

User Manual

Revision 1.000

English

EtherCAT / NMEA0183 - Converter

(Order Code: HD67E18-2-A1, HD67E18-5-A1)

For Website information:

www.adfweb.com?Product=HD67E18

For Price information:

www.adfweb.com?Price=HD67E18-2-A1

www.adfweb.com?Price=HD67E18-5-A1

Benefits and Main Features:

- ✦ Very easy to configure
- ✦ Triple Electrical isolation
- ✦ Temperature range: -40°C/+85°C (-40°F/+185°F)



For other EtherCAT Slave products see also the following link:

Converter EtherCAT Slave to

www.adfweb.com?Product=HD67E00
www.adfweb.com?Product=HD67E01
www.adfweb.com?Product=HD67E02
www.adfweb.com?Product=HD67E03
www.adfweb.com?Product=HD67E04
www.adfweb.com?Product=HD67E05
www.adfweb.com?Product=HD67E06
www.adfweb.com?Product=HD67E07
www.adfweb.com?Product=HD67E08
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www.adfweb.com?Product=HD67E26
www.adfweb.com?Product=HD67E27
www.adfweb.com?Product=HD67E28
www.adfweb.com?Product=HD67879

(Serial)
(Modbus Master)
(Modbus Slave)
(Modbus TCP Master)
(Modbus TCP Slave)
(BACnet Master)
(BACnet Slave)
(CAN)
(CANopen)
(DeviceNet Master)
(DeviceNet Slave)
(DMX)
(Ethernet)
(IEC61850 Client)
(IEC61850 Server)
(J1939)
(MQTT)
(NMEA2000)
(OPC UA Client)
(OPC UA Server)
(PROFINET Master)
(PROFINET Slave)
(SNMP Manager)
(SNMP Agent)
(EtherNet/IP Master)
(EtherNet/IP Slave)
(S7comm Client)
(IO-Link Master)



User Manual

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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 | 20/02/2023 | Ln | All | First Release |
| | | | | |
| | | | | |
| | | | | |

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:

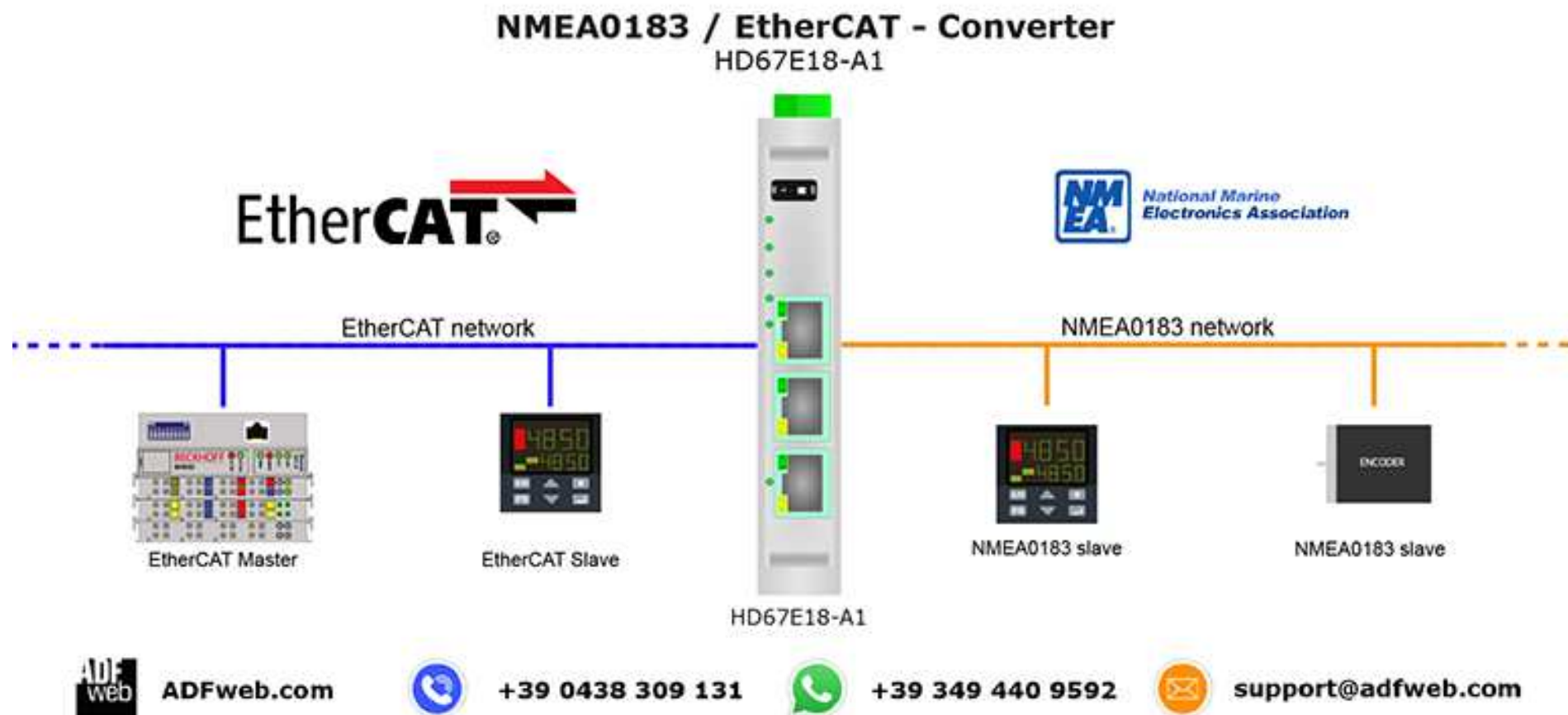


This symbol indicates that non-observance of the safety instructions is a danger for people that could lead to serious injury or death and / or the possibility of damage.

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:



CONNECTION SCHEME:

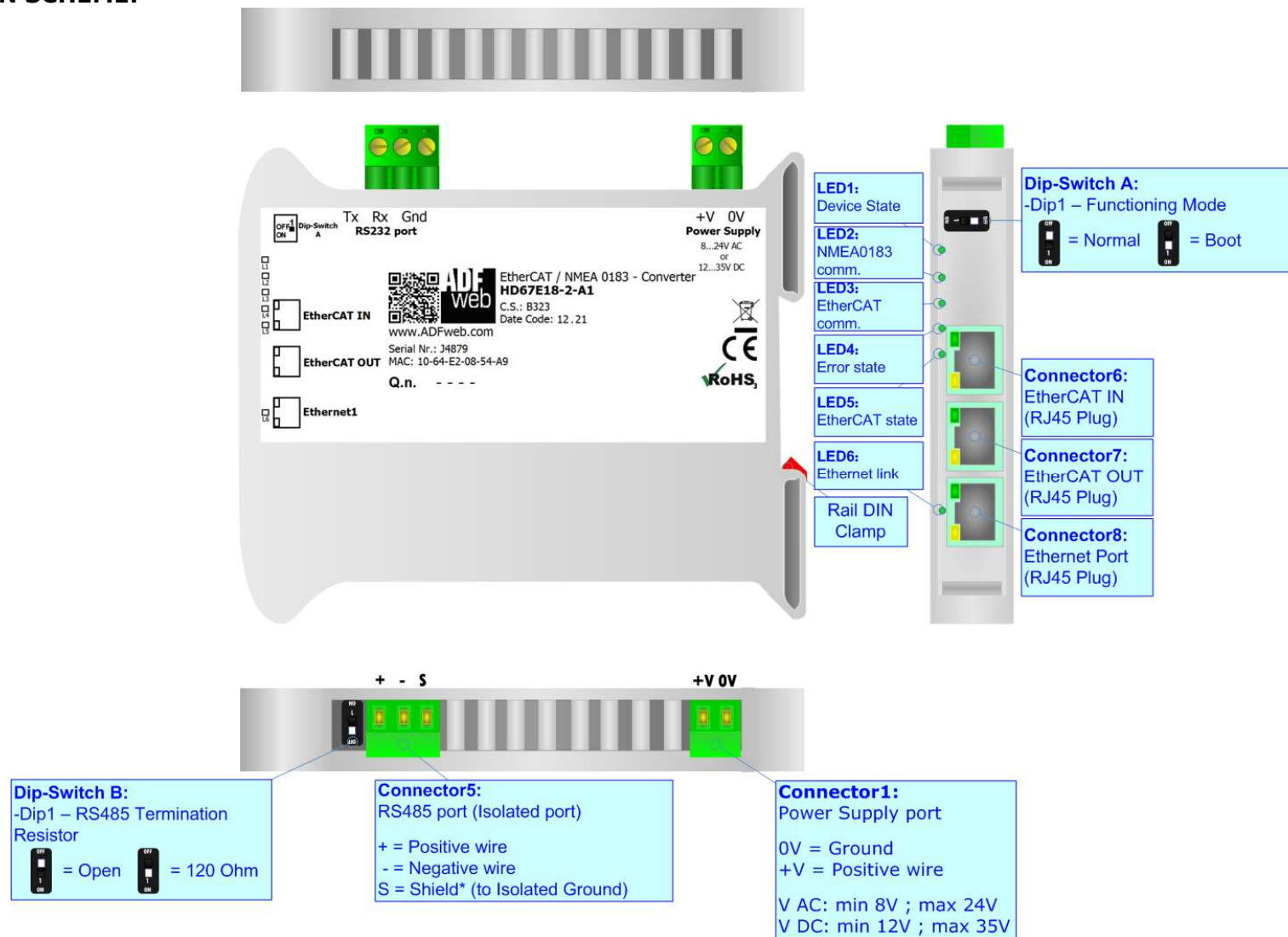


Figure 1a: Connection scheme for HD67E18-2-A1

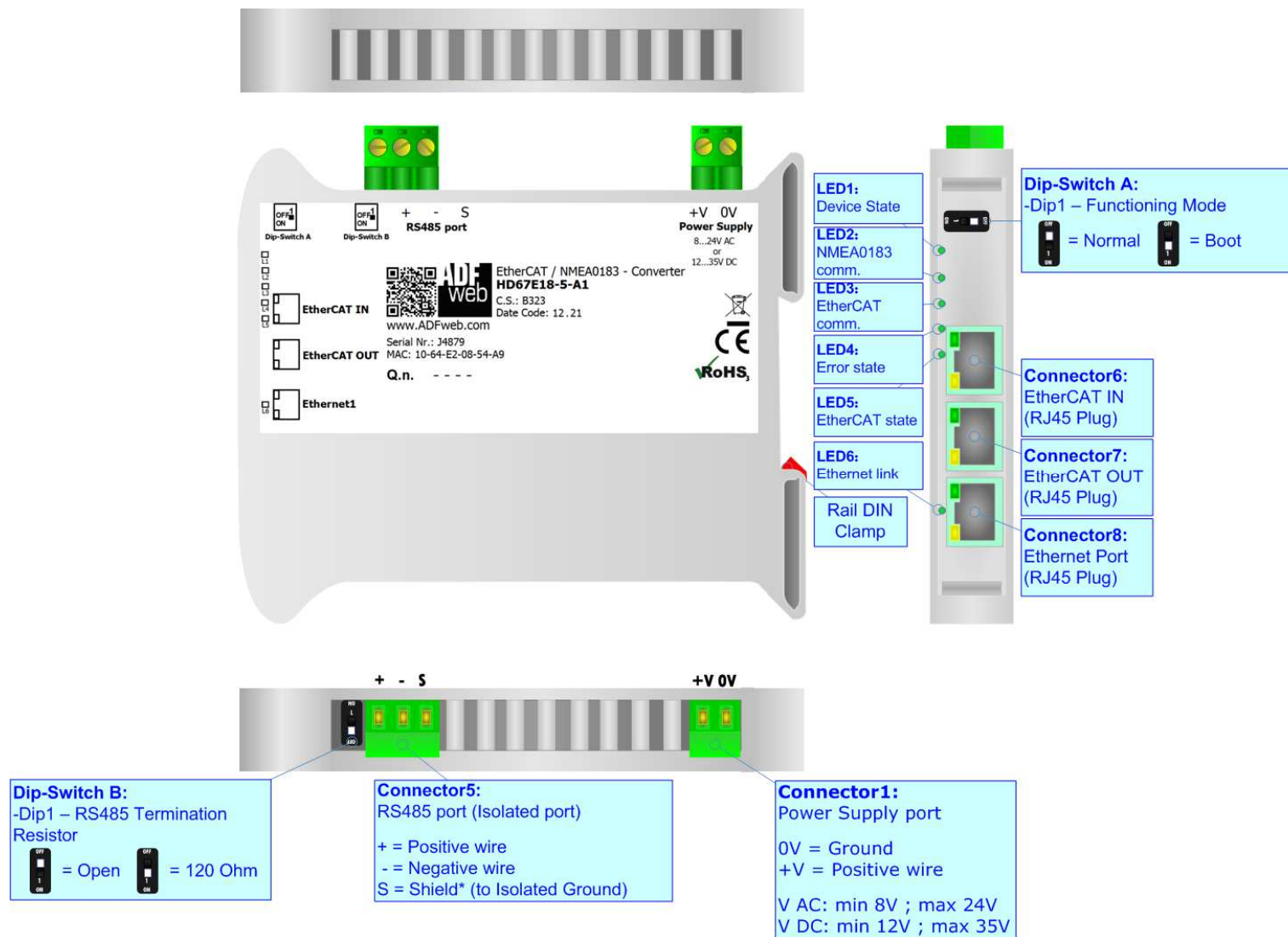


Figure 1b: Connection scheme for HD67E18-5-A1

CHARACTERISTICS:

The HD67E18-x-A1 are EtherCAT / NMEA0183 - Converters.

It allows for the following characteristics:

- Isolation between EtherCAT – NMEA0183 – Power Supply;
- Two-directional information between EtherCAT bus and NMEA0183 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 SW67E18 software on your PC in order to perform the following:

- Define the parameters of EtherCAT line;
- Define the parameters of NMEA0183 line;
- Define EtherCAT variables to read and write;
- Define the list of NMEA 0183 sentences to receive;
- Export the ESI file for configuration of EtherCAT Master;
- 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 |

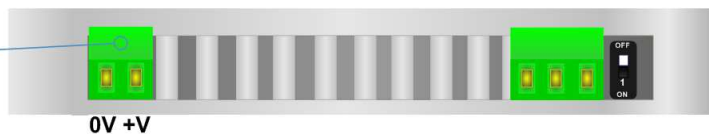
Consumption at 24V DC:

| Device | Consumption [W/VA] |
|--------------|--------------------|
| HD67E18-x-A1 | 3.5 |

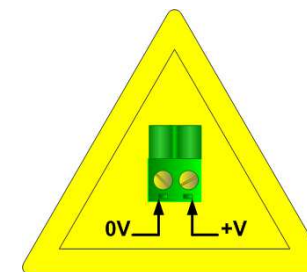
Connector1:
Power Supply port

0V = Ground
+V = Positive wire

V AC: min 8V ; max 24V
V DC: min 12V ; max 35V



Caution: Do not reverse the polarity power



HD67E18-x-A1

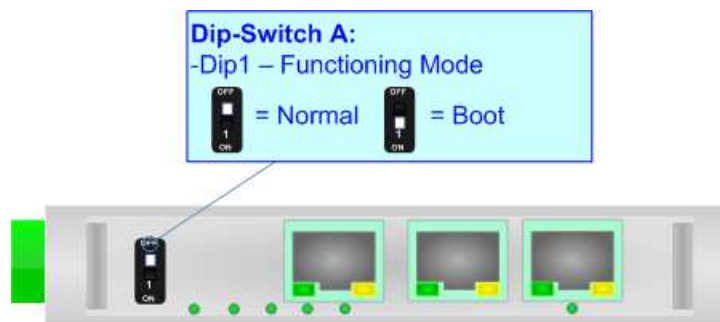
FUNCTION MODES:

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.

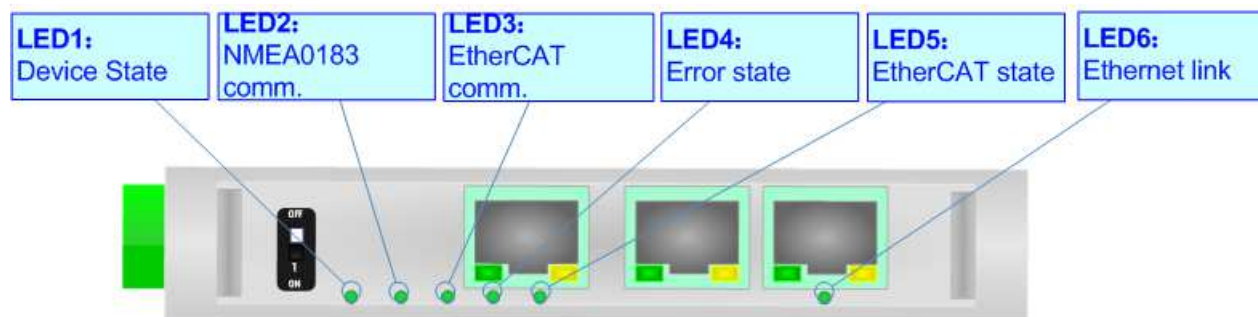
According to the functioning mode, the LEDs will have specific functions, see 'LEDS' section.



LEDS:

The device has got seven 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: Device State (green) | Blinks slowly ($\sim 1\text{Hz}$) | Blinks quickly: Boot state Blinks very slowly ($\sim 0.5\text{Hz}$): update in progress |
| 2: NMEA0183 comm. (green) | It blinks when a NMEA0183 message is received | Blinks quickly: Boot state Blinks very slowly ($\sim 0.5\text{Hz}$): update in progress |
| 3: EtherCAT comm. (green) | It blinks when EtherCAT communication is running | Blinks quickly: Boot state Blinks very slowly ($\sim 0.5\text{Hz}$): update in progress |
| 4: Error state (green) | ON: An error in the communication busses occurs OFF: No errors are present | Blinks quickly: Boot state Blinks very slowly ($\sim 0.5\text{Hz}$): update in progress |
| 5: EtherCAT state (green) | OFF: EtherCAT Master not connected Blinking: EtherCAT Master is connecting ON: EtherCAT Master is connected | Blinks quickly: Boot state Blinks very slowly ($\sim 0.5\text{Hz}$): update in progress |
| 6: Ethernet1 link (green) | ON: Ethernet cable connected OFF: Ethernet cable disconnected | ON: Ethernet cable connected OFF: Ethernet cable disconnected |

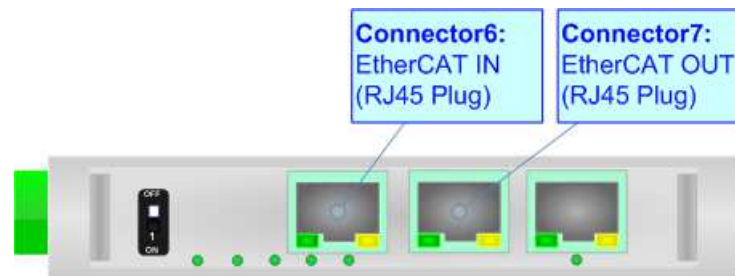


ETHERCAT

EtherCAT (Ethernet for Control Automation Technology) is an Ethernet-based fieldbus system, invented by Beckhoff Automation.

The protocol is standardized in IEC 61158 and is suitable for both hard and soft real-time computing requirements in automation technology. With EtherCAT, the standard Ethernet packet or frame (according to IEEE 802.3) is no longer received, interpreted, and copied as process data at every node. The EtherCAT slave devices read the data addressed to them while the telegram passes through the device, processing data "on the fly". In other words, real-time data and messages are prioritized over more general, less time-sensitive or heavy load data.

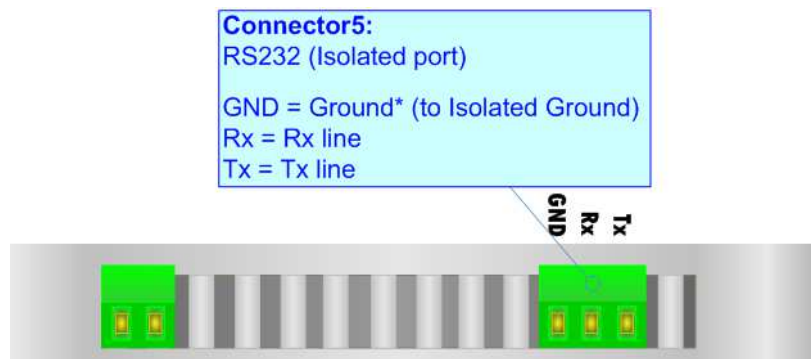
The converter has two EtherCAT ports, one is used as Input port (Connector6) and it will receive the incoming messages from the Master, the other is used as Output port (Connector7) and it will forward the messages to the others nodes of the network.



RS232:

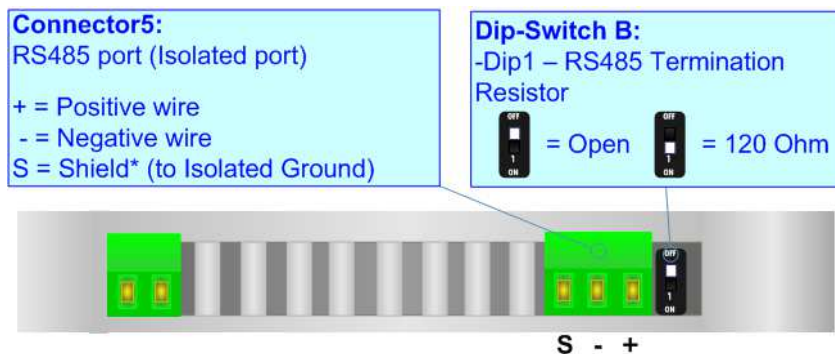
The connection from RS232 socket to a serial port (example one from a personal computer) must be made with a NULL MODEM cable (a serial cable where the pins 2 and 3 are crossed).

It is recommended that the RS232 cable not exceed 15 meters.



RS485:

For terminate the RS485 line with a 120Ω resistor it is necessary to put ON dip 1, like in figure.



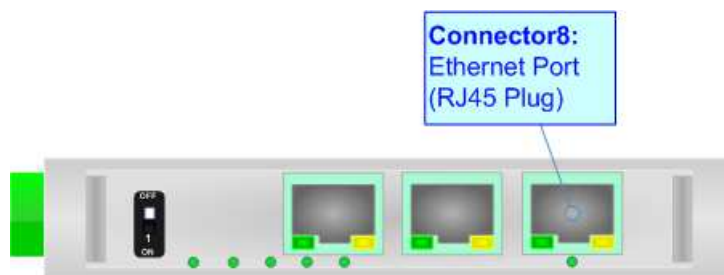
The maximum length of the cable should be 1200m (4000 feet).

Here some codes of cables:

- Belden: p/n 8132 - 2x 28AWG stranded twisted pairs conductor + foil shield + braid shield;
- Belden p/n 82842 - 2x 24AWG stranded twisted pairs conductor + foil shield + braid shield;
- Tasker: p/n C521 - 1x 24AWG twisted pair conductor + foil shield + braid shield;
- Tasker: p/n C522 - 2x 24AWG twisted pairs conductor + foil shield + braid shield.

ETHERNET:

The updating of the converter must be made using Connector8 of the HD67E18-x-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 SW67E18:

To configure the Converter, use the available software that runs with Windows called SW67E18. 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, 11; 32/64bit).

When launching the SW67E18, the window below appears (Fig. 2).



Note:

It is necessary to have installed .Net Framework 4.

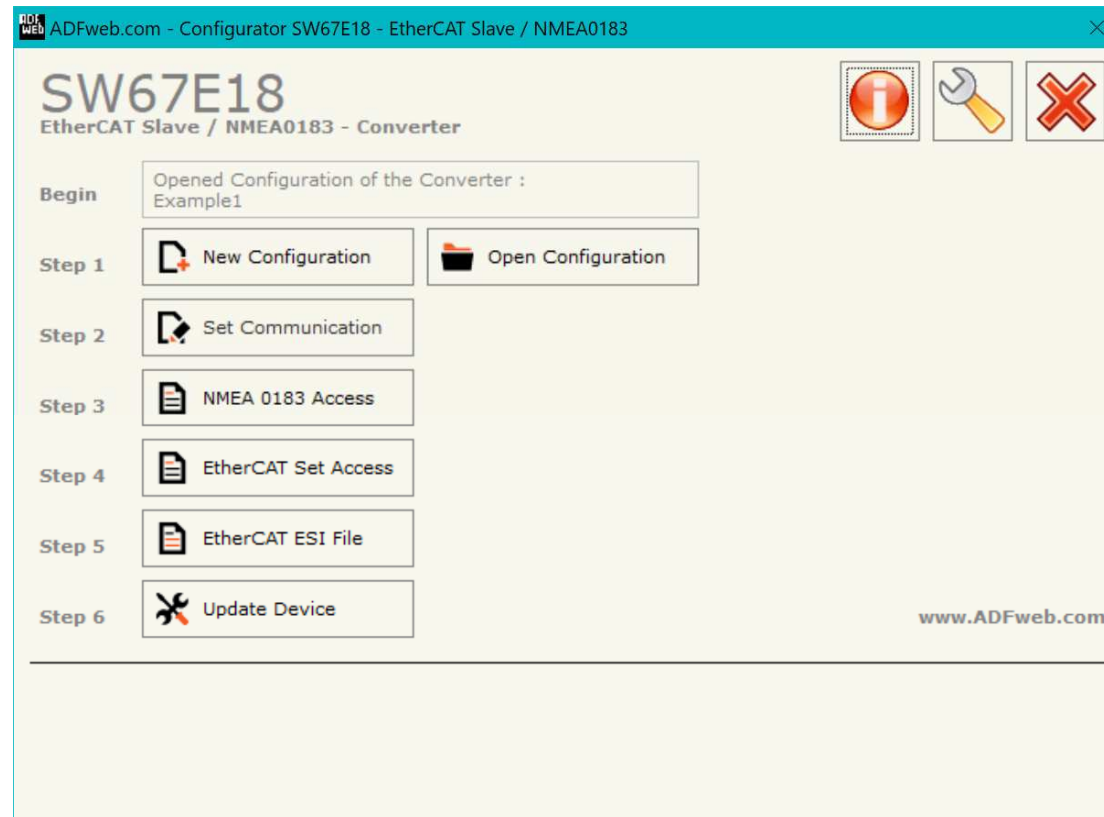
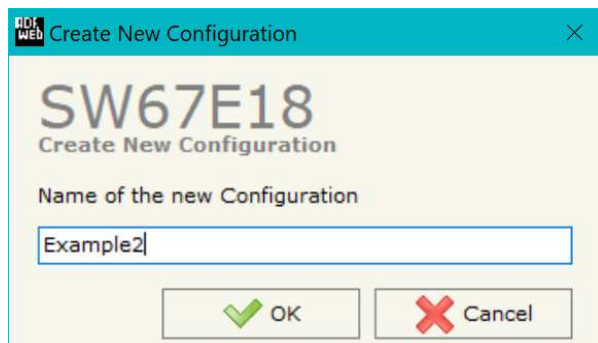


Figure 2: Main window for SW67E18

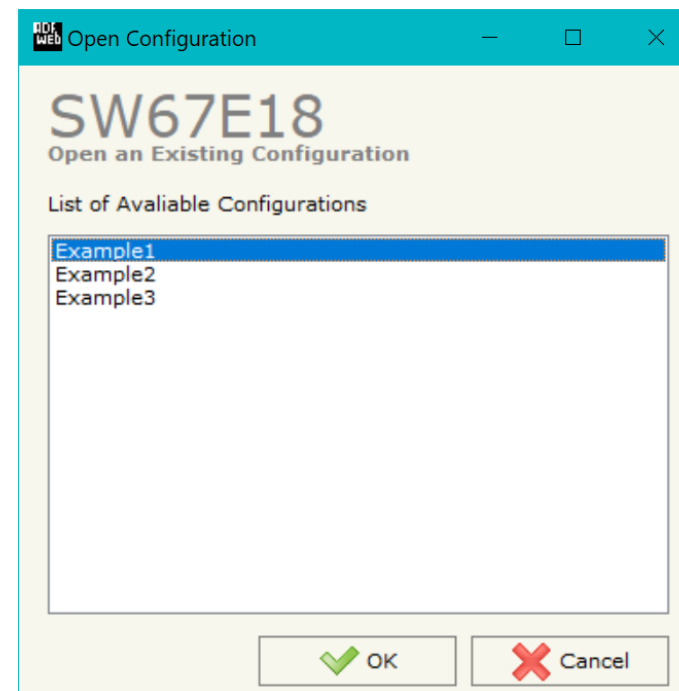
NEW CONFIGURATION / OPEN CONFIGURATION:

The “**New Configuration**” button creates the folder which contains the entire device’s configuration.




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

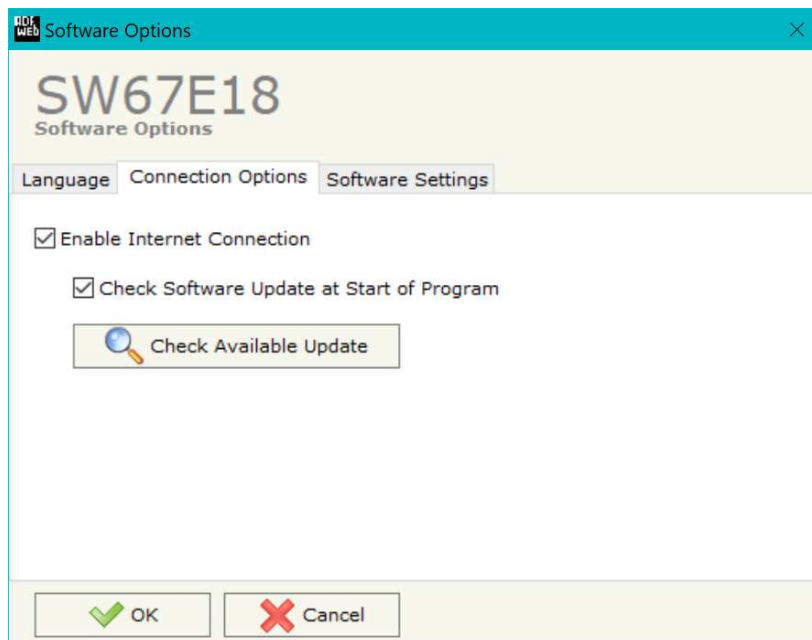
- To clone the configurations of a programmable “EtherCAT Slave / NMEA0183 - Converter” in order to configure another device in the same manner, it is necessary to maintain the folder and all its contents;
- To clone a project in order to obtain a different version of the project, it is sufficient to duplicate the project folder with another name and open the new folder with the button “**Open Configuration**”.



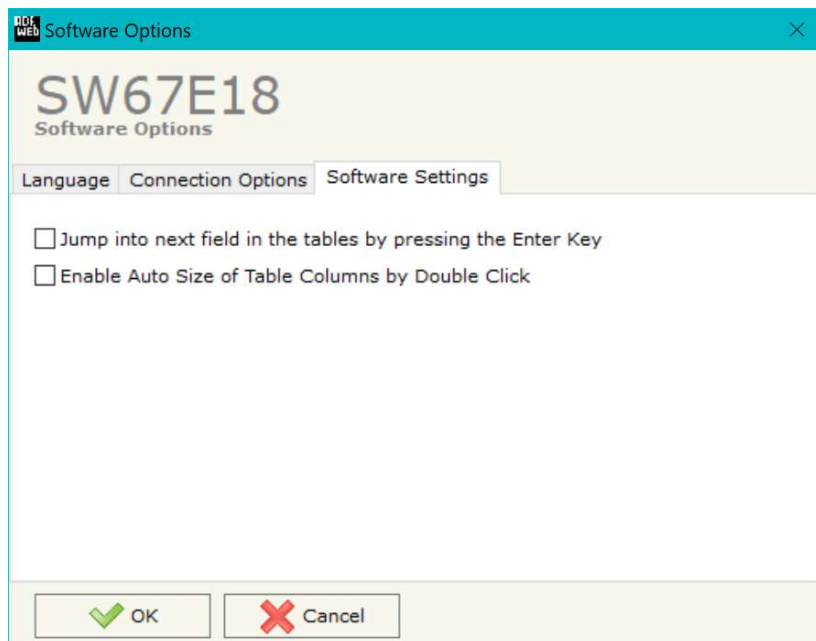
SOFTWARE OPTIONS:

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 SW67E18 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, EtherCAT and Modbus.

By Pressing the "**Set Communication**" button from the main window for SW67E18 (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 "EtherCAT Slave" are:

- In the field "**Revision Number**" the revision number of the converter is defined;
- In the field "**Slave Name**" the name of the converter is defined;
- In the field "**Node Address**" the ID of the converter is defined.

The means of the fields for "Ethernet" are:

- In the fields "**IP Address**" the IP address for Ethernet side of the converter is defined;
- In the fields "**SubNet Mask**" the SubNet Mask for Ethernet side of the converter is defined;
- In the fields "**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;

The screenshot shows the 'Set Communication' window for device SW67E18. The window has a title bar with the ADFweb logo and a close button. The main content area is divided into four sections, each with a tab icon on the right:

- 1. Ethernet Connection:** Contains a text field for 'Device Name (Hostname)', two checkboxes for 'Obtain an IP Address Automatically (DHCP for Cable Connection)' and 'Obtain an IP Address Automatically (DHCP for Wi-Fi Connection)', a checkbox for 'Enable DNS', and two rows of IP address fields for 'Primary DNS' and 'Secondary DNS'.
- 2. EtherCAT Slave:** Contains three text fields: 'Revision Number' (value: 3), 'Slave Name' (value: devicename1), and 'Node Address' (value: 1).
- 3. Ethernet:** Contains three rows of IP address fields for 'IP Address' (192.168.0.10), 'SubNet Mask' (255.255.255.0), and 'Gateway' (192.168.0.1). There is a checkbox next to the 'Gateway' label.
- 4. Serial:** Contains three dropdown menus: 'Baudrate' (4800), 'Parity' (NONE), and 'Stop Bits' (1 bit).

At the bottom right of the window are two buttons: 'OK' with a green checkmark icon and 'Cancel' with a red X icon.

Figure 3: "Set Communication" window

The means of the fields for "Serial" are:

- In the field "**Baudrate**" the baudrate for the serial line is defined;
- In the field "**Parity**" the parity of the serial line is defined;
- In the field "**Stop Bits**" the number of Stop Bits of the serial line is defined.

NMEA 0183 ACCESS:

By pressing the “**NMEA 0183 Access**” button from the main window for SW67948 (Fig. 2) the “Definition of NMEA 0183 Sentences” window appears (Fig. 4).

The NMEA 0183 sentences inserted in this table contain the output data of MQTT. These sentences are accepted by the converter.

| N | Enable | Sentence | Index | Data Field | Post Ope | Swap All | Swap 16 | Position | Mnemonic |
|---|-------------------------------------|----------|-------|----------------|----------|--------------------------|--------------------------|----------|----------|
| 1 | <input checked="" type="checkbox"/> | ZDA | | hour [decimal] | None | <input type="checkbox"/> | <input type="checkbox"/> | 0 | |
| 2 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |
| 3 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |
| 4 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |
| 5 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |
| 6 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |
| 7 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |
| 8 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |
| 9 | <input checked="" type="checkbox"/> | | | | | <input type="checkbox"/> | <input type="checkbox"/> | | |

Figure 4: “Definition of NMEA 0183 Sentences” window

The data of the columns have the following meanings:

- If the field “**Enable**” is checked, the NMEA 0183 sentence is enabled;
- In the field “**Sentence**” the NMEA 0183 sentence is defined;
- In the field “**Index**” the Index of the NMEA 0183 sentence is defined;
- In the field “**Data Field**” the parameter of the selected sentence to map on EtherCAT side is defined;
- In the field “**Post operation**” the post operation on the data received is defined;
- If the field “**Swap All**” is checked, the bytes order on EtherCAT side will be reversed;
- If the field “**Swap 16**” is checked, a swap by word will be applied;
- In the field “**Position**” the byte of the memory array where mapping the data is defined;
- In the field “**Mnemonic**” a brief description is defined.

ETHERCAT SET ACCESS:

By Pressing the “**EtherCAT Set Access**” button from the main window for SW67E18 (Fig. 2) the window “EtherCAT Slave Set Access” appears (Fig. 5).

This section is used to define the EtherCAT variables readable by the EtherCAT Master (Slave To Master) and the EtherCAT variables writeable by the EtherCAT Master (Master To Slave).

SLAVE TO MASTER

| N | Enable | Type | Length | Name | Init Value | Position | Start Bit | Mnemonic |
|---|-------------------------------------|--------|--------|-------|------------|----------|-----------|----------|
| 1 | <input checked="" type="checkbox"/> | Int16 | 2 | test1 | 0 | 0 | 0 | Test1 |
| 2 | <input checked="" type="checkbox"/> | UInt32 | 4 | test2 | 0 | 2 | 0 | Test2 |
| 3 | <input checked="" type="checkbox"/> | | | | | | | |
| 4 | <input checked="" type="checkbox"/> | | | | | | | |
| 5 | <input checked="" type="checkbox"/> | | | | | | | |
| 6 | <input checked="" type="checkbox"/> | | | | | | | |
| 7 | <input checked="" type="checkbox"/> | | | | | | | |
| 8 | <input checked="" type="checkbox"/> | | | | | | | |

Figure 5: “EtherCAT Slave Set Access → Slave To Master” window

The means of the fields are:

- If the field “**Enable**” is checked, the EtherCAT variable is enabled;
- In the field “**Type**” the data format of the EtherCAT variable is defined;
- In the field “**Length**” the dimension of the EtherCAT variable is defined;
- In the field “**Name**” the name of the EtherCAT variable is defined;
- In the field “**Init Value**” the default value of the EtherCAT variable is defined;
- In the field “**Position**” the starting address of the EtherCAT array where the variable is mapped is defined;
- In the field “**Start Bit**” the starting bit of the selected Position where the variable is mapped is defined;
- In the field “**Mnemonic**” a description of the variable is defined.

ETHERCAT ESI FILE:

By pressing the “**EtherCAT ESI File**” button it is possible to save the ESI file for the EtherCAT side of the converter.
The ESI file is used to configure the EtherCAT Master.

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.

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.

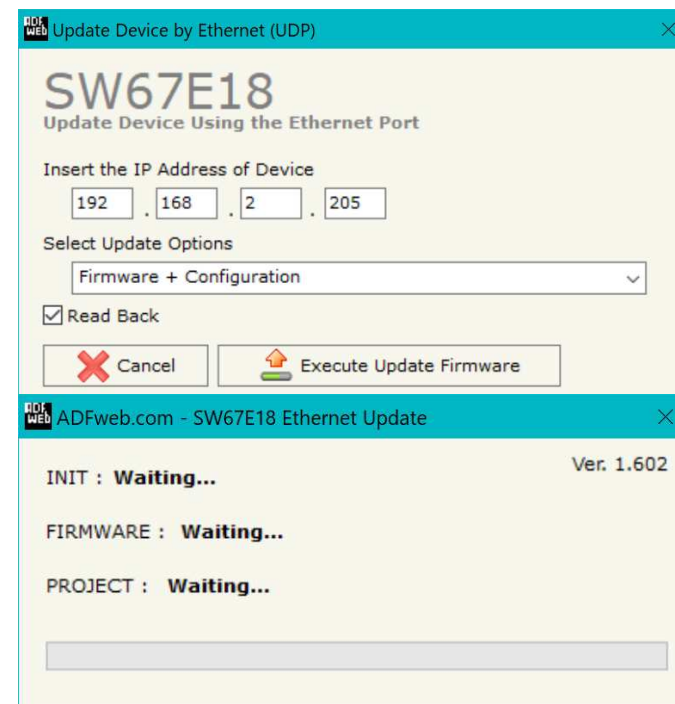


Figure 6: "Update device" windows



Note:

When you receive the device, for the first time, you also have to update the Firmware in the HD67E18 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 or 10,11 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, 11 you have to launch the "Command Prompt" with Administrator Rights;
- Pay attention at Firewall lock.

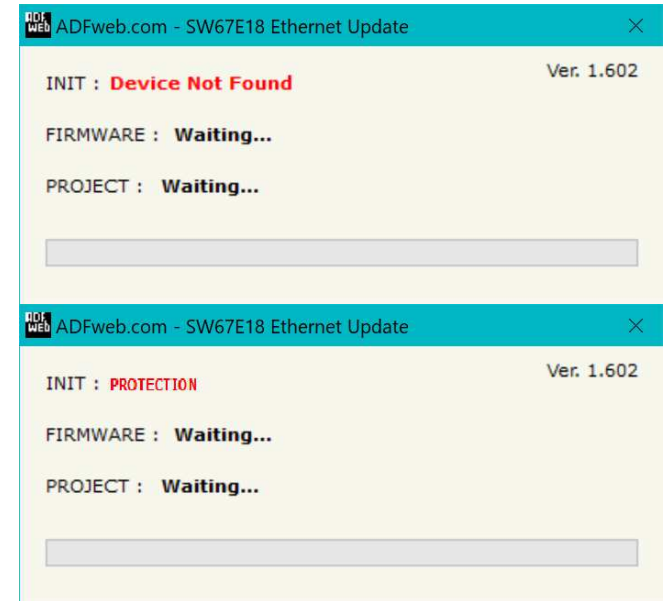


Figure 7: "Error" window



Warning:

In the case of HD67E18 you have to use the software "HD67E18": www.adfweb.com/download/filefold/SW67E18.zip.

MECHANICAL DIMENSIONS:

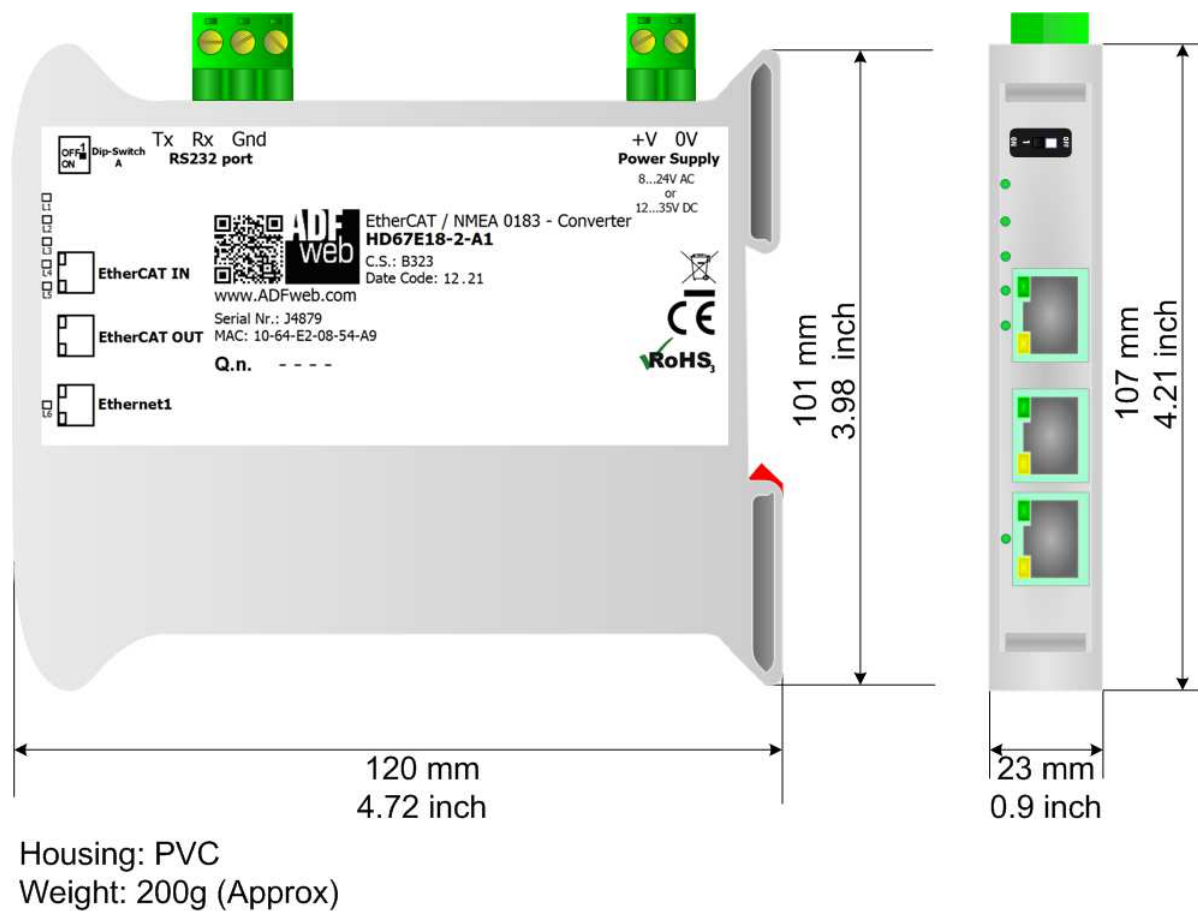


Figure 8a: Mechanical dimensions scheme for HD67E18-2-A1

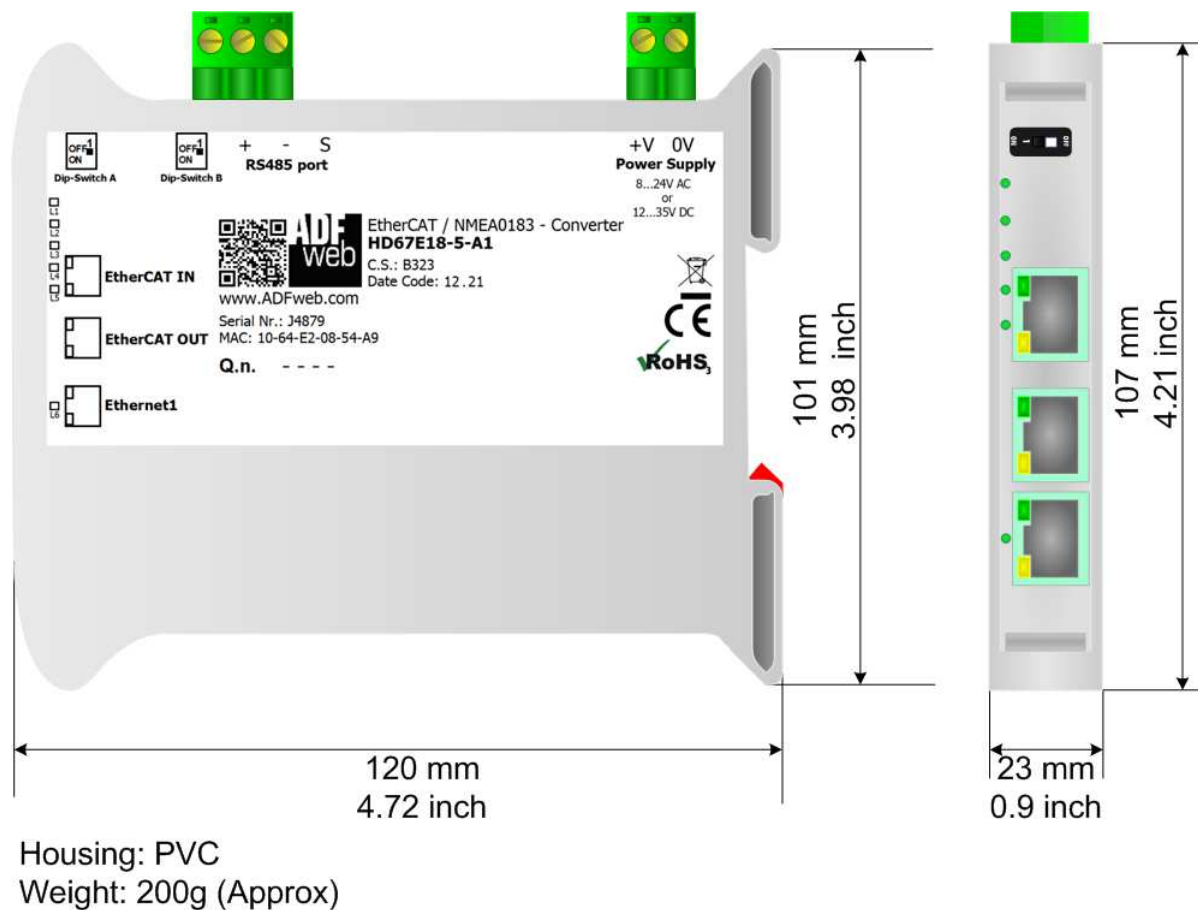
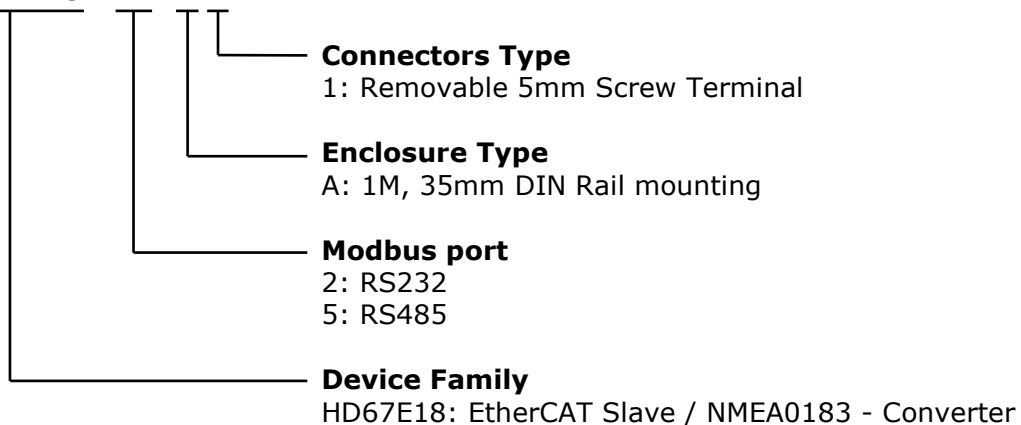


Figure 8b: Mechanical dimensions scheme for HD67E18-5-A1

ORDERING INFORMATION:

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

HD67E18 - x - xx



Order Code: **HD67E18-2-A1** - EtherCAT Slave / NMEA0183 – Converter (RS232)

Order Code: **HD67E18-5-A1** - EtherCAT Slave / NMEA0183 – Converter (RS485)

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.



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