MOD4DV: quad 0-10V output module for generic applications or for external dimmers control

MOD4DV module allows controlling, through the Contatto bus, 4 external power dimmers by 0-10V analog signal. The module can also be set for operation as quad 0-10V output analog module for general purpose applications.

MOD4DV module, in dimmer mode, may be controlled by one or more pushbuttons connected to the Contatto bus. It is possible to control the module both by two pushbuttons (Up/Down) and by a single pushbutton (single command) as here bottom described.

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, while if lamp is OFF it causes the switching ON at last brightness level or at a fixed programmable value.

The one-touch function can be disabled: in this case, it is possible to install some buttons allowing the regulation of the brightness level among the minimum and maximum value.

MOD4DV module performs 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
- Up/Down and Single commands may be defined, with and without one-touch function
- two ramps for each channel, in the range 1 to 60 seconds
- minimum and maximum level output can be set as required for each channel
- dynamic lights scenes can be easily implemented
- the current brightness level may be stored and recalled by the user; each output channel allows up to 9 presets which will be stored in the non-volatile memory of the module, allowing to create "real time" lighting scenes
- the output level may be controlled by a supervisor, simply writing the desired value to the module outputs
- the supervisor may read the current output level of each channel
- if a bus failure occurs, the output level will be automatically set to a user-defined level
- the module can be set as 4 general purpose 0-10V (8-bit resolution) analog output

The module provides a removable terminal blocks for the connection to Contatto bus and a fixed terminal blocks for the analog signal outputs.

Four red LEDs on the front panel light when the voltage value on the related output is not zero; a green LED reports the power-on condition.

Module setting

MOD4DV module takes 4 consecutive output addresses (one for each dimmer channel) and from 0 to 4 input addresses. A 6-pole dip-switch is located under the front panel allowing to set the module operation according to the application as resumed in the following tables:

	OFF	ON
SW1	channel 1 takes an output address only	channel 1 takes an output and an input address
SW2	channel 2 takes an output address only	channel 2 takes an output and an input address
SW3	channel 3 takes an output address only	channel 3 takes an output and an input address
SW4	channel 4 takes an output address only	channel 4 takes an output and an input address
SW5	the enabled input addresses report the current level of the related output *(Note 1)*	the enabled input addresses report the ON/OFF status of the 4 outputs *(Note 2)*
SW6	the module is set for 4 external dimmers control	the module is set as 4 general purpose 0-10V analog output (8-bit)

Note 1: the value reported by the enabled input addresses is in the range 0-100 if the module is set for dimmer mode, or it is in the range 0-255 if the module is set fo general purpose analog outputs (see SW6)

Note 2: points from 1 to 4 of each enabled input address are the "digital" status of the related output; each point will be ON if the level on the related output is not zero. Each enabled address reports, in this case, the same information

Setting examples

Following examples show some possible settings of MOD4DV module. Last two columns in the following tables show the amount of output and input addresses required for that setting.

Note that if all input addresses are enabled to report the "digital" status of the outputs, then a redundant information will be achieved, because the data at the input addresses will be the same.

In this case it is suggested to enabled an input address only. It is not possible to get information about the digital status of the outputs and the current brightness level at the same time.

- 4 dimmer outputs

SW1	SW2	SW3	SW4	SW5	SW6	OUT	IN
OFF	OFF	OFF	OFF	OFF	OFF	4	0

The module is set for dimmer operation; the input addresses are disabled, therefore the module takes 4 consecutive output addresses only.

- 4 dimmer outputs and 2 analog inputs

SW1	SW2	SW3	SW4	SW5	SW6	OUT	IN
ON	OFF	**ON**	OFF	OFF	OFF	4	2

The module is set for dimmer operation; channel 1 and 3 have an input address too, reporting the current output level of the related output as percentage value 0-100%.

- 4 dimmer outputs and 4 analog inputs

SW1	SW2	SW3	SW4	SW5	SW6	OUT	IN
ON	**ON**	**ON**	**ON**	OFF	OFF	4	4

The module is set for dimmer operation; all channels have an input address too, reporting the current output level of the related output as percentage value 0-100%.

- 4 dimmer outputs and 4 digital inputs

SW1	SW2	SW3	SW4	SW5	SW6	OUT	IN
ON	OFF	OFF	OFF	**ON**	OFF	4	1

The module is set for dimmer operation; channel 1 has an input address too, reporting the current "digital" status of the 4 outputs; point 1 of the input address is the status of the output 1, point 2 is the status of output 2 and so on.

Each input point is activated when the level on the related output is not zero.

- 4 general purpose 0-10V outputs

SW1	SW2	SW3	SW4	SW5	SW6	OUT	IN
OFF	OFF	OFF	OFF	OFF	**ON**	4	0

The module is set as 4 general purpose 0-10V outputs (8-bit resolution). The value 0 is related to 0V output voltage and the value 255 is related to 10V output voltage.

- 4 general purpose 0-10V outputs and 4 analog inputs

| SW1	SW2	SW3	SW4	SW5	SW6	OUT	IN
ON	**ON**	**ON**	**ON**	OFF	**ON**	4	4

The module is set as 4 general purpose 0-10V outputs (8-bit resolution). All channels have an input address too reporting the current level on the related output as value in the range 0-255.

Note: for any setting, a user-defined level will be forced to the outputs when a bus failure occurs (see in the next sections).

Address programming

Assigning, by FXPRO programmer, a base address `n`, the module will automatically take the addresses `On`, `On+1`, `On+2`, `On+3` and, depending on SW1÷SW4 settings, `In`, `In+1`, `In+2`, `In+3`. A white label on the front panel allow writing the assigned base address for an easy visual identification.

Wiring diagram
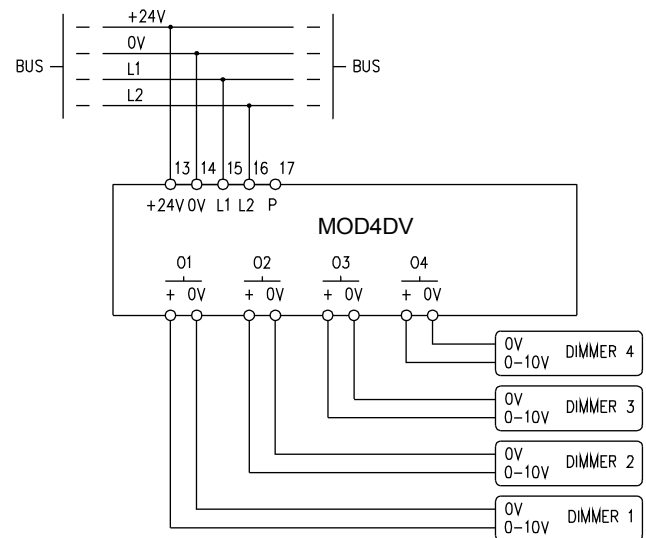
Installation hints

To set the dip-switch, disconnect the power supply and re-move the front panel; to do this, lift it delicately using a small screwdriver inserted into the slit on the middle of each short side of the panel.

The dip-switch is placed on the printed circuit board and each pole is numbered, left to right, from 1 to 6, with ON position toward the top side. To avoid damages due to electrostatic discharges, it is strongly recommended to not touch any other component on the circuit. After the dip-switch setting according to the application, put back the front panel inserting one of its two short sides at first, and then pushing the other side toward the module, levering on the slit on the same side by the screwdriver.

Reading the input section from the bus

At the input address of each channel it is possible to read the digital status or the current output level. To enable the address input of a channel switch ON the related dip-switch (SW1..SW4). Setting the module for reporting the digital status of the outputs (SW5 ON), MOD4DV module will provide the following information:

In.1	Status of output 1	In.5	Not used
In.2	Status of output 2	In.6	Not used
In.3	Status of output 3	In.7	Not used
In.4	Status of output 4	In.8	Not used

Note: if all input addresses were enabled for reading the digital status, the information reported on the 4 addresses is the same; in this case only one input address may be enabled.

Setting the module for reporting the output level (SW5 OFF), then MOD4DV module will provide on the bus a value in the range 0 e 100 (the percentage of the output level) or a value in the range 0..255 (8-bit) depending on the dimmer or general purpose setting of the module.

Operation from the bus in dimmer mode

Warning: the command listed in this paragraph, unless otherwise noted, can be applied exclusively when the module is set for dimmer operation.

Since MOD4DV module has 4 identical channels, the following description will be referred to only one channel.

The following codes refer to MOD4DV version >= F23.

Considering a dimmer channel which output address is **n**, the executed function depends on the value of the data byte written to output address **On** as here bottom listed:

Data written to On	Function
0÷100	Set the brightness to 0÷100% according to current ramp
101÷109	Save the current brightness to Preset 1÷9
110	Save the current ramp as default primary ramp
111÷119	Recall the brightness from Preset 1÷9 according to current ramp
120	Save the current ramp as secondary ramp
123	Recall Preset 8 but only if, at the arriving of this code, the output was completely OFF. When a different code arrives, but only if this code have an effect on the output (exactly codes 1÷100, 111÷119, 125÷127, 129, 130÷134), the command associated to this new code will be executed. If code 255 arrives from the bus and the previous received code was 123 (and in this case only), then the output will be switched OFF (but without the storing of the last level). The ramp used by this code is the secondary ramp
124	As for code 123, but recalling Preset 9
125	Up command without one-touch function
126	Down comm. without one-touch function
127	Single comm. without one-touch function
128	No operation
129	Up command with one-touch function
130	Down command with one-touch function
131	Single command with one-touch function
132	Switch ON to MAX according to secondary ramp
133	Set the brightness to 0 according to secondary ramp and store last value
134	Set the brightness to last level value according to secondary ramp
135	Set the current brightness as MIN value
136	Set the current brightness as MAX value
137	Reset MIN level to default (1%)
138	Reset MAX level to default (100%)
139	Save the current brightness as level to be loaded during bus failure condition
140 ÷ 170	Set the current ramp to 0 ÷ 30 seconds (1 second steps)
171 ÷ 173	Set the current ramp to 40 ÷ 60 seconds (10 seconds steps)
174	Set the current brightness as value to be recalled from one-touch function; if 0 the one-touch recalls the last value
255	See codes 123 and 124

Two ramps are available for changing from a brightness value to another: these are called current ramp (or primary) and secondary ramp.

The current ramp must be set by the codes 140 ÷ 173; the code 110 allows to save the current value as default primary ramp and the code 120 allows to save the current value as secondary ramp. These values are stored in a non-volatile memory, avoiding the loss when a power supply failure occurs.

When powering-up the module, the default value of the primary ramp become the current value; this value concerns all the brightness changes with the exception of switching ON and OFF by codes 132, 133 and 134 (for these codes the value of the secondary ramp will be used).

The using of two distinct ramps allows, for example, the possibility to control the outputs according to a (current) slow ramp to create light scenes, dynamic lights and automatic light controls and to have quick switching ON and OFF commands according to the (secondary) fast ramp.

The code 139 saves in the non-volatile memory of the module the current brightness value that will be automatically recalled when a bus failure occurs (or generally during an interruption of the communication between the dimmer module and MCP controller); this function (but not its setting) will be still activated even if the module is set as 4 general purpose 0-10V outputs.

Notes:

- the switching ON and OFF by one-touch function is made according to the current ramp
- the ramp used for the brightness control by Up, Down and Single command pushbuttons is fixed and cannot be modified

To send commands and values from MCP to the dimmer channel, use the counter registers as in these examples:

MCP MOD or MCP Plus:
```
V1 = !(I1.1 | I1.2 | I1.3)
V100 = C0=1 P[129]I1.1 & P[130]I1.2 & \
       P[50]I1.3 & P[128]V1 & O1
```

where **I1.1** and **I1.2** are Up and Down inputs and **O1** is the output section of channel 1; button connected to **I1.3** will cause the setting of brightness to 50%. At releasing of each pushbutton, the counter will be always set to 128 (no operation condition). The value of the counter, for each variation, will be transferred to the dimmer output (**O1**). To drive simultaneously more channels or modules, add other "**& Ox**" terms to the equation in above example.

MCP XT:
```
V1 = !(I1.1 | I1.2 | I1.3)
AO1:1 = P(129)I1.1 & P(130)I1.2 & \
        P(50)I1.3 & P(128)V1
```

where the meaning of the terms is similar to that described in the previous example.

Settings of the operating parameters

Warning: the settings listed in this paragraph, unless otherwise noted, can be applied exclusively when the module is set for dimmer operation.

MCPTools (rel. 4.0.5 or higher) and MCP Visio (rel. 2.1.5 or higher) allow to set the operating parameters of each dimmer channel during the installation setup.

From the main menu of MCPTools select *Supervision* and then *Show Maps*. Select then, from the MAP menu, *Configuration* (or *Configuration* from the main menu of MCP Visio) and then *MOD2DM/MOD2DV/MOD4DV*; the following window will appear.
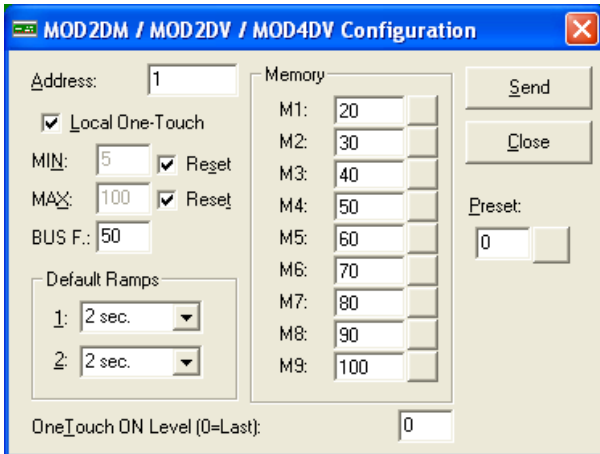
The required parameters in this window are:

- Address: output address of the dimmer channel to be set

- Local One-Touch: not used for MOD4DV

- MIN: minimum brightness level; select Reset checkbox to restore the default value (1%)

- MAX: maximum brightness level; select Reset checkbox to restore the default value (100%)

- BUS F.: the brightness level (%) to be loaded to the output when a bus failure occurs. *This value can be set in dimmer mode only but the function will be still activated even if the module is set as 4 general purpose 0-10V outputs*

- Default Ramps: the value of the primary and secondary ramps. *This values can be set in dimmer mode only but the function will be still activated even if the module is set as 4 general purpose 0-10V outputs (in this case the output level variation will follow the primary ramp)*

- Memory: the values to be loaded to the 9 Presets; the pushbutton on the right side of each value allows to recall the related Preset currently stored in the module

- Preset: writing a value in the range 0 to 100 and clicking on the button on the right side, the brightness level will be forced to that value

- One Touch ON level: this value is the ON level loaded by a one touch command (0 means last value)

Fill out this windows with the wanted values and then click on the *Send* button to transfer the shown configuration to the dimmer channel.

Factory setting

MOD4DV module is factory set for dimmer operation and with all input addresses disabled. The factory assigned base address is 1. The factory setting of the dip-switches is then the following:

SW1	SW2	SW3	SW4	SW5	SW6
OFF	OFF	OFF	OFF	OFF	OFF

The factory setting of the other parameters is the following:

Parameter	Factory setting
MIN	1%
MAX	100%
Primary ramp	2 seconds
Secondary ramp	2 seconds
9 Preset	20÷100%, step10%
Switch on value from one-touch	Last value
Brightness level in bus failure condition	0%

Technical characteristics

Supply voltage	24V $=$ ± 25% SELV
MAX current consumption (@ 24V)	45mA
Output (each channel)	0-10V / 10mA
Resolution for 4 general purpose 0-10V outputs	8 bits (255 steps)
Error on the 0-10V output	• 0.5% of f.s. on 10Kohm load • 3% of f.s. on 2Kohm load
Operating temperature	-10 ÷ +50 °C
Storage temperature	-30 ÷ +85 °C
Protection degree	IP20

Outline dimensions