## ModLC / ModLC-P: SMART module for ambient light regulation with integrated brightness and occupancy (-P type) sensors and 2 generic inputs

ModLC module allows to transmit, over the CONTATTO bus, the ambient brightness value detected by the sensor integrated inside the module itself. This module provides a PID algorithm for the automatic regulation of the ambient brightness and some SMART modes, thus allowing to considerably simplify the programming of the MCP controller when realizing these kinds of applications. ModLC-P version also features a built-in occupancy sensor.

ModLC module provides two generic digital inputs (ON/OFF with NO/NC setting) for connecting the local command pushbuttons; one of these inputs can be set for connecting one or more occupancy sensors (for instance the DUEMMEGI module code SRP) that, for -P version, will operate in parallel to the internal sensor.

ModLC module can thus be well applied in the brightness regulation of offices, stores and open spaces, allowing to develop applications complying with the new European norms about the energetic classification of the plants (European Norm EN 15232).
ModLC module is suitable for false ceiling mounting; the sensor detect the light reflected by the surface under it (for instance the floor or a desk). The special integrated sensor has the same spectral sensitivity of the human eye.

The module features a 5-way removable terminal block for the connection to the CONTATTO bus and a 3-way removable terminal block for the connection to external contacts or additional occupancy sensors. A blue LED (ModLC-P only) reports the movement detection.
ModLC module, for its operations, can work only in systems equipped with MCP XT or MCP 4. The housing is plastic material with IP20 protection degree.

***Note: this technical sheet applies to ModLC or ModLC-P equipped with FW 3.3 or higher.***

## Address programming

ModLC module takes one input address and, if enabled, one output address with the same value; the address has to be assigned by FXPRO programmer. The label on the the module has a space to write the assigned address.

## Wiring diagram

Figure 1 shows the connections to be made from ModLC to CONTATTO bus and to the external contacts.

The input 2 can be set for connecting one or more occupancy sensors that, for -P version, will operate in parallel with the built-in sensor; the contacts of these sensors, which must be free of potential, must be connected between the terminals 1 and 3.


When using one DUEMMEGI SRP occupancy sensor, refer to the schematic in Figure 2.

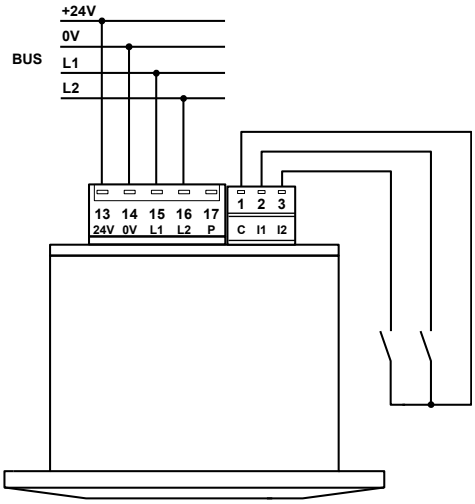



*Figure 1*

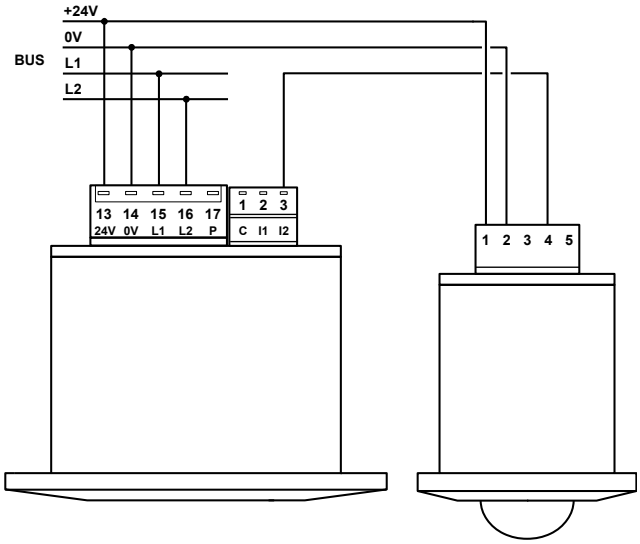



*Figure 2*

If more SRP occupancy detection sensors are required, refer to the schematic diagram in Figure 3.

## Detection characteristic

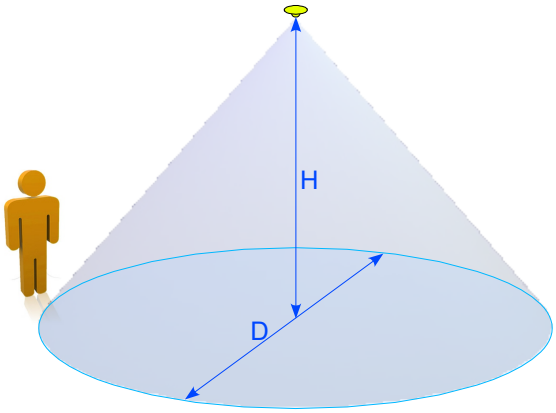
The occupancy sensor, as said above, can detect the movement in the range of 5 meters under the sensor itself.

When a person is moving, thanks to the detection of infrared radiation emitted by the body, the sensor will be able to detect the movement.

For the calculation of the covered area refer to the following formula:

$$D = H \times 2.30$$

where D is the diameter of the cone basis and H is the mounting height, as shown in the following figure.




## Installation hints

The correct positioning of the sensor plays a fundamental role in the application of automatic light regulation. Even if it is hard to give a general rule for the positioning of the sensor, because each specific case could be evaluated, as approximated general rule the sensor could be installed on the false ceiling in a proper position avoiding the *direct* incidence of external light entering from windows or other openings (in practice the optimal position is the darker location of the ceiling in all the conditions). This because, on the contrary, the direct light should be predominant in respect to the reflected light that is, at the end, the light to be regulated (because, generally, the purpose is to make constant the illumination of the working desks).

For instance, in the case of a room with two windows on the same wall, the sensor may be placed near to the same wall between the two windows. Also, a “stable” surface under the sensor is needed: this surface must be at a constant distance from the sensor and it must have always the same color (it may be the floor or a bookcase or other).

The height and position for proper installation must be however evaluated taking in account also the occupancy sensor and the physical shape of the room. Given that the occupancy detection is based on the detection of infrared emissions, it is good practice to take in account also the following aspects related to the use and to the installation of ModLC-P module, in order to avoid errors in the detection by the sensor itself.

*Detection of heat sources other than a human body*

The following cases show various situations where detection mistakes by the detection sensor may happen.

- ✗ small animals entering in the detection range
- ✗ infrared emissions from sunlight, incandescent light or some other sources of far infrared rays

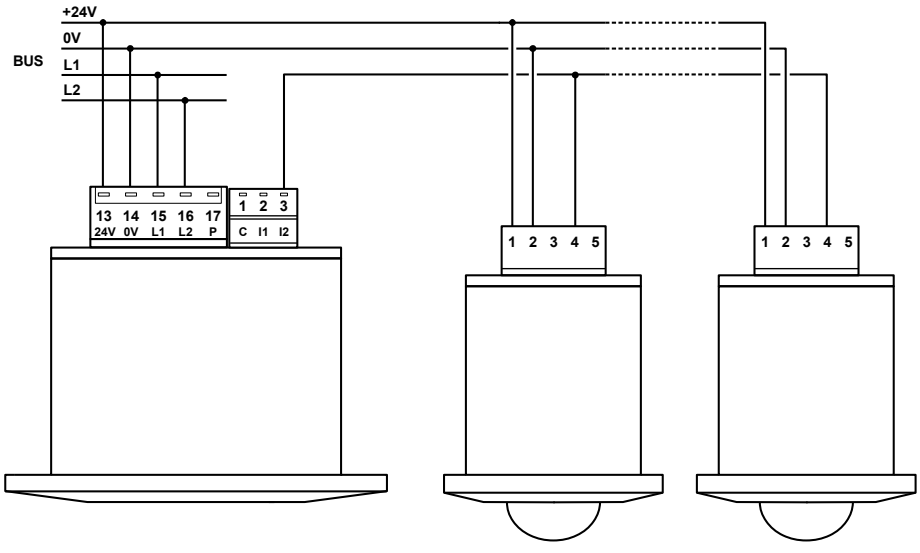



*Figure 3: Schematic diagram for the connection of more presence detection sensors SRP*

- ✗ sudden change of the temperature due to the entry of cold or warm air from an air-conditioning or heating unit or water vapor from a humidifier

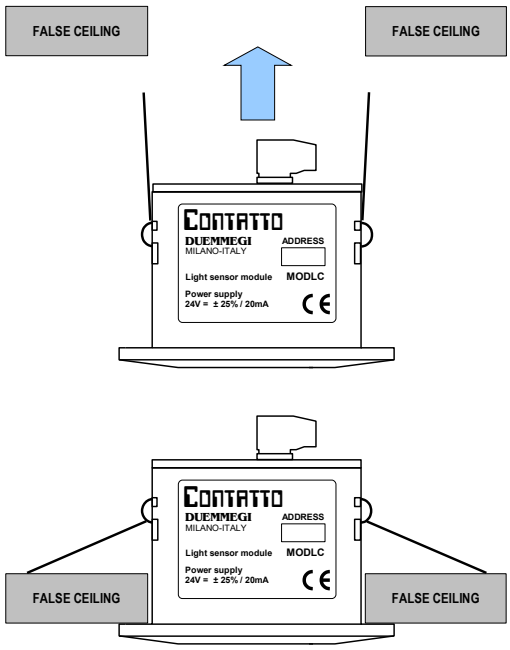
*Bad conditions for the detection*

- ✗ the detection of movement by the sensor could be disturbed by the occupancy of glasses objects, acrylic or other materials that may shield the infrared rays
- ✗ a heat source not moving or moving too quickly or moving too slowly may be undetected by the sensor
- ✗ the sensor is less sensible when the temperature of the moving body is near to the ambient temperature

*Other handling cautions*

- ✗ be careful to keep clean from dust or dirt accumulating on the lens because this will adversely affects the detection sensitivity
- ✗ the lens is made by a soft material (polyethylene); avoid applying a load or impact since this will deform or scratch the lens
- ✗ to cleaning the sensor avoid the use of fluids that may enter inside the sensor causing a deterioration

To install the sensor, make a hole of proper diameter for the introduction of the sensor in the false ceiling and execute the mounting as shown in the following figure. The sensor must be fixed to the false ceiling by means of the two proper mounting springs. It is suggested to insert the two removable terminal blocks just before the mounting in the false ceiling and however after having executed the needed connections (see paragraph “Wiring diagram”).




## Automatic regulation of the brightness

ModLC module features a PID regulation algorithm (Proportional Integral Derivative). This allows to implement a system for the automatic brightness regulation: fixed the desired setpoint ([1]), ModLC module will calculate autonomously the optimal value which, sent to the dimmer of the luminous source, will allow to reach and maintain that setpoint.

Therefore this system for the automatic regulation will constantly follow the assigned setpoint, thus compensating the external environmental contributions like, for instance, the increasing or decreasing of the light quantity coming from the windows of the room being automatically regulated.

The speed at which the regulation system reaches the setpoint can be adjusted changing the regulation parameters Ki and Ki Fine; increasing the value of Ki ([2]), the system will reach the setpoint quickly. It is also possible to define a range around the setpoint (Zone Ki Fine) where the control change from the normal Ki to the Ki Fine; in this way the speed will be reduced in order to approaching to the setpoint with better precision, avoiding as much as possible overshoots and oscillations. Once the setpoint has been reached, the regulator will not execute other operations during all the time the measured value falls inside a range, called dead zone; this dead zone, in addition to Ki and Ki Fine, can be defined during the setting up.

ModLC module also allows to define a ramp value to be sent to the dimmer in order to avoid discontinuous light changes, with a bad optical effect, when increasing or decreasing the brightness of the lamp.

([1]): the setpoint is defined as the brightness value that the automatic regulation system has like target to be reached and maintained.

([2]): an excessive speeding up of the system may generate instability events, also appearing as periodic switching on and off of the light source.

## SMART mode

To realize a system of automatic regulation of ambient light, with or without occupancy sensor, it is possible to use ModLC module in conjunction with proper programming of MCP controller, according to the application requirements.

ModLC module, however, features the SMART mode operation: in practice it is possible to choose among some predefined modes of operation, which generally cover most of real cases; therefore, it will be enough to select the desired SMART mode, among the available options, and the module will autonomously manage all the operation logic and regulation, including the management of the local pushbutton for manual adjustment, the occupancy sensor, the automatic/manual switching and so on. In this way, the programming of MCP will be reduced to “turn” the contents of the input channel 2 input of ModLC to the dimmer module or to ModDALI module (in the case of systems with DALI lighting).

ModLC module can therefore work in traditional way (that means absolutely equivalent to ModLC with firmware version lower than 2.0) or in SMART mode. The predefined SMART modes will be described in the following. In all cases, ModLC will place on its input channel 2 a value or a command code to be sent to dimmer or to a DALI group.

In the following description "One Touch" means a short press of the local button (less than 400ms).

In all cases, adjustments and switchings can be performed by a supervisor acting on the output points of CH4 or on the value of output channel CH2 (see paragraph Information on the bus).

***Mode SMART 1***

Arrangement for the typical zone:

- ModLC module
- Occupancy sensor (Internal or connected to IN2)
- Local button connected to Ix.y (may be an input of ModLC itself); One touch on this button toggles between AUTO and OFF

The point 6 channel 4 of output address (Ox:4.6) allows an additional option for SMART1 as here below described.

*Operation with Ox:4.6=0:*

Starting with lights OFF, the AUTO brightness regulation will be activated at the occupancy detection. One Touch pressings on the local button will toggle the system between AUTO and OFF. Long pressings on the local button will switch the system in MANUAL mode and activate the mono-command (the light increases or decreases for all the time the button is pressed). When the time delay related to the occupancy sensor elapses, the system will be turned off regardless of the condition in which it was (AUTO or MANUAL).

*Operation with Ox:4.6=1:*

Starting with lights OFF, nothing happens at the occupancy detection, because the the turn ON in AUTO mode can occur only by One Touch pressing on the local button. Successive One touch pressings will switch the system between AUTO and OFF.

Long pressings on the local button will switch the system in MANUAL mode and activate the mono-command (the light increases or decreases for all the time the button is pressed). When the time delay related to the occupancy sensor elapses, the system will be turned off regardless of the condition in which it was (AUTO or MANUAL).

***Mode SMART 2***

Arrangement for the typical zone:

- ModLC module
- Occupancy sensor (Internal or connected to IN2)
- Local button connected to Ix.y (may be an input of ModLC itself); One touch on this button switches the system to MANUAL mode and toggle the light level between 0% and K% (K = 1 to 100)

*Operation:*

Starting with lights OFF, the AUTO brightness regulation will be activated at the occupancy detection.

One Touch pressings on the local button will switch the system to MANUAL and they will toggle the lights alternately between 0% and K% (K must be set during configuration of ModLC). Long pressings on the local button will switch the system in MANUAL mode and activate the mono-command (the light increases or decreases for all the time the button is pressed). When the time delay related to the occupancy sensor elapses, the system will be turned off regardless of the condition in which it was (AUTO or MANUAL).

***Mode SMART 3***

Arrangement for the typical zone:

- ModLC module
- Occupancy sensor (Internal or connected to IN2)
- Local button connected to Ix.y (may be an input of ModLC itself); One touch on this button switches the system to MANUAL mode and toggle the light level between 0% and last stored value

*Operation:*

Starting with lights OFF, the AUTO brightness regulation will be activated at the occupancy detection. One Touch pressings on the button will switch the system to MANUAL and they will toggle the lights alternately between 0% and the last value which has been stored after a manual adjustment. Long pressings on the local button will switch the system in MANUAL mode and activate the mono-command (the light increases or decreases for all the time the button is pressed). When the time delay related to the occupancy sensor elapses, the system will be turned off regardless of the condition in which it was (AUTO or MANUAL).

***Mode SMART 4***

Arrangement for the typical zone:

- ModLC module
- Without occupancy sensor
- Local button connected to Ix.y (may be an input of ModLC itself); One touch on this button toggles between AUTO and OFF

*Operation:*

Starting with lights OFF, a One Touch pressing on the local button will activate the AUTO brightness regulation; another One Touch pressing will switch OFF. Long pressings on the local button will switch the system in MANUAL mode and activate the mono-command (the light increases or decreases for all the time the button is pressed). To switch OFF after a mono-command, a One Touch pressing must be performed.

## Occupancy sensor and digital inputs

As said before, ModLC module provides 2 digital inputs (ON/OFF, with NO/NC setting). Input IN2 can beset for connecting occupancy sensors that, for ModLC-P version, will be parallel connected to the internal occupancy sensor. When a sensor detects a presence, the point 2 of the input CH4 of ModLC will be activated; when deactivating it, the point 2 remains activated until the expiring of a delay time which can be configured, during the setting up, in the range 0 to 3600 seconds (1 hour).

This behavior allows to send to MCP, with the chosen delay, the information about the deactivation of the sensor, in order to switch off the light source with a given delay in respect to the last detected presence.

This allows, particularly, to realize energy saving lighting applications, complying with the new European norms about the energetic classification of the plants (European Norm EN 15232).

## Information on the bus

As said before, ModLC module takes, inside the CONTATTO bus, 1 input address and, if enabled, 1 output address, both made by 4 channels 16-bit.

***Input section:***

This section reports the following information:

| Point | CH1 | CH2 | CH3 | CH4 |
|---|---|---|---|---|
| 1 | Value proportional to the brightness detected by the sensor | Calculated value for the automatic brightness regulation | Not used | Status Aut.Reg. |
| 2 | | | | Status OS+delay |
| 3 | | | | - |
| 4 | | | | - |
| 5 | | | | - |
| 6 | | | | - |
| 7 | | | | IN1 |
| 8 | | | | IN2 |
| 9 | | | | - |
| 10 | | | | - |
| 11 | | | | - |
| 12 | | | | - |
| 13 | | | | - |
| 14 | | | | - |
| 15 | | | | - |
| 16 | | | | - |

The meaning of this input information will be here described in detail.

**CH1**: Channel 1 reports a value proportional to the brightness detected by the sensor, eventually multiplied by the parameter K Light Sens.

**CH2**: Channel 2 reports the value or the command code to be sent to the dimmer or to the DALI group, in order to execute the required functions, through proper programming of MCP (see examples in the following).

**CH4**: Channel 4 reports digital information:

- Point 1: the status of the automatic regulation (1 when it is activated); this point always reflects the status of the output CH4 point 1.
- Point 2: the status of the occupancy sensor (or IN2), including the delay chosen during the setting up (see the related paragraph). This point will be 1 if the sensor is activated or if the delay time, in respect to the last occupancy detection, has not been elapsed yet.
- Points 7 and 8: status of inputs IN1 and IN2

***Output section***

The module can have, as said before, an output address too, for the setting via bus of some operating parameters; this address has to be enabled, if needed, through the configuration panel of ModLC module, as described in the following. The output section reports the following information:

| Point | CH1 | CH2 | CH3 | CH4 |
|---|---|---|---|---|
| 1 | Set the setpoint for the automatic brightness regulation | Preset | Set the deactivation delay time of the occupancy sensor | Activate Aut.Reg. |
| 2 | | | | Reset OS delay |
| 3 | | | | Reset Aut. Reg. |
| 4 | | | | Global Reset |
| 5 | | | | Virtual Button |
| 6 | | | | No ON by OS |
| 7 | | | | Occupancy forcing |
| 8 | | | | - |
| 9 | | | | - |
| 10 | | | | - |
| 11 | | | | - |
| 12 | | | | - |
| 13 | | | | - |
| 14 | | | | - |
| 15 | | | | - |
| 16 | | | | - |

The meaning of this output information will be here described in detail.

**CH1**

Channel 1 allows to set the desired setpoint value for the brightness regulation; in practice, when the system is regulating, the value of input CH1 will be equal (or very near) to the value of output CH1. Allowed value for output CH1 ranges from 0 to 1000.

**CH2**

Output channel 2 *is meaningful only if ModLC module has been set to a SMART mode.*

Writing a value on this channel (exclusively in the range 0 to 100), this one will be copied to input CH2, so that automatically it will be then transferred to the dimmers (or DALI group) by MCP. This is useful to impose a fixed value of light from the supervisor or similar devices.

When the Preset is activated, that means when output CH2 has a value between 0 and 100, *the occupancy sensor, if installed, will be is ignored* (in order to prevent the lights turn ON and OFF caused by the sensor); the local button too (regardless if it is the "physical" button or the point 5 of output CH4 output, see below) will lose any functionality functionality.

If instead CH2 contains the value 128, it means that the Preset is not active (and therefore the presence sensor and the local button will be considered).

To exit the Preset mode, activate the point 4 of output CH4 (Global Reset, see below), or switch to AUTO mode activating the point 1 of CH4; in this case, the value on CH2 will be automatically set to 128.

**CH3**

Channel 3 allows to set the deactivation delay time of the occupancy sensor (seconds).

**CH4**

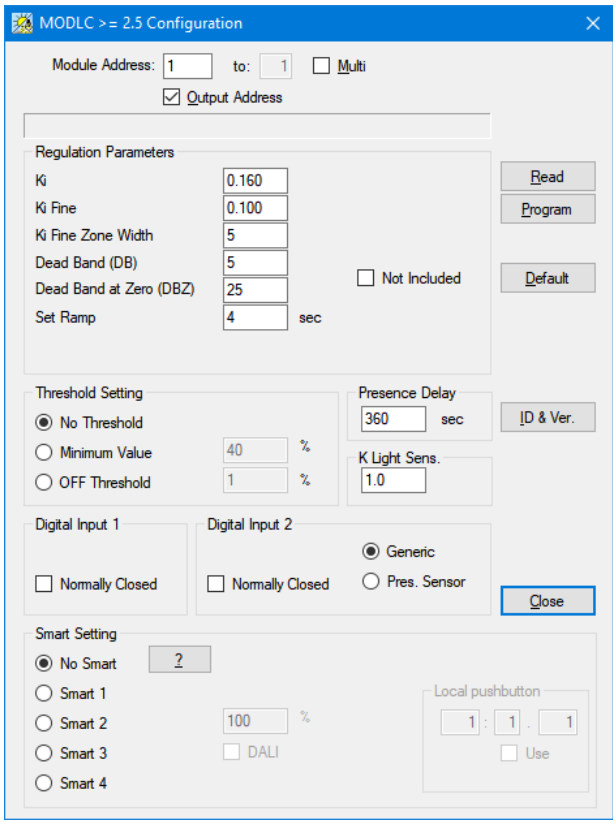
Channel 4 allows to perform the following actions:

- Point 1: **Activate Automatic Regulation**. When activated, it enables the automatic regulation, therefore ModLC module calculates the value to be placed on input CH2 to reach and keep the setpoint specified by output CH1. When deactivated, ModLC module stops the calculation and the input CH2 holds the last calculated value; to reset this value, the point 3 described in the following has to be activated. *In SMART mode, this point will be automatically managed by ModLC module itself.*
- Point 2: **Reset OS Delay**. When activated it forces the expiring of the deactivation delay time of the occupancy sensor; this point works on the level: the delay time will be always zero if it remains activated.
- Point 3: **Reset Automatic Regulation**. When activated it disables the automatic regulation, it deactivates the point 1 of the same output channel and it reset the input CH2 (and this means, normally, that lights will be switched OFF); if this point remains in its active state, it will not possible the activation of the output point 1, therefore it will not be possible the activation of the automatic regulation. *In SMART mode, unless a particular function has to be obtained, this point must not be modified.*
- Point 4: **Global Reset**. When activated a global reset will be performed, thus a reset of automatic regulation, a clear of IN delay and a zeroing of input CH2. As long as this point remains activated, everything remains locked, including the detection of the digital input of ModLC and of the local pushbutton (of course the communication on the bus remains in operation); then this point may be used by the supervisor to disable the ignition of the lamps. When this point goes deactivated, the system starts normally according to how it was configured and according to the situation of that moment.
- Point 5: **Virtual Button**. Controlling this output point, the same functions related to the local “physical” button, for the selected SMART mode, can be achieved; this point is therefore useful to have a button on the supervisor (or on WEBS page) with functions similar to those of the “physical” button (keep in mind that One Touch features, when allowed, may not work properly due to delays introduced by the communication between the supervisor, MCP and ModLC).
- Point 6: **No ON by OS.** When active, the switching ON in SMART1 does not happen by occupancy sensor but by local button only.
- Point 7: **Occupancy forcing**. When activated, it forces the occupancy in ModLC module; in other words, this output point behaves as if it is the "physical" ocupance input of ModLC. This point is useful, for example, when the occupancy of a ModLC module must set the occupancy in another ModLC module.

## Configuration of ModLC module

The configuration panel available in MCP IDE program allows to set the parameters of ModLC module through MCP and the CONTATTO bus; this operation, to be executed during the setting up, will be here described.

From the main menu of MCP IDE select Configuration, Sensors and then MODLC >= 2.5; the following window will be shown:




***Note:*** *the "Not Included" option, when checked, allows all the parameters displayed on the panel to be sent to the ModLC except for the Regulation Parameters. This option is useful when you want to program several ModLCs (also with the "Multi" option) without modifying the regulation parameters.*

The meaning of the fields and of the buttons in this window will be here described.

**Module Address:** it is the address of ModLC module to be configured or to be read.

**Multi:** to program all ModLC modules whose address is between Module Address and “to”

**Output Address:** checking this option, the output address of ModLC will be enabled (the value of the output address will be the same assigned to the input).

**Read:** to read the parameters from ModLC and to show them into the window.

**Program:** to transfer the parameters currently shown in the windows to ModLC module.

**Default:** restore the module parameters to default values

**ID & Ver:** to check that ModLC module with the specified address is connected to the BUS and to show the firmware version.

**Close:** to close the configuration panel.

***Regulation parameters***

**Ki (integral coefficient):** this parameter, multiplied by the error value ([3]), defines the amount of the increase or decrease, in respect to the previous value, of the value to be sent to the dimmer (CH2 of the input section); this parameters will be taken in account only when the measured value is outside the zone of Ki Fine (see later). In practice, increasing the value of Ki, the system will reach the setpoint quickly; when the distance from the setpoint is lower than a given value (see Amplitude of Ki Fine Zone), the coefficient changes to Ki Fine defined in the following point. In this way the approaching to the desired setpoint occurs with more precision (and without oscillations); of course, Ki Fine must be lower than Ki.

Allowed values for Ki: 0.001 to 0.999.

([3]): the error is defined as the difference between the setpoint and the brightness value measured by the sensor.

**Ki Fine (fine integral coefficient):** as for the Ki described at the previous point, but with lower value; this parameter will be considered only when the measured value is inside the Ki Fine Zone (see Amplitude of Ki Fine Zone).

Allowed value for Ki Fine: 0.001 to 0.999.

**Ki Fine Zone Width:** it defines the zone around the setpoint where the fine integral coefficient has to be applied (Ki Fine). In the default conditions, Ki Fine will be applied in the zone from setpoint-5 to setpoint+5.

**Dead Band (DB):** it defines the zone around the setpoint where the automatic regulation algorithm does not execute any calculation; therefore, if the measured value falls inside this zone, no new values will be sent to the dimmer. This value can be 0, and in this case the precision in regulation will be the best.

**Dead band at zero (DBZ):** when the regulator has calculated an output value equal to zero, the dead band becomes equal to this parameter, which must be greater than that of the previous point. It is used to avoid ON-OFF oscillations when the calculated level is zero.

**Set Ramp:** it defines the value of the working ramp of the dimmer during the automatic regulation; the ramp allows to avoid discontinuous light changes during the automatic regulation.

***Threshold setting***

**No Threshold:** no threshold will be applied.

**Minimum Value:** it defines the minimum value which can be sent to the dimmer (as percentage value) when the brightness automatic regulation is running. This parameter is useful when it is required to never switch off the lamps, even if the brightness read by the sensor is very higher in respect to the setpoint.

**OFF Threshold:** it defines a brightness value on the dimmer output (as percentage value) under which the lamps have to be switched off. This parameter is useful when the lamps should be dimmed to a so low value that the luminous contribute is near to zero, therefore it is more convenient to completely switch off the lamps.

**Presence delay:** this parameter is the time that must elapse (in seconds) after deactivation of the presence sensor (internal or connected to IN2) before the information is sent on the bus.

**K Light Sens.:** the value read by the light sensor is multiplied by the value specified for this K, allowing to scale the brightness value transmitted on the bus as desired. If this K is 1, the brightness value on the input channel 1 is exactly what the sensor measures. For different values, the value on the bus will be the “native” value multiplied by K. This function is useful if you want to "align" the value read by a reference luxmeter (eg located on the working plane) and the value reported by the ModLC. The same scaling, if K is different from 1, also occurs on the setpoint, so that the two values are congruent. Allowed values for K: from 1.0 to 15.8 included.

***Digital Input IN1***

**Normally Closed:** when checked, the input I1 is set for normally closed contact.

***Digital Input IN2***

**Generic:** set IN2 as generic input.

**Occupancy Sensor:** set IN2 for connecting one or more external occupancy sensors.

**Normally Closed:** when checked, the input IN2 is set for normally closed contact.

***SMART Setting***

This section of the configuration window allows to choose if ModLC module has to work in “No Smart” mode or according to one of the available 4 SMART modes as described in the related paragraph.

When selecting one of the 4 SMART modes, the parameters that will be time to time enabled as necessary for that mode must be set. In detail:

**Smart 1** requires the setting of address, channel and point to which the local button has been connected.

**Smart 2** requires the setting of address, channel and point to which the local button has been connected and the value at which the lights must be switched on at One Touch pressing.

**Smart 3** requires the setting of address, channel and point to which the local button has been connected and if the lights belong to a DALI system, in which case the related option must be activated (otherwise CONTATTO dimmer modules will be assumed).

**Smart 4** requires the setting of address, channel and point to which the local button has been connected.

The option “Use” enables and disables the local button.

The button ? in the configuration window recalls a help window describing the available Smart modes, in order to have a quick reference when choosing the proper operation.

To set the parameters of the light regulator, the following the following procedure is recommended:

- ✗ darken the ambient from sources of external lights (or perform the procedure after sunset or in a dark day)
- ✗ **Set K Sens. Light at 1 (important)**
- ✗ force zone lights to be adjusted to 100%
- ✗ read the brightness value Lfs (full scale brightness) measured by the ModLC
- ✗ the optimal values of the parameters Ki, Kif, AZ Kif, DB and DBZ (respectively Ki, Ki Fine, Ki Fine Zone Width, Dead Band and Dead Band at zero) are those in the table on the line closest to measured Lfs

| Lfs | Ki | Kif | AZ Kif | DB | DBZ |
|---|---|---|---|---|---|
| **100** | 0,170 | 0,065 | 5 | 0 | 5 |
| **200** | 0,095 | 0,037 | 10 | 1 | 10 |
| **300** | 0,070 | 0,027 | 15 | 1 | 15 |
| **400** | 0,058 | 0,022 | 20 | 2 | 20 |
| **500** | 0,050 | 0,019 | 25 | 2 | 25 |
| **600** | 0,045 | 0,017 | 30 | 3 | 30 |
| **700** | 0,041 | 0,016 | 35 | 3 | 35 |
| **800** | 0,039 | 0,015 | 40 | 4 | 40 |
| **900** | 0,037 | 0,014 | 45 | 4 | 45 |
| **1000** | 0,035 | 0,013 | 50 | 5 | 50 |

These values can however be adjusted based on the characteristics of the application. Please note that large value for Ki and Kif could cause fluctuations.

## MCP programming examples

For proper operation, it is *absolutely mandatory* to add to MCP configuration the directive **FIELDtoRAM** for output CH2 and CH3 and for point 1 of output CH4 related to all installed ModLC. If, for instance, 2 ModLC modules addressed as 1 and 2 have been installed, the following directive must be added to MCP configuration:

```
FIELDtoRAM = ( AO1:2, AO1:3, O1:4.1, \
               AO2:2, AO2:3, O2:4.1 )
```

***Example 1: No smart***

If ModLC is used as simple sensor of light, then the output address of the module should be disabled because it will not be used; in this case, MCP needs only the following configuration directive (supposed to have assigned the address 1 to ModLC module):

```
MODLC = ( I1 )
```

At this point, the read brightness value (CH1 input) and the status of the digital inputs and of the occupancy sensors will be available. The value and the status of digital points can be then used in the equations and/or in the script of MCP in order to implement the wanted functions.

***Example 2: No smart***

A simple system for the automatic regulation can be made by a lighting device controlled by a dimmer module (for instance Mod2DV or Mod2DM) and by the occupancy detection sensor **DUEMMEGI** SRP connected to input IN2 of ModLC whose output address has been enabled. Supposing to have assigned the address 100 to Mod2DM and 1 to ModLC, the configuration of MCP must include the following directives:

```
MODLC = ( I1, O1 )
MOD2DM = ( I100, I101, O100, O101 )
FIELDtoRAM = ( AO1:2, AO1:3, O1:4.1 )
```

Fixed a value for the setpoint, writing its value on the output CH1 of ModLC, the application requires that, as soon as a presence is detected, the lamps switches on and the automatic regulation is activated. At the deactivation of point 2 of the input channel CH4, that means after the delay time has expired from the last detected presence (see previous paragraph), the lamp must be switched off.

To obtain this behavior, MCP controller must be programmed with the following equations:

```
O1:4.1 = I1:4.2
AO100:1 = AI1:2
O1:4.3 = !I1:4.2
```

The first equation activates the Auto bit at the activation of the digital input of ModLC, corresponding to the detection of a presence. When ModLC module is in Auto mode, the values (in the range 0 to 100) to be sent to the dimmer will be available on the input channel CH2, thus allowing to reach and keep the desired setpoint; therefore, it will be enough to send these values, through MCP, to the dimmer, and this is done by the second equation.

The third equation, finally, activates the Reset Auto bit at the deactivation of the input point 2 of CH4 (occupancy plus delay), thus zeroing the value to be sent to the dimmer and causing the lamp switching off.

***Example 3: Smart 1***

In addition to the operating mode of the previous example, the application requires a button performing the classic “single command” function, allowing to manually adjust the brightness of the lamp; in other words, pushing and holding down this button, the brightness must increase or decrease, keeping the reached value at the release of the same button.

When the system has the automatic regulation activated, a short push (less than 0.4 seconds) on the button will switch off the light.

In any case, when no more occupancy is detected (included the delay time), the lamp will be switched off. When a new occupancy is detected, if Ox:4.6=0, the system will return to the light automatic regulation, otherwise (Ox:4.6=1) the switching ON can occur by local button only.

In practice, the operation (Ox:4.6=0) is the following:
an employee goes in its office, the presence will be detected by the occupancy sensor and the light will be switched on in automatic regulation. If the employee wants to increase the brightness, then he pushes and holds down the button; if instead he wants to decrease the brightness, he releases the button and then he pushes and olds down it again. When the brightness satisfies the employee, he releases the button and the lamps will maintain the reached brightness value. To switch OFF the lights , the employee will execute a short pushing on the button; to switch ON them again, another short pushing is required.
If the employee exits from its office and he does not enter again for a time longer than the programmed delay, the light will be switched off. When the employee enter again in the office, his presence will be detected and the system will start again in automatic regulation mode, even if the employee had manually adjusted before the brightness.

The operation just described, is exactly the Smart 1 mode, therefore ModLC must be set for this mode. Assuming that the button is connected to a local Mod8I/A with address 50, and that the zone is controlled by a Mod2DM dimmer module with address 100 and 101, the MCP configuration must contain the following directives:

```
MODLC = ( I1, O1 )
MOD2DM = ( I100, I101, O100, O101 )
MOD8I/A = ( I50 )
FIELDtoRAM = ( AO1:2, AO1:3, O1:4.1 )
```

The program of MCP, thanks to Smart mode of ModLC, will be simply the following:

```
AO100 = AI1:2
AO101 = AI1:2
```

To control more dimmer modules from the same ModLC, it is enough to add rows of equations like the previous ones.

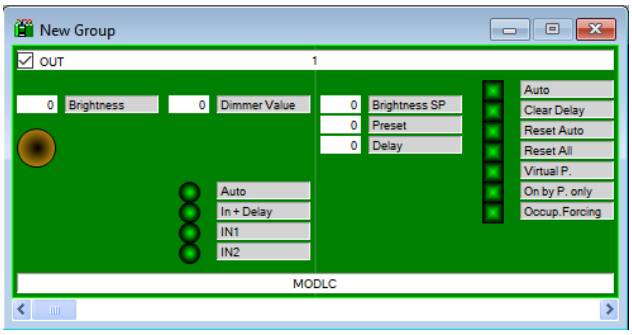
When using a DALI system (interfaced by ModDALI module), instead of dimmer modules of CONTATTO family, it will be easier to use the specific equation. Suppose to realize a system made by 4 offices, each one with its ModLC configured with one of the available Smart modes.
Also suppose that a DALI group each office has been assigned to each office (e.g. G1, G2, G3 and G4). To transfer the value or the command proposed by each ModLC (contained in the input CH2) to the respective group, the DALI equation may be used as follows:

```
AO100:1 = DALI ( G1, AI1:2, \
                 G2, AI2:2, \
                 G3, AI3:2, \
                 G4, AI4:2  \
)
```

where AO100:1 is the channel 1 of ModDALI controlling the 4 offices and are the related AI1-AI2-AI3-AI4 ModLC modules.

## Mapping

MCP Visio allows to show the map of ModLC module as in the following figure.




***Note:*** *if the output address has not been enabled, the right side of the module map (related to the setpoint and digital commands) will be shown in gray color.*

### *Input section*

**Brightness:** it is the value proportional to the brightness measured by ModLC sensor.

**Dimmer Value:** it is the value that, during the automatic regulation, has to be sent to the dimmer (%).

**Digital points:**

- ✗ Auto: it shows the status of the brightness automatic regulation
- ✗ In + Delay: it shows the status of the presence sensor including the delay time
- ✗ IN1 and IN2 show the status of the related inputs

### *Output section*

**Brightness Setpoint:** it is the value of the setpoint for the automatic regulation.

**Preset:** it is the Preset value; entering a value in the range 0 to 100, the system will be switched to Preset mode and this value will be copied to input CH2, so that automatically it will be then transferred to the dimmers (or DALI group). When it contains a value in the range 0 to 100, *the presence sensor and the local button, if installed, will be is ignored*; otherwise this channel will contain the value 128 indicating that the Preset is not active.

**Delay:** it is the occupancy sensor delay.

**Digital points:**

- ✗ Auto: point allowing to enable/disable the automatic regulation
- ✗ Clear Delay: when this point is activated, the delay time of the digital input is forced to zero
- ✗ Reset Auto: when this point is activated, the automatic regulation is disabled and, in addition, the value to be sent to the dimmer is forced to zero
- ✗ Reset All: when activated a global reset will be performed, thus a Reset Auto, a Clear Delay and a zeroing of input CH2
- ✗ Virtual P.: controlling this output point, the same functions related to the local “physical” button, for the selected SMART mode, can be achieved
- ✗ On by P. only: option for mode SMART1
- ✗ Occup.Forcing: forces the occupancy

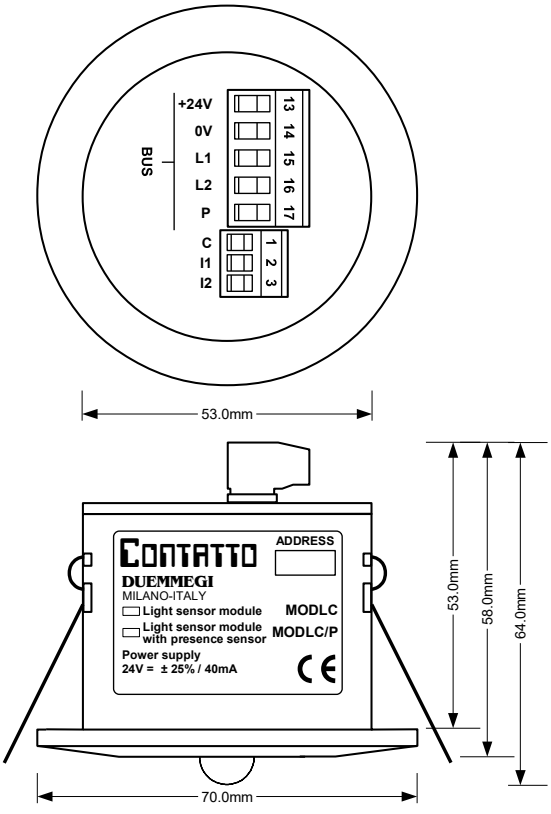
## Technical characteristics

| | |
|---|---|
| Supply voltage | 24V ⎓ ± 25% SELV |
| MAX current consumption | 40mA @ 24V ⎓ |
| Sensor type | Photo sensor with spectral response equivalent to the human eye sensitivity |
| Full scale light sensor | 1000 points about |
| Occupancy sensor (-P):<br>Aperture angle<br>Range of detection MAX | Passive infrared principle (PIR)<br>100°<br>5 meters |
| Digital inputs<br>Operating voltage<br>Input current | 2, configurable as NO or NC<br>24V nominal<br>4mA @ 24V ⎓ |
| Operating temperature | -10 ÷ +50 °C |
| Storage temperature | -30 ÷ +85 °C |
| Protection degree | IP20 |

***Note 1: this technical sheet applies to ModLC or ModLC-P equipped with FW 3.3 or higher.***

***Note 2: the FW versions equal or higher than 3.0 are not compatible with previous versions of ModLC or ModLC-P.***

## 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.