

## DFAI: dual configurable 0÷10V or 0÷5V analog input module

DFAI modules allow to transmit, through the **Domino** bus, 2 different 0÷10V or 0÷5V analog signals; it is also possible to connect one or two potentiometers supplied by a reference voltage provided by the module itself.

DFAI input module provides a 2-pole terminal block for the connection to the bus and a 5-pole terminal block for the connection to 2 analog inputs or to the potentiometers.

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

Alongside of 5-pole 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. A small connector (PRG) allows the connection to the optional tester/programmer. The compact dimensions of the DFAI module allow the housing directly in the standard wall box like 503 code or similar.

DFAI module takes, inside the **Domino** bus, *two consecutive input address*; to setting up the module it is enough to assign a single base address. Assigning an address n to DFAI module, it will take addresses n and n+1

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.

### Operation

DFAI module sends on the Domino bus, for each one of the two inputs, an analog value in the range 0 to 1000, corresponding to 0÷10V or 0÷5V input voltage, depending on the setting as will be later described. Any value read from bus, in the two possible settings, will be related to an applied input voltage equal to:

0÷10V setting	0÷5V setting
$V_{in} = VAL_{bus} / 100$	$V_{in} = VAL_{bus} / 200$

where  $V_{in}$  is the voltage applied on input and  $VAL_{bus}$  is the related value sent on the bus.

On the other hand, an applied voltage on the input will be sent on the bus as:

0÷10V setting	0÷5V setting
$VAL_{bus} = V_{in} \times 100$	$VAL_{bus} = V_{in} \times 200$

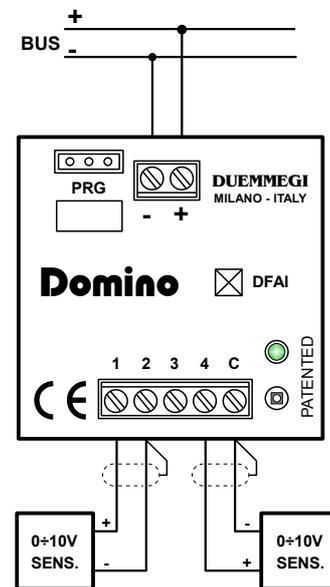
The 0÷5V setting is recommended when the related input is connected to a potentiometer supplied by the module itself, because the reference voltage provided by the module at terminal 3 is 5V±5%.

In this way, the value returned by that input will be in the range 0 to 1000, depending on the position of the potentiometer. The recommended value of potentiometer is 10KΩ (47KΩ MAX).

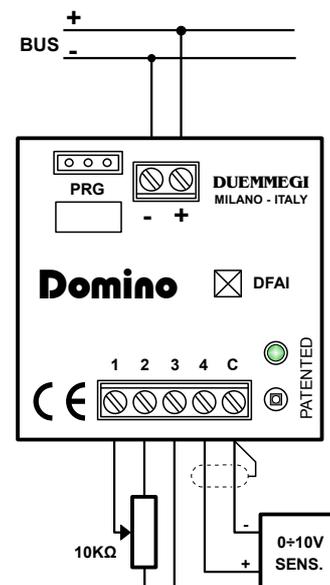


### Module connection

DFAI module allows the connection to 0÷10V analog transmitters, as for example temperature sensors, humidity sensors, light sensors etc., or to one or two potentiometers. Following figures show the proper connections to be made.



Connection to 2 sensors



Connection to one potentiometer and one sensor



Connection to 2 potentiometers

## Installation hints

DFAI module must be installed far away from possible sources of electromagnetic disturbances, for example inverter, dimmer, motors, etc.

If the distance between module and sensor is longer than **1 meter**, it is recommended to use a 2x0.5mm<sup>2</sup> shielded cable; the shield must be connected to terminal 2 (or terminal C, in case of second input) of DFAI module, leaving it disconnected at the sensor side.

When connecting a potentiometer, the length of cables must be less than 50cm.

In any case avoid to put down the cables of DFAI module inputs in pipes taken up by power cables.

## Using the information returned by DFAI and threshold equation

The analog values read from DFAI 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 DFAI 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 DFAI 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 DFAI module, must be in the range 0 to 1000. Other allowable operators are AND (&) and OR (|). More threshold functions can be combined in the same equation as shown by the following examples.

$$O4.1 = AI1 \geq 730,2$$

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

$$V130.1 = AI1 == 40 | AI2 \geq 30$$

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).

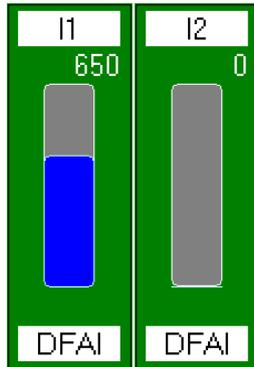
$$O3.2 = AI9 > 30 \ \& \ AI9 < 128 | AI5 > 600$$

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

## Mapping

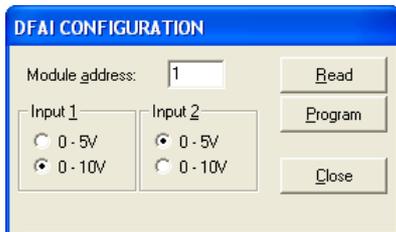
DFAI module can be displayed on the map of BDTools (release 6.0.1 or higher ) as in the picture on this right side. As for all **Domino** modules, the background of the module is in green color if the module is connected and properly working, otherwise the background is in red color.

The 2 bar graphs show the input level of the 2 channels, and the numbers over the bar show the values in numerical format (in the range 1..1000).



## Setting

Each input of DFAI module can be set for 0÷10V or 0÷5V range. As said before, the range 0÷5V is recommended when connecting a potentiometer supplied by the module itself. To set DFAI module, both DFPRO programmer and BDTools program (version 6.0.1 or higher) can be used. From the menu of this last program select "Programming" and then "DFAI Configuration"; the following window will be shown:



Choose the desired range and then pres the Program button; the Read button allows to retrieve the current setting.

## Technical characteristics

Power supply (bus side)	By specific centralized power supply mod. DFPW2
Number of analog inputs	2, 0÷10V or 0÷5V type
Input impedance	220 KΩ
Input resolution	1000 points
Linearity	±1 LSB
MAX error	±0.2% of full scale
Output voltage for potentiometer power supply	5V ±5%
Value of potentiometer	Recommended 10KΩ linear type, MAX 47KΩ
MAX length of cables for the connection to sensors	10 meters, with shielded cable
MAX length of cables for the connection to potentiometers	50 cm, no shield required
Operating temperature	-5 ÷ +50 °C
Storage temperature	-20 ÷ +70 °C
Protection degree	IP20

## Outline dimensions

