Mod4TP/I: Module for controlling 4 roller shutters or blinds with detection of travel time and 8 digital inputs

Mod4TP/I module controls 4 independent 230Vac motors with double winding for moving blinds, roller shutters and similar devices through the **Contatto** bus. The travel times from the fully open to fully closed position and vice versa are measured and stored automatically by detecting the interruption of the current flow in the motors when the limits are reached.

The measurement of the travel time allows extended features of precise positioning of the roller shutter to any intermediate value between 0 and 100% of the totally closed position.

The output contacts for each motor feature an electromechanic interlock in order to avoid damages to the motors themselves and to the module.

Mod4TP/I module also provides 8 generic digital inputs for connection of potential-free contacts (buttons, switches or other).

Main features of Mod4TP/I module are:

- 8 power contacts for controlling 4 roller shutters or blinds
- 8 digital generic inputs of **Contatto** system
- automatic measurement of the travel time for each motor
- functions for full opening and closing and positioning to any intermediate percentage value 0-100%
- adjustment of the slats in the case of Venetian blinds

The module features removable terminal blocks for an easy installation and maintenance. A 5-way terminal block is dedicated to **Contatto** bus connection, a 9-way terminal block for connection of 8 inputs and 4 3-way terminal blocks to connect the motors. A green LED next to the bus terminal block reports the power on condition.

Mod4TP/I module is housed in a reduced height 6M modular box for DIN rail mounting.

Mod4TP/I module allows a high degree of configuration so that it can be adapted to several operating conditions; the configuration parameters will be detailed in the following paragraphs.
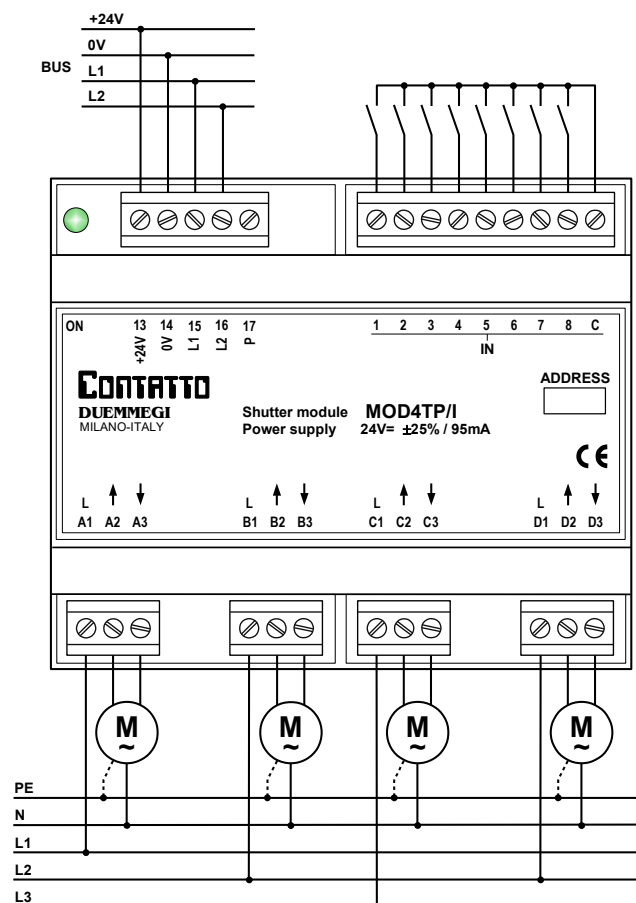
Address programming

Mod4TP/I module takes, inside the **Contatto** bus, 1 input and 1 output address, each one made by 4 16-bit channels. Assigning, with the FXPRO programmer, a base address **n**, the module is configured as **In** and **On**.
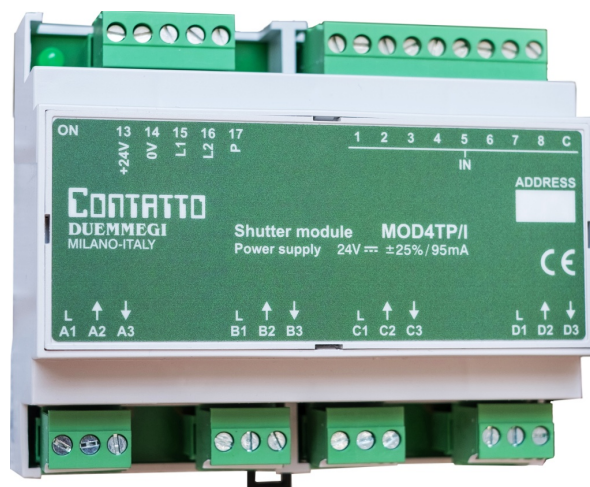
Wiring diagram

The following figure shows the wiring diagram for Mod4TP/I module.

The wiring of the motors to different phases is allowed.

Information form and to Mod4TP

Mod4TP/I module, as said above, takes an input and an output address, 4-channel 16-bit; the following tables list the information mapped on these addresses:

Input section:

Point	IN			
	CH1	**CH2**	**CH3**	**CH4**
1	Shutter/Slats position 1	Shutter/Slats position 2	Shutter/Slats position 3	Shutter/Slats position 4
2				
3				
4				
5				
6				
7				
8				
9	IN1	IN3	IN5	IN7
10	IN2	IN4	IN6	IN8
11	-	-	-	-
12	-	-	-	-
13	MOT1 Up	MOT2 Up	MOT3 Up	MOT4 Up
14	MOT1 Dw	MOT2 Dw	MOT3 Dw	MOT4 Dw
15	MOT1 ON	MOT2 ON	MOT3 ON	MOT4 ON
16	CAL. 1	CAL. 2	CAL. 3	CAL. 4

Shutter/Slats position n: the 8 least significant bits of each channel report, as a number between 0 and 100, the position of the roller shutter or the position of the slats position depending on the last selection made by the command 0x20 (see output section that follows). The position 0 is fully open, 100 is fully closed.

IN1..IN8: the points 9 and 10 of each channel report the status of the related input 1..8 of the module.

MOTn Up, MOTn Dw: points 13 and 14 of each channel will be activated when the related motor is running in for opening or closing respectively; these points allow to report the motors status.

MOTn ON: point 15 of each channel will be activated when the related motor is running; this point allows to show if a motor is currently driven or not (in practice it is the logic sum of point 13 and 14 described before).

CAL. n: point 16 of each channel will be activated when the calibration of the related shutter is running (detection of the travel time).

Output section:

Point	OUT			
	CH1	**CH2**	**CH3**	**CH4**
1	Value 1	Value 2	Value 3	Value 4
2				
3				
4				
5				
6				
7				
8				
9	Command 1	Command 2	Command 3	Command 4
10				
11				
12				
13				
14				
15				
16				

The 4 output channels allow to send several commands and settings to the module.

The executed function depends on the Command code and on the Value as described in the following table (in hexadecimal format).

Com.	Val.	Function
0x00	0x00	NOP (no operation)
	0x01	Open
	0x02	Close
	0x04	Open after a programmed delay
	0x08	Close after a programmed delay
	0x10	Stop
	0x11	Open for 1 step time
	0x12	Close for 1 step time
0x01	P	Move shutter to position P (0..00%)
0x02	P	Move slats to position P (0..100%)
0x11	T	Set opening/closing delay to T (0-255s) (1)
0x12	T	Set opening/closing timeout to T (0-255s) (1)
0x13	T	Set opening time to T (0.00-240.00s) (2)
0x14	T	Set closing time to T (0.00-240.00s) (2)
0x15	N	Set number of step N (0-255) for slats (3)
0x16	T	Set step time T for slats (0.00-2.55s) (3)
0x17	T	Set pause time (0.0-25.5s) (4)
0x18	N	Slats dead time at 0% in step number (0-255) (5)
0x19	N	Slats dead time at 100% in step num. (0-255) (5)
0x20	0x00	Disable automatic function (6)
	0x01	Enable automatic function (6)
	0x02	Set short push for automatic (7)
	0x03	Set long push for automatic (7)
	0x04	Report shutter position on input CH (8)
	0x05	Report slats position on input CH (8)
	0x06	Set shutter mode (no slats) (9)
	0x07	Set blind mode (with slats) (9)
0xAA	0x55	Execute calibration (10)

The commands for parameter settings (Com. 0x11 to 0x20) are useful for a supervisor; normally, the module has to be set using the related configuration panel in MCP Ide program (see the related paragraph).

(1): steps of 1s; when sending to module a command 0x0004 or 0x0008, the start of the motor will be delayed by this value

(2): steps of 0.01s; T must be the desired time in s multiplied by 100 and it is the time which the shutter takes to go from one extreme to another. Normally these times are measured by the module itself; they may be entered manually in cases where the motor of the shutter does not allow the detection of the travel time.

(3): slats adjustment takes place by driving the motor for a fairly short time (step): the lower this time and the better the resolution in the positioning. Once the time step has been set, the motor must be repeatedly driven, starting from completely closed slats, and counting how many steps are needed to fully open the slats. The following paragraphs will give more information on setting these parameters. The step time can be set in steps of 0.01s, therefore the T parameter in the table must be the desired time in s multiplied by 100.

(4): steps of 0.1s; T must be the desired time multiplied by 10. This is the pause time before a reversal of the motor direction.

(5): these parameters are used to compensate the dead times of the slats mechanism. See the section about configuration for more information.

(6): enables and disables the automatic operation.

(7): the full opening or closing of the shutter can be performed as the result of a short or long push on the related control button. These codes allow to choose the preferred mode; in the case of blinds with slats, always choose "long push for automatic".

(8): each one of the 4 input channels can report the position of the roller shutter or the one of the slats (as a value between 0 and 100). To choose which of the two parameters must be inserted into the input channel, use these codes (0x2004 and 0x2005)

(9): these codes allow you to choose between roller shutter mode (without slats) or blind mode (with slats).

(10): This code begins the process for the detection of the travel times. See the following paragraphs for more information about this subject.

Installation and setting up

The advanced functions of Mod4TP/I module require to set, during startup, the parameters necessary for the proper operation of the shutter.

The configuration is performed via bus using the specific tool in MCP Ide. Select, from MCP Ide menu, Programming, Modules Configuration, MOD4TP; the window in Figure 1 will appear, showing the usual buttons for reading, programming and ID/FW version request of the module which address is equal to that entered into the related field.

The values reported in the configuration panel, for each of each one of the 4 motors, have the following meaning:

Figure 1

T Open: is the time the roller shutter needs to go from the fully closed to the fully opened position; this time is measured by the module itself during the calibration procedure, but it can also be manually entered (eg. if the used motor does not allow the detection of the travel time, or to copy the value from another identical shutter already calibrated)

T Close: is the time the roller shutter needs to go from the fully opened to the fully closed position; this time is measured by the module itself during the calibration procedure, but it can also be manually entered (eg. if the used motor does not allow the detection of the travel time, or to copy the value from another identical shutter already calibrated)

Timeout: maximum time during which the motor is driven (it must be greater, eg. of about ten seconds, than the previous two times); this time too, in case of calibration, is calculated by the module itself

T Step: is the duration of the driving step (pulse) to the motor to move the slats; lower this time and the higher the resolution in the positioning of the slats (min. 0.01s); a typical step T Step = 0.05s is suggested

N Step: is the number of steps required to perform a complete movement of the slats

Delay: when sending commands 0x0004 or 0x0008 to the module, the start of the motor is delayed by this value

Pause: the motor stopping time before reversing the movement; follow the specifications of the manufacturer of the roller shutter

DTSxC: is the dead time, expressed as number of steps of duration T Step each one, needed by the slats, starting from the fully opened position, to begin to rotate

DTSxO: is the dead time, expressed as number of steps of duration T Step each one, needed by the slats, starting from the fully closed position, to begin to rotate

DTSh: is the dead time, in seconds, needed by the shutter to begin to open when starting from the fully closed position

After making sure that the module has been addressed and connected to the motors correctly, follow the following procedures depending on whether it is a roller shutter with slats or not.

Rolling shutter with slats
- enter in the Mod4TP configuration window the module address
- execute a reading of the current parameters (Read); this is necessary in the case some motors have already been set and thus their configuration must not be corrupted
- select, for the desired motor, the options Slats=Yes, Auto=Yes, PressxAuto=Long, Pos.onBus=Shutter
- enter, for the desired motor, T.Step = 0.05s, DTSxO = 0 and DTSxC = 0
- execute a writing (Program) in order to transfer the entered parameters
- move the shutter to a height such that the slats movement can be seen and easily evaluated (use the map in MCP Ide)
- move the shutter until the slats are fully closed (usually by sending a Close command)

- perform a series of opening steps and count the number of steps required to actually start the movement of the slats; this number of steps is the parameter DTSx O (mechanical dead time as number of steps starting from slats closed). Enter this value in the related text box of configuration panel
- move the shutter until the slats are fully open (usually by sending an Open command)
- perform a series of closing steps and count the number of steps required to actually start the movement of the slats; this number of steps is the parameter DTSx C (mechanical dead time as number of steps starting from slats opened). Enter this value in the related text box of configuration panel
- execute a writing of the module (Program) in order to transfer the two newly entered values
- move again the shutter until the slats are fully closed (usually by sending a Close command)
- perform one opening step: the motor should be driven for the time necessary to recover the mechanical dead time
- perform a series of opening steps and count the number of steps required to move the slats in the completely opened position; This number of steps is the parameter N.Step (number of steps required to perform a complete movement of the slats). Enter this value in the related text box of configuration panel
- execute a writing of the module (Program) in order to transfer the parameter just entered
- at this point it is possible to perform an automatic calibration, that is the measurement of the opening and closing times; to do this, press the button Calib. related to the desired motor in the configuration window, then wait for the completion of the operation (for details on the calibration procedure see the related paragraph)
- at the end of calibration, perform a reading (Read); the 3 parameters T Open, T Close. and Timeout in the configuration window should contain the measured values for that shutter
- complete the parameter setting by entering the desired values for Delay and Pause (for the latter parameter the value 0.5s generally goes well)

Rolling shutter without slats
- enter in the Mod4TP configuration window the module address
- execute a reading of the current parameters (Read); this is necessary in the case some motors have already been set and thus their configuration must not be corrupted
- select, for the desired motor, the options Slats=No, Auto=Yes, PressxAuto=Short, Pos.onBus=Shutter
- execute a writing (Program) in order to transfer the entered parameters
- perform an automatic calibration, that is the measurement of the opening and closing times; to do this, press the button Calib. related to the desired motor in the configuration window, then wait for the completion of the operation (for details on the calibration procedure see the related paragraph)

- at the end of calibration, perform a reading (Read); the 3 parameters T Open, T Close. and Timeout in the configuration window should contain the measured values for that shutter
- complete the parameter setting by entering the desired values for Delay and Pause (for the latter parameter the value 0.5s generally goes well)

Calibration

To move the roller shutter or the venetian blind to a desired position, the module drives the motor for a well defined time; this technique requires accurate measurement of travel times from fully open to fully closed position and vice versa. These two times are measured by the module itself during the calibration procedure that consists in the following steps:

- full opening of the shutter (until upper limit stop end)
- fully closing (until lower limit end) and measuring the time needed to go from one extreme to the other one
- storage of the closing time
- complete opening (until upper limit end) and measuring the time needed to go from one extreme to the other one
- storage of the opening time

MCP XT and MCP 4 programming

Like for any **Contatto** module, each Mod4TP/I module installed in the plant must be declared in the MCP program. Therefore, in the MCP Ide Configuration tab, a directive similar to the following one must be entered for each Mod-4TP/I module:

```
MOD4TP = ( Ix, Ox )
```

where **x** is the address assigned to the module.

To send commands to a channel of Mod4TP/I module from bus input points (real or virtual), an equation similar to the following one must be used:

```
AO1:1 = P(0x0001)I14.1 & P(0x0000)!I14.1 & \
        P(0x0002)I14.2 & P(0x0000)!I14.2 & \
        P(0x0132)I14.3 & P(0x014B)I14.4
```

where **I14.1** and **I14.2** are Open and Close commands (see the table listing the bus commands).

The two terms **!I14.1** and **!I14.2** cause the sending of the NOP code (no operation) at the releasing of the related pushbuttons; these terms are very important because they allow to the module to measure the pushing time of the button and in order to decide to perform a manual or automatic movement. The information about the releasing is needed only for the commands Open and Close, Open and close after delay and Open and Close for a step.

If two or more roller shutters have been driven in the same way, it is possible to load the related commands in a register and then copy the register to the desired shutter channels as follows:

```
R0 = P(0x0001)I14.1 & P(0x0000)!I14.1 & \
     P(0x0002)I14.2 & P(0x0000)!I14.2 & \
     P(0x0132)I14.3 & P(0x014B)I14.4
```

```
AO1:1 = R0
AO1:2 = R0
AO1:3 = R0
AO1:4 = R0
```

A supervisor can send commands to the shutter channels by writing the command code and value directly to the outputs, or, in the case of the example showing the use of the register, by writing directly to the register itself.

Mapping

MCP Visio allows to show Mod4TP/I module as in Figure 2.

As for all other **Contatto** modules, the background is in green color if the module is connected and properly working, otherwise the background is in red color. The status of digital input points is shown on the map in red or green color depending on the status ON or OFF respectively. The 4 white text boxes under digital input points report the current position of the 4 shutters.
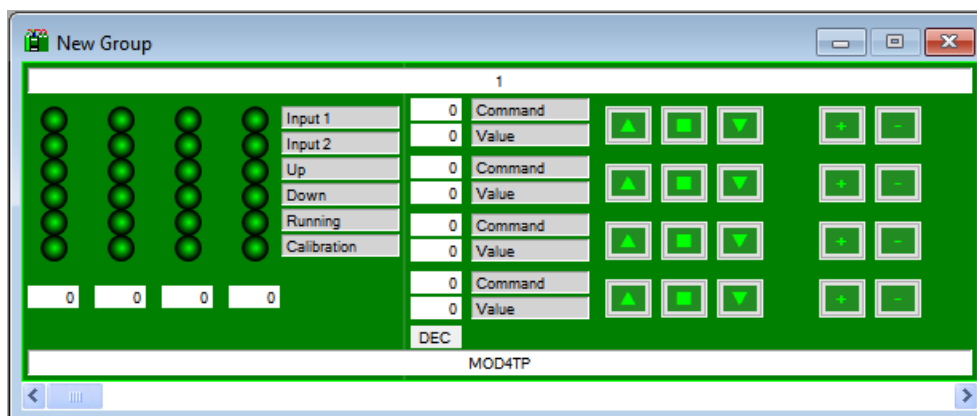

Figure 2

The 4 pairs of Command/Value text boxes allow to send commands/values to the 4 channels (such as listed in the the related table).

The four groups of three buttons send Open, Stop and Close commands respectively (with the related handling of the long/short pressure). The 4 pairs of buttons + and -, finally, allow to control the slats executing one step for each press of the related button.

Technical characteristics

Supply voltage	24V ⎓ ± 25% SELV
MAX current consumption	95mA @ 24V ⎓
Relays contact: Rating for res. load 1-phase motor MAX peak current	5A @ 250V~ 2.4A @ 250V~ (550VA 0,75HP) 150A (20ms)
Min motor current for travel time detection	> 100mA
Number of digital inputs	8 for potential free contacts
Nominal input voltage on digital inputs	24V ⎓
Current for each digital input	4mA @ 24V ⎓
Operating temperature	-10 ÷ +50 °C
Storage temperature	-30 ÷ +85 °C
Protection degree	IP20

Outline dimensions
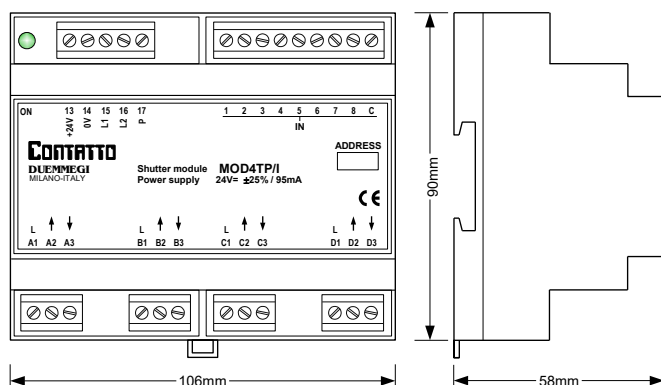
Installation and use restrictions
Standards and regulations

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)

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.

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