

User Manual

Revision 1.000
English

NMEA 2000 / Modbus Slave – Converter

(Order Code: HD67452)

For Website information:

www.adfweb.com?Product=HD67452

For Price information:

www.adfweb.com?Price=HD67452

Benefits and Main Features:

- ✦ Very easy to configure
- ✦ Wide supply input range
- ✦ Electrical isolation
- ✦ Industrial temperature range:
- ✦ -40°C / 105°C (-40°F / 221°F)



User Manual



For other Gateways / Bridges:

CAN from/to Modbus

See also the following links:

www.adfweb.com?product=HD67012 (Modbus RTU Slave)
www.adfweb.com?product=HD67514 (Modbus TCP Master)
www.adfweb.com?product=HD67515 (Modbus TCP Slave)

CANopen from/to Modbus

See also the following links:

www.adfweb.com?product=HD67001 (Modbus RTU Master)
www.adfweb.com?product=HD67502 (Modbus RTU Slave)
www.adfweb.com?product=HD67504 (Modbus TCP Master)
www.adfweb.com?product=HD67505 (Modbus TCP Slave)

Do you have an your customer protocol?

See the following links:

www.adfweb.com?Product=HD67003

Do you need to choose a device? do you want help?

Ask it to the following link:

www.adfweb.com?Cmd=helpme

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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	15/06/2017	Ff	All	First release version

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:

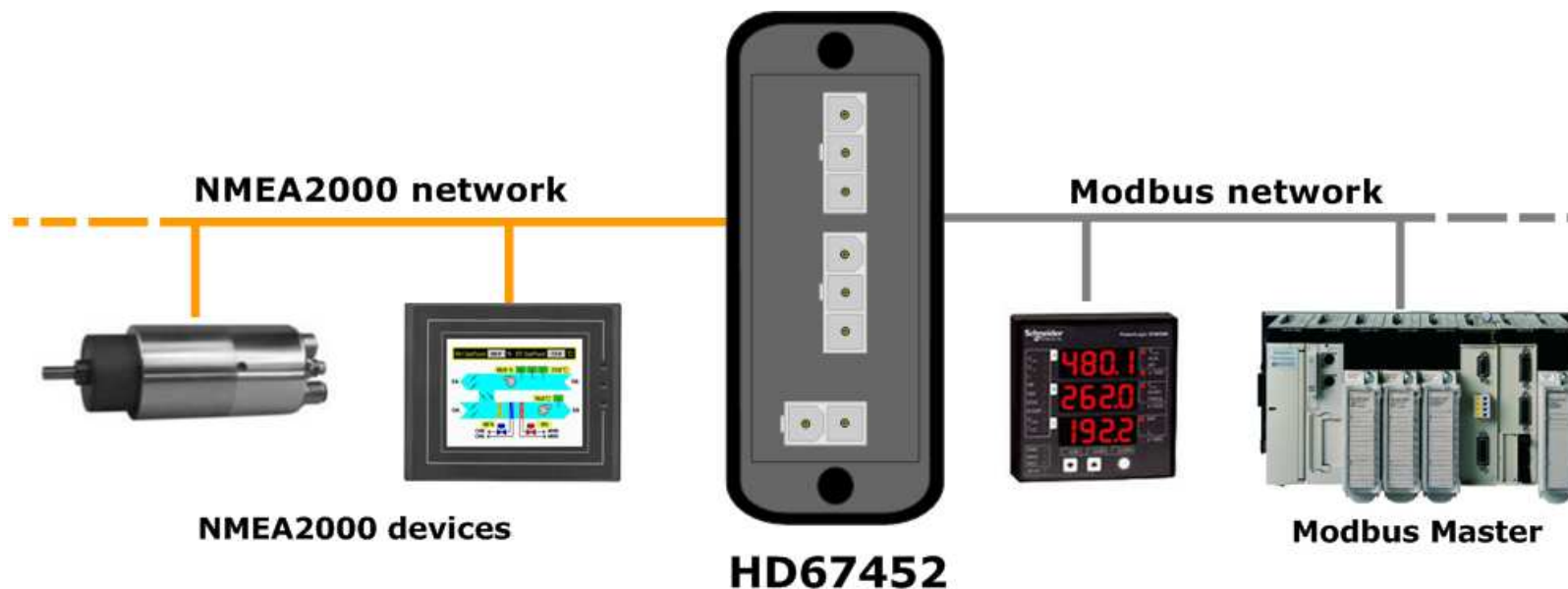


This symbol indicates that non-observance of the safety instructions is a danger for people that could lead to serious injury or death and / or the possibility of damage.

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 HD67452-E4x-xxx

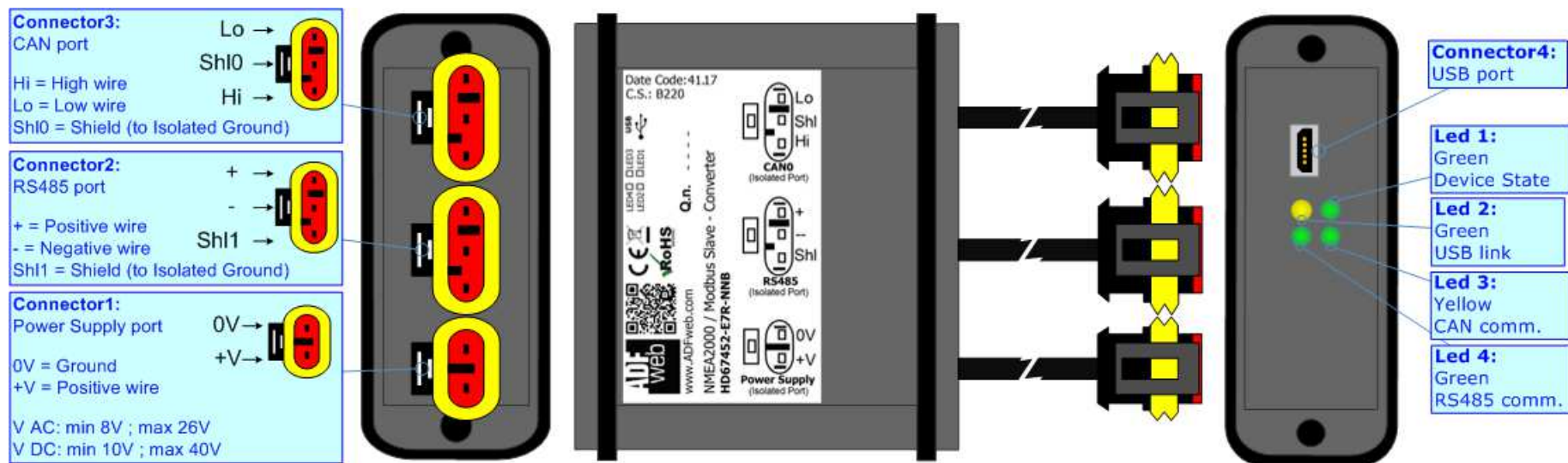


Figure 1b: Connection scheme for HD67452-E7x-xxx

CHARACTERISTICS:

The "HD67452" series are rugged devices used to interface NMEA 2000 devices with Modbus Master.

With his particular enclosure, equipped with four fixing lugs, makes available the mounting of the device in any plane surface (horizontal, vertical, oblique).

It is possible to have the device varnished or totally resined and also in both cases with "Mini-Fit®" connectors or "AMP SuperSeal 1.5" connectors. If is resined, the enclosure, like the "AMP SuperSeal 1.5" connectors, is waterproof.

All the four series have these characteristics:

- Triple 4kV isolation between Power Supply / RS485 / CAN;
- Varnished / Resined (optionally);
- Wide power supply input range: 8...26V AC | 10...40V DC;
- Mini-Fit® / AMP SuperSeal 1.5 connectors;
- Metal enclosure with fixing lugs;
- Possibility to use Metal hose clamps for fixing it without using lugs;
- Microprocessor for data control;
- Wide temperature range: -40°C / 105°C (-40°F / 221°F).

CONFIGURATION:

You need Compositor SW67452 software on your PC in order to perform the following:

- Define the NMEA 2000 frames received by the converter;
- Define the NMEA 2000 frames transmitted by the converter;
- Define the Modbus registers readable by the Master;
- Define the Modbus registers writeable by the Master;
- Update the device.

POWER SUPPLY:

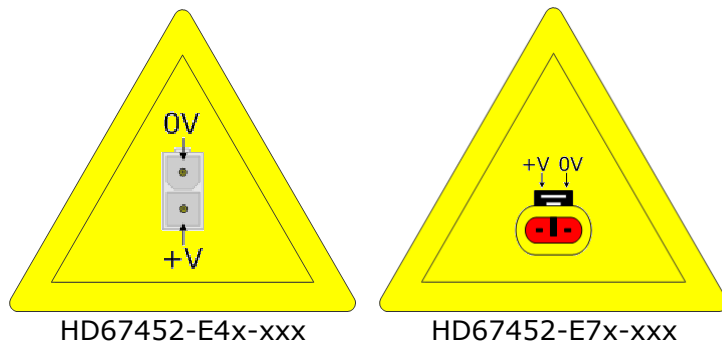
The devices can be powered between a wide range of tensions. For more details see the two tables below.

	VAC		VDC	
	Vmin	Vmax	Vmin	Vmax
HD67452-Exx-xxx	8V	26V	10V	40V

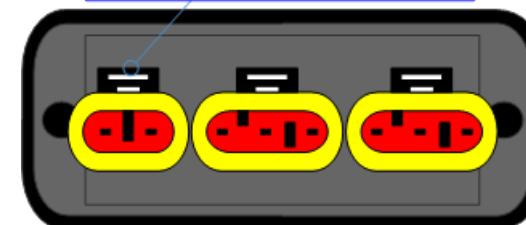
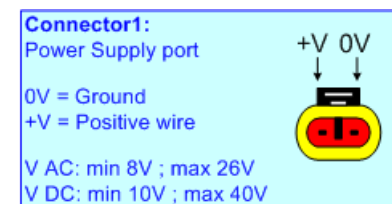
Consumption at 24V DC:

Device	W/VA
HD67452-Exx-xxx	4

Caution: Not reverse the polarity power



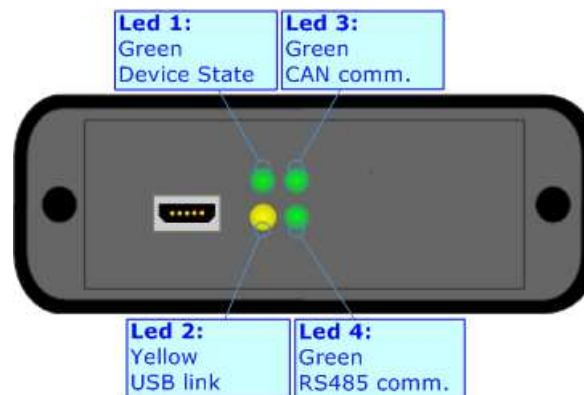
Note: It is possible to use also negative tensions. In this case the polarity must be inverted.



LEDS:

The device has got four LEDs that are used to give information of 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 (~1Hz)	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress
2: USB link (yellow)	ON: USB cable inserted OFF: USB cable not inserted	ON: USB cable inserted OFF: USB cable not inserted
3: CAN Communication (green)	Blinks when NMEA 2000 frames are received	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress
4: RS485 communication (green)	Blinks when a Modbus request is received	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress



RS485:

The connection of the RS485 in the HD67452-E4x-xxx device must be made with a 3way MiniFit Female connector. The pinout of Male MiniFit connector of the board is at right side of the page.

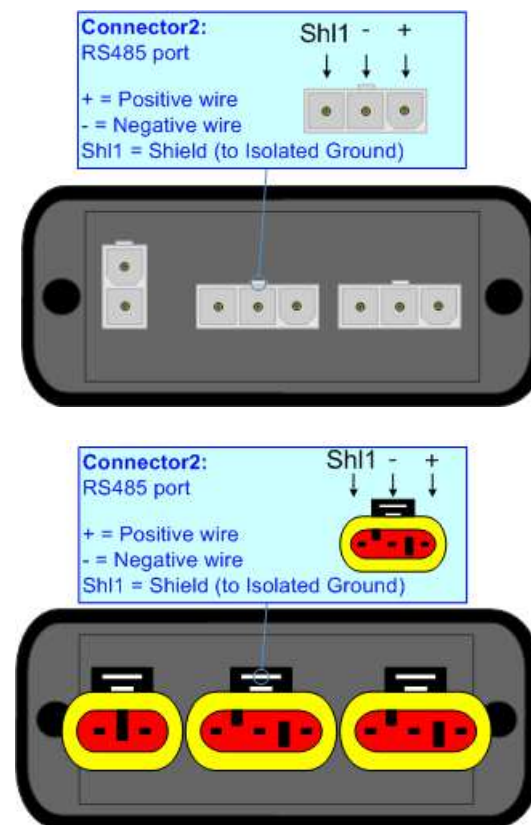
The connection of the RS485 in the HD67452-E7x-xxx device must be made with a AMP SuperSeal 1.5 Male connector. The pinout of Female connector of the board is at right side of the page.

The termination of RS485 line, with a 120Ω resistor, in the HD67452-Exx-xxx is made internally of the device; when the order is performed. If the device have the RS485 terminated the code is the follow: HD67452-Exx-xYx; otherwise is this other: HD67452-Exx-xNx.

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.



Link for Mini-Fit® connectors: http://www.molex.com/molex/products/group?key=minifit_products&channel=products

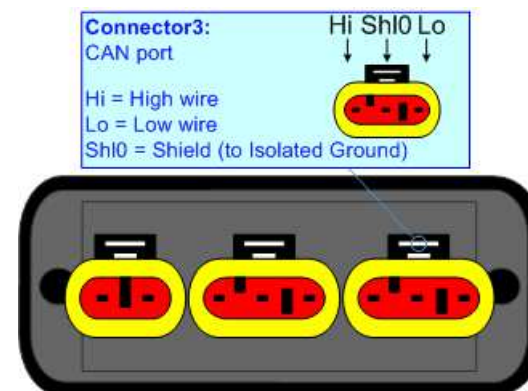
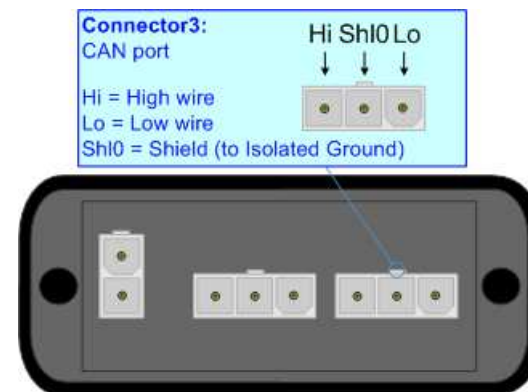
Link for SuperSeal 1.5 connectors: <http://www.te.com/catalog/cinf/en/c/10876/956>

CAN:

The connection of the NMEA 2000 in the HD67452-E4x-xxx device must be made with a 3way MiniFit Female connector. The pinout of Male MiniFit connector of the board is at right side of the page.

The connection of the NMEA 2000 in the HD67452-E7x-xxx device must be made with a AMP SuperSeal 1.5 Male connector. The pinout of Female connector of the board is at right side of the page.

The termination of NMEA 2000 line, with a 120Ω resistor, in the HD67452-Exx-xxx is made internally of the device; when the order is performed. If the device have the NMEA 2000 terminated the code is the follow: HD67452-Exx-Yxx; otherwise is this other: HD67452-Exx-Nxx.

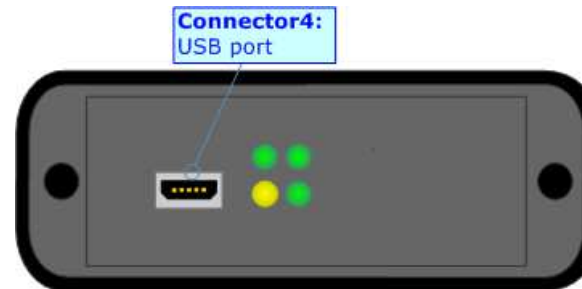


Cable characteristics:

DC parameter:	Impedance	70 Ohm/m
AC parameters:	Impedance	120 Ohm/m
	Delay	5 ns/m
Length	Baud Rate [bps]	Length MAX [m]
	10 K	5000
	20 K	2500
	50 K	1000
	100 K	650
	125 K	500
	250 K	250
	500 K	100
	800 K	50
	1000 K	25

USB:

The USB port is used to start the converter in Boot Mode and to program the converter. It is necessary to use a Micro USB type B cable.



USE OF COMPOSITOR SW67452:

To configure the Converter, use the available software that runs with Windows called SW67452. 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; 32/64bit).

When launching the SW67452, the window below appears (Fig. 2).

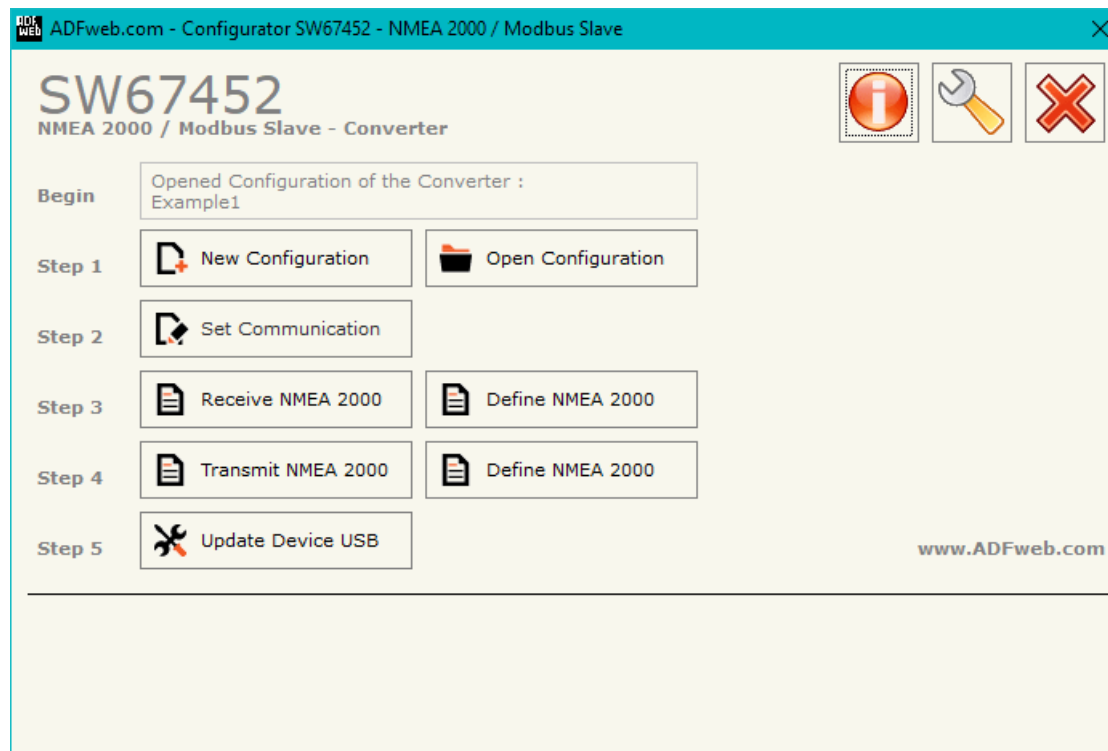
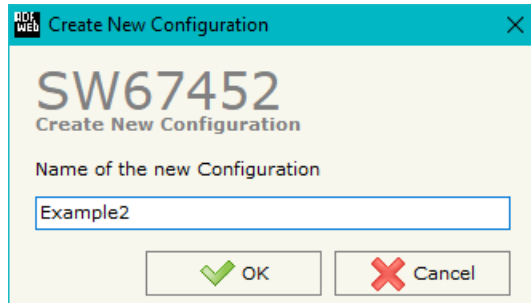


Figure 2: Main window for SW67452

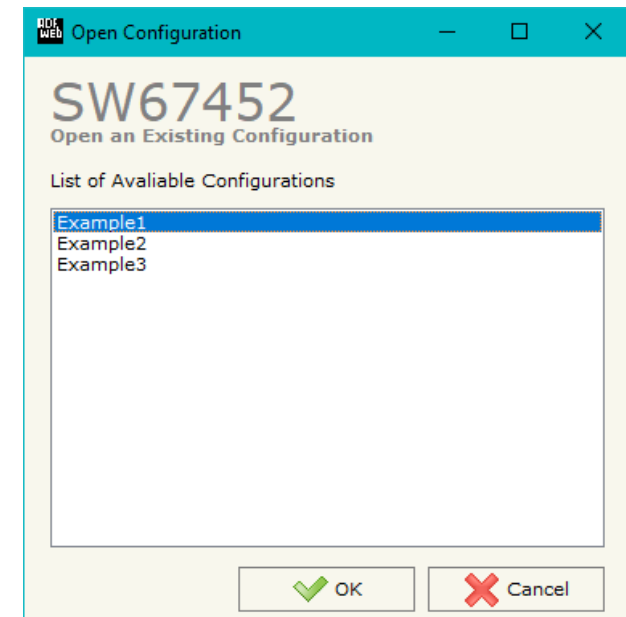
NEW CONFIGURATION / OPEN CONFIGURATION:

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




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

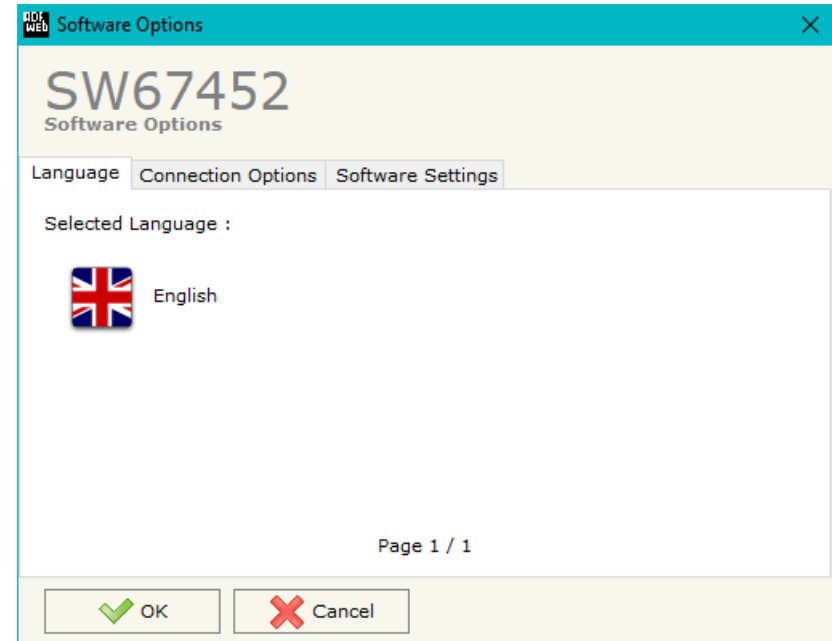
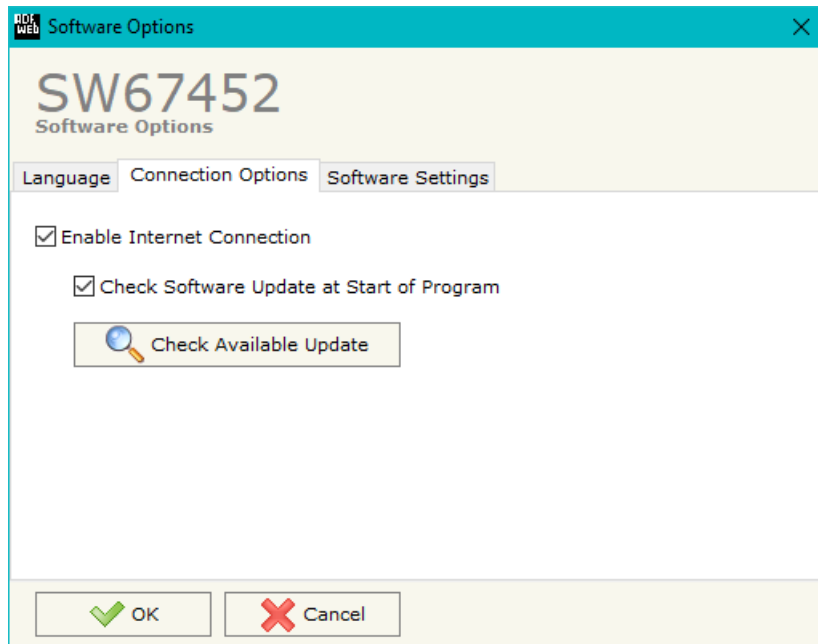
- To clone the configurations of a programmable “NMEA 2000 / Modbus Slave - Converter” in order to configure another device in the same manner, it is necessary to maintain the folder and all its contents;
- To clone a project in order to obtain a different version of the project, it is sufficient to duplicate the project folder with another name and open the new folder with the button “**Open Configuration**”.



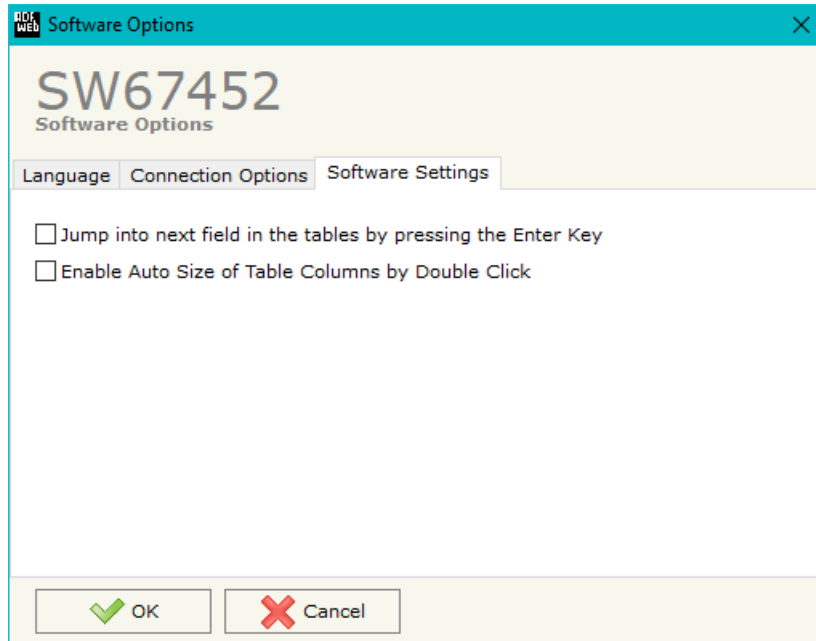
SOFTWARE OPTIONS:

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 SW67452 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 defines the fundamental communication parameters of two buses, NMEA 2000 and Modbus.

By pressing the **"Set Communication"** button from the main window for SW67452 (Fig. 2) the window "Set Communication Setting" appears (Fig. 3).

The means for the fields for the "NMEA 2000" are:

- In the field **"Baud Rate"** the data rate of the NMEA 2000 is defined;
- In the field **"TimeOut"** the timeout of the data is defined. If this time is elapsed the value of the data of the NMEA 2000 frame become "0". If the "Cancel Data" field is checked in the "Receive NMEA 2000" window;
- The field **"Modbus Reg. TimeOut"** a Modbus register is defined. In this register it is possible to visualize if the data is reliable, if '1' the data is ok, if '0' the data is oldest of the time inserted in the "TimeOut Data" field;
- If the field **"Enable Peer to Peer"** is checked, the Source Address of the PGNs received by the converter is masked (only if a single NMEA device is connected);
- In the field **"Device ID NMEA 2000"** the ID of the converter is defined;
- If the field **"Filter FECA (ms)"** is checked, when the FECA PGN arrives the gateway puts the values in Standby. If the time, expressed in milliseconds and written at the right side of "Filter FECA", is elapsed and there aren't arrived the frames of Transport Protocol the gateway put the data of FECA into Modbus Registers. Otherwise if the Transport Protocol arrives before the time is elapsed the gateway put his data into Modbus Registers discarding the data of FECA. When this field is checked the values aren't updated when the FECA frame arrive but there is an offset of xx ms. You can use this function if there is only one NMEA 2000 device in the network.

The meaning of the fields of "Modbus Slave" are:

- In the field **"Baudrate"** the data rate of the RS485 bus is defined;
- In the field **"Parity"** the serial parity is defined;
- In the field **"ID Device"** the Modbus ID is defined.

The screenshot shows a software window titled "Set Communication" for device "SW67452". The window is divided into two main sections: "NMEA 2000" and "Modbus Slave".

NMEA 2000 Section:

- Baudrate: 250K (dropdown menu)
- TimeOut Data (s): 10 (text input)
- Modbus Reg. TimeOut: 0 (text input)
- Enable Peer to Peer: (checkbox)
- Device ID NMEA 2000: 5 (text input)
- Filter FECA (ms): 500 (text input, checkbox is unchecked)

Modbus Slave Section:

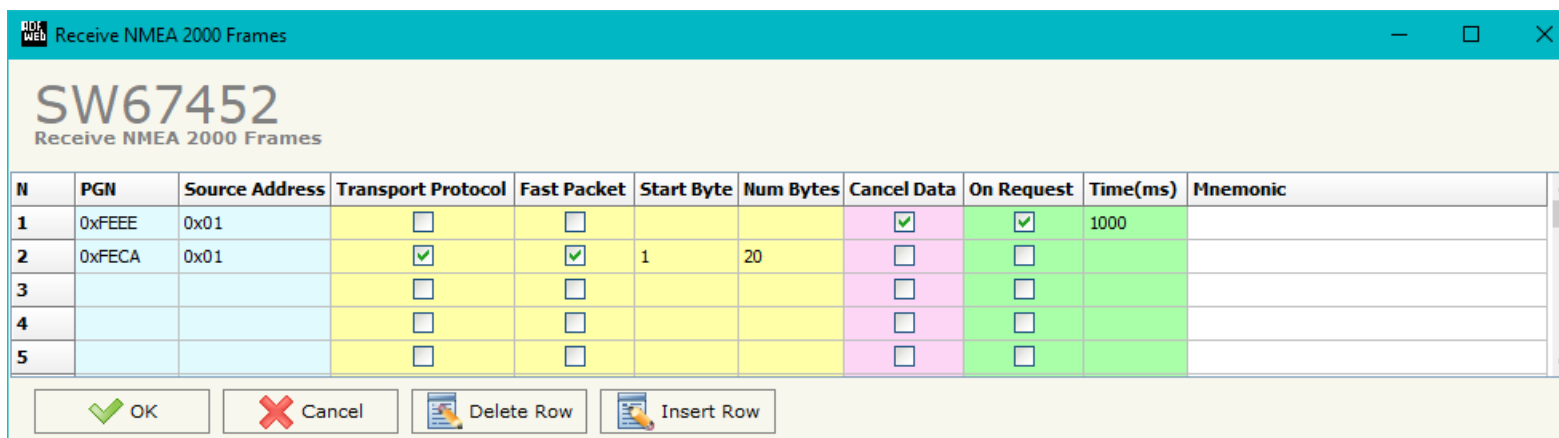
- Baudrate: 115200 (dropdown menu)
- Parity: NONE (dropdown menu)
- ID Device: 1 (text input)

At the bottom of the window, there are two buttons: "OK" (with a green checkmark icon) and "Cancel" (with a red X icon).

Figure 3: "Set Communication" window

RECEIVE NMEA 2000:

By pressing the “**Receive NMEA 2000**” button from the main window of SW67452 (Fig. 2) the window “Receive NMEA 2000 Frames” appears (Fig. 4). This section is used to define the NMEA 2000 messages accepted by the converter.



N	PGN	Source Address	Transport Protocol	Fast Packet	Start Byte	Num Bytes	Cancel Data	On Request	Time(ms)	Mnemonic
1	0xFEEE	0x01	<input type="checkbox"/>	<input type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1000	
2	0xFECA	0x01	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	20	<input type="checkbox"/>	<input type="checkbox"/>		
3			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		
4			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		
5			<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		

Figure 4: “Receive NMEA 2000 Frames” window

The means of the fields of the table are:

- In the field “**PGN**” the PGN of the NMEA 2000 message to receive is defined (in the NMEA 2000 protocol, the PGN is an identifier);
- In the field “**Source Address**” the address of the device that sends the frame is defined.
- If the field “**Transport Protocol**” is checked, the frame can use transport protocol functions;
- If the field “**Fast Packet**” is checked, the frame will use the Fast Packet functions;
- In the field “**Start Byte**” the starting byte to save on Modbus side is defined. This field is enabled only when the field “Transport Protocol” is checked;
- In the field “**Num Bytes**” the number of consecutive byte from the starting one is defined. For example, if the Start Byte is ‘20’ and Num Bytes is ‘10’, it is possible to read the byte from 20 to 30;
- If the field “**Cancel Data**” is checked and the “Modbus Register” in the section “Set Communication” is different from ‘0’, the converter, when the data is oldest of the time inserted in the “TimeOut Data”, sets “0xFF” in the Modbus registers reserved for the PGN;
- If the field “**On Request**” is checked, the converter sends a request for the PGN: this option is used if the PGN can be only sent on request by the NMEA 2000 devices;



- In the field "**Time(ms)**" the delay between two NMEA 2000 requests is defined;
- In the field "**Mnemonic**" the description for the frame is defined.

DEFINE NMEA 2000:

By pressing the **Define NMEA 2000** button near "Receive NMEA 2000" from the main window for SW67452 (Fig. 2) the window "Define Modbus Registers for Receive NMEA 2000 Frames" appears (Fig. 5):

- In the field **List of Receive NMEA 2000 Frames** there is the list of NMEA 2000 frames that you inserted in "Receive NMEA 2000" section
- In the field **List of Modbus Registers Relative to the PGN Selected** there are the Modbus words.
- In the field **Create/Modify a Modbus Register** you can define the index of the Modbus register and the bytes of the can frame that you map in.

For example:

Click on the frame, insert the valid address in the field "Index of Modbus Register", select the byte position (Byte 1 in High Modbus byte and Byte 3 in Low Modbus byte), click the "Create" button, in the field "List of Modbus Registers" appears the new Modbus register created with the data that it contains.

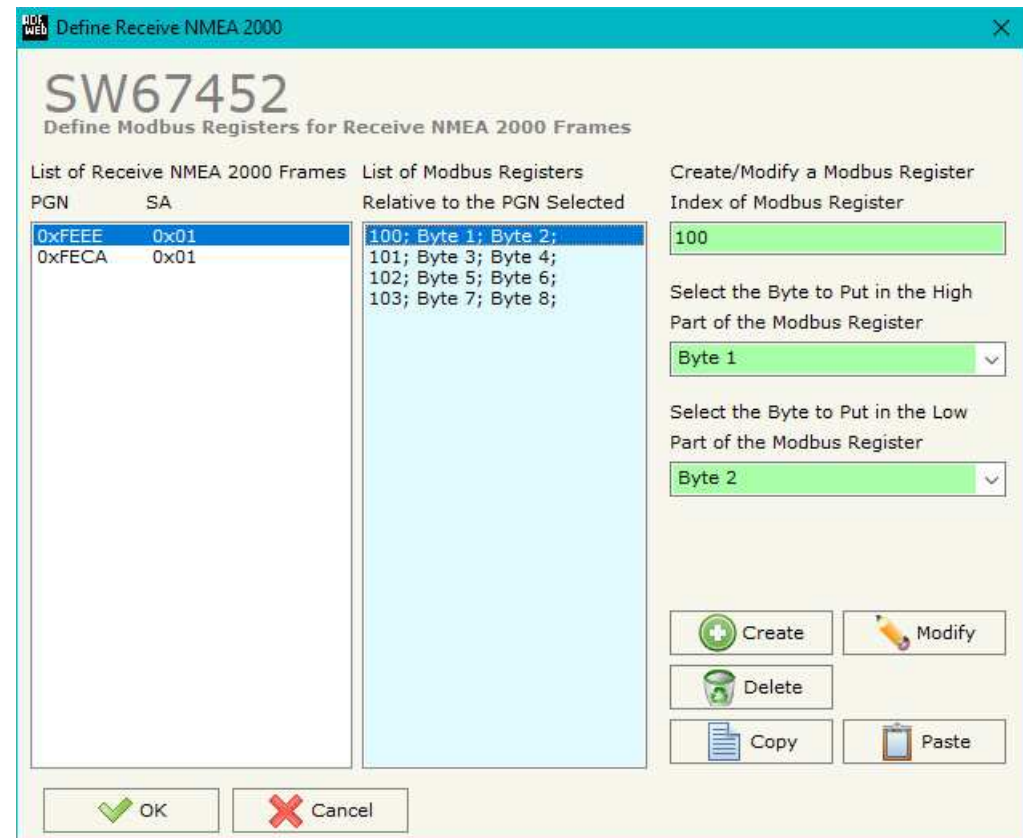
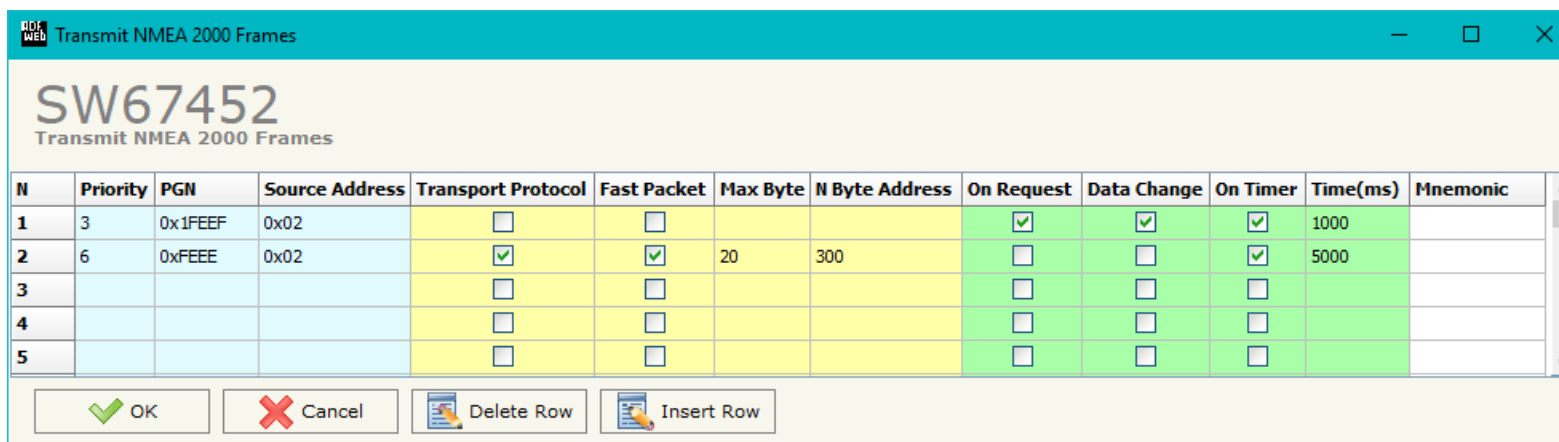


Figure 5: "Define Modbus Registers for Receive NMEA 2000 Frames" window

TRANSMIT NMEA 2000:

By pressing the **Transmit NMEA 2000** button from the main window of SW67452 (Fig. 2) the window "Transmit NMEA 2000 Frames" appears (Fig. 6). This section is used to define the NMEA 2000 messages sent by the converter.



N	Priority	PGN	Source Address	Transport Protocol	Fast Packet	Max Byte	N Byte Address	On Request	Data Change	On Timer	Time(ms)	Mnemonic
1	3	0x1FEEF	0x02	<input type="checkbox"/>	<input type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1000	
2	6	0xFEFE	0x02	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	20	300	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5000	
3				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
4				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
5				<input type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Figure 6: "Transmit NMEA 2000 Frames" window

The means of the fields of the table are:

- In the field **Priority** the priority of the NMEA 2000 message is defined. In NMEA 2000 protocol, the priority is a number between 0 and 7. 0 is the highest priority and 7 is the lowest;
- In the field **PGN** the PGN of the NMEA 2000 message to be written from Modbus is defined (in NMEA 2000 protocol the PGN is an identifier);
- In the field **Source Address** the address of the device that sends the frame is defined;
- If the field **Transport Protocol** is checked, the frame can use transport protocol functions;
- If the field **Fast Packet** is checked, the frame will use the Fast Packet functions;
- In the field **Max Byte** the maximum number of bytes of the NMEA 2000 message is defined. This field is enabled only when the field "Transport Protocol" is checked;
- In the field **N Byte Address** the Modbus register where writing the number of bytes to transmit is defined;
- If the field **On Request** is checked, the NMEA 2000 frame is sent when a request frame from the NMEA 2000 network is received;
- If the field **Data Change** is checked, the NMEA 2000 frame is sent when a byte from Modbus side changes value;

- If the field "**On Timer**" is checked, the NMEA 2000 frame is sent cyclically;
- In the field "**Time (ms)**" the delay (in milliseconds) with which sending the NMEA 2000 message is defined;
- In the field "**Mnemonic**" a description for the frame is defined.

DEFINE NMEA 2000:

By pressing the **Define NMEA 2000** button near "Transmit NMEA 2000" from the main window for SW67452 (Fig. 2) the window "Define Modbus Registers for Transmit NMEA 2000 Frames" appears (Fig. 7):

- In the field **List of Transmit NMEA 2000 Frames** there is the list of NMEA 2000 frames that you inserted in "Transmit NMEA 2000" Section.
- In the field **List of Modbus Registers Relative to the PGN Selected** there are the Modbus words.
- In the field **Create/Modify a Modbus Register** you can define the index of the Modbus register and the bytes of the NMEA 2000 frame where you write it.
- With the field **Send NMEA 2000 frame on Modbus Write** it is possible to decide when to send the NMEA 2000 frame. If a Modbus word has written "False" in this field, the NMEA 2000 frame is not sent immediately but it is sent when another word that have this field "True" is written.

For example:

Click on the frame, insert the valid address in the field "Index of Modbus Register", select the byte position (Byte 1 in High Modbus byte and Byte 2 in Low Modbus byte), click the "Create" button, in the field "List of Modbus Registers" appears the new Modbus register created.

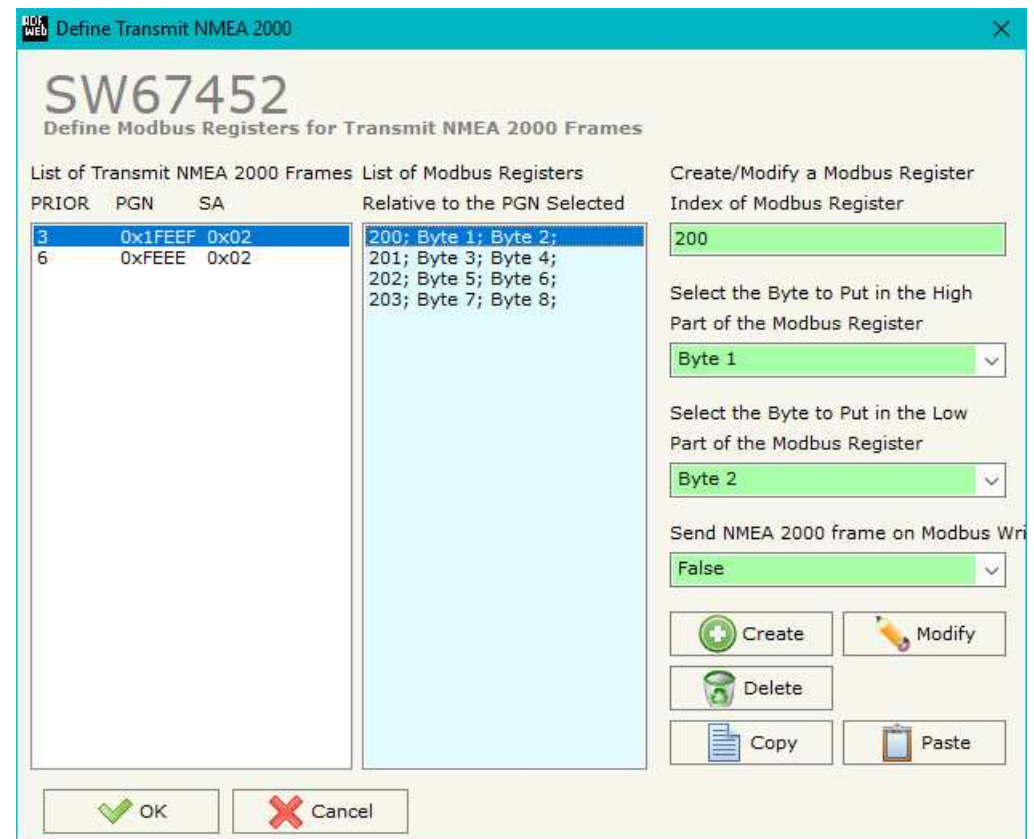


Figure 7: "Define Modbus Registers for Transmit NMEA 2000 Frames" window

UPDATE DEVICE USB:

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

In order to load the parameters or update the firmware in the device, follow these instructions:

- Connect the USB cable from your PC to the Converter;
- Turn ON the converter (it starts in Boot Mode);
- Select the **"COM port"**;
- Select which operations you want to do.
- Press the **"Execute update firmware"** button to start the upload;
- When all the operations are "OK", disconnect the USB cable.

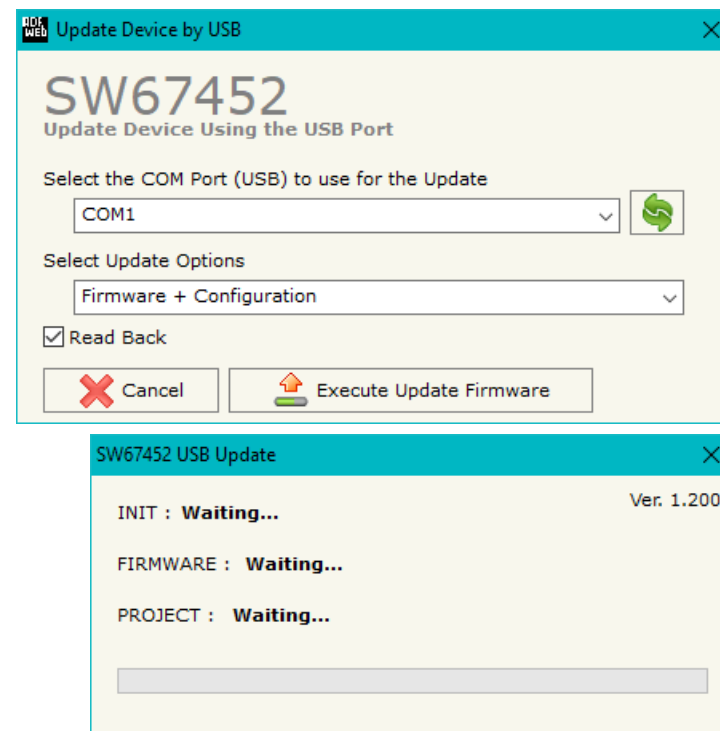





Figure 8 "Update Device" windows

 **Note:**
When you install a new version of the software it is better if the first time you do the update of the Firmware in the HD67452 device.

 **Note:**
When you receive the device, for the first time, you have to update also the Firmware in the HD67452 device.

 **Warning:**
If the Fig. 9 appears when you try to do the Update before require assistance try these points:

- Check if the serial COM port selected is the correct one;
- Check if the USB cable is connected between the PC and the device;
- Try to repeat the operations for the updating;
- Try with another PC;
- Try to restart the PC;
- If you are using the program inside a Virtual Machine, try to use in the main Operating System;
- If you are using Windows Seven or Vista or 8 or 10, make sure that you have the administrator privileges;
- Pay attention to Firewall lock.

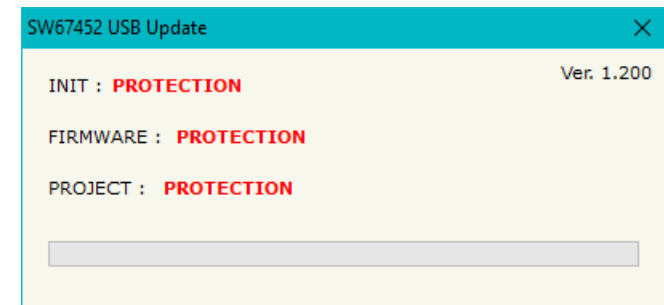
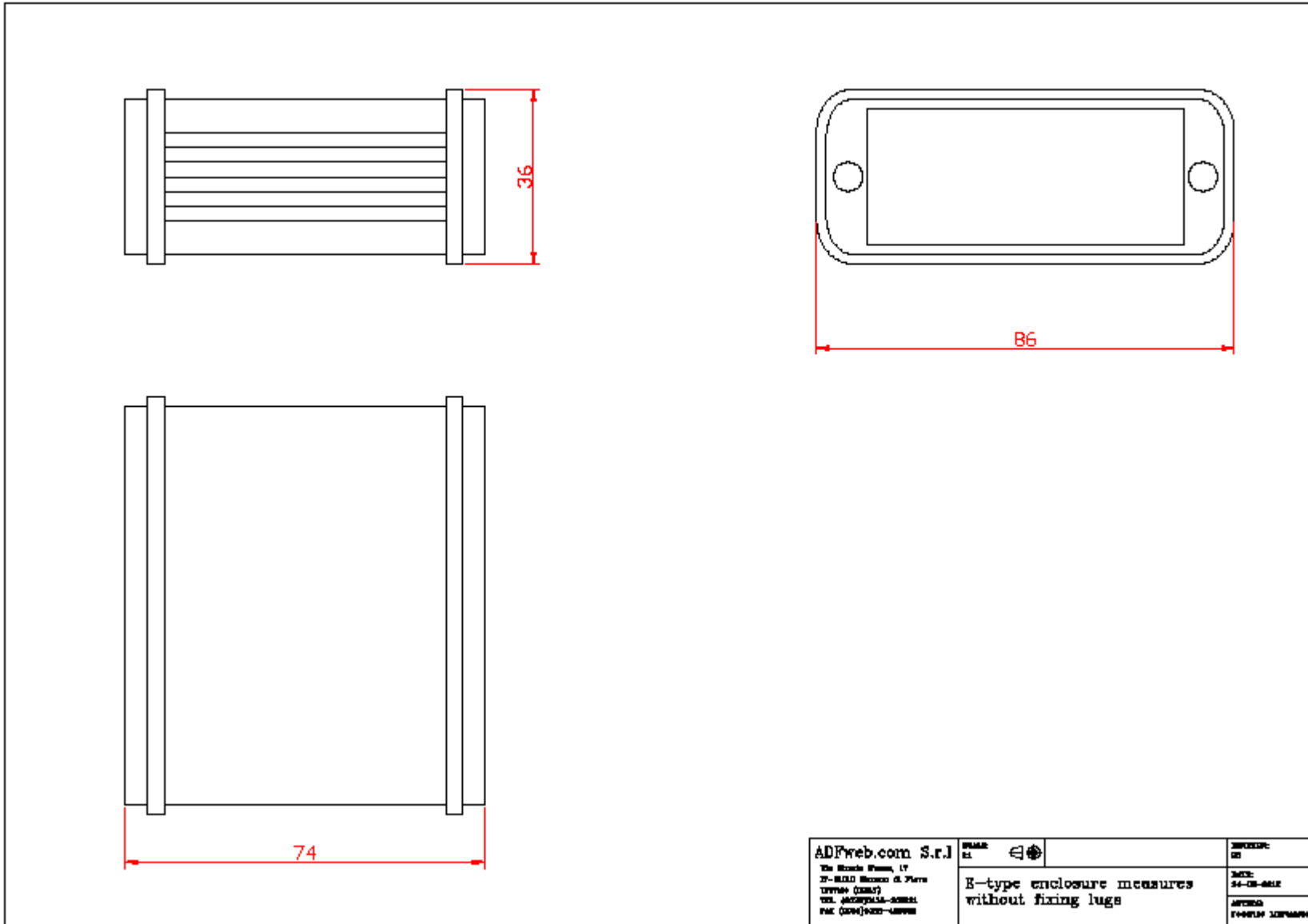
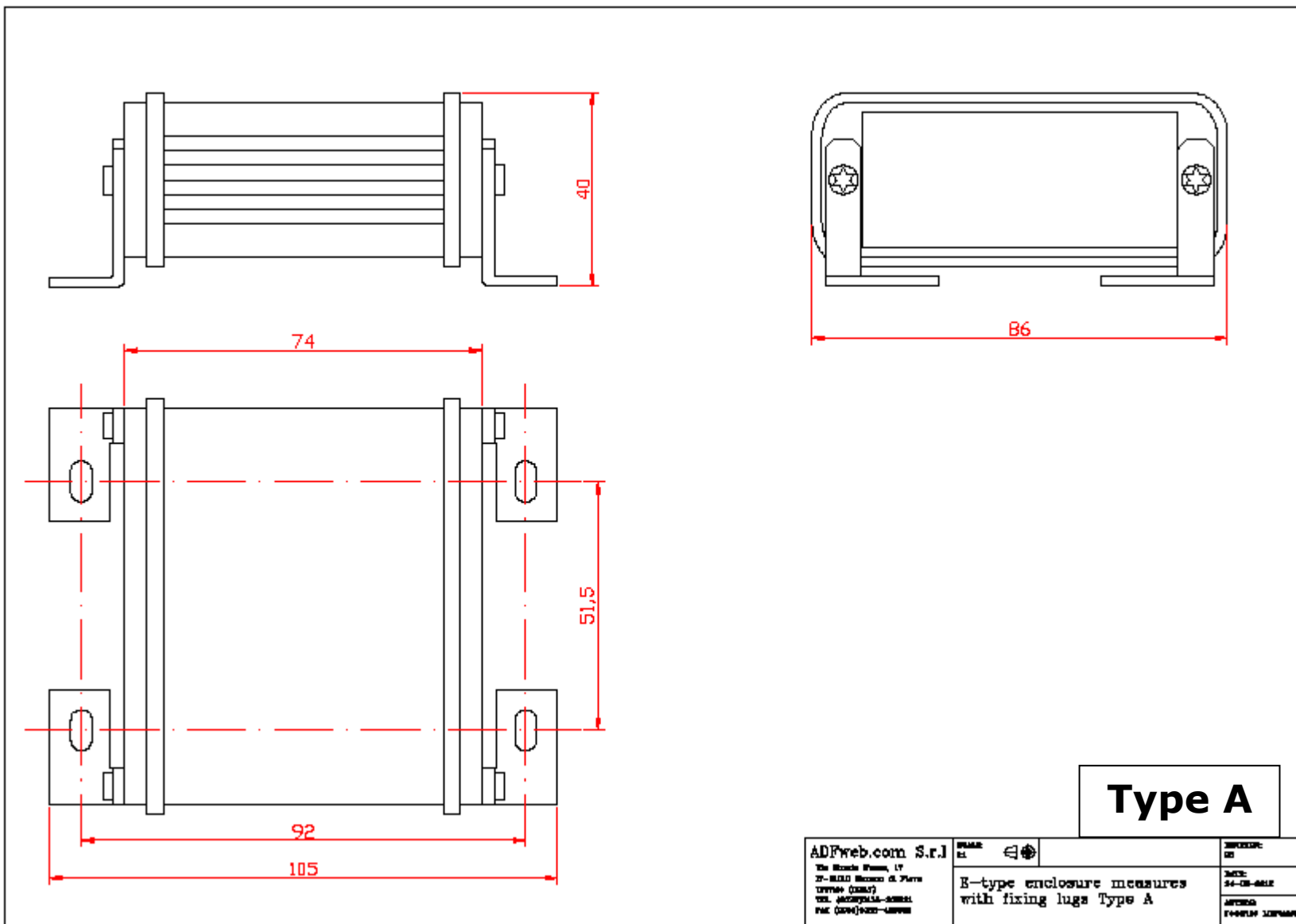


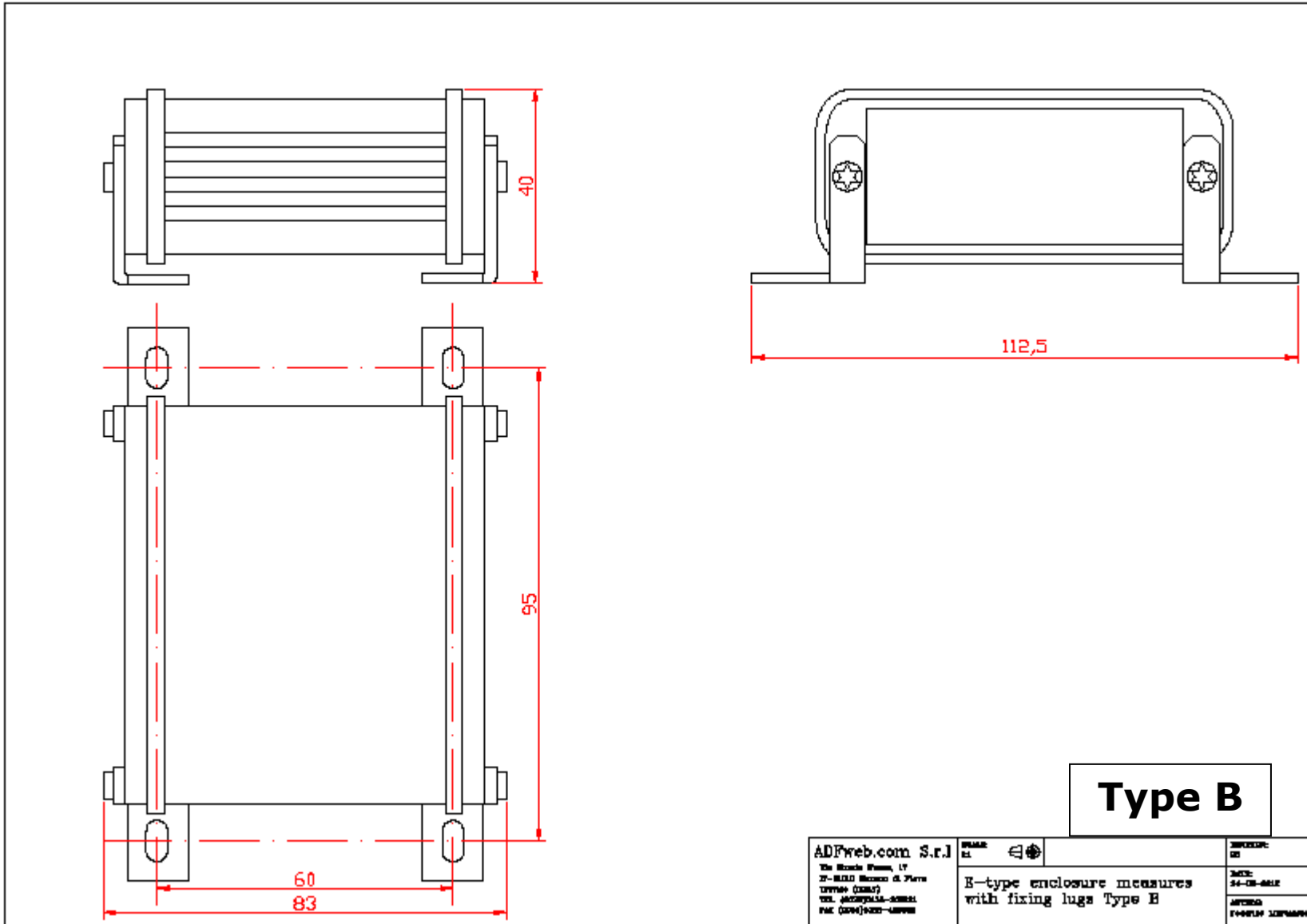
Figure 9: "Protection" window

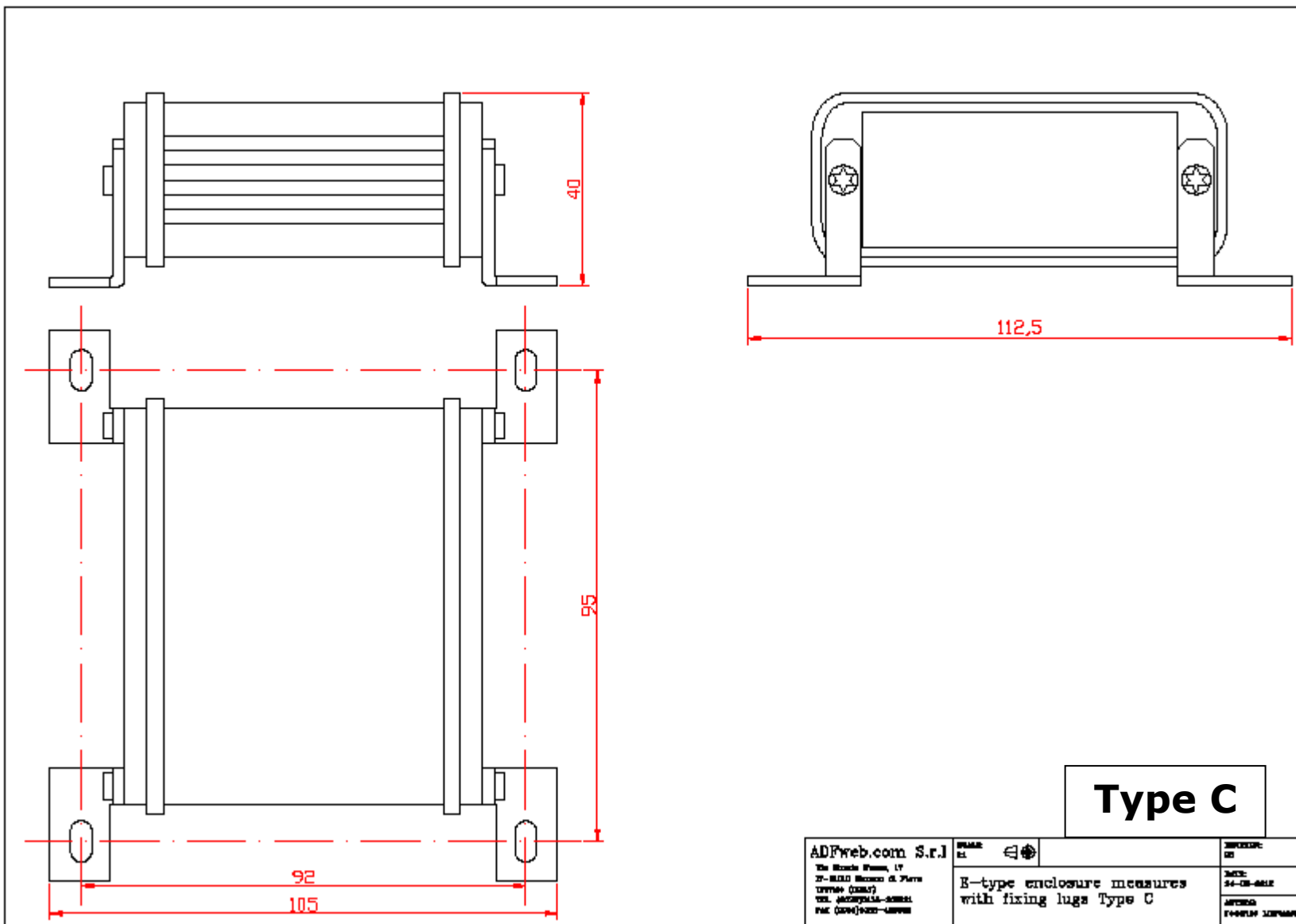
In the case of HD67452 you have to use the software "SW67452": www.adfweb.com/download/filefold/SW67452.zip.

MECHANICAL DIMENSIONS:





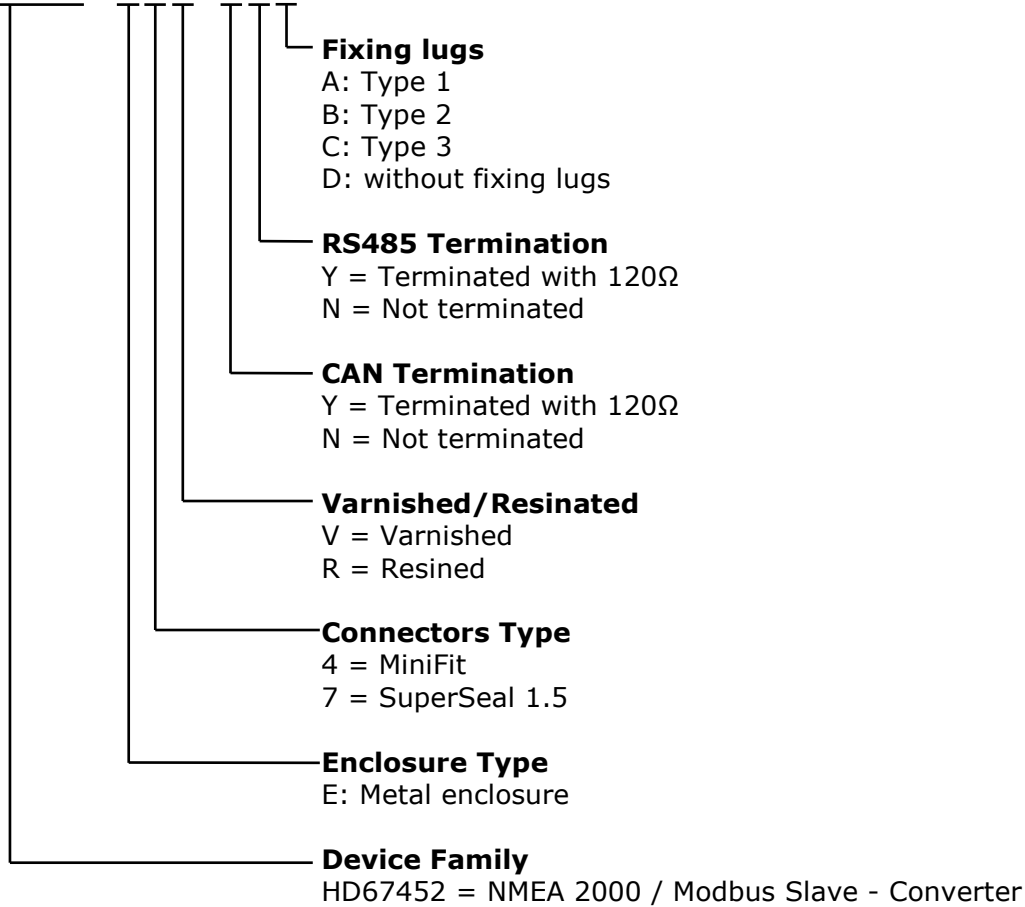




ORDERING INFORMATIONS:

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

HD67452 - E y z - s d f



ACCESSORIES:

- Order Code: **AC34001** - Rail DIN - Power Supply 220/240V AC 50/60Hz – 12 V AC
- Order Code: **AC34002** - Rail DIN - Power Supply 110V AC 50/60Hz – 12 V AC
- Order Code: **AC67402** - Cable Super Seal 1.5 MALE 2-pole - 1.0 Meter
- Order Code: **AC67402-3** - Cable Super Seal 1.5 MALE 2-pole - 3.0 Meters
- Order Code: **AC67403** - Cable Super Seal 1.5 MALE 3-pole - 1.0 Meter
- Order Code: **AC67403-3** - Cable Super Seal 1.5 MALE 3-pole - 3.0 Meters
- Order Code: **AC67410** - Accessory Automotive Devices - Support for rail DIN

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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