User Manual

Revision 1.001
English

IEC 61850 Server / Modbus TCP Slave - Converter

(Order Code: HD67736-A1)

For Website information:
www.adfweb.com?Product=HD67736

For Price information:
www.adfweb.com?Price=HD67736-A1

Benefits and Main Features:

- Triple Electrical isolation
- Temperature range: -40°C/+85°C (-40°F/+185°F)

For other IEC 61850 server products see also the following link:

Converter IEC 61850 Server to

www.adfweb.com?Product=HD67733	**(Modbus Master)**
www.adfweb.com?Product=HD67734	**(Modbus Slave)**
www.adfweb.com?Product=HD67735	**(Modbus TCP Master)**
www.adfweb.com?Product=HD67737	**(BACnet Master)**
www.adfweb.com?Product=HD67738	**(BACnet Slave)**
www.adfweb.com?Product=HD67739	**(CAN)**
www.adfweb.com?Product=HD67740	**(CANopen)**
www.adfweb.com?Product=HD67741	**(DeviceNet Master)**
www.adfweb.com?Product=HD67742	**(DeviceNet Slave)**
www.adfweb.com?Product=HD67743	**(EtherNet/IP Master)**
www.adfweb.com?Product=HD67744	**(EtherNet/IP Slave)**
www.adfweb.com?Product=HD67745	**(J1939)**
www.adfweb.com?Product=HD67746	**(KNX)**
www.adfweb.com?Product=HD67747	**(MQTT)**
www.adfweb.com?Product=HD67748	**(NMEA 0183)**
www.adfweb.com?Product=HD67749	**(NMEA 2000)**
www.adfweb.com?Product=HD67750	**(PROFIBUS Master)**
www.adfweb.com?Product=HD67751	**(PROFIBUS Slave)**
www.adfweb.com?Product=HD67B82	**(PROFINET Master)**
www.adfweb.com?Product=HD67752	**(PROFINET Slave)**
www.adfweb.com?Product=HD67753	**(SNMP Manager)**
www.adfweb.com?Product=HD67754	**(SNMP Agent)**
www.adfweb.com?Product=HD67755	**(Serial)**
www.adfweb.com?Product=HD67756	**(Ethernet)**

Do you have your customer protocol? Then go to:
www.adfweb.com?Product=HD67003

Do you need to choose a device? Do you want help?
www.adfweb.com?Cmd=helpme



User Manual

INDEX:

	Page
INDEX	2
UPDATED DOCUMENTATION	2
REVISION LIST	2
WARNING	2
TRADEMARKS	2
SECURITY ALERT	3
EXAMPLE OF CONNECTION	4
CONNECTION SCHEME	5
CHARACTERISTICS	6
CONFIGURATION	6
POWER SUPPLY	7
FUNCTION MODES	8
LEDS	9
ETHERNET	10
USE OF COMPOSITOR SW67736	11
NEW CONFIGURATION / OPEN CONFIGURATION	12
SOFTWARE OPTIONS	13
SET COMMUNICATION	15
IEC 61850 ACCESS	17
TLS KNOWN CERTIFICATE	18
UPDATE DEVICE	19
MODBUS MAP	21
MECHANICAL DIMENSIONS	22
ORDERING INFORMATIONS	23
ACCESSORIES	23
DISCLAIMER	24
OTHER REGULATIONS AND STANDARDS	24
WARRANTIES AND TECHNICAL SUPPORT	25
RETURN POLICY	25

UPDATED DOCUMENTATION:

Dear customer, we thank you for your attention and we remind you that you need to check that the following document is:

- Updated
- Related to the product you own

To obtain the most recently updated document, note the "document code" that appears at the top right-hand corner of each page of this document.

With this "Document Code" go to web page www.adfweb.com/download/ and search for the corresponding code on the page. Click on the proper "Document Code" and download the updates.

REVISION LIST:

Revision	Date	Author	Chapter	Description
1.000	18/09/2020	Ff	All	First Release
1.001	14/07/2025	Mdb	All	New design

WARNING:

ADFweb.com reserves the right to change information in this manual about our product without warning.
ADFweb.com is not responsible for any error this manual may contain.

TRADEMARKS:

All trademarks mentioned in this document belong to their respective owners.

SECURITY ALERT:

GENERAL INFORMATION

To ensure safe operation, the device must be operated according to the instructions in the manual. When using the device, legal and safety regulation are required for each individual application. The same applies also when using accessories.

INTENDED USE

Machines and systems must be designed so the faulty conditions do not lead to a dangerous situation for the operator (i.e. independent limit switches, mechanical interlocks, etc.).

QUALIFIED PERSONNEL

The device can be used only by qualified personnel, strictly in accordance with the specifications.
Qualified personnel are persons who are familiar with the installation, assembly, commissioning and operation of this equipment and who have appropriate qualifications for their job.

RESIDUAL RISKS

The device is state-of-the-art and is safe. The instruments can represent a potential hazard if they are inappropriately installed and operated by untrained personnel. These instructions refer to residual risks with the following symbol:

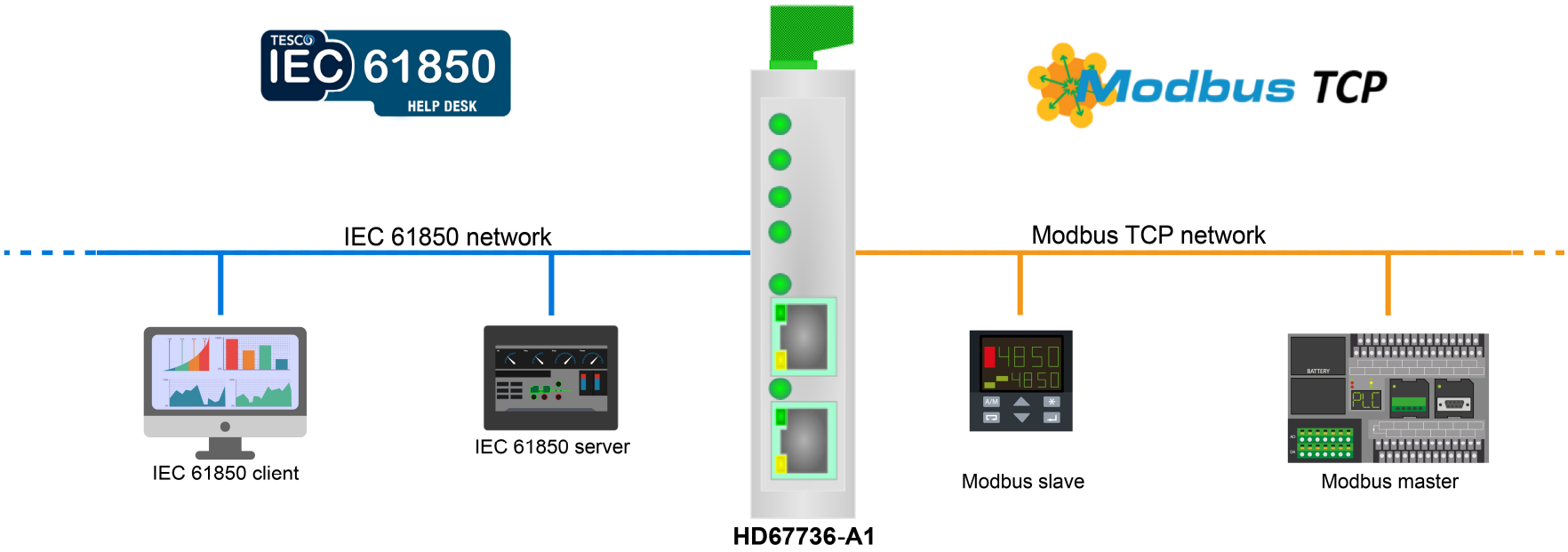


This symbol indicates that non-observance of the safety instructions is a danger for people that could lead to serious injury or death and / or the possibility of damage.

CE CONFORMITY

The declaration is made by our company. You can send an email to support@adfweb.com or give us a call if you need it.

EXAMPLE OF CONNECTION:



ADFweb.com **+39 0438 309 131** **+39 349 440 9592** **support@adfweb.com**

CONNECTION SCHEME:

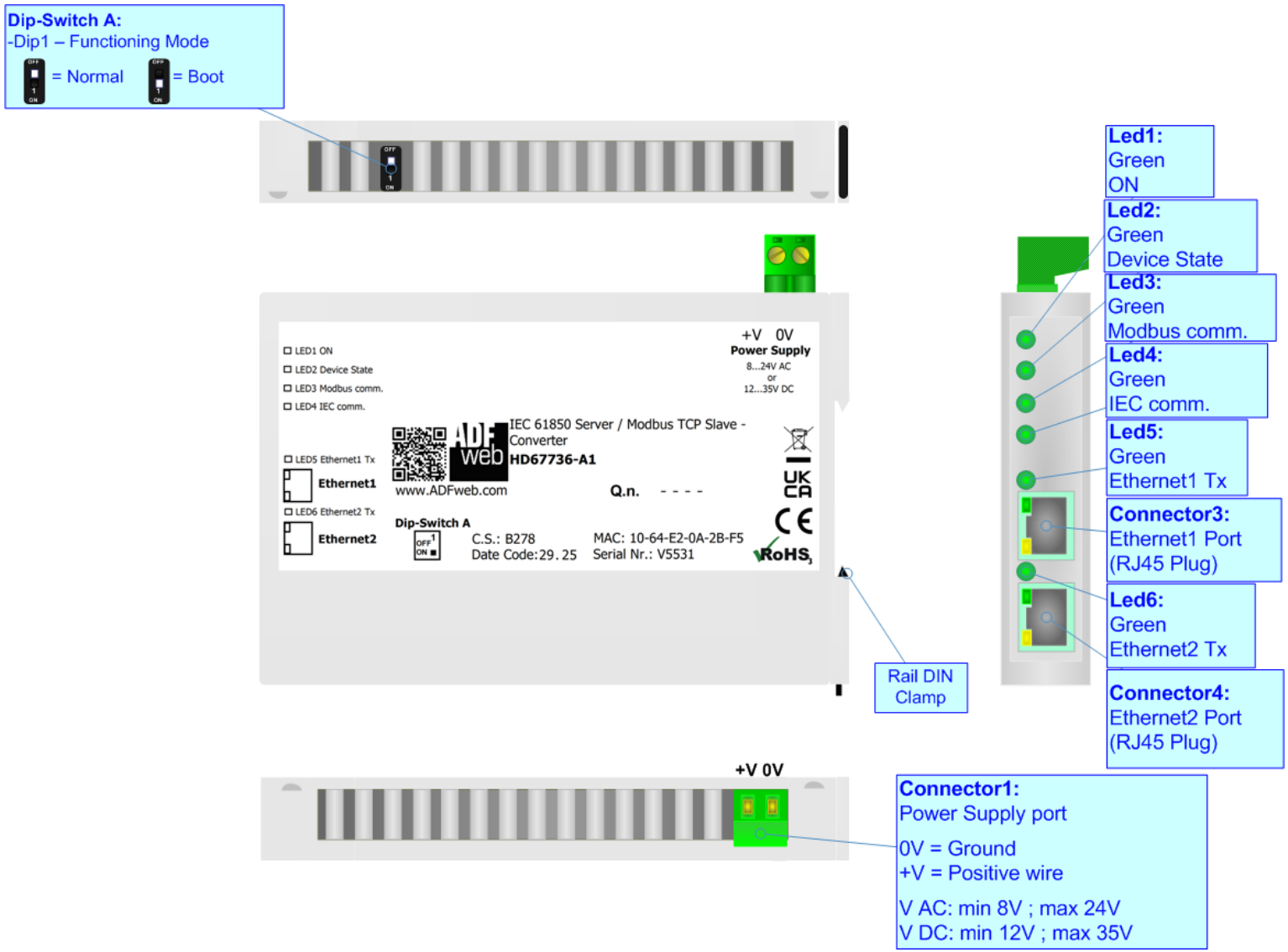


Figure 1: Connection scheme for HD67736-A1

CHARACTERISTICS:

The HD67736-A1 are IEC 61850 / Modbus TCP Slave - Converters.

It allows for the following characteristics:

- Isolation between Ethernet - Power Supply;
- Two-directional information between IEC 61850 bus and Modbus TCP bus;
- Mountable on 35mm Rail DIN;
- Wide power supply input range: 8…24V AC or 12…35V DC;
- Wide temperature range: -40°C / +85°C [-40°F / +185°F].

CONFIGURATION:

You need Compositor SW67735 software on your PC in order to perform the following:

- Define the parameters of IEC 61850 line;
- Define the parameters of Modbus TCP line;
- Define IEC 61850 variables to read and write;
- Update the device.

POWER SUPPLY:

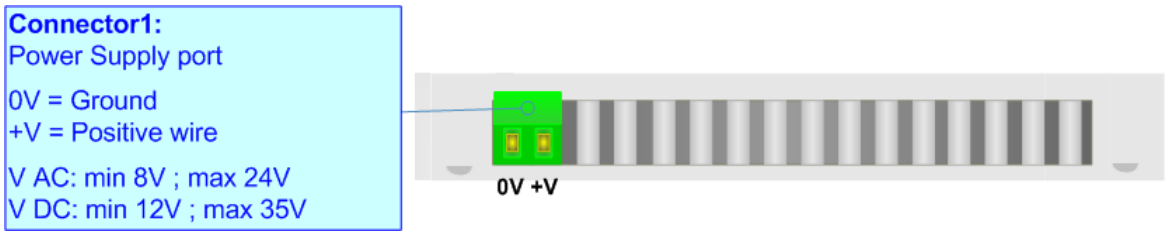
The devices can be powered at 8…24V AC and 12…35V DC. For more details see the two tables below.

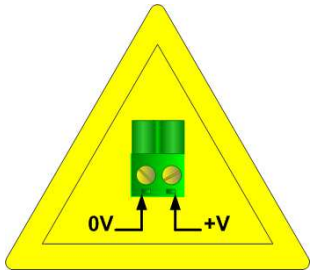
VAC ~		VDC ⎓	
Vmin	**Vmax**	**Vmin**	**Vmax**
8V	**24V**	**12V**	**35V**

Consumption at 24V DC:

Device	Consumption [W/VA]
HD67736-A1	3.5

Caution: Do not reverse the polarity power





HD67736-A1

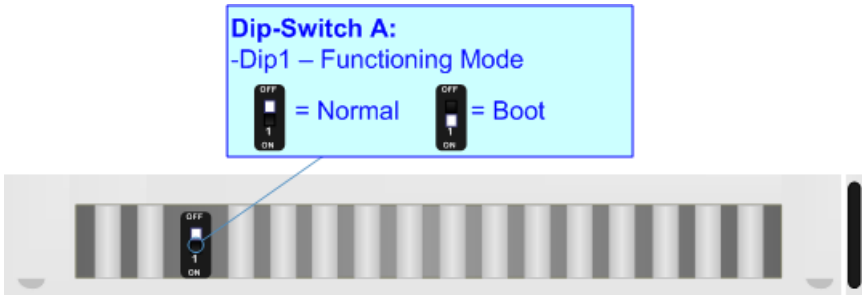
FUNCTION MODES:

The device has got two function modes depending on the position of the 'Dip1 of Dip-Switch A':

- The first, with 'Dip1 of Dip-Switch A' at "OFF" position, is used for the normal working of the device.
- The second, with 'Dip1 of Dip-Switch A' at "ON" position, is used for uploading the Project and/or Firmware.

For the operations to follow for the updating, see 'UPDATE DEVICE' section.

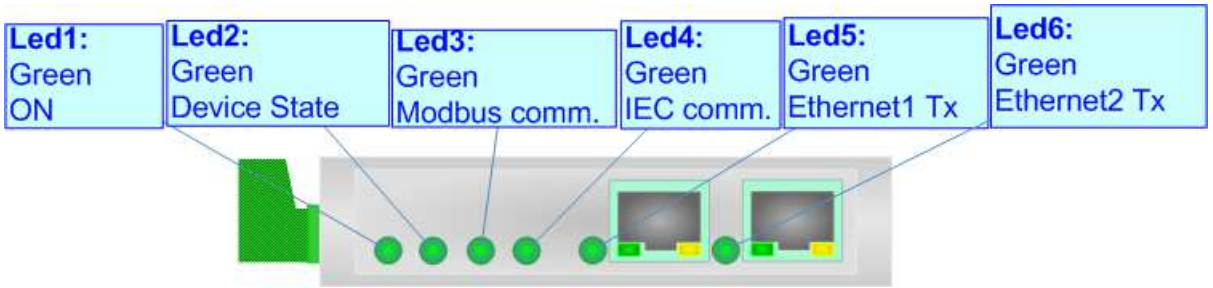
According to the functioning mode, the LEDs will have specific functions, see 'LEDS' section.



LEDS:

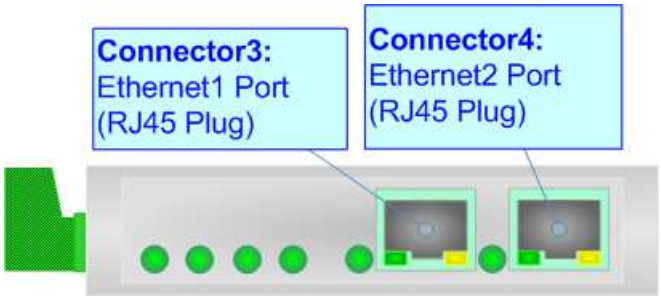
The device has got six LEDs that are used to give information about the functioning status.
The various meanings of the LEDs are described in the table below.

LED	Normal Mode	Boot Mode
1: ON [supply voltage] (green)	**ON:** Device powered **OFF:** Device not powered	**ON:** Device powered **OFF:** Device not powered
2: Device State (green)	Blinks slowly (~1Hz)	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
3: ModbusTCP comm. (green)	It blinks when a Modbus TCP request is received	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
4: IEC 61850 comm. (green)	It blinks when a IEC 61850 request is received	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
5: Ethernet1 Tx (green)	Blinks when is transmitting Ethernet frames	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
6: Ethernet2 Tx (green)	Blinks when is transmitting Ethernet frames	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress



ETHERNET:

IEC 61850, Modbus TCP connection and the updating of the converter must be made using Connector3 and/or Connector4 of the HD67736-A1 with at least a Category 5E cable. The maximum length of the cable should not exceed 100m. The cable has to conform to the T568 norms relative to connections in cat.5 up to 100 Mbps. To connect the device to an Hub/Switch is recommended the use of a straight cable, to connect the device to a PC/PLC/other is recommended the use of a cross cable.



USE OF COMPOSITOR SW67736:

To configure the Converter, use the available software that runs with Windows called SW67736. It is downloadable on the site www.adfweb.com and its operation is described in this document. *(This manual is referenced to the last version of the software present on our web site)*. The software works with MSWindows (XP, Vista, Seven, 8, 10 or 11; 32/64bit).

When launching the SW67736, the window below appears (Fig. 2).

Note:
It is necessary to have installed .Net Framework 4.

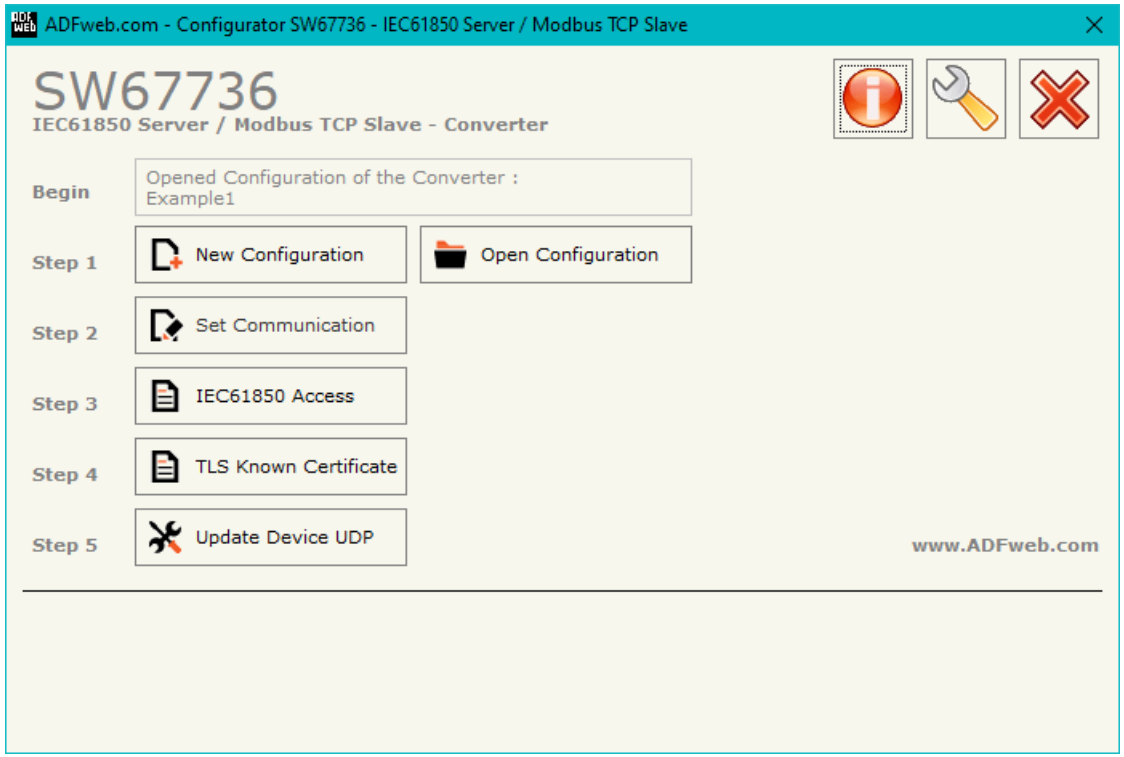
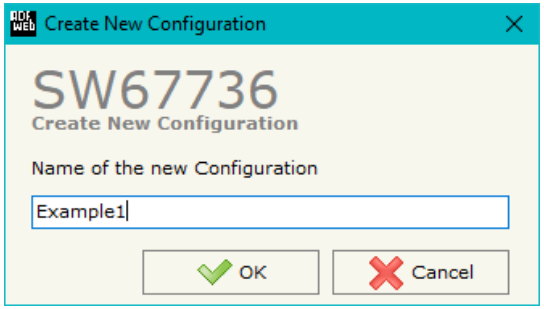


Figure 2: Main window for SW67736

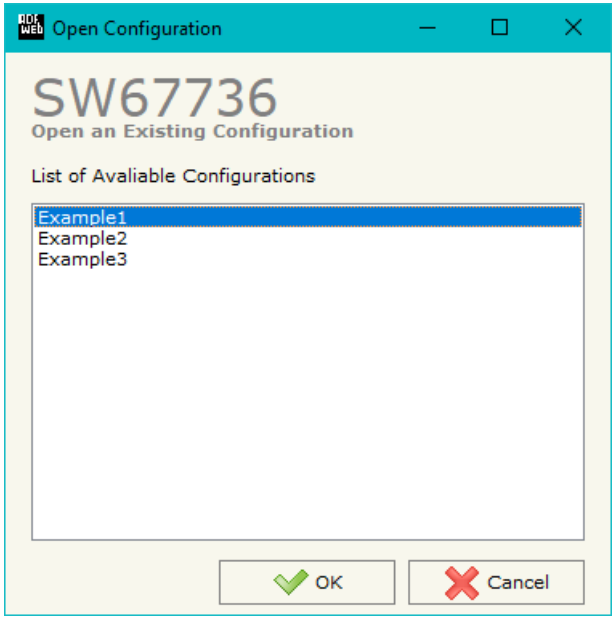
NEW CONFIGURATION / OPEN CONFIGURATION:

The "**New Configuration**" button creates the folder which contains the entire device's configuration.



A device's configuration can also be imported or exported:

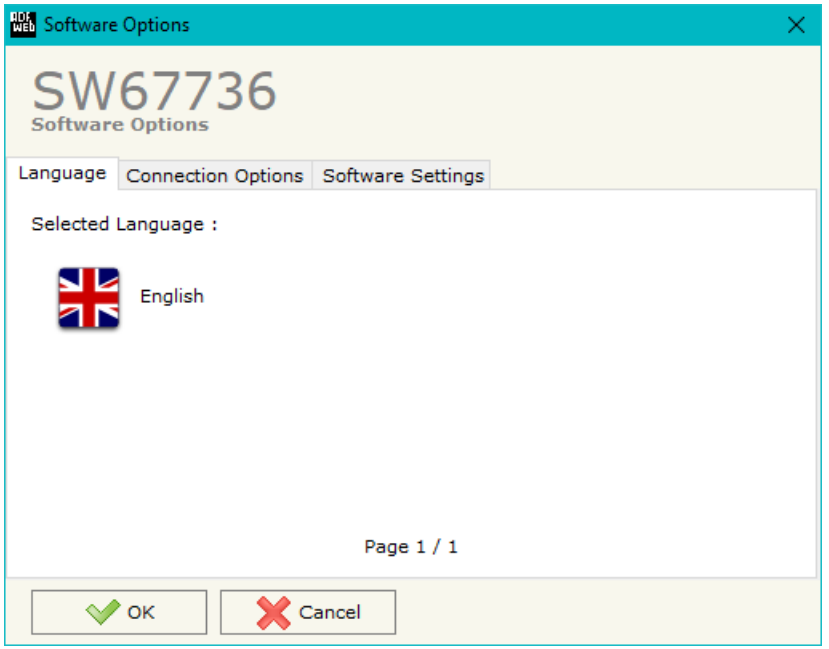
- To clone the configurations of a programmable "IEC 61850 Server / Modbus TCP Slave - Converter" in order to configure another device in the same manner, it is necessary to maintain the folder and all its contents;
- To clone a project in order to obtain a different version of the project, it is sufficient to duplicate the project folder with another name and open the new folder with the button "**Open Configuration**".

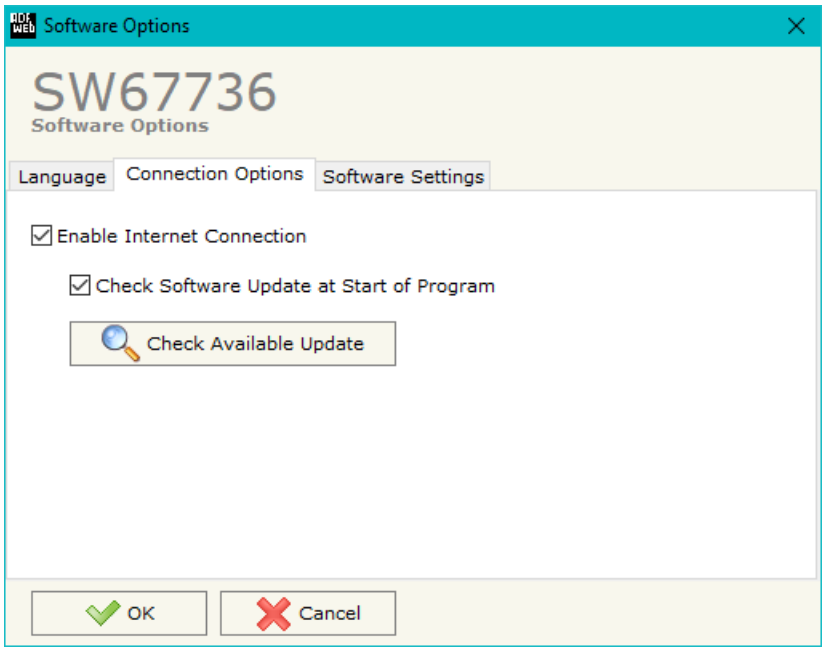


SOFTWARE OPTIONS:

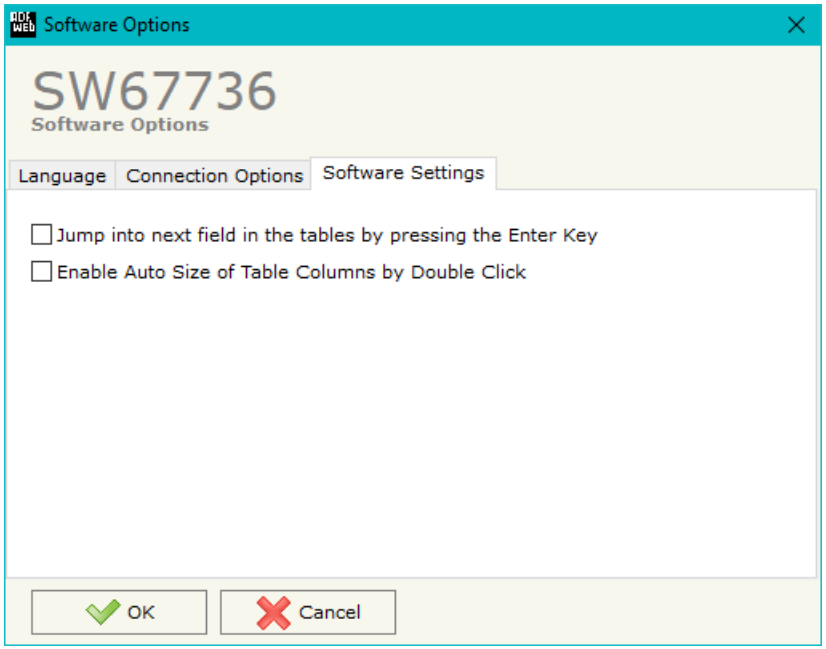
By pressing the "**Settings**" ( ) button there is the possibility to change the language of the software and check the updatings for the compositor.

In the section "Language" it is possible to change the language of the software.





In the section "Connection Options", it is possible to check if there are some updatings of the software compositor in ADFweb.com website.
Checking the option "**Check Software Update at Start of Program**", the SW67736 checks automatically if there are updatings when it is launched.



In the section "Software Settings", it is possible to enable/disable some keyboard's commands for an easier navigation inside the tables contained in the different sections of the software.

SET COMMUNICATION:

This section define the fundamental communication parameters of two buses, IEC 61850 and Modbus TCP.

By Pressing the "**Set Communication**" button from the main window for SW67736 (Fig. 2) the window "Set Communication" appears (Fig. 3).

The means of the fields for "Ethernet Connection" are:

- In the field "**Device Name (Hostname)**" the Hostname to assign to the converter is defined;
- If the field "**Obtain an IP Address Automatically (DHCP for Cable Connection)**" is checked, DHCP for LAN connection is enabled;
- If the field "**Enable DNS**" is checked, DNS protocol is enabled;
- In the field "**Primary DNS**" the IP Address of the primary DNS server is defined;
- In the field "**Secondary DNS**" the IP Address of the secondary DNS server is defined.

The means of the fields for "IEC61850 Server" are:

- In the field "**IP Address**" the IP address for IEC 61850 side of the converter is defined;
- In the field "**SubNet Mask**" the SubNet Mask for IEC 61850 side of the converter is defined;
- In the field "**Gateway**" the default gateway of the net is defined. This feature can be enabled or disabled pressing the Check Box field. This feature is used for going out of the net;
- In the field "**Port**" the port used for IEC 61850 communication is defined;
- If the field "**Password**" the password used for accessing to IEC 61850 variables is defined.
- In the field "**Name of Server**" the name of the IEC 61850 Server is defined.

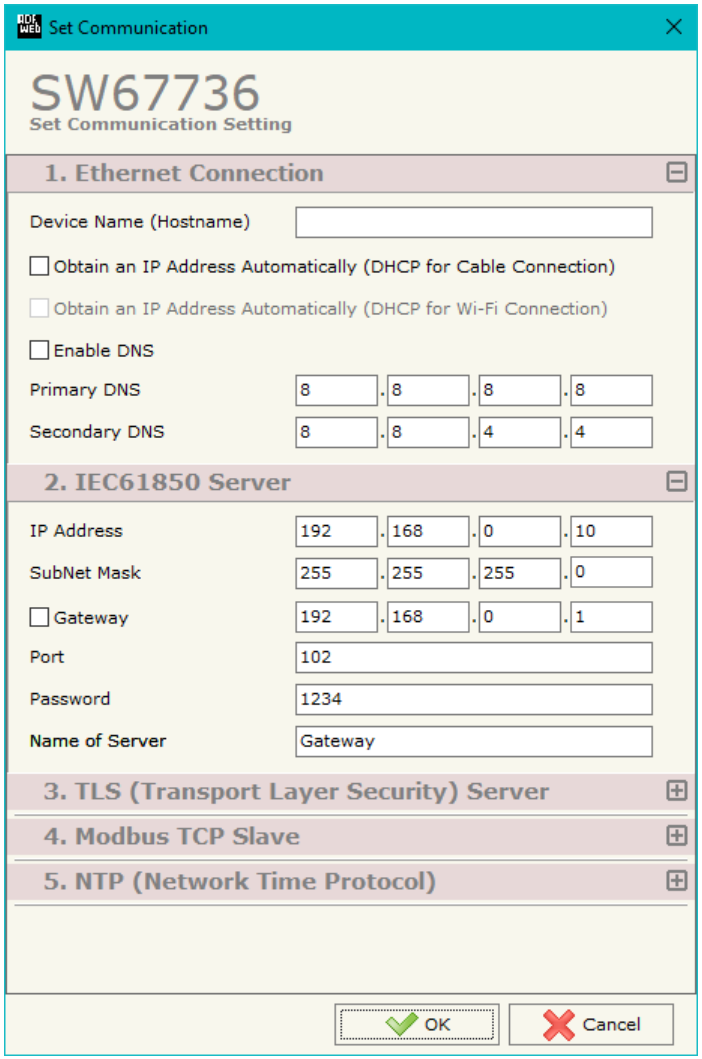


Figure 3a: "Set Communication" window

The means of the fields for "TLS" are:

- If the field "**Enable TLS**" is checked, the TLS protocol for secure connection is enabled;
- In the field "**Key**" the key for the authentication is defined;
- In the field "**Key Password**" the password for decrypting the key is defined;
- In the field "**Server Certificate**" the certificate for the server is defined;
- In the field "**Root Certificate**" the root of the server is defined;
- If the field "**Enable Only Known Certificates**" is checked, the converter will accept just connection from known Clients (defined in the section "TLS Known Certificate").

The means of the fields for "Modbus TCP Slave" are:

- In the field "**IP Address**" the IP address for Modbus TCP side of the converter is defined;
- In the field "**SubNet Mask**" the SubNet Mask for Modbus TCP side of the converter is defined;
- In the field "**Gateway**" the default gateway of the net is defined. This feature can be enabled or disabled pressing the Check Box field. This feature is used for going out of the net;
- In the field "**Port**" the port used for Modbus TCP communication is defined.
- If the field "**Read with Input Register / Status Function**" is checked, it is possible to read the Input bytes of IEC 61850 side with Input Registers (Function 04) and write the Output bytes of IEC 61850 side with Holding Registers (Function 06/16). The Output bytes are readable with Function 03. Otherwise, only Holding Registers will be used and the Output bytes of IEC 61850 side cannot be read back.

The means of the fields for "NTP (Network Time Protocol)" are:

- In the field "**Server URL**" the URL or the IP Address of the NTP Server is defined;
- In the field "**Poll Time (seconds)**" the polling time for the time synchronization is defined.

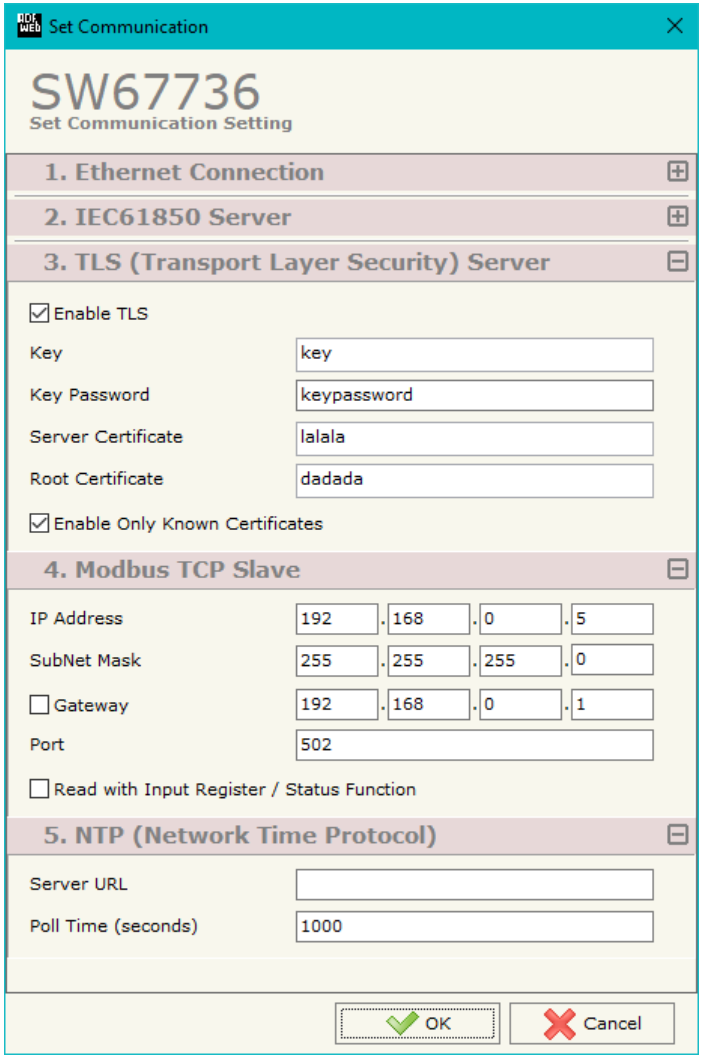


Figure 3b: "Set Communication" window

IEC 61850 ACCESS:

By Pressing the "**IEC 61850 Access**" button from the main window for SW67736 (Fig. 2) the window "Set Variables Access for IEC 61850" appears (Fig. 4).
This section is used to define the IEC 61850 variables from/to which take/map the data of Modbus TCP map.

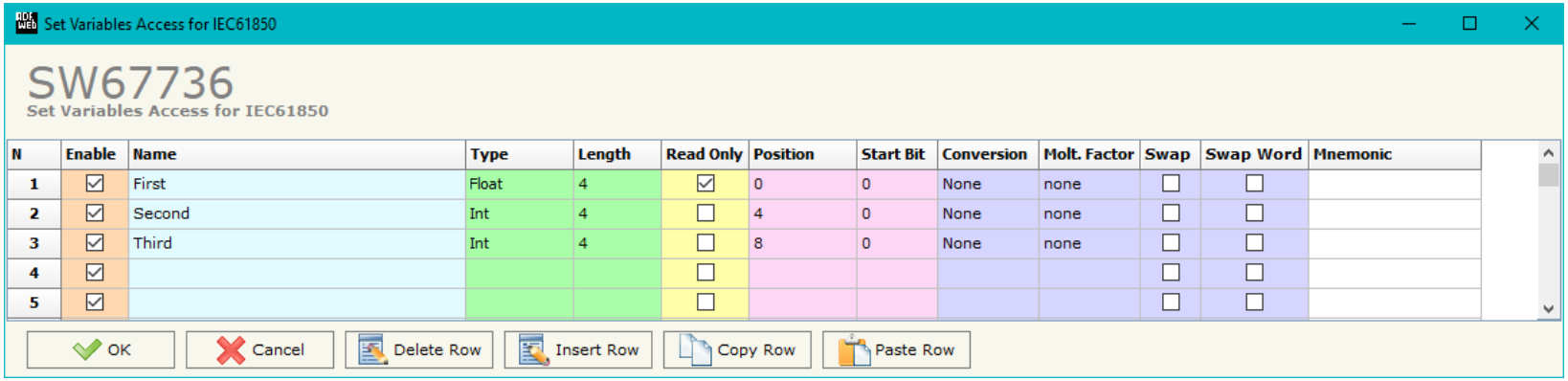


Figure 4: "IEC 61850 Access" window

The means of the fields are:

- If the field "**Enable**" is checked, the IEC 61850 variable is enabled;
- In the field "**Name**" the name of the IEC 61850 variable is defined;
- In the field "**Type**" the data format of the IEC 61850 variable is defined;
- In the field "**Length**" the length of the IEC 61850 variable is defined;
- If the field "**Read Only**" is checked, the IEC 61850 variable is just in reading. Otherwise, it is writeable too;
- In the field "**Position**" the starting byte of the internal memory arrays from/to which taking/mapping the data is defined;
- In the field "**Start Bit**" the starting bit of the byte of the field "Position" is defined;
- In the field "**Conversion**" the conversion of the data is defined. This option is used to convert the data format between Modbus and IEC 61850;
- In the field "**Molt. Factor**" a multiplicative factor of the value is defined;
- If the field "**Swap**" is checked, the bytes' order is swapped;
- If the field "**Swap Word**" is checked, the words' order is swapped;
- In the field "**Mnemonic**" a description of the variable is defined.

TLS KNOWN CERTIFICATE:

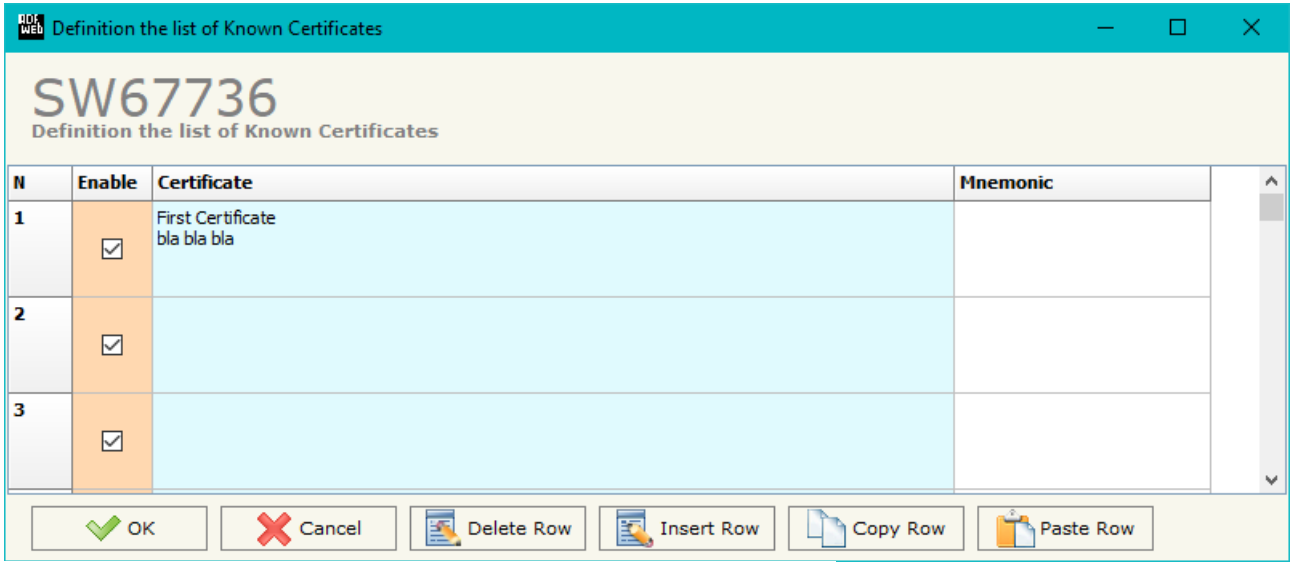


Figure 5: "TLS Known Certificate" window

By pressing the "**TLS Known Certificate**" button from the Main Window of SW67736 (Fig. 2) the "Definition the list of Known Certificates" window appears (Fig. 5).

The data of the columns have the following meanings:

- If the field "**Enable**" is checked, the TLS certificate is allowed;
- In the field "**Certificate**" the certificate of the Client is defined;
- In the field "**Mnemonic**" a description is defined.

UPDATE DEVICE:

By pressing the "**Update Device**" button, it is possible to load the created Configuration into the device; and also the Firmware, if necessary. This by using the Ethernet port.

If you don't know the actual IP address of the device you have to use this procedure:

- Turn OFF the Device;
- Put Dip1 of 'Dip-Switch A' in ON position;
- Turn ON the device
- Connect the Ethernet cable;
- Insert the IP "**192.168.2.205**";
- Select which operations you want to do;
- Press the "**Execute update firmware**" button to start the upload;
- When all the operations are "OK" turn OFF the Device;
- Put Dip1 of 'Dip-Switch A' in OFF position;
- Turn ON the device.

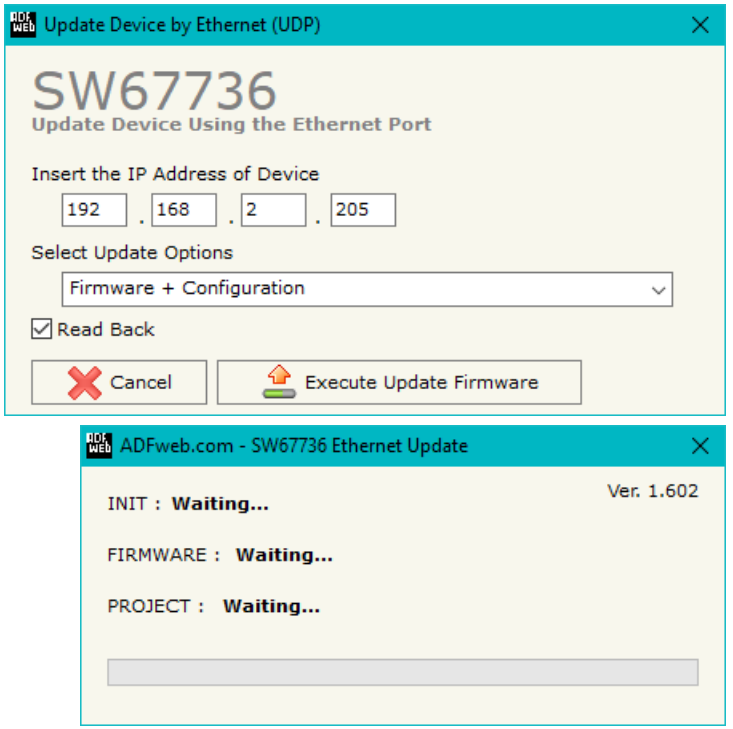


Figure 6: "Update device" windows

If you know the actual IP address of the device, you have to use this procedure:

- Turn ON the Device with the Ethernet cable inserted;
- Insert the actual IP of the Converter;
- Select which operations you want to do;
- Press the "**Execute update firmware**" button to start the upload;
- When all the operations are "OK" the device automatically goes at Normal Mode.

At this point the configuration/firmware on the device is correctly updated.

Note:
When you receive the device, for the first time, you also have to update the Firmware in the HD67736 device.

Warning:
If Fig. 7 appears when you try to do the Update try these points before seeking assistance:

- Try to repeat the operations for the updating;
- Try with another PC;
- Try to restart the PC;
- Check the LAN settings;
- If you are using the program inside a Virtual Machine, try to use in the main Operating System;
- If you are using Windows Seven, Vista, 8, 10 or 11 make sure that you have the administrator privileges;
- In case you have to program more than one device, using the "UDP Update", you have to cancel the ARP table every time you connect a new device on Ethernet. For do this you have to launch the "Command Prompt" and write the command "arp -d". Pay attention that with Windows Vista, Seven, 8, 10 or 11 you have to launch the "Command Prompt" with Administrator Rights;
- Pay attention at Firewall lock.

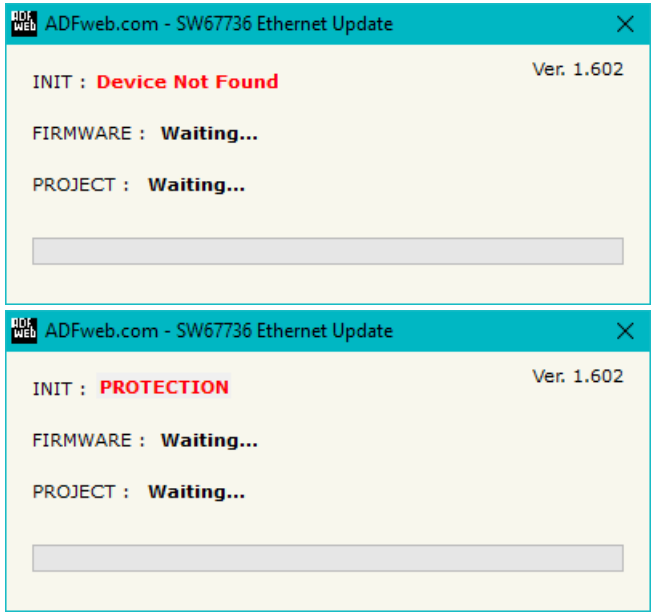


Figure 7: "Error" window

Warning:
In the case of HD67736 you have to use the software "SW67736": www.adfweb.com\download\filefold\SW67736.zip.

MODBUS MAP:

Data in reading:

Type	Address	Function	Description
Input Register	0	04	Input Bytes 0-1 of internal array (Position)
Input Register	1	04	Input Bytes 2-3 of internal array (Position)
Input Register	2	04	Input Bytes 4-5 of internal array (Position)
.			
Input Register	718	04	Input Bytes 1436-1437 of internal array (Position)

Data in writing:

Type	Address	Function	Description
Holding Register	0	R: 03 W: 06/16	Output Bytes 0-1 of internal array (Position)
Holding Register	1	R: 03 W: 06/16	Output Bytes 2-3 of internal array (Position)
Holding Register	2	R: 03 W: 06/16	Output Bytes 4-5 of internal array (Position)
.			
Holding Register	718	R: 03 W: 06/16	Output Bytes 1436-1437 of internal array (Position)

Note:

The data can be read/written as single bits too using Input/Coil Status (Function 02 and Functions 01/05/15).

MECHANICAL DIMENSIONS:

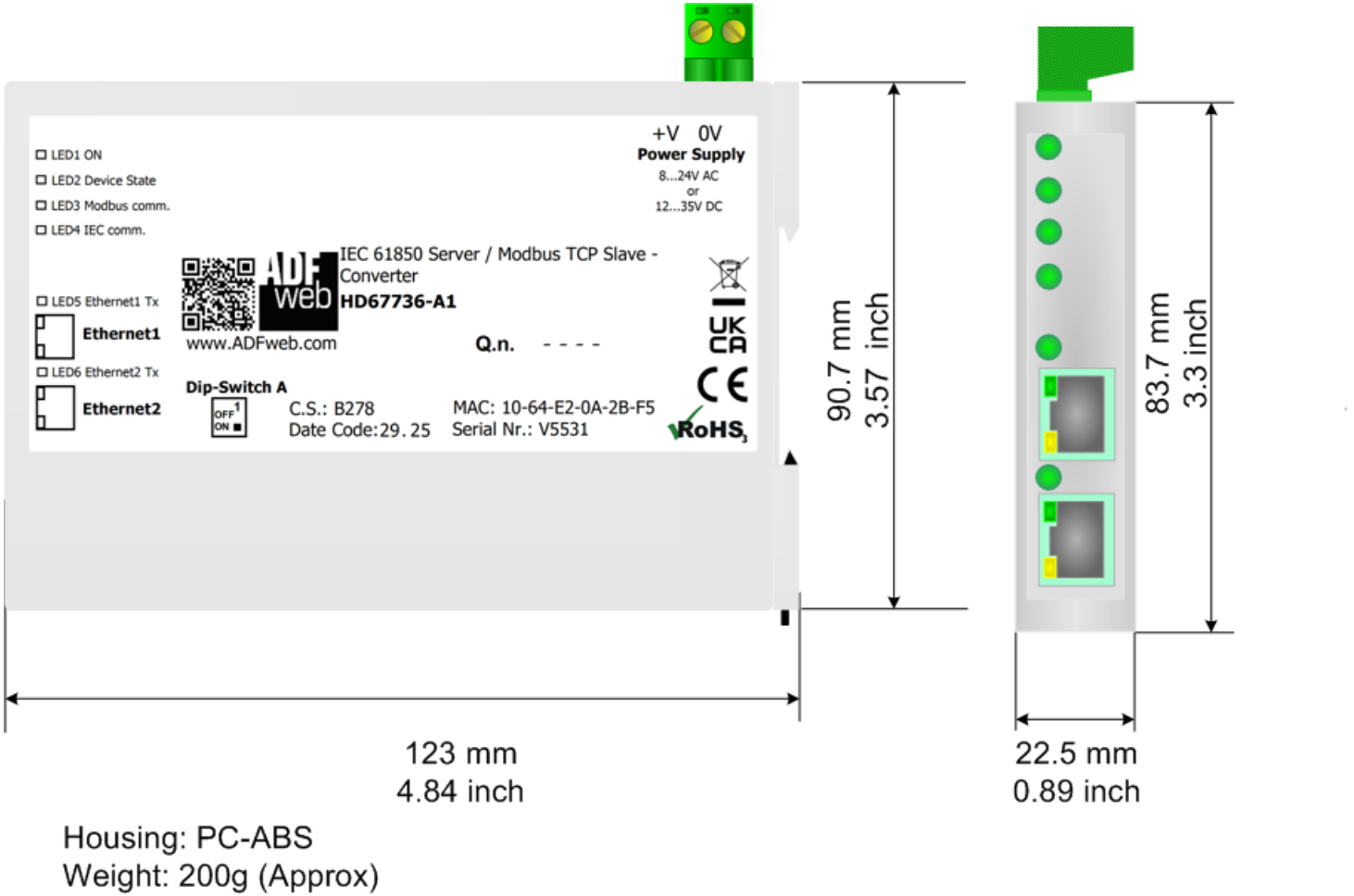


Figure 8: Mechanical dimensions scheme for HD67736-A1

ORDERING INFORMATIONS:

The ordering part number is formed by a valid combination of the following:

HD67736 – xx

Connectors Type
1: Removable 5mm Screw Terminal

Enclosure Type
A: 1M, 35mm DIN Rail mounting

Device Family
HD67736: IEC 61850 Server / Modbus TCP Slave - Converter

Order Code: **HD67736-A1** **-** IEC 61850 Server / Modbus TCP Slave - Converter

ACCESSORIES:

Order Code: **AC34011** **-** 35mm Rail DIN - Power Supply 220/240V AC 50/60Hz – 12 V DC

Order Code: **AC34012** **-** 35mm Rail DIN - Power Supply 220/240V AC 50/60Hz – 24 V DC

DISCLAIMER:

All technical content within this document can be modified without notice. The content of the document is a under continual renewal.
For losses due to fire, earthquake, third party access or other accidents, or intentional or accidental abuse, misuse, or use under abnormal conditions repairs are charged to the user. ADFweb.com S.r.l. will not be liable for accidental loss of use or inability to use this product, such as loss of business income. ADFweb.com S.r.l. shall not be liable for consequences of improper use.

OTHER REGULATIONS AND STANDARDS:

WEEE INFORMATION



Disposal of old electrical and electronic equipment (as in the European Union and other European countries with separate collection systems).

This symbol on the product or on its packaging indicates that this product may not be treated as household rubbish. Instead, it should be taken to an applicable collection point for the recycling of electrical and electronic equipment. If the product is disposed correctly, you will help prevent potential negative environmental factors and impact of human health, which could otherwise be caused by inappropriate disposal. The recycling of materials will help to conserve natural resources. For more information about recycling this product, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

RESTRICTION OF HAZARDOUS SUBSTANCES DIRECTIVE

The device respects the 2002/95/EC Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (commonly referred to as Restriction of Hazardous Substances Directive or RoHS).

CE MARKING

The product conforms with the essential requirements of the applicable EC directives.

WARRANTIES AND TECHNICAL SUPPORT:

For fast and easy technical support for your ADFweb.com SRL products, consult our internet support at www.adfweb.com.
Otherwise contact us at the address support@adfweb.com

RETURN POLICY:

If while using your product you have any problem and you wish to exchange or repair it, please do the following:

- Obtain a Product Return Number (PRN) from our internet support at www.adfweb.com. Together with the request, you need to provide detailed information about the problem.
- Send the product to the address provided with the PRN, having prepaid the shipping costs (shipment costs billed to us will not be accepted).

If the product is within the warranty of twelve months, it will be repaired or exchanged and returned within three weeks. If the product is no longer under warranty, you will receive a repair estimate.

ADFweb.com S.r.l.
Via Strada Nuova, 17
IT-31010 Mareno di Piave
TREVISO (Italy)
Phone +39.0438.30.91.31
Fax +39.0438.49.20.99
www.adfweb.com