gland (M16x1.5 for cross-sections of between 5 and 10 mm.
Remove the cover (19.1) of the connector box (19) so that the individual strands of the connecting cable can be connected to the terminal (19.2) or to the contacts of the built-in rectifier (19.2).

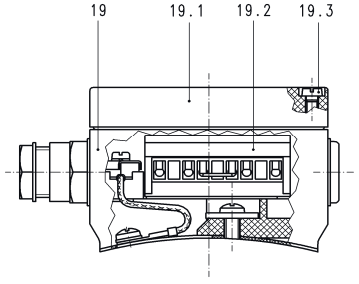


Fig. 15/1: Connector box (19) with terminal (19.2) or rectifier (19.2)

KENDRION
WE MAGNETISE THE WORLD

INDUSTRIAL DRIVE SYSTEMS

Rectifier series	Rectifier type	Rated input voltage range U_1/VAC (40-60 Hz)	Output voltage U_2/VDC	Max. output current R-load I/ADC	Max. output current L-load I/ADC
32 07332B40	half-wave	0-500 (⊠10%)	U_1 ⊠ 0.445	1.6	2.0
Specific rectifier specification sheets must be observed!					

Table 16/1: Rectifier for single-phase AC voltage supply via connecting terminal (19.2)

Attention!

When installing the cover (19.1) and connector box (19), the cheese head screws (19.3) must be tightened to M_A = 1.6 Nm. Damage to the seal between the connector box (19) and cover (19.1) must be avoided.

Brakes equipped with built-in rectifiers (19.2) use half-wave rectification.
The built-in rectifier (19.2) can be wired in such a way that AC side switching (normal coupling time t_1) or DC side switching (short coupling time t_1) is possible (see Fig. 16/1).
Depending on the brake size and torque, voltage ripple due to intermittent power supply may cause brake humming or incorrect brake operation.
Perfect brake operation must be ensured by the user or system manufacturer by providing suitable electrical controls.

Attention!

When connecting the rectifier (19.2), the terminals must be tightened to a tightening torque of M_A = 0.4 Nm.

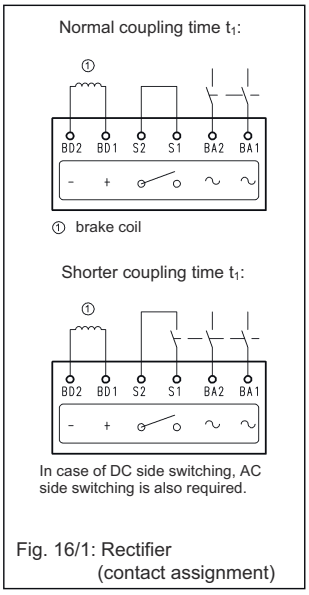
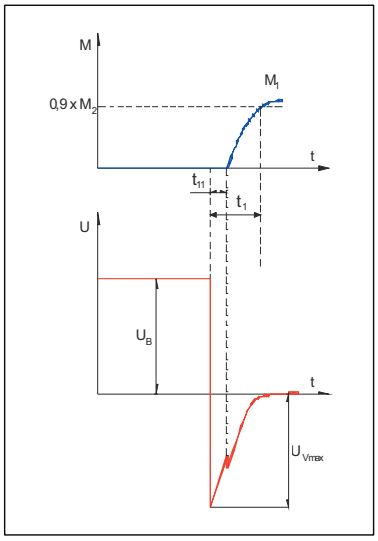


Fig. 16/1: Rectifier (contact assignment)

5.3.1 DC power supply

The figure to the right shows the voltage curve after the field coil (1.2) has been de-energized.



U_B operating voltage (coil voltage)
U_{Vmax} disconnection voltage

Attention!

The peak voltage U_{Vmax} during disconnection without protective circuit may reach **several thousand V** in the millisecond region. This may cause irreversible damage to the field coil (1.2), switching contacts and electronic components.
Sparking will occur on the switch during disconnection. Consequently, a protective circuit must be provided to reduce the current during disconnection and to limit the voltage. The maximum permitted overvoltage during disconnection is 1500 V.
If Kendrion Binder rectifiers are used (see Table 16/1), the protective circuit required for the built-in electronic components and field coil (1.2) is included in the rectifier and limits the disconnection voltage to approx. 300 V. This also applies to contacts S1 and S2 (DC side disconnection).

Attention!

In case of DC side switching and connection to a DC power source, the brake must be operated with a protective circuit to avoid overvoltage. Additional protective elements (e.g. varistors, spark arresters, etc.) must be installed to avoid damage such as burns or fusing of contacts.

Attention!

Sensitive electronic components (e.g. logical components) may also be damaged by the lower voltage.

5.3.2 AC power supply

Warning!

Work on the brake must only be carried out by qualified specialist personnel. Make sure that no voltage is applied during brake connection. The specifications on the rating plate and the information provided in the circuit diagram in the terminal box or in the Operating Instructions must be strictly observed.

Direct connection of the spring-applied single-disc brake to an AC power source is only possible if a rectifier is used. The coupling times vary depending on the switching type (DC side switching or AC side switching) (see Section 5.3).

Half-wave rectification:

In case of half-wave rectification, the U_2 coil voltage is lower by factor 0.445 than the rectifier input voltage. Half-wave rectifiers produce voltage with high residual ripple which, depending on the brake size, may slightly reduce the switching times when compared to bridge rectifiers. Due to the shorter switching times and the lower coil voltage, half-wave rectifiers are generally preferred to bridge rectifiers. However, brake humming may occur when small size brakes are used.

DC side switching:

In case of DC side brake switching, an auxiliary contact is provided on the motor contactor, for example. This auxiliary contact is designed to interrupt the power supply on the DC side.

5.3.3 Electrical connection of brake modules with microswitch (27)

Note!

Machinery-specific regulations and requirements (e.g. for hoists, cranes and elevators) must be observed when using brakes with microswitches (27).
When the brake is used for applications during which a load torque is generated, the system user is responsible to ensure correct and safe wiring of the microswitch (27) and brake module.

Warning!

The motor circuit must be protected in such a way that no accidental motor start-up can occur when the microswitch (27) contact closes.

If brakes are equipped with a microswitch (27) to control the release status (released/engaged) of the spring-applied single-disc brake module, the microswitch (27) must be tied into the control circuit of the machine (e.g. motor). This is crucial to ensure that the microswitch (27) prevents start-up of the machine (e.g. motor) before the spring-applied single-disc brake module has been released. The optional microswitch (27) must be ordered together with the brake as it cannot be retrofitted to the brake at a later date. The microswitch (27) is factory-adjusted prior to shipment of the brake module.

5.4 Set-up and start-up

Warning!

The functional check of the brake must not be performed unless the machine (e.g. motor) has been switched off (disconnected) and secured against accidental or unintentional start-up.

Attention!

When using machines (e.g. motors) with vertically upward directed shaft end, any ingress of fluids (water or cooling lubricant) into the ball bearing (15) of the brake module must be avoided. The brake module must be mounted in such a way that sufficient heat dissipation is ensured.

Attention!

Check that the brake has been connected in accordance with the specifications provided on the rating plate before it is started. Even short-term operation outside the specified supply voltage limits may cause irreversible damage to the brake or electronic accessories. Such damage may not be apparent immediately. DC side brake switching without protective circuit as described in Section 3.3 will cause damage to electronic rectifiers, electronic accessories, switching contacts and to the field coil (1.2).

Warning!

Before starting the machine (e.g. motor) test run without driven components, the feather key (if used) must be secured in such a way that it cannot be hurled out. The shaft must not be exposed to load torques. Before the machine (e.g. motor) is re-started, the brake must be de-energized.

Caution!

The brake surface temperature may rise to over 100°C. Heat-sensitive parts such as conventional cables or electronic components must not be fixed to or be in contact with these surfaces. If necessary, suitable protections and hand guards must be installed to avoid accidental contact with hot surfaces!

Attention!

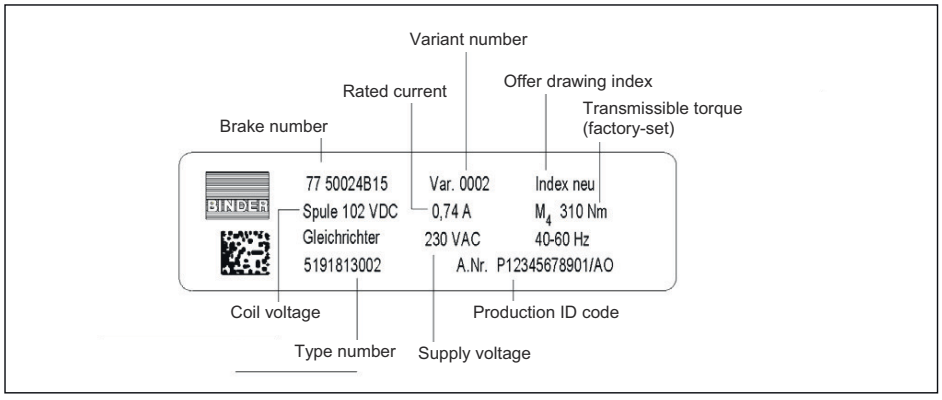
High-voltage tests performed during brake mounting within an overall system or during start-up must be carried out in such a way that damage to the built-in electronic accessories is avoided. The limits for high-voltage tests and follow-up tests specified by DIN VDE 0580 must be observed.

The following checks must be carried out:

- Check compliance with the specifications provided on the rating plate with respect to the mounting position and protection class.
- Ensure that power is supplied separately to the spring-applied single-disc brake module (and not to the motor) and turn the motor shaft while the brake is released to check that the friction disc (4) and brake shaft (13) move smoothly. Proceed to perform a functional test of the axial armature movement.
- Check that the axial and radial runout is within the tolerance range specified in EN 50347-N.
- Information on ball bearing break-in conditions, bearing lubrication intervals etc. is provided in the specification sheets of the bearing manufacturers and in the motor manual.

After completion of mounting, all necessary covers and guards must be installed.

Specifications on rating plates (example):



5.4.1 Manual brake release

Warning!

Extreme caution is advised during manual release (jog mode) of the spring-applied single-disc brake module (e.g. for maintenance work on the machine (e.g. motor) or in case of failure of the regular power supply and use of a UPS system). If the drive system is unbalanced, the load torque may accelerate the drive. The brake user is required to take adequate precautions to ensure that no hazardous situations are caused by the load torque when the brake module is released and engaged in jog mode.

The spring-applied single-disc brake module can be released "manually" by means of a mechanical hand release (24) (accessories). In case of failure of the regular power supply, it is also possible to use a commercial UPS (e.g. UPS battery system) for the electrical release of the brake module. For this purpose, the brake user is required to install a UPS system that complies with the voltage specifications given on the brake module rating plate.

5.5 M_4 transmissible torque adjustments

Attention!

When adjusting the adjusting ring (9) on the basis of the values given in the offer drawing, make absolutely sure that the M_4 transmissible torque is not below the minimum torque required.
The changed adjusting ring clearance "E" must be marked on the bottom of the solenoid housing. The adjusted theoretical M_4 transmissible torque must be entered in the blank field provided on the rating plate of the brake module (see rating plate example).
After adjustment of the M_4 transmissible torque, the brake user is required to ensure that the adjusting ring (9) is secured with the set screw (25), applying a tightening torque of M_A = 3 Nm.
The adjusting ring (9) must be turned in such a way that the set screw (25) can be located between the studs (8). The M_4 torque tolerance is +15%/-5%.

1. The brake modules are factory-adjusted to the standard M_4 transmissible torque specified in the specification sheet. The M_4 transmissible torque applicable at the time of shipment is specified on the rating plate.
2. The torque can be adjusted by means of the adjusting ring (9). After completion of adjustment, the ring must be locked by means of the set screw (25). The adjusting ring clearance "E" (see Fig. 11/1) is marked on the bottom of the solenoid housing near the set screw (25). After having loosened the set screw (25), the M_4 standard torque can be changed by changing the adjusting ring clearance "E" by means of a pin spanner.
3. After having changed the torque, the new adjusting ring clearance "E" must be marked on the solenoid housing. The adjusting ring must be locked by means of the set screw (25), making sure, however, that the set screw is not within the reach of the studs (8).
4. Secure the set screw (25) with Loctite 243, for example.
5. While torque variations only have a minor impact on coupling times t_1, the disconnection time t_2 is reduced proportionally to the torque reduction.

	Size		
	19	24	29
Transmissible torque change ⊠M_4/mm [%]	approx. 15	approx. 12	approx. 14
M_4 transmissible torque (standard value) [Nm]	150	310	500
Maximum transmissible torque $M_{4\ max.}$	150	310	500

Table 20/1: Change in the M_4 transmissible torque [%] from 1 mm axial adjustment of the adjusting ring (9); M_4 transmissible torque (standard value) and maximum transmissible torque $M_{4\ max.}$

Note: Torque adjustments are not possible for size 13 brakes.

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

6. Maintenance

Warning!

Whenever carrying out inspection and maintenance work, ensure that

- the machine (e.g. motor) is secured against accidental or unintentional start-up.
- no load torque acts on the shaft.
- the lock provided to prevent accidental start-up of the machine (e.g. motor) is removed after completion of inspection and maintenance work.
- all friction surfaces are free from grease and oil. An oily or greasy friction disc (4) cannot be cleaned.
- no swelling of the friction lining has occurred (to be checked by air gap measurement).
- no hardening (glazing) of the friction lining has occurred (only visible when the brake is released).
- the brake module has been switched off and disconnected from the power supply.

6.1 Checks and service

Attention!

Depending on its operating condition, it may no longer be possible to release the spring-applied single-disc brake when the maximum air gap s_{max} (see Table 28/1: air gap s_{nom} and s_{max}) has been exceeded. In this case, the braking effect cannot be neutralized. This may cause thermal overloading of and irreversible damage to the brake module if the machine (e.g. motor) is started before the brake has been released. Thermal overloading of the machine (e.g. motor) may occur if the machine (e.g. motor) is not started while the brake is still engaged.

1. The spring-applied single-disc brake module does not require any particular maintenance except that the air gap 's' (see Table 28/1: air gap s_{nom} and s_{max}) and the degree of wear of the friction disc (4) must be measured at regular intervals.
2. For this purpose, the brake must be released electromagnetically during motor standstill to allow the air gap 's' between the armature (2) and friction disc (4) to be measured through the threaded bore (1.3) by means of a feeler gauge. The air gap can only be measured after having removed the cover (23) or – when using brakes with hand release – after having removed the hand release lever (24.2) and complete cam assembly (24.1) (see Fig. 14/1).
3. If the maximum air gap s_{max} (see Table 28/1) is reached the friction disc (4) must be replaced to ensure functional reliability and safety of the brake. When replacing the friction disc (4), check the friction surfaces of the armature (2) and flange (3). It is not possible to perform adjustments (air gap adjustments) to compensate for wear.
4. If the ball bearing (15) (accessories) needs to be replaced, make sure to use bearings of the same type or of identical design.
5. The sealing rings (6 and 11) do not require any maintenance. However, they should be replaced every time the brake unit is opened.
6. The new sealing rings (6 and 11) must be glued in place after having cleaned the contact surfaces. To this end, Loctite 480 or an equivalent adhesive must be applied to individual spots on the front face of the solenoid housing (1.1) and on the circumference of the flange (3) before the sealing rings (6 and 11) are inserted and pressed on.

6.2 Brake module removal from motor and replacement of component parts

The following instructions must be strictly followed when replacing individual brake components:

- Centre the friction disc (4) relative to the centre of the brake module.
- Adjust the microswitch (27) when using brakes equipped with microswitch.
- Ensure that the friction disc is free from grease and oil.
- Adjust the required clearance "E" of the adjusting ring (9) (see marking on bottom of solenoid housing).
- Tighten the cheese head screws (10) in the flange (3) to the tightening torques specified in Table 22/1.
- Before removing the brake module from the motor, cautiously remove all components still fitted to the brake shaft (13), such as gear, feather key, etc. Loosen the fixing screws to allow the brake to be removed.

1. After having removed the fixing screws, the brake module can be pulled off the motor shaft by means of a withdrawal device. This device must be applied to the fixing corners on the output side flange of the solenoid housing (1.1) and supported on the front face of the brake shaft (13).
2. To avoid damage to the centring bore in the brake shaft (13), a shim ring can be inserted under the withdrawal device.

Note!

Substantial forces may have to be applied as the ball bearing (15) needs to be pulled off together with the brake module. Extreme caution is advised during these operations. If the brake module is in a horizontal position when removing it from the motor shaft, the brake must be supported in radial direction. Ball bearings (15) must not be reused after removal, regardless of their service life.

1. If individual components of the brake module need to be replaced, loosen the set screw (25) and unscrew the adjusting ring (9) to unload the compression springs (7).
2. Unscrew the cheese head screws (10) so that the flange (3) and all other components can be removed.
3. Use only grease-free cleaning agents to clean the brake components, when necessary. Bear in mind that the friction disc (4) cannot be cleaned. When using brakes equipped with microswitch (27), the armature (2) can only be removed after having taken off the stud (31) and the straight pin (32). Used studs (31) and straight pins (32) must be replaced by new parts after the brake module has been reassembled.

Installation of the brake module must be carried out in reverse order of removal.

	Size			
	13	19	24	29
M_A tightening torques of cheese head screws (10) of flange (3)	5	9	14	22

Table 22/1: M_A tightening torques of cheese head screws (10) for flange (3)

6.3 Microswitch (27) adjustment (only applicable to brake modules with microswitch (27))

Warning!

The motor circuit must be protected in such a way that no accidental motor start-up can occur when the microswitch (27) contact closes. The cheese head screws (29) must be tightened to the specified M_A tightening torques.

When using brake modules equipped with a microswitch (27), the microswitch may need to be adjusted during maintenance and service work.

1. The microswitch can only be adjusted after the brake has been released electrically and the cheese head screws (29) have been slightly loosened. Check whether the microswitch status is "open" or "closed" by using a continuity tester connected to "NO" and "C" (see Fig. 11/2).
2. When "closed", push the microswitch (27) back beyond the change-over point in the direction indicated by "B" (see Fig. 11/2). When "open", screw in the screw (34) (hexagon head cap screw M2.5x8, not supplied) to push the microswitch in the direction indicated by "A" up to the change-over point.
3. At this point, continue to tighten the screw (34) by the adjustment length "L" or by the screw-in angle ⍁ specified in Table 23/1 and position it correctly by tightening one of the cheese head screws (29).
4. Secure the second cheese head screw (29) with Loctite type 241 and tighten it (M_A tightening torque specified in Table 23/1). Loosen the first cheese head screw (29), apply Loctite 241 and re-tighten it.
5. Remove the screw (34) after completion of the microswitch adjustment.
6. Switch the brake module on and off to check that the microswitch (27) works correctly.

C = common contact
NO = normally open contact

	Size			
	13	19	24	29
Adjustment length L of screw (34) [mm]	0.11	0.15	0.2	0.2
Screw-in angle ⍁ of screw (34) [°]	90	120	160	160
M_A tightening torque of machine screw (29) [Nm]	0.7	0.7	0.7	0.7

Table 23/1: M_A tightening torque of cheese head screws (29), adjustment length L and screw-in angle ⍁ of screw (34)

6.4 Brake shaft (13) removal

Caution!

As high pressures are generated during the removal of the brake shaft, personal protection equipment, such as face guards, gloves etc., and protective covers must be used.

Proceed with extreme caution and follow all relevant safety instructions when removing the brake shaft (13). The brake shaft (13) must be removed by means of an oil pressure system (see Fig. 24/1).

1. To this end, a withdrawal device consisting of a forcing screw (37), a forcing pin (35) and an oil injector or oil pump (36) must be used. Remove the screw plug (17) and screw the oil injector or oil pump (36) connection into the oil inlet bore (17.1).
2. Insert the forcing pin (35) on the front face of the brake shaft (13) up to the limit stop and slightly tighten it by means of the forcing screw (37).
3. The pressure oil must be supplied through the oil inlet bore. The oil pressure should be gradually increased to about 60 % of the maximum pressure p_{max}. Then the pressure should be kept constant for about 60 minutes.
4. Proceed to increase the pressure to the maximum oil pressure p_{max}. After the maximum pressure has been reached, screw in the forcing screw (37) smoothly and evenly so that the brake shaft (13) can be pulled off the motor shaft. While removing the brake shaft, the tangential torque arm should be applied to the square socket (size 13, 19, 24 brakes) or to the external teeth of the brake shaft (13) (size 29 brakes). The technical specifications applicable to the brake shaft (13) removal are given in Table 25/1.

Note!

Pressure oil type LHDF900 with a viscosity of 900 mm^2/s at 20°C supplied by SKF can be used, for instance.

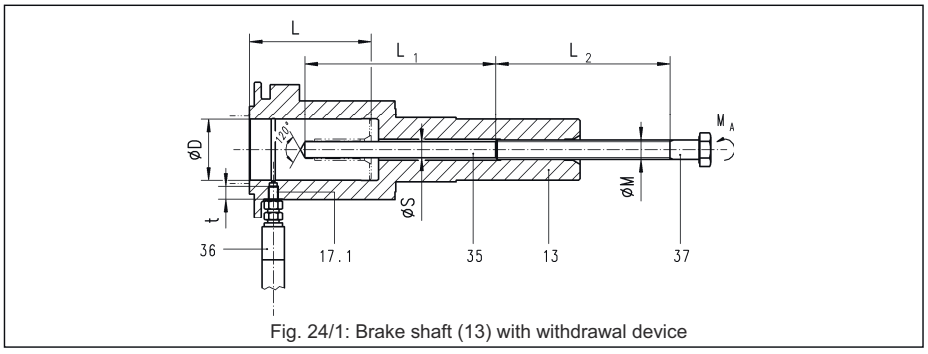


Fig. 24/1: Brake shaft (13) with withdrawal device

Key to Fig. 24/1:

13	Brake shaft	L_1	Forcing pin (35) length
17.1	Oil inlet bore	L_2	Forcing screw (37) thread length
35	Forcing pin	D	Shaft end diameter (motor)
36	Oil pump	S	Forcing pin (35) diameter
37	Forcing screw	M	Forcing screw (37) thread diameter
L	Shaft end length (motor)	M_A	Forcing screw (37) loosening torque

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

	Size			
	13	19	24	29
Motor shaft height	AH 80	AH 100	AH 132	AH 160
Oil inlet bore / screw-in depth t [mm]	M6/7.5	M6/8	Rp1/8''/9.5	Rp1/8''/10
Oil pressure p_{max} [bar]	1400	1400	1400	1400
Forcing pin (35) length L_1 [mm]	124	124	160	170
Forcing screw (37) thread length L_2 [mm]	130	130	170	170
Forcing pin (35) diameter S [mm]	9.8	9.8	13	17
Forcing screw (37) thread diameter M [mm]	12	12	16	20
Forcing screw tightening torque M_A [Nm]	15	35	60	90
Oil pump / oil injector connection tightening torque M_A [Nm]	4	4	10	10

Table 25/1: Technical specifications for brake shaft (13) removal

7. Motor design

The brake module must be mounted to a motor that complies with the following requirements:

- Motor mounting type IMB5 or IMB35
- Motor shaft end and flange tolerances (axial and radial runout) to EN 50347-R
- Brake module shaft end and flange tolerances to EN 50347-N after mounting to motor
- Motor shaft without feather key due to brake shaft removal from motor shaft by means of an oil pressure system
- The fits and surface roughness depths of the brake shaft bore and motor shaft (Rz<6.3) required to ensure reliable press-fit must be agreed with the brake manufacturer.
- Balancing of the brake shaft with a half key (half key balancing) to DIN ISO 8821

The permitted transverse forces acting on the shaft end of the motor/brake unit and the permitted axial forces are specified in the motor specification sheet.

Note!

Mounting of the brake module to the motor may cause heat build-up on the A-face motor end shield as heat dissipation towards the machine wall is inhibited. Consequently, only fan-cooled motors must be used.

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

8. Driven components, balancing

The installation and removal of driven components, such as clutch, gear, pulley, etc., on the brake shaft must be carried out using suitable devices and tools. Use the thread in the brake shaft for installation purposes and heat the components prior to assembly, if possible. In order to protect the centring piece and thread in the brake shaft, a shim must be inserted before removing driven components (see Fig. 26/1). The brake shaft is balanced with a half key (half key balancing to DIN ISO 8821). Check that the correct balancing method is used when installing the driven components.

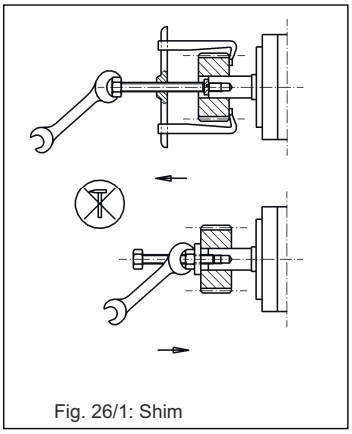


Fig. 26/1: Shim

Note!

General precautions must be taken to prevent accidental contact with driven components. The brake is an electromagnetic device which may generate electromagnetic stray flux. In general, driven components remain unaffected by the presence of such stray flux.

9. Condition at delivery

The brake module is delivered in a preassembled condition with factory-adjusted (standard) transmissible torque M_4. The brake shaft with screw plug, spring washer, ball bearing, circlip, feather key, hand release, rubber bolts (size 19 and 24 brakes) and O-ring (size 29 brakes) are not included in the scope of supply.
The ball bearing set (ball bearing, spring washer, circlip), hand release, brake shaft with screw plug, rubber bolts (size 19 and 24 brakes) or O-ring (size 29 brakes) can be ordered as accessories.
The brake module can be equipped with an optional microswitch.
The friction disc is centred relative to the brake centre to facilitate brake mounting.

Attention!

In order to avoid any shift of the friction disc, the brake unit should only be released electromagnetically or by means of the hand release lever when the friction disc is guided by the brake shaft. Brakes equipped with microswitches are delivered with factory-adjusted microswitch.

Upon receipt of the shipment, the brake must be checked for transit damage before storage.

Ordered accessories are delivered together with the brake.

The spring-applied single-disc brake module is delivered ready for mounting with factory-adjusted M_4 transmissible torque and factory-adjusted rated air gap 's'.

Attention!

The brake module should be transported and stored in vertical position with the output side solenoid housing (1.1) flange pointing upwards. This flange must be provided with eye bolts (e.g. to DIN 580) fixed to two diagonally opposite fixing bores. These eye bolts are required to attach handling equipment secured with nuts for internal transport purposes or for mounting the brake module to the motor.

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

Note!

If the brake module is equipped with a microswitch, make sure the microswitch is not exposed to shocks and vibrations during brake transport and storage. This is crucial to avoid any changes in the microswitch adjustment. The same applies to the connector box of the brake module. If the brake is not installed immediately upon delivery, it must be stored in a dry, dust-free and vibration-proof place.

10. Troubleshooting

Fault	Cause	Corrective actions
Brake release failure	Air gap too large	Check the air gap. Install a new friction disc, if necessary.
	No voltage applied to brake	Check the electrical connection and correct faults, if found.
	Voltage applied to field coil too low	Check the field coil supply voltage and correct faults, if found.
	Armature plate blocked mechanically	Eliminate mechanical blocks. Install a new brake, if necessary.
	Damaged rectifier	Check the rectifier and replace it, if necessary.
	Damaged field coil	Check the field coil resistance. Install a new brake, if necessary.
	Friction disc thermally overloaded	Install a new friction disc.
Delayed brake release	Air gap too large	Check the air gap. Install a new friction disc, if necessary.
	Voltage applied to field coil too low	Check the field coil supply voltage and correct faults, if found.
Brake engagement failure	Voltage applied to field coil in unpowered condition too high (residual voltage)	Check whether residual voltage is applied to the field coil and correct faults, if found.
	Armature plate blocked mechanically	Eliminate mechanical blocks. Install a new brake, if necessary.
Delayed brake engagement	Voltage applied to field coil too high	Check the field coil supply voltage and correct faults, if found.
Brake torque too low	Air gap too large	Check the air gap. Install a new friction disc, if necessary.
	Oily or greasy friction surfaces	Install a new friction disc.
	Broken compression spring	Install a new brake module.
Microswitch failure	Damaged microswitch	Install a new microswitch.
	Adjustment error of microswitch switching point	Readjust the microswitch switching point.

Table 27/1: Possible faults, causes and corrective actions (list not exhaustive)

11. Definitions

(based on: DIN VDE 0580 November 2011, not exhaustive)

Transmissible torque M_4	highest torque that can be applied to the engaged brake or clutch without causing the brake/clutch to slip
Rated voltage U_N	supply voltage specified by the manufacturer for voltage windings to identify the device or component
Rated air gap s	air gap of a new brake
Maximum air gap s_{max}	maximum possible air gap at the wear limit during brake operation

The switching times are defined in DIN VDE 0580. When using static systems (holding operation), the switching times can also be determined on the basis of the current flow (see Fig. 28/1).

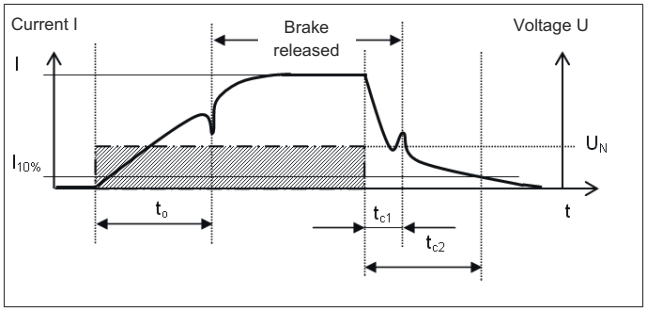


Fig. 28/1: Definition of switching times for (static) holding operation

Definitions:

t_o	opening time (**o**pen) –	brake mechanically open
t_{c1}	closing time (**c**lose) –	brake mechanically closed
t_{c2}	activation time –	brake mechanically closed and full holding torque reached almost completely

12. Technical specifications

	13	19	24	29
Rated air gap s [mm]	$0.3^{+0.2}$	$0.35^{+0.2}$	$0.4^{+0.25}$	$0.45^{+0.25}$
Max. air gap s_{max} (at 70% of rated current) [mm]	0.65	0.8	1.05	1.2

Table 28/1: Air gap s_{nom} and s_{max}

	Size			
	13	19	24	29
Speed n [rpm]	250	125	125	125
Coil ON time t_5 [s]	6	6	6	6
Coil OFF time t_6 [s]	1	1	1	1
Break-in period t_{tot} [min]	3	3	3	3

Table 28/2: Break-in process parameters for the spring-applied single-disc brake module

KENDRION
WE MAGNETISE THE WORLD
INDUSTRIAL DRIVE SYSTEMS

	Technical specifications
Switching capacity	250 VAC, 5 A
	400 VAC, 1.5 A
	24 VAC, 2 A
Min. switching power	12 VDC, 10 mA
Mech. service life [switching operations]	5 x 10^7
Contact type	normally open contact
Temperature range [°C]	–40 to +130
Protection	IP 67

Table 29/1: Microswitch specifications

The required operating conditions specified in **DIN VDE 0580** must be observed during operation of the spring-applied single-disc brake module!

Specifications subject to change without notice!

13. Revision history

Date of issue:	**Modifications:**
Issue dated 12 December 2013	Text revisions on page 16 and 17
Issue dated 2 July 2012 (initial issue)	–



INDUSTRIAL DRIVE SYSTEMS

Kendrion (Villingen) GmbH
Industrial Drive Systems
Wilhelm-Binder Straße 4-6
78048 Villingen-Schwenningen

Tel. +49 7721 877-1417
Fax +49 7721 877-1462

www.kendrion.com
sales-ids@kendrion.com

A.2 Description of terms

Rated torque M_N

The rated torque is the torque that is mechanically available at the shaft and can be thermally provided corresponding to the specified operating mode (duty type) according to IEC 60034-1.

Rated speed n_N

This is the speed for which the rated power and the rated torque are defined corresponding to the specified operating mode (duty type) according to IEC 60034-1.

Rated voltage V_N

Voltage between two motor phases for which the rating data (P_N, n_N, etc.) is defined. The rated voltage definition takes into account magnetic (iron saturation) and thermal factors.

Rated current I_N

This is the current (rms phase value) that flows at the rated speed and rated torque and can be thermally provided according to the specified operating mode (duty type) according to IEC 60034-1.

Rated frequency f_N

Frequency required to obtain the performance ratings (P_N, n_N, etc.).

Rated power P_N

The rated power is the power that is mechanically available at the shaft and can be thermally provided corresponding to the specified operating mode (duty type) according to IEC 60034-1.

Speed for field weakening with constant power n_2

Maximum achievable speed at rated power corresponding to the specified operating mode (duty type) according to IEC 60034-1.

No-load current I_μ

This is the current (rms phase current) that is required in order to operate the motor under no-load conditions at rated speed without load torque. The no-load current defines the motor magnetization in the base speed range (low speed at the start of field weakening).

Maximum speed n_{max}

The maximum permissible speed n_{max} is determined by mechanical factors. The maximum speed n_{max} must not be exceeded.

NOTICE
Motor damage when the maximum speed is exceeded The maximum speed n_{max} is the highest permissible operating speed. The maximum speed n_{max} is stamped on the rating plate (nameplate). The motor can be damaged if operated at inadmissible speeds. • Ensure that the maximum permissible speed is not exceeded. Realize this using a suitable control system or activate the speed monitoring function in the drive.

If $n_{S1} < n_{max}$, the motor must not be operated at n_{max} continuously. Unless a different duty cycle (duty cycle duration 10 minutes) is specified, the speed must be reduced as stated below:

t_1: 1 min---n_1= 0 r/min; t_2: 6 min---n_2= 2/3 n_{max}; t_3: 3 min---n_3= n_{max}

Maximum torque M_{max}

Torque which is briefly available for dynamic operations (e.g. when accelerating).

Max. current I_{max}

This is the current (rms phase value) produced at rated speed (n_{rated}) and maximum torque (M_{max}).

S1 duty (continuous operation)

Operation with a constant load, the duration of which is sufficient that the motor goes into a thermal steady-state condition.

S6 duty (intermittent operation)

Operation which comprises a sequence of identical duty cycles; each of these duty cycles comprises a time with constant motor load and a no-load time. Unless otherwise specified, the load period refers to a duty cycle of 10 min.

for example,

S6-40 % = 4 min load operation, 6 min no-load operation
S6-60 % = 6 min load operation, 4 min no-load operation

Thermal time constant T_{th}

The thermal time constant defines the temperature rise of the motor winding when the motor load is suddenly increased (step increase) up to the permissible S1 torque. The motor has reached 63% of its S1 final temperature after T_{th}.

A.3 Environmental compatibility

Environmental compatibility

- Environmental aspects during development
  When selecting supplier parts, environmental compatibility was an essential criteria.
  Special emphasis was placed on reducing the envelope dimensions, weight and variety of metal and plastic parts.
  Effects that impair paint-wetting can be excluded (PWIS test)
- Environmental aspects during production
  Supplier parts and the products are predominantly transported in re-usable packing.
  Hazardous materials do not have to be transported.
  The packing materials themselves essentially comprises paperboard that is in compliance with the Packaging Directive 94/62/EC.
  Energy consumption during production was optimized.
  Production has low emission levels.
- Environmental aspects for disposal
  Motors must be disposed of carefully taking into account domestic and local regulations in the normal recycling process or by returning to the manufacturer.
  The following must be taken into account when disposing of the motor:
  Oil according to the regulations for disposing of old oil (e.g. gearbox oil when a gearbox is mounted)
  Not mixed with solvents, cold cleaning agents or remains of paint
  Components that are to be recycled should be separated into:
  - Electronics scrap (e.g. encoder electronics, sensor modules)
  - Scrap iron
  - Aluminum
  - Non-ferrous metal (worm gears, motor windings)

More information

SIMOTICS:
www.siemens.com/simotics

SiePortal:
www.siemens.com/sieportal