

ModDALI: 4-channel DALI gateway

ModDALI module allows the management, through the **CONTATTO** bus, of 4 DALI lines upon it's possible to connect up to 32 devices for line (or channel). In this way it's possible to control and regulate up to 128 DALI ballasts (or other similar devices). A firmware special version (6.x), available on request, transforms the module into 2-lines for 64-ballasts each one; the following refers to the standard version unless otherwise specified.

ModDALI module performs, for each channel, the following main features:

- all timing functions are accomplished by the module and it may be controlled by any real or virtual input of the system, by supervisor or by video terminal
- Up/Down and Single commands may be defined for the manual regulation of lighting level
- programmable ramp, in the range 0 to 60 seconds
- setting of minimum and maximum output levels
- dynamic lights scenes can be easily implemented through MCP
- the current brightness level may be stored and recalled by the user; up to 16 presets are available to create "real time" lighting scenes; the preset will be stored in the non-volatile memory of the ballasts
- if a **CONTATTO** bus failure or DALI bus failure occurs, the output level will be automatically set to a user-defined level
- diagnostics of short circuit on the DALI lines and lamp failure, with information about the line where the failure occurred
- galvanic insulation between DALI and **CONTATTO** buses

The 32 devices for each line can be controlled by:

Line: each command sent on a line will be executed by all the devices connected on that same line, therefore all the related devices will behave in the same way.

Individually: the commands will be individually sent to each device, therefore each single device will behave independently; for this operation, the DALI devices must be addressed as described in the following paragraphs.

Groups: the command will be sent to groups, therefore each group of devices will behave independently; for this operation, DALI devices must be addressed and the groups must be defined as described in the following paragraphs.

The failure of a lamp or ballast can be detected and therefore reported only at line level and not individually. ModDALI module can operate exclusively in systems with MCP controller.

The ModDALI module provides a 5-way terminal blocks for the connection to **CONTATTO** bus, a 2-way terminal block for the supply voltage of DALI section and a 9-way terminal blocks for the connection to the 4 DALI lines; all terminal blocks are of removable type. A green LED on the front panel reports the power-on condition.

On the front panel, four yellow LEDs report the communication status on the related DALI line; moreover these LEDs report information about lamp failure and/or lines failure.



Four pushbuttons on the front panel, one for each DALI line, allow the manual control of connected devices; the possible functions, through these pushbuttons, are the continuous regulation of the brightness level and the one-touch switching on and off.

ModDALI module is housed inside a standard DIN 6M module for rail mounting.

Address programming

ModDALI module takes 1 output address and, if enabled, 1 input address with the same value (both one made by 4 channels 16-bit).

The address has to be assigned by FXPRO programmer. A white label on the front panel allows to write the programmed module address; a check box near to this label allows to annotate if input address has been enabled or not.

Operation

ModDALI features 1 output address with 4 channels 16 bit; each channel is related to one of the 4 DALI lines. Sending to the output address a code among the available ones (see following paragraphs), it's possible to perform the desired function.

The easiest way to control each line connected to the DALI ballasts is by two pushbuttons (Up/Down) or by a single pushbutton (single command); these pushbuttons can be connected to any **CONTATTO** input module and the operation is like here bottom described.

Up/Down pushbuttons: pushing and holding the 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. Releasing and pushing again the button the brightness decreases to minimum level. Release the button at desired level to hold it.

In addition to these simple manual commands, DALI devices may be controlled by supervisor or by video terminal (ex. touch screen), simply writing on the output channel the code of the function which must be executed and to which ballast must be sent.

Installation hints

The schematic diagram in Figure 1 shows the connections to be made between ModDALI module, the **CONTATTO** bus, the auxiliary power supply and the 4 DALI lines.

As said above, ModDALI module performs galvanic insulation between DALI section and **CONTATTO** bus, through photo couplers inside the module, while the 4 DALI lines are not isolated each one to the others. All terminal identified as DA- in the schematic are internally connected each one to the others.

The auxiliary power supply (AUX SUPPLY in the schematic of Figure 1) can be a transformer with 12V~ secondary winding (at full load) 10VA, or it can be a stabilized dc power supply having output voltage in the range 15V to 24V (MAX), capable to deliver 1A; in this last case the polarity is automatic, so the positive pole can be connected indifferently to the terminal 19 or 20. **Warning:** voltage over 24V could damage the connected DALI devices.

It is suggested the using, for the DALI lines, of a normal 2-core cables with double insulation. It's allowed to lay these cables in the same pipe in which there are power cables, provided that they have double isolation too.

It is recommended to avoid the using of multi core cables carrying both the two DALI signals and ballast supply, because the capacitive coupling between the signal wires and the power lines may cause very dangerous conditions for the human safety.

The following table gives some rules for the MINIMUM cable section. As said above, no special cables are required for the 4 DALI lines, provided that they have double insulation.

In any case, the distance between ModDALI module and the farthest ballast must not be more than 300 meters.

Connection	Suggested cable
CONTATTO bus	4 x 2.5 mmq unshielded
DALI SUPPLY	1 mmq (if the power supply is near to the module)
DALI lines	Up to: 2 x 0.50mmq
	Up to 175m: 2 x 0.75mmq
	Up to 230m: 2 x 1.00mmq
	Up to 300m: 2 x 1.50mmq

During the setting up of the system, 4 pushbuttons on the front panel allow the manual control of the connected ballasts, separately for each line, even if MCP is disconnected (see the related paragraph).

On the front panel 4 LEDs are available for diagnostics (see the related paragraph).

Information from and to ModDALI

Since ModDALI module features 4 identical channels (both input and output), the following description will be referred to one channel only. A DALI line is related each channel of the module.

Input section

On the input address, if enabled, 4 channels 16 bit are available for diagnostics of DALI system, as described in the following table:

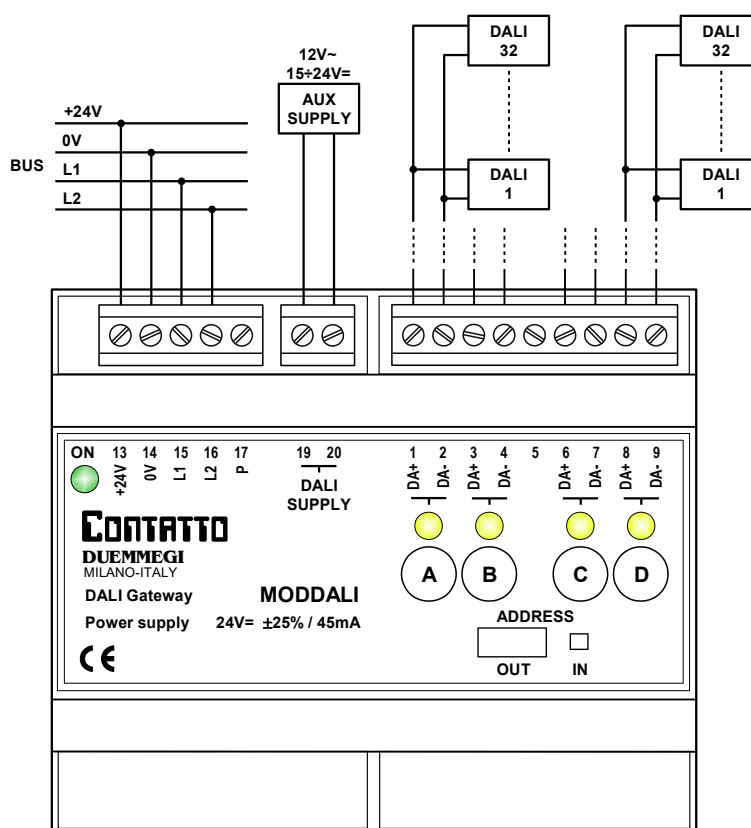


Figure 1: Wiring connections for standard version (4-line / 32-ballast)

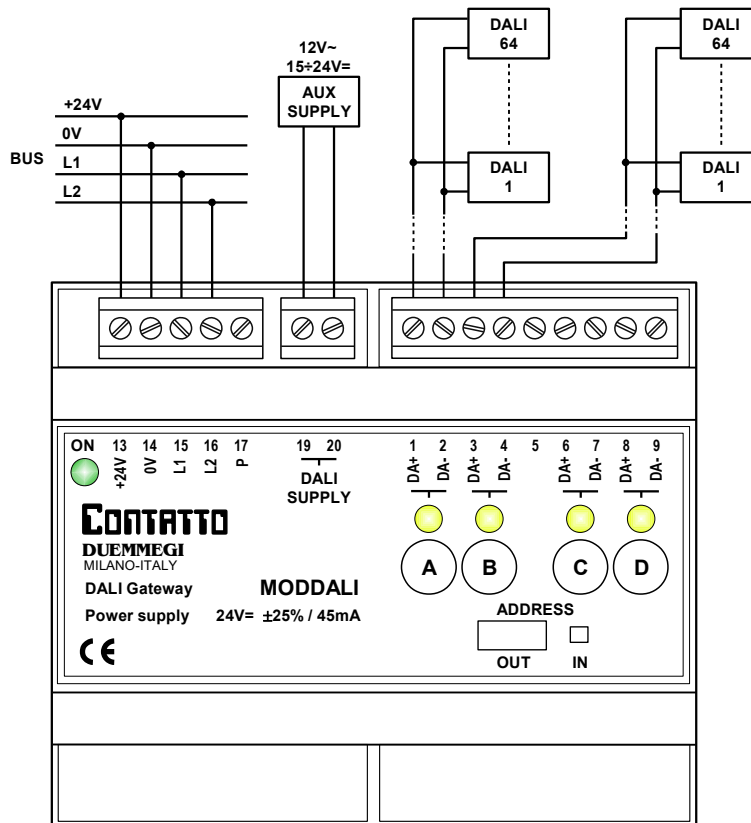


Figure 2: Wiring connections for special version (2-line / 64-ballast)

Point	Description
1	
2	
3	
4	
5	Current brightness
6	
7	
8	
9	-
10	-
11	Polling disabled
12	Power supply loss on DALI side
13	Test button pressed
14	Lamp failure
15	DALI line broken
16	DALI line short circuit

The first available information (the 8 lower bits of the channel) is the brightness level of the ballast having address 1 on each DALI line (assumed as reference for all the other ballasts). Thus, to use this function, the ballasts have to be addressed starting from address 1. The value of the current brightness level is in the range 0 to 100; if no ballast has been addressed as 1, then the reported value will be 255. A lamp failure condition will be instead reported by the value 128; if the answer from the ballast will not be understood the value 129 will be reported.

If the brightness level of each ballast on each DALI line is required by the application, a script for MCP is available for this purpose; contact **DUEMMEGI** for more information.

Output section

4 channels 16 bit are available on the output address for the execution of commands to the ballasts, as described in the following table:

Point	Description
1	
2	
3	
4	
5	Function
6	
7	
8	
9	
10	
11	
12	Destination
13	
14	
15	
16	

The *destination* can assume different values depending on the typology of the addressed target, identified by the value of the high byte of the channel, as in the following table:

Written data		Destination
HEX	DEC	
0x00	0	All the ballasts on the line
0x01 ÷ 0x20	1 ÷ 32	single ballast (1÷32)
0x81 ÷ 0x90	129 ÷ 144	single group (1÷16) of ballasts

The function executed by the module depends on the value written on the low byte of the channel, as described in the following table:

Written data		Function
HEX	DEC	
0x00 ÷ 0x64	0 ÷ 100	Set the brightness to 0÷100% according to the current ramp
0x70	112	Disable polling
0x71	113	Enable polling
0x7D	125	Up command without one-touch function
0x7E	126	Down command without one-touch function
0x7F	127	Single command without one-touch function
0x80	128	No operation (<i>in this case the value of the destination must be zero</i>)
0x87	135	Set the current brightness a MIN value
0x88	136	Set the current brightness a MAX value
0x89	137	Reset MIN value to default (1%)
0x8A	138	Reset MAX value to default (100%)
0x8B	139	Save the current brightness as level to be loaded during bus failure condition
0x8C ÷ 0xAA	140 ÷ 170	Set the current ramp to 0 ÷ 30 seconds (1s step)
0xAB ÷ 0xAD	171 ÷ 173	Set the current ramp to 40 ÷ 60 seconds (step 10 s)
0xB5 ÷ 0xC4	181 ÷ 196	Save the current brightness to Preset 1÷16
0xC9 ÷ 0xD8	201 ÷ 216	Recall brightness from Preset 1÷16 according to current ramp

Note:

- the previous table applies to ModDALI module equipped with firmware 2.0 or higher.

The value to be written in the channel to perform a given function to a given destination will be thus:

- in hexadecimal: 0xYYZZ where YY is the destination in hexadecimal format (HEX) and ZZ is the code of the function in hexadecimal format (HEX)
- in decimal: K where K is given by [(256 x YY) + ZZ], where YY is the destination in decimal format (DEC) and ZZ is the code of the function in decimal format (DEC)

Notes:

- ModDALI module, normally, polls all the ballasts connected to the 4 lines; this polling can be disabled, independently for each line, sending the code 112 (of course losing all information about the diagnostic and the current level). The code 113 enable again the polling; the current status of the polling is reported by the point 11 of the input channel (if enabled). At the module power up or after a reset the polling is always enabled by default.
- The code 128 is required only to inform ModDALI about when interrupt a running function. For instance, to perform an Up function, the code 125 must be sent: the brightness will increase until the sending of code 128.
- The code 139 saves, in the non volatile memory of the ballasts, the brightness level which will be automatically recalled when during a DALI bus failure condition or during a communication loss with MCP controller.
- The change from a brightness level to another one will be executed according to a ramp that can be set as desired by the codes 140 to 173. The ramp value will be stored in the non volatile memory of the ballasts, therefore a power failure does not affect it.

The sending of commands or values to DALI devices can be performed through a supervisor simply writing the memory locations of MCP related to the output channels of the installed ModDALI modules.

As option, or in addition, it is possible to send commands or value from MCP to the DALI channel through proper equations as in the following example:

```
V1 = !(I1.1 | I1.2 | I1.3)
AO2:1 = P(128)V1 & \
        P(125)I1.1 & P(126)I1.2 & \
        P( 50)I1.3
```

where I1.1 and I1.2 are, for instance, the Up and Down inputs and AO2:1 is the channel 1 of the ModDALI module with address 2; I1.3 will set the brightness to 50%. The specified value, at each variation, will be transferred to the DALI output (AO2:1). At the releasing of each pushbutton, the value is always set to 128 (no operation, but needed to inform the module about the releasing of the buttons).

To get the same result on a ballast individually addressed, it is easiest (even if not mandatory) to use the hexadecimal format to write the equations, because the address of the ballast has to be specified in the high byte of the channel:

```
V1 = !(I1.1 | I1.2 | I1.3)
AO2:1 = P(0x0080)V1 & \
        P(0x017D)I1.1 & P(0x017E)I1.2 & \
        P(0x0132)I1.3
```

where I1.1 and I1.2 are the Up and Down inputs and AO2:1 is the channel 1 of the ModDALI module with address 2; I1.3 will set the brightness to 50%.

The specified value, at each variation, will be transferred to the DALI output (**A02:1**). At the releasing of each pushbutton, the value is always set to **0x0080** (no operation, but needed to inform the module about the releasing of the buttons).

A similar example is true to send command to a group of ballasts:

```
V1 = !(I1.1 | I1.2 | I1.3)
A02:1 = P(0x0080)V1 & \
        P(0x817D)I1.1 & P(0x817E)I1.2 & \
        P(0x8132)I1.3
```

The specified value, at each variation, will be transferred to the DALI devices assigned to group 1 on the channel (**A02:1**). At the releasing of each pushbutton, the value is always set to **0x0080** (no operation, but needed to inform the module about the releasing of the buttons).

Of course the commands to DALI devices can be also sent by MCP through the using of the Scripts.

Commands from the front panel

Four pushbuttons on the front panel, related to each DALI line, allow the following functions: a short pulse will cause the complete switching ON and OFF, while holding down the button the brightness increases or decreases depending on previous action (every next continuous pressing will invert the previous one). These pushbuttons are useful during the installation procedure.

Meaning of the LEDs on the front panel

For each DALI line, the related LED continuously flashes during normal operation. Since the four lines are sequentially polled, thus the LEDs flash in the same way, even if MCP controller is not connected.

The LEDs on the front panel will be fixed lighted when these one or more of the following events will occur on the related DALI line:

- Lamp failure
- Dali line broken or no ballast connected
- Short circuit on DALI line

In the case of short circuit, an automatic procedure will try to restore the fault line, thus allowing to module to return to the normal operation with a maximum 15 sec delay after the short circuit condition has been removed.

All the LEDs will be instead switched off if the DALI section of the module is not supplied (terminals 19-20) or if the polling has been disabled.

In any case, the occurred problem can be discriminated by MCP Visio or by a supervisor or video-terminal connected to MCP (reading input channel as described in the related paragraph).

Note:

- In lamp failure condition, it is not possible to know on which DALI device this event occurred: it is only possible to know on which of the 4 lines of ModDALI the failure is present.

Setting the operating parameters

MCP IDE allows to set the operating parameters of each DALI channel and to perform some diagnostic functions. The setting up is performed via the **CONTATTO** bus and MCP through a specific configuration panel which can be opened selecting, from the menu of MCP IDE, "Configuration", "Lighting Gateway" and then "MODDALI". The window in Figure 3 will be shown. The following refers to the standard version, but the procedures for the special version are similar.

This configuration panel allows to set the main parameters and some other options as described in the following of this paragraph. Before to proceed with any other action, the communication with MCP has to be enabled.

The top side of the DALITools window reports the section for the addresses management. After having entered the address of the ModDALI to be managed, it is possible to enable the input address of the module through the check box named "Input Address" and then clicking on the button Program; by the button Read it is instead possible to check the current setting, after having specified the desired module address and the channel.

Six tabs in the window allow some well defined functions as described in the following.

The button ID & Ver. on the lower side allows to read the firmware version of the selected ModDALI module.

Addressing

3 mutually exclusive functions are available::

Set the address. In the first case, an address will be assigned to all the connected ballasts, and the starting address can be chosen (the typical value is 1). This type of addressing assigns consecutive values, in the range 1 to 32, to the ballasts in a random order.

If some ballasts on the selected channel have been previously addressed and some other ballasts have to be added, the addressing procedure can be performed without any modification to the previously assigned addresses. A timer icon will inform that the operation is running.

At the end of the procedure, the normal mouse icon will be restored.

The time required for this procedure is about:

$$T = 5\text{sec} + (5\text{sec} \times \text{"nr. of ballasts"})$$

Remove the address. If some addressing or reconfiguration errors occurred, it can be useful removing the address of all the ballasts on the line or of a well specified ballast.

Restore the factory setting. The DALI ballasts are factory set without any address and with a basic configuration for the main parameters; the following table shows a typical default configuration:

Parameter	Value
Minimum brightness level	1%
Maximum brightness level	100%
Brightness level in failure conditions	100%
Ramp value	0 seconds
Preset	None

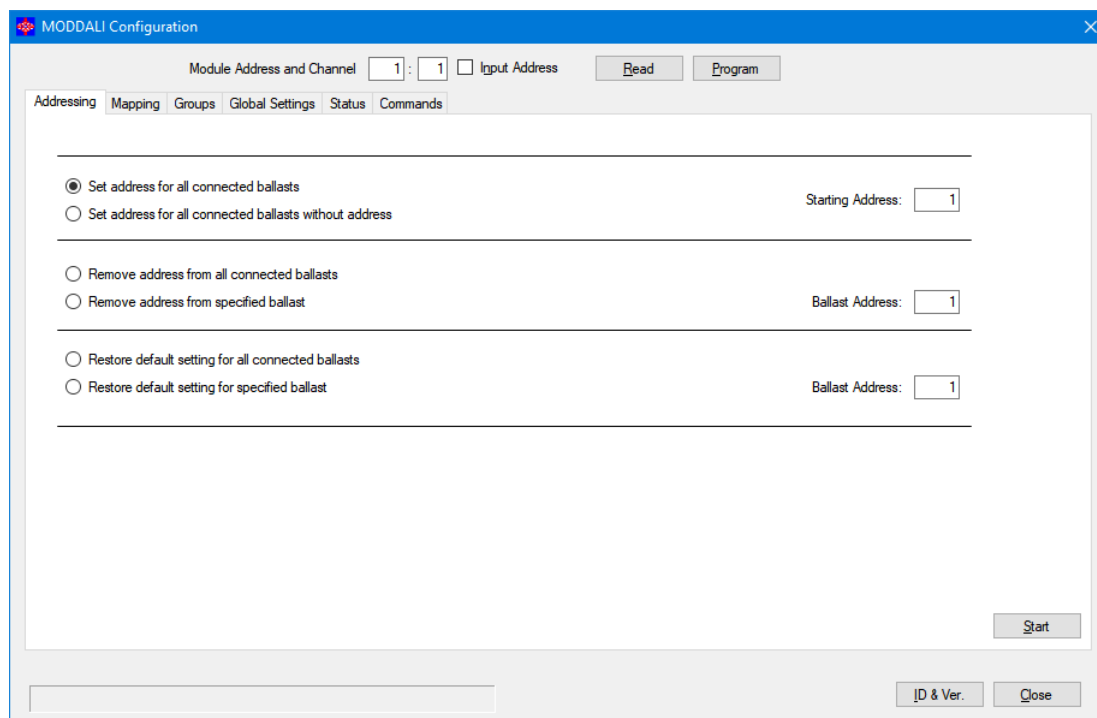
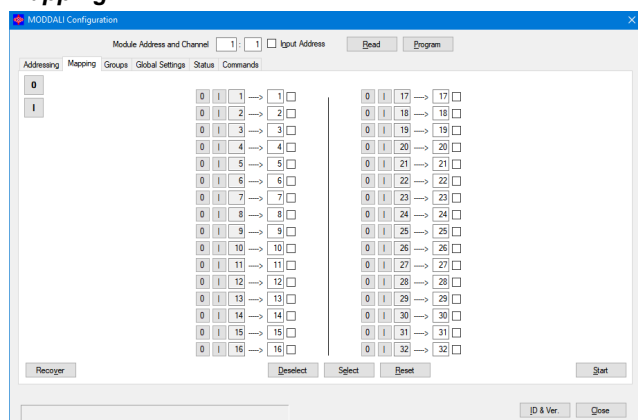


Figure 3: Configuration Panel

These settings can be restored both for all ballasts connected to that line and for a single ballast. Restoring of the settings does not imply the reset of the ballast address. The visible result of the factory setting restoring is the switching on of the lamps at the bus failure default level, typically at 100%.

Mapping



Once the ballasts have been random addressed, it can be useful to reorder the assigned addresses in order to simplify the supervision and the management of the installed ballasts.

Each ballast can be managed in order to change it previously assigned address to a new desired value (always in the range 1 to 32).

For each address, the program shows a line similar to the following one: 0 1 1 -----> 23

The button 0 allows to switch off the ballast with the address specified in the gray text box (1 in this example) while the button 1 allows the switching on; this function is useful to see where the ballast addressed as 1 (in this example) is physically located. In the white text box the new desired address must be entered (23 in this example) for the ballast whose current address is 1.

The execution of the mapping procedure (pressing the button Start) will take place only for the ballasts selected by the related checkbox. A timer icon will inform that the operation is running. At the end of the procedure, the normal mouse icon will be restored. The time required by the mapping procedure is about 1sec per ballast.

If the procedure has not been successfully executed, a warning message will be shown; in this case follows these steps:

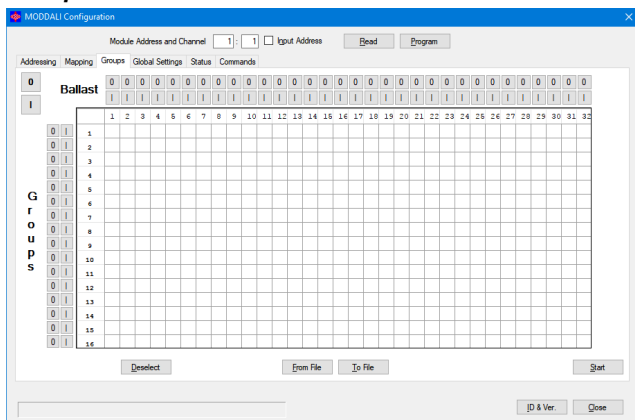
- click on the button "Recover" to remove the address of each ballast for which the mapping procedure has not been successfully completed
- address again the ballasts without address selecting as starting address a free value followed by a sufficient number of free addresses (see the Status TAB)
- execute again the mapping procedure

The correctness of the changes made can be checked by switching on and off the ballasts using the buttons identified as 0 (off) and 1 (on).

The two big buttons 0 and 1 on the left side allow to switch off and to switch on all the ballasts connected to that line.

The buttons Select (select all) and Deselect (deselect all) and Reset (restore the address value in the consecutive order) complete this tab.

Groups



This tab features a grid where each ballast, on the selected line, can be assigned to one or more groups. This choice can be done by clicking on each cell located at the intersection between the desired ballast (the columns) and the desired group (the rows). A X symbol will be shown in the related cell.

In the example of the figure on this side, the group 1 contains the ballasts 1-2-5, the group 2 the ballasts 1-3 and the group 3 the ballasts 2-4-5.

	Ballast	1	2	3	4	5
0	0	0	0	0	0	0
1	1	1	1	1	1	1
0	0	1	X	X		X
0	0	1	X		X	
0	0	1		X		X
0	0	1			X	X

The button Deselect remove all the X symbols on the grid. The execution of the assignment of the groups (clicking on the button Start) will take in account only the ballast deselected by the X symbol. A timer icon will inform that the operation is running. At the end of the procedure, the normal mouse icon will be restored.

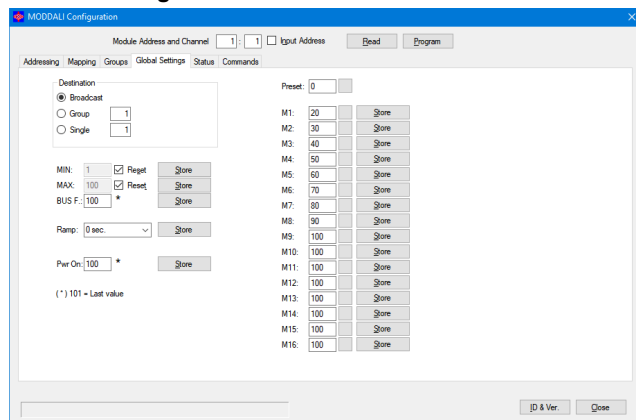
The time required by this procedure is about:
 $T = 8\text{sec} + (0,5\text{sec} \times \text{"nr. of X in the window"})$

If the procedure has not been successfully executed, a warning message will be shown; in this case the procedure has to be repeated.

The correctness of the changes made can be checked by switching on and off the ballasts using the buttons identified as 0 (off) and 1 (on); the buttons on the top side act on the single ballast, the buttons on the left side act on the groups and the two big buttons 0 and 1 switch off and on all the ballast on that line.

The buttons From File and To File allow to store and recall the settings of the groups; take in account that it is not possible to read, from ModDALI module, the current settings of the groups, therefore it is strongly recommended to save them into a file for future modifications.

Global Settings

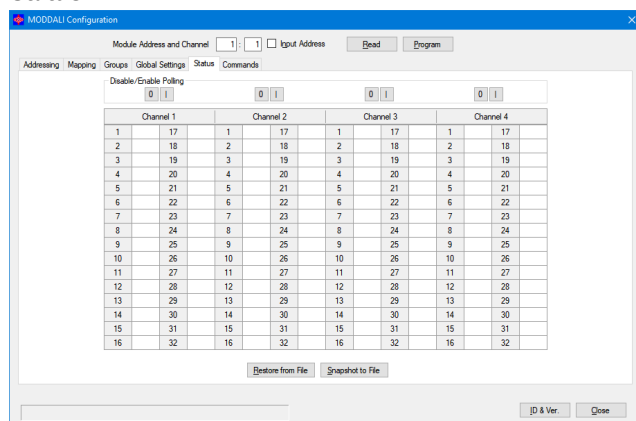


In this tab it is possible to set, for all ballasts on the selected line, the following parameters:

- MIN:** minimum brightness value (0-100%); enabling the Reset check box, the default value will be restored (1%).
- MAX:** maximum brightness value (0-100%); enabling the Reset check box, the default value will be restored (100%).
- BUS F.:** the brightness value (0-100%) to be recalled by ballasts during bus failure conditions on **CONTATTO** and/or DALI bus; the value 101 means that the outputs will keep the last value .
- Ramp:** the ramp value in seconds.
- Pwr On:** the brightness value (0-100%) to be recalled by ballasts at their power up; the value 101 means that the value outputted before the power off will be recalled.
- Preset:** writing a value (0 to 100) and clicking on the button on the right side, the brightness will be forced to that value.
- M1 ÷ M16:** the value to be loaded into the 16 presets; the button on the right side allows to recall the related preset stored into the ballast.

Enter in this tab the desired parameters and then click on Start to send the configuration. A timer icon will inform that the operation is running. The time required by this procedure is about 15 seconds. If the procedure has not been successfully executed, a warning message will be shown; in this case the procedure has to be repeated.

Status



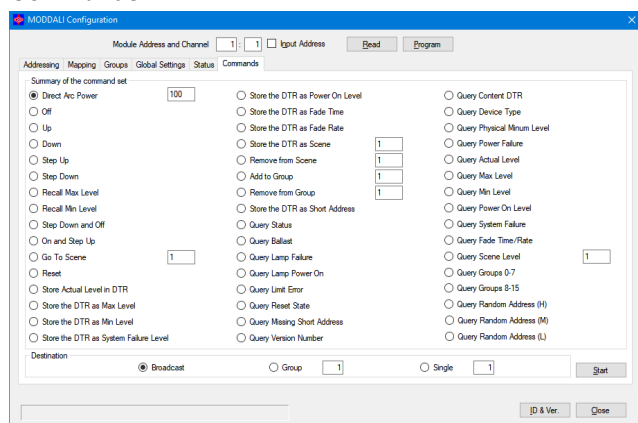
This tab provides, if the ballasts have been addressed, shows the current brightness level of each ballast on all the 4 channels. These values are in the range 1 to 100; when a ballast does not answer to the polling, the reported value will be 255 (and the table will show "-"). If a lamp failure occurs, a X symbol on a pink background will be shown.

In addition it is possible to force the brightness entering the value in the cell related to the desired device.

4 pairs of buttons in the top side of the table allow to enable and disable the polling independently for each channel of the module. When the polling is disabled, the related label of the channel will be shown over a red background.

The buttons "Snapshot to File" and "Restore from File" allow respectively to save and recall a given configuration of brightness levels; in this way it is possible to save on the PC one or more scenery (each scenery will be a file).

Commands

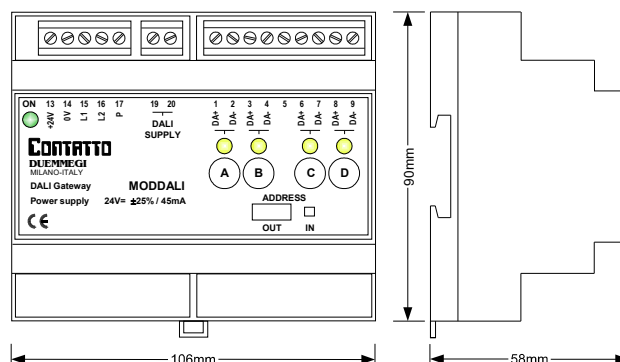


This tab provides a several commands belonging to DALI protocol; this section is addressed to highly qualified staff, so it is recommended not to use it if you are not aware of what you are doing.

Technical characteristics

Supply voltage CONTATTO bus side	24V $\pm 25\%$
Supply voltage DALI bus side	12V \sim -5% ÷ +35% (at full load) or 15V ÷ 24V \pm <i>Note: voltage over 24V \pm could damage the connected DALI devices</i>
MAX current consumption CONTATTO bus side	45mA
MAX current consumption DALI bus side	1A at 18V \pm , 10VA a 12V \sim
Number of DALI lines	Standard version: 4 Special version: 2
Number of DALI devices for each line	Standard version: 32 MAX Special version: 64 MAX
Operating temperature	-10 ÷ +50 °C
Storage temperature	-30 ÷ +85 °C
Protection degree	IP20

Outline dimensions



Correct disposal of the 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 documentation indicates that the product and its electronic accessories 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. Business users should contact their supplier and check the terms and conditions of the purchase contract. Adequate disposal of the decommissioned equipment for recycling, treatment and environmentally compatible disposal contributes in preventing potentially negative effects on the environment and health and promotes the reuse and/or recycling of equipment materials. Abusive product disposal by the user is punishable by law with administrative sanctions.

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 **CONTATTO** 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.

Setting up

The physical address must be assigned with the specific programmer and the setting of parameters (if any) must be performed by the specific configuration softwares; for more details refer to the specific data sheet of the product. For the first installation of the device, generally and unless otherwise specified on the specific data sheet of the product, 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

The devices belonging to **CONTATTO** line comply with the essential requirements of the following directives:

2014/30/UE (EMC)

2014/35/UE (Low Voltage)

2011/65/UE (RoHS)

Note

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