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USER AND MAINTENANCE MANUAL

EP43RS / EP46RS ELECTRONIC HOLLOW SHAFT DISPLAY  
WITH SERIAL OUTPUT

**Manual purpose**

This manual has been designed by the Manufacturer to provide the necessary information regarding the EP43RS / EP46RS display to those who are authorized to carry out safely its installation, maintenance, removal and disposal. All the necessary information for the buyers and planners can be found in the Sales documentation. In addition to adopting good technical construction practices, the information should be read carefully and strictly applied. Failure to observe 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 good conditions by a responsible person in an ideal place so that it is always available for consultation. In case this manual is lost or deteriorates, a replacement should be requested directly from the manufacturer indicating the manual's code. This manual reflects the state 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 further notice.

**Identification of the equipment**

The identification label is applied on the instrument.

To determine the identification code of the instrument, consult the sales documentation.

**Environmental conditions**

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

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

**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 packaging.

**Conformity declaration and EC marking**

The instrument respects the following Communitarian Directives:

2014/30/EU Electromagnetic compatibility, 2011/65/EU RoHS.

**Maintenance**

The instrument does not need particular maintenance except cleaning, only with a soft cloth dampened with ethyl alcohol or water. Do not use hydrocarbon solvents (petrol, thinners, etc.): the use of these products could affect the proper function of the instrument.

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

**Calibrations and tests**

It is advisable to calibrate the instrument periodically, once every working year.

To conduct calibration, follow the calibration procedure described in the present manual.

**Technical Support**

For any kind of technical assistance, contact the sales department of the Manufacturer directly indicating the information given on the identification label, 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 applicable national safety and accident-prevention laws.
- Incorrect installation, inobservance of, or incorrect procedures in contrast with the instructions provided in the present manual.
- Defective electrical power supply.
- Modifications or tampering.
- Operations carried out by untrained or unqualified staff.

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 carried out by qualified staff.
- The configurations indicated in the manual are the only ones permitted.
- Do not attempt to use the instrument in anyway which is contrary to the indications provided.
- The instructions in this manual do not substitute but are a complement to the obligations of the current legislation regarding safety laws.

**Installation**

Before installing the instrument, heed the following warnings:

- a) Connect the instrument strictly following the instructions of the manual.
- b) It is the responsibility of the user to check, before using, the correct setting of all parameters of the instrument to avoid damage to persons or things.
- c) The instrument CANNOT function in a hazardous environment (inflammable or explosive).
- d) The unit contains parts sensitive to electrostatic charge, therefore handling of the internal electronic cards has to be carried out with appropriate care to avoid permanent damage.

**Description**

The electronic position indicator EP43RS / EPRS, which includes within the same case a position transducer and a display unit, is a device for measuring linear or angular movement which is compact, easy to install, and applicable in several types of industry (packaging, woodworking, aluminum, sheet metal, etc.)

This device simplifies and quickens format changeover on machines with manual axis adjustment (for ex. with hand-wheels).

The backlit LCD display has two lines: the first shows the current value and the second shows the value to be reached in the new machine configuration.

The target value is communicated to the EP43RS / EPRS via a serial interface with the PLC to allow a manual changeover by handwheel. The two LEDs indicate if the target value has been reached or not.

With the 3 frontal keys it is possible to program the value on the display for every rotation of the hollow shaft and activate the following functions: reset/preset of the value, absolute/relative measurement, mm/inches conversion, and reading range in degrees.

The instrument must be powered externally with a 10-30VDC power supply and is equipped with an internal backup battery which assures that the value is updated and saved, even in the absence of external power, for a period of 6-8 years. When external power is not present, the display is off and the serial port is inactive.

The robust case of the EP43RS / EPRS is made of aluminum alloy which is billet machined and anodized while the hollow shaft is made of stainless steel and is supported by ball bearings.

**Programming**

To access programming of the parameters, keep pressed until **PASS** appears on the display. Then press **0** 2 times and 3 zeroes will appear. The first digit on the right will blink: using **▲** (digit increase) and **◀** (digit selection) insert the pass code which is 273 and confirm with **0**. In case of incorrect insertion of the password, the unit exits the programming mode.

The various parameters can be scrolled with and appear in the following order:

<b>u IS</b>	value to be displayed after one complete rotation of the shaft
<b>ndEC</b>	number of decimal places
<b>tRSt</b>	button activation mode
<b>Pr 50</b>	preset quote
<b>d lr</b>	count direction
<b>LooP</b>	backlash compensation value
<b>tGt</b>	target value
<b>InPoS</b>	tolerance around target value
<b>Addr</b>	device address
<b>bAUd</b>	serial port communication baud rate
<b>PAR</b>	parity bit

To modify the selected parameter press **0** two times (the first time displays only the value). With and set the desired value and confirm with **0**.

To set a negative number, press until the last digit on the left blinks then press once again and after press so that the minus sign will appear.

To exit programming press **◀**.

**Value to be displayed after one complete rotation of the hollow shaft:  $\mu IS$** 

This parameter, together with the following one, defines the value which is displayed after one rotation of the hollow shaft. The allowable range is from 0,0001 to 99999. The decimal place is set after programming the last digit on the left: after pressing, the decimal place will blink and with it can be moved to the desired position. Confirm with **O**.

**Number of decimal places:  $ndEC$** 

It is the number of decimal places to visualize on the display, allowed range from 0 to 4.

Example 1: if each rotation of the hollow shaft will cause a displacement of 50, set  $\mu IS=50$  and  $ndEC=0$ .

Example 2: if each rotation of the hollow shaft will cause a displacement of 12,345 and the desired output on the display is 12.3, set  $\mu IS=12.345$  and  $ndEC=1$ .

**Button activation mode:  $LRSE$** 

This parameter programs the button functions.

The value is a number with 3 digits, each corresponding to a button: the digit on the right sets the **O** button, the digit in the middle sets while the last digit on the left sets.

The possible values are in the following table:

VALUE	◀	O	▲
0	Not active	Not active	Not active
1	mm/inch conversion	Reset	ABS/REL measurement
2	Not active	Preset	Not active
3	Not active	Fast Preset	Not active
4	Not active	Delayed Reset after 3s (*)	Not active
5	Not active	Delayed Preset after 3s (*)	Not active

(\*) Delayed means that to activate the function (reset or preset), it is necessary to keep **O** pressed for approximately 3 s.

**1) Reset:** reset function of the displayed value; after pressing **O** the displayed value is set to zero.

**2) Preset:** preset function of the displayed value; after pressing **O** the displayed value becomes equal to the value in the **PrSetO** parameter, which can be set immediately after **LRSE 1** (when the digit on the right is set to 2).

**3) Fast Preset:** the fast setting of the displayed value on the display; after pressing **O**, **PrSetO** appears and pressing 2 times **O** it is possible to set the value directly (use and then confirm with **O**). This function is useful when the displayed value must be corrected often.

**4) Delayed Reset:** to activate the function reset it is necessary to keep **O** pressed for approximately 3 s

**5) Delayed Preset:** to activate the function preset it is necessary to keep **O** pressed for approximately 3 s

**ABS/REL measurement:** Enables switching from an absolute to relative value; after pressing, the displayed value is temporarily set to zero to measure a relative motion of the shaft. On the display the rel icon indicates that the current display is relative to the reference point that has just been created. Pressing again causes the absolute value to be displayed and the abs icon will appear.

Note: The ABS/REL function is enabled only if the measurement is in mm units.

**mm/inch conversion:** Pressing converts the measurement from millimeters to inches and back. When in inch mode, the inch icon will appear and the displayed value will have an additional decimal place. When the parameter  $ndEC=4$  the mm/inch conversion is not available.

**Count direction  $d lr$** 

It sets the count direction, allowed values are 0 or 1.

By setting 0, the displayed value increases turning the shaft clockwise.

By setting 1, the displayed value decreases turning the hollow shaft clockwise.

**Target Value  $tGt$** 

Value shown on the first line of the display which indicates the position which must be reached by manual adjustment.

**Backlash compensation value  $LoP$** 

If set different to zero, at each inversion of the rotation direction, the displayed value does not change until the shaft completes a rotation which is equal to or above the backlash compensation value.

Set a positive value for backlash compensation in the forward direction and a negative value for compensation in the reverse direction.

**Tolerance around target value  $InPoS$** 

When the actual value reaches inside the window around the target value (which is defined by the tolerance) the red LED is turned off the green LED is turned on.

Example: with target value  $tGt=50$  and  $InPoS=10$ , the green LED is on between 40,1 e 59,9.

**Address device  $Addr$** 

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

**Baud rate serial port communication  $bAUD-r$** 

VALUE	Baud rate
0	9600
1	19200
2	38400
3	57600
4	115200

**Parity bit  $PAr$** 

This constant sets the serial communication parity bit.

VALUE	Parity
0	even
1	odd
2	no parity, 2 stop bit

**Adjustment of displayed value**

After the installation of instrument on the machine and setting of all parameters, in order to visualize on the display the correct value it is necessary to carry out the reset or preset.

Position the shaft in a position where the correct measurement that has to be visualized is known exactly (for example the stroke end point) or measure the position in that position of the shaft. Program parameter

$nEASt$  with value 3 in the first digit on the right and exit programming.

Now press **O** and **PrStD** will appear, press again 2 times **O** and set the correct value to display, then confirm with **O** The display will now show the desired value.

If the required value is zero, instead of the preset function it is possible to use the reset function by setting 1 in the first digit on the right in the  $EASt 1$  parameter so that pressing **O** will bring the displayed value to zero.

Now that the instrument is adjusted, it is necessary to insert the desired  $EASt 1$  parameter to avoid accidental reset/preset of the displayed value.

**Battery status**

The battery status is indicated by an icon on the display and by the modbus vBatt register.

The modbus vBatt register can have three different values:

- 0x0000 if the battery is charged and is functioning optimally.
- 0xFFFF if the battery charge level is below a critical threshold: in this case it is necessary to substitute it within 15 days.
- 0x00FF if the battery is completely discharged, absent, or malfunctioning. In this case the battery must be immediately replaced because in this state it is not guaranteed that the instrument will be able to maintain the correct value when the 24VDC power supply is off.

**NOTE: if this value is present when the machine is turned on, it is necessary to execute a homing or reset procedure because the value measured by the instrument is no longer consistent with the actual position of the machine.**

**Battery substitution**

The internal backup battery assure that the value is updated and saved, even in the absence of external power, for a period of 6-8 years depending on the working conditions.

When the battery icon appears on the display it is necessary to substitute it within 15 days, according to the following procedure:

- power the unit with the external power supply to prevent losing the correct position
- remove the two hex screws and lift the battery cover (note: the cover is connected to a small flexible cable and special care must always be used to prevent damaging or pinching the cable)
- remove the old battery
- insert a new ½ AA 3,6V battery respecting the polarity (the negative pole must be oriented towards the inside of the unit)
- replace the battery cover making sure the cable is positioned correctly along the battery.

**Serial connection protocol**

The device has a serial output connection RS485 with MODBUS RTU protocol to dialogue with remote units. When a power is supply is not available, the serial port is not active and the instrument does not respond to the master. Below is a list of the registers of the instrument with the relative addresses and number of bytes. It is possible to read and write these registers, using a reading/writing ModBus compatible query.

ADDRESS	REGISTER NAME	SIZE (bytes)	RANGE
0	<b>DIS</b> value to be displayed after one complete rotation of the shaft	4	-99999...99999
2	decimal point position for <b>DIS</b>	2	0...4
3	<b>ndEC</b> position of decimal point	2	0...4
4	<b>ntRSt</b> button activation mode	2	000... 0x151
5	<b>dIr</b> count direction	2	0...1
6	<b>PrSD</b> Preset0 value	4	-99999...99999
8	<b>LoaP</b> backlash compensation value	4	-99999...99999
10	<b>InPoS</b> target value tolerance	2	0...59999
11	<b>uBAEt</b> battery status	2	0x0000 = battery OK  0xFFFF = battery needs substitution  0x00FF = battery completely depleted or malfunctioning(refer to battery status section)
12	<b>QuotA</b> Current value	4	-99999...99999
14	<b>EGt</b> Target value	4	-99999...99999
16	SAVE setting the value 0x5A4E, the parameters transferred by modbus are saved in the EP43RS / EPRS permanent memory	2	0x5A4E

The system (slave) transmits by an instrument MASTER on the serial line through a protocol type MODBUS RTU words of 8bit; 1 stop bit and parity bit according to the **PAR**. constant which is set.

The physical interface is RS-485. Every EP4-<sub>RS</sub> has an identifying address. The protocol is based on a QUERY/RESPONSE structure: the slave devices reply to the queries with a message that contains the identifying address and the requested data.

Further Information on the creation of two CRC bytes are available on [www.modicon.com](http://www.modicon.com).

The activated MODBUS commands are:

0x03: multiple reading of registers

0x10: writing of several registers.

0x06 writing of one 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

DATA\_1\_HI | DATA\_1\_LO | DATA\_2\_HI | DATA\_2\_LO | ... is the stream of data read.

### 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):

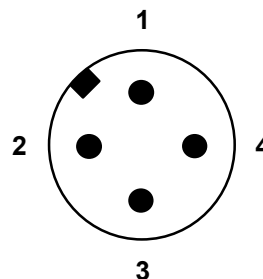
ADDRESS | 0x10 | START\_REG\_HI | START\_REG\_LO | N\_REG\_HI | N\_REG\_LO | NBYTE | DATA\_1\_HI | DATA\_1\_LO | DATA\_2\_HI | DATA\_2\_LO | ..... | CRC\_HI | CRC\_LO

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

### Connection scheme

- 1 10 ÷ 30VDC positive power supply
- 2 GND negative power supply
- 3 RS+ RS485 serial port positive
- 4 RS- RS485 serial port negative

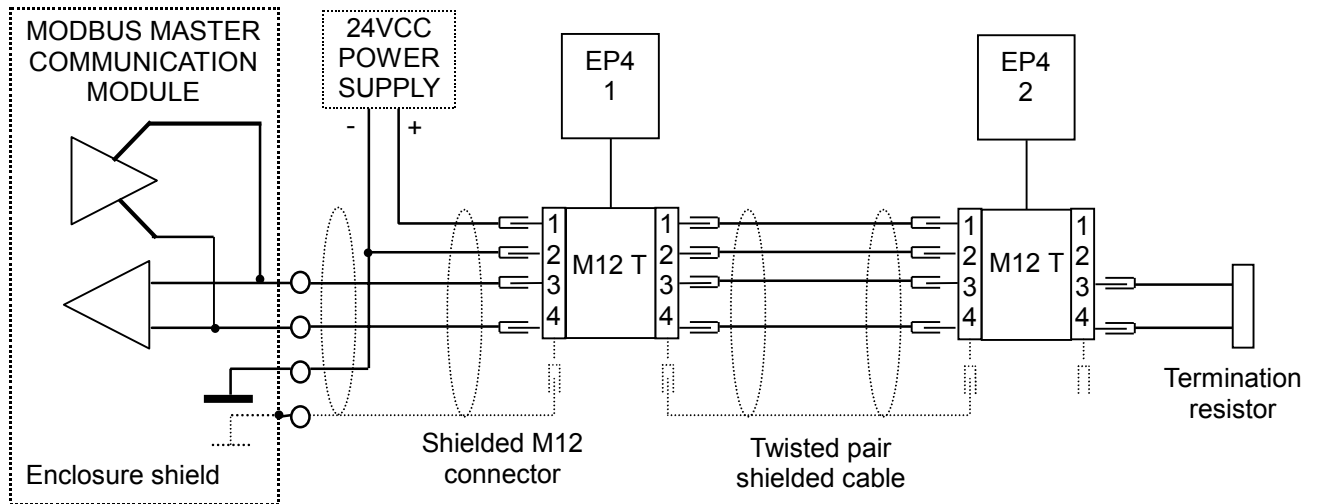


Male connector: 4 pin M12x1 A-coding.

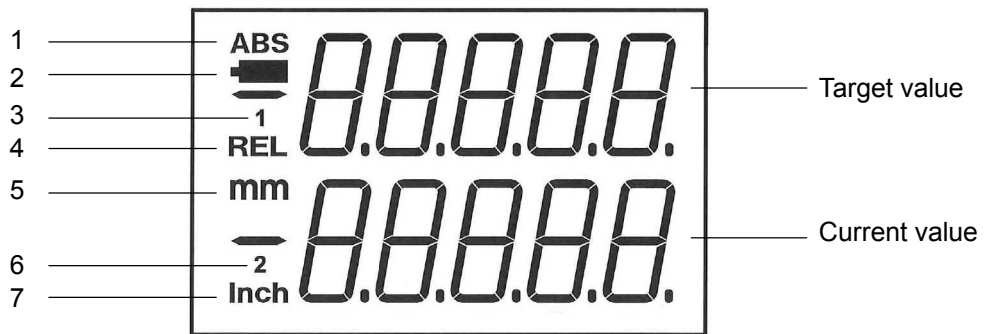
The pin configuration of both connectors is identical.

**Please pay attention: an incorrect electrical connection could damage the unit.**





**Display symbols legend**



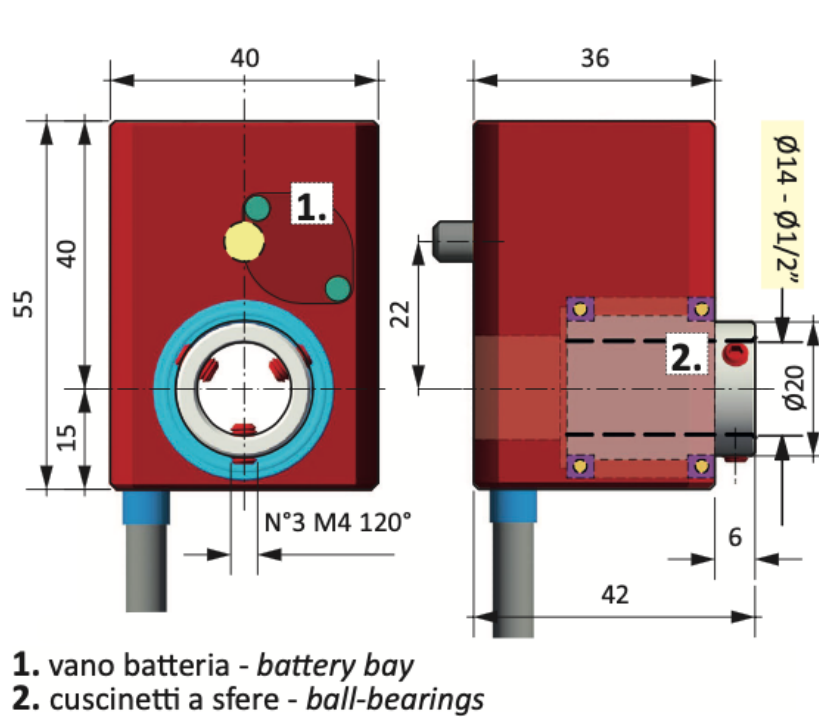
- 1. Absolute mode indicator
- 2. Low battery indicator: begins to blink when the level of charge is lower than a certain value and when it stays on is necessary to change the batteries within 15 days.
- 3. origin 1 indicator (not used)
- 4. Relative mode indicator
- 5. mm unit indicator
- 6. origin 2 indicator (not used)
- 7. inch unit indicator

**Error messages:**

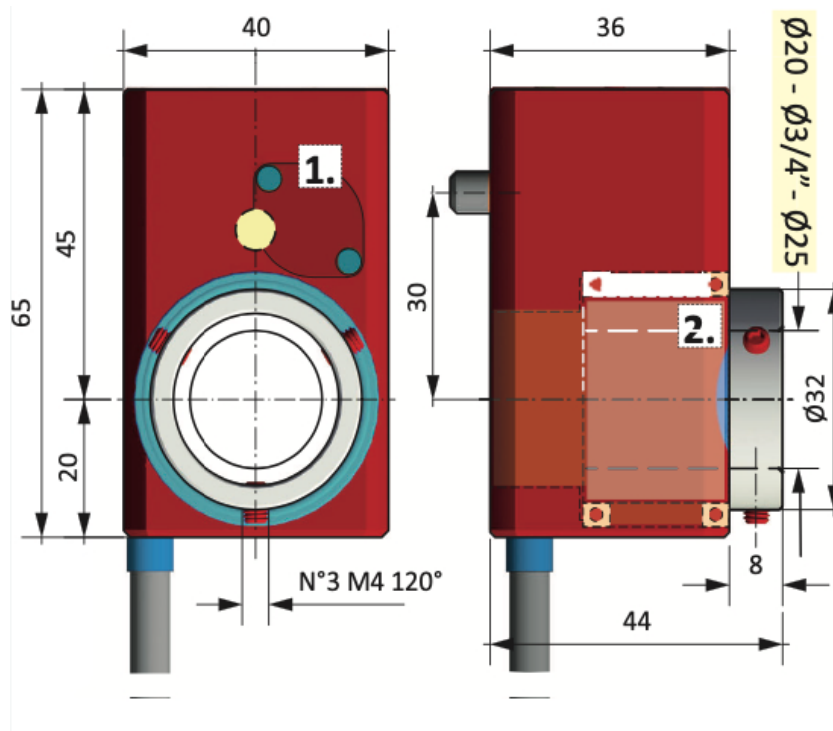
**ouEr** the current value exceeds the maximum value that can be visualized (from -99999 to 999999);

**Dimensions**

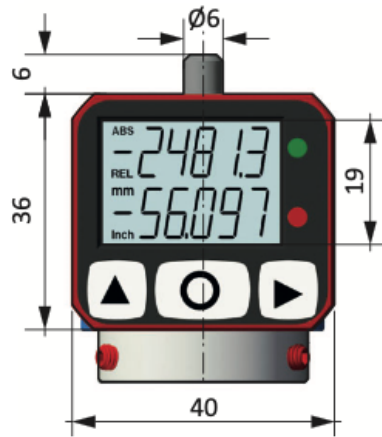
**EP43RS**



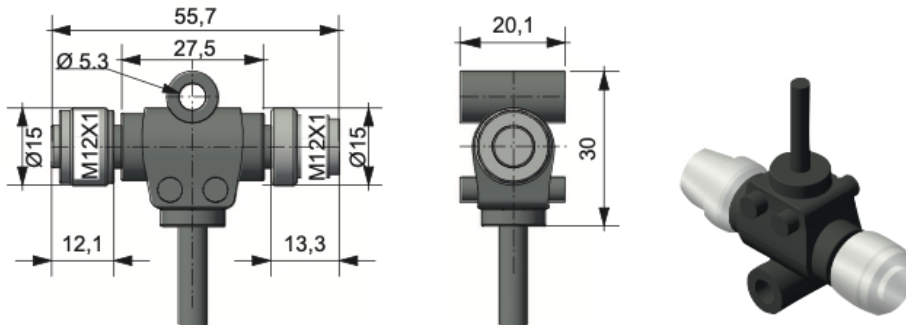
**EP46RS**



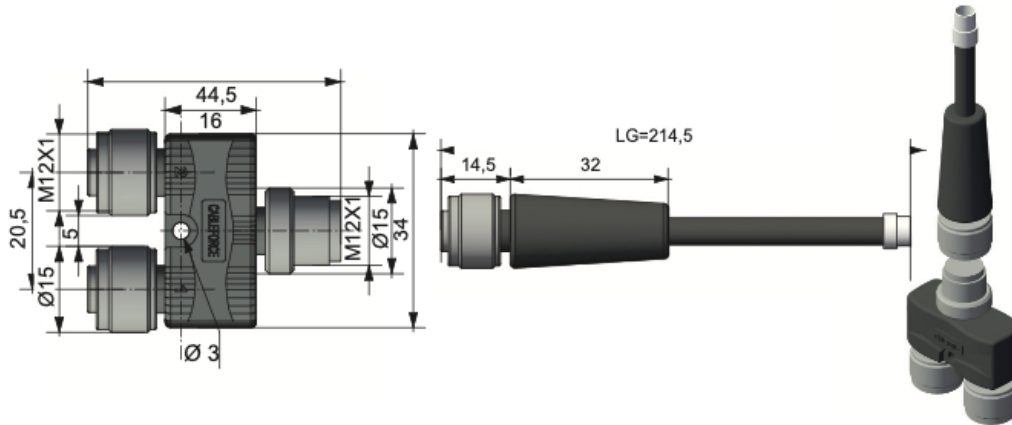
**Top view**



**M12T connector**



**M12Y connector**



**Technical specifications**

Power supply	10-30 VDC, max 100mA
Battery life 6-8 years	3,6V 1/2 AA format
Hollow shaft diameter	EP43RS: Ø14, Ø1/2" EP46RS: Ø20, Ø3/4", Ø25
Max rotation speed	1000 RPM
Resolution	EP43RS: 3200 pulses/revolution EP46RS: 4000 pulses/revolution
Range	-99999; 99999
Display	high readability LCD with 10mm-high-digits
Keyboard	3 digits for programming and function activation
Serial port output	RS485 MODBUS RTU
Serial port connection (T or Y connector M12)	T or Y connector, 4 pin male-female M12x1, A coding
Available functions	reset/preset, absolute/incremental value, mm/inches conversion
Protection degree	IP65
Working temperature	0-50°C
Relative humidity	35-85%
Electromagnetic compatibility	2014/30/UE
RoHS	2011/65/UE

**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 tampering and improper use and in any cases that are not compatible with the features of the instrument.**

