

DFDMX: DMX gateway

DFDMX module allows to handle, through the **Domino** bus, up to 32 DMX devices. DFDMX module makes possible the communication over the first 64 of the 512 DMX channels allowed by this protocol. DFDMX module can be successfully employed in domestic and professional lighting applications, where systems communicating by the USITT DMX-512 protocol are used.

DFDMX module features the following characteristics:

- x all functions are managed by the module and can be controlled by any real or virtual input of the system, by supervisor or by video-terminal
- x possibility to control the DMX system from one or more pushbuttons connected to the **Domino** bus
- x up to 64 sceneries are available to realize "real time" sceneries; the sceneries are stored in the non volatile memory of the module
- x management of fade times
- x management of several rooms by the same DFDMX

The module can handle 64 DMX channels, but the maximum amount of devices that can be effectively connected may be lower if each one of these needs more than one channel. In addition, the maximum amount of connected devices cannot override 32 units. DFDMX module can work in system with DFCP controller, but also without it. In any cases, it is possible the execution, on each channel, functions like Up, Down and Single Command controlled by real or virtual points, with one-touch function (see in the next of this manual); also it is possible to save and recall up to 64 sceneries.

As for almost all modules of Domino family, DFDMX is supplied by the bus itself. A 2-way terminal block allows the connection of the module to the Domino bus; a fixed 3-way terminal block, on the other side, is available for the DMX line. Near to the bus terminal block, the module features a small pushbutton for the assignment of the address and a green LED that shows the operating status; the same green LED normally flashes every 2 seconds about to signal that the module is properly supplied and operating, while a yellow LED near to the 3-way terminal block shows the presence of communication on the DMX line. Removing the cover of the bus terminal block, a small connector (PRG) can be accessed; this one allows the connection to the optional tester/programmer. DFDMX module is housed in a standard DIN 3M box for rail mounting.

Note: this data sheet applies to DFDMX modules with firmware version 2.1 or higher.

Address programming

DFDMX module takes only one output address. A white label on the front panel allows the writing of the assigned base address for an immediate visual identification. For details about address programming refer to the related documentation.

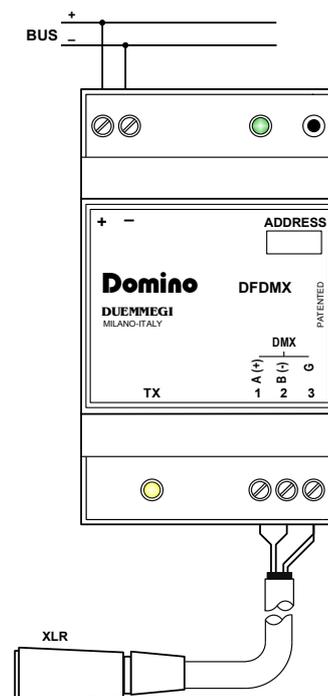


Wiring diagram

The following schematic diagram shows the connection to be made between DFDMX module, the **Domino** bus and the DMX line, using cables as described by the table in the following of this same paragraph.

Generally, the DMX devices feature a female XLR 5-way or 3-way connector, therefore in this case the cable of DFDMX must be properly wired to a male XLR connector (not provided) according to the specification of the manufacturer of the device.

Even if the standard specifies a maximum of 32 devices for the DMX line, as a good rule do not override a total amount of 16-20 devices. If the number of devices is higher than 20, use proper line splitters to connect the devices overriding this limit.



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The following table provides some suggestions about the cables to be used for the connections and the related maximum length.

Connection	Suggested cable
Domino bus	2 x 0,8 mmq MAX not shielded
DMX line	2 twisted pairs 2 x AWG22 MIN (e.g.: Belden 3107A or 9841 or CEAM CPR6003), MAX 1Km

For the DMX connections always use only cables specified for EIA RS485 communication, with 120 ohm impedance and low coupling capacitance between the cores. Use a twisted pair for the lines A and B. Do not connect the shield of the DMX cable; use instead another pair to connect the G terminal (ground) of DFDMX and of the connected devices. Do not connect any DMX cable (G terminal included) to the protective earth, because this can inject some disturbances causing negative effects on the communication.

All DMX devices must be connected in sequential way; absolutely avoid star connections. The DMX line must be terminated at its start and at its end by a 120 ohm resistor (not provided), as recommended by RS 485 specifications.

Bus commands

As said before, DFDMX takes, inside the **Domino** bus, 1 output address which related 16-bit data field has the following meaning:

Bit	Data field at the output address
1	Value or Scenery Number or Channel Number
2	
3	
4	
5	
6	
7	
8	
9	Command Code
10	
11	
12	
13	
14	
15	
16	

Command code

Granted that DMX channels are numbered from 1 to 64, DMX channels are controlled through the output address of DFDMX module.

Considering the 16 bits as group of 2 bytes, the most significant byte represents the code of the command to be executed, while the less significant byte set the value or the scenery number or the channel number depending on the specific command to be executed.

The following table lists the allowed command codes.

DEC	HEX	Function
0	0x00	No operation (stop Up/Down and Single Command)
1 + 64	0x01 + 0x40	Select DMX channel on which the value specified by the low byte has to be written
101	0x65	Save the current status of the (included) channels into the scenery specified by the low byte
102	0x66	Include the channel specified by the low byte in the next scenery that will be saved (1); if the low byte is 0, then all channels will be included
103	0x67	Exclude the channel specified by the low byte in the next scenery that will be saved (1); if the low byte is 0, then all channel will be excluded
111	0x6F	Recall the scenery specified by the low byte
112	0x70	Disable the DMX flux; the value of the low byte has not influence
113	0x71	Enable the DMX flux; the value of the low byte has not influence
128	0x80	No operation (stop Up/Down and Single Command)
129	0x81	Up command with one-touch function on the channel specified by the low byte
130	0x82	Down command with one-touch function on the channel specified by the low byte
131	0x83	Single command with one-touch function on the channel specified by the low byte
133	0x85	Switch off (write zero) the DMX channel specified by the low byte and store the last value
134	0x86	Recall the last stored value on DMX channel specified by the low byte (switch on to last value)
135	0x87	Set as DMX minimum level the value specified by the low byte
136	0x88	Set as DMX maximum level the value specified by the low byte
140	0x8C	Set as ramp time the value specified by the low byte
255	0xFF	Broadcast command: send to all DMX channels the value specified by the low byte

Some of the more used codes will be described in the following of this paragraph.

Writing a value on a channel

For codes 1+64 (write a value on a channel) the allowed range for the value is 0 to 255, taking in account the type of the connected DMX device, which can be a RGB spot, a rotating light machine or others. For this reason, regarding the meaning of each value, always refer to the manual of the connected DMX devices.

To send a well defined value to a well defined DMX channel at the pushing of a button connected to an input module of the **Domino** bus, supposed to have assigned the address 1 to DFDMX module, the simplest way is to insert in

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the program of DFCP an equation similar to the following one:

AO1 = P(0x0164) I1.1 & P(0x0100) I1.2

In this case, at the activation of **I1.1**, the value 0x64 (low byte of the Word inside parenthesis, equal to decimal 100) will be sent to the channel 01 (high byte of the same Word). The second preset will send the value 0 to channel 1 at the activation of **I1.2**.

If a 3-channels RGB device is connected, different values loaded on the 3 DMX channel could allow, for instance, to reproduce $256^3 = 16.777.216$ colors. In this same example, to generate a succession of random colors, the following simple script and equation can be used, and this shows the potentiality of DFCP controller and of DFDMX module. **V1** simply generates a "clock" to recall the script every 1 second.

```
script 1
  trigger = V1
  R0 = RANDOM(0)
  R0 = R0 & 0X00FF
  R0 = R0 | 0x0100
  AO1 = R0

  R0 = RANDOM(0)
  R0 = R0 & 0X00FF
  R0 = R0 | 0x0200
  AO1 = R0

  R0 = RANDOM(0)
  R0 = R0 & 0X00FF
  R0 = R0 | 0x0300
  AO1 = R0
endscript
```

V1 = TIMER(!V1,5,5)

Up, Down and Single Command functions

These control functions, with one-touch feature, are those typical of the conventional dimmer modules of the **Domino** family and they will be described here in the following.

Up/Down pushbuttons: pushing and holding Up (Down) button, the brightness increases (decreases) until the max (min) value is reached. When the brightness has reached the desired level, release the button to hold it.

Single Command: holding down the button, the brightness increases until the max value is reached and, after 1 second about, the brightness decreases to the min value, then it increases again and so on. Release the button at the desired level to hold it.

When the lamp is ON, a short pulse (one-touch) on any control button will cause the complete switching OFF. When the lamp is OFF, a short pulse on any control push-button will cause the switching ON at the last brightness level.

DFDMX module also provides the possibility to execute Up, Down and Single Command function also without the DFCP controller, as described in the related paragraph.

In the following example, at the pushing of one of the 3 buttons, the single command code (0x83) will be sent to the channel specified by the low byte (01, 02 or 03).

When releasing the button, the stop code (0x80, 0x00 can be also used) will be sent **to the same channel**, allowing the module to understand that the button has been released.

**AO1 = P(0x8301) I1.1 & P(0x8001) !I1.1 & **
**P(0x8302) I1.2 & P(0x8002) !I1.2 & **
P(0x8303) I1.3 & P(0x8003) !I1.3

To use the Up and Down functions instead of the single command, simply use the related codes (0x81 and 0x82 respectively).

Ramp or fade time

As ramp, or fade time, it is intended the time required to change a channel value from 0 to 255. The allowed fade times are in the range 0 to 255; it is possible to set the desired fade time according to the following relationship:

$$\text{Fade Time} = \text{Value} \times 255 \times 0,01 \text{ [seconds]}$$

The fade time is always the same for all the 64 DMX channels; to set it, use the command 140.

The Fade Time is given in seconds. The following table shows the relationship between some values that can be written at the output address +1 and the related fade time.

Set value	Fade time [sec]
0	0
1	2,55
2	5,10
3	7,65
....
255	650,25 (10' and 50" about)

Note: it is not possible to set a different fade time for each channel; in other words, the fade time is a global parameter.

Sceneries, inclusion and exclusion of channels

The function for inclusion and exclusion of a channel from a scenery allows the independent management of different rooms using the same DFDMX module.

In other words, this feature allows to recall a scenery, e.g. related to a room to which some DMX channels have been reserved, avoiding to influence the current status of the other rooms to which some other channels have been reserved.

The codes 102 and 103 (0x66 and 0x67) allow to select which DMX channels will be included in the scenery under construction. The less significant byte written at the output address specifies the number of the DMX channel to be included or excluded.

The codes 101 and 111 (0x65 and 0x6F) allow to store and recall up to 64 sceneries. The less significant byte written at the output address specifies the number of the scenery to be saved or recalled.

The following simple equation stores 3 sceneries (1, 2 and 64) at the pushing of 3 different buttons (I1.1 . . I1.3) and it recalls them by other 3 buttons (I2.1 . . I2.3):

```
AO3 = P(0x6501) I1.1 & P(0x6502) I1.2 & \
      P(0x6540) I1.3 & P(0x6F01) I2.1 & \
      P(0x6F02) I2.2 & P(0x6F40) I2.3
```

DFDMX module allows however to save and recall the sceneries even if the DFCP controller has not been installed in the plant, as described in the related paragraph. To include the channel NN in the scenery, send the command 0x66NN. If NN = 0 then all the channels will be included.

To exclude the channel NN in the scenery, send the command 0x67NN. If NN = 0 then all the channels will be excluded.

Enable and disable DMX flux

To enable and disable the communication (or flux) from DFDMX to the connected DMX devices, commands 113 and 112 can be respectively used (0x71 and 0x70). This allows to execute a sequence of DMX commands in a unique flux, in order to avoid undesired effects. The following script shows an example of the using of this command for the control of DMX flux.

```
script 1
  trigger = I1.1
  AO3 = 0x7000
  AO1 = 0x01FF
  AO1 = 0x02FF
  AO1 = 0x03FF
  AO3 = 0x7100
endscript
```

At the activation of the input I1.1 the script executes, in the sequence, the following functions:

- x disabling of DMX flux
- x loading in the memory of DFDMX of 3 values into 3 different DMX channels (but these one will not be still sent to the connected devices because the flux is disabled)
- x enabling of DMX flux: at this point DFDMX will transfer the value of the channels to the connected devices

Set minimum and maximum value

The commands 135 and 136 (0x87 and 0x88) allow to set a minimum and a maximum value on all DMX channel for the functions Up, Down and Single Command.

Broadcast command

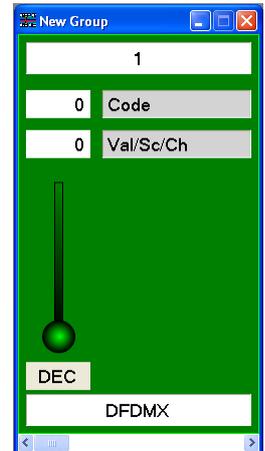
The command 255 allows to send a value to all DMX channels at the same time.

Mapping

DFDMX module is shown inside the map of BDTools or DCP Ide like in the figure on this right side.

As for all **Domino** modules, the background of the module will be in green color if the module is connected and properly working, otherwise the background will be in red color.

The text box on the top is for the code, while the text box on the bottom is for the value or scenery or channel as previously described in the paragraph about the bus commands.



Setting and management of the sceneries

As said before, DFDMX module can store and recall up to 64 sceneries. This paragraph describes the management of these sceneries by the program BDTools or DCP Ide in simple and fast way. The sceneries management is performed by a PC connected to the **Domino** bus through DFRS, DFTS or DFCP. To access the configuration panel, from the menu of BDTools (or DCP Ide) select Programming, then Modules Configuration and then DFDMX. The window shown in Figure 1 will appear.

Note: Take in account that the main purpose of configuration program is for the sceneries management during the setting up and the maintenance of the plant; it is also useful as "evaluation program" to get confidence with DFDMX module, but the "real" management of the plant must be executed by a proper supervision program taking in account the global requirements of the structure property.

The "Settings" TAB in Figure 1 shows 64 sliders allowing to change the value of the related DMX channel; in addition, a slider named "T" allows to set the ramp time. The address of the DFDMX module to be managed must be entered in the text box in the upper left side (1). The bar in the upper side of the window also features some buttons with the following meaning:

- x **Read and Program:** respectively to transfer the values currently displayed in the window to DFDMX module, and to read the current situation of DFDMX and report it into the window
- x **ID & Ver.:** ask for the firmware version of DFDMX
- x **From File and To File:** respectively to open a file containing a scenery and to save the scenery currently displayed in the window into a file
- x **All '0':** reset to 0 all the sliders
- x **Include All:** include all DMX channels into the scenery
- x **Exclude All:** exclude all DMX channels from scenery
- x **Close:** close the configuration window

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Each slider reports the number of the DMX channel to which it is referred (1 in the example of the figure on this right side) and it allows to change the value of the channel playing by the mouse on the cursor of the slider (holding down the left button); the value of the channel is also displayed by the number on the slider. As an alternative, it is possible to double click on the value, enter the desired value and press Enter on the keyboard.



The numbers of the channels will have white or gray background depending on their includes/excluded status respectively. A double click on the number of the channel will include or exclude the channel itself.

The 3 RGB text boxes on the left side identify the 3 channels related to red, green and blue values; these ones will be set to proper values depending on the color chosen in the square located under the RGB boxes. Clicking in this square, a color selection window will be opened. The 3 RGB channels can be changed by double-clicking in the body of the slider.

The buttons 1 to 64 near the icon  allow to recall the related scenery stored in the DFDMX module memory.

The buttons 1 to 64 near the icon  allow to transfer the values currently displayed in the window to DFDMX and to store the current situation as scenery which number is equal to the number of the pressed button.

These operations also include the fade time and the included/excluded channels for each scenery.

As said before, it is possible to save into a file the scenery currently displayed in the window; each file can contain only one scenery, thus, if more sceneries have to be saved, it is required to create more files; these ones must have .DMX extension.

The "I/V Table" TAB, shown in Figure 2, allows to create up to 80 relationship between real or virtual inputs of the **Domino** bus and the following commands: Up, Down, Single Command, save scenery and recall scenery. For each command simply enter the input point (without I or V, with ! if the negation is required), the function and the channel or the scenery.



These functions are managed directly by DFDMX module, thus without the need of any controller and any programming; the regulation functions also include the one-touch feature.

To compile the table, left click with the mouse on the first available cell on the Input column, enter address and point (without I or V, with ! if needed) and press Enter. The command list will appear: choose the desired function (Mono, Up, Down, Recall e Save) and press Enter. The cell of the column Cmd will then show the symbol of the chosen function; to change the function, simply click again on the cell. The next cell on the column C/S (Channel or Scenery) will be automatically highlighted: enter the desired value, that is the channel on which the regulation has to be executed, or the number of the scenery to be saved or recalled.

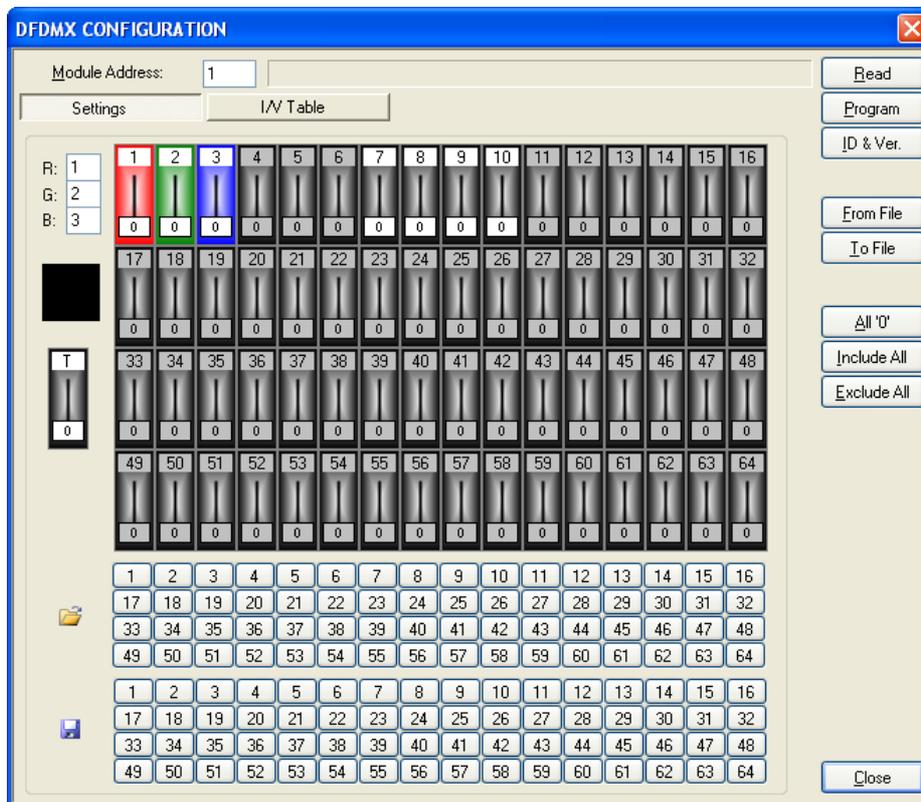


Figure 1: Settings

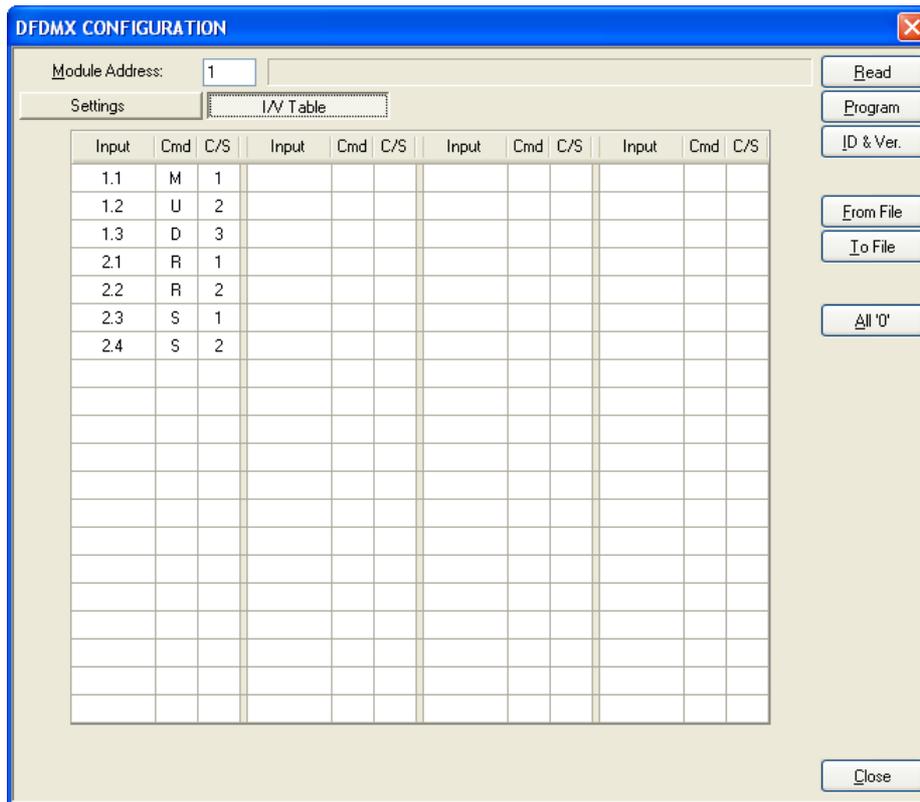


Figure 2: I/V Table

It is allowed that the same input execute the same command on more channels at the same time (different commands could have no meaning); for instance, the same input may execute a Single Command on 3 RGB channels in order to regulate the light level with white color.

The buttons **Read** and **Program** allow, respectively, to read the current configuration of DFDMX and report it into the window and to transfer the value currently shown in the window to DFDMX module.

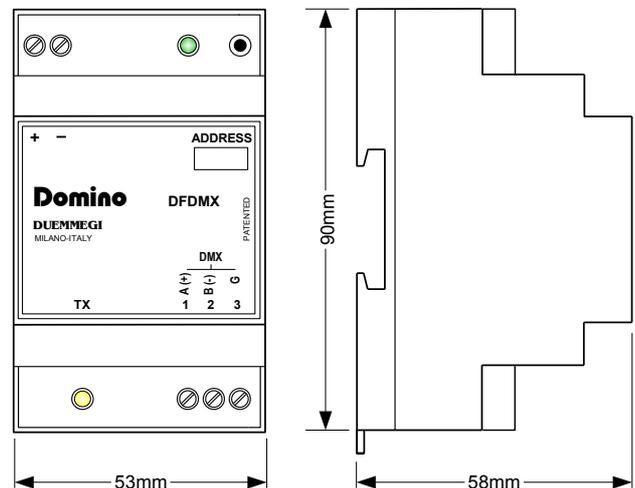
The buttons **From File** and **To File** allow, respectively, to open a file, with .TIV extension, containing a previously saved I/V table and to save the I/V table shown in the window to a file.

The buttons **All '0'** clears the table.

Technical characteristics

Supply voltage	By specific centralized power supply mod. DFPW2
MAX current consumption	Equal to 4 standard Domino modules
DMX channels	64
Managed DMX devices	32 MAX, suggested 16
Number of generic commands	80 (I/V Table)
Fade time	0 to 650,25 seconds, step 2.55 seconds
Operating temperature	-5+ +50 °C
Storage temperature	-50 ÷ +70 °C
Protection degree	IP20

Outline dimensions



Correct disposal of this product

(Waste Electrical & Electronic Equipment)
(Applicable in the European Union and other European countries with separate collection systems). This marking on the product, accessories or literature indicates that the product should not be disposed of with other household waste at the end of their working life. To prevent possible harm to

the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources. Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take these items for environmentally safe recycling. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

Installation and use restrictions**Standards and regulations**

The design and the setting up of electrical systems must be performed according to the relevant standards, guidelines, specifications and regulations of the relevant country. The installation, configuration and programming of the devices must be carried out by trained personnel.

The installation and the wiring of the bus line and the related devices must be performed according to the recommendations of the manufacturers (reported on the specific data sheet of the product) and according to the applicable standards.

All the relevant safety regulations, e.g. accident prevention regulations, law on technical work equipment, must also be observed.

Safety instructions

Protect the unit against moisture, dirt and any kind of damage during transport, storage and operation. Do not operate the unit outside the specified technical data.

Never open the housing. If not otherwise specified, install in closed housing (e.g. distribution cabinet). Earth the unit at the terminals provided, if existing, for this purpose. Do not obstruct cooling of the units. Keep out of the reach of children.

Setting up

The physical address assignment and the setting of parameters (if any) must be performed by the specific softwares provided together the device or by the specific programmer. For the first installation of the device proceed according to the following guidelines:

- Check that any voltage supplying the plant has been removed
- Assign the address to module (if any)
- Install and wire the device according to the schematic diagrams on the specific data sheet of the product
- Only then switch on the 230Vac supplying the bus power supply and the other related circuits

Applied standards

This device complies with the essential requirements of the following directives:

2004/108/CE (EMC)
2006/95/CE (Low Voltage)
2002/95/CE (RoHS)

Note

Technical characteristics and this data sheet are subject to change without notice.