DFANA-M: network analyzer module for Domino bus

DFANA-M and DFANA-S modules allow the measurements of electrical variables of a three-phase network and it is available, under request only, in special version for single-phase network. DFANA-M module interfaces directly to the **Domino** bus, thus making the measurements immediately available and easy to use. The measurements are also showed on the front panel of DFANA-S by through a back-lighted LCD display.

Among the several available measurements, shown on the display of DFANA-S (with the symbol showed in the following table), DFANA-M can report on the bus up to 20 variables to be chosen among the following:

Variables	Symbol	Measured units
3 Phase voltages (*)	V1N V2N V3N	[V]
3 Linked voltages (*)	V12 V23 V31	[V]
1 Linked average voltage (*)	Vtm	[V]
3 Currents (**)	I1 I2 I3	[A]
1 Average current (**)	Itm	[A]
3 Active powers	P1 P2 P3	[W]
1 Total active power	Ptot	[W]
3 Reactive powers	Q1 Q2 Q3	[VAR]
1 Total reactive power	Qtot	[VAR]
3 Apparent powers	S1 S2 S3	[VA]
1 Total apparent powers	Stot	[VA]
3 Phase power factors	PF1 PF2 PF3	-
1 Total power factor	PF	-
1 Frequency	Frequency	[Hz]
1 Positive active energy	Wh(+)	[Wh]
1 Negative active energy	Wh(-)	[Wh]
1 Positive reactive energy	VARh(+)	[VARh]
1 Negative reactive energy	VARh(-)	[VARh]
1 Hour-meter	Hour Meter	[ore]
1 Cabinet temperature	Temperature	[°C]

(*): Voltages are sent on the bus multiplied x 10

(**): Currents are sent on the bus multiplied x 100

DFANA_M module also provides the possibility to reset:
- Energies
- Hour-meter

DFNA-M module features a 2-way fixed terminal block for the connection to **Domino** bus and a 3-way fixed terminal blocks for the connection to DFANA-S module.
For information about terminal blocks, connections and the several possible settings of the measurements section of DFANA-S module, refer ti the related User's Manual (DFANA-S_xxMIT).

Near to the bus terminal block, DFANA-M module features a small pushbutton and a green LED that shows the operating status; this LED normally flashes every 2 seconds about to signal that the module is properly connected to the bus. DFANA-M module is housed in a standard 2M modular box for rail mounting

Note: *the setting up of DFANA-M module requires BDTools or DCP IDE software.*


Address programming

DFANA-M module takes, in dynamic mode, up to a maximum of 20 consecutive input addresses and, if enabled, 1 output address equal to the base address; the address can be assigned by DFPRO programmer or by BDTools or DCP IDE. A white label on the front panel allows the writing of the assigned base address for an immediate visual identification. The effective amount of used addresses depends on the number of measurements to be transferred on the bus.

Module connection

The following schematic diagram shows the connection between DFANA-M. DFANA-S and and **Domino** bus.
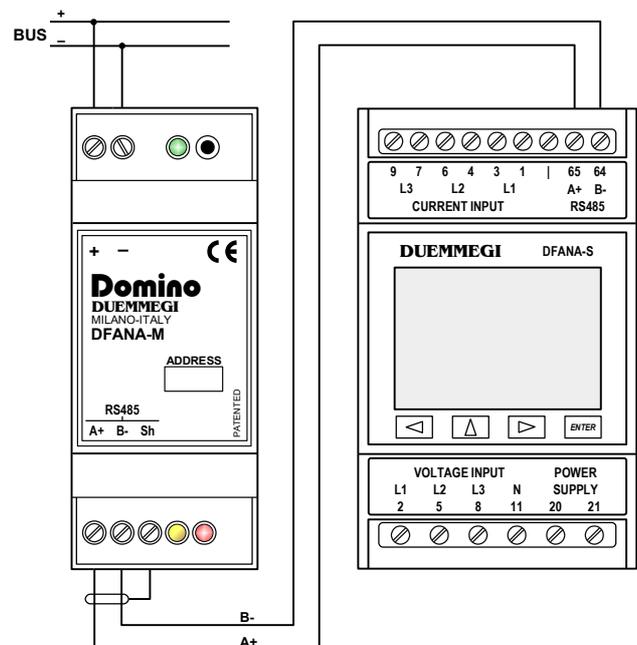
For details about the connection to the AC line and to the aux power supply, refer to the related User's Manual (DFANA-S_xxMIT.

Information reported on the bus

Input section

As said above, DFANA-M module takes, inside **Domino** bus, up to 20 addresses, each one reporting the measurements chosen during the setting up. The values reported at the several addresses are expressed in the measured units selected during the setting up, taking attention to the following details:

✗ the voltages are expressed in V multiplied by 10 (e.g. a 230.4V voltage will be sent on the bus as 2304)

✗ the currents are expressed in A multiplied by 100 (e.g. a current 22.65A will be sent on the bus as 2265)

✗ the power factors are multiplied by 1000 and in two's complement (so the range -1000 to +1000)

✗ the active and reactive powers are given in two's complement in the range -32768 to +32767

✗ each energy counters takes 3 channels (48 bits), being split in 3 parts (1-2, 3-4 and 5-6) to be combined as described in a following paragraph

Output section

The module can feature 1 output address for resetting the energy measurements and the hour-meter; this address has to be enabled, if required, by the configuration panel as described in the following. The output section, if enabled,

report 2 digital points forcing, when activated, the following actions:

✗ Point 1: reset the energy counters
✗ Point 2: reset the hour-meter

DFANA-M configuration panel

The configuration panel available in BDTools and DCP IDE allows the setting up of DFANA-M module as required.

The configuration of the module is performed through the **Domino** bus as described in the following.

When using DCP IDE, all DFANA-M modules installed in the plant must be declared in the configuration of DFCP, specifying the addresses as in the following example (supposing to have a single DFANA-M module with base address 22 and 3 used addresses, with output address enabled):

DFANA-M = (I22, I23, I24, O22)

From the main menu of DCP IDE select Configuration, Energy Management, and then DFANA-M; the window in Figure 1 will be shown.
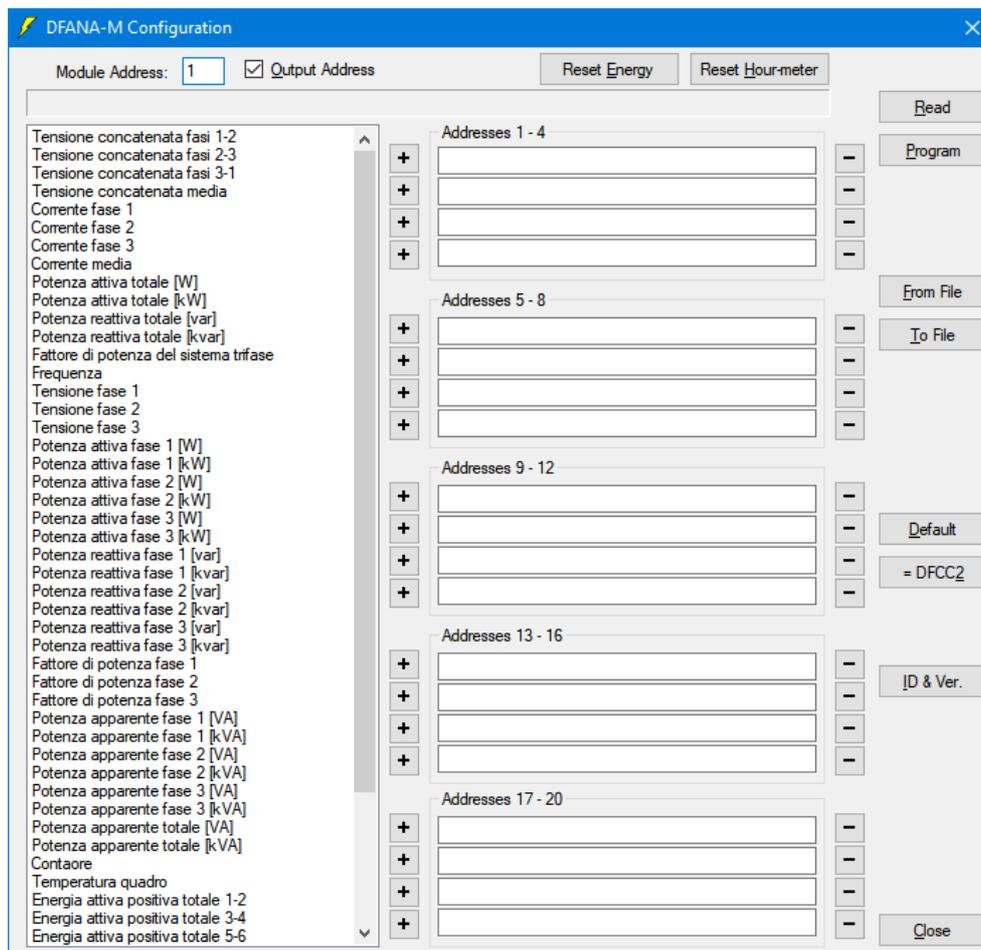

Figure 1: DFANA-M configuration panel

The left side of this window contains all parameters that can be reported by DFANA-M module, while the middle section of the window shows 5 groups of 4 addresses for a total of 20 address; insert the desired measurements in the chosen addresses selecting them in the list on the left side and then press the little button + near to the position where that measurement has to be inserted. To remove a measurement from the channel press instead the little button -.

Additional options in this windows are the following:

Module Address: it is the base address of DFANA-M module to be configures or to be read.
Output Address: enabling these parameter, the output address of DFANA-M will be activated (the value of the output address will be the same assigned to the base address).
Reset Energy: reset the energy counters.
Reset Hour-meter: reset the hour-meter.
Read: transfer the current configuration of DFANA-M to the configuration window.
Program: transfer the configuration currently displayed in the window to DFANA-M.
From File: load from a file the settings of DFANA-M and show them in the configuration window.
To File: save on a file the settings shown in the configuration window.
Default: remove all measurements from the configuration window (but not from DFANA-M).
=DFCC2: fills the table with the same measurements of DFCC2 module (for APPs iCasaMia and aCasaMia).
ID & Ver.: ask to DFANA-M the ID code and the firmware version.
Close: quit the configuration panel.

As said before, the module will take a number of addresses (1 to 20) depending on the current compilation of the table shown in Figure 1.
If an empty table has been sent, then DFANA-M will take for default a single address reporting a null measurement.

Concerning all the measurement of active, reactive and apparent power, it is possible to choose from the list in the configuration panel the measured units between W or KW (or VAR/KVAR for reactive power, or VA/KVA for apparent power) as in the following figure.

Total active power [W]
Total active power [kW]
Total reactive power [var]
Total reactive power [kvar]

The choice must be done considering that the maximum value which can be transferred on the bus is

- ✗ -32768 to 32767 for active and reactive power
- ✗ 65535 for apparent power

If the installed powers do not override 32767 W (or Var), then choose the 1st case, otherwise choose the 2nd one (so that it is possible to report up to 32767 kW or kVar). Idem for apparent power.

Concerning the active and reactive energy counters, each value is made by 6 bytes, therefore 3 addresses are needed for each counter (e.g. total active power 1-2, 3-4 and 5-6). The total value of the energy in kWh (or kVarh for reactive power) will be given by the formula:

65536x(Energy 1-2) + (Energy 3-4) + (Energy 5-6)/1000

For instance, suppose to have:
(Energy 1-2) = 35
(Energy 3-4) = 33897
(Energy 5-6) = 59

The energy value will be then:
65536x(35) + (33897) + (59)/1000 = 2.327.657,059 kW

that means more then 2327 MWh.

Mapping

The map of DFANA-M module can be displayed by BD-Tools or DCP IDE as shown in the example of figure 2.
Like for all the group that can be displayed in the map, it is possible to place labels near to each measurement for an immediate visual identification.
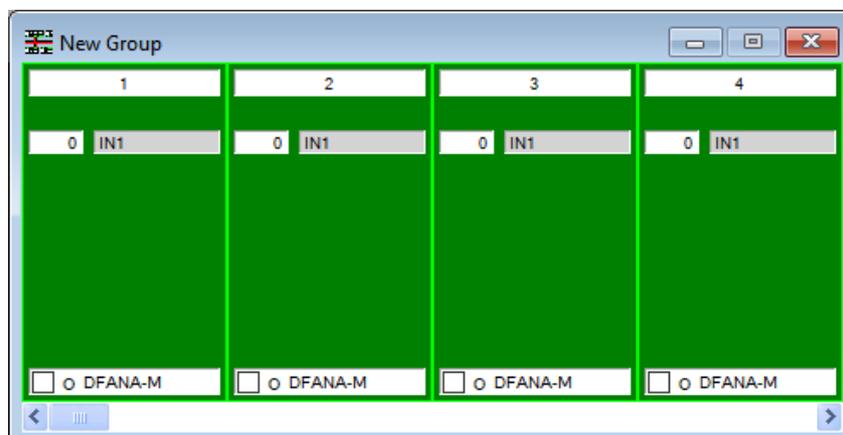

Figure 2: Map of DFANA-M module

Parameters settings of DFANA-S

The communication parameters of DFANA-S module must not be modified from their factory settings e they must be: Adr=1, Bps=9.6, Par=None, Stop=2

Technical characteristics

Power supply, bus side	By specific centralized power supply mod. DFPW2
MAX current consumption bus side	Equivalent to 2 standard modules
Communication protocol	MODBUS RTU, slave address = 1
Communication parameters	9600 baud, no parity, 8 data bits, 2 stop bits
RS485 cable type	Twisted pair, shield is not needed (if available, connect it to terminal Sh)
RS485 cable max lenght	5 meters
Operating temperature range	-5 ÷ +50 °C
Recommended operating temperature range	+5 ÷ +40 °C
Storage temperature	-20 ÷ +70 °C
Protection degree	IP20

Note: For more information about the technical characteristics of the measurements section DFANA-S, refer to the user's manual DFANA-S_xxMIT.

Outline dimensions
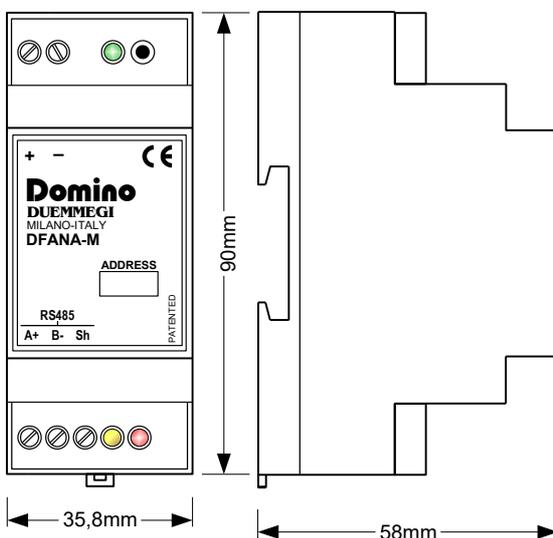
Correct disposal of this product

(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 essential requirements of the following directives and norms:
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.