ModANA-M: network analyzer module for Contatto bus

The couple of modules ModANA-M and ModANA-S allows the measurements of several electrical parameters of a three-phase or single-phase network. ModANA-M module interfaces directly to the Contatto bus, thus making the measurements immediately available and easy to use. The measurements are also showed on the front panel of ModANA-S by a back-lighted LCD display.

Among the several available measurements, shown on the display (with the symbol showed in the following table), ModANA-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]

ModANA-M module also provides the possibility to reset:

✗ Energies
✗ Hour-meter

ModANA-M module features a 5-way removable terminal block for the connection to Contatto bus and a 3-way fixed terminal blocks for the connection to ModANA-S module. Regarding the terminal blocks, the connections and the several possible settings of the analyzer measurement section of ModANA-S, refer to the related User Manual (ModANA-S_xxMIT).
A green LED near to the bus terminal block lights when the module is powered; the two LED TX and RX flash when the communication between the two modules is active.

ModANA-M module is housed in a standard DIN 2M modular box for rail mounting; ModANA-S module is housed in a standard 3M modular box for rail mounting.

*Note: ModANA-M can work only in plants where MCP XT or MCP 4 controller has been installed.*

Address programming

ModANA-M module takes, in dynamic mode, up to a maximum of 5 consecutive input addresses and, if enabled, 1 output address equal to the base address. The base address must be lower or equal to 123 and it has to be assigned by FXPRO programmer. A white label on the front panel allows writing the assigned base address. The effective amount of taken addresses depends on the number of measurements to be transferred on the bus; this setting must be executed by the specific configuration tool provided by MCP IDE like described later in this manual.

Wiring diagram

The following schematic diagram shows the connection between ModANA-M, ModANA-S and Contatto bus.
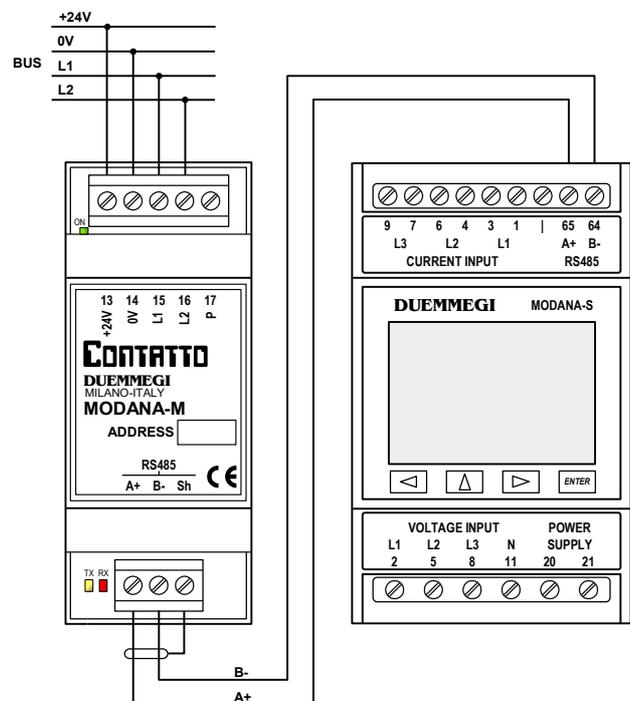
For details about the connection to the three-phase or single-phase line and to the aux power supply, refer to the related User's Manual (ModANA-S_xxMIT).

Information reported on the bus

Input section

As said above, ModANA-M module takes, inside Contatto bus, up to 5 addresses with 4 channels 16-bit format, each one reporting the measurements chosen during the setting up. The values reported in the channels of the several addresses are expressed in the measured units selected during the setting up, taking attention to the following details:

✗ the power factors are given in two's complement in the range -1000 to +1000

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

✗ each energy count takes 3 channels (48 bits), and it is 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 MODANA-M configuration panel, as described in the following. The output section, if enabled, features a single channel (CH1) with 2 digital points forcing, when activated, the following actions:

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

ModANA-M configuration panel

The configuration panel available in MCP IDE release 3.2.5 or higher allows the setting up of ModANA-M module as required.

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

All ModANA-M modules installed in the plant must be declared in the configuration of MCP XT or MCP 4, specifying the addresses as in the following example (supposing to have a single ModANA-M module with base address 22 and 3 used addresses, with output address enabled):

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ModANAM = ( I22, I23, I24, O22 )
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From the main menu of MCP IDE select Configuration, Energy Management and then MODANA-M; the window in Figure 1 will be shown.
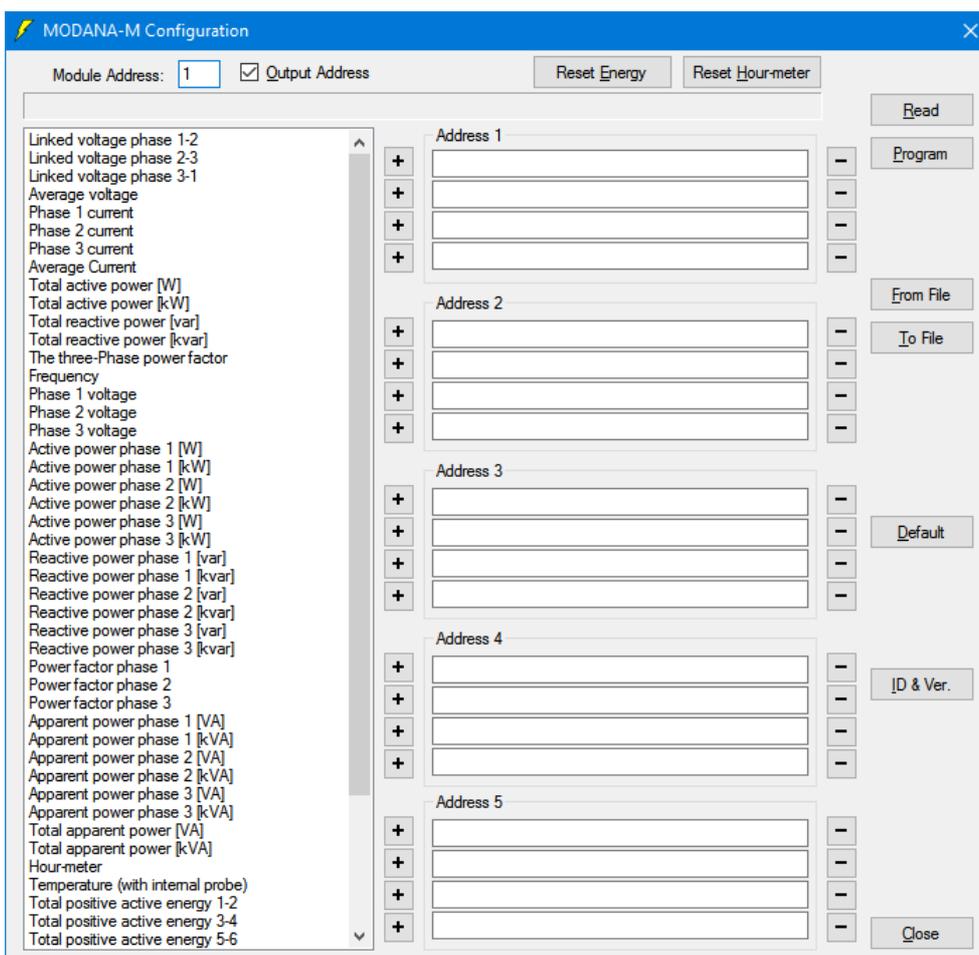

Figure 1: ModANA-M configuration panel

The left side of this window contains all parameters that can be reported by ModANA-M module, while the middle section of the window shows up to 5 addresses of the module, each one made by 4 channels (lines); insert the desired measurements in the channels 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 inthis windows are the following:

Module Address: it is the base address of ModANA-M module to be configures or to be read.
Output Address: enabling these parameter, the output address of ModANA-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 ModANA-M to the configuration window.
Program: transfer the configuration currently displayed in the window to ModANA-M.
From File: load from a file the settings of ModANA-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 channels shown in the configuration window (but not from ModANA-M).
ID & Ver.: ask to ModANA-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 5) depending on how the the table shown in Figure 1 has been filled.
If an empty table has been sent, then ModANA-M will take for default a single address reporting 4 null measurements.
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).

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 powers do not exceed 32767 W (or Var) choose the first case, on the contrary choose the second one in order to report up to 32767 kW or kVAr . The same choice (VA or kVA) must be done for apparent power.

Concerning the active and reactive energy counters, each value is made by 6 bytes, therefore 3 channels 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 following 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 kWh

that means more than 2327 MWh.

Mapping
The map of ModANA-M module can be displayed by MCP IDE as shown in figure 2.

Like for all the groups that can be displayed by MCP Visio, it is possible to place labels near to each measurement for an immediate visual identification.

Setting ModANA-S parameters
The RS485 communications parameters of ModANA-S analyzer module should not be changed from their factory settings and they must be:
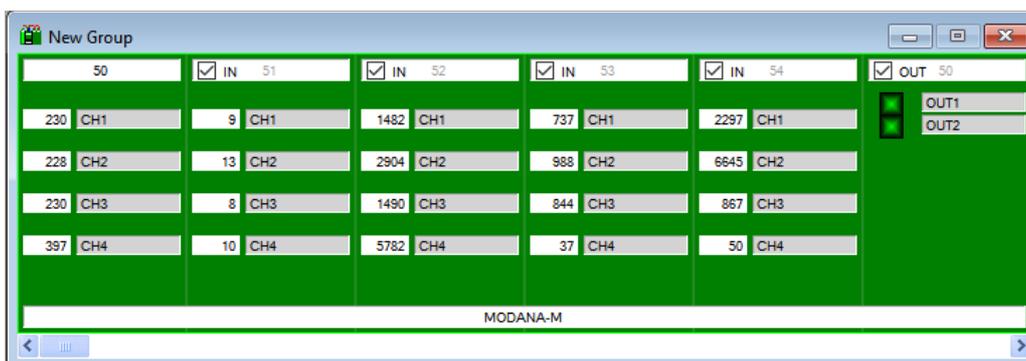Adr=1, Bps=9.6, P=None, Stop=2

Figure 2: Map of ModANA-M module

Technical characteristics

Power supply, bus side	24V === ± 25% SELV
MAX current consumption bus side	35mA
Interface for ModANA-S module	RS485
Communication protocol	MODBUS RTU slave address = 1
Communication parameters	9600 baud, no parity, 8 data bits, 2 stop bits
RS485 cable	Twisted pair, shield not required (if available, connect it to SG terminal)
Max length RS485 cable	5 meters
Operating temperature range	-10 ÷ +50 °C
Storage temperature	-30 ÷ +70 °C
Protection degree	IP20

Note: For more information about technical characteristics, connections and settings of the measurements section ModANA-S, refer top ModANA-S_xxMIT manual.

Outline dimensions
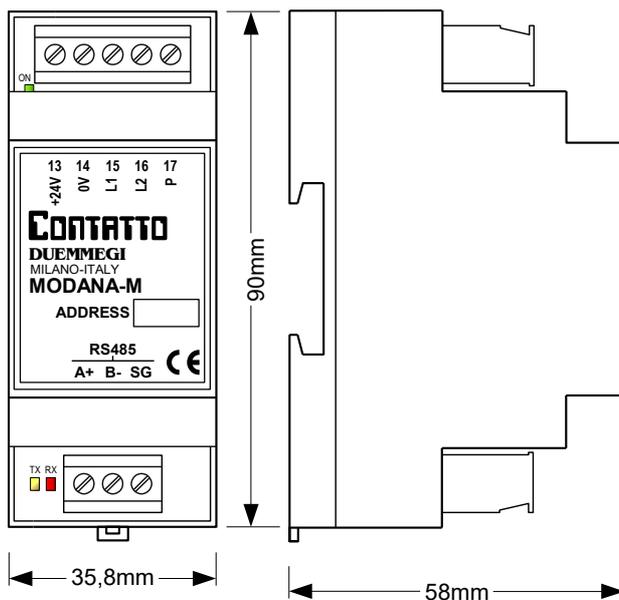
Correct disposal of this product

(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.