

DFCC2: Module for the management of loads shedding

DFCC2 module allows, through the **Domino** system, to manage the power absorbed by a single-phase electrical system (or three-phase systems using 3 DFCC2 modules, one for each phase), avoiding the interruptions of the electrical network caused by the simultaneous supplying of many loads with an excessive total power consumption; this module is a valid solution for the classification of a civil plant according to level 2 (V3 variant of the standard 64-8). More DFCC2 modules can be installed in the same **Domino** system, each one with its own address.

DFCC2 module can manage up to 8 distinct loads; many parameters for optimizing the module operation may be defined during the setting up.

DFCC2 constantly monitors the total active power absorbed by the connected electrical systems (on the considered phase) and, if its value exceeds a threshold fixed during the setting up, it starts to disconnect the loads according to a well defined sequence until the total power returns under the threshold. The module takes into account the direction of the current, so it can be used in systems equipped with photovoltaic generator. The loads can be disconnected from the electrical network by the **Domino** power relay output modules (e.g. DF4RP).

DFCC2 module can operate in systems with or without DFCC controller.

The power supply needed for DFCC2 module operation is derived from the Domino bus itself. Three fixed 2-way terminal block allow the connection of the module to the bus, to the ac voltage to be monitored and to the provided CT (current transformer).

Under the cover of the upper terminal block, the module features a small pushbutton for the assignment of the address and a green LED that shows the operating status; this green LED normally flashes every 2 seconds about to signal that the module is properly supplied and operating.

The assignment of the address by DFPRO is allowed only if the bus is supplied.

DFCC2 module is housed in a standard DIN 4M box for rail mounting.

Note: this technical sheet applies to DFCC2 modules equipped with firmware 1.1 or higher.

Mode of operation

DFCC module measures the total active power absorbed by the connected loads through an external current transformer (CT); the measured value is compared to the threshold value fixed during the setting up through the support program BDTools or DCP Ide (allowed power value up to 12KW).

The loads that can be disconnected when the power exceeds the threshold are connected to the electrical network by means of power relay output module (e.g. DF4RP) that, through the **Domino** bus, are controlled by DFCC2 module.



If a power overload occurs, the first load to be disconnected will be the number 8 (which must be that considered the less important by the user). The load shedding occurs after 2 seconds after exceeding the threshold; in this case, if there still remains the overload condition, DFCC2 module will disconnect the successive loads until the total power returns below the thresholds.

The last disconnected load will be anyway reconnected after a maximum of 4 minutes after the shedding of the same load, or after a shorter time if the conditions established by a specific algorithm are satisfied.

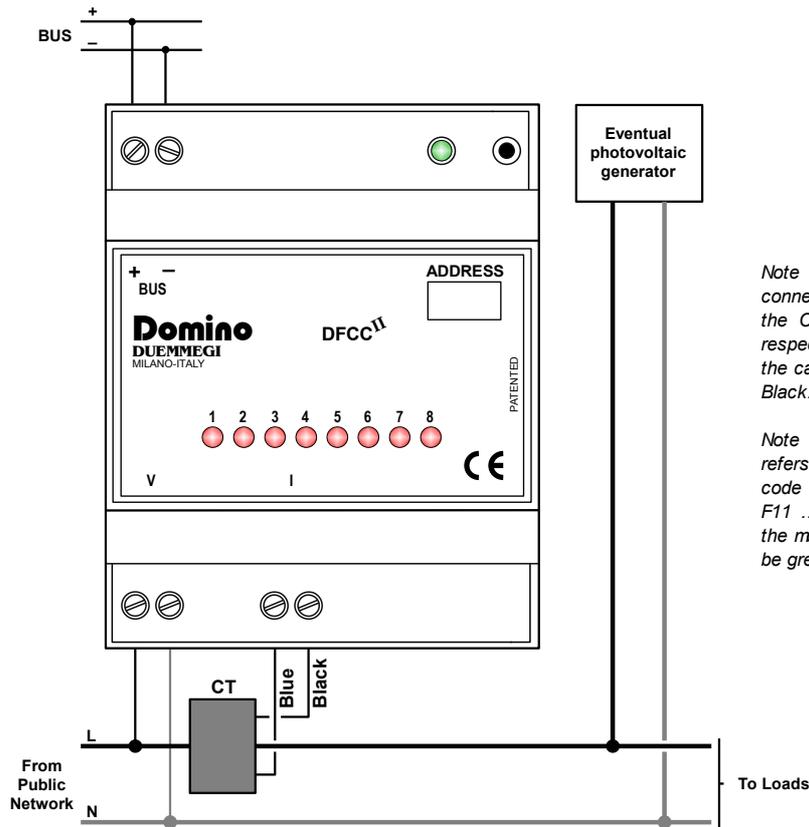
It is however possible to avoid the shedding of a load, or it can be reconnected after a shedding, acting on the related point of the module output address (see next paragraphs). The shedding status of the 8 loads is reported by DFCC2 module by means of 8 LEDs placed on its front panel and by a buzzer that, if not desired, can be disabled (see in the next paragraphs). Each LED is OFF when the related load is connected, while it is ON when the load is disconnected; a flashing LED means that the related load has been set to avoid the shedding.

Address programming

DFCC2 module takes, inside the **Domino** bus, 10 consecutive input addresses and, if enabled through the configuration panel provided by BDTools or DCP Ide, one output address. To set the module it is however enough to assign a single base address; assigning an address n, it will take the input addresses from n to n+9 and the output addresses n (if enabled). For details about the address assignment refer to the related documentation

Module connection

DFCC module needs the connection to the bus, to the 230V~ electrical network and to the external current transformer (CT) for the measurement of the current consumption. The following schematic diagram shows the proper connection to be made.



Note 1: Respect the shown connections, particularly connect the CT as shown in the diagram, respecting the sense of insertion of the cable L and the the colors Blue/Black.

Note 2: The schematic diagram refers to DFCC2 module with lot code greater than or equal to F11; see label on the back of the module: the first two digits must be greater than or equal to 11.

Information on the bus

DFCC2 module takes, inside the **Domino** system, 10 input addresses and, if enabled, 1 output addresses. Said n the assigned base address, the meaning of the input and output data fields is the following.

Input section n

The input address n provides 8 digital points that, instead to be connected to "physical contact", are controlled by DFCC2 module. Each one of these 8 points is related to a load; when the status of a point is 1 (ON), the load must be connected. These "fictitious" input points have to be used as described in the following. The following table lists the meaning of these input points.

Point	Description
1	Load 1
2	Load 2
3	Load 3
4	Load 4
5	Load 5
6	Load 6
7	Load 7
8	Load 8
9	-
10	-
11	-
12	-
13	-
14	-
15	-
16	-

The points in the input section with base address must be used in the programming of **Domino** system to control the 8 loads, adding to relay output modules a simple equation as in the following example:

$$O31.1 = I41.1$$

where **O31.1** is the relay output controlling the load 1 and **I41.1** is the point 1 of DFCC2 having base address 41. Of course, up to 8 equations of this type are needed, one for each load to be controlled.

While in a system without DFCP it is not necessary to declare in BTools the presence of a DFCC2 module, when using DFCP this is mandatory; in the Configuration TAB of DCP Ide, supposing to declare a DFCC2 module having base address 1 and output address enabled, the following directive must be added:

$$DFCC2 = (I1, O1)$$

If the output address is disabled, the directive will be:

$$DFCC2 = (I1)$$

Input section n+1

This address reports the value of the **RMS Voltage** measured by the module at terminals V, expressed in Volts multiplied 10; for example, if the voltage is 230,4V, the module will send on the bus the value 2304.

Input section n+2

This address reports the value of the **RMS Current** measured by the module at terminals I by means of the provided current transformer (CT), expressed in Amperes multiplied 100; for example, if the current is 22,65A, the module will send on the bus the value 2265.

Input section n+3

This address reports the value, in two's complement (because it can be a negative value), of the **Active Power (P)** in Watts; for example, if the active power is 1825W, the module will send on the bus the value 1825. A negative value of active power means that the plant is giving energy rather than consuming it (eg. Photovoltaic system).

Input section n+4

This address reports the value of the **Apparent Power (S)** in VA; for example, if the apparent power is 2478VA, the module will send on the bus the value 2478.

Input section n+5

This address reports the value, in two's complement (because it can be a negative value), of the **Reactive Power (Q)** in VAR; for example, if the reactive power is 357VAR, the module will send on the bus the value 357.

Input section n+6

This address reports the value, multiplied by 1000 and in two's complement (because it can be a negative value), of the **Power Factor (PF)**; for example, if the PF is 0,985, the module will send on the bus the value 985. The power factor is a dimensionless value.

The power factor is the ratio P/S and it gives an indication of the phase angle of current with respect to voltage; a sign depending on the type of load is assigned to the PF as follows:

- PF positive → inductive load
- PF negative → capacitive load

Input section n+7, n+8, n+9

These addresses report the values for the calculation of the **Active energy consumption (kWh)** calculated by the module; the formula to have the value of kWh is:
 $65536 \times V(n+7) + V(n+8) + [V(n+7) / 1000]$

where $V(n+7)$, $V(n+8)$ and $V(n+9)$ are the values at the input addresses n+7, n+8 e n+9 respectively.

Output section n

The output address n provides 10 digital points. The first 8 allow to avoid the disconnection of the related load: when the status of a point is 1 (ON) the load is always connected. Point 9, when activated, resets the Energy meter (kWh). Point 10 controls the operation of the internal buzzer: when it is 1 (ON), the buzzer is enabled. The following table shows the meaning of the output points.

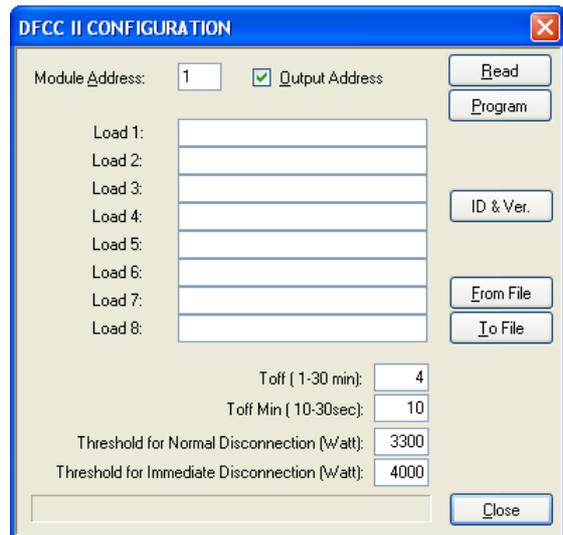
Point	Description
1	Load 1 always connected
2	Load 2 always connected
3	Load 3 always connected
4	Load 4 always connected
5	Load 5 always connected
6	Load 6 always connected
7	Load 7 always connected
8	Load 8 always connected
9	Reset the Energy meter
10	Enable the buzzer
11	-
12	-
13	-
14	-
15	-
16	-

Note: the output section of DFCC2 module cannot be programmed by means of equations. The listed output points should be controlled by a supervisor, by touch screen video terminals, by WEBS module or similar devices by writing directly to the desired point.

Setting up

DCP Ide and BDTools programs allow to set the operating parameters of DFCC2 module. DFCC2 module can be thus adjusted according to the requirements of the specific application. The setting up can be performed via the **Domino** bus using a proper interface like DFRS (or DFUSB or DFCP or DFPRO) and the configuration panel provided by DCP Ide or BDTools.

From main menu of BDTools or DCP Ide, select Programming, Modules Configuration, DFCC and DFCCII to open the window shown in the figure; the meaning of the fields will be here described.



Module Address: it is the base address of DFCC2 module to be set or read

DFCC II

Output Address: when checked, this option enables the output addresses of DFCC2 module (which will be the same assigned to the input section)

Load 1...Load 8: these text boxes allow to enter a description of the connected load (e.g. washing machine, oven, etc.) with a maximum number of 16 characters; these descriptions have not any particular function except as a reminder of the connected load

Toff (1-30min): it is the maximum time (1 to 30 minutes) during which a load can remain disconnected; in other words, if within Toff the measured power does not return below the value calculated by DFCC2, the last disconnected load will be however reconnected

Toff Min (10-30sec): it is the minimum time (10 to 30 seconds) during which a load remains disconnected; in other words, if there are the conditions for reconnecting the load just disconnected but this has been disconnected for less than "Toff Min" seconds, then DFCC2 will wait anyway for "Toff Min" seconds before to reconnect it

Threshold for Normal Disconnection (Watt): it is the value of power (in Watts) beyond which the loads shedding start; the load shedding occurs with a maximum delay of 2 seconds after the threshold has been exceeded. This value, generally, should be set equal to the size of the counter +10%; for example, for a 3kW counter, this threshold may be 3300W

Threshold for Immediate Disconnection (Watt): it is the value of power (in Watts) beyond which the loads shedding is immediate; this value, generally, should be set equal to the size of the counter +33%; for example, for a 3kW counter, this threshold may be 4000W

Read: read the current settings of the selected DFCC2 module

Program: send the settings displayed in the window to the selected DFCC2 module

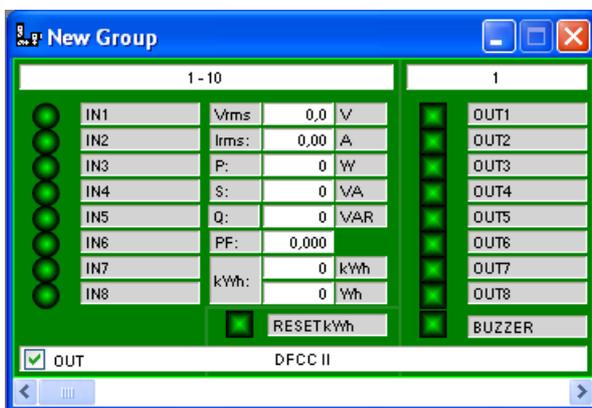
ID & Ver.: ask the current firmware version to the selected DFCC2 module

From file: recalls, from a previous saved file, the configuration of the module

To file: save on a file, with .cc extension, the configuration of the module

Mapping

BDTools and DCP Visio allow to display the map of DFCC2 module as in the following figure.



The points identified IN1 .. IN8 are related to the base input address; the status of these points is shown by a green "dot" if the point is not active or red if the point is active.

The points identified OUT1 .. OUT8, BUZ and RESET kWh are related to the output address (if enabled); the status of these points is represented by a green "square" if the point is not active or by a red "square" if the point is active.

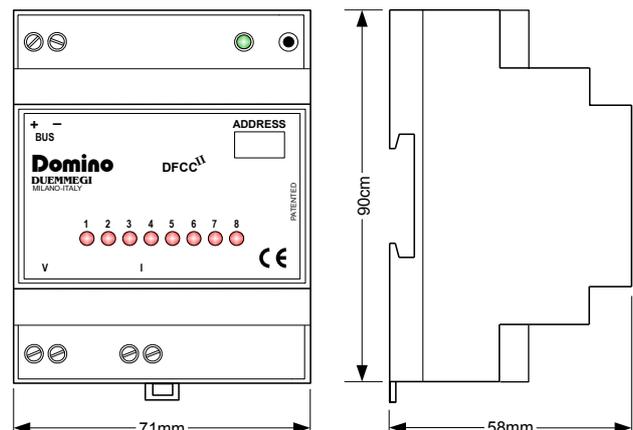
The central section of the symbol shows the measured values as indicated.

As usual, the background of the module is shown in green when it is connected and working, otherwise the background will be red.

Technical characteristics

Power supply (bus side)	By specific centralized power supply mod. DFPW2
MAX current consumption on bus side	= 5 standard Domino modules
Nominal A.C. Mains voltage	230V~ 50Hz single-phase
Current transformer (CT)	Provided
Active power max measurement	Standard: 12KW
Measured or calculated parameters	RMS Voltage RMS Current Active power Apparent power Reactive power Power factor Active energy consumption
Amount of managed loads	Up to 8
Signaling	8 LEDs on the panel Internal buzzer
Housing	Standard DIN 4M for DIN rail
Operating temperature	-5 ÷ +50 °C
Storage temperature	-20 ÷ +70 °C
Protection degree	IP20

Outline dimensions



Correct disposal of this 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 literature indicates that the product 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. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

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 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. Keep out of the reach of children.

Setting up

The physical address assignment and the setting of parameters (if any) must be performed by the specific softwares provided together the device or by the specific programmer. For the first installation of the device 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

This device complies with the essential requirements of the following directives:

2004/108/CE (EMC)
2006/95/CE (Low Voltage)
2002/95/CE (RoHS)

Note

Technical characteristics and this data sheet are subject to change without notice.