

User Manual

Revision 1.001
English

EtherNet/IP / Modbus Master – Converter

(Order Code: HD674-A004)

For Website information:

www.adfweb.com?Product=HD674-A004

For Price information:

www.adfweb.com?Price=HD674-A004

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)



For others Gateways / Bridges:

J1939 to Modbus

See also the following links:

www.adfweb.com?Product=HD67212 (Modbus RTU)

CANopen to Modbus

See also the following links:

www.adfweb.com?Product=HD67001 (Modbus RTU Master)

www.adfweb.com?Product=HD67002 (Modbus RTU Slave)

www.adfweb.com?Product=HD67004 (Modbus TCP Master)

www.adfweb.com?Product=HD67005 (Modbus TCP Slave)

For others Gateways / Bridges:

For **CAN bus 2.0A** and/or **CAN bus 2.0B to Modbus**

See also the following links:

www.adfweb.com?Product=HD67011 (Modbus RTU Slave)

www.adfweb.com?Product=HD67012 (Modbus RTU Master)

www.adfweb.com?Product=HD67014 (Modbus TCP Slave)

www.adfweb.com?Product=HD67015 (Modbus TCP Master)

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



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	11/01/2017	Ff	All	First released version
1.001	13/03/2017	Ff	All	Revision

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:

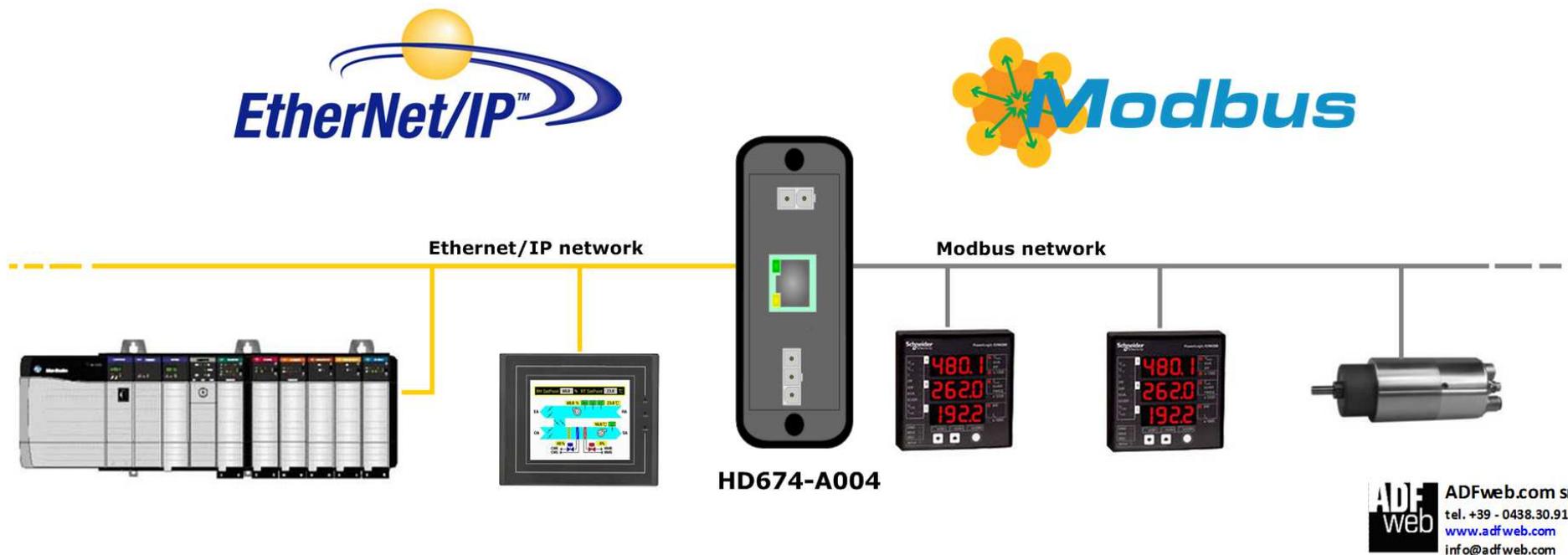


This symbol indicates that non-observance of the safety instructions is a danger for people that could lead to serious injury or death and / or the possibility of damage.

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 ADFweb.com srl
 tel. +39 - 0438.30.91.31
www.adfweb.com
 info@adfweb.com

CONNECTION SCHEME:



Figure 1a: Connection scheme for HD674-A004-2-E4x-xx

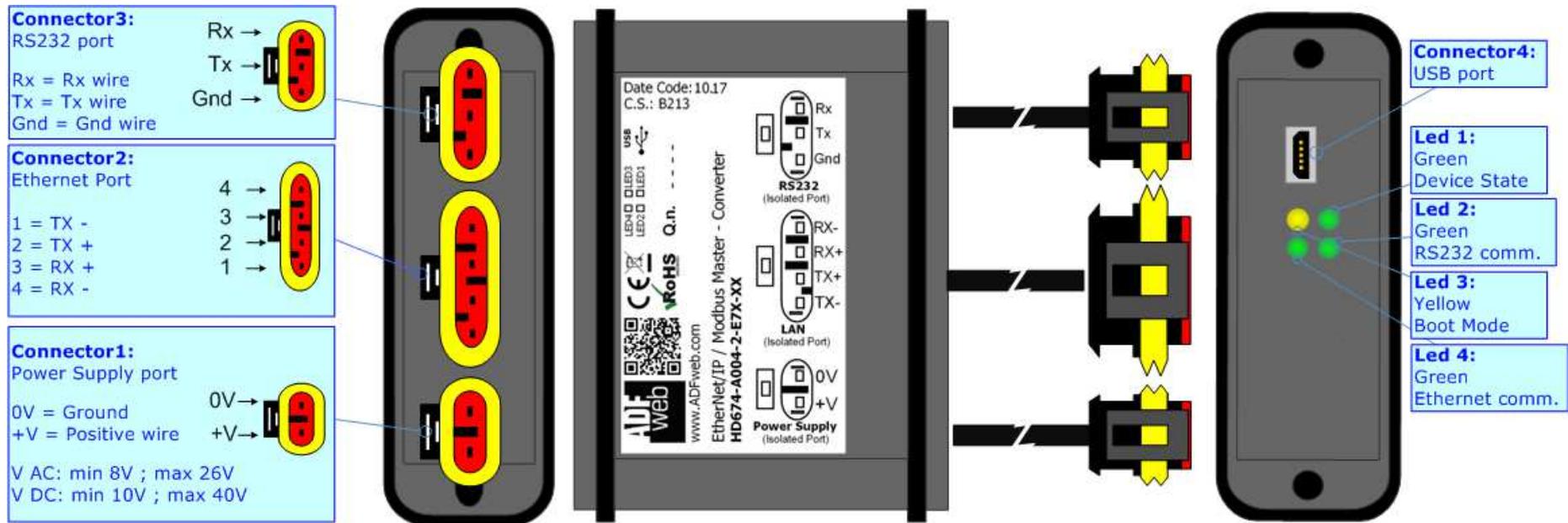


Figure 1b: Connection scheme for HD674-A004-2-E7x-xx



Figure 1c: Connection scheme for HD674-A004-4-E4x-xx

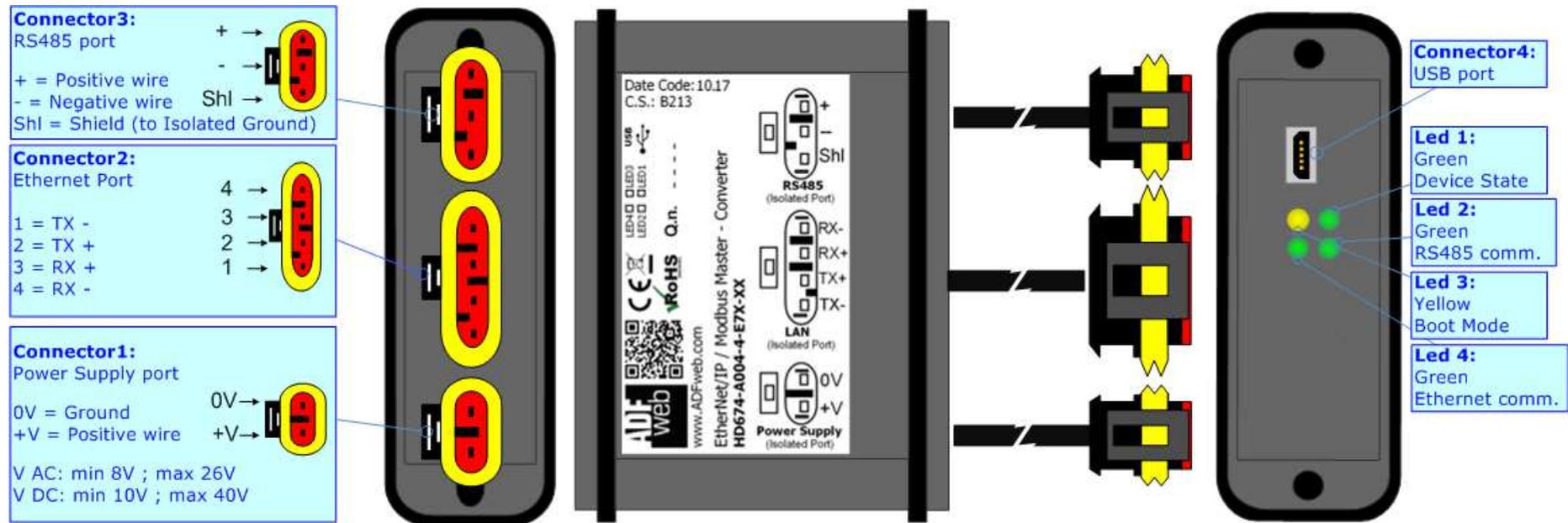


Figure 1d: Connection scheme for HD674-A004-4-E7x-xx

CHARACTERISTICS:

The “**HD674-A004**” series are rugged devices used to interface Modbus devices with EtherNet/IP network.

With its 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 / EtherNet/IP / Modbus;
- 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 SW674-A004 software on your PC in order to perform the following:

- Define the parameter of Ethernet/IP line;
- Define the parameter of Modbus line;
- Determinate which Ethernet/IP byte transfer in Modbus and vice versa;
- Update the device.

POWER SUPPLY:

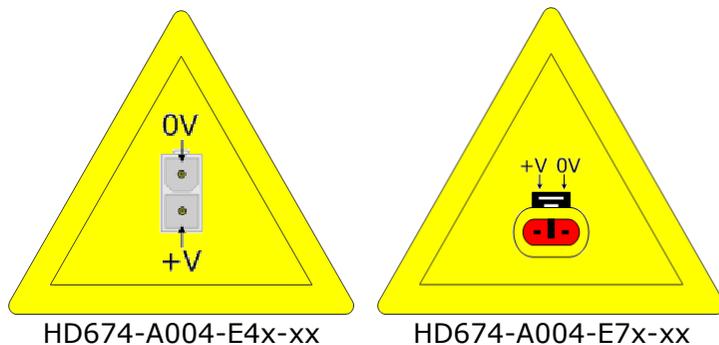
The devices can be powered between a wide range of tensions. For more details see the two tables below.

	VAC		VDC	
	Vmin	Vmax	Vmin	Vmax
HD674-A004-Exx-xx	8V	26V	10V	40V

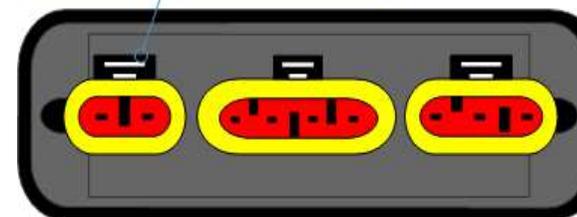
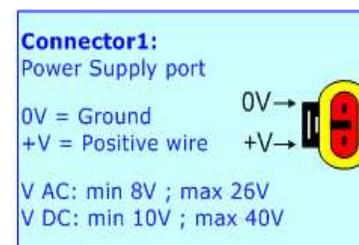
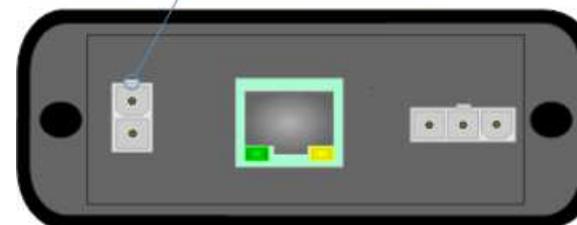
Consumption at 24V DC:

Device	W/VA
HD674-A004-Exx-xx	4

Caution: Not reverse the polarity power



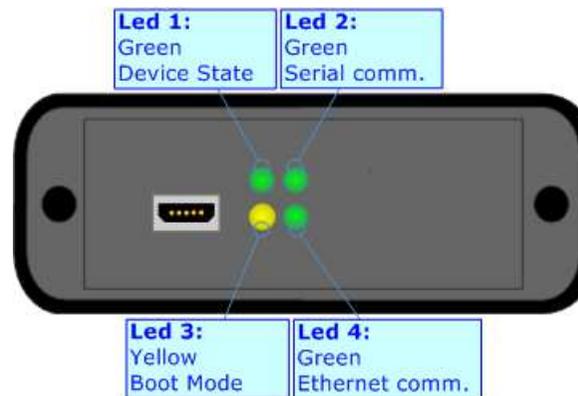
Note: It is possible to use also negative tensions. In this case the polarity must be inverted.



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: Serial Communication (green)	Blinks when Modbus responses are received	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress
3: USB Link (yellow)	ON: USB cable inserted OFF: USB cable not inserted	ON: USB cable inserted OFF: USB cable not inserted
4: Ethernet communication (green)	Blinks when EtherNet/IP communication is working	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress



RS232:

The connection of the RS232 in the HD674-A004-2-E4x-xx 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.

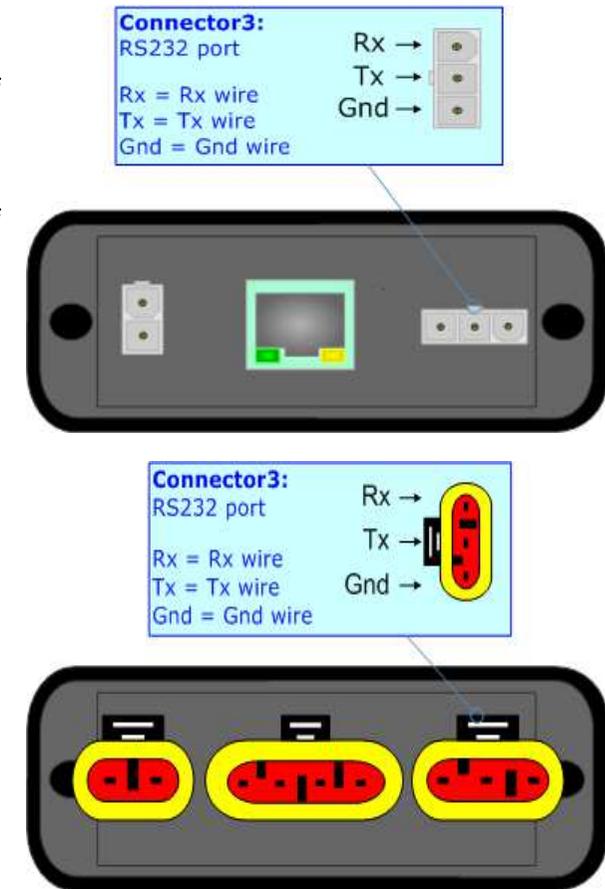
The connection of the RS232 in the HD67-A004-2-E7x-xx device must be made with a AMP SuperSeal 1.5 Male connector. The pinout of Female connector of the board is at right side of the page.

The maximum length of the cable should be 15m.

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>



RS485:

The connection of the RS485 in the HD674-A004-4-E4x-xx 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.

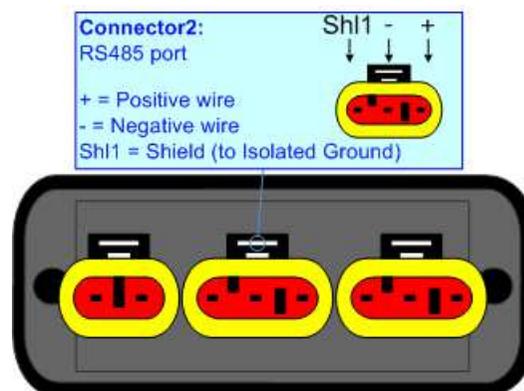
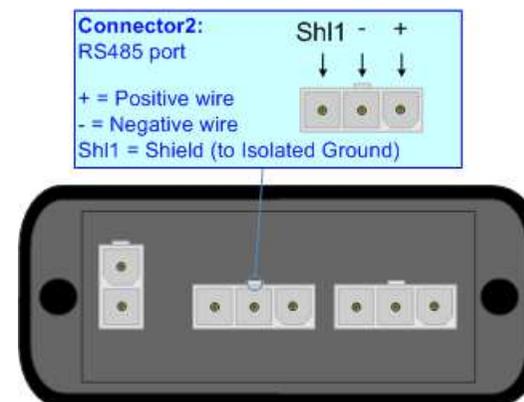
The connection of the RS485 in the HD67-A004-4-E7x-xx device must be made with a AMP SuperSeal 1.5 Male connector. The pinout of Female connector of the board is at right side of the page.

The termination of RS485 line, with a 220Ω resistor, in the HD674-A004-4-Exx-xx is made internally of the device; when the order is performed. If the device have the RS485 terminated the code is the follow: HD674-A004-4-Exx-Yx; otherwise is this other: HD674-A004-4-Exx-Nx.

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

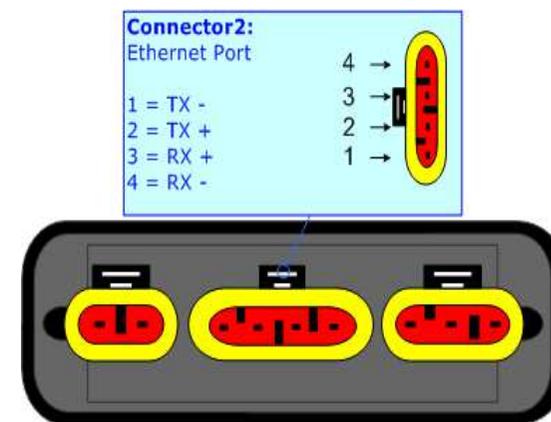
Link for SuperSeal 1.5 connectors: <http://www.te.com/catalog/cinf/en/c/10876/956>

ETHERNET:

The connection of Ethernet in the HD674-A004 device must be made 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.

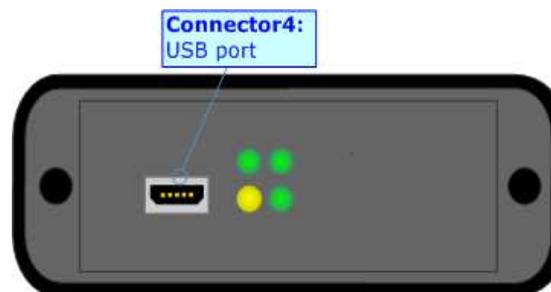
The connection of Ethernet in the HD674-A004-x-E4x-xx device must be made with RJ45 connector.

The connection of the Ethernet in the HD674-A004-x-E7x-xx 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.



USB:

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



USE OF COMPOSITOR SW674-A004:

To configure the Converter, use the available software that runs with Windows called SW674-A004. 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 SW674-A004, the window below appears (Fig. 2).

**Note:**

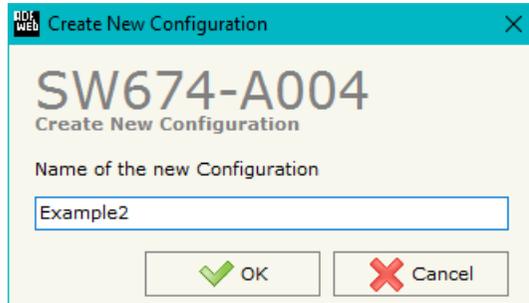
It is necessary to have installed .Net Framework 4.



Figure 2: Main window for SW674-A004

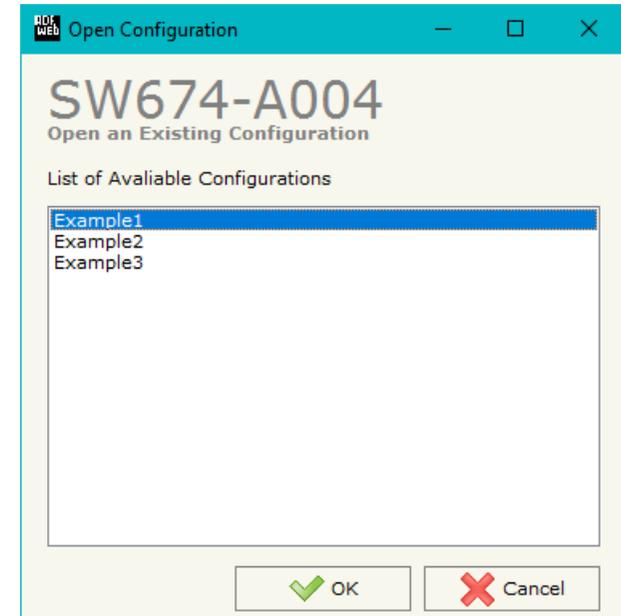
NEW CONFIGURATION / OPEN CONFIGURATION:

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



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

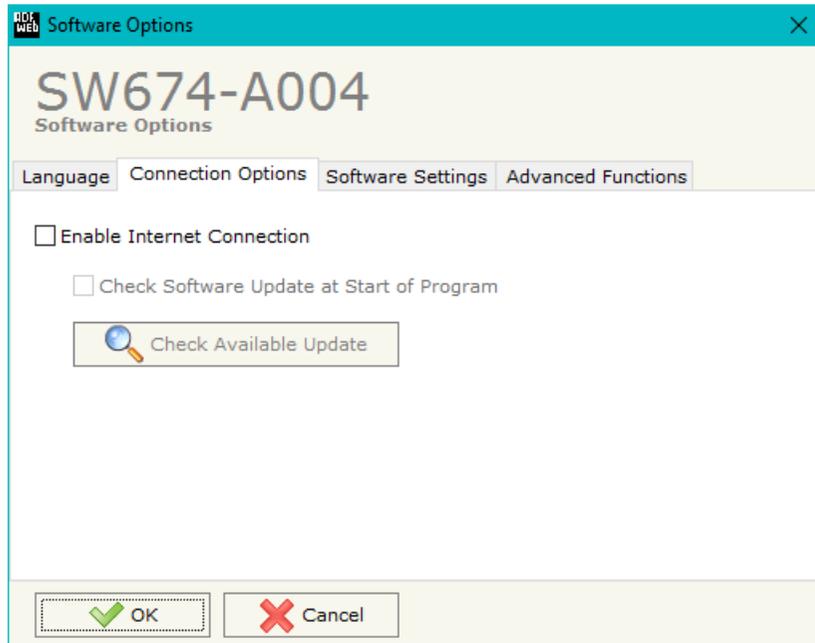
- To clone the configurations of a programmable “EtherNet/IP / Modbus Master - Converter” in order to configure another device in the same manner, it is necessary to maintain the folder and all its contents;
- To clone a project in order to obtain a different version of the project, it is sufficient 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.

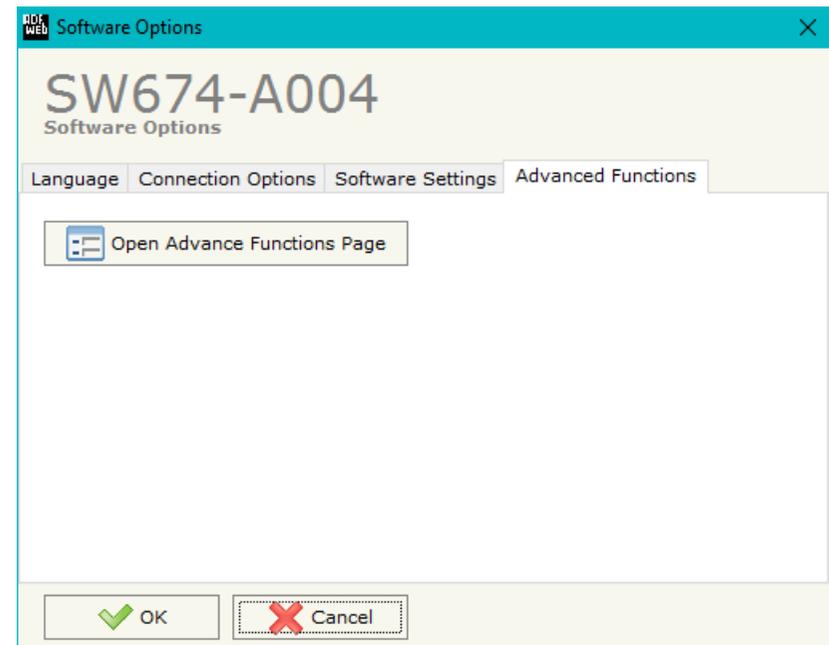


In the section “Connection Options”, it is possible to check if there are some updatings of the software compositor in ADFweb.com website. Checking the option “**Check Software Update at Start of Program**”, the SW674-A004 checks automatically if there are updatings when it is launched.



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.

In the section "Advanced Functions", it is possible to send some advanced commands to the converter in order to monitor the Modbus communication and enable/disable the Modbus requests. See page 25 for more info.



SET COMMUNICATION:

This section define the fundamental communication parameters of two buses, Modbus and EtherNet/IP.

By Pressing the **"Set Communication"** button from the main window of SW674-A004 (Fig. 2) the window "Set Communication" appears (Fig. 3).

The meaning of the fields of "EtherNet/IP" are:

- In the field **"IP ADDRESS"** the IP address of the EtherNet/IP side of the converter is defined;
- In the field **"SUBNET Mask"** the SubNet Mask of the EtherNet/IP side of the converter is defined;
- In the field **"GATEWAY"** the default gateway of the network 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 **"Tunneling Port"** the tunneling port used for transparent communication is defined (see page xx for more info);
- In the field **"Number Byte IN"** the number of byte from the Ethernet/IP to the Converter is defined (at maximum it is possible to use 496 byte);
- In the field **"Number Byte OUT"** the number of byte from the Converter to the Ethernet/IP is defined (at maximum it is possible to use 496 byte);
- In the field **"Diagnostic"** the starting byte of the EtherNet/IP array where saving the diagnostic of Modbus side is defined. It is possible to enable/disable this function using the checkbox. For more informations about the diagnostic, see page 24.

The means of the fields for the "Modbus Master" section are:

- In the field **"Serial"** the serial port to use is defined (RS232 or RS485);
- 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 **"TimeOut (ms)"** the maximum time that the converter attends for the answer from the Slave interrogated is defined;
- In the field **"Cyclic Delay (ms)"** the delay (idle time) between two Modbus polls is defined.

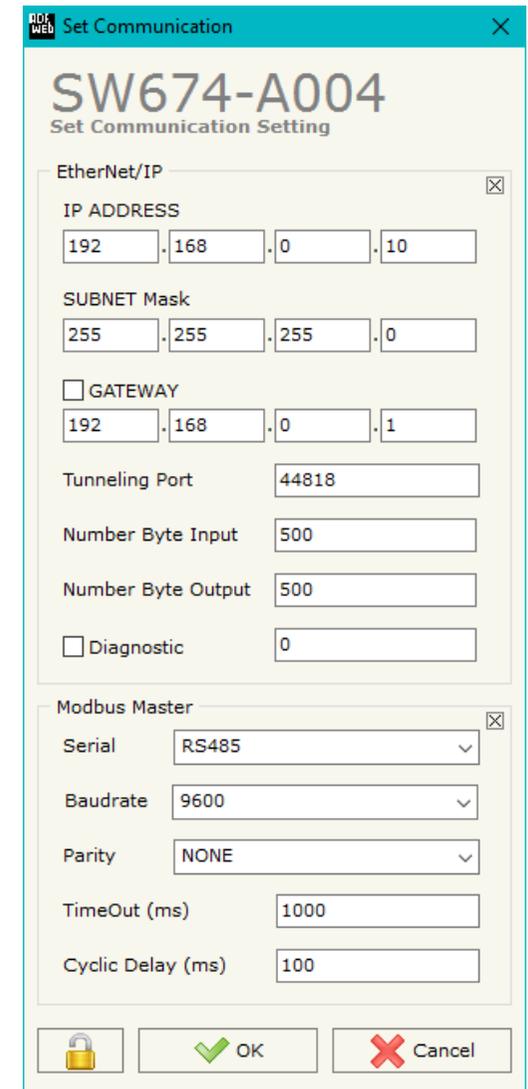


Figure 3: "Set Communication" window

SET ACCESS:

By pressing the "Set Access" button from the main window for SW674-A004 (Fig. 2) the window "Set Access" appears.

This window is divided in two parts, the "Modbus Read" (Fig. 4a) and the "Modbus Write" (Fig. 4b).

The first part "Modbus Read" is used to read the data from the Modbus slaves and make them available to read from the EtherNet/IP Master. The second part "Modbus Write" is used to write the data that arrives from the EtherNet/IP Master into the Modbus slaves.

MODBUS READ

The means of the fields are:

- ✚ In the field "Slave ID" the address of the Modbus device to read is defined;
- ✚ In the field "Type" the data type of the register to read is defined. The following options are available:
 - Coil Status;
 - Input Status
 - Holding Register;
 - Input Register.
- ✚ In the field "Address" the starting address of the register to read is defined;
- ✚ In the field "NPoint" the number of consecutive registers to read is defined;
- ✚ In the field "Poll Time" the delay time between two Modbus requests is defined;
- ✚ In the field "Max Error" the number of consecutive errors that the converter waits before suspending the poll until the next reboot is defined. If it is set to '0', this function is disabled;
- ✚ In the field "Position" the address of the EtherNet/IP array where mapping the information is defined;
- ✚ In the field "Start Bit" the bit of the selected byte of the field "Position" where starting to map the data is defined. Valid only for the "Coil Status" and "Input Status" type;
- ✚ If the field "Swap" is checked, the bytes' order is exchanged;
- ✚ In the field "Mnemonic" the description for the request is defined.

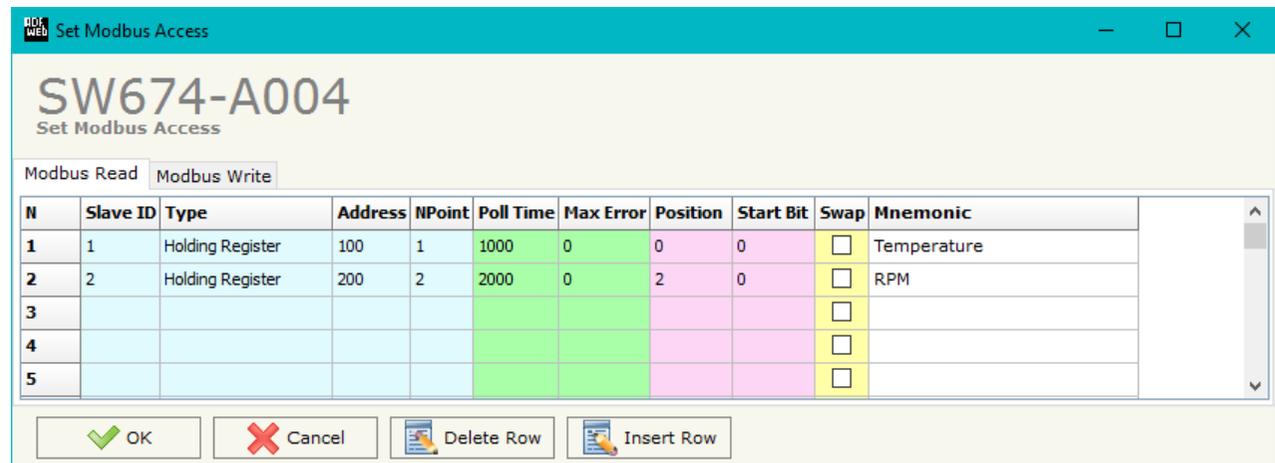


Figure 4a: "Set Access→Modbus Read" window

MODBUS WRITE

The means of the fields are:

- In the field "**Slave ID**" the address of the Modbus device to write is defined;
- In the field "**Type**" the data type of the register to write is defined. The following options are available:
 - Coil Status;
 - Holding Register;
- In the field "**Address**" the starting address of the register to write is

defined;

- In the field "**NPoint**" the number of consecutive registers to write is defined;
- In the field "**Poll Time**" the delay time between two Modbus requests is defined;
- If the field "**On Change**" is checked, the converter sends the writing request only when the data from EtherNet/IP change the value;
- In the field "**Max Error**" the number of consecutive errors that the converter waits before suspending the poll until the next reboot is defined. If it is set to '0', this function is disabled;
- In the field "**Position**" the address of the EtherNet/IP array where taking the information is defined;
- In the field "**Start Bit**" the bit of the selected byte of the field "Position" where starting to take the data is defined. Valid only for the "Coil Status" type;
- If the field "**Swap**" is checked, the bytes' order is exchanged;
- In the field "**Mnemonic**" the description for the request is defined.



Note:

In order to write the data only "On Change", the "Poll Time" must be set to '0'.



Note:

If the field "On change" is checked and the "Poll Time" is different from 0, the converter sends the writing request cyclically and also when the data is changed.

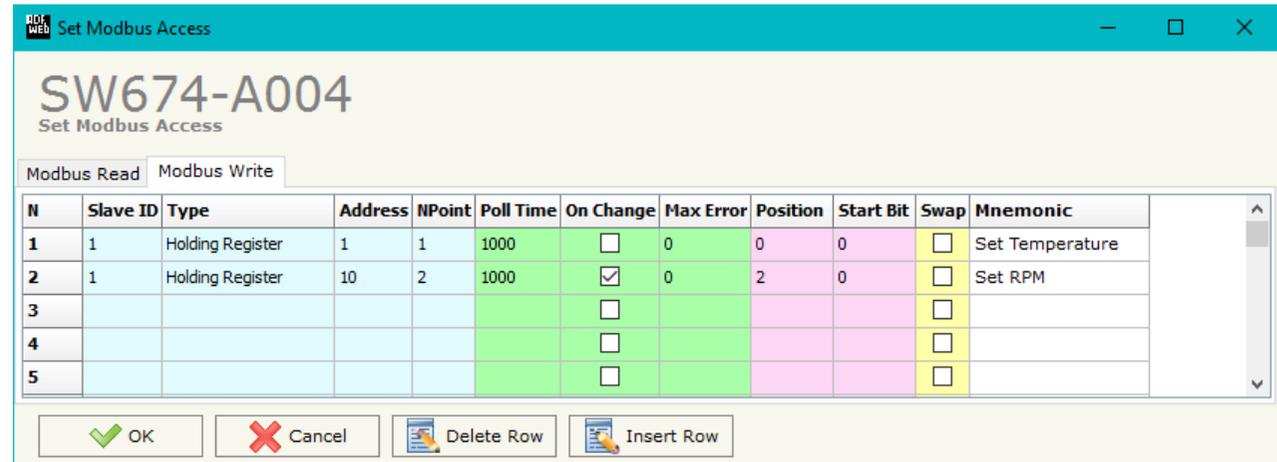


Figure 4b: "Set Access → Modbus Write" window

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.

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

- Connect the USB cable;
- Connect the Ethernet cable;
- Turn ON the converter;
- Insert the IP “**192.168.2.205**”;
- Press the “**Ping**” button, “Device Found! must appear”;
- Press the “**Next**” button;
- Select which operations you want to do;
- Press the “**Execute update firmware**” button to start the upload;
- When all the operations are “OK”, the updating is done;
- Remove the USB cable;

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

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;
- Press the “**Ping**” button, must appear “Device Found!”;
- Press the “**Next**” button;
- 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.

 **Note:** When you install a new version of the software, if it is the first time it is better you do the update of the Firmware in the HD674-A004 device.

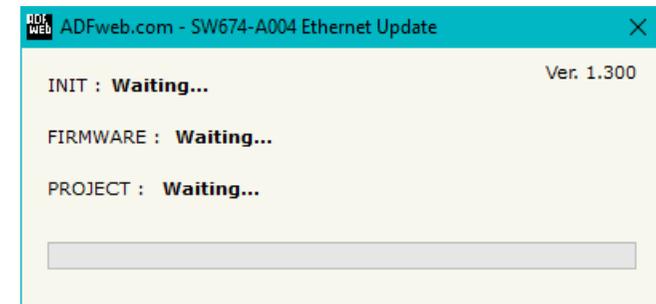
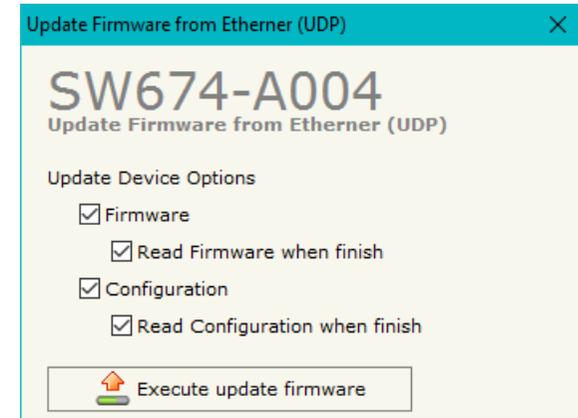
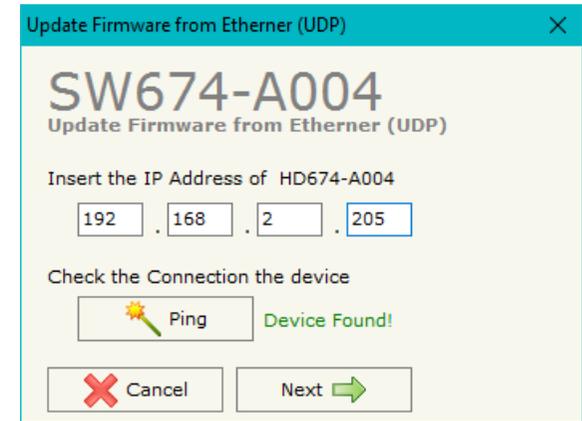


Figure 5: “Update Device” windows

**Note:**

When you receive the device, for the first time, you also have to update the Firmware in the HD674-A004 device.

**Warning:**

If Fig. 6 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 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 you have to launch the "Command Prompt" with Administrator Rights;
- ➔ Pay attention at Firewall lock.

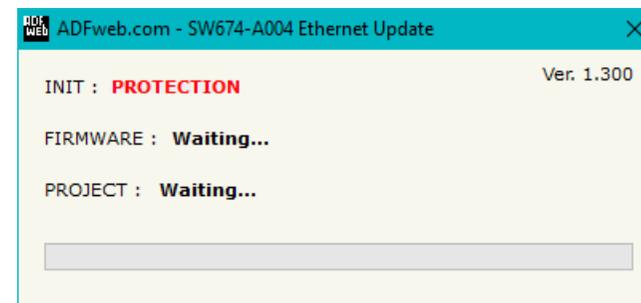


Figure 6: "Protection" window

In the case of HD674-A004 you have to use the software "SW674-A004": www.adfweb.com/download/filefold/SW674-A004.zip.

MODBUS DIAGNOSTIC OVER ETHERNET/IP:

It is possible to save the Modbus Diagnostic on EtherNet/IP array using the field "Diagnostic" of the section "Set Communication". In this case, the status of each Modbus request defined in the section "Set Access" is saved starting from the byte of the EtherNet/IP array defined in the section "Set Communication".

Each bit will represent the status of a Modbus request:

- If for a request the converter receives a correct response, the status bit is put to '0';
- If for a request the converter receives a wrong response or it doesn't receive any response, the status bit is put to '1'.

Example:

In the section "Set Access" are defined 8 Modbus reading requests ("Modbus Read" table) and 8 Modbus writing requests ("Modbus Write" table). The Modbus reading requests are working and the Modbus writing request are not working.

The status bits of the Modbus Diagnostic on EtherNet/IP will be:

Byte x								Byte x+1							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

where 'x' is the starting byte of the EtherNet/IP array where the Modbus diagnostic is saved.

ADVANCED FUNCTIONS:

In the HD674-A004 are implemented some advanced commands that allow to check the functioning of the converter and send some Modbus commands directly from Ethernet side.

These commands can be sent directly from the SW674-A004 software, using the section "Advanced Functions" under the "Option" window.

ENABLE/DISABLE MODBUS POLLS (B0/B1)

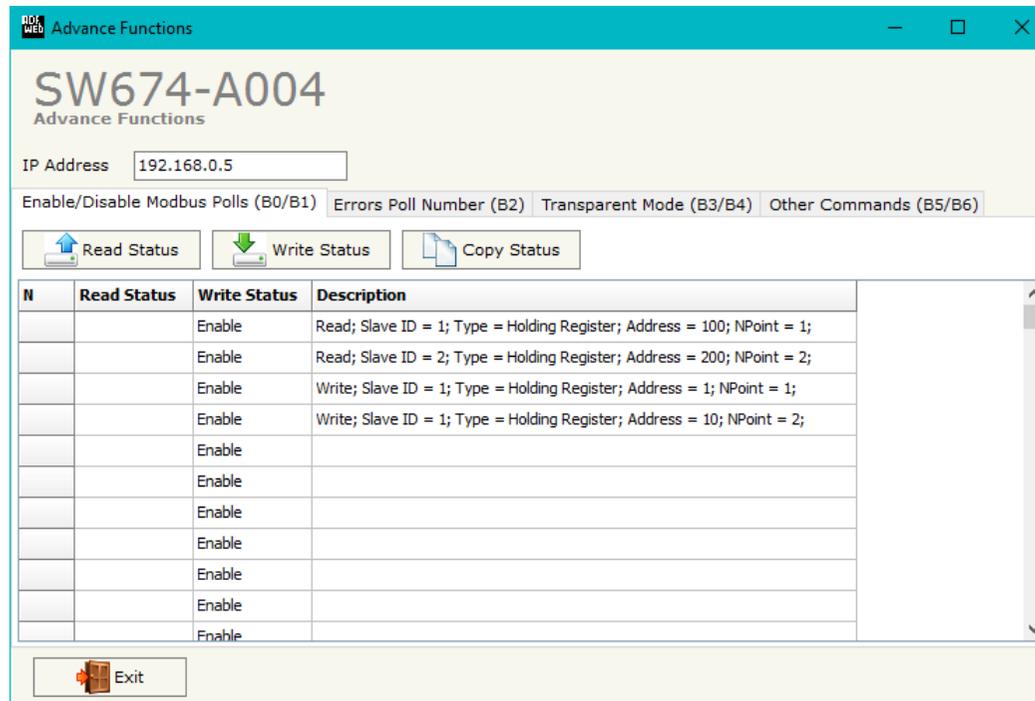


Figure 7: "Advanced Functions → Enable/Disable Modbus Polls" window

This section of the software allows to read the status of the Modbus requests (enabled or disabled) and it allows to change their status without re-programming the converter.

ERROR POLL NUMBER (B2)

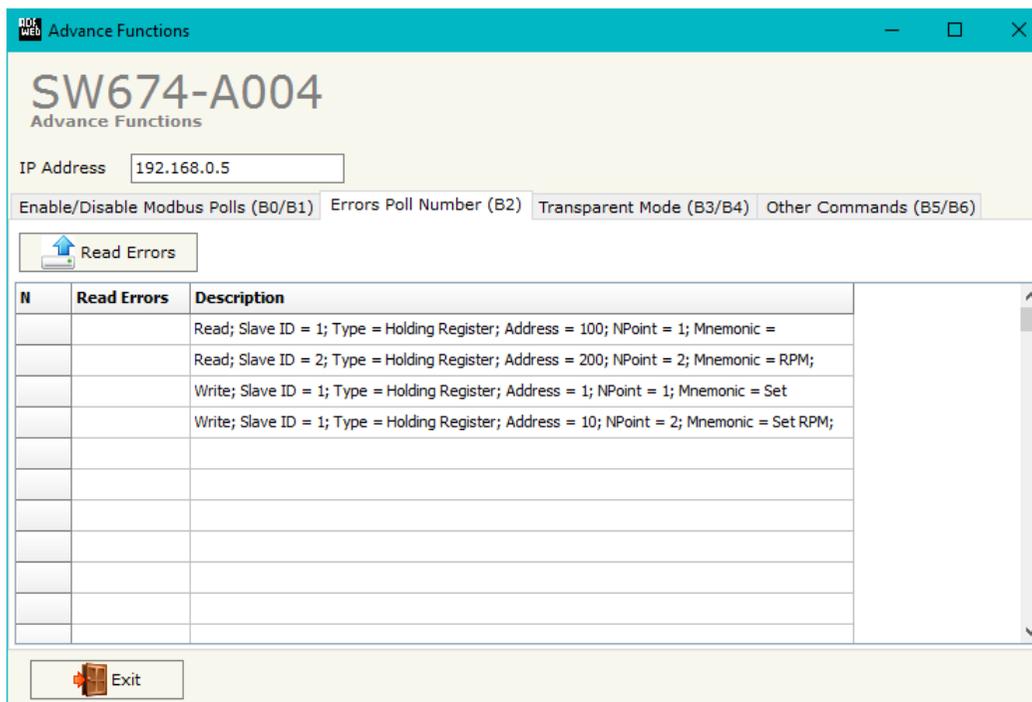


Figure 8: "Advanced Functions→Error Poll Number" window

These section of the software allows to read number of errors received (timeout or exception) for each Modbus request defined.

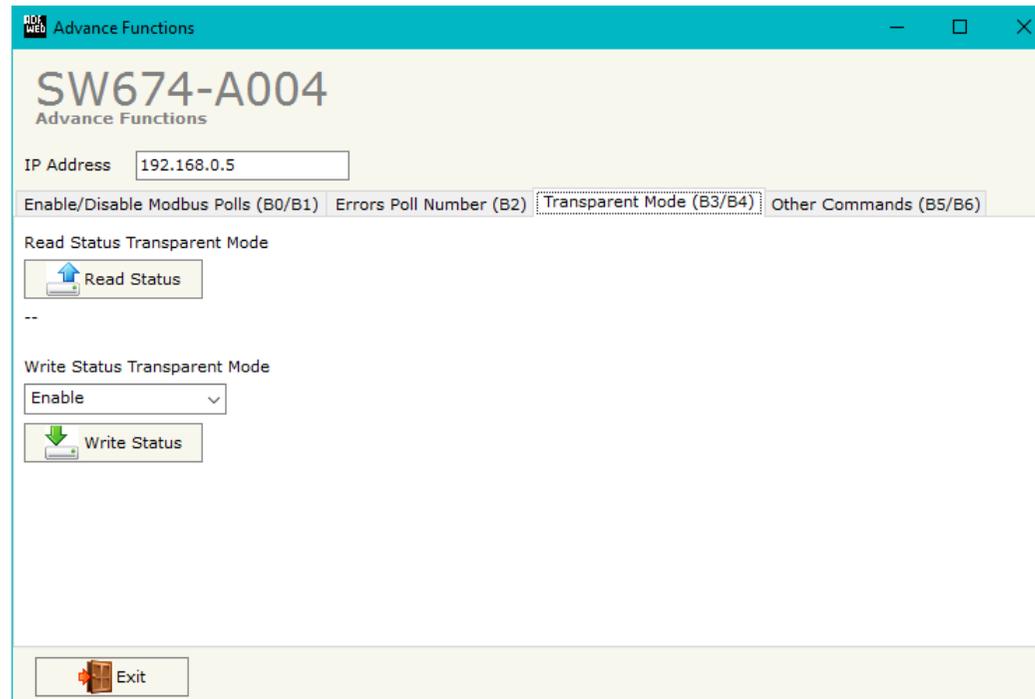
TRANSPARENT MODE (B3/B4)

Figure 9: "Advanced Functions → Transparent Mode" window

This section of the software allows to enable/disable the Transparent Mode of the converter. This Mode is used to send/receive some serial messages directly from UDP messages. The UDP messages will be addressed from/to the Tunneling Port defined in the section "Set Communication" of the SW674-A004.

**Note:**

When the Transparent Mode is enabled, the normal functioning of the converter is stopped until this function is disabled again.

OTHER COMMANDS (B5/B6)

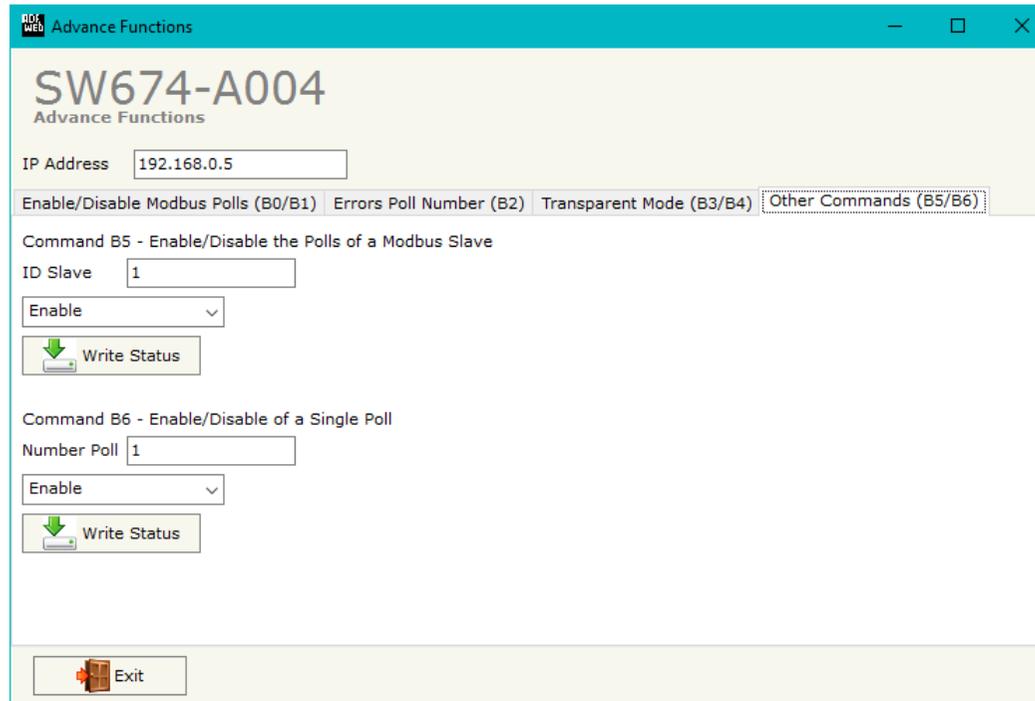


Figure 10: "Advanced Functions→Other Commands" window

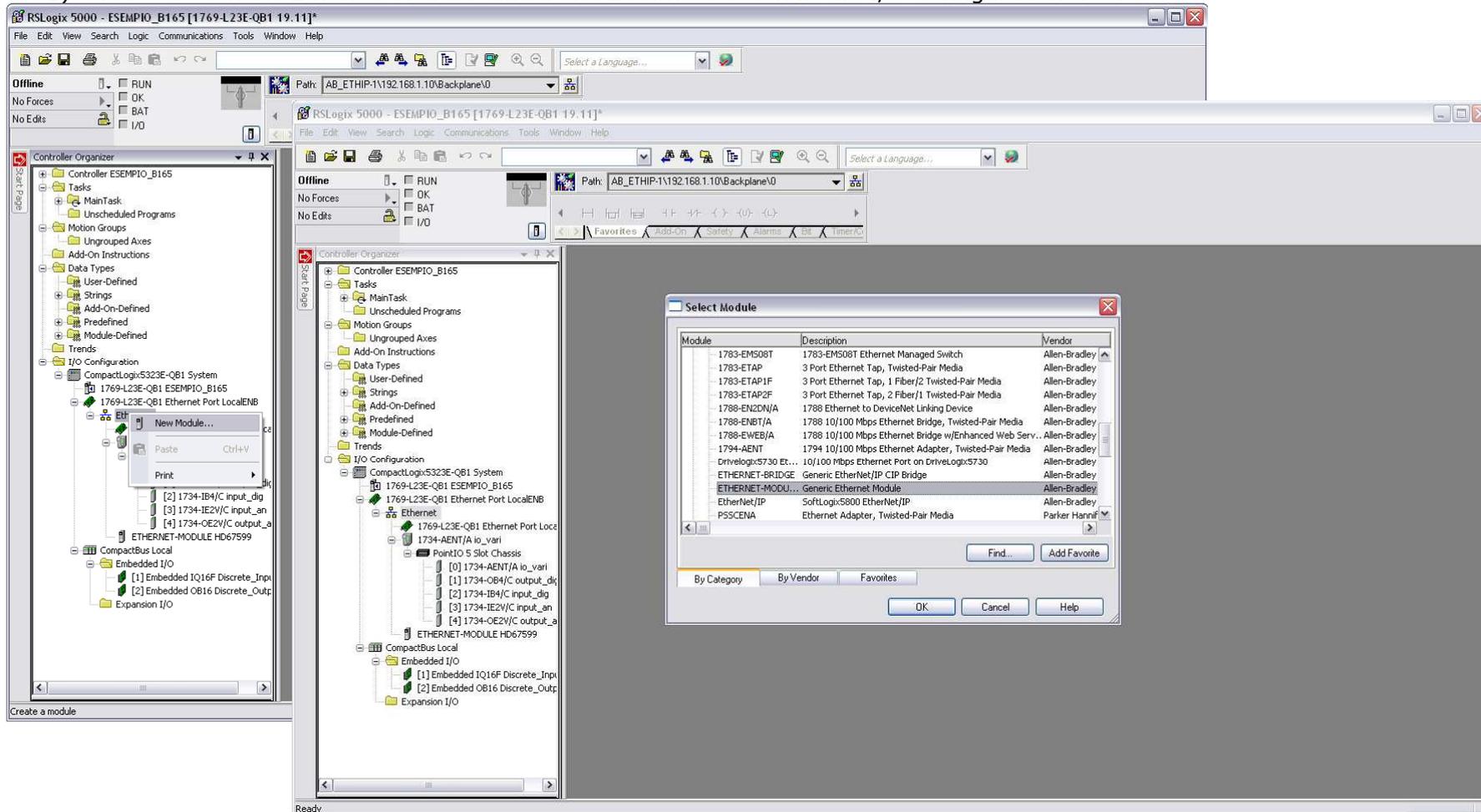
These section of the software allows to enable/disable the Modbus polling for a specific slave (ID) and/or a single poll of the Modbus tables defined in the section "Set Access" of the SW674-A004.

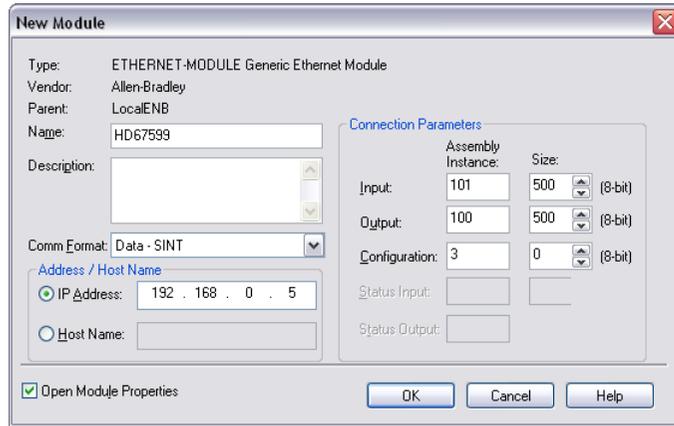
PLC CONFIGURATION:

The configuration and commissioning of the EtherNet/IP Converter as described on the following pages was accomplished with the help of the "RSLogix 5000" software of Rockwell Automation. In case of using a control system from another supplier please attend to the associated documentation.

These are the steps to follow:

1) Create a "Generic Ethernet Module" under the Ethernet section in the I/O Configuration tree.





2) Edit the settings of the new Generic Ethernet Module. As shown in the screen shot below, the module was named "HD674-A004" and the IP-address assigned is 192.168.0.5.

For the Comm Format "Data - SINT" shall be selected as the data type.

The HD674-A004 can use up to 496 bytes for input assembly instance 101 and 496 bytes for output assembly instance 100.

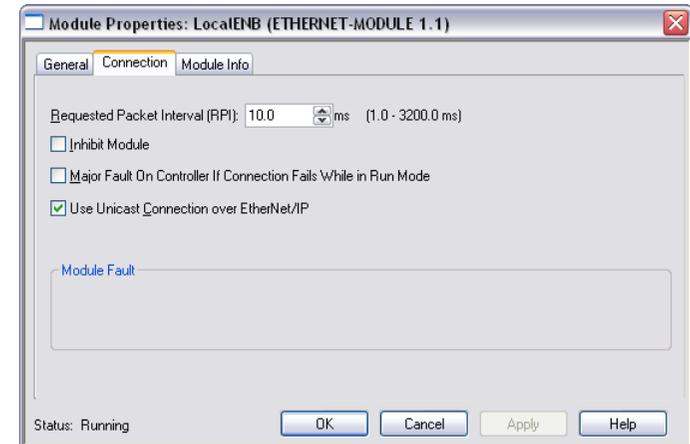
RSLogix 5000 requires a configuration assembly instance. Both modules do not provide a configuration assembly instance. Therefore it is allowed to select an instance of 3 and to set the value to zero.

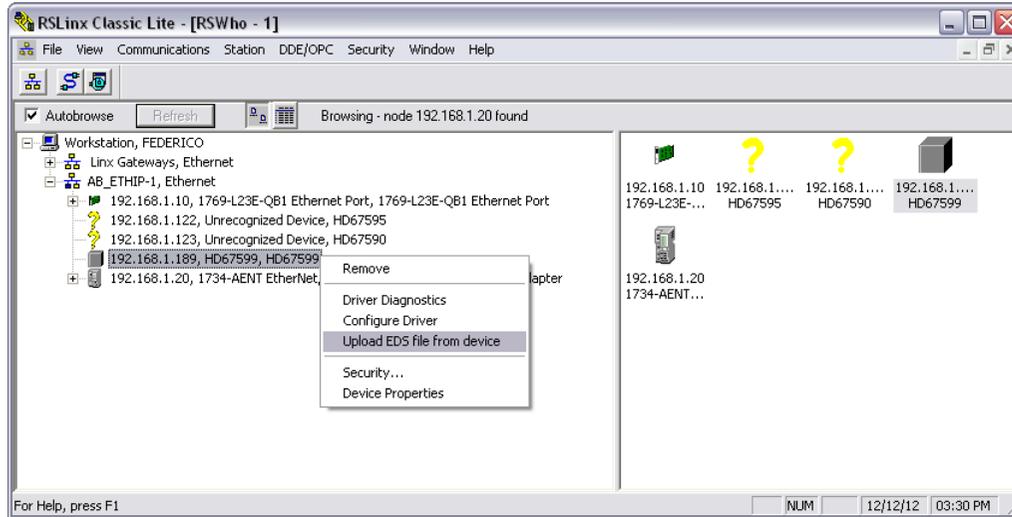
3) The setting of 10msec for the "Requested Packet Interval (RPI)" is adequate but it is possible to change this value as required. A lower value of 2ms shall not be selected.



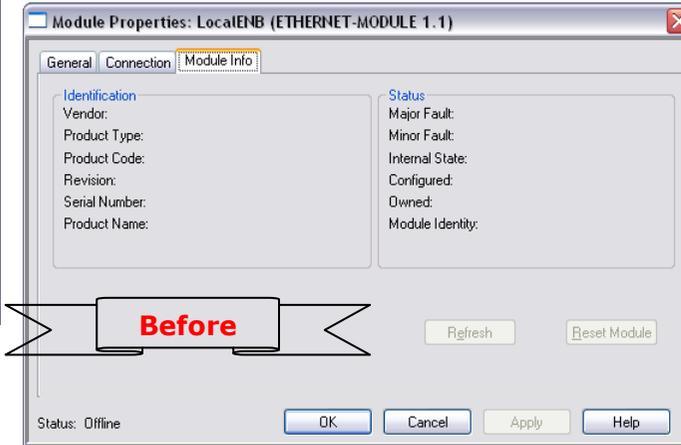
Warning:

The field "Use Unicast Connection over EtherNet/IP" must be checked.

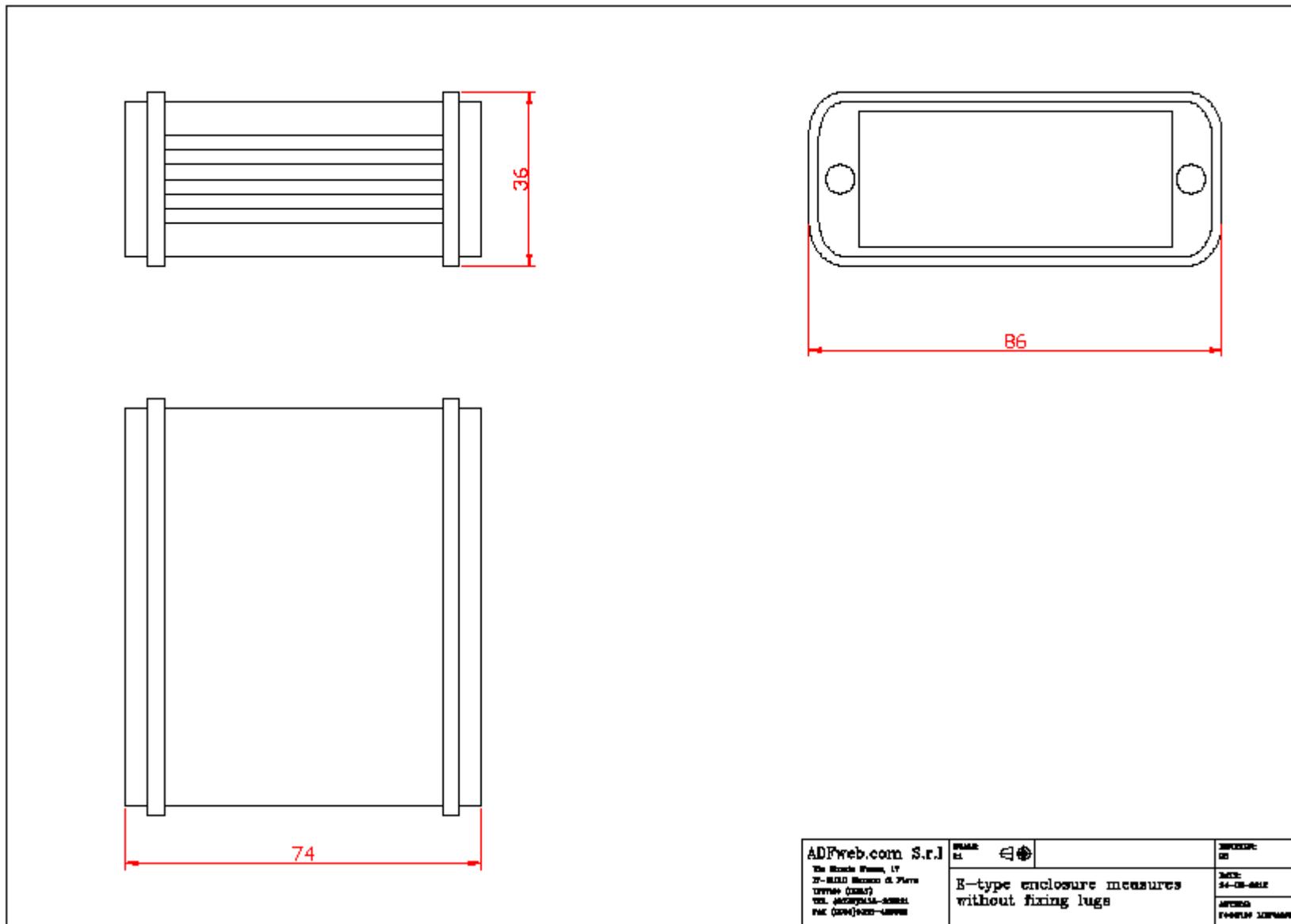


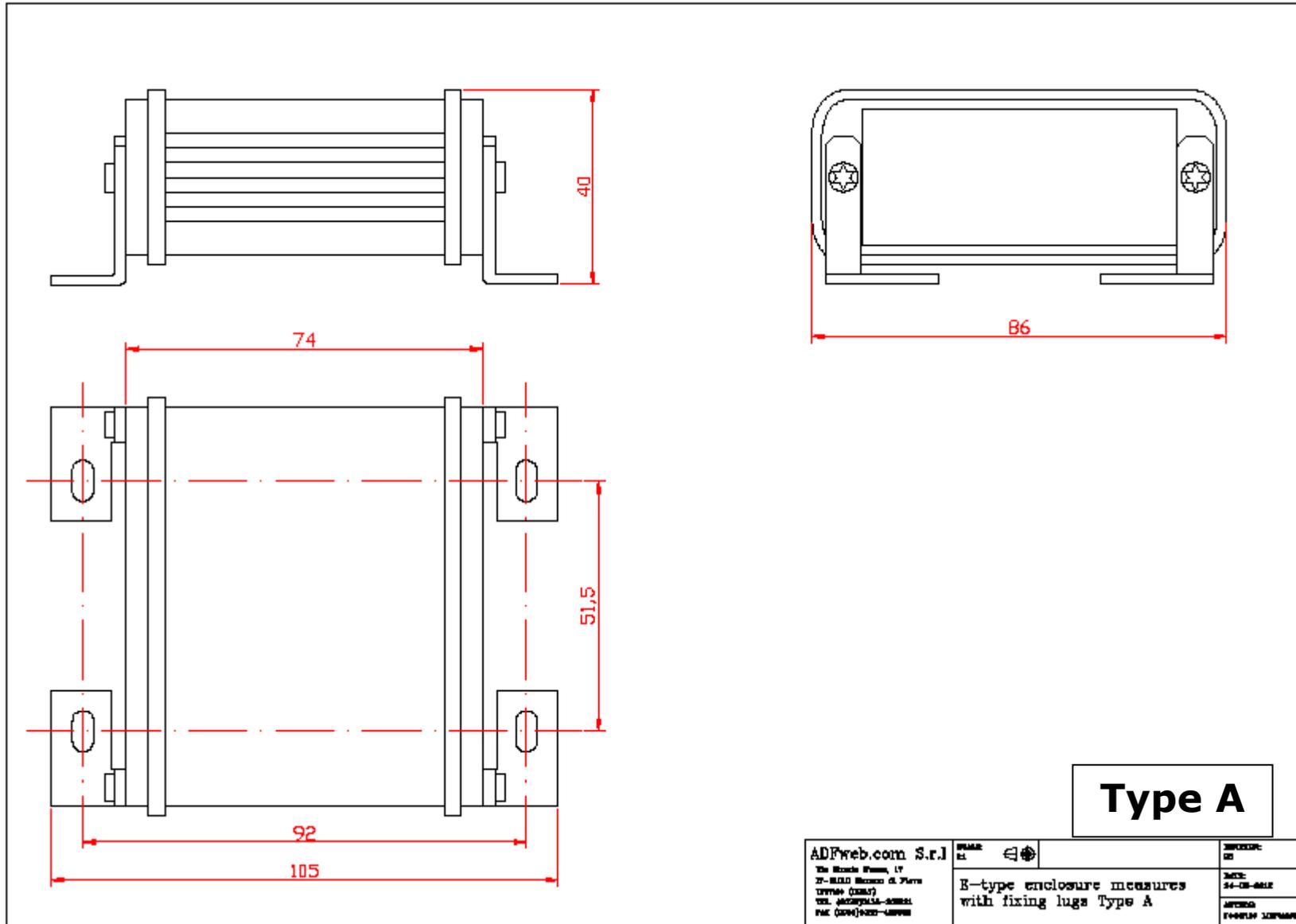


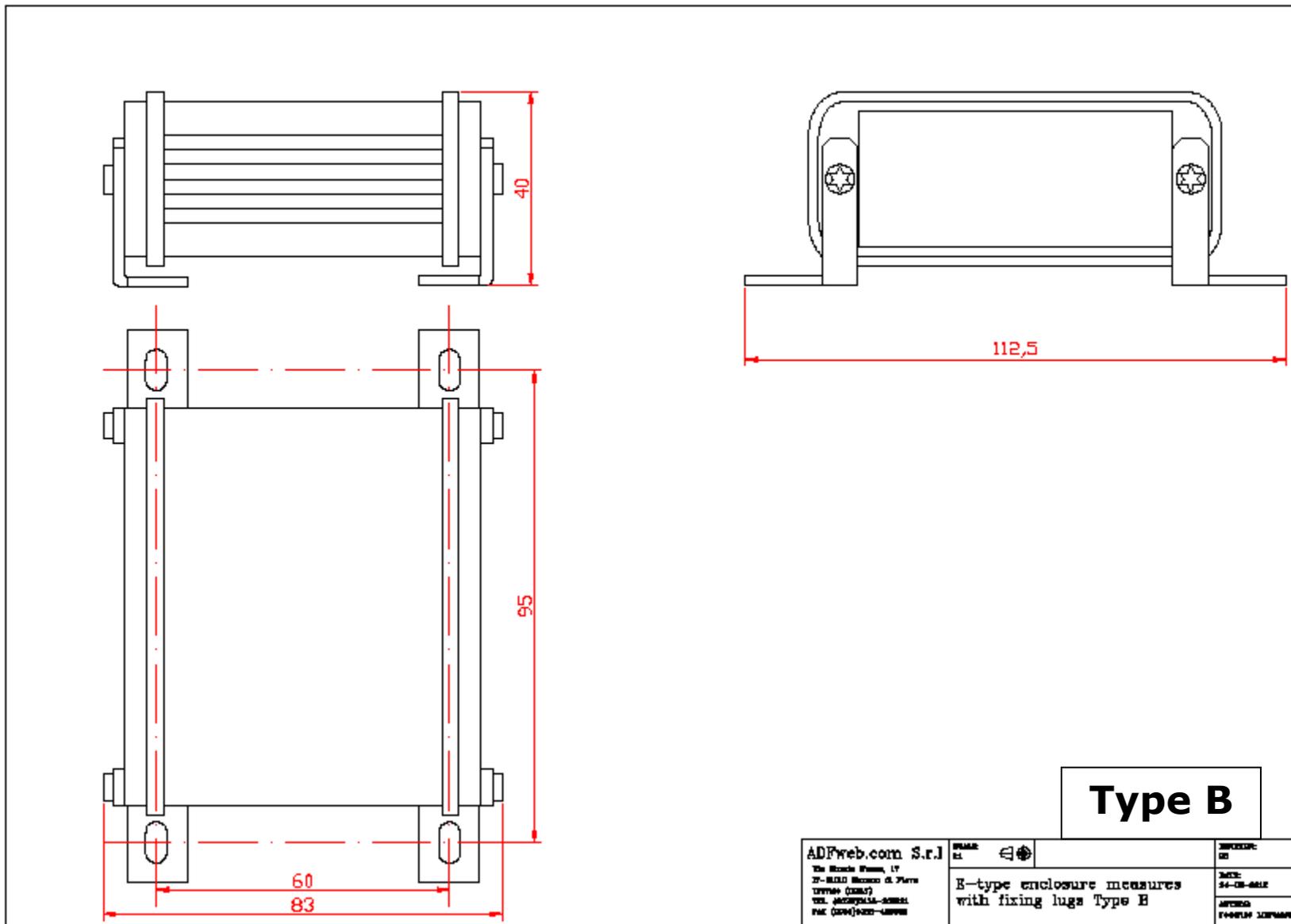
5) With "RSLinks Classic Lite", after have done a network scan (RSWho), and finding the EtherNet/IP device, it is possible to load the EDS file for the device in order to have the "Module Info" compiled.

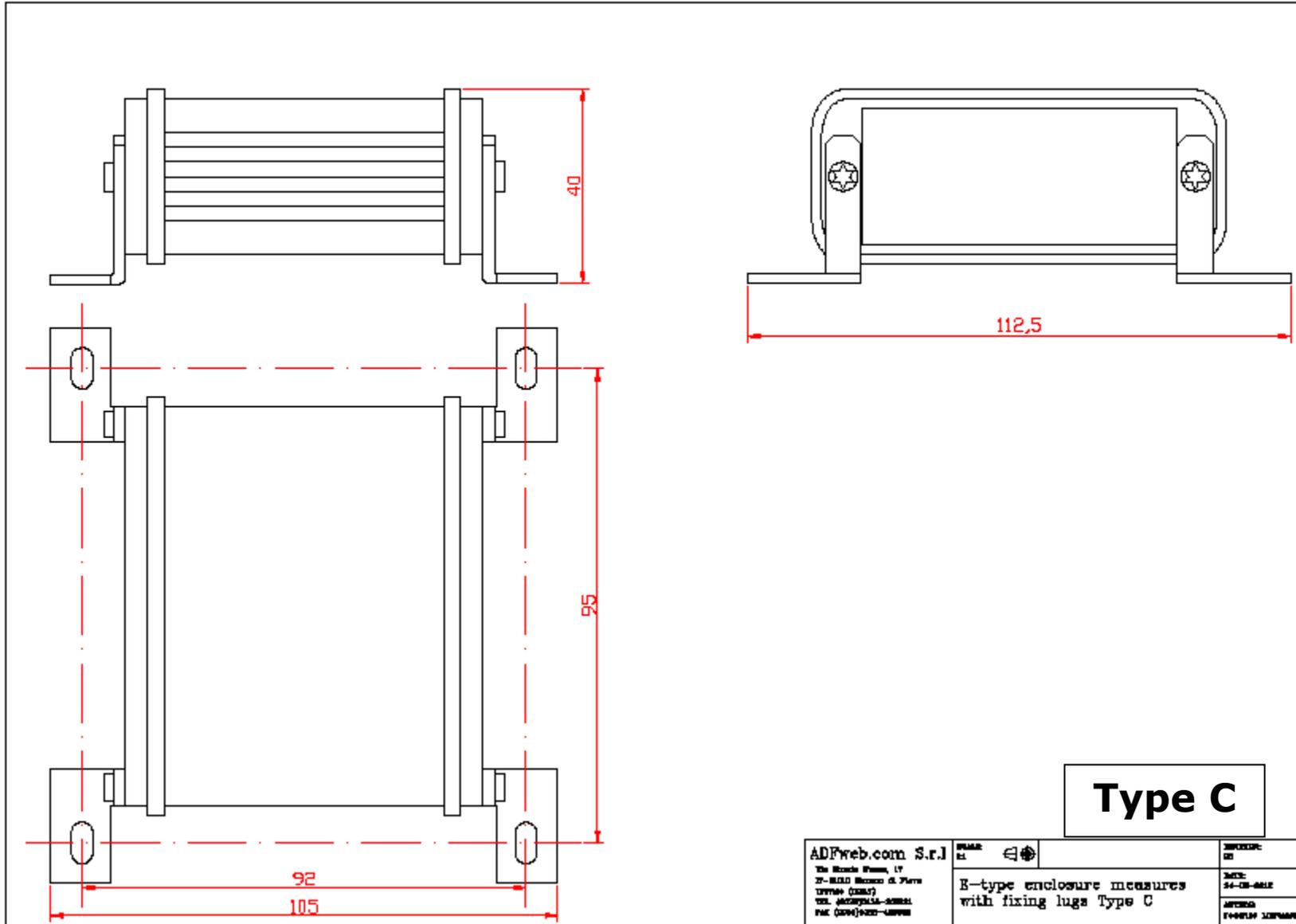


MECHANICAL DIMENSIONS:





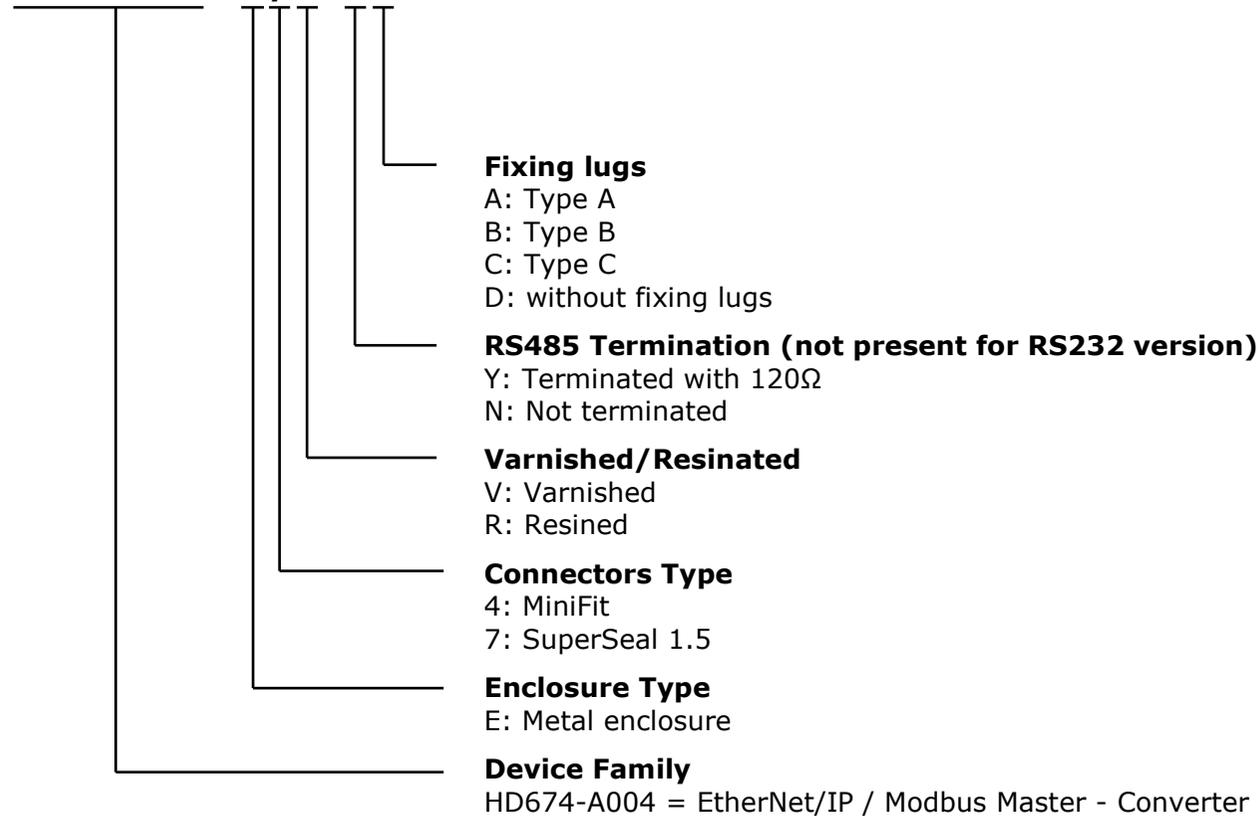




ORDERING INFORMATIONS:

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

HD674-A004 - E y z - s 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: **AC67410** - Accessory Automotive Devices - Support for rail DIN

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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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