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Data sheet 6ES7146-6FF00-0BB0



SIMATIC ET 200eco PN, F-DI 4x, F-DQ 2x 2 A PM, DIQ 4x, CM 1x IO-Link, M12-L, PROFIsafe up to PL e (ISO 13849) / SIL 3 (IEC 61508), degree of protection IP65/67 and IP69K, including eCoding plug-in connector

General information	
HW functional status	FS01
Firmware version	V1.1.x
● FW update possible	Yes
Vendor identification (VendorID)	002AH
Device identifier (DeviceID)	0306H
Product function	
● I&M data	Yes
● Isochronous mode	No
● IRT	No; module will participate within an IRT topology
● Fast startup	No
● Prioritized startup	No
Engineering with	
● STEP 7 TIA Portal configurable/integrated from version	STEP 7 V20 or higher with HSP0468
● PROFINET from GSD version/GSD revision	GSDML V2.4.x
Operating mode	
● DI	Yes
● Counter	No
● DQ	Yes
● MSI	No
● MSO	No
Supply voltage	
Rated value (DC)	24 V
Reverse polarity protection	Yes
power supply according to NEC Class 2 required	No
Load voltage 1L+	
● Rated value (DC)	24 V
● permissible range, lower limit (DC)	20.4 V
● permissible range, upper limit (DC)	28.8 V
● Reverse polarity protection	Yes; Against destruction; encoder power supply outputs applied with reversed polarity
Load voltage 2L+	
● Rated value (DC)	24 V
● permissible range, lower limit (DC)	20.4 V
● permissible range, upper limit (DC)	28.8 V
● Reverse polarity protection	Yes; against destruction
Input current	
Current consumption (rated value)	100 mA 1L+ without load; 45 mA 2L+ without load
from load voltage 1L+ (unswitched voltage)	12 A; Maximum value

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from load voltage 2L+, max.	12 A; Maximum value
Encoder supply	
Number of outputs	6; Us0, Us1, Vs0 - Vs3
24 V encoder supply	
● Short-circuit protection	Yes; per channel, electronic
● Output current, max.	0.5 A
Actuator supply	
Number of outputs	3; Us2 - Us4
Short-circuit protection	Yes; per channel, electronic
Output current	
● nominal	1 A
Power loss	
Power loss, typ.	12 W
Address area	
Address space per module	
● Inputs	46 byte
● Outputs	39 byte
Hardware configuration	
Submodules	
● Number of configurable submodules, max.	3
Digital inputs	
Number of digital inputs	4 single-channel F-DI (SIL2) parameterizable as 2 two-channel (SIL3); 4 parameterizable as DIQ
Digital inputs, parameterizable	Yes
Sourcing/sinking input	P-reading
Input characteristic curve in accordance with IEC 61131, type 1	Yes; F-DI
Input characteristic curve in accordance with IEC 61131, type 3	Yes; DIQ
Number of simultaneously controllable inputs	
all mounting positions	
— up to 60 °C, max.	8
Input voltage	
● Rated value (DC)	24 V
● for signal "0"	-3 to +5V
● for signal "1"	+15 to +30 V F-DI; +11 to +30 V DIQ
Input current	
● for signal "1", typ.	3 to 6 mA F-DI; 2.5 mA DIQ
Input delay (for rated value of input voltage)	
for standard inputs	
— parameterizable	Yes; 0.8 / 1.6 / 3.2 / 6.4 / 12.8 ms F-DI; 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms DIQ
Cable length	
● unshielded, max.	30 m
Digital outputs	
Number of digital outputs	7; 2 F-DQ; 1 parameterizable F-DQ or IO-LINK Class B (with or without safety-shutdown); 4 parameterizable as DIQ
● in groups of	3 F-DQ (2L+); 4 DIQ (1L+)
Short-circuit protection	Yes; per channel, electronic
● Response threshold, typ.	10 A F-DQ; 1 A DIQ
Limitation of inductive shutdown voltage to	Typ. -74 V (typ. -26 V P-switch; typ. +48 V M-switch) F-DQ; Typ. 1L+ (-70 V) DIQ
Controlling a digital input	No F-DQ; Yes DIQ
Switching capacity of the outputs	
● with resistive load, max.	2 A F-DQ; 0.5 A DIQ
● with inductive load, max.	2 A F-DQ; 0.5 A DIQ
● on lamp load, max.	10 W F-DQ; 5 W DIQ
Load resistance range	
● lower limit	12 Ohm F-DQ; 48 Ohm DIQ
● upper limit	2 kOhm F-DQ; 4 kOhm DIQ
Output voltage	
● for signal "1", min.	2L+ (-2 V) F-DQ (2L+ (-1.5 V) P-switch; 0.5 V M-switch); 1L+ (-0.8 V) DIQ

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Output current	
● for signal "1" rated value	2 A F-DQ; 0.5 A DIQ
● for signal "0" residual current, max.	0.5 mA F-DQ; 0.1 mA DIQ
Output delay with resistive load	
● "0" to "1", max.	100 µs
● "1" to "0", max.	100 µs; F-DQ; 150 µs DIQ
Parallel switching of two outputs	
● for uprating	No
● for redundant control of a load	No F-DQ; Yes DIQ
Switching frequency	
● with resistive load, max.	30 Hz F-DQ; 100 Hz DIQ
● with inductive load, max.	0.1 Hz F-DQ; 0.5 Hz DIQ
● on lamp load, max.	30 Hz F-DQ; 100 Hz DIQ
Cable length	
● unshielded, max.	30 m; 10 m F-DQ in hardware revision FS-01 for burner applications related to EN 298
Encoder	
Connectable encoders	
● 2-wire sensor	No F-DI; Yes DIQ
— permissible quiescent current (2-wire sensor), max.	0.5 mA F-DI; 1.5 mA DIQ
IO-Link	
Number of ports	1
IO-Link protocol 1.0	Yes
IO-Link protocol 1.1	Yes
Transmission rate	4.8 kBd (COM1); 38.4 kBd (COM2)
Cycle time, min.	2 ms
Size of process data, input per port	33 byte
Size of process data, input per module	33 byte
Size of process data, output per port	32 byte
Size of process data, output per module	32 byte
Memory size for device parameter	2 kbyte
Master backup	Possible with function block IO_LINK_MASTER
Configuration without S7-PCT	Possible; autostart/manual function
Cable length unshielded, max.	20 m
Connection of IO-Link devices	
● Port type A	Yes; via 3-core cable
● Port type B	Yes; additional device supply: max. 2 A; also available with integrated Safety Shutdown via F-DQ 2
Interfaces	
Transmission procedure	100BASE-TX
Number of PROFINET interfaces	1
1. Interface	
Interface type	PROFINET with 100 Mbit/s full duplex (100BASE-TX)
Interface types	
● M12 port	Yes; 2x M12, 4-pin, D-coded
● Number of ports	2
● integrated switch	Yes
Protocols	
● PROFINET IO Device	Yes
● Open IE communication	Yes
PROFINET IO Device	
Services	
— IRT	No; module will participate within an IRT topology
— Prioritized startup	No
— Shared device	Yes
— Number of IO Controllers with shared device, max.	2
Interface types	
M12 port	
● Autonegotiation	Yes

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● Autocrossing	Yes
● Transmission rate, max.	100 Mbit/s
Protocols	
Supports protocol for PROFINET IO	Yes
PROFIsafe	Yes
EtherNet/IP	No
Modbus TCP	No
Redundancy mode	
● PROFINET system redundancy (S2)	Yes
● PROFINET system redundancy (R1)	No
● H-Sync forwarding	No
Media redundancy	
— MRP	Yes
— MRPD	No
Open IE communication	
● TCP/IP	No
● SNMP	Yes
● DCP	Yes
● LLDP	Yes
● ping	Yes
● ARP	Yes
Interrupts/diagnostics/status information	
Substitute values connectable	Yes
Alarms	
● Diagnostic alarm	Yes; Parameterizable
● Maintenance interrupt	Yes; Parameterizable
● Hardware interrupt	Yes; Parameterizable
Diagnoses	
● Diagnostic information readable	Yes
● Monitoring the supply voltage	Yes
— Parameterizable	Yes
● Wire break	Yes; DI, input current < 0.3 mA, per channel
● Wire-break in actuator cable	Yes
● short-circuit	Yes; F-DI, F-DQ, DIQ as output, encoder supply
Diagnostics indication LED	
● RUN LED	Yes; green LED
● ERROR LED	Yes; red LED
● MAINT LED	Yes; Yellow LED
● Monitoring of the supply voltage (PWR-LED)	Yes; green LED
● NS LED	No
● MS LED	No
● IO LED	Yes; red/green/yellow LEDs
● Channel status display	Yes; green LED
● for channel diagnostics	Yes; red LED
● For load voltage monitoring	Yes; green LED
● Connection display LINK TX/RX	Yes; green LED, only link
Potential separation	
between the load voltages	Yes
between Ethernet and electronics	Yes
Potential separation channels	
● between the channels	Yes
● between the channels and the power supply of the electronics	4 F-DI / 4 DIQ / 1 IO-LINK are non-isolated and 3 F-DQ are isolated from supply voltage 1L+
Isolation	
tested with	
● 24 V DC circuits	707 V DC (type test)
● Test voltage for interface, rms value [Vrms]	1 500 V; According to IEEE 802.3
Degree and class of protection	
IP degree of protection	IP65/67/69K

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Standards, approvals, certificates	
Suitable for safety-related tripping of standard modules	No
Highest safety class achievable in safety mode	
● Performance level according to ISO 13849-1	PLd (F-DI single-channel, F-DQ with dark test disabled), PLe (F-DI two-channel, F-DQ with dark test enabled)
● Category according to ISO 13849-1	Cat. 3 (F-DI single-channel, F-DQ with dark test disabled), Cat. 4 (F-DI two-channel, F-DQ with dark test enabled)
● SIL acc. to IEC 61508	SIL 2 (F-DI single-channel, F-DQ with dark test disabled), SIL 3 (F-DI two-channel, F-DQ with dark test enabled)
Probability of failure (for service life of 20 years and repair time of 100 hours)	
— Low demand mode: PFDavg in accordance with SIL2	< 8.00E-05 F-DI; < 3.00E-04 F-DQ for altitude <= 5 000 m
— Low demand mode: PFDavg in accordance with SIL3	< 7.00E-05 F-DI; < 8.00E-05 F-DQ for altitude <= 5 000 m
— High demand/continuous mode: PFH in accordance with SIL2	< 1.00E-09 1/h F-DI; < 5.00E-09 1/h F-DQ for altitude <= 5 000 m
— High demand/continuous mode: PFH in accordance with SIL3	< 6.00E-10 1/h F-DI; < 4.00E-09 1/h F-DQ for altitude <= 5 000 m
Use in hazardous areas	
● Explosion protection category for gas	ATEX, UKEX, IECEx, CCCEx for Zone 2
● Explosion protection category for dust	ATEX, UKEX, IECEx, CCCEx for Zone 22
Security	
signed firmware update	Yes
safely removing data	Yes
Ambient conditions	
Ambient temperature during operation	
● min.	-25 °C
● max.	60 °C
Altitude during operation relating to sea level	
● Ambient air temperature-barometric pressure-altitude	Up to max. 5 000 m, at installation height > 2 000 m additional restrictions
Connection method	
Design of electrical connection	4/5-pin M12 circular connectors
Design of electrical connection for the inputs and outputs	M12, 5-pin, A-coded
Dimensions	
Width	45 mm
Height	200 mm
Depth	48 mm
Weights	
Weight, approx.	900 g

Classifications

	Version	Classification
eClass	16	27-24-26-04
eClass	14	27-24-26-04
eClass	12	27-24-26-04
eClass	9.1	27-24-26-04
eClass	9	27-24-26-04
eClass	8	27-24-26-04
eClass	7.1	27-24-26-04
eClass	6	27-24-26-04
ETIM	10	EC001599
ETIM	9	EC001599
ETIM	8	EC001599
ETIM	7	EC001599

Approvals / Certificates

General Product Approval

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Miscellaneous

China RoHS

For use in hazardous locations		Functional Saftey		Food, Pharmaceut-ical, Medical	Environment
	CCC-Ex	TUEV	TUEV	Confirmation	

Industrial Communication	
PROFIsafe	PROFINET

last modified: 9/16/2026

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