OPERATING INSTRUCTIONS

MAGNETIC MEASURING SYSTEM

MPI-R10-RF
*(GN 7110)**

*(Produktcode gültig für Deutschland -
Product series valid only for Germany)

These operating instructions are valid for the following products:

CE.99971-W2   MPI-R10-RF-W2-IP54
CE.99976-W2   MPI-R10-RF-W2-IP67

Contents

elesa®

1. Safety Instructions

This device has been designed and manufactured in accordance with current legislation. To keep the product in this state, it must be assembled and used correctly, in strict compliance with the instructions contained in this instruction manual and with the following specific safety precautions. This manual is intended as an indispensable supplement to the existing documentation (catalogues, data sheets and assembly instructions).

Make sure that the user has read and understood the instruction manual and in particular this chapter "Safety instructions". In addition to the instruction manual, all legal regulations regarding accident prevention and environmental protection must be observed.General remarks

This equipment generates,uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

> ⚠ Use without respecting the specific descriptions/parameters, in combination with systems/ machines/processes to be controlled, can lead to product malfunction, which causes:
> - health hazards,
>
> - environmental hazards,
>
> - damage to the product and to its proper functionality.

The device must not be used:
- in explosion hazard areas;
- in medical/life support areas and equipment.

Do not open the equipment and do not apply any modifications! Modification of the equipment could adversely affect the reliability of the device and could lead to hazards! Do not attempt any repairs.
Always return any defective equipment to the manufacturer! Any breach of the integrity of the device as delivered will invalidate the warranty.

Configuration/Commissioning

In the event of abnormal behaviour (including change of operating conditions), the device must be shut down immediately. Installation and commissioning must only be carried out by adequately trained and authorised personnel. After correct assembly and commissioning, the device is ready for operation.

Maintenance/repair

Switch off the power supply to the equipment before carrying out any operation. Maintenance must be performed only by trained and authorised persons. Do not open or modify the device case. Tampering with this product can compromise the correctness and accuracy of its function.

In the event of a malfunction, do not attempt to repair the unit and contact the Elesa sales office.

2. Version and functionality

This manual was written for firmware version 1.0.xx of the device (see chap 10.6.5). Some menu items may not be described as they relate to functionalities that are additional, experimental or reserved for special use. In case of specific need, it is recommended to ask the Elesa service staff for assistance.

Elesa reserves the right, without further communication, to make improvements, additions, corrections to the menu items, that do not modify or affect the described functionality of the product but are necessary for the continuous improvement to which these products are subjected.

3. Device description

The MPI-R10-RF connected to the dedicated sensor Cable FC-MPI, combined with the Elesa magnetic band M-BAND-10, is a complete system for the measurement of linear and angular displacement. Characterised by extremely easy assembly, it allows precise alignment and positioning, reducing times and machining procedures to a minimum.

MPI-R10-RF mai features are:
- Multifunction LCD with 4 function keys.
- Absolute/ incremental mode.
- Programmable offset and targets function.
- Lithium battery powered.
- Accidental polarity inversion protection.

Mechanical and electrical characteristics	
Power supply	Lithium battery 1/2AA 3.6 V
Battery life	2.5 years
Display	7-digit LCD of 12 mm height and special characters
Reading scale	-199999; 999999
Number of decimal digits	programmable
Programmable measuring unit	mm, inches, degrees (angles)
Max operating speed [1]	1 ÷ 5 m/s programmable
Resolution [2]	0.01 mm - 0.001 in - 0.01°
Precision [3]	±0.03mm
Repeat accuracy [4]	0.0002xL mm (L is the measure in mm)
Self-diagnostic	battery check, sensor check, magnetic tape check
Protection level	IP65
Operating temperature	0°C ÷ +50°C
Storage temperature	-20°C ÷ +60°C
Relative humidity	max. 95% a 25°C without condensation
Environment	indoor use
Conditions of use	For use in closed and sheltered places only
Altitude	up to 2000 m
RF frequencies	2400-2416MHz

[1] The reading speed influences the battery life.

[2] Resolution: the smallest change in length that the system is capable of displaying.

[3] Precision: the maximum deviation of the value measured by the system from the actual one.

[4] Repeat accuracy: the degree of closeness between a series of measures of the same sample, when the single measurements are carried out with the conditions unchanged.

WARINING: The value of the maximum speed, the frequency of transmissions and the number of operations in general affect the battery life. Battery life depends on the conditions of use (setup, temperature, ...). The indicated value is an estimate made in temperature conditions > 20 ° C and <30°C and default setup. Furthermore, this value refers to the condition of the device when it leaves the Elesa factory. Long storage times must always be considered for the estimation of the battery life when the device becomes operational.
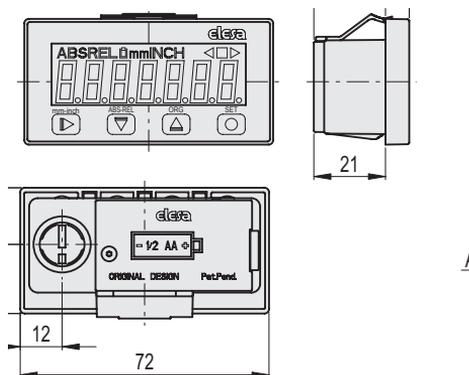
Fig. 3-1 – MPI-R10 - dimensional drawing

Sensor Cable

The sensor cable, FC-MPI, is made from a metallic enclosure containing the sensor electronic, a multipolar flexible cable and a connector to plug it in the MPI-R10-RF.

The sensor cable is available in different lengths.
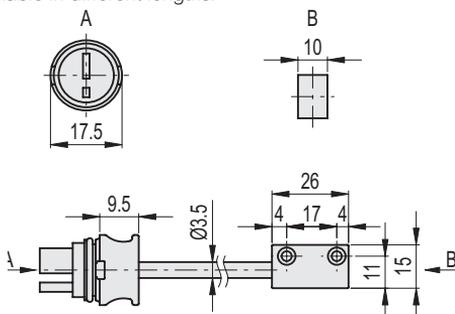
Fig. 3-2 – FC-MPI – dimensional drawing

Magnetic Bend

The magnetic band M-BAND-10 is made of two separate parts: the magnetic band and the cover strip.
The magnetic band is made of a magnetic tape, a carrier strip and an adhesive tape (Fig. 2).
The cover strip is made of a protection strip and an adhesive tape (Fig. 1).

M-BAND-10 Technical data	
Accuracy class	± 40 μm
Material	magnetic tape: nitrilic rubber
	carrier strip: stainless steel
	cover strip: stainless steel
	acrylic adhesive tape
Width	magnetic band: 10 mm ± 0.20 mm
	cover strip: 10 mm ± 0.20 mm
Thickness	magnetic band: 1.43 ± 0.15 mm
	cover strip: 0.23 mm
Magnetic pole pitch	5 mm
Operating and storage temperature	min -40°C max +100°C
Linear thermic expansion factor	17×10^{-6} K^{-1}

Fig.1

Cover strip

Protection strip (0.1 mm)
Adhesive tape (0.13 mm)

Fig.3
Proper assembly

Cover strip

Fig.2

Magnetic band

Magnetic tape (1 mm)
Carrier strip (0.3 mm)
Adhesive tape (0.13 mm)

Magnetic band
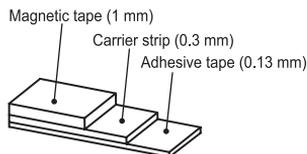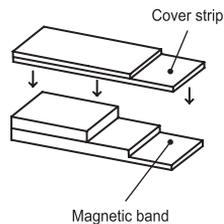
4. Installation

4.1. Display installation

1. Drill the panel according to the template dimensions reported.
2. Remove all drilling burrs before fitting the device.
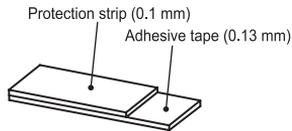3. Fit the lower part of the case into the housing.
4. Press onto the upper part until the case is completely snapped in.
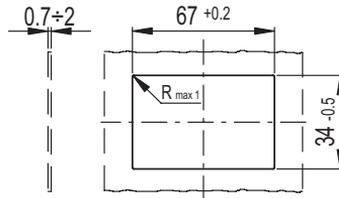
4.2. Sensor installation

Fix the magnetic sensor by using M3 screws (not included in the supply).
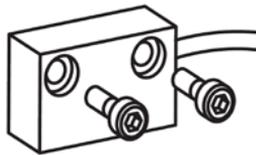
During the installation, use a planar spacer (max 1 mm is suggested) to grant the parallelism between the sensor and the magnetic band.
The maximum distance between the sensor and the magnetic band to ensure a correct reading of the displacement is 1mm.

4.3. Magnetic band installation

To mount the magnetic band follow the instructions below:
- Clean the mounting surface carefully.
- Remove the protective foil from the adhesive tape of the magnetic band.
- Stick the magnetic band on the mounting surface.
- Clean the surface of the magnetic band carefully.
- Remove the protective foil from the adhesive tape of the cover strip.
- Stick the cover strip on the magnetic band. The cover strip must be installed over the magnetic band to protect it from possible mechanical damages.
- In the absence of a seat for the housing of M-BAND-10, secure the ends of the cover strip to prevent unintentional peeling.

The mounting surface must be flat. Buckles or bumps will lead to measuring inaccuracies. To guarantee an optimal adhesion of the adhesive tapes, the mounting surfaces must be perfectly cleaned, dry and smooth. The following surface roughness is recommended: Ra <= 3,2 N8 (Rz <= 25). To maximize the adhesion install the strip applying pressure. Gluing should preferably be carried out at temperatures between 20 °C to 30 °C and in dry atmosphere.

WARNING

Once the installation is completed, the calibration procedure must be carried out as shown in chap. 10.6.2.

5. Display
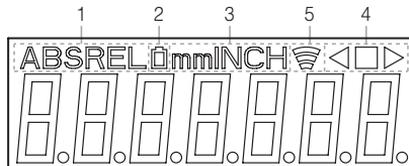
1. Absolute or relative mode indicator
2. Low battery level indicator
3. mm, INCH or degree unit of measure
4. Target position indication
5. RF connection indicator

6. Key's functions

Using these 4 keys is possible to move between the menus and set the working parameters. Furthermore is possible to configure some additional function using one or a couple of keys.

Key Or Key Combination	Operating Mode	Programming Mode
SET ○	Keep pressed for 3 sec to enter the Programming Mode: during the pressing, the word "Fooo" appears on the display to indicate the activation progress.	Select the item menu or confirm selection or insertion of the parameter value
ORG △	Keep the key pressed for 3 seconds to set the origin of the measurement. Programmable with one of the following options (see the $\_\_\_\_ 0 \_\_$ voice of the menu – chap. 10.3): **d_toG0** [DEFAULT]: when a target is loaded the display shows the distance to reach the target position. Pressing the key, on the display will appear the actual absolute position. **d_tArG**: when a target is loaded the display shows the actual absolute position. Pressing the key, on the display appears the target absolute position to reach **0FF**: the function is disabled.	While entering the numeric value of a parameter: Short press: increment the selected digit by one with each press. Press and hold: After one second incremental selected digit until released. While scrolling through menu items: Short press: scrolls upwards through the list of possible selections or menu items. Press and hold: upwards the list of possible selections or menu items.

elesa

Key Or Key Combination	Operating Mode	Programming Mode
ABS-REL ▽	Select between absolute and relative measure mode: It is possible to choose one of the following options (see the $\_\_0\_\_\_\_$ itemof the menu – chap. 10.3): *ArCLr* [DEFAULT]: switching from *ABS* to *REL* the counter is set to zero. *Ar*: switching from *ABS* to *REL* the counter is not set to zero. *0FF*: the function is disabled.	While entering the numeric value of a parameter: Short press: decreases the selected digit by one with each press. Press and Hold: after one second it decreases the selected digit until it is released. While scrolling through menu items: Short press: scrolls down the list of selections possible or the menu items. Holding down: scrolls down the list of possible selections or menu items.
mm-inch ▷	Unit of measure selection. The available options are: millimetres, inches and degrees. It is possible to choose one of the following options (see the $0_____$ voice of the menu – chap. 10.3): *ALL* [DEFAULT]: selectable units of between: mm, inch, D *nodEG*: selectable units between: mm, inch *0FF*: the function is disabled.	While scrolling through menu items: Exit While entering the numerical value of a parameter: Short press: selects the following digit Press and Hold: cancels the entry
SET ◯ + mm-inch ▷	Programmable with one of the following functions (see the $0\_\_\_\_\_0$ voice of the menu – chap. 10.3): *P_0rG* [DEFAULT]: show and allow you to set the *0riGin* parameter *P_0FS*: show and set the *0FFSEt* parameters *0FF*: the function is disabled.	None

Key Or Key Combination	Operating Mode	Programming Mode
SET + ABS-REL	In relative measure mode, resets the measure. In absolute measure mode it is programmable for one of the following functions (see the $\_\_0\_\_\_0$ voice of the menu – chap. 10.3): *L_0FFS* [DEFAULT]: Load one of the 10 stored offsets. *Set0rg:* Reset the origin in the current position (see chap. 8.5) *0FF*: the function is disabled.	None
SET + ORG	Programmable with one of the following options (see the $\_\_\_\_0\_0$ voice of the menu – chap. 10.3): *tArGEt*: the keys combination allows to load/program one of the 32 target positions (see chap.8.8). *0FF* [DEFAULT]: the function is disabled.	None

elesa

7. Switching on/off the device

7.1. Switching on the device

After you have read and understood the section "Safety Instructions", proceed by switching on the device.

To switch on the device, hold down ▷ while pressing the key ◯

The display will switch on and the device will be ready for use.

WARNING:
When the device is turned on, especially after a long period of storage, it is possible that some segments of the display remain abnormally lit during the startup phase. The phenomenon is transitory and does not affect correct operation and use of the device as it will disappear in a short time.

7.2 Switching off the device (for storage only)

To switch the system off :
- select the *rESEt* item from the main menu (see chap.10.6.1)

- using the keys △ ▽ ,scroll through the items to select *OFF*

- press ◯ to confirm.The display will switch off and the device will go into sleep mode.

8. Operational mode

8.1 Reference points, origin and offset

When the device is turned on or reset, the position of the sensor at that moment is set as the origin of the measure.The value attributed to this position is given by the parameters,Origin and Offset, which can be set by the user. Origin is an arbitrary number that can be set in the range -199999÷999999 depending on the resolution set and is to be considered the as the machine's limit switch value in its default conditions.The offset is added to Origin which is always an arbitrary value that can be set in the range -199999÷999999 depending on the resolution and which allows you to move the actual origin of the measure based on any changes in the machine configuration.

For example, a certain set point can operate different tools with relative displacements of the point of origin. For example, in the case of a tube cutting machine the device indicates the position of the stop that determines the length of the tube. The limit switch point is fixed but it does not necessarily correspond to a zero length of the tube and therefore Origin will be different from zero but always the same.

However, the machine makes it possible to mount different blades depending on the type of tube and these can have different positions and/or thicknesses.Therefore the actual length will have to be corrected with a determined value which will be memorised as an offset.

For greater flexibility of use, the MPI-R10 permits storage of up to 10 different offset values. To program the offset values see the $OFFSEt$ parameter in chap. 10.2.

However, during installation and for other specific applications, it is useful to be able to reset the internal reference value in another position. For this purpose, see chap 8.5.

WARNING: The value of the Origin parameters and the offsets are the same for the mm and inch units of measure and are displayed, depending on the unit of measure in use (see chap. 8.4), with the appropriate conversion coefficient. In the case of degrees, these parameters are totally different and independent from the previous ones.

8.2 Resolution

The device manages different measure display resolution values for each of the three managed units of measurement (mm, inch and degrees). The same display resolution set is used to set different parameters such as origin, offsets and targets.

WARNING: If the resolution of one of the units of measure is changed, to avoid setting errors, all the parameters that are affected are reset: Origin, offset, etc.: It is therefore advisable to decide and set the display resolution of all units of measure as a first step in installing the device. To make the most of the device's measure capacity, the resolution is automatically reduced if the measure to be displayed exceeds the capacity of the display. The measure on the display will flash.

In this case, the resolution variation is temporary (it is restored if the display is able to display the measurement with the set resolution) and has no effect on the set parameters.

8.3. Absolute or relative measure selection

Press the key to select the absolute or incremental measuring mode. The selected measure mode is shown on the display by the symbols:

ABS: absolute measuring mode

$REL:$ incremental measuring mode

It is possible to change the function of the key by choosing one of the options available in the menu item $\_\_\,0\,\_\_\_\_\_$
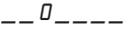
The available options are:

- $ArCLr$ (default): when changing from ABS to REL the counter is reset.

- Ar: when changing from ABS to REL the counter is not reset. Only in relative measure mode, the counter is set to zero by pressing + .

- OFF: the key is disabled and it's not permitted to change measure mode.

8.4 Unit of measure selection

Press the key ^{mm-inch}▷ to select the required unit of measure.

The available options are millimetres, inches and degrees.

The selected measure mode is indicated on the display by the symbols:

- mm: millimeters - $INCH$: inches - $°$: degrees

0 _ _ _ _ _ _

▷ ▽ △ ○

It is possible to change the function of the key ^{mm-inch}▷ by choosing one of the options available in in Programming Mode in the menu item 0 _ _ _ _ _ _ (see chap. 10.3).

The available options are:

- ALL (default): selectable units of measure: mm, inches and degrees.

- $nodEG$: selectable units of measure: mm, inch

- $0FF$: the key ^{mm-inch}▷ is disabled and it is not permitted to change the selected measure mode.

8.5 Internal reference point reset

It is possible to reset the internal measurement reference of the device in the ways described below.

By holding the key ^{ORG}△ down for more than 3s the $SEt\ 0rG$ message is displayed.

Pressing then the button ^{SET}○ confirms the choice and to reset the origin point to the current position.

It is also possible to enable the pair of ^{SET}○ + ^{ABS-REL}▽ keys to reset the internal reference, see chap. 10.6.1
In this case, when the two keys are pressed simultaneously, the $SEt0rg$ message is displayed.

Press the key ^{SET}○ to confirm the choice and to reset the origin point to the current position.

Alternatively, you can use the Reset command as described in the chapter. 10.6.1.

8.6 Reference point or offset settings

Using this key combination ^{SET}○ + ^{ABS-REL}▽ it is possible either to set an offset value choosing from those stored or to reset the device measurement references.

_ _ 0_ _ _0

▷ ▽ △ ○
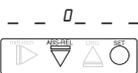
It is possible to change the function of the key combination by choosing one of the options available in the menu item _ _ 0_ _ _0

The available options are:

- L_OFFS (DEFAULT): the key combination allows you to select an offset .

- $SEtOrG$: the key combination allows to reset the origin.

- OFF: the keys combination ^{SET} ⃝ + ^{ABS-REL} ▽ is disabled.

WARNING: This function is available only in absolute measure mode.

If the L_OFFS option has been selected, pressing the key combination of keys ⃝ + ▽ will display the last used offset value (e.g. $OFFS0$).

It is possible to choose the desired compensation value among the 10 stored by pressing

the keys ^{ABS-REL} ▽ and ^{ORG} △ . Then, by pressing the key ^{SET} ⃝ , the selected offset value will be loaded and used in

the measurement. By pressing the key ^{mm-inch} ▷ , the operation will be cancelled. If the $SEt\ OrG$ option has been

selected, pressing the key combination ⃝ + ▽ the screen will show $SEt\ OrG$. By pressing the key ⃝ the origin of the measurement will be moved to current position and the display will show the value of the origin point given by the value of Origin + Offset .

8.7 Direct programming of Origin, Offset and Step parameters

The keys combination ^{SET} ⃝ + ^{mm-inch} ▷ can be programmed to allow direct access to the programming of the $OrIGIn$ or $OFFSEt$ parameters.

$0\_\ \_\ \_\ \_\ \_0$

▷ ▽ △ ⃝

It is possible to change the function of the keys combination chosing one of the available options in the menu voice $0\_\_\_\_\_0$ (see chap. 10.3).

The available options are:

- P_OrG (DEFAULT): direct programming of the absolute reference value ($OrIGIn$ parameter).

- P_OFS: direct programming of the compensation value ($OFFSEt$ parameter).

- OFF: the keys combination is disabled.

WARNING: The *OrIGIn, Step and OFFSEt* values are different and independent for length measurements (mm and inch) and for degrees measurements.

elesa

8.8 Targets

The MPI-R10-W2 permits to set up to 32 Targets allowing you to store any relevant and frequently used positions.

8.8.1 Programming the targets

To program the targets:
- activate the Programming Mode
- selet $tArGEt$ in the main menu (see chap 10.3).
- select $PrOG\_t$ (see chap.10.4).
- select the wanted memory location ($PtG\ 00$ to $PtG\ 31$) using the keys ▽ (ABS-REL) and △ (ORG) .
- press the key ○ (SET) to select.
- Follow the instruction in chap. 8.1 to set the wanted value.

8.8.2 Load a target

To load a target:
- selet $tArGEt$ in the main menu (see chap 10.3).
- select $LOAd\_t$ (see chap. 10.4).
- select the wanted target value ($LtG\ 00$ to $LtG\ 31$) using the keys ▷ (mm-inch) and △ (ORG)
- press the key ○ (SET) to select.
- The selected target value is displayed.
- Press ○ (SET) again to confirm or press ▷ (mm-inch) to go back to the target selection list.

WARNING:

While a target is active, it is not be possible to change the unit of measurement, set the origin and other functions accessible from the keyboard.

The absolute or relative measurement function remains available but remember that the target values, both stored on the device and sent via RF, always refer to the absolute value.

8.8.3 Direct access to programming and/or loading targets

The keys combination ○ (SET) + △ (ORG) allows direct access to the programming or loading of targets.
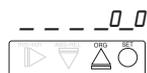
_ _ _ _ _0_0	
▷ ▽ △○	It is possible to change the function of the keys combination chosing one of the available otions in the menu voice $\_\_\_\_\ 0\_0$ (see chap. 10.4).

The available options are:
- $tArGet$: enable the direct load or program targets functions.
- OFF (DEFAULT): the keys combination SET ⭕ + ORG △ is disabled.

8.8.4 Indications for reaching the target position

When a target is selected ot is is sent by the PLC the device will suggest the direction of movement of the sensor to reach the target through the symbols ◀■▶ of the target direction indicators.

It is possible to set the $FLIP\_tG$ parameter (see chap. 10.2) to adapt the target position indication to the actual sensor configuration.

It is possible to set an acceptable tolerance value for the targets via the P_tOLL parameter so that the target position is considered reached when the difference between the set target and the current position is, in absolute value, less than P_tOLL.

The target direction indicators works, depending from the $FLIP\_tG$ and P_tOLL parameters, as in the following table.

	FLIP ◀	FLIP ▶	
M < T - Toll	◀	▶	T = set target
T - Toll <= M < T	◀■	■▶	M = measured value
M = T	■	■	Toll = tolerance (see P_tOLL)
T < M < = T + Toll	■▶	◀■	
M > T + Toll	▶	◀	

8.8.5 Display in target mode

By pressing the key ORG △ when a target is active,you can view the current position or the target position depending on the device settings.

`_ _ _ _0 _ _`

▷ ▽ ORG △ ○

It is possible to change the function of the key and the target mode chosing one of the available options in the menu voice `_ _ _ _0 _ _` (see chap. 10.3).

The available options are:
- d_tArG : when a target is activated, the display shows the actual absolute position and the direction to reach the target (see chap. 8.8.4). Pressing the key ORG △ the set target position is shown.
- d_to_Go (DEFAULT): when a target is activated, the display flashes showing the distance from the

elesa

set target and the idirection to reach it (see chap. 8.8.4). When the target is reached, less than the set

tolerance, the display shows the current position and stops blinking. Pressing the key ⬓(ORG) the display shows the actual absolute position.

- **OFF**: the key ◯(SET) is disabled.

8.8.6 Disabling the target

If the Target Mode is active, it can be cancelled by pressing the key ◯(SET): will appear the **StoPt** option.

Press the key ◯(SET) to confirm the return to Operational mode, otherwise press the key ▽(ABS-REL) to cancel. the keys combination ◯(SET) + ⬓(ORG) and confirm the **St0P_tG** command pressing the key ◯(SET). To keep the target selection press the key ▷(mm-inch).

y, it can be canceled by pressing, if activated, the ◯(SET) + ⬓(ORG) key combination and confirming the **St0P_tG** command by pressing the key ◯(SET). To maintain target selection, press the key ▷(mm-inch).

9. RF functionalities

MPI-R10-RF is compatible with the Elesa's wireless network that allow electronic meters and devices to communicate via radio with a PLC.

The Elesa's wireless network is made by the following components:

- One control unit UC-RF
- Max 36 electronic position devices or meter as DD51-E-RF, DD52R-E-RF or MPI-R10-RF

Fig.4
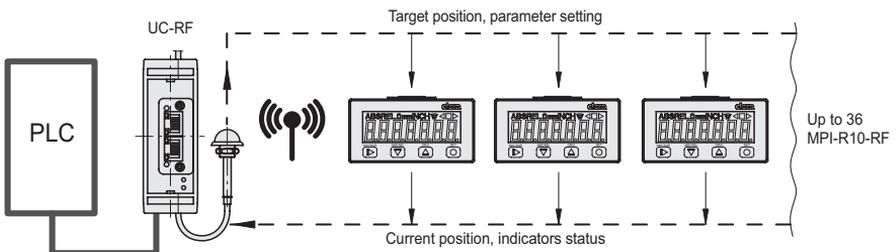
The UC-RF exchanges information with the MPI-R10-RF via radio frequency and makes it possible to:
- reading of the current position
- setting of the target position

- configuration of device parameters.

Through an interface, available for the most common industrial buses (ProfiNet, Ethernet/IP, Modbus/TCP ,...), the UC-RF control unit allows the exchange of this information with a PLC and/or a generic plant controller machine.

WARNING: The new generation network (W2) is not compatible with the previous one.

9.1 Device ID

Each Elesa's RF device of the W2 series is characterized by a 4-byte identifier uniquely assigned at the factory. This number, called device ID, can be viewed by selecting the *dd_Id* item in the *Radio* menu.

The number displayed is the least significant part of a decimal number from which it is possible to derive the Device ID according to the following rule:

byte 3	byte 2	byte 1	byte 0
Device type	Device ID		

Device type (HEX)	Associated device
00	Reserved
01	UC-RF – Profinet
02	UC-RF – ETH/IP
03	UC-RF – MODBUS
04	UC-RF - EtherCAT
20	DD52R-E
40	DD51-E
60	MPI-R10

9.2 Binding

The Device Id allows to recognize the device online and create a stable communication link with a UC-RF. The operation that allows this association is called Binding.

A device is born not associated with any UC-RF (unbound). When in operation, it transmits its data and these can be read by any reachable UC-RF.

The user can, by acting on UC-RF, via a specific command, request the remote device to associate. If the operation is successful, the remote device will communicate only with the associate UC-RF.

It is possible to check the ID of the associated UC-RF by choosing the *UC_Id* item in the *Radio* menu. If the device is not bound, 000000 will be displayed.

If you want to associate the remote device with another UC-RF you must perform the so-called un-binding

operation. This is done simply by selecting and then confirming the Unbin item in the Radio menu.

WARNING: Once no longer bound, the remote device will automatically re-associate with the first UC-RF that requests it. If the previously associated UC-RF is reachable by the RF signal, the remote device must also be removed from table of associated devices of the latter. Otherwise, as soon as the two devices were to get back in contact, they would reassociate.

9.3 Heartbeat

Remote devices broadcast their position and status at a fixed rate. By analogy, this transmission is called heartbeat (HB) and its frequency the heartbeat rate.

The parameters of this transmission can be configured by selecting the following items from the Radio menu:

- *HbrAtE* (HB Fast Rate): is the default transmission frequency of the device. It can be configured with a value from 0 to 7 which represents the time between one communication and another according to the following table:

Hbrte	THB (ms)
0	507.8
1	1015.6
2	2031.2
3	4062.4
4	8124.8
5	16249.6
6	32499.2
7	64998.4

- *HbFrAt* (HB Fast Rate): is the transmission frequency in fast rate mode. It can be configured with a value from 0 to 7 which represents the time between one communication and another according to the following table:

-*HbAUPd* (HB Auto Update): when activated, this function ensures that, if the position of the device has varied more than the allowed target tolerance (see the *P_tol* parameter), this will be immediately transmitted as if it is in HB Fast Rate mode.

HbFte	THB
(ms)	507.8
0	127.0
1	253.9
2	380.9
3	507.8
4	634.8
5	761.7
6	888.7
7	1015.6

WARNING: RF communications are quite energy-consumimng. As a result, battery life is greatly affected by the HB frequencies you set.

9.4 Targets

Using MPI-R10-RF, target positions can be sent from the PLC to the devices through the control unit. When a target is set, the behaviour is the same as decribed in chap.8.8.

ATTENTION: If target transmission on UC-RF is enabled, it will be refreshed on the device every time a communication occurs. Consequently, before disabling the target on the device, disable the transmission of the target on UC-RF.

9.5 RF communication quality

The device transmits and allows you to view some parameters that allow you to evaluate the quality of the RF communication.
In the Radio menu you can find the $RSSI$ and Lqi items.
If you notice a difficulty in transmitting/receiving data, you can monitor the value shown in the Rssi menu. The values shown have a mainly qualitative value but it can be said that if lower than -80 dB they indicate a serious communication problem. In this case it is advisable to intervene on the position of the UC-RF antenna. The higher the signal quality, the higher the $RSSI$ values will be.
WARNING: $RSSI$ values are expressed in -dB so the higher the value, the lower the number displayed, in absolute value, will be. If the target transmission on UC-RF is enabled, it will be refreshed on the Device every time a communication occurs. Consequently, before disabling the target on the device (see chap. 8.7.4), disable the target transmission on UC-RF.

10. Programming mode

In Operational Mod press the key $\bigcirc$ (SET) for 3 seconds to access the Programming mode. Depending on the setting of $PASS$ parameter (see chap. 10.2), the system may require you to enter a password.

Press the key $\bigtriangledown$ (ABS-REL) and $\bigtriangleup$ (ORG) to scroll through the list of parameters and selct the wanted one pressing $\bigcirc$ (SET). Press the key $\triangleright$ (mm-inch) to exit the programming mode. The programming mode is automatically dropped after 30 seconds of inactivity.

WARNING: When programming the parameters, the bushing must be locked in the current position, otherwise there is the possibility of obtaining a false measurement once you exit the programming mode. If this is not possible, it is recommended to check the device setting once back in measurement mode.

elesa

10.1. Input of numeric parameters

Press the key ⬓ ORG and ⬔ ABS-REL keys to increase or decrease the value of the displayed parameter. Each time the aforementioned keys are pressed, the value will be increased or decreased by one unit, ten, hundred,... depending on the position of the flashing digit. Then use ⬔ ABS-REL and ⬓ ORG to respectively

decrease or increase the flashing digit. It's possible to select the digit to change by pressing the key ▷ mm-inch . With each press, the digit to the right of the current one will be selected. If the selected digit is already the rightmost one on the display, the selection will move to the first digit on the left. If the value of the parameter decreases below zero and it is allowed, the parameter will take on a negative value.
Please remember that by further decreasing a negative value, the selected cipher will increase. To confirm

the entered value, press the key ◯ SET. If the confirmed parameter is different from the one currently stored, the display will show the message *CHAnGEd*.

WARNING: If you do not want to modify the value already stored, you can: set it to the same value as

before and check that the writing *CHAnGEd* does not appear, hold down the button ▷ mm-inch until the writing

CANCEL appears or wait 30 s and the device will exit programming mode without save the changes.

The value of any modified parameters is stored only when exiting programming mode. If the operation was

successful, the display will show the message *StorEd*.

10.2. Device parameters (in alphabetic order)

Parameter	Description	Available options	Default
Deg corr	Angular scale correction	Programmable value: *0.00001 +/- 9.999999.* *0.00000* cannot be accepted (the coefficient is automatically set to 1.00000).	*1.000000*
Deg res	Resolution of the angular measurement	The parameter allows to define the resolution of angular measurement. The available options are: *1; 0.1; 0.01*	*0.01*
dir	Measurement direction Set direction of the positive axis	*dir-- (▶)* *--dir (◀)*	*dir--* *(▶)*

[5] The symbols on the display related to the target feature are used.

Parameter	Description	Available options	Default
FLIP_tG	Arrow to target devices direction	◀ or ▶ [5] The parameter set the direction of the arrow devices when the target is not reached	▶
HbrAte	Heart beat rate	*Radio readings update rate:* <table><tr><td>0</td><td>507.8 ms</td></tr><tr><td>1</td><td>1015.6 ms</td></tr><tr><td>2</td><td>2031,2 ms</td></tr><tr><td>3</td><td>4062.4 ms</td></tr><tr><td>…</td><td>….</td></tr><tr><td>7</td><td>64.3 s</td></tr></table>	*3*
HbFrAt	Radio readings update ratewhen in fast rate:	*Radio readings update ratewhen in fast rate:* <table><tr><td>0</td><td>126.95ms</td></tr><tr><td>1</td><td>253.9 ms</td></tr><tr><td>2</td><td>380.85 ms</td></tr><tr><td>…</td><td>….</td></tr><tr><td>7</td><td>1015.6 ms</td></tr></table>	*2*
HbAUPd	Heart beat auto update	*ON – OFF*	*OFF*
CorrECt	Linear scale correction	Programmable value: *0.000001 +/- 9.999999.* *0.00000* cannot be accepted (the coefficient is automatically set to 1.00000).	*1.000000*
OFFSEt	Offset Value	Programmable value *Res = 1:-999999 ÷ 999999* *Res = 0.1:-99999.9 ÷ 99999.9* *Res = 0.01:-9999.99 ÷ 9999.99* *Res =0.001:-999.999 ÷ 999.999* The system allows you to store up to 10 compensation values: *OFFS 0 … OFFS 9*	*0000.00*

elesa

Parameter	Description	Available options	Default
OriGin	Reference value	Programmable value *Res = 1:-999999 ÷ 999999* *Res = 0.1:-99999.9 ÷ 99999.9* *Res = 0.01:-9999.99 ÷ 9999.99* *Res =0.001:-999.999 ÷ 999.999*	*0000.000*
Pass	Password	*ON*: the system requires the password 22011 to enter the programming mode. *OFF* [DEFAULT]: the system does not require a password to enter the programming mode.	*OFF*
P_toll	Tolerance of target position	*0.01÷9.99* The parameter value depends on the unit of measure selected.	*0.10*
rAdiuS	Radius of the circumference where the reading sensor moves	Programmable value: *0.01-9999.99* The parameter allows to define the radius of the arc where the magnetic band is placed for angular measurement.	*100.00*
rES	Resolution	The parameter allows defining the resolution of the measure. The available options are: *mm: 1; 0.1; 0.01* *inches: 1; 0.1; 0.01; 0.001* *degrees: 1; 0.1; 0.01*	*mm: 0.01* *inches:* *0.001* *degrees:* *0.01°*
SPEEd	Reading max speed	Programmable values *1;2;3;4;5* The parameter set the maximum speed of the movement in m/s that can be correctly read.	*03*
tArGEt	Target value	Programmable value *Res = 1:-999999 ÷ 999999* *Res = 0.1:-99999.9 ÷ 99999.9* *Res = 0.01:-9999.99 ÷ 9999.99* *Res =0.001:-999.999 ÷ 999.999* The system allows you to store up to 32 compensation values: *LtG00* ... *LtG31*. The parameter value depends on the unit of measure and resolution set.	*0*

10.3. Main menu tree

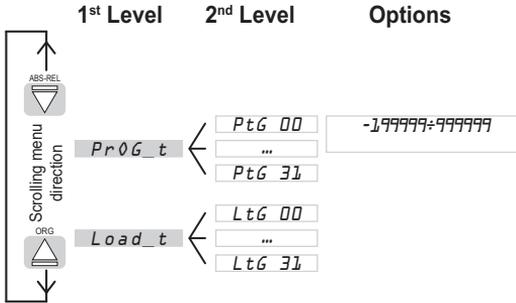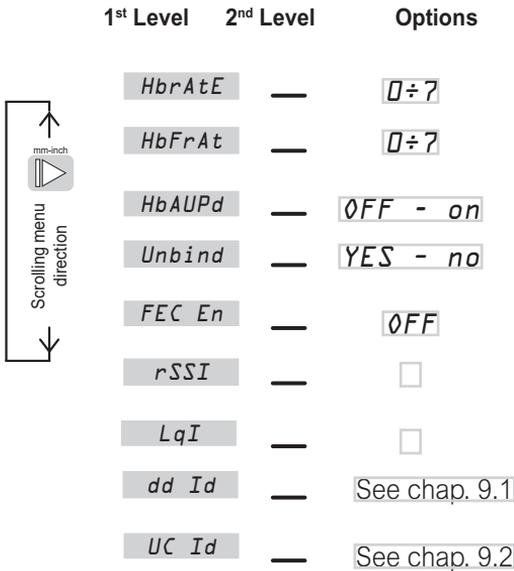| 1st Level	2nd Level	Options
dir	<	dir-- [▶ 7]
		--dir [◀ 7]
OriGin	—	-999999 ÷ 999999 6
OFFSEt	< OFS 0	
		-999999 ÷ 999999 6
	OFS 9	
rES	—	If mm: 1, 0.1,0.01
		If inch 1, 0.1, 0.01, 0.001
CorrECt	< OFS 0	
		0.000001÷9.999999
	OFS 9	
AnGuLAr	< Radius	0.01÷9999.99
SPEEd	—	SPEEd 1 ÷ SPEEd 5
rAdio	—	See chap 10.5
P_toLL	—	0.01 / 1.99
FLIP_tG	—	FLIP ◀, ▶ 7
tArGEt	—	See chap.9.4
0 _ _ _ _ _ _ 8	<	ALL (default)
		No dEG
		OFF
_ _ 0 _ _ _ _ 8	<	ArClr (default)
		Ar
		OFF
_ _ _ _ 0 _ _ 8	<	dd_toGo (default)
		OFF
		d_tArGt
0 _ _ _ _ _ 0 8	<	P_0rG
		P_StP / P_OFS
		OFF
_ _ 0 _ _ _ 0 8	<	P_0rG
		P_StP / P_OFS
_ _ _ _ 0 _ 0 8	<	tArGEtS (default)
		OFF
PASS	<	See chap.10.4
		0n
LcdtSt	—	See chap.. 10.6.3
ECO	—	See chap.10.6.7
rESEt	—	See chap.. 10.6.1
InFO	—	See chap.. 0

Scrolling menu direction

ORG
△

ABS-REL
▽

6 The parameter value depends on the unit of measure and resolution set
7 The symbols on the display related to the target feature are used
8 See key definition in chap 6

elesa

10.4.Target menu

1st Level   **2nd Level**   **Options**

	PtG 00	-199999÷999999
PrOG_t	...	
	PtG 31	

	LtG 00
Load_t	...
	LtG 31

Scrolling menu direction

ABS-REL

ORG

10.5. Radio menu

1st Level   **2nd Level**   **Options**

HbrAtE	—	0÷7
HbFrAt	—	0÷7
HbAUPd	—	OFF - on
Unbind	—	YES - no
FEC En	—	OFF
rSSI	—	☐
LqI	—	☐
dd Id	—	See chap. 9.1
UC Id	—	See chap. 9.2

mm-inch

Scrolling menu direction

10.6. Additional functions

10.6.1. Reset

To set only the internal measurement reference to zero:
- select the *rESEt* item from the main menu
- using the keys △ (ORG) and ▽ (ABS-REL) select *OrG*.
- press the key to confirm
To return the device to the factory configuration:
- select the RESEt item from the main menu
- using the keys △ (ORG) and ▽ (ABS-REL) select *ALL*.
- press the key ◯ (SET) to confirm, the Device will restart as after the swicth-on.

To return the device to its factory configuration and turn it off:
- select the *rESEt* item from the main menu (see chapter Error. The reference origin was not found.)
- using the keys △ (ORG) and ▽ (ABS-REL) select *ALL OFF*.
- press the key to confirm, the display will switch off and the Device will go into sleep mode.

To cancel the reset command, press the key ▷ (mm-inch) or:
- using the △ (ORG) and ▽ (ABS-REL) keys select *no*.
- press the key ◯ (SET) to confirm.

10.6.2 Calibration

The Calibration voice in the main menu activates the CALIBRATION MODE and the display shows GO.

At this point, the user must slowly move the sensor in one direction along the magnetic band.

After the GO it will be displayed a progress bar that will grow as long the sensor is moved. The procedure end when the position measurement is shown again by the display.

This operation allow the sensor to be accurately bound to the magnetic tape and have to be done every time after the installation of the sensor.

elesa

10.6.3 Test LCD

The *LcdtESt* item in the main menu allows you to turn on all the segments and symbols of the display to check that it is working correctly.

10.6.4 Correction coefficients

To improve the corerectness of the measurement, MPI-R10 allow to set two correction factors that take into account about differencies between ideal and actual installation of the magnetic band:
- *LinCorr*: is the ratio between the actual mesurement and the value measured by the device in linear measurements
- *LDEGCorr*: is the ratio between the actual mesurement and the value measured by the device in angular measurements
To calculate the correction factor, set it to 1 then read the value measured (call it M) in a reference point (call it K). The Correction fator will be equal to K/M.

Verify if the measurements done in the reference and/or other known points are correct.

10.6.5 Device info

The INFO menu contains some information relating to the device.
- *rEL*: firmware release of the device

WARNING: A change in the last two digits in the revision code has no impact on the characteristics and performances of the device.
- *dAtE*: production date
- *SErIAL*: serial number of the device. In the RF version it equals the three least significant bytes of the device Id (see chapter Error. The reference origin was not found.)
- *r bYtE:* root of the serial number. In the RF version it is equivalent to the most significant byte of the device Id

The data in the Info menu must be noted and provided to Elesa In case support request.

10.6.6 Password

You can prevent unwanted access to the device's menu by choosing *ON* in the *PaSS* menu item.
By default the password is set to: 22011.

It is possible to change the password by selecting the *Set* from the Password menu

10.6.7 Echo (experimental)

The *Eco* menu contains some settings related to energy saving and therefore battery consumption:

d tout: allows you to set the time value in seconds of device inactivity after which the display turns off.

rSSi: sets an acceptable RF reception quality level and adjusts the transmit power based on this

11. Battery replacement

The symbol ▯ is shown on the display when the battery replacement is required.
The replacement is made by simply removing the cover on the back
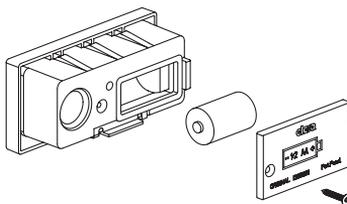

Fig. 11 1 -MPI-R10 - battery replacement

You have a few seconds to replace the battery without memory loss. If the display goes out and the start-up sequence of the device starts when the new battery is inserted, the settings and the zero point must be checked

elesa

12. Display messages and troubleshoting

Message on the display	Description	Action
o - - - - - or *- - - - - o*	Display overflow The value cannot be displayed because it exceeds the capacity of the display (-1999999;9999999)	The value of the maximum speed, the frequency of transmissions and the number of operations in general affect the life of the battery. The symbol or indicates the direction of rotation that caused the overflow. To return to the viewable range, rotate in the opposite direction. If the measured value is within the viewing capacity of the display, it will be displayed correctly. In operating mode, the device continues to correctly measure the position of the shaft. If you are viewing a parameter, the problem could be due to the difference in units of measurement between when it was set and when it is displayed. Change the current unit of measurement and try to view the parameter again. Attempting to modify a parameter when the display shows display overflow automatically brings the parameter to the first displayable value, losing the initial setting.
SEnSor	The sensor is not connected	Connect the sensor or verify the cable and the connector
no tAPE	The magnetic tape is not detected	Verify if the sensor is correctly mounted near to the magnetic tape
SPeed X	The sensor is moving too fast according the value of the set in the Speed parameter. X is the present setting of the Speed parameter.	SET Press ◯ to go back to the value reading and re-set the absolute reference.
🔋 Flashing battery symbol	Low Battery	Replace the battery (see chap. 11).

EU DECLARATION OF CONFORMITY (DoC)

COMPANY NAME: Elesa S.p.a.
POSTAL ADDRESS: Via Pompei 29
POSTCODE AND CITY: 20900 Monza
TELEPHONE NUMBER: +39 039 28111
E-MAIL ADDRESS: info@elesa.com

Declare that the DoC is issued under our sole responsibility and belongs to the following product:

PRODUCT: Sistema magnetico di misura
APPARATUS MODEL: MPI-R10-RF
TRADE MARK: Elesa

The object of the Declaration described above is in conformity with the relevant Union Harmonization Legislation:

2014/53/EU (RED):   Radio Equipment Directive
2011/65/UE (RoHS):   Restriction of the use of certain Hazardous Substances in electrical and electronic equipment

The following harmonized standards and technical specifications have been applied:

EN 62311:2008
EN 61010-1:2010
ETSI EN 301 489-1 V2.1.1
ETSI EN 301 489-1 V2.2.3
ETSI EN 301 489-17 V3.1.1
Draft ETSI EN 301 489-17 v3.2.2
EN 61326-1:2013
ETSI EN 300 328 V2.2.2

Notified Body:
Not Involved (Annex II - Conformity Assessment Module A)

PLACE, DATE OF ISSUE: CARLO BERTANI

     Monza – Italy   MANAGING DIRECTOR

     28/05/2024   GENERAL MANAGER

Elesa S.p.A., Monza, November 2024

The texts and examples have been written with great care, nonetheless, mistakes can always happen.

The Company Elesa S.p.A. can neither be held legally responsible nor liable for lacking or incorrect information and the ensuing consequences.

The Company Elesa S.p.A. reserves the right to alter or improve the electronic position devices or parts of them and/or the enclosed brochures without prior notice.