ADF web

Industrial Electronic Devices

User Manual

Revision 1.000
English

LoRaWAN / M-Bus Master/M-Bus Wireless - Converter

(Order Code: HD67D15-B2-868MHz-xxx,
HD67D15-B2-868MHz-xxxMHz-0, HD67D15-B2-868MHz-xxxMHz-xxx)

For Website information:
www.adfweb.com?Product=HD67D15-B2

For Price information:
www.adfweb.com?Price=HD67D15-B2-868MHz-xxx
www.adfweb.com?Price=HD67D15-B2-868MHz-xxxMHz-0
www.adfweb.com?Price=HD67D15-B2-868MHz-xxxMHz-xxx

Benefits and Main Features:

⊕ Very easy to configure

⊕ Power Supply 18…35V DC and 8…24 V AC

⊕ Temperature range: -40°C/+85°C (-40°F/+185°F)

User Manual

For others LoRaWAN products, see also the following links:

Converter LoRaWAN to

www.adfweb.com?Product=HD67D01	(Modbus Master)
www.adfweb.com?Product=HD67D02	(Modbus Slave)
www.adfweb.com?Product=HD67D03	(Modbus TCP Master)
www.adfweb.com?Product=HD67D04	(Modbus TCP Slave)
www.adfweb.com?Product=HD67D05	(Serial)
www.adfweb.com?Product=HD67D16	(BACnet Master)
www.adfweb.com?Product=HD67D17	(BACnet Slave)
www.adfweb.com?Product=HD67D18	(Ethernet)
www.adfweb.com?Product=HD67D19	(CAN)
www.adfweb.com?Product=HD67D20	(CANopen)
www.adfweb.com?Product=HD67D21	(DeviceNet Master)
www.adfweb.com?Product=HD67D22	(DeviceNet Slave)
www.adfweb.com?Product=HD67D23	(DMX)
www.adfweb.com?Product=HD67D24	(EtherNet/IP Master)
www.adfweb.com?Product=HD67D25	(EtherNet/IP Slave)
www.adfweb.com?Product=HD67D26	(J1939)
www.adfweb.com?Product=HD67D27	(KNX)
www.adfweb.com?Product=HD67D28	(NMEA 0183)
www.adfweb.com?Product=HD67D29	(NMEA 2000)
www.adfweb.com?Product=HD67D30	(PROFIBUS Master)
www.adfweb.com?Product=HD67D31	(PROFIBUS Slave)
www.adfweb.com?Product=HD67D32	(PROFINET Master)
www.adfweb.com?Product=HD67D33	(PROFINET Slave)
www.adfweb.com?Product=HD67D34	(IEC61850 Client)
www.adfweb.com?Product=HD67D35	(IEC61850 Server)
www.adfweb.com?Product=HD67D36	(MQTT)
www.adfweb.com?Product=HD67D37	(OPC UA Client)
www.adfweb.com?Product=HD67D38	(OPC UA Server)
www.adfweb.com?Product=HD67D39	(S7comm)
www.adfweb.com?Product=HD67D40	(SNMP Manager)
www.adfweb.com?Product=HD67D41	(SNMP Agent)

INDEX:

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	04/12/2020	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.

Industrial Electronic Devices

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.

Industrial Electronic Devices

EXAMPLE OF CONNECTION:

M-Bus Wireless / LoRaWAN - Converter
HD67D27-KNX-B2
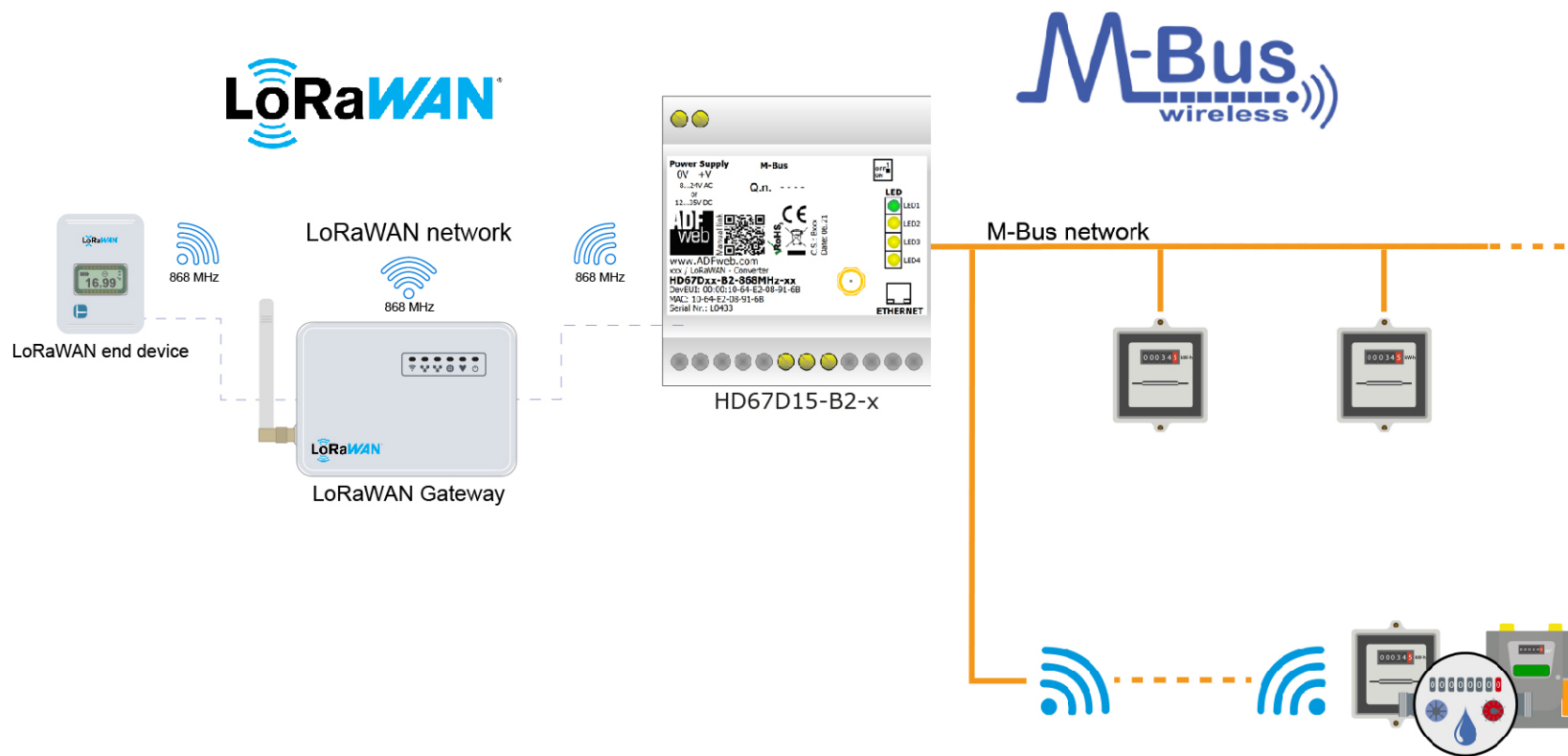
HD67D15-B2-x

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

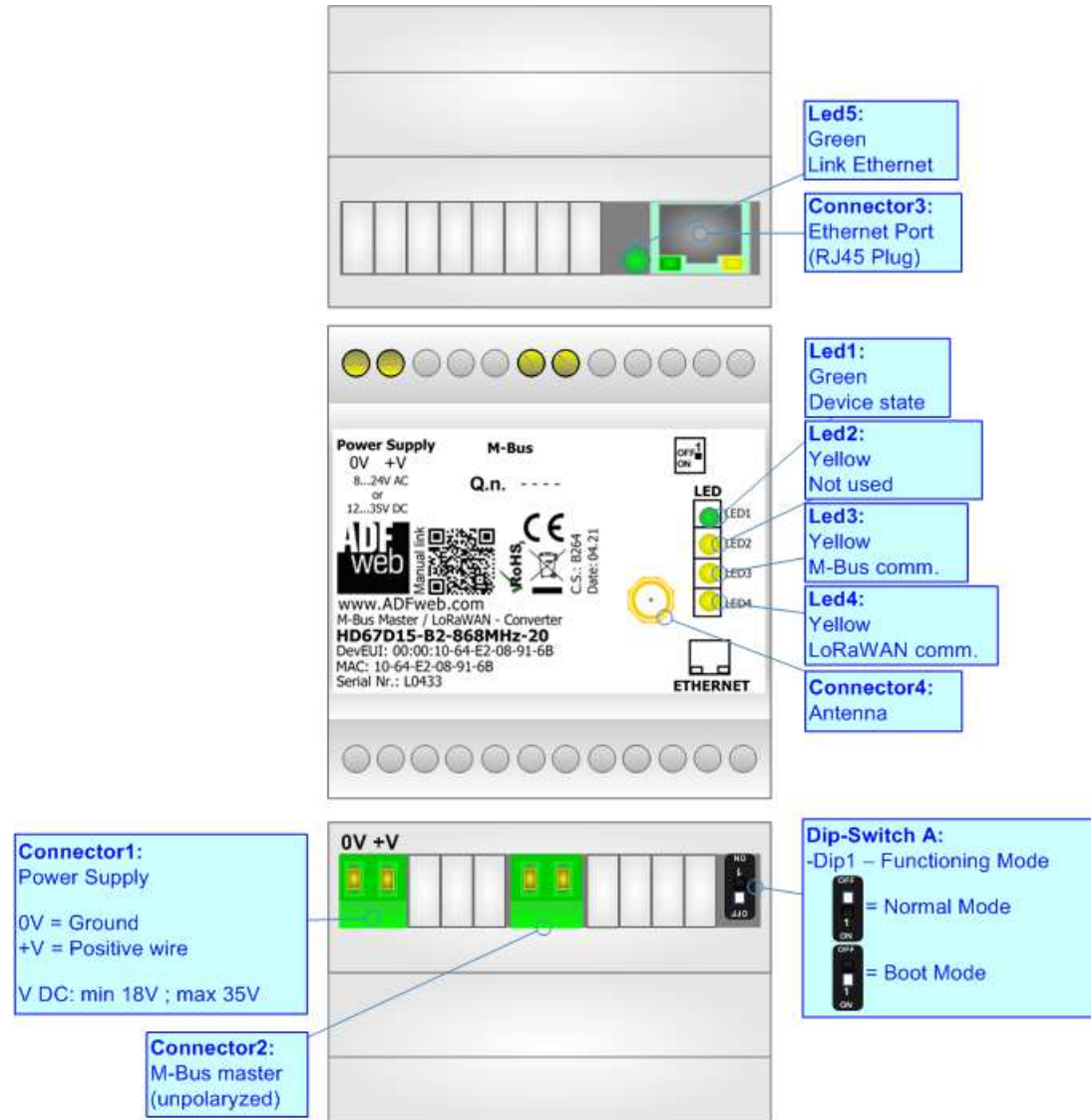*ADFweb.com S.r.l.*

Industrial Electronic Devices

CONNECTION SCHEME:

Figure 1a: Connection scheme for HD67D15-B2-xxxMHz-xxx

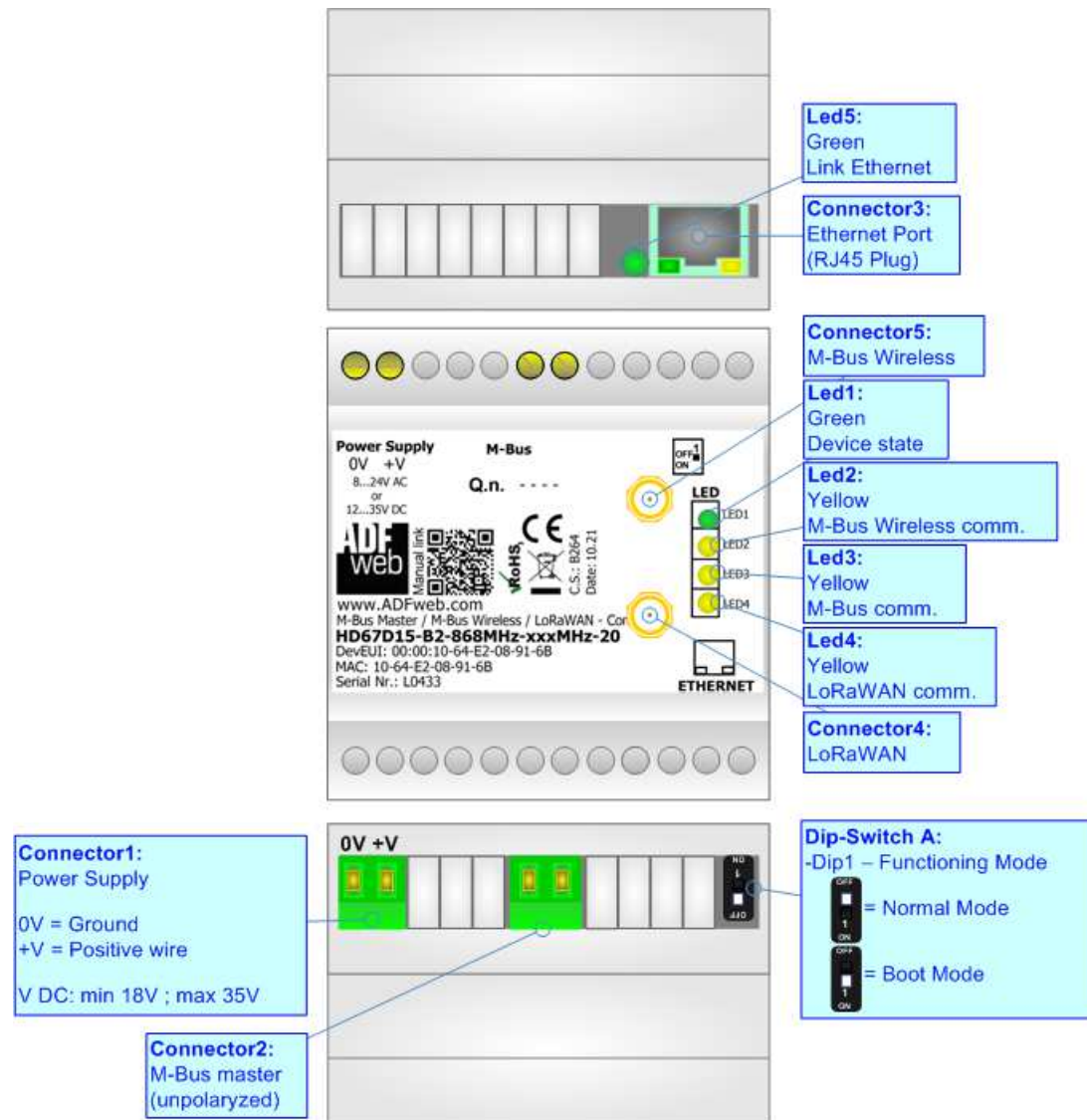*Figure 1b: Connection scheme for HD67D15-B2-xxxMHz-xxxMHz -0*

ADFweb

Industrial Electronic Devices

Led5:
Green
Link Ethernet

Connector3:
Ethernet Port
(RJ45 Plug)

Connector5:
M-Bus Wireless

Led1:
Green
Device state

Led2:
Yellow
M-Bus Wireless comm.

Led3:
Yellow
M-Bus comm.

Led4:
Yellow
LoRaWAN comm.

Connector4:
LoRaWAN

Connector1:
Power Supply

0V = Ground
+V = Positive wire

V DC: min 18V ; max 35V

Connector2:
M-Bus master
(unpolaryzed)

Dip-Switch A:
-Dip1 – Functioning Mode

= Normal Mode

= Boot Mode

Power Supply
0V +V
8...24V AC
or
12...35V DC

M-Bus
Q.n. - - - -

www.ADFweb.com
M-Bus Master / M-Bus Wireless / LoRaWAN - Con
HD67D15-B2-868MHz-xxxMHz-20
DevEUI: 00:00:10-64-E2-08-91-6B
MAC: 10-64-E2-08-91-6B
Serial Nr.: L0433

Figure 1b: Connection scheme for HD67D15-B2-xxxMHz-xxxMHz-xxx

Industrial Electronic Devices

CHARACTERISTICS:

The HD67D15-B2 is a LoRaWAN / M-Bus Master / M-Bus Wireless Converter.

It allows the following characteristics:

- Electrical isolation between M-Bus and Power Supply;
- Mountable on 35mm Rail DIN;
- Wide power supply input range: 18…35V DC;
- Wide temperature range: -40°C / 85°C [-40°F / +185°F].

CONFIGURATION:

You need Compositor SW67D15 software on your PC in order to perform the following:

- Define the parameter of M-Bus and/or M-Bus Wireless line;
- Define the parameter of LoRaWAN line;
- Define which M-Bus variables are sent to LoRaWAN Gateway;
- Define the list of LoRaWAN messages in uplink to the LoRaWAN gateway;
- Update the device.

ADFweb

Industrial Electronic Devices

POWER SUPPLY:

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

VDC ===	
Vmin	**Vmax**
18V	**35V**

Consumption at 24V DC:

Device	[W/VA]
HD67D15-B2-xxxMHz-0	3.5

Device	No Load [W/VA]	Full Load [W/VA]*
HD67D15-B2-xxxMHz-20, HD67D15-B2-xxxMHz-xxxMHz-20	3.5	4
HD67D15-B2-xxxMHz-40, HD67D15-B2-xxxMHz-xxxMHz-40		5
HD67D15-B2-xxxMHz-80, HD67D15-B2-xxxMHz-xxxMHz-80		8
HD67D15-B2-xxxMHz-160, HD67D15-B2-xxxMHz-xxxMHz-160		14
HD67D15-B2-xxxMHz-250, HD67D15-B2-xxxMHz-xxxMHz-250		30

* This value is with all the Slave M-Bus devices of the code (20, 40, 80, 160, 250) connected to the line (wired side)

Connector1:
Power Supply

0V = Ground
+V = Positive wire

V DC: min 18V ; max 35V

+V 0V
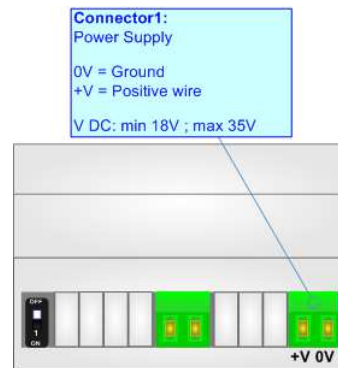
Caution: Not reverse the polarity power

+V_   _0V

HD67D15-B2-xxxMHz-xxxMHz-xxx

ADFweb.com S.r.l.

Industrial Electronic Devices
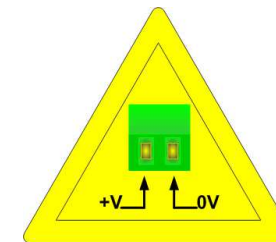
FUNCTION MODES:

The device has got two functions mode depending of the position of the 'Dip1 of Dip-Switch A':

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

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

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

Industrial Electronic Devices
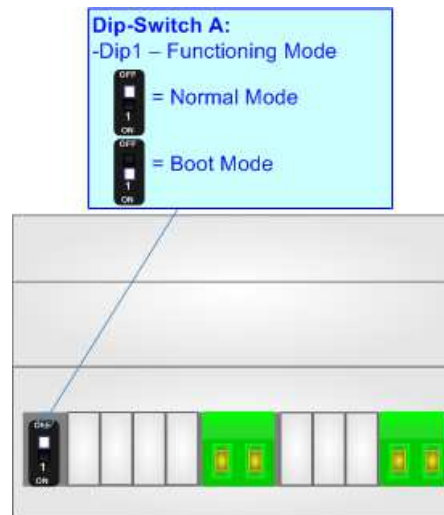
LEDS:

The device has got two 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: M-Bus Wireless comm. (yellow)	Blinks quickly when a M-Bus Wireless message is received (only if M-Bus Wireless is present)	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
3: M-Bus comm. (yellow)	Blinks quickly when a reply to a M-Bus request arrives (only if M-Bus is present)	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
4: LoRaWAN comm. (yellow)	Blinks when LoRaWAN data is received	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
5: Ethernet Link (green)	**ON:** Ethernet cable connected **OFF:** Ethernet cable disconnected	**ON:** Ethernet cable connected **OFF:** Ethernet cable disconnected

![ADFweb logo] Industrial Electronic Devices
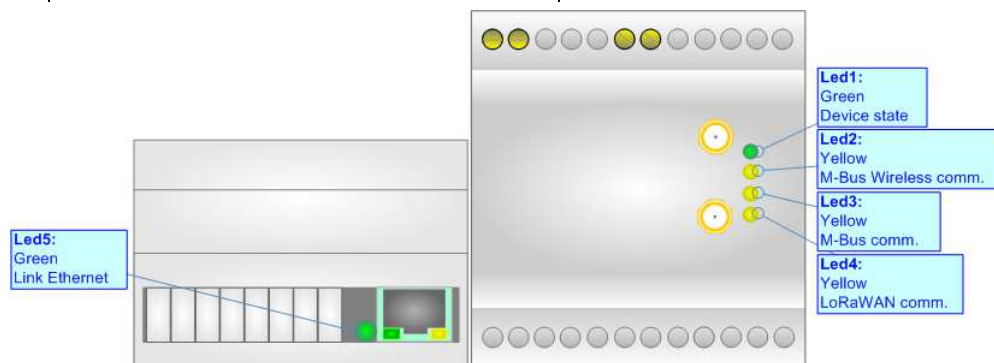
LORAWAN:

The LoRaWAN® specification is a Low Power, Wide Area (LPWA) networking protocol designed to wirelessly connect battery operated 'things' to the internet in regional, national or global networks, and targets key Internet of Things (IoT) requirements such as bi-directional communication, end-to-end security, mobility and localization services.
LoRaWAN® network architecture is deployed in a star-of-stars topology in which gateways relay messages between end-devices and a central network server.
The wireless communication takes advantage of the Long Range characteristics of the LoRa physical layer, allowing a single-hop link between the end-device and one or many gateways. All modes are capable of bi-directional communication, and there is support for multicast addressing groups to make efficient use of spectrum during tasks such as Firmware Over-The-Air (FOTA) upgrades or other mass distribution messages.

Converters from HD67D15 serie act as end-devices and they can communicate with one or more LoRwaWAN Gateways.
The converters support all the standard datarates and they work both on public and private networks.

Connector5: Antenna
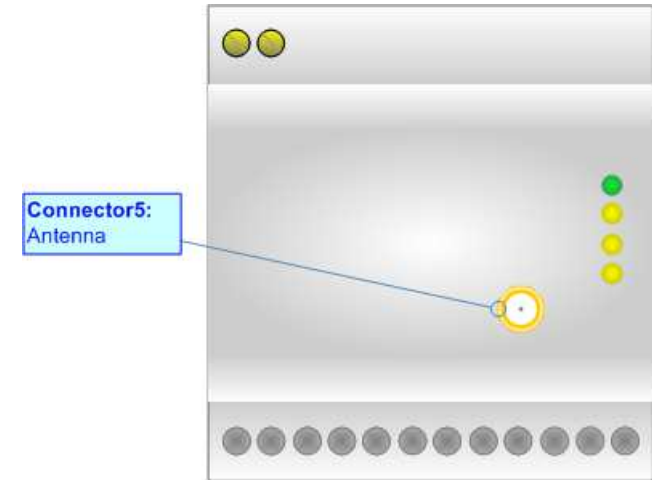
M-BUS:

The M-Bus is a unpolarized bus.
A two wire standard telephone cable (JYStY N*2*0.8 mm) is used as the transmission medium for the M-Bus. The maximum distance between a slave and the repeater is 350m; this length corresponds to a cable resistance of up 29Ω. This distance applies for the standard configuration having Baud rates between 300 and 9600 Baud, and a maximum of 250 slaves. The maximum distance can be increased by limiting the Baud rate and using fewer slaves, but the bus voltage in the space state must at no point in a segment fall below 12V, because of the remote powering of the slaves. In the standard configuration the total cable length should not exceed 1000m, in order to meet the requirement of a maximum cable capacitance of 180nF. (*Taken from M-Bus specifics*)
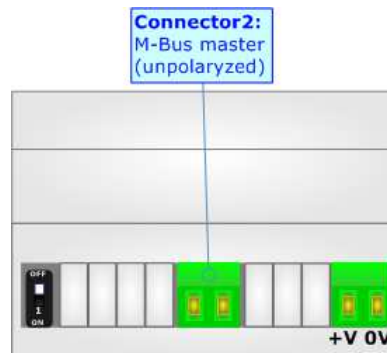
M-BUS WIRELESS:

The standards of M-Bus Wireless are specified in EN 13757-4. The signal is @ 169 MHz or 433 MHz or 868 MHz (in relation to the order code).
The Antenna connector is a SMA Female ('Female Outer Shell' and 'Female Receptacle') so the Antenna must have a SMA Male connector.

Industrial Electronic Devices
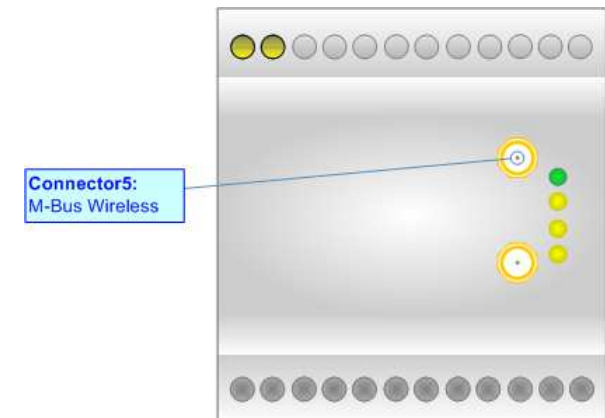
ETHERNET:

The Ethernet port is used for programming the device.

The Ethernet connection must be made using Connector3 of HD67D15-B2 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 is recommended the use of a cross cable.

Industrial Electronic Devices
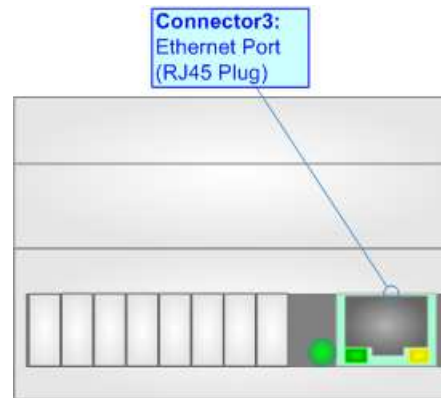
USE OF COMPOSITOR SW67D15:

To configure the Converter, use the available software that runs with Windows called SW67D15. It is downloadable on the site www.adfweb.com and its operation is described in this document. The software works with MS Windows (XP, Vista, Seven, 8, 10; 32/64bit).

When launching the SW67D15, the window below appears (Fig. 2).
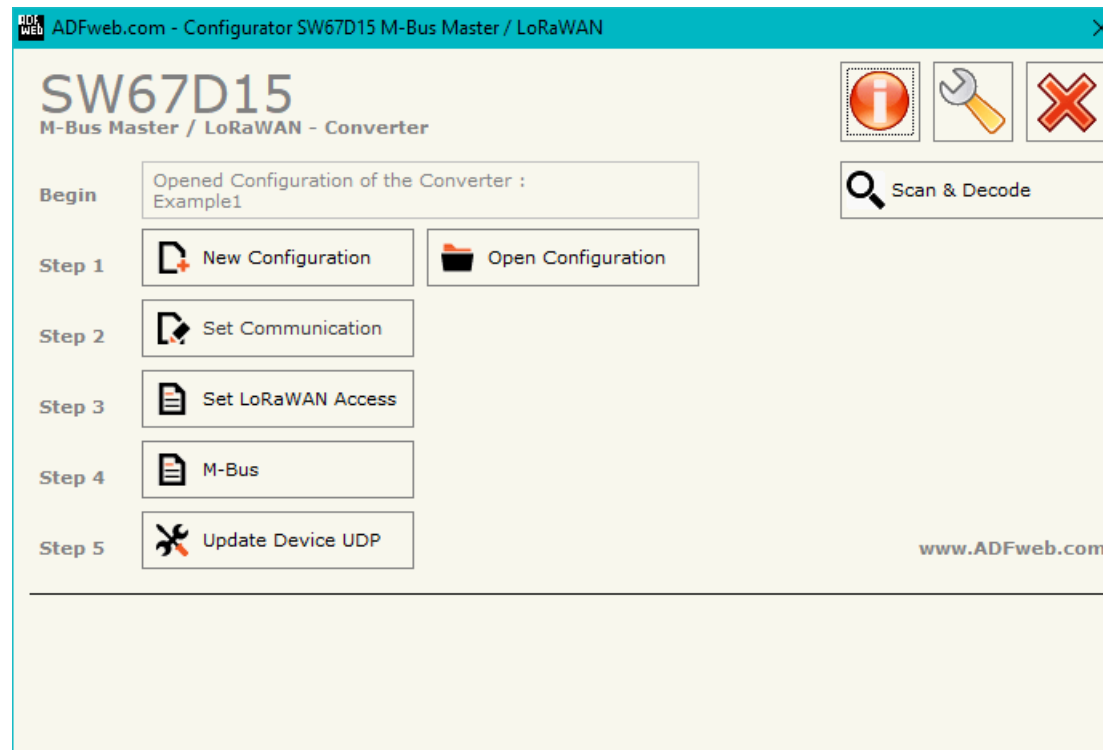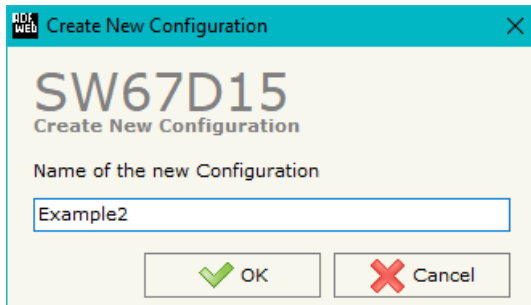
Note:
It is necessary to have installed .Net Framework 4.


Figure 2: Main window for SW67D15

Industrial Electronic Devices

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 "LoRaWAN / M-Bus Master/M-Bus Wireless - 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**".
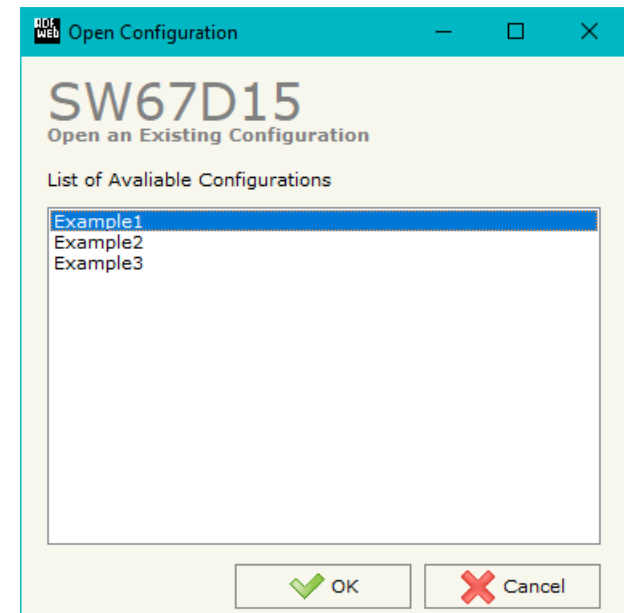
SOFTWARE OPTIONS:

By pressing the "**Settings**" (🔧) button there is the possibility to change the language of the software and check the updatings for the compositor.
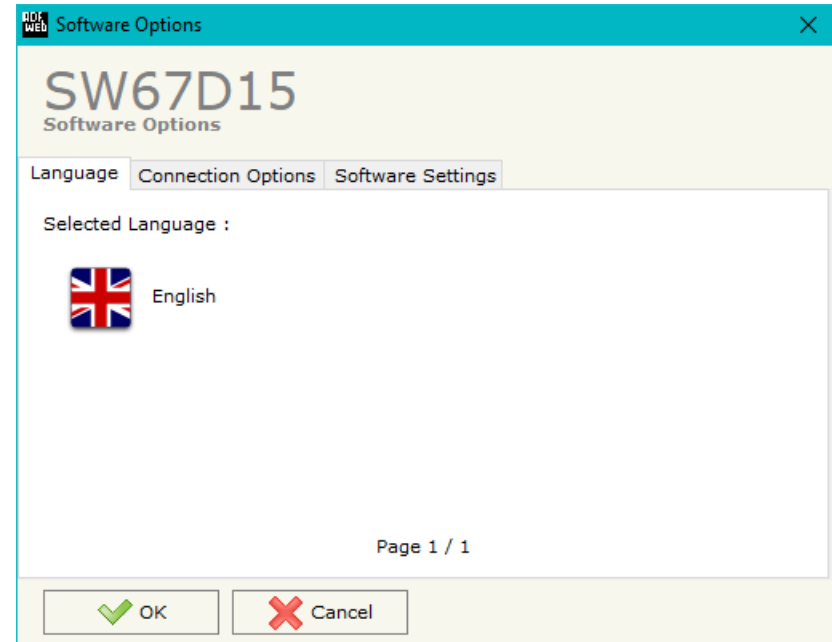
In the section "Language" it is possible to change the language of the software.
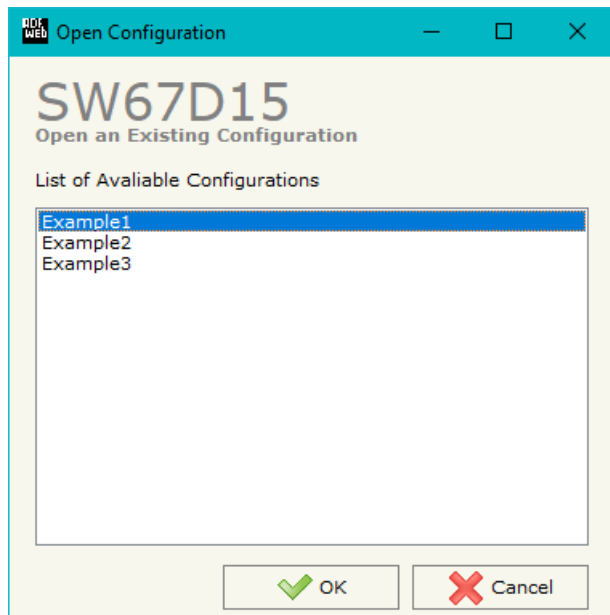
In the section "Connection Options", it is possible to check if there are some updatings of the software compositor in ADFweb.com website.
Checking the option "**Check Software Update at Start of Program**", the SW67D15 check automatically if there are updatings when it is launched.

Industrial Electronic Devices

Software Options

SW67D15
Software Options

| Language | Connection Options | **Software Settings** |

☐ Jump into next field in the tables by pressing the Enter Key

☐ Enable Auto Size of Table Columns by Double Click

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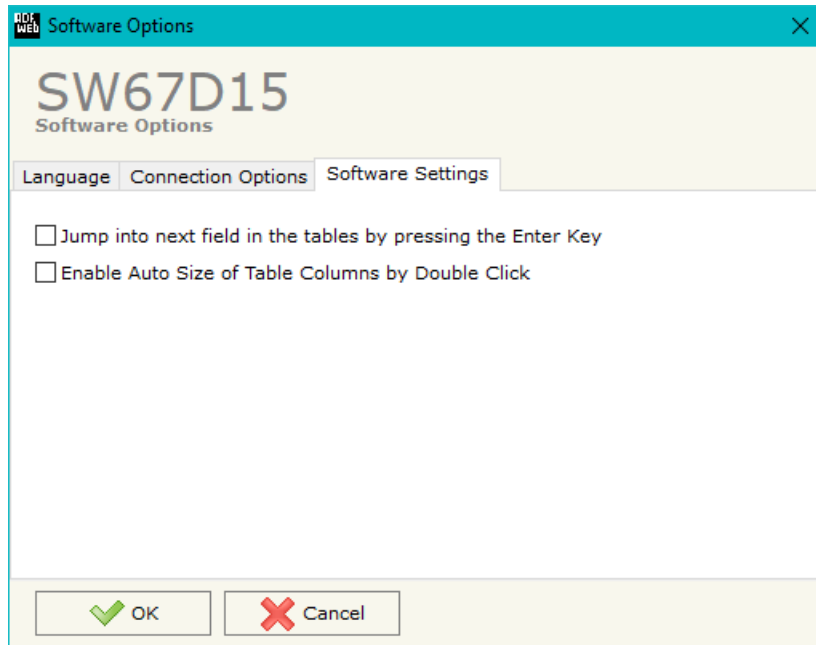
In the section "Software Settings", it is possible to enable/disable some keyboard's commands for an easier navigation inside the tables contained in the different sections of the software.

Industrial Electronic Devices

SET COMMUNICATION:

By Pressing the "**Set Communication**" button from the main window for SW67D15 (Fig. 2) the window "Set Communication" appears (Fig. 3).

The means of the fields for the "LoRaWAN" section are:

- In the field "**RF Band**" the wireless band used for LoRaWAN communication is defined;
- In the field "**Network Type**" the type of LoRaWAN network is defined;
- If the field "Adaptive Data Rate" is checked, the converter will enable the ADR functionalities to select the best data rate to be used in relation to the environmental conditions;
- In the field "**Data Rate**" the data rate for LoRaWAN communication is defined;
- In the field "**Transmission Type**" the type of LoRaWAN communication is defined;
- In the field "**Max Payload Size**" the maximum dimension of the LoRaWAN messages is defined (fixed in relation to the data rate selected);
- In the field "**Activation Method**" the method used to join into a LoRaWAN network is defined;
- In the field "**Device Address**" the device identifier (DevEUI) is defined (only for ABP method);
- In the field "**Application Identifier**" the application identifier (AppEUI) is defined (only for ABP method);
- In the field "**Network Session Key**" the key used for the communication with the LoRaWAN gateway (NwkSKey) is defined (only for ABP method);
- In the field "**Application Session Key**" the key for encryption and decryption of the payload (AppSKey) is defined (only for ABP method);
- If OTAA method is selected, in the field "**Application Key**" the secret key for the dynamic activation of the converter in the LoRAWAN network is defined.

Figure 3: "Set Communication" window

Industrial Electronic Devices

The means of the fields for the "M-Bus" section are:

- In the field "**M-Bus on Wire**" it is possible to define if the port is present or not;
- In the field "**Baudrate**" the data rate of the M-Bus line is defined;
- In the field "**Parity**" the parity of the M-Bus line is defined;
- If the field "**Cyclic Delay**" the delay (expressed in seconds) between two M-Bus scanning is defined;
- In the field "**Node State value when slave device is not present**" it is possible to insert the value to assign to the "Node State" when the Gateway doesn't find the interrogated M-Bus slave;
- If the field "**Use Fix C Field**" is checked, it is possible to define a fixed value for the C field of the M-Bus requests. This function is used for particular M-Bus meters that require this feature.

The means of the fields for the "M-Bus Wireless" section are:

- In the field "**M-Bus on Wireless**" it is possible to define if the port is present or not;
- In the field "**Mode**" the communication mode is defined;
- In the field "**Radio Channel**" the radio channel is defined (only for 169 MHz).

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

- In the fields "**IP ADDRESS**" the IP address of the converter is defined;
- In the fields "**SUBNET Mask**" the SubNet Mask of the converter is defined;
- In the fields "**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.

Industrial Electronic Devices

LORAWAN ACCESS:

By Pressing the "**LoRaWAN Access**" button from the main window for SW67D15 (Fig. 2) the window "Set LoRaWAN Access" appears (Fig. 4).

This section is used to define the LoRAWAN messages where the converter will place the data read from M-Bus (Uplink).

LoRaWAN Uplink
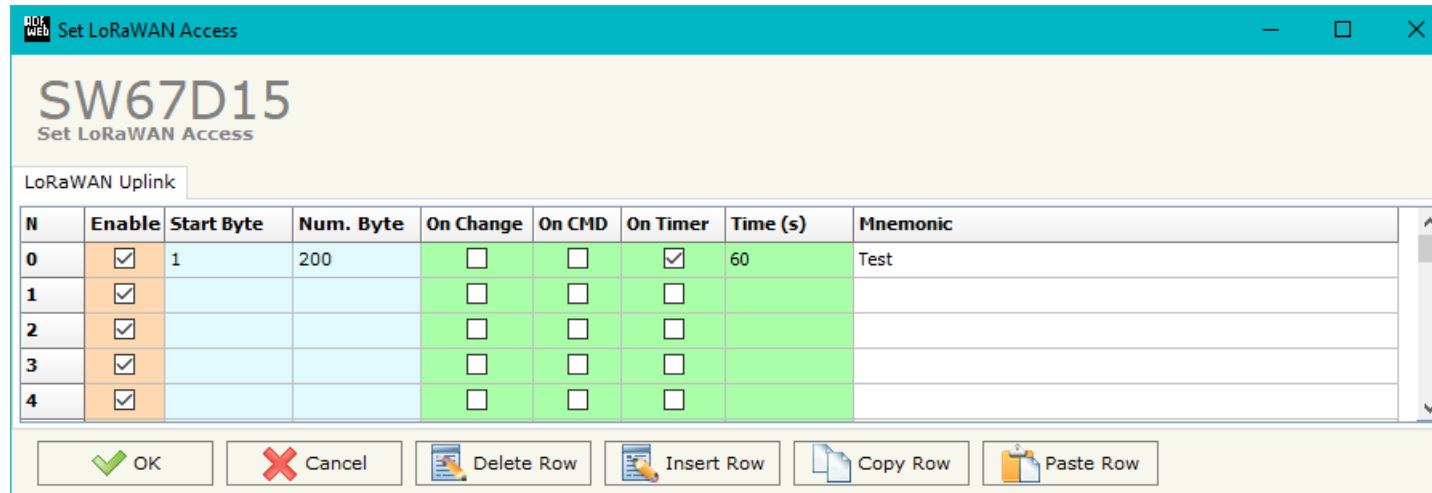
Figure 4: "LoRAWAN Access → LoRaWAN Uplink" window

The means of the fields are:

- If the field "**Enable**" is checked, the LoRaWAN message is enabled;
- In the field "**Start Byte**" the starting byte of the internal memory array where taking the data is defined;
- In the field "**Num. Byte**" the number of consecutive bytes to take from the internal array starting from "Start Byte" is defined;
- If the field "**On Change**" is checked, the LoRaWAN message is sent only when the data from M-Bus change;
- If the field "**On CMD**" is checked, the LoRaWAN message is sent when a M-Bus response is received;
- If the field "**On Timer**" is checked, the LoRaWAN message is sent cyclically with the delay defined in "**Time (s)**" field;
- In the field "**Mnemonic**" a description of the message is defined.

Industrial Electronic Devices

M-BUS

By Pressing the "**M-Bus**" button from the main window for SW67D15 (Fig. 2) the window "M-Bus Network" appears (Fig. 5).

In the section "Nodes" it is possible to create the nodes of M-Bus line:

  + In the field "**Description**" it is possible to write a short description of the node.
  + In the field "**M-Bus Type**" it is possible to select if the node uses M-Bus (on wire) or wM-Bus.

SECTION NODES (M-BUS NODES):

  + In order to create a new node it is necessary to select which address use, selecting "**Primary ID**" or "**Secondary ID**", to makes the requests and then insert the "Primary Address" (from 1 to 250) or the Secondary Address" (from 0 to 99999999) of M-Bus device.
  + In the field "**Node State**" it is possible to insert the address of the internal memory arrays where mapping the Status of the M-Bus device. If you don't need to know this, put this register at 0.
  + In the field "**Identification Number**" it is possible to insert the internal memory arrays where mapping the Identification Number of the M-Bus device. It will use 4 consecutive bytes starting from the one configured.
  + If the field "**Convert BCD in Integer Identification Num.**" is checked the Converter converts the Identification Number that is normally expressed in BCD in a Integer.
  + In the field "**Swap Identification Num.**" it is possible to select the swap mode of the Identification Number. If swap isn't necessary you have to select "None"; otherwise see the section "Swap Identification" (page 35) of this document for select the swap mode.
  + If the field "**Send SND_NKE**" is checked, the Converter send the "SND_NKE" frame to start the communication.
  + In the field "**Send Reset App.**" Is checked the Converter send the "Application Reset" command to the slave.
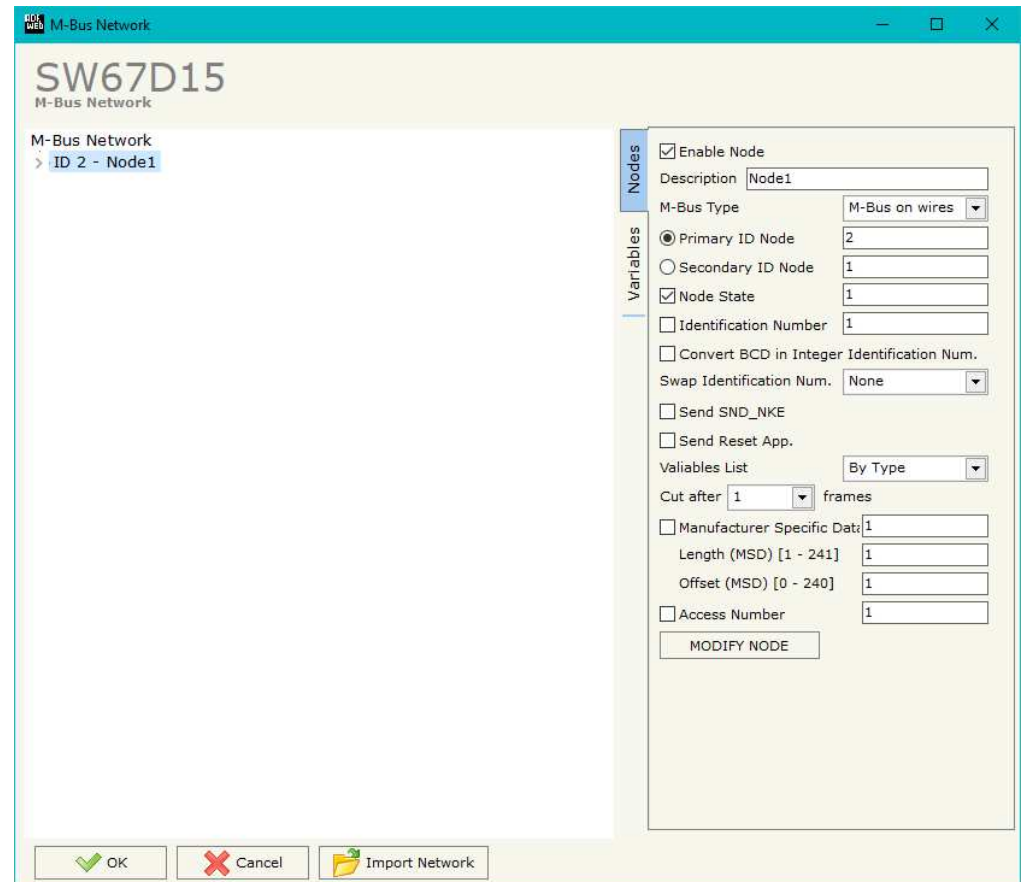

Figure 5a: "M-Bus Network" window

ADFweb.com S.r.l.

ADF web

Industrial Electronic Devices

- In the field "**Variables List**" it is possible to select which type of variables definition to use. If is selected "By Type" it is necessary to fill all fields, in the section Variables, with the correct values; otherwise if "By Position" is selected you can insert the progressive number of the variable that you need (page 30 for more information).
- In the field "**Cut after**" it is possible to select after how many frames stops data requests. It is used when the slave has got many data frames and you don't need to read all them;
- In the field "**Manufacturing Specific Data**" is possible to insert the starting address of internal memory array from which you want to save the information of Manufacturer Specific (after DIF=0x0F or DIF=0x1F).
- In the field "**Length (MSD) [1 - 241]**" is possible to insert the length of the data you need to save.
- In the field "**Offset (MSD) [0 - 240]**" is possible to insert the offset from where save the data;
- In the field "**Access Number**", it is possible to save the number of polling sent to the M-Bus node.

For more information about "Manufacturer Specific Data" functions, see page 39.

After that, pressing the "**ADD NODE**" button, a new node appears in the left side of the window. In order to modify a created node it is necessary to select the desired node, change the wrong items and then press the "**MODIFY NODE**" button.

Industrial Electronic Devices

SECTION NODES (WM-BUS NODES):

→ In the field "**Manufacturer ID**" it is necessary to define the Manufacturer ID of the wM-Bus node.

→ In the field "**Address**" it is necessary to define the ID of the wM-Bus node.

→ If the field "**Version**" it is necessary to define the version of the wM-Bus node.

→ In the field "**Device Type**" it is possible to define the Type of the wM-Bus node.

→ The field "**Key Enable**" is used to decode the M-Bus frame sent by the wM-Bus node if it uses encrypted communication. In the following 16 fields, you have to

→ If the field "**Node State**" is checked the gateway reserves one byte at the starting of internal data array and saves the status of the counter.

→ If the field "**Identification Number**" it is possible to insert the internal memory arrays where mapping the Identification Number of the M-Bus device. It will use 4 consecutive bytes starting from the one configured.

→ If the field "**RSSI**" is checked the gateway reserves one byte at the starting of internal data array and saves the signal quality of the device.

→ In the field "**Access Number**", it is possible to save the number of messages sent by the M-Bus node.

→ If the field "**Convert BCD in Integer Identification Num.**" is checked the Converter converts the Identification Number that is normally expressed in BCD in a Integer.

→ In the field "**Swap Identification Num.**" it is possible to select the swap mode of the Identification Number. If swap isn't necessary you have to select "None"; otherwise see the section "Swap Identification" (page 35) of this document for select the swap mode.
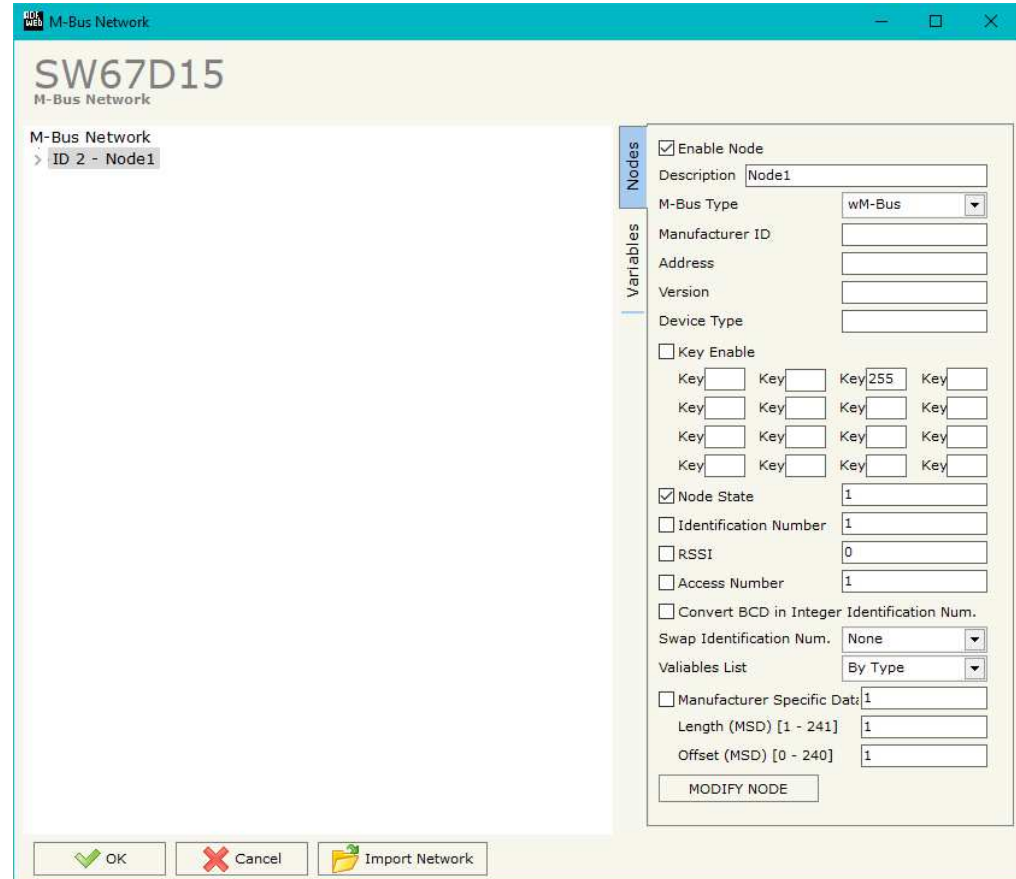
Figure 5b: "M-Bus Network" window

- In the field "**Variables List**" it is necessary to select which type of variables definition to use. If is selected "By Type" it is necessary to fill all fields, in the section Variables, with the correct values; otherwise if "By Position" is selected you can insert the progressive number of the variable that you need (page 30 for more information).
- In the field "**Manufacturing Specific Data**" is possible to insert the starting address of internal memory array from which you want to save the information of Manufacturer Specific (after DIF=0x0F or DIF=0x1F).
- In the field "**Length (MSD) [1 - 241]**" is possible to insert the length of the data you need to save.
- In the field "**Offset (MSD) [0 - 240]**" is possible to insert the offset from where save the data;

For more information about "Manufacturer Specific Data" functions, see page 39.

After that, pressing the "**ADD NODE**" button, a new node appears in the left side of the window. In order to modify a created node it is necessary to select the desired node, change the wrong items and then press the "**MODIFY NODE**" button.

Industrial Electronic Devices

SECTION VARIABLES (BY TYPE):

Selecting the desired node it is possible to add a variable. In order to create a new variable it is necessary to fill these items:

+ To use the created variable the field "**Enable Variable**" must be checked. If you have created a variable but for the moment it is unused it is possible to uncheck the field "Enable Variable" without delete it;

+ In the field "**Description**" it is possible to write a description of the variable (it isn't a necessary information, it helps the readability of the tree of network);

+ The field "**Type of Data**" is used to select the unit of measure;

+ In the field "**VIF ASCII String**" insert the string of VIF. It is possible to use this field only if the "Type of Data" is "VIF is in ASCII";

+ In the field "**Function Field**" it is necessary to select the type of data;

+ The field "**Dimension**" is used to select the dimension of the variable (8, 16, 24, 32, 32 real, 48, 64 bit, Variable Length);

+ In the field "**Length(Variable Len)**" insert the length of the data in the case of the dimension is "Variable Length";

+ In the field "**Unit**" if it is necessary it is possible to select the unit of that variable. The Unit is used for indicates from which device the data come;

Figure 5c: "M-Bus Variables (By Type)" window

+ In the field "**Storage Number**" if it is necessary it is possible to insert the value of storage counter of that variable. With this field the slave can indicate and transmit various stored counter states or historical values, in the order in which they occur;

+ In the field "**Tariff**" if it is necessary it is possible to insert the value of the tariff of that variable. The Tariff is used for indicates from which device the data come;

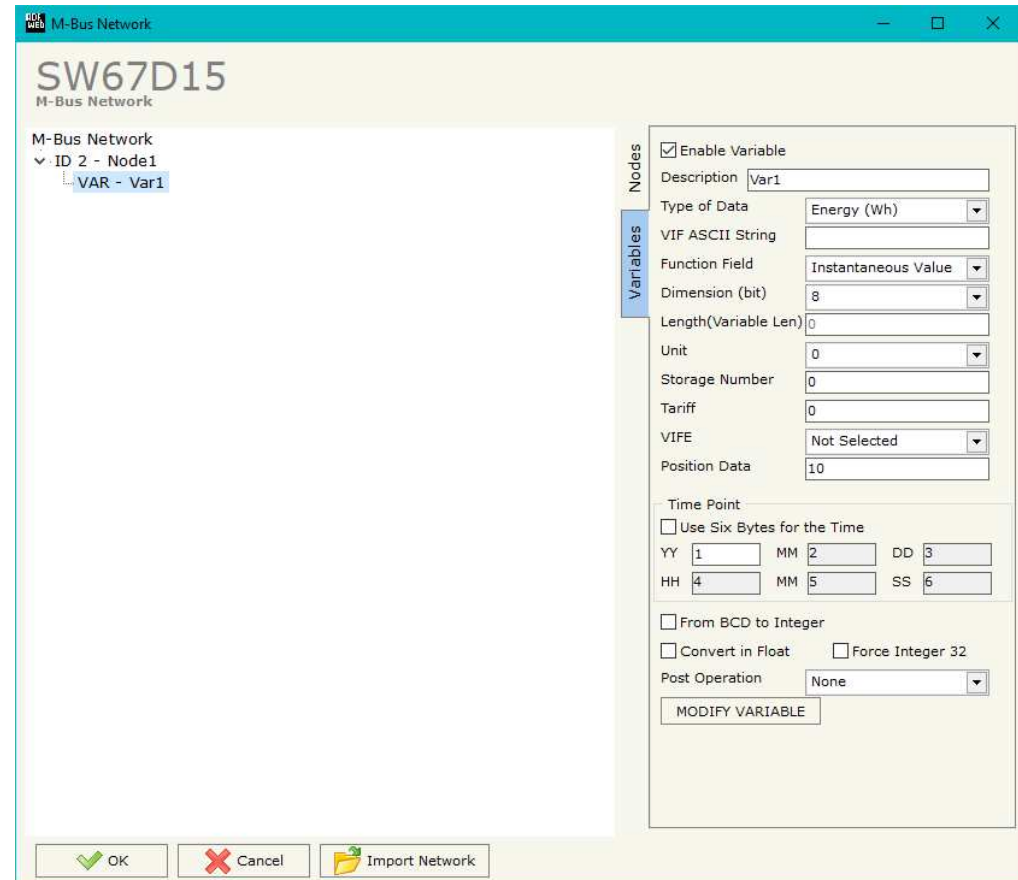+ In the field "**VIFE**" it is possible to select a sub-type of "Type of Data";

ADFweb.com S.r.l.

Industrial Electronic Devices

- In the field "**Position Data**" insert the address of the internal memory array where mapping the data.
- If the field "**Use Six Bytes Register**" and the "Type of Data" is "Time Point" it is possible to read the information of Year, Month, Day, Hour, Minutes, Seconds on six consecutive bytes of the internal memory array without decoding the data (if not selected the values are the same of the reply of the slave device, so coded with a determinate structure). You have to insert the first Position (byte) to be used.
- If the field "**From BCD to Integer**" is checked the Converter converts the BCD value of variable in Integer format. This happens only if the variable is in BCD format; if it isn't nothing changes.
- If the field "**Convert in Float**" is checked the converter converts the data into Float type.
- If the field "**Force Integer 32**" is checked, the variable is mapped in 4 consecutive bytes on internal memory array.
- In the field "**Post Operation**" it is possible to define an operation on the data read before mapping it in the internal memory array.

Having completed this fields, to add the variable the button "**ADD VARIABLE**" must be pressed.

In order to modify a created variable it is necessary to select the desired variable, change the wrong items and then press the "**MODIFY VARIABLE**" button.

Industrial Electronic Devices

SECTION VARIABLES (BY POSITION):

Selecting the desired node it is possible to add a variable. In order to create a new variable it is necessary to fill these items:

➜ To use the created variable the field "**Enable Variable**" must be checked. If you have created a variable but for the moment it is unused it is possible to uncheck the field "Enable Variable" without delete it;

➜ In the field "**Description**" it is possible to write a description of the variable (it isn't a necessary information, it helps the readability of the tree of network);

➜ The field "**Dimension**" is used to select the dimension of the variable (8, 16, 24, 32, 32 real, 48, 64 bit, Variable Length);

➜ In the field "**Length(Variable Len)**" insert the length of the data in the case of the dimension is "Variable Length";

➜ In the field "**Position Data**" insert the address of the internal memory array where mapping the data.

➜ If the field "**Use Six Bytes Register**" and the "Type of Data" is "Time Point" it is possible to read the information of Year, Month, Day, Hour, Minutes, Seconds on six consecutive bytes of the internal memory array without decoding the data (if not selected the values are the same of the reply of the slave device, so coded with a determinate structure). You have to insert the first Position (byte) to be used.

➜ If the field "**From BCD to Integer**" is checked the Converter converts the BCD value of variable in Integer format. This happens only if the variable is in BCD format; if it isn't nothing changes.

➜ If the field "**From BCD to Integer**" is checked the Converter converts the BCD value of variable in Integer format. This happens only if the variable is in BCD format; if it isn't nothing changes.

Figure 5d: "M-Bus Variables (By Position)" window

ADF web

Industrial Electronic Devices

- If the field "**Convert in Float**" is checked the converter converts the data into Float type.
- If the field "**Force Integer 32**" is checked, the variable is mapped in 4 consecutive bytes on internal memory array.
- In the field "**Post Operation**" it is possible to define an operation on the data read before mapping it in the internal memory array.
- In the field "**Position Var**" insert the number of the variable that you want on LoRaWAN.

Having completed this fields, to add the variable the button "**ADD VARIABLE**" must be pressed.

In order to modify a created variable it is necessary to select the desired variable, change the wrong items and then press the "**MODIFY VARIABLE**" button.

Industrial Electronic Devices

Example:

0x68 - Start Byte
0xBD - L Fied
0xBD - L Field
0x68 - Start Byte
0x08 - C Field
0x02 - A Field
0x72 - CI Field

0x71 - Identification Number (Byte 4of4)
0x65 - Identification Number (Byte 3of4)
0x45 - Identification Number (Byte 2of4)
0x28 - Identification Number (Byte 1of4)
0x4D - Manufacturer (Byte 2of2)
0x6A - Manufacturer (Byte 1of2)   Fixed Data Header
0x81 - Version
0x04 - Medium
0x3E - Access Number
0x27 - Status
0x00 - Signature (Byte 2of2)
0x00 - Signature (Byte 1of2)

0x04 - DIF
0x79 - VIF   Identification
0x00 - Data (Byte 4of4)   First Variable (①)
0x00 - Data (Byte 3of4)
0x00 - Data (Byte 2of4)
0x00 - Data (Byte 1of4)

0x04 - DIF
0x06 - VIF   Energy
0x00 - Data (Byte 4of4)   Second Variable (②)   To be use in the "**Position**" field
0x00 - Data (Byte 3of4)
0x00 - Data (Byte 2of4)
0x00 - Data (Byte 1of4)

0x44 - DIF
0x06 - VIF   Energy
0x00 - Data (Byte 4Of4)   Third Variable (③)
0x00 - Data (Byte 3Of4)
0x00 - Data (Byte 2Of4)
0x00 - Data (Byte 1Of4)
...   Other Variables
...
0x55 - Check Sum
0x16 - Stop Byte

ADFweb.com S.r.l.

Industrial Electronic Devices
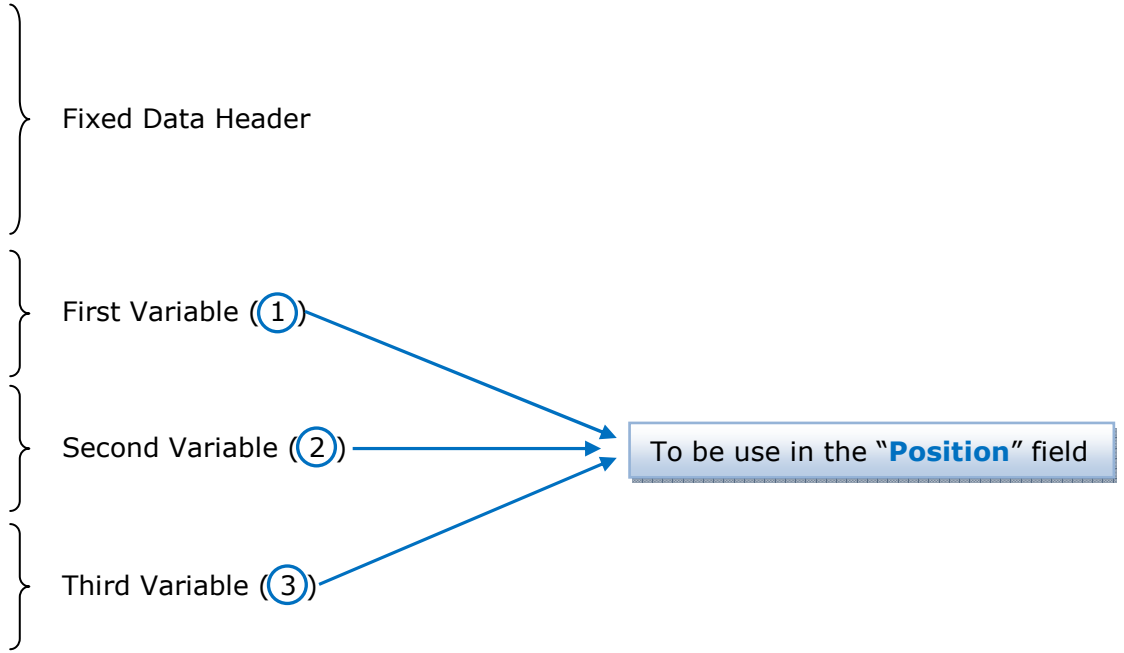
COPY, PASTE AND DELETE ITEMS:

By pressing the right button of the mouse over an item (Variable or Node) it is possible to Copy, Paste and Delete.
It is possible to Copy a variable from a Node and copy it to another Node, or copy a Variable from a project and paste in another one.
It is also possible to copy an entire Node with all its Variables.

Note:
By pressing the "**Import Network**" button is possible to import the file generated by the Analyzer HD67031.
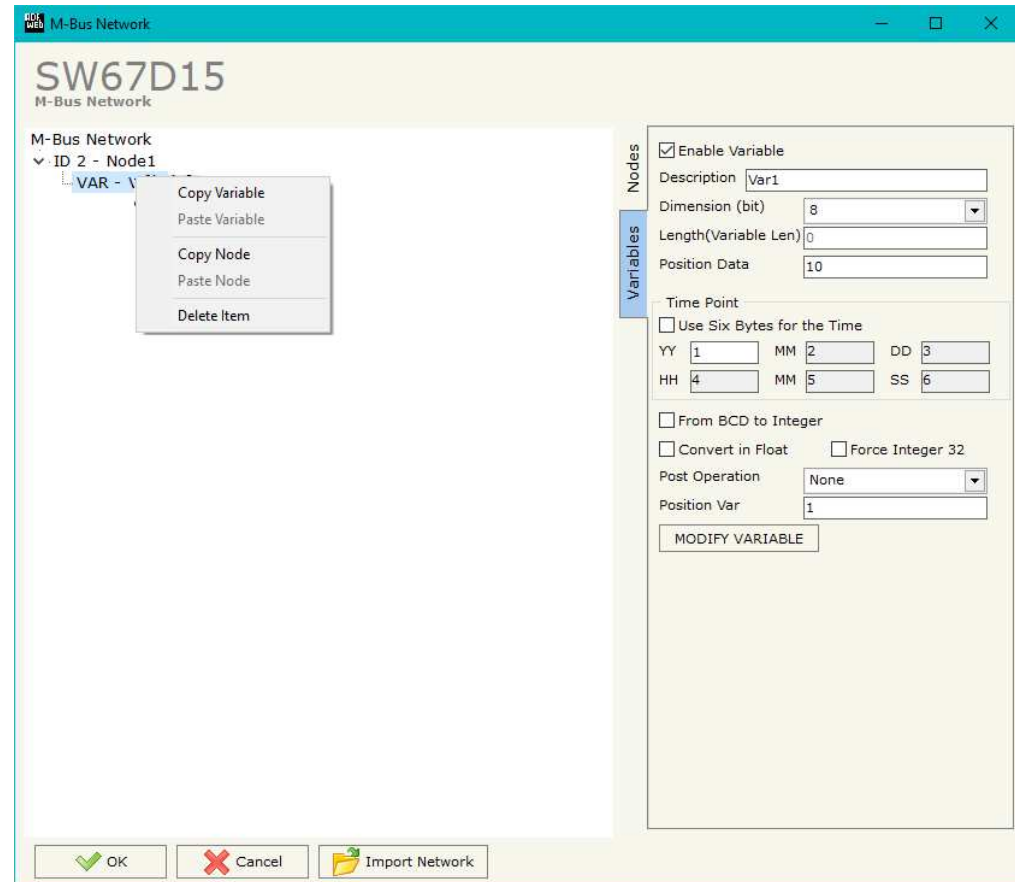
Figure 5e: "Copy / Paste" window

ADFweb.com S.r.l.

Possible choices for the fields used to create a variable:

Type of Data:
 |_Energy (Wh)
 |_Energy (J)
 |_Volume (m^3)
 |_Mass (Kg)
 |_On Time
 |_Operating Time
 |_Power (W)
 |_Power (J/h)
 |_Volume Flow (m^3/h)
 |_Volume Flow Ext. (m^3/min)
 |_Volume Flow Ext. (m^3/s)
 |_Mass Flow (Kg/h)
 |_Flow Temperature (°C)
 |_Return Temperature (°C)
 |_Temperature Difference (K)
 |_External Temperature (°C)
 |_Pressure (bar)
 |_Averaging Duration
 |_Actuality Duration
 |_Type of data in VIFE
 |_Time Point
 |_VIF is in ASCII
 |_Unit for H.C.A.
 |_Fabrication No
 |_(Enhaced) Identification
 |_Bus Address

Function Field:
 |_Instantaneous Value
 |_Minimum Value
 |_Maximum Value
 |_Value During Error State

Dimension (bit):
 |_8
 |_16
 |_24
 |_32
 |_32 real
 |_48
 |_64
 |_Variable Length

Industrial Electronic Devices

VIFE:

|_ Not Selected
|_ Credit of the nominal local legal currency units
|_ Debit of the nominal local legal currency units
|_ Access Number (transmission count)
|_ Medium (as in fixed header)
|_ Manufacturer (as in fixed header)
|_ Parameter set identification
|_ Model/Version
|_ Hardware Version #
|_ Firmware Version #
|_ Software Version #
|_ Customer Location
|_ Customer
|_ Access Code User
|_ Access Code Operator
|_ Access Code System Operator
|_ Access Code Developer
|_ Password
|_ Error flags (binary)
|_ Error mask
|_ Digital Output (binary)
|_ Digital Input (binary)
|_ Baudrate [Baud]
|_ response delay time [bittimes]
|_ Retry
|_ First storage # for cyclic storage
|_ Last storage # for cyclic storage
|_ Size of storage block
|_ Storage interval [sec(s)..day(s)]
|_ Storage interval month(s)
|_ Storage interval year(s)
|_ Duration since last readout[sec(s)..day(s)]
|_ Start (date/time) of tariff
|_ Duration of tariff (nn=01..11:min to day)
|_ Period of tariff [sec(s) to day(s)]

|_ Period of tariff months(s)
|_ Period of tariff year(s)
|_ dimensionless/ no VIF
|_ Volts
|_ Ampere
|_ Reset counter
|_ Comulation counter
|_ Control signal
|_ Day of week
|_ Week number
|_ Time point of day change
|_ State of parameter activation
|_ Special supplier information
|_ Duration since last comulation [hour(s)..year(s)]
|_ Operation time battery [hour(s)..year(s)]
|_ Date and time of battery change
|_ Energy MWh
|_ Energy GJ
|_ Volume
|_ Mass
|_ Volume 0,1 feet^3
|_ Volume 0,1 american gallon
|_ Volume 1 american gallon
|_ Volume flow 0,001 american gallon/min
|_ Volume flow 1 american gallon/min
|_ Volume flow 1 american gallon/h
|_ Power MW
|_ Power GJ/h
|_ Flow Temperature
|_ Return Temperature
|_ Temperature Difference
|_ External Temperature
|_ Cold/Warm Temperature Limit °F
|_ Cold/Worm Temperature Limit °C
|_ Cumul. count max power

|_ per second
|_ per minute
|_ per hour
|_ per day
|_ per week
|_ per month
|_ per year
|_ per revolution/measurement
|_ increment per input pulse on input channel
|_ increment per output pulse on output channel
|_ per liter
|_ per m^3
|_ per kg
|_ per K (Kelvin)
|_ per kWh
|_ per GJ
|_ per kW
|_ per (K*l)(Kelvin*liter)
|_ per V (Volt)
|_ per A (Ampere)
|_ multiplied by sek
|_ multiplied by sek/V
|_ multiplied by sek/A
|_ start date(/time) of
|_ VIF contains uncorrected unit instead of corrected unit
|_ Accumulation only if positive contributions
|_ Accumulation of abs value only if negative contributions
|_ upper/lower limit value
|_ # of exceeds of lower/upper limit
|_ Date(/time) of begin/end of first/last lower/upper limit exceed

|_ Duration of limit exceed
|_ Duration of first/last
|_ Date(/time) of first/last begin/end
|_ Multiplicative currection factor
|_ Additive correction constant * unit of VIF (offset)
|_ Moltiplicative correction factor: 10^3
|_ future value
|_ next VIFE's and data of this block are manufacturer specific
|_ None
|_ Too many DIFE's
|_ Storage number not implemented
|_ Unit number not implemented
|_ Tariff number not implemented
|_ Function not implemented
|_ Data class not implemented
|_ Data size not implemented
|_ Too many VIFE's
|_ Illegal VIF-Group
|_ Illegal VIF-Exponent
|_ VIF/DIF mismatch
|_ Unimplemented action
|_ No data available (undefined value)
|_ Data overflow
|_ Data underflow
|_ Data error
|_ Premature end of record

Industrial Electronic Devices

Swap Identification:

This field is used for select the Swap mode of Identification Number.

At the moment there are these possibilities:
- None;
- Type 1.

Examples:

- Identification Number (Secondary Address): 12345678; Address Register 1000; Convert BCD in Integer Identification Num. not checked.

None	Type 1
1000: 0x1234	1000: 0x5678
1001: 0x5678	1001: 0x1234

- Identification Number (Secondary Address): 12345678; Address Register 1000; Convert BCD in Integer Identification Num. checked.

None	Type 1
1000: 0x00BC	1000: 0x614E
1001: 0x614E	1001: 0x00BC

UPDATE DEVICE:

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

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

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

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

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

At this point the configuration/firmware on the device is correctly updated.
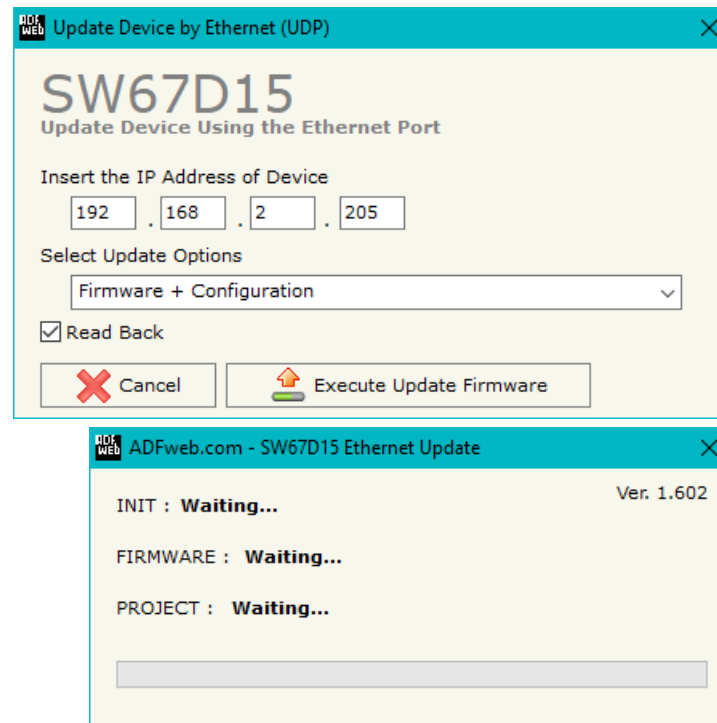
Figure 6: "Update device" windows

Note:
When you receive the device, for the first time, you also have to update the Firmware in the HD67D15 device.

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

- Try to repeat the operations for the updating;
- Try with another PC;
- Try to restart the PC;
- Check the LAN settings;
- If you are using the program inside a Virtual Machine, try to use in the main Operating System;
- If you are using Windows Seven, Vista, 8 or 10 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.
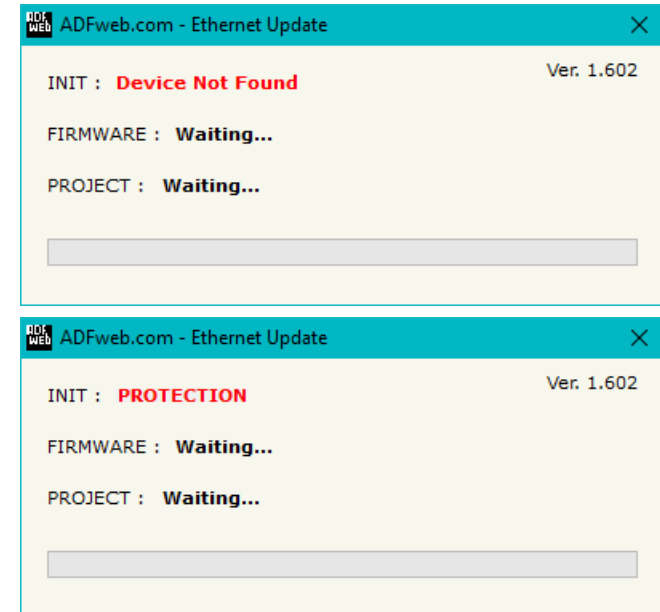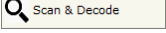
Warning:
In the case of HD67D15 you have to use the software "SW67D15": www.adfweb.com\download\filefold\SW67D15.zip.

Figure 7: "Error" window

SCAN & DECODE FUNCTION:

"SCAN & DECODE" functions are integrated in the configurator software SW67D15. It is possible to access to these functions by simple click on the " 🔍 Scan & Decode " button.

It has the following characteristics:

- ➔ Possibility to scan M-Bus network;
- ➔ Automatic decode of M-Bus telegrams;
- ➔ Easy connection directly through the Ethernet port of the converters.

For the description of the function, it is possible to refer to this manual: www.adfweb.com/download/filefold/SCAN&DECODE_ENG.pdf

Industrial Electronic Devices

MANUFACTURER SPECIFIC DATA

Using this function is possible to save into internal memory array the part of M-Bus frame that is coded like Manufacturer Specific Data. Usually these data are at the end of the frame and after a DIF byte with the value 0x0F of 0x1F.

Here an example of the frame and the mentioned data (hexadecimal):

68 20 20 68 08 01 72 78 56 34 12 86 04 05 00 08 00 00 00 0C 78 78 56 34 12 0F 11 22 33 44 55 66 77 88 99 AA 74 16

If you want to save all ten bytes from byte 200 of internal memory array you have to compile the fields "Manufacturer Specific Data", "Length (MSD) [1 – 241]" and Offset (MSD) [0 - 240] in this way: Manufacturer Specific Data: 200 | Length: 10 | Offset: 0.

If you want to save only the byte 33 and 44 in byte 200 of internal memory array you have to compile the fields "Manufacturer Specific Data", "Length (MSD) [1 – 241]" and Offset (MSD) [0 - 240] in this way: Manufacturer Specific Data: 200 | Length: 2 | Offset: 2.

If you want to save only the byte 66 in the byte 200 of internal memory array you have to compile the fields "Manufacturer Specific Data", "Length (MSD) [1 – 241]" and Offset (MSD) [0 - 240] in this way: Manufacturer Specific Data: 200 | Length: 1 | Offset: 5.

Industrial Electronic Devices

LORAWAN PAYLOAD

The LoRAWAN messages in Uplink and Downlink are structured into a defined format in order to recognize them from LoRaWAN gateway side and to understand to which M-Bus variables they are associated.

The payload of the LoRaWAN messages is defined in Hex format:

- The first byte refers to the row of the tables defined into "LoRaWAN Access" section of SW67D15: it can have a value between 0 and 255 (0xFF);
- The following bytes will contain the data to be linked to the internal memory arrays of the converter (using "Start Byte" and "Num. Byte" of "LoRaWAN Access" section of SW67D15);

Example 1:

the converter is sending a LoRaWAN message related to row 4 of "LoRaWAN Access → LoRaWAN Uplink" table of "LoRaWAN Access" section of SW67D15 with a "Num. Byte" set of '4'. The data from these 4 bytes is "01 02 03 04" (hex).
The payload of the LoRaWAN message will look like "04 01 02 03 04" where:

- 04: index of the row of "LoRaWAN Access → LoRaWAN Uplink" table;
- 01 02 03 04: data taken from internal memory array of the converter.

Example 2:

The external LoRaWAN gateway needs to send a LoRaWAN message to the converter and link it to row 3 of "LoRaWAN Access → LoRaWAN Downlink" table of "LoRaWAN Access" section of SW67D15. The "Num. Byte" set is '4' and the data to be written is "55 66 77 88" (hex).
The payload of the LoRaWAN message will look like "03 55 66 77 88" where:

- 03: index of the row of "LoRaWAN Access → LoRaWAN Downlink" table;
- 55 66 77 88: data to be written to the internal memory array of the converter.

ADFweb.com S.r.l.

Industrial Electronic Devices
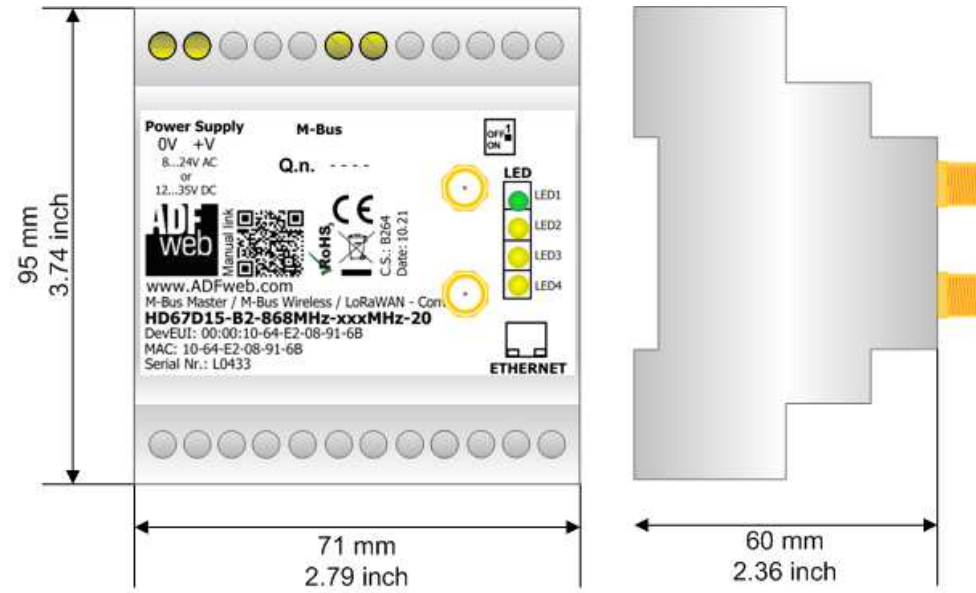
MECHANICAL DIMENSIONS:

Figure 8: Mechanical dimensions scheme for HD67D15-B2-xxxMHz-xxxMHz-xxx

Industrial Electronic Devices

ORDERING INFORMATIONS:

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

HD67D15 - B 2 – xxxMHz – xxxMHz - xxx

Maximum number of slaves supported
0: Only M-Bus Wireless port is present
20: up to 20 standard slaves (1.5mA consumption) connected to M-Bus
40: up to 40 standard slaves (1.5mA consumption) connected to M-Bus
80: up to 80 standard slaves (1.5mA consumption) connected to M-Bus
160: up to 160 standard slaves (1.5mA consumption) connected to M-Bus
250: up to 250 standard slaves (1.5mA consumption) connected to M-Bus

Frequency for M-Bus Wireless communication
None: M-Bus Wireless port not present
169: 169 MHz
433: 433 MHz
868: 868 MHz

Frequency for LoRaWAN communication
868: 868 MHz

Connectors Type
2: Fixed Screw Terminal

Enclosure Type
B: Modulbox 4M, 35mm DIN Rail mounting

Device Family
HD67D15: LoRaWAN / M-Bus Master / M-Bus Wireless - Converter

Industrial Electronic Devices

Order Code: **HD67D15-B2-868MHz-20**   -   LoRaWAN / M-Bus – Converter (up to 20 M-Bus slaves)
Order Code: **HD67D15-B2-868MHz-40**   -   LoRaWAN / M-Bus – Converter (up to 40 M-Bus slaves)
Order Code: **HD67D15-B2-868MHz-80**   -   LoRaWAN / M-Bus – Converter (up to 80 M-Bus slaves)
Order Code: **HD67D15-B2-868MHz-160**   -   LoRaWAN / M-Bus – Converter (up to 160 M-Bus slaves)
Order Code: **HD67D15-B2-868MHz-250**   -   LoRaWAN / M-Bus – Converter (up to 250 M-Bus slaves)

Order Code: **HD67D15-B2-868MHz-169MHz-0**   -   LoRaWAN / M-Bus Wireless – Converter (wM-Bus @ 169MHz)
Order Code: **HD67D15-B2-868MHz-433MHz-0**   -   LoRaWAN / M-Bus Wireless – Converter (wM-Bus @ 433MHz)
Order Code: **HD67D15-B2-868MHz-868MHz-0**   -   LoRaWAN / M-Bus Wireless – Converter (wM-Bus @ 868MHz)

Order Code: **HD67D15-B2-868MHz-169MHz-20** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 20 M-Bus slaves - wM-Bus @ 169MHz)
Order Code: **HD67D15-B2-868MHz-169MHz-40** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 40 M-Bus slaves - wM-Bus @ 169MHz)
Order Code: **HD67D15-B2-868MHz-169MHz-80** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 80 M-Bus slaves - wM-Bus @ 169MHz)
Order Code: **HD67D15-B2-868MHz-169MHz-160** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 160 M-Bus slaves - wM-Bus @ 169MHz)
Order Code: **HD67D15-B2-868MHz-169MHz-250** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 250 M-Bus slaves - wM-Bus @ 169MHz)

Order Code: **HD67D15-B2-868MHz-433MHz-20** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 20 M-Bus slaves - wM-Bus @ 433MHz)
Order Code: **HD67D15-B2-868MHz-433MHz-40** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 40 M-Bus slaves - wM-Bus @ 433MHz)
Order Code: **HD67D15-B2-868MHz-433MHz-80** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 80 M-Bus slaves - wM-Bus @ 433MHz)
Order Code: **HD67D15-B2-868MHz-433MHz-160** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 160 M-Bus slaves - wM-Bus @ 433MHz)
Order Code: **HD67D15-B2-868MHz-433MHz-250** -   LoRaWAN / M-Bus / M-Bus Wireless - Converter
(up to 250 M-Bus slaves - wM-Bus @ 433MHz)

Industrial Electronic Devices

Order Code: **HD67D15-B2-868MHz-868MHz-20**   **-**   LoRaWAN / M-Bus / M-Bus Wireless - Converter (up to 20 M-Bus slaves - wM-Bus @ 868MHz)

Order Code: **HD67D15-B2-868MHz-868MHz-40**   **-**   LoRaWAN / M-Bus / M-Bus Wireless - Converter (up to 40 M-Bus slaves - wM-Bus @ 868MHz)

Order Code: **HD67D15-B2-868MHz-868MHz-80**   **-**   LoRaWAN / M-Bus / M-Bus Wireless - Converter (up to 80 M-Bus slaves - wM-Bus @ 868MHz)

Order Code: **HD67D15-B2-868MHz-868MHz-160**   **-**   LoRaWAN / M-Bus / M-Bus Wireless - Converter (up to 160 M-Bus slaves - wM-Bus @ 868MHz)

Order Code: **HD67D15-B2-868MHz-868MHz-250**   **-**   LoRaWAN / M-Bus / M-Bus Wireless - Converter (up to 250 M-Bus slaves - wM-Bus @ 868MHz)

ACCESSORIES:

Order Code: **APW020**   -   Power Supply for M-Bus Master device that supports up to 20 Slaves
Order Code: **APW040**   -   Power Supply for M-Bus Master device that supports up to 40 Slaves
Order Code: **APW080**   -   Power Supply for M-Bus Master device that supports up to 80 Slaves
Order Code: **APW0160**   -   Power Supply for M-Bus Master device that supports up to 160 Slaves
Order Code: **APW0250**   -   Power Supply for M-Bus Master device that supports up to 250 Slaves

Industrial Electronic Devices

DISCLAIMER:

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

OTHER REGULATIONS AND STANDARDS:

WEEE INFORMATION

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

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

RESTRICTION OF HAZARDOUS SUBSTANCES DIRECTIVE

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

CE MARKING

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

WARRANTIES AND TECHNICAL SUPPORT:

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

RETURN POLICY:

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

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

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

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