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USER'S MANUAL AND MAINTENANCE

MICROPROCESSOR DISPLAY F1X5_RS
WITH MODBUS RTU SERIAL OUTPUT RS232, RS485

Manual purpose

This manual has been designed by the Manufacturer to provide the necessary information regarding the instrument to those who are authorized to carry out safely its installation, maintenance, dismantling and disposal. All the necessary information for the buyers and planners can be found in the "Sales catalogue".

Besides than adopting good technical construction methods, the information should be read carefully and strictly applied. Inobservance of this information could cause risks for the health and safety of people and economical damage. This information, provided by the Manufacturer in the original language (Italian) is also available in other languages to satisfy legislative and/or commercial needs.

This manual must be kept in a good condition by a responsible person in an ideal place so that it is always available for consultation. In case of loss or deterioration of the manual, a replacement should be requested directly from the manufacturer quoting the manual's code.

This manual reflects the state of skill of the instrument at the time of input on the market: however the manufacturer reserves the right to make changes, add or improve the manual without giving any reason to hold the present manual inadequate.

Identification of the equipment

The identification plate represented is applied to the instrument. To find the identification code of the instrument, consult the sales catalogue.

**Environmental conditions**

Temperature setting: min. 0°C, max. + 50°C.

It is forbidden to use the instrument other than its specific use and in potentially explosive conditions or where anti-explosive elements are used.

Storage

Here below are some references to be followed for the storage of the instrument

Avoid environments with excessive humidity and those exposed to bad weather (avoid open areas). Avoid putting the instrument directly on the ground. Store the instrument in its original packing.

Conformity declaration and EC marking

The instrument answers to the following Communitarian Directives:

2014/30/EU Electromagnetic compatibility, 2014/35/EU Low voltage, 2011/65/EU RoHS.

Maintenance

Reparations should be done only and exclusively at the FIAMA technical assistance centre.

Turn off the power before touching the internal parts. Clean the external plastic parts using a soft, damp cloth with ethylic alcohol or water.

Do not use hydrocarbon solvents (petrols, diluants): using these products could affect the proper mechanical functioning of the instrument.

Calibrations and tests

It is advisable to calibrate the instrument periodically, once every working year. To do the calibration, follow the calibration procedure indicated in the present manual.

For any kind of technical assistance request, contact the sales department of the Manufacturer directly indicating the information given on the identification plate, the number of hours used and the type of defect.

Manufacturer's responsibility

The manufacturer declines any responsibility in case of:

- Using the instrument contrary to the national safety and accident-prevention laws.
- Wrong installation, inobservance or wrong procedures of the instructions provided in the present manual.
- Defective electrical power supply.
- Modifications or tamperings.
- Operations carried out by untrained or unqualified personnel.

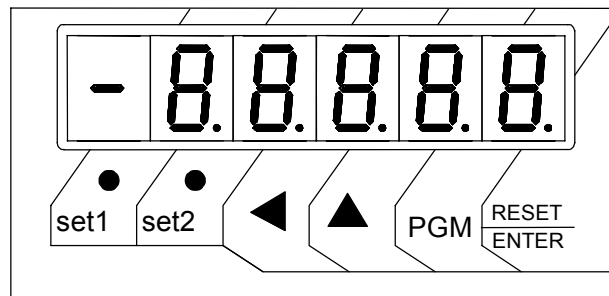
The safety of the instrument also depends on the strict observance of the procedures indicated in the manual: always operate the instrument in its functioning capacity and carry out a careful routine maintenance.

- All phases of inspection and maintenance should be done by qualified personnel.
- The configurations provided in the manual are the only ones permitted.
- Do not try to use them anyway contrary to the indications provided.
- The instructions in this manual do not substitute but accomplish the obligations of the current legislation regarding the safety laws.

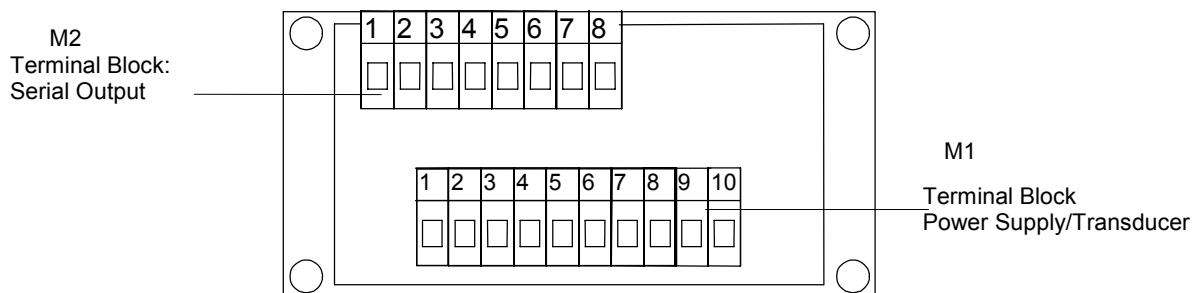
Description

The F1X5_ is a mono-bidirectional microprocessor multiple keyboard counter, that processes signals supplied by incremental transducers (encoders, optical lines, etc...) on a 5 digit display (reading scale -99999 +99999). The programming of this microprocessor is carried out by means of four keys on the frontal panel, after introducing a password. The microprocessor allows the operator to set the input pulse correction factors, and to multiply these factors by a 6 digit coefficient. The device has a serial output connection RS485 (or RS232) with MODBUS RTU protocol to dialogue with remote units. This instrument can keep its data in memory also when the machine is switched off thanks to a not volatile Eeprom memory. The Reset-Enter digit is employed to input a Preset quote too. By means of the input located on the terminal-board you can switch on the Reset or Preset functions. This instrument is set inside a 48 x 96 panel case according to DIN 43700.

Front view



Rear view



Installation

Before installing the instrument, read the following warnings:

- Connect the instrument strictly following the instructions of the manual.
- Carry out the connections using the correct wires within the limits of the tension and power supply as indicated in the technical data.
- The instrument does not have an ON/OFF switch, hence it comes on when connected to the power supply. For safety reasons, the equipment connected permanently to the power supply requires a bi-phasal selector switch which should be within easy reach of the operator.
- If the instrument is connected to any apparatus not isolated electrically, carry out an earth connection to avoid it being connected directly through the structure of the machine.
- It is the responsibility of the user to check, before using, the correct settings of the parameters of the instrument to avoid damage to persons or things.
- The instrument cannot function in a dangerous environment (inflammable or explosive). It can be connected to elements that operate in the same atmosphere only through appropriate interfaces, according to the current safety regulations.
- Avoid dust, humidity, corrosive gases, heat sources.
- Do not block air vents, the work temperature should be maintained between $0 \div 50^{\circ}\text{C}$.

Power supply

- Before connecting the instrument, check that the power supply tension is within the permitted limits and that it corresponds to the one indicated on the tag.
- Carry out the electrical connections with the instrument disconnected.
- For the power line to instruments and sensors, a power supply line separate from that of the power is required : it is necessary to use an isolating transformer.
- The power line should foresee a device that separates the set fuses of the instruments and should not be used to regulate, meters, etc.
- If the network tension is very disordered (eg. from the change-over of the power units, motors, inverters, welders, etc.), use the appropriate filters of the network.
- If an earth connection is needed, ensure that the plant has a good earth system: tension between neutral and earth $<1V$ and the resistance $<6\ \Omega$.

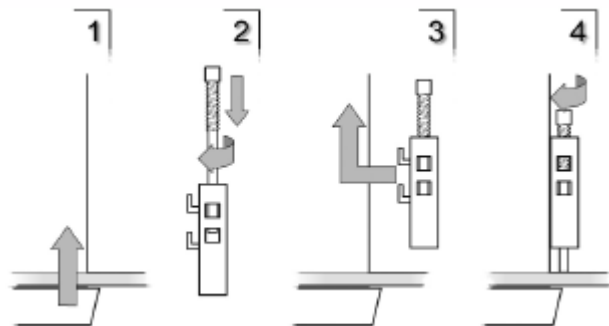
Connections entries and exits

- Physically separate the entry wires from those of the power supply, the exits and the power connections; use twined and shielded wires with the display connected to the earth only at one point.
- Connect the exits of adjustments, alarms (meters, electrovalves, motors, ventilators, etc.) assembling units RC (resistance and condenser in series) parallel to the charged inductives that work alternatively.

Assembly of the instrument

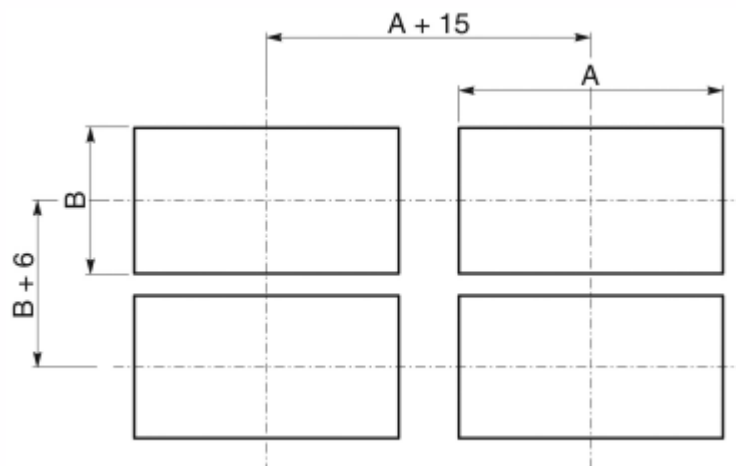
To carry out the correct installation of the instrument, it is necessary to follow the shown procedure:

- Insert the instrument in the opening provided.
- Screw the screw on the fixing block.
- Hook the block to the instrument through the joints.
- Block the instrument by screwing the screws of the two blocks.
- Then carry out the electrical connections.



To assemble several instruments placed side by side, it is necessary to follow the interaxes as shown in the design.

The articles A and B can be read under space dimensions found in the present manual.



PROGRAMMING

In the scheme below you can find the programming digits associated to their peculiar functions:

- PGM** To start the programming
- ▲ To increase the number, which is being modified.
To select the constant to modify
- ◀ To proceed from one numeral to the following one.
To leave the constant programming sections

RESET/ENTER To confirm the data you have just inserted

Press **PGM** To start the programming section: the number "000" , whose first numeral on the right flashes, is displayed. At this point you are requested to insert the number **273** in the following way:

press ▲ to increase the flashing number

Press ◀ to select the flashing number

After introducing **273** pls. confirm by means of **RESET/ENTER** . For some seconds you will read the word "Set1" followed by its own value.

N.B.: If you input a false password, the instrument will immediately leave the programming phase.

Press **RESET/ENTER** and modify the constant value by means of the digits ▲ ◀

Press **RESET/ENTER** again to confirm your choice

Press ▲ to start working with other constants or

Press ◀ to leave the programming section

The constants, which have to be programmed, and can be run over by the digit ▲ are the following ones:

SEt 1	Threshold for relay 1, not used in version without relay
SEt 2	Threshold for relay 1, not used in version without relay
DISUAL	The display shows a value after 1 encoder revolution
IMPULS	Impulse number after one encoder revolution
ndEE	Decimal numbers
PRESET	Preset quote
NRSS	Zero setting
INPUt	Input selection (encoder or proximity sensor)
FILTEr0	Debounce of the count inputs
rELE	Start of the output relay , not used in version without relay
nodSEt	Thresholds for the relays, not used in version without relay
baUDe	Baud rate serial port communication
Addr	Address device

Constants

SEt 1 **Threshold for Relay 1**

Not used in version without relay.

SEt 2 **Threshold for Relay 2**

Not used in version without relay.

VISUAL Value which Corresponds to 1 Encoder Revolution

This instrument can correct the impulses, and multiply them by a coefficient, which corresponds to the ratio between constant **VISUAL** and **IMPULS**. If you programme these two constants correctly the display will visualize the value you need with a certain number of impulses (they are reckoned in the inputs). The programmed value of this parameter represents the value visualized on the display.

The interval value of this count is programmable between 0 ÷ 999999.

IMPULS Number of Impulses for every Encoder Revolution

The value, which should be programmed in this section, represents the number of impulses for every encoder revolution, this is to say the division factor of input impulses.

The interval of the allowed values is 0 ÷ 999999.

Example 1:

If you have a 100 impulse/rev. Encoder, and for every revolution you need to visualize 123,4567 pls. follow the next description: VISUAL=1234 and IMPULS=100 . If you need to input a decimal number in the second position too, pls. insert N.DEC=1.

N.B: In order to reduce the approximation error we suggest you to multiply VISUAL and IMPULS by 10 or 100 or 1000 . With reference to the above mentioned values you will get :123.4567 x 100 =123456 and IMPULS=10000.

The value will be composed by 6 numerals (instead of 4) for every visualization.

Example 2:

If you have a proximity sensor, and after 10 impulses you need to see the value 7, pls. programme in the following way: VISUAL=7 and IMPULS=10.

ndEC Decimal Numbers

This constant shows the decimal point position : programme 0 if you have not any decimal number, 1 for 1 decimal number, ecc... Accepted values: from 0 to 4.

PrESEt Preset

This instrument allows you to programme a value which will be shown after pressing RESET/ENTER or after activating the Reset input in the key-board according to the scheme M.Azz. "Zero setting" .

The allowed values are included between -999999 and 999999.

nR55 Zero setting

By means of the zero-setting programming you can select the function of the instrument after choosing the RESET/ENTER digit or after starting the RESET in the terminal board.

The Reset function zeros the visualized quote on the display, while the Preset shows the value, which has been programmed in the constant **PrESEt** before hand.

According to the following scheme, please choose your preferred type of zero setting :

nR55	PRESET Input	RESET/ENTER Digit
0	Reset	Disabled Digit
1	Preset	Disabled Digit
2	Reset	Reset
3	Reset	Preset
4	Preset	Reset
5	Preset	Preset
6	Disabled Input	Reset
7	Disabled Input	Preset
8	Disabled Input	Disabled Digit
9	Disabled Input	Delayed Reset (press for about 3 sec)

INPUT**Inputs**

By means of this constant you can programme the input types, and count according to the following scheme:

INPUT	Input
0	Bidirectional count from an encoder with 2 quadrature channels
1	Monodirectional count with input coming from a sensor or a mechanical contact : A = count impulses (from open to closed) B = count direction: when B is open, the count increases, when B is closed the count decreases *
2	Monodirectional count with input coming from a sensor or a mechanical contact: A = Count impulses (from open to closed) B = count direction: when B is open the count increases, when B is closed the count decreases
3	Bidirectional count with inputs coming from sensors or mechanical contacts : A = Increasing count impulses from open to closed phase B = Decreasing count impulses from open to closed phase
4	Bidirectional count with inputs coming from sensors or mechanical contacts : A = Increasing count impulses from closed to open phase B = Decreasing count impulses from closed to open phase

* B has to be connected to GND if the sensor is NPN; to +12V if the sensor is PNP (see connection scheme)

FILTR0**Debounce Filter for Count Inputs**

If you use an input coming from a mechanical contact in order to avoid debounce impulses you have to programme this constant "1". In this case you can start a filtre of 10Hz in the count inputs, which avoids interferences in the opening or in the mechanical connection of the instrument.

This constant can have only a 0 value (except for the filtre), and 1 (working filtre).[It does not matter if you chose a bidirectional encoder with quadrature channels in the opening phase! (INPUT CONSTANT = 0)].

rELE**Output Relays**

Not used in version without relay.

nodSEt**Relay Thresholds Outside the Password Section**

Not used in version without relay.

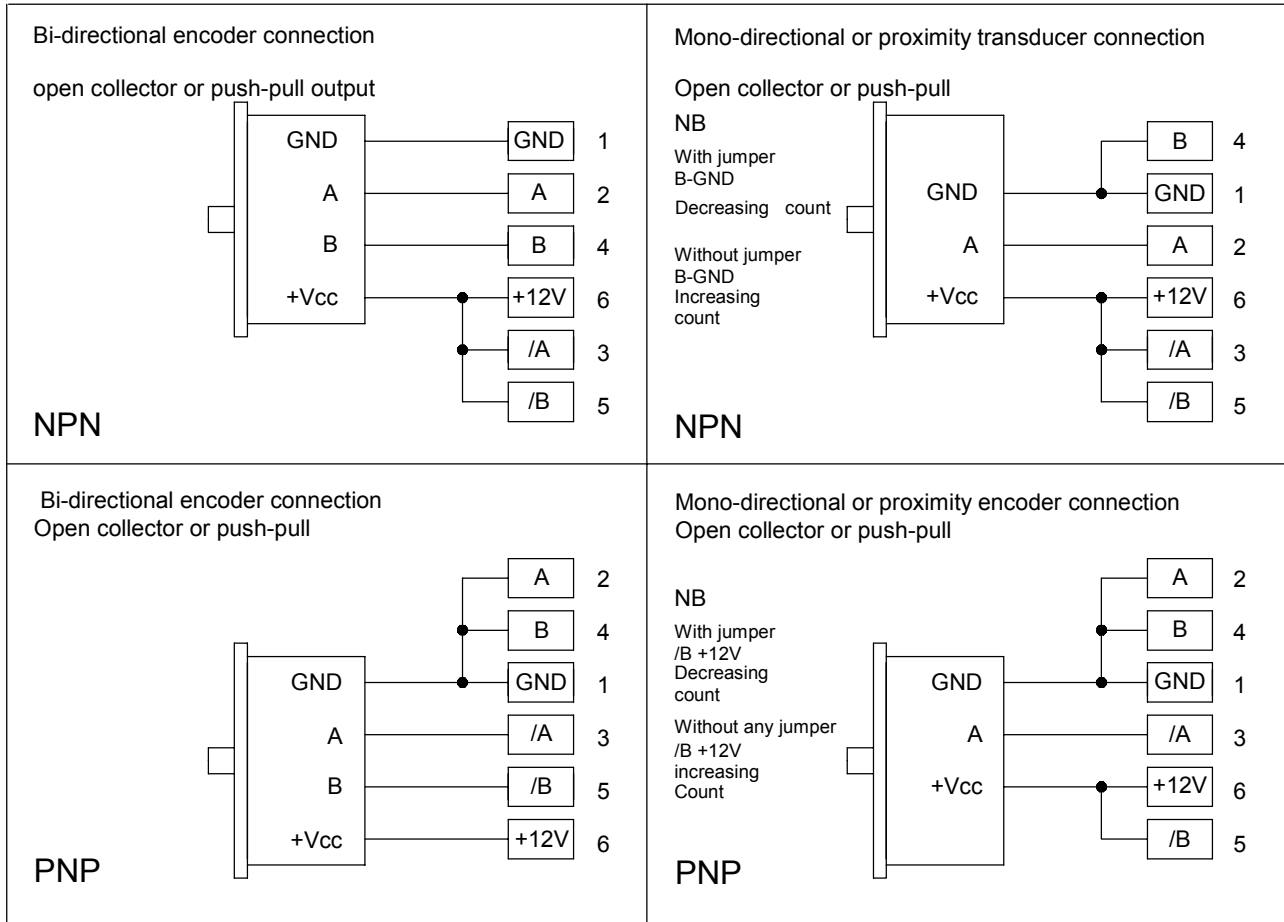
baUDE**Baud rate serial port communication**

baUDE	Baude rate
0	600
1	1200
2	2400
3	4800
4	9600
5	19200

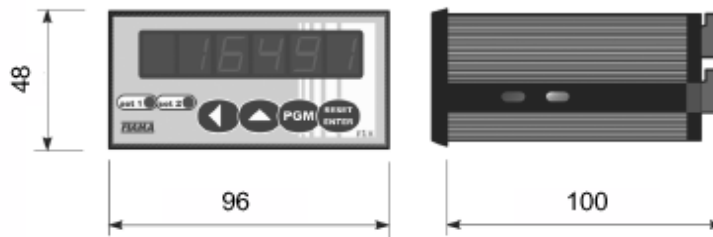
AddrES**Address device**

This is the identification address of the unit, it must be unique for every device connected to the bus network, admitted value from 1 to 247.

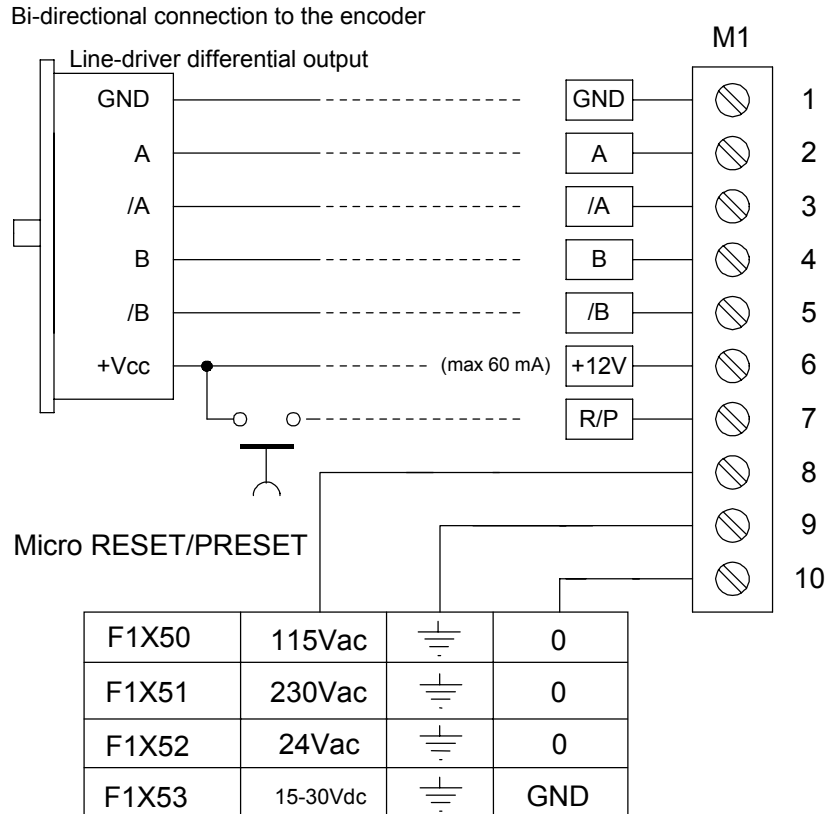
Transducers connection scheme Terminal Block M1



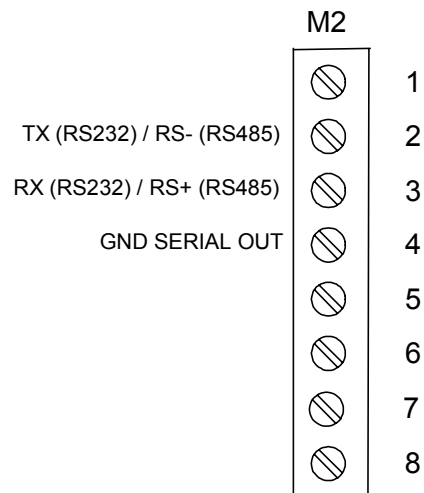
Overall dimensions



Connections scheme



SERIAL OUTPUT CONNECTION



NB: only one serial output port (RS232 or RS485) is active.
Please refer to F1X5 model.

Further Information on the making of the two CRC bytes are available on the site www.modicon.com.

The F1X5 MODBUS commands are:

0x03: multiple reading of registers

0x10: writing of several registers.

0x03 READING OF REGISTERS

To read the registers of the instrument, the master must send a query composed as follows (every element is a byte):

ADDRESS | 0x03 | START_REG_HI | START_REG_LO | N_REG_HI | N_REG_LO | CRC_HI | CRC_LO

- START_REG_HI | START_REG_LO is the address at the starting 16 bit for the reading
- N_REG_HI | N_REG_LO is the number (16 bit) of the registers to be read

The instrument replies with the following message:

**ADDRESS | 0x03 | NBYTE | DATA_1_HI | DATA_1_LO | DATA_2_HI | DATA_2_LO | ...
| CRC_HI | CRC_LO**

- DATA_1_HI | DATA_1_LO | DATA_2_HI | DATA_2_LO | ... is the sequence of the data read..

NBYTE is the number of the given bytes that follow

0x10 WRITING OF REGISTERS

To write the registers of the instrument, the master must send a query composed as follows (every element is a byte):

ADDRESS | 0x10 | START_REG_HI | START_REG_LO | N_REG_HI | N_REG_LO | NBYTE | DATA_1_HI | DATA_1_LO | DATA_2_HI | DATA_2_LO | | CRC_HI | CRC_LO

NBYTE is the number of the given bytes that follow.

The instrument replies with the following message:

ADDRESS | 0x10 | START_REG_HI | START_REG_LO | N_REG_HI | N_REG_LO | CRC_HI | CRC_LO

ATTENTION!!: to make operative the new value introduced you must send the “reload parameter” command writing in the Operation Register (*) (address 0x15) the value 0x01.

Exceptions management:

In case the slave recognizes an error in the query received and addressed to it, it replies with an exceptional message composed as following:

ADDRESS | FUNCTION_CODE + 0x80 | EXCEPT. CODE | CRC_HI | CRC_LO

The Exception Code can be one of the following:

- 01 → Illegal Function:** The function code received in the query is not valid.
- 02 → Illegal Data Address:** The address received in the query is not valid.
- 03 → Illegal Data Value:** A value contained in the query is not valid.

REGISTER TABLE

Register	Address Hex	N° of byte register
Threshold for relay 1, HIGH (#) (not used w/o relay)	0x00	2 byte (HIGH byte don't care)
Threshold for relay 1 LOW (#) (not used w/o relay)	0x01	2 byte
Threshold for relay 2 HIGH (#) (not used w/o relay)	0x02	2 byte (HIGH byte don't care)
Threshold for relay 2 LOW (#) (not used w/o relay)	0x03	2 byte
Visual HIGH	0x04	2 byte (HIGH byte don't care)
Visual LOW	0x05	2 byte
Impuls HIGH	0x06	2 byte (HIGH byte don't care)
Impuls LOW	0x07	2 byte
Decimal N°	0x08	2 byte (HIGH byte don't care)
Preset HIGH	0x09	2 byte (HIGH byte don't care)
Preset LOW	0x0a	2 byte
Zero setting	0x0b	2 byte (HIGH byte don't care)
Input selection	0x0c	2 byte (HIGH byte don't care)
Filter debounce input	0x0d	2 byte (HIGH byte don't care)
Relays mode (not used)	0x0e	2 byte (HIGH byte don't care)
Time activation relays (not used)	0x0f	2 byte (HIGH byte don't care)
Thresholds relays under password (not used w/o relay)	0x10	2 byte (HIGH byte don't care)
Absolute counting value HIGH (#)	0x11	2
Absolute counting value LOW (#)	0x12	2
Relative counting value HIGH (#)	0x13	2
Relative counting value LOW (#)	0x14	2
Operation Register (*)	0x15	2 byte (HIGH byte don't care)

(#) this parameter is expressed in encoder count number, then is not multiplied by VISUAL/IMPULS correction factor. The value read from serial port is equal to the display value only if VISUAL/IMPULS =4.

Technical Features

Power supply	115Vac, 230Vac, 24Vac, 15÷30Vdc ±10%
Line frequency	50/60 Hz
Power absorbtion	3 VA
Display	-99999; 999999
Inputs type	Optoisolated
Encoder power supply	12Vdc (max 60mA)
Count input	Open collector NPN/PNP Push-pull Differential Line driver Mechanical contact
Input maximum frequency	10 KHz
Count possibility	Bi-directional Monodirectional (counting up) Monodirectional (counting down)
Serial port connection	RS232 or RS485 MODBUS RTU protocol
Working temperature	0-50°C
Relative humidity	10-90%
Size (with terminal box)	48x96x100 mm
Drilling template	45x92 mm
Front case protection	IP54
Electromagnetic compatibility	2014/30/EU
Low voltage	2014/35/EU
RoHS	2011/65/EU

Manufacturer

All communications to the manufacturer should be addressed to:

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FIAMA srl is not responsible for any damage to persons or things caused by tamperings and wrong use and in any case that are not consistent with the features of the instrument.