

User Manual

Revision 2.003
English

CANopen / CANopen - Converter

(Order Code: HD67121)

for Website information:

www.adfweb.com?Product=HD67121

for Price information:

www.adfweb.com?Price=HD67121

Benefits and Main Features:

- ▶ Very easy to configure
- ▶ Low cost
- ▶ Rail mountable
- ▶ Wide supply input range
- ▶ Galvanic isolation
- ▶ Industrial temperature range:
-40°C / 85°C (-40°F / 185°F)



HD67121

Similar Products



Benefit



For other Gateways / Bridges:

Canopen to Modbus / DeviceNET

See also the following links:

www.adfweb.com?product=HD67001

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(Modbus RTU Slave)

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(Modbus TCP Master)

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

Ask it to the following link:

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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:

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REVISION LIST:

Revision	Date	Author	Chapter	Description
1.015	19/06/2006	Ddt	All	documentation code changed
1.016	22/06/2007	Av	All	Revision
1.017	26/06/2007	Av	All	Revision
2.000	10/07/2007	Av	All	New document format
2.001	20/07/2009	MI	All	Revision
2.002	05/07/2010	FT	All	Revision
2.003	13/02/2013	Nt	All	Added new chapters

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SECURITY ALERT:**GENERAL INFORMATION**

To ensure safe operation, the device must be operated according to the instructions in the manual. When using the device are required for each individual application, legal and safety regulation. 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 instrument can represent a potential hazard if they are inappropriately installed and operated by personnel untrained. These instructions refer to residual risks with the following symbol:

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

CE CONFORMITY

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

CHARACTERISTICS:

The CANopen to CANopen Gateway allows the following characteristics:

- Two-directional translation of information at high levels between two distinct CANopen Buses;
- Electrical isolation between two Buses;
- The association between objects of device modules located in different buses, readable via SDO from the Gateway on the other side;
- The generation of EMCY on one side of the Gateway when there is an EMCY on the other side (originator);
- The generation of PDO on one side of the Gateway when there is a PDO on the other side (originator);
- Temperature range -40°C to 85°C.

The CANopen to CANopen Gateway must be used for interfacing two CANopen lines. Otherwise, in order to extend the length and the electrical isolation of more branches than CANopen line you must use CAN Repeater device (note: view PRODUCTS AND RELATED DOCUMENTS).

The Gateway cannot perform as Master in the network management functions; for example, it cannot begin the “start” of the network. “Start” means the type of package made for carrying modules from the preoperational to the operational state.

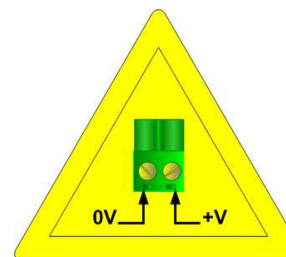
If the two CANopen networks which connect the gateway do not have a device for a single network that acts as a Master, the Gateway cannot transmit a PDO from one network to another. This because a CANopen network cannot use a PDO in the “preoperational” state.

POWER SUPPLY:

Recommended Power Supply	
VDC	VAC
24v	12v

VDC		VAC	
Vmin	Vmax	Vmin	Vmax
8v	35v	8v	19v

Caution: Not reverse the polarity power .



CONFIGURATION:

To configure the Gateway, use the available software that runs with Windows, called SW67121. It is downloadable on the site www.adfweb.com and its operation is described in this document.

The Configurable CANopen Gateway can be configured up to a maximum 1600 SDO (SDO CAN 0 + SDO CAN 1). The maximum number of the following:

- EMCY;
- PDO;

depends on the available memory of the Gateway and the number defined SDO.

CONNECTION SCHEME:

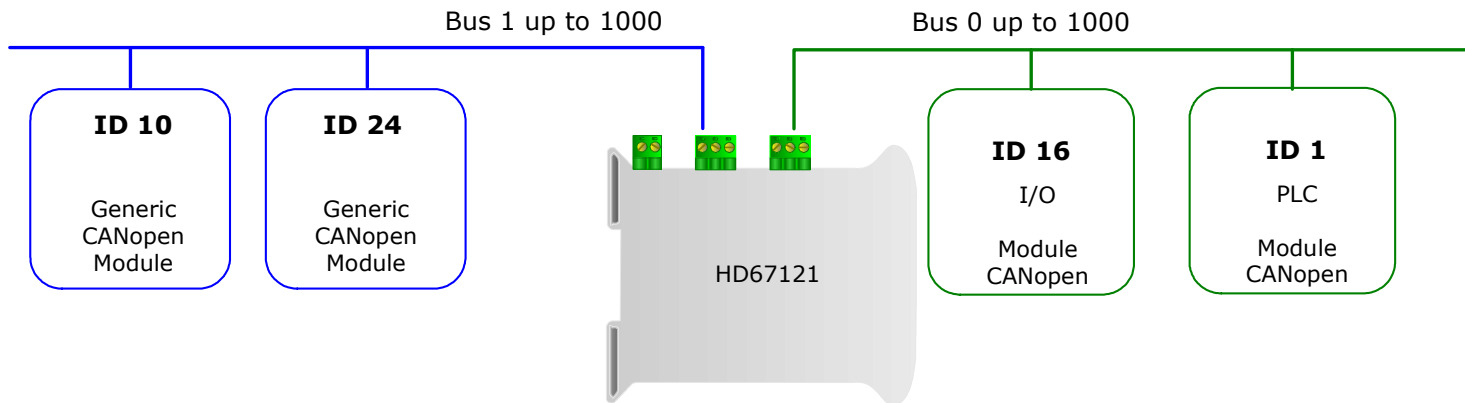


Figure 1: Connection scheme of HD67121 between CANopen and CANopen

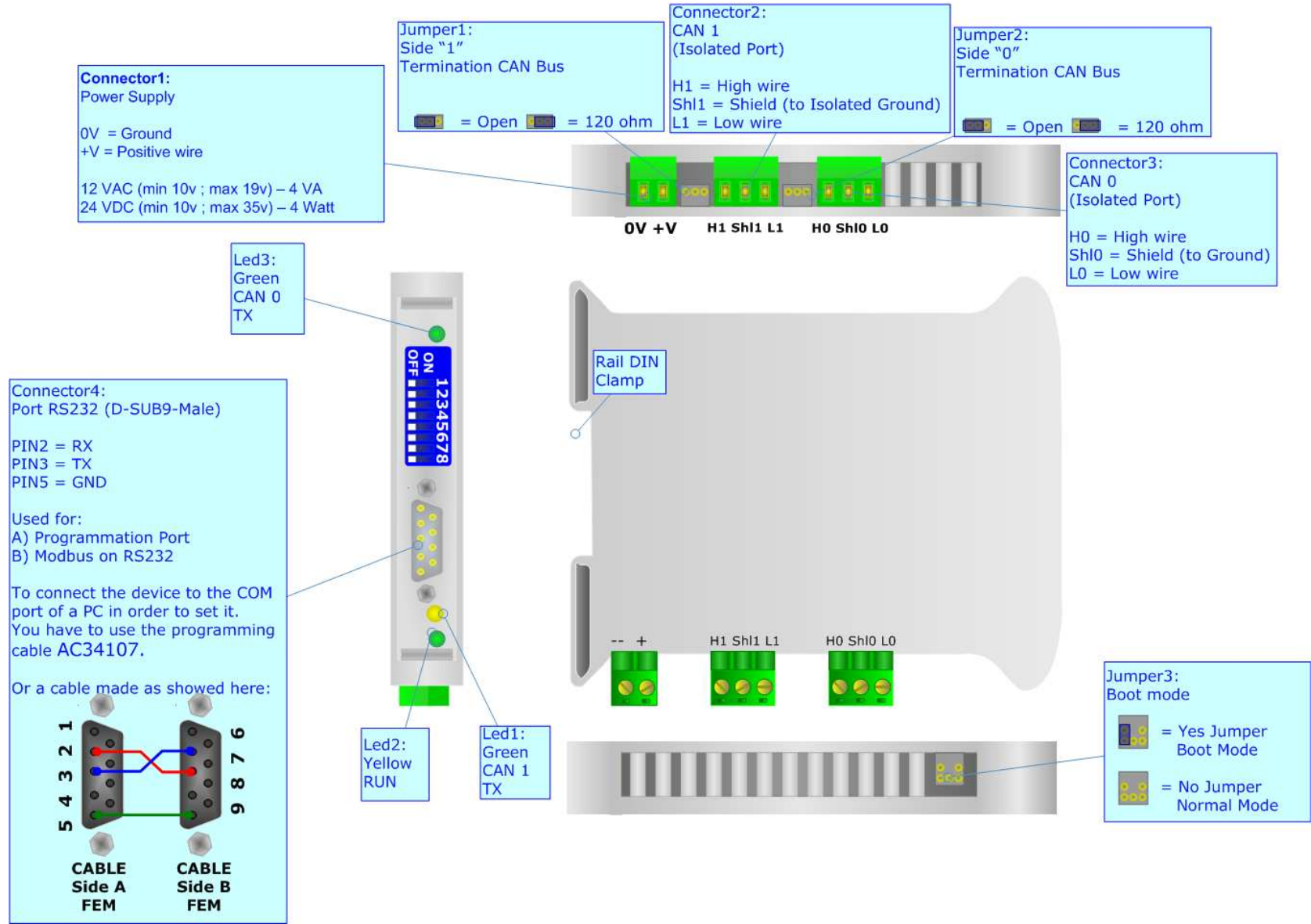


Figure 2: Connection scheme for HD67121

INTRODUCTION:

The Gateway, allows a CANopen line to communicate with a different CANopen line. We simply call these "CAN 0" and "CAN 1" in this manual.

The two networks are symmetrical at a logical level. What "CAN 0" can do to "CAN 1", "CAN 1" can do to "CAN 0" too. "CAN 0" and "CAN 1" are different only on the level of hardware. One of the two CANopen has the power supply in common with the logic of the device. The other CANopen is isolated, based on the logic of the device.

You need Compositor SW67121 software on your PC in order to perform the following:

- Define that the SDO of the "CAN 0" are accessible from "CAN 0";
- Define that the SDO of the "CAN 1" are accessible from "CAN 0";
- Define which and how the EMCY of the "CAN 0" are accessible from "CAN 1";
- Define which and how the EMCY of the "CAN 1" are accessible from "CAN 0";
- Define which PDO of "CAN 0" are accessible from "CAN 1";
- Define which PDO of "CAN 1" are accessible from "CAN 0";
- Update the new configurations of the device;
- Save, duplicate, modify, export the configurations.

USE OF COMPOSITOR SW67121:

When launching the SW67121 the right window appears
(The SW67121 is downloadable on the site

<http://www.adfweb.com/home/download/download.asp>

This manual is referenced to the last version of the software present on our web site).

The following explains the function of the buttons:

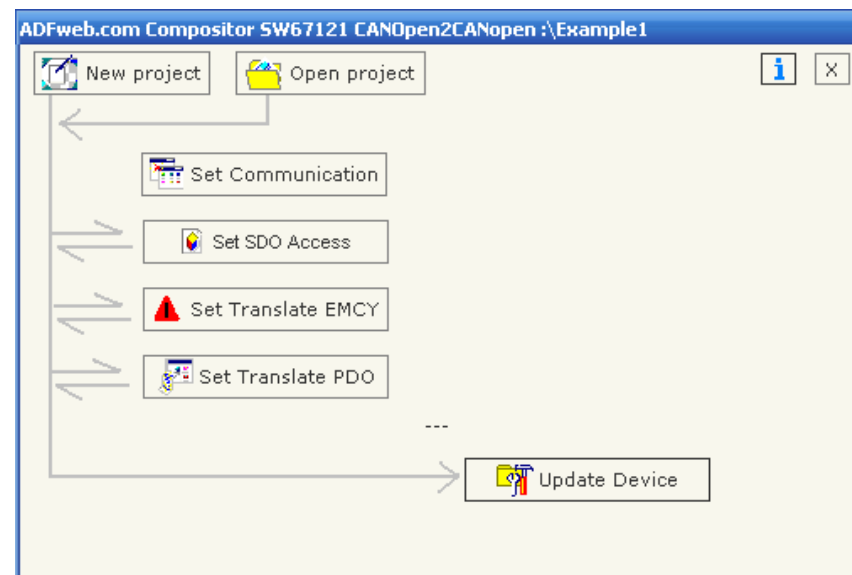


Figure 3: Main window for SW67121

NEW PROJECT / OPEN PROJECT:

The "New Project" button creates the folder which contains the entire device configuration. A device configuration can also be imported or exported:

- To clone the configurations of the Gateway in order to configure another Gateway 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 it with the button "Open Project".

When a new project is created or an existent project is open, it will be possible to access the various configuration sections of the software:

- **"Set Communication";**
- **"Set SDO Access";**
- **"Set Translate EMCY";**
- **"Set Translate PDO".**

SET COMMUNICATION:

This section defines the fundamental communication parameters of two Buses.

By pressing the "Set Communication" button from the main window for SW67121 (Fig. 3) the "Set Communication" window appears (Fig. 4):

- In the field "DevID" the CAN address of "CAN 0" is defined;
- In the fields "Baud rate" the velocity of the two Buses are defined;
- "SDO timeout" is the maximum waiting time when the device of "CAN 0" asks the Gateway for a SDO that comes from the device of "CAN 1" and the device of "CAN 1" does not respond (vice-versa if you have changed "CAN 1" with "CAN 0"). The parameter "SDO Timeout (1/10)" is expressed in decimal milliseconds so the example in the window is set at 100 ms.

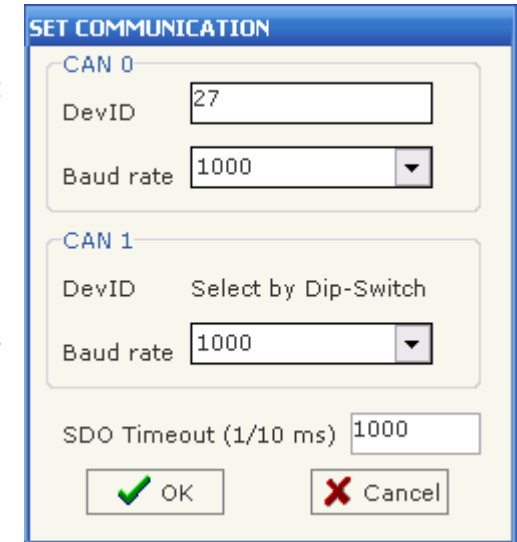


Figure 4: "Set Communication" window

DevID Select by dip-Switch

“CAN 1” address is defined through the dip-switch present in the device. To set it you must convert the address in binary. (The address must be between 1 and 127).

Example 1:

DevID=1

Binary:00000001



DevID=127

Binary:01111111



Some other examples:

DevID	Dip 1	Dip 2	Dip 3	Dip 4	Dip 5	Dip 6	Dip 7	Dip 8
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
50	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
100	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
127	ON	ON	ON	ON	ON	ON	ON	OFF

SET SDO ACCESS:

The following objects can be defined within the section "Set SDO Access":

- The SDO of the "CAN 0" are accessible also by "CAN 1";
 - The SDO of the "CAN 1" are accessible also by "CAN 0";
- (note: when a SDO in the "CAN 0" is defined, a SDO corresponds in the "CAN 1" and vice-versa).

By pressing the "Set SDO Access" button from the main window for SW67121 (Fig. 3) the "Set SDO Access" window appears (Fig. 5).

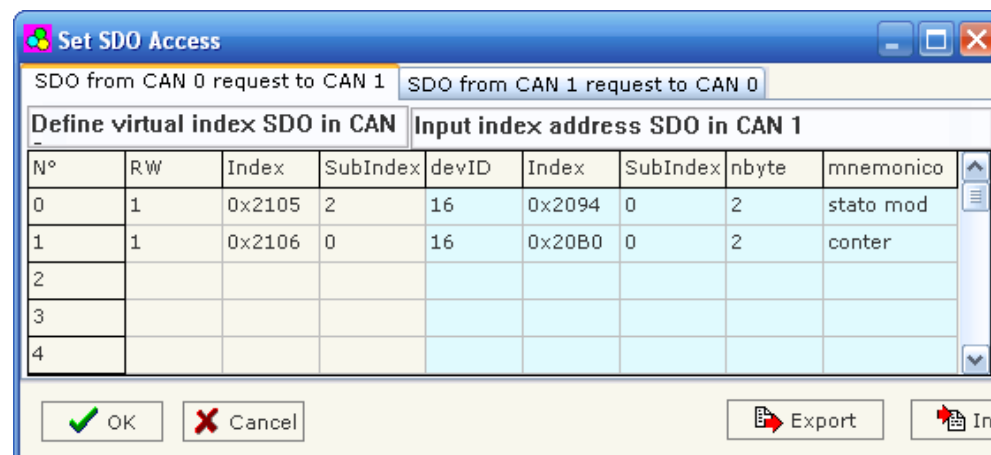


Figure 5: "Set SDO Access" window

The columns' data have the following meanings:

- The field "RW" indicates if the data is in read/write or read only (in "CAN 0"):
 - The controls are done from the Gateway. If the variable on the opposite BUS is in read /write but I want to block the access of the writing, I must write "0" in the cell "RW". In this way, even if the module where the data resides requires an access in write from its side of the network, I can still block the writing on the other network;
- In the fields "Index" and "SubIndex0" insert the indexes of the new object SDO that must be defined on "CAN 0", because a device in "CAN 0" can request a SDO from a "CAN 1" device:
 - Procedures can be changed by switching "CAN 0" and "CAN 1" and vice-versa;
- In the field "devID" insert the address of the original device of the SDO data in the "CAN 1" (where the data is actually contained);
- In the fields "Index" and "SubIndex" insert only the coordinates of the SDO that the Gateway must read on "CAN 1" to make the requested data available to the device on "CAN 0";
- In the field "Nbyte" insert the data size (this value can be 1, 2, or 4);
- In the field "Mnemonico" you can insert a brief description.

Example 1:

If I want to read the data present in the "CAN 1" network while I am in the "CAN 0":
The address data in "CAN 1" are the following:

- Address 16;
- Index 0x2094;
- SubIndex 0;
- Dimension 2 Bytes.

Through the gateway using the following:

- Index 0x2105;
- SubIndex 2.

In the above example:

The generic CANopen Module at the address "10" in the "CAN 0" network reads a parameter of the CANopen module at the address "16" in the "CAN 1", at the index "2094" and SubIndex "0".

The data is readable in the "CAN 0" network by accessing the following:

- Address 44, in the "CAN 0";
- Index 2105;
- SubIndex 2.

The dimension of the data is specified in nByteB.

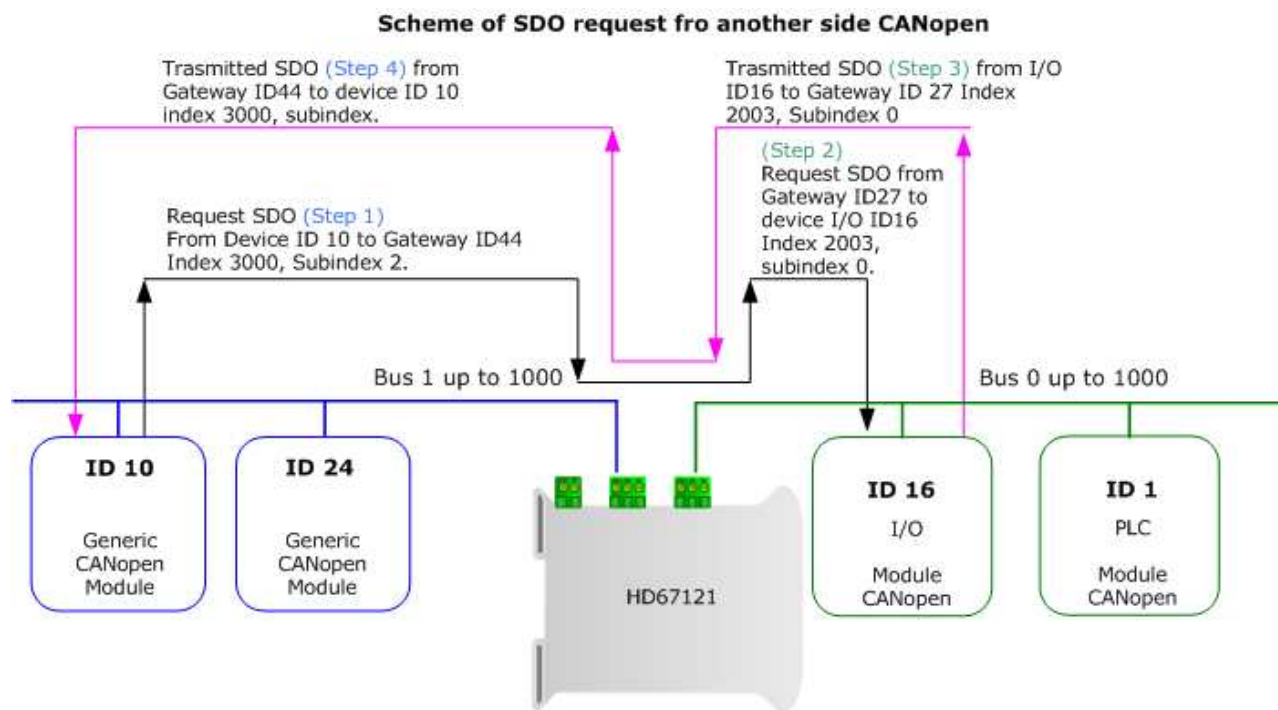


Figure 6: Chart of SDO request from CANopen sides

SET TRANSLATE EMCY:

By pressing the "Set Translate EMCY" button from the Main window for SW67121 (Fig. 3) the "Set Translate EMCY" window appears (Fig. 7).

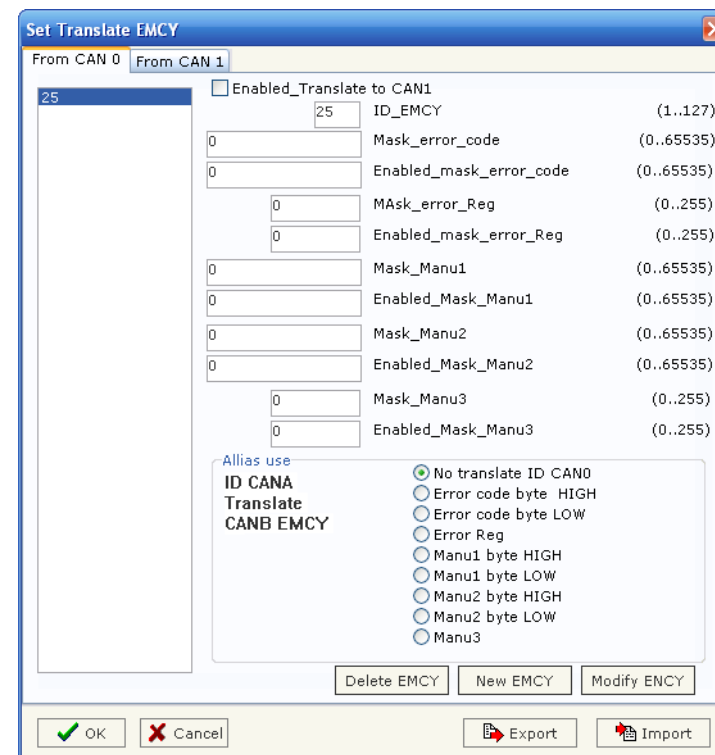


Figure 7: "Set Translate EMCY" window

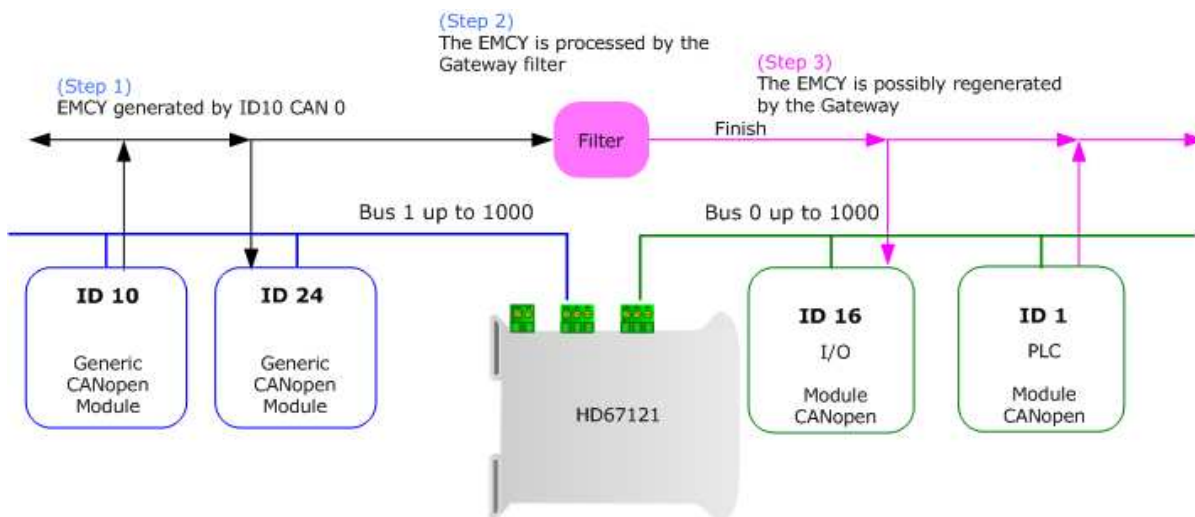


Figure 8: Propagation scheme of an EMCY from "CAN 0" to "CAN 1"

CREATION OF AN EMCY:

In order to intercept the EMCY of the device, at first it is necessary to define the EMCY and then fill the window "Set Translate EMCY" as desired.

Use the button "New EMCY" to define a new EMCY.

DEFINING STRUCTURE OF THE EMCY REGISTERS

Reg.	Description	Mascaras filtro Gateway	Dimension of the register
1	ID	ID_EMCY	7 bit
2	Error_code	Mask_Error_Code	16 bit
3	Error_reg	Mask_Error_Reg	8 bit
4	Manu1	Mask_Manu1	16 bit
5	Manu2	Mask_Manu2	16 bit
6	Manu3	Mask_Manu3	8 bit

Packet CAN of the EMCY. How it result from registers structure (see left)

COB	ID of the propagation device
	BYTE 1 = Error_code (Low)
	BYTE 2 = Error_code (hight)
	BYTE 3 = Error_reg
	BYTE 4 = Manu 1 (Low)
	BYTE 5 = Manu 1 (hight)
	BYTE 6 = Manu 2 (Low)
	BYTE 7 = Manu 2 (hight)
	BYTE 8 = Manu 3

TRANSLATION OF AN EMCY FROM "CAN 0" TO "CAN 1":

In order to intercept an EMCY from "CAN 0" you have to:

- Select the folder "FROM CAN 0" at the top of the EMCY window;
- Fill the field "ID_EM CY" with the address of the "CAN 0" device where the EMCY will be intercepted;
- Write "0" in the fields:
 - "Enable_Mask_Error_Code" = 0;
 - "Enable_Mask_Error_Reg" = 0;
 - "Enable_Mask_Manu1" = 0;
 - "Enable_Mask_Manu2" = 0;
 - "Enable_Mask_Manu3" = 0.
- Check the "Enable_Translate_to_CAN1" box;
- Finally press the "New EMCY" button at bottom of the window.

These operations enables the Gateway to:

- Intercept all the EMCY coming from devices with a specific address from "ID EMCY" in the "CAN 0";
- Replicate the EMCY definitions mentioned above in "CAN 1".

The EMCY replicates are the same as those intercepted with the only difference that the "CAN 0" devices will see the address of the "CAN 1" side of the Gateway and not the "CAN 1" device that generated them (note: they will not see the number in the ID_EM CY).

If you also want to pass the address of the "CAN 0" generating device, you must renounce one data component of the 8 byte in the original EMCY. To do this, refer to the section "Alias USE".

Of course, by doing this it is necessary that the "CAN 1" devices understand how to interpret the registers in order to know where the EMCY derives from.

EXAMPLE OF SETTING A FILTER FOR THE EMCY:

ACTION:

The device on the "CAN 0" of the ID 10 generates and therefore passes an EMCY to the "CAN 0".

CONSEQUENCE:

The Gateway (ID 27 on the "CAN 1") verifies the set conditions on the window "SET Translate EMCY". So then it passes the generated EMCY from "CAN 0" to "CAN 1".

EXAMPLE OF THE CONDITION:

The translation must be done when the ERROR CODE register of the generated EMCY takes the value, for example = 0x0B15. In this case, the message must be translated from "CAN 0" to "CAN 1" (Note: the filter functions therefore in all the other cases):

Therefore: **(see EMCY structure and the correspondent CAN Package)**

"Error Code"= 0x**0B15**

Means when:

Byte1 = **00001011** Byte2 = **00010101**

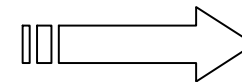
In this case the following fields are inserted in the window **"SET Translate EMCY"**:

- ID_EMCY = **10**;
- Mask_Error_Code = 0x**0B15** (**0000101100010101**);
- Enable_Mask_Error_Code (**1111111111111111**) (**All the BITS of Error Code will be examined**);
- Enable_Translate_to_CANB must be checked.

(Note: the window "SET Translate EMCY" accepts decimal and hexadecimal values in the format with the prefix "0x" or "\$").

Packet CAN of the EMCY that are generated in CAN A:

COB	ID 10
	BYTE 1 = 0x0B
	BYTE 2 = 0x15
	BYTE 3 = Error_Reg
	BYTE 4 = Manu 1
	BYTE 5 = Manu 1
	BYTE 6 = Manu 2
	BYTE 7 = Manu 2
	BYTE 8 = Manu 3



Packet CAN of the EMCY that are transmitted in CAN B by the Gateway

COB	ID 27
	BYTE 1 = 0x0B
	BYTE 2 = 0x15
	BYTE 3 = Error_Reg
	BYTE 4 = Manu 1
	BYTE 5 = Manu 1
	BYTE 6 = Manu 2
	BYTE 7 = Manu 2
	BYTE 8 = Manu 3

VARIATION ON THE PREVIOUS FILTER CONDITION:

In this case the "SET Translate EMCY" window is set up with the following fields:

- ID_EM CY = **10**;
- Mask_Error_Code = 0x**0B15** **(0000.1011.0001.0101)**;
- Enable_Mask_Error_Code = 0x03FF **(0000.0011.1111.1111)** (all the BIT of Error Code will be examined);
- Enable must be checked.

For all the values of the "Mask_Error_Code" register equal to "**XXXX XX11 0001 0101**", the message will pass from "CAN 0" to "CAN 1". Therefore the most significant 6 bit of the "Error_Code" register result as indifferent.

SPECIFIC LIMITATION OF THE FILTER MASK:**ACTION:**

We want the EMCY to translate if:

- Its "Error Code" Register has the value 0x007C;
- or Its "Error Code" Register has the value 0x0063;
- or Its "Error Code" Register has the value 0x0062.

(Note: the OR operations in all above conditions)

CONSEQUENCE:

The Gateway can transmit the EMCY only with values raise the same bits, but in this case the messages also transmit with other specific conditions.

MOTIVE:

1° valore di Error_Code per traslare EMCY 0x007B = 0000 0000 0111 1011
2° valore di Error_Code per traslare EMCY 0x0063 = 0000 0000 0110 0011
3° valore di Error_Code per traslare EMCY 0x0062 = 0000 0000 0110 0010

Enable_Mask_Error_Code to activate the comparison 1111 1111 1110 0110
Mask_Error_Code to compare 0000 0000 0110 0110

The Mask must be calculated by doing the operations NOT XOR BIT to BIT of all values to be intercepted.

Instead, the activation must be calculated by doing the operations AND BIT to BIT of all values to be intercepted.

And so they will transmit all the EMCY that will have the following "ERROR CODE" values.

0x0062 = 0000 0000 0110 0010
 0x0063 = 0000 0000 0110 0011
0x006A = 0000 0000 0110 1010
0x006B = 0000 0000 0110 1011
0x0072 = 0000 0000 0111 0010
0x0073 = 0000 0000 0111 0011
0x007A = 0000 0000 0111 1010
 0x007B = 0000 0000 0111 1011

Note how the BITS that are undetermined, create the extra EMCY values.

SUMMARY OF THE EMCY FILTER:

We have already established that for each generating ID there is the possibility of an EMCY.

The EMCY generated by the device and the respective filter for gateway are composed of the following:

- 5 Registers "Error_Code", "Error_Reg", "Manu1", "Manu2", "Manu3", respectively 16, 8, 16, 16; 8 BIT (note: they are the data received by the EMCY CAN Package);
- 5 masks used to compare the 5 registers, of course, of the same dimension in BITS as the registers (respectively "mask_eq_ec", "mask_eq_er", "mask_eq_m1", "mask_eq_m2", "mask_eq_m3");
- 5 activations BIT to BIT of the masks ("Enable_Mask_Error_Code", "Enable_Mask_Error_Reg", "Enable_Mask_Manu1", "Enable_Mask_Manu2", "Enable_Mask_Manu3", respectively 16, 8, 16, 16; 8 BIT).

CONSIDERATIONS:

When all the BITS of all activation registers are at zero, all the EMCY are transmitted by the filter, because there is not a single BIT that activates the comparison (BIT to 1). This is true for any value of entering data (5 EMCY registers generated) and for any mask value.

SET TRANSLATE PDO:

The Configurable CANopen Gateway has three PDO in output for each BUS according to the standard CANopen.

A user who must pass a PDO from "CAN 0" to "CAN 1" needs to insert the coordinates of the PDO to be transmitted in the field "SET Translate PDO" of the window.

By pressing the "Set Translate PDO" button from the main window for SW67121 (Fig. 3) the window "Define Translate PDO" appears (Fig. 9):

- In the field "**cobid**" insert the Cob_ID of the original PDO;
- In the field "**id_dev_orig**" insert the address of the original device of **CAN 0** (note: an alias can be inserted in the field instead of the actual address of the PDO generator);
- In the field "**en_translate**" insert the number 1 (Note: there are two values: 1 the PDO being transmitted; 0 the PDO that is only defined);

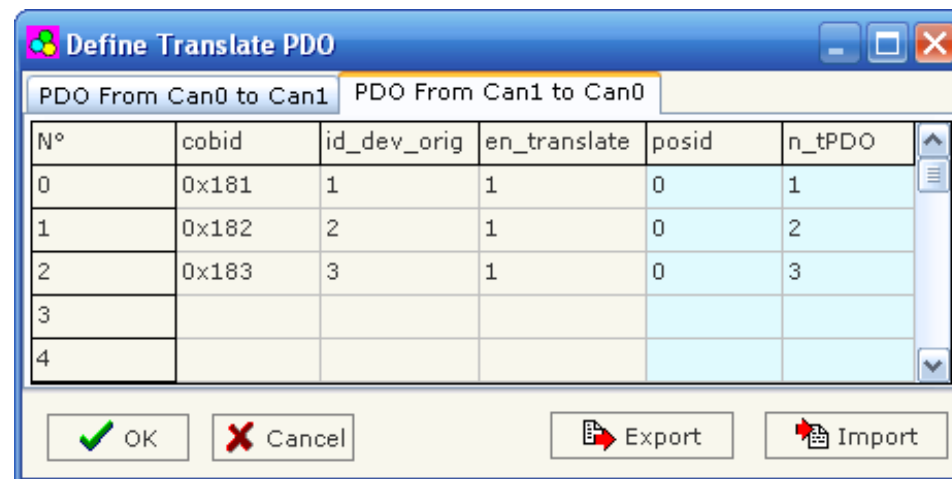
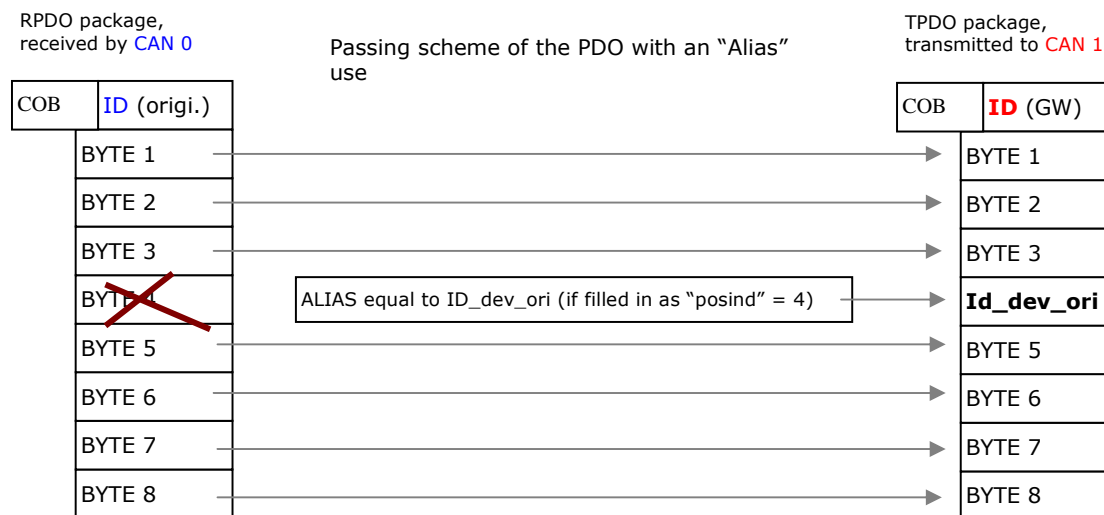


Figure 9: "Define Translate PDO" window

In this way the user creates a corresponding PDO in "CAN 1" that will have one of three CobID choices that the Gateway has on the "CAN 1" side.

The new PDO is created by completing the remaining fields:

- in the field "posid" insert the pointer in one of 8 bytes of the CANopen package transmitted in the "CAN 1" (values 0,1,2,3,4,5,6,7,8, with "0" signifying that "id_dev_ori" is lost in the PDO translated in "CAN 1");
- In the field "n_tPDO" insert the number of the output PDO (of the 3 that the gateway has on the "CAN 1" side). The transmitted PDO exits the values 1, 2 or 3).



UPDATE DEVICE:

Section "Update Device":

Insert the boot jumper (see figure 2).

In order to load the parameters after they are set, set the COM port you used for update, then you must click the button "Execute update firmware" on the principal window.

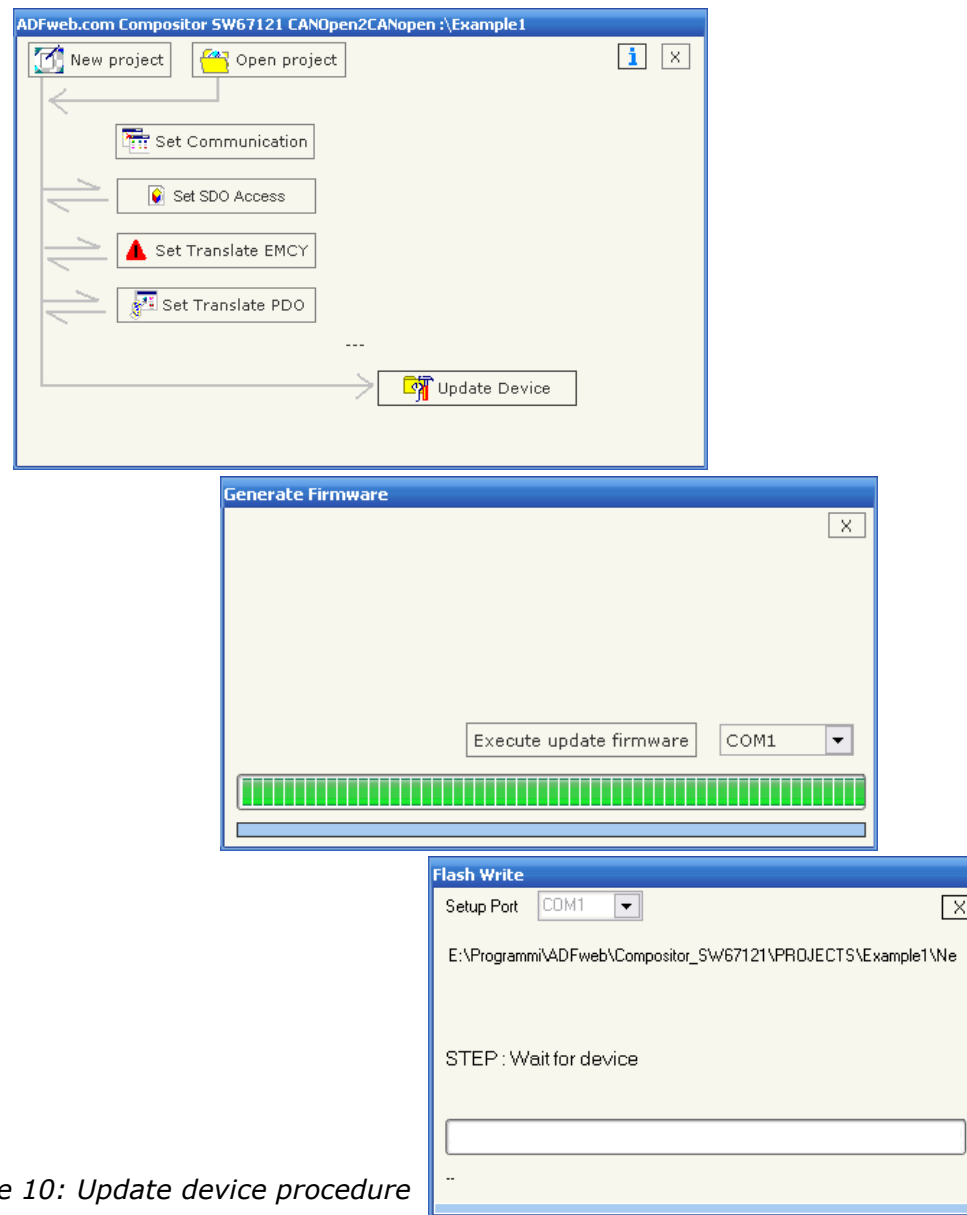


Figure 10: Update device procedure

CHARACTERISTICS OF THE CABLES:

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.

The connection with the Ethernet socket must be with a Ethernet Cable with a RJ45 Plug.

The connection with the RS485 socket must be done with a twisted and shielded cable.

The terminal resistor must be inserted when the HD67102 is at the end of the line, using the Terminator jumper.

Can bus 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

MECHANICAL DIMENSIONS:

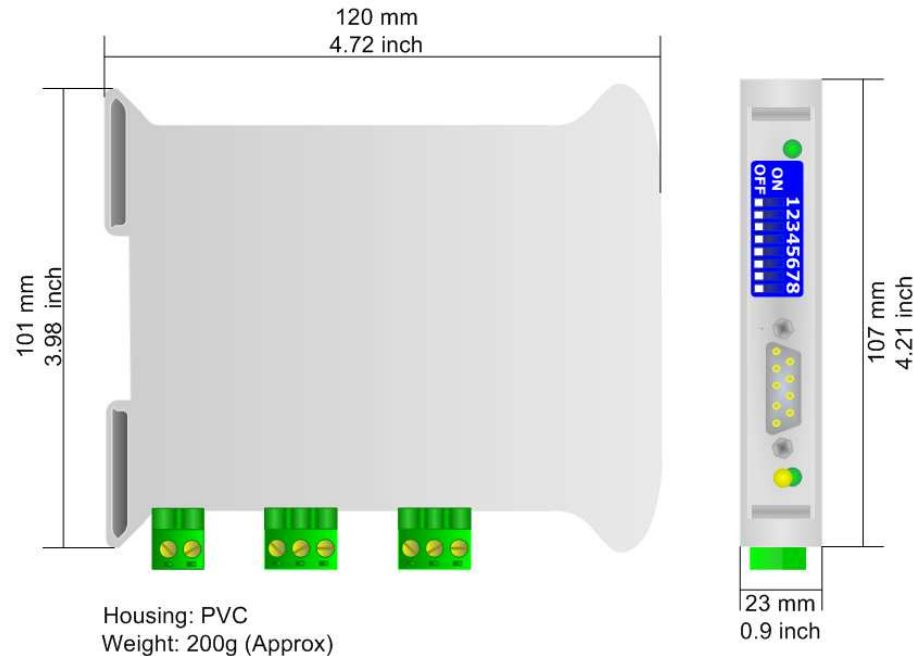


Figure 11: Mechanical dimensions scheme

ORDER CODE:

Order Code: **HD67121** - CANopen / CANopen - Converter

ACCESSORIES:

Order Code: **AC34107** - Null Modem Cable Fem/Fem DSub 9 Pin 1,5 m

Order Code: **AC34114** - Null Modem Cable Fem/Fem DSub 9 Pin 5 m

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

DISCLAIMER

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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 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:

- 1) 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.
- 2) 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.

PRODUCTS AND RELATED DOCUMENTS:

Part	Description	URL
HD67121	Gateway CANopen / Canopen	www.adfweb.com?Product=HD67121
HD67001	Gateway CANopen / Modbus – RTU Master	www.adfweb.com?Product=HD67001
HD67505	Gateway CANopen / Modbus – Ethernet TCP	www.adfweb.com?Product=HD67505
HD67134	Gateway CANopen / DeviceNet	www.adfweb.com?Product=HD67134
HD67117	CAN bus Repeater	www.adfweb.com?Product=HD67117
HD67216	CAN bus Analyzer	www.adfweb.com?Product=HD67216