

## DFLUX: ambient light measurement module with sensor for ceiling mounting

DFLUX module allows to transmit, over the **Domino** bus, the ambient brightness value detected by a sensor provided together the module.

DFLUX module can be well applied for the brightness regulation of domestic rooms but also of offices and stores.

The sensor has been expressly developed for the ceiling mounting and its prismatic shape allows a good directivity; in this way only the light reflected by the surface in front of the sensor is detected (e.g the floor or the table). Thanks to special filter, the sensor is adapted to the sensitivity of the human eyes.

By a 4-way dip switch, ModLUX module can be configured for 5 full scale values: 250, 500, 1000, 1500 and 2000 lux.

As for almost all modules of **Domino** family, the power supply required for the module operation is derived from the bus itself.

Alongside of the bus terminal block, a small push-button allows the address programming and a green LED shows when the module is ready to receive the address itself; the same LED normally flashes every 2 seconds about to signal that the module is properly operating. Under the cover of the bus terminal block, a small 3-way connector (PRG) allows the connection to the optional tester/programmer. On the opposite side, a 2-way terminal block allow the connection of the sensor.

DFLUX module takes, inside the **Domino** bus, 1 input address. A white label on the top panel allows the writing of the programmed module base address for an immediate visual identification.

For more details about the programming, refer to the related documentation.

DFLUX module is housed inside a DIN 3M module with reduced height; the module is provided with the sensor already connected by 1 meter cable.

### Setting the full scale value

To set full scale of DFLUX module, the cover of the light sensor terminal block has to be removed. This operation can be performed with the help of a little screwdriver.

In this way, the 4-way dip switch can be accessed (see the figure in the wiring diagram paragraph); allowed settings are the following:

F.Scale [lux]	SW1	SW2	SW3	SW4
250	OFF	OFF	OFF	OFF
500	ON	OFF	OFF	OFF
1000	ON	ON	OFF	OFF
1500	ON	ON	ON	OFF
2000	ON	ON	ON	ON



The ON position of each switch is toward the top side. To avoid damage due to electrostatic discharge, it is strongly recommended to avoid to touch other parts of the circuit. After the desired setting has been performed, put back the terminal cover inserting it in its proper site.

The factory setting of DFLUX full scale is 1000 lux.

### Operation

As said above, DFLUX module take one input address. The brightness measured by DFLUX module is reported on the bus as analog value in the range 0 to 1023; the value read from the bus will then match, for each one of the available full scale, a value in lux given by:

F.Scale [lux]	Formula
250	$L_{lux} = 0.25 \times VAL_{bus}$
500	$L_{lux} = 0.5 \times VAL_{bus}$
1000	$L_{lux} = VAL_{bus}$
1500	$L_{lux} = 1.5 \times VAL_{bus}$
2000	$L_{lux} = 2 \times VAL_{bus}$

where  $VAL_{bus}$  is the value read from the bus and  $L_{lux}$  is the brightness value measured by the sensor.

On the contrary, a given brightness value will be sent on the bus as:

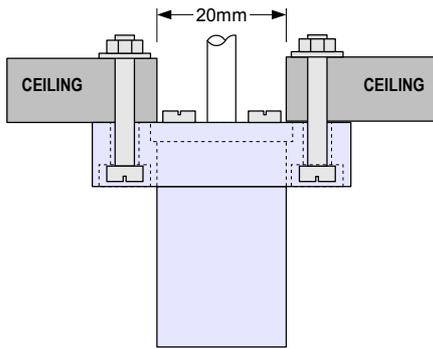
F.Scale [lux]	Formula
250	$VAL_{bus} = 4 \times L_{lux}$
500	$VAL_{bus} = 2 \times L_{lux}$
1000	$VAL_{bus} = L_{lux}$
1500	$VAL_{bus} = 0.666 \times L_{lux}$
2000	$VAL_{bus} = 0.5 \times L_{lux}$

### Installation hints

The sensor must be fixed on the ceiling by two 3 or 4mm screws (not provided). For proper mounting, the sensor can be disconnected from the module.

Make a 20mm hole in the ceiling and mount the sensor as shown in the following figure:

**DFLUX**



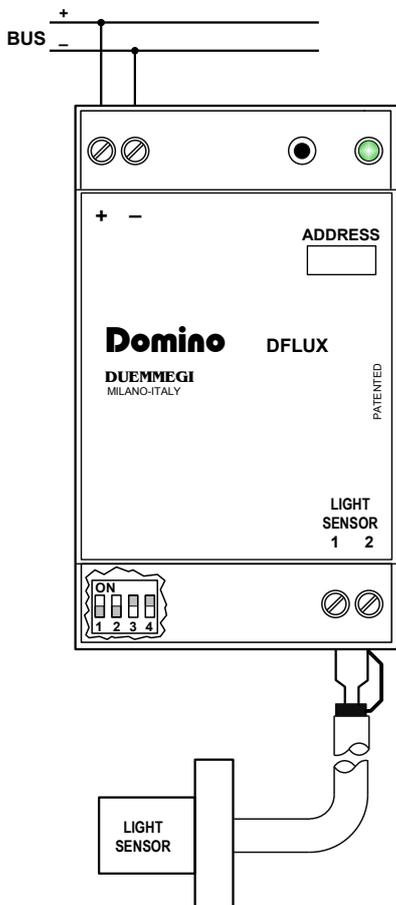
Insert the cylinder of the sensor in the provided ring, from the side where the hole is bigger. Fix then the ring and the sensor to the ceiling by 2 screws with nuts or by 2 Parker screws.

Connect again the sensor cable to the module (white wire to terminal 1, brown and black wires to terminal 2).

Avoid to prolong the connection cable between the sensor and the module; on the contrary, some degradations on the module performance can occur.

**Module connection**

DFLUX module, for its proper operation, simply needs the connection to the **Domino** bus and to the provided sensor. The following wiring diagram shows the proper connections.



**Using the information returned by DFLUX and threshold equation**

The analog values read from DFLUX module can be used as inputs in the **Domino** equations, both those contained in the **DFCP** controller and, in simpler applications, those directly uploaded into output modules DF2R, DF4R, DF4RP and into virtual modules DF4I/V.

Concerning the using of DFLUX module in **DFCP** based applications, refer to the user's manual of the controller.

The following will instead describe the threshold function, which can be uploaded directly into output modules as said before.

Threshold equation controls a digital output (that can be both a real or a virtual point) as function of the result of comparison between an analog value (for instance that returned by a DFLUX module) and a threshold, eventually with a hysteresis.

The following equation is a typical threshold equation:

$$O1.1 = AI1 \geq 240,12$$

where **O1.1** is the output (real out in this case) controlled by the threshold function, **AI1** represents the analog input which address is 1, **>=** is the comparison operator (greater or equal to), **240** is the threshold and **12** is the hysteresis (the comma symbol must be placed before it).

Allowed comparison operators:

- < lower than
- <= lower or equal to
- = equal to
- != not equal to
- > greater than
- >= greater or equal to

The hysteresis has a different meaning depending on the comparison operator as here described:

- < the output goes ON when  $AI < T$  and it returns OFF when  $AI \geq (T + H)$
- <= the output goes ON when  $AI \leq T$  and it returns OFF when  $AI > (T + H)$
- = the output goes ON when  $AI = T$  and it returns OFF when  $AI > (T + H)$  or when  $AI < (T - H)$
- != output goes OFF when  $AI = T$  and it returns ON when  $AI > (T + H)$  or when  $AI < (T - H)$ . This behavior is complementary to the previous case.
- > the output goes ON when  $AI > T$  and it returns OFF when  $AI \leq (T - H)$
- >= the output goes ON when  $AI \geq T$  and it returns OFF when  $AI < (T - H)$

**Note:** if hysteresis has not been specified, then it will be assumed equal to zero.

Of course, threshold and hysteresis values, for DFLUX module, must be in the range 0 to 1023. Other allowable operators are AND (&) and OR (|). More threshold functions can be combined in the same equation as shown by the following examples.

**O4.1 = AI1 >= 730,2**

The output goes ON when the analog value is greater or equal to 730, and it goes OFF when it is lower than 728.

**V130.1 = AI1 == 240 | AI2 >= 30**

The virtual output goes ON when the analog value AI1 is exactly equal to 240 or when AI2 is greater or equal to 30.

**O1.4 = AI1 < 128 & AI1 > 30**

The output goes ON when the analog value is in the range 30 to 128 (greater than 30 and lower than 128).

**O3.2 = AI9 > 30 & AI9 < 128 | AI5 > 600**

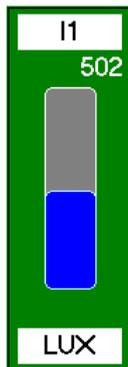
The output goes ON when the analog value AI9 is in the range 30 to 128 or when AI5 is greater than 600.

## Mapping

DFLUX module can be displayed on the map of BDTools (release 6.1.1 or higher) as in the picture on this right side.

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

The bar graph shows the detected brightness level and the number over the bar shows the value in numerical format (in the range 1..1023). Note that this value is represented as number of points, it is not the lux value, because this last one depends on the dip switch setting; to find the lux value refer to the paragraph about the module operation.

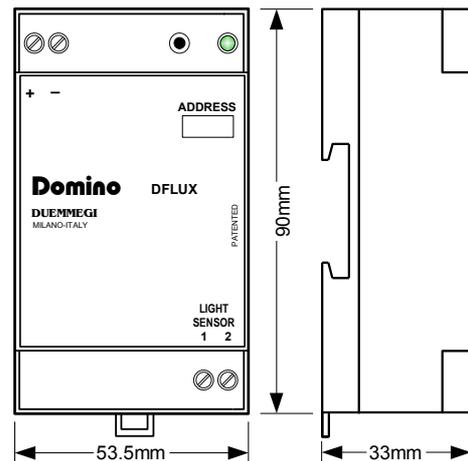


## Technical characteristics

Power supply (bus side)	By specific centralized power supply mod. DFPW2
Sensor type	Photodiode with integrated filter for adaptation to human eye sensitivity
Full scale	Configurable among: • 250 lux • 500 lux • 1000 lux • 1500 lux • 2000 lux
Resolution	1023 points
Measurement error	±5% of full scale value
Operating temperature	-5 ÷ +50 °C
Storage temperature	-20 ÷ +70 °C
Protection degree	IP20

## Outline dimensions

**DFLUX module:**



**Sensor:**

