

Operation Manual

LMI

Battery-powered Linear Measuring Indicator



- Large 7 digit LCD Display, digit height 14mm
- With sign and special signs
- Battery status indicator
- ° Symbol for angle measurement
- Fraction display in inch mode
- Resolution up to 0.01 mm
- Display in inch mode '0.001 INCH'
- Tool-offset
- Simple installation
- Snap-in housing or built-on enclosure with mounting holder

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LMI Operation Manual

1 General

1.1 Operation Manual Information

This manual contains important information regarding the handling of the measuring system components.

For your own safety please note all safety warnings and instructions.

A precondition for safe operation is compliance with the specified safety and handling instructions. Moreover, observe the existing local accident prevention regulations and general safety rules.

Please read this operation manual carefully before starting work. It should be kept accessible at all times. The illustrations in the manual are for better representation of the facts; they are not necessarily to scale and may differ slightly from the actual.




1.2 Explanation of Symbols

Warning notices are characterised by symbols in the operation manual.


The notices will be introduced by signal words to express the magnitude of the danger.

Follow these notices in order to avoid accidents and injuries to persons and property.


Warning notices:

	<p>DANGER!</p> <p>This symbol in connection with the signal word "Danger" indicates an immediate danger for the life and health of persons.</p> <p>Failure to heed these instructions can result in serious damage to health and even fatal injury.</p>
	<p>WARNING!</p> <p>This symbol in connection with the signal word "Warning" indicates a possible danger to the life and health of persons.</p> <p>Failure to heed these instructions can result in serious damage to health and even fatal injury.</p>
	<p>ATTENTION!</p> <p>This symbol in connection with the signal word "Attention" indicates a possibly dangerous situation.</p> <p>Failure to heed these instructions can lead to minor injury or property damage.</p>

Specific safety instructions:

	<p>DANGER!</p> <p>...marks electrical hazards. If safety instructions are not observed death or severe injuries may result. These operations must be carried out only by a qualified electrician.</p>
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Tips and recommendations:

	<p>NOTE!</p> <p>Here you can see highlights, useful tips, information and recommendations for efficient and trouble-free operation.</p>
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1.3 Statement of Warranty

The warranty conditions are in a separate document.

Guarantee

The manufacturer guarantees the functional capability of the process engineering and the selected parameter. The period of warranty is one year and begins from the date of delivery.

1.4 Dismantling and Disposal

Unless otherwise authorized, dispose of the item considering the safety instructions.

Before dismantling

- Disconnect the power supply
- Secure against re-start
- Disconnect supply lines physically and discharge remaining energy
- Dispose operating supplies with respect to the environment

Disposal

Recycle the dismantled elements:

- Metal elements in metal scrap
- Electronic components in electronic scrap
- Recycle plastic parts
- Dispose of remaining components according to their raw material



ATTENTION!

Incorrect disposal → damage caused to the environment!

Electronic waste, electronic components, lubricants and operating supplies must be treated as hazardous waste.

Only approved specialized companies should perform disposal.



Local authorities and waste management facilities provide information about environmentally suitable disposal.

2 Safety



NOTE

Please read the operation manual carefully, before using the unit! Observe the installation instructions! The warranty is invalidated if the damage is caused by a failure to observe the operating instructions.

HepcoMotion and its subsidiaries are not liable for any damage to persons, property or assets caused by defective material on the unit and/or its associated.
HepcoMotion take no responsibility for consequential damage!

The user is obliged to implement any necessary safety measures.

Commissioning may only be performed by qualified, authorized and trained personnel.

2.1 General Cause of Risks

This section gives an overview of important safety aspects for optimal protection of employees. (See section 9)
Non-observance of the instructions mentioned in this operation manual can result in hazardous situations.

2.2 Personal Protective Equipment

Employees should wear protective clothing during installation of the unit to minimize the risk of accidents.

Therefore:

Change into protective clothing before beginning the work process. Also observe any labels in the operating area regarding protective clothing.

Protective clothing:



Safe work clothing

... is close-fitting
... is tear proof
... has tight sleeves without distant parts

Also do not wear rings, necklaces or other jewellery.



Wear protective gloves

... to protect hands against abrasion and cuts.

2.3 Conventional Use

The **HepcoMotion LMI** is for the limited purpose as described in this manual:

The HepcoMotion LMI is constructed for measuring and displaying distances.



ATTENTION!

Danger through non-conventional use!

Non-intended use and non-observance of this operation manual can lead to dangerous situations.
Therefore:

- Use the LMI only as described
- Strictly follow this manual

Avoid in particular:

Remodelling, refitting or changing the unit or parts of it with the intention of altering its functionality or scope.

HepcoMotion is not liable for any damages resulting from improper use of the product.

The operator is liable for all damages during non-conventional use.

3 Transport and Storage

3.1 Safety Instructions for Transport, Unpacking and Loading

**ATTENTION!**

Professional transport only.
Do not drop, strike or crush the package.

3.2 Handling of Packaging Material

Refer to section 1.4 for notes on correct disposal.

3.3 Receipt of Goods

Examine goods immediately on receipt to ensure they are complete and undamaged.

In case of externally visible transport damages

- Do not accept the delivery or accept conditionally
- Note the extent of any damage on the transport documents or the delivery note
- File any complaint immediately

**NOTE!**

Claim for any damage you recognize as soon as possible. Claims for damage must be filed within the lawful reclaim period.

3.4 Storage

Store unit only under following conditions:

- Do not store outside
- Keep dry and dust-free
- Do not expose to aggressive media
- Protect from direct sunlight
- Avoid mechanical shocks
- Storage temperature: 10 to + 60 °C
- Relative humidity: 80% non-condensing
- Inspect packages regularly if stored for an extended period of time (> 3 months).

4 Product Features

The **HepcoMotion LMI** linear measuring indicator consists of an external magnetic sensor connected via a drag-chain suitable cable to a display unit.

For the measurement a coded magnetic tape provides the sensor with the necessary information (current position), this is glued along the distance to be measured. The sensor is installed parallel and without contact to the magnetic tape and the system is therefore wear-free.

The external sensor is designed to a high protection class making it resistant to any type of dust, dirt or water-jet. Its compact installation size makes it easy to integrate into existing or new builds.

The position indicator has extensive possibilities of parameterization (see section 10.3.6) and can be easily adapted to different applications. The basic functions, available in the standard firmware, cover a wide range of applications. There are also customized versions (on request) available for special types of machines.

For installation no special tools are needed, there are no wire or electrical connections required. The LMI linear measuring indicator is therefore particularly suitable for mounting on movable slides and stop systems, since no power supply cables need to be provided.

The snap-in mounting of the panel mount version (LMI-PM) allows easy installation in a defined panel cut out e.g. in a front panel.

The built-on enclosure with mounting holder of the rugged enclosure version (LMI-RE) allows flexible assembly (mounting holder above/mounting holder below/angle adjustable). Retrofitting is also simplified.

**NOTE**

With no, or a flat, battery movements of the magnetic sensor are not recorded!
A reference must be conducted when a battery is fitted (at a known mechanical position the indicator is set to the corresponding value, e.g. ZERO).

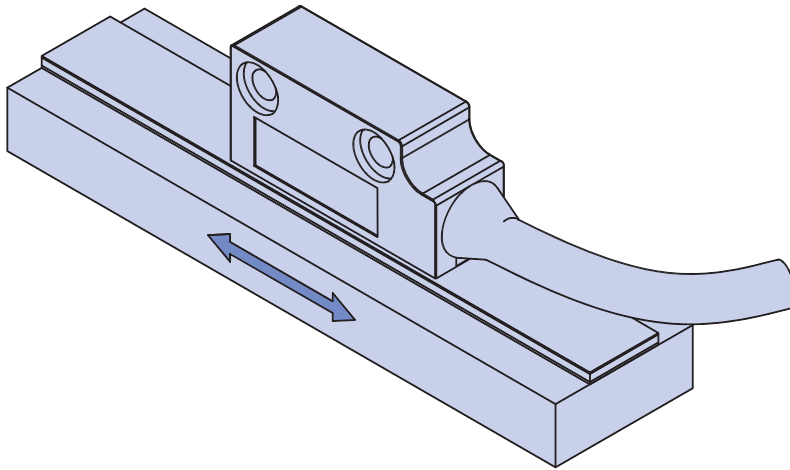
**NOTE**

The resolution of the measurement system is 0.01mm!
All settings of the multiplication factor refer to this resolution!

5 Applications

5.1 Magnetic Measurement

5.1.1 Direct Distance Measurement



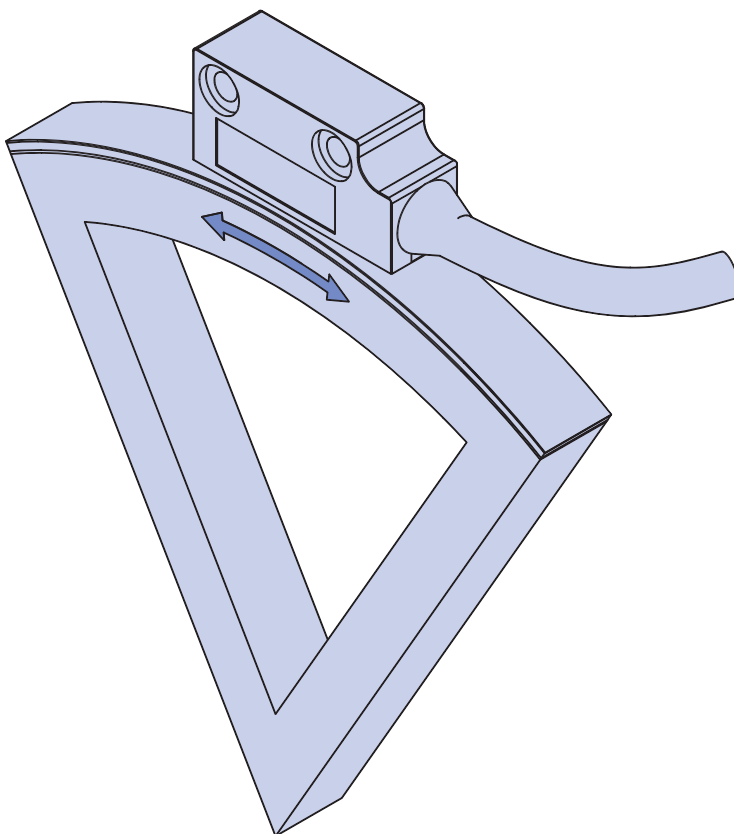
The magnetic tape is glued on a solid ground (e.g. machine base) along the measuring distance.

Example 1 Indicator [mm], resolution 0.01mm
 → P02=0 P03=2 P08=1,0000

Example 2 Indicator [m], resolution 0.001m
 → P02=2 P03=3 P08=0,01

Example 3 Indicator [inch], resolution 0.001 inch
 → P02=1 P03=fixed=3 P08=1,0000

5.1.2 Angle Measurement 0...<360°



The magnetic tape is glued on a solid ground (e.g. angle stop) along the measuring distance.

To parameterize the indicator or to calculate the multiplication factor a minimum angle of 90° is recommended, because the actual measurement distance (=angle) also depends on the bending radius of the magnetic tape.

Example: Indicator [°], resolution 0.01°
 → P02=3 P03=2 P08=1,0000 P09=0

- a) Move to the desired mechanical zero point, then set the indicator to the reference value.
- b) Move to the defined angle position (e.g. 90°) and note the actual value at the indicator (e.g. 471,20)
- c) Calculate and enter the multiplication factor:

P08 = Angle/ Display Value

(e.g. $P08 = 90^\circ / 471,20 = 0,1910$)

→ P02=3 P03=2 P08=0,1910

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6 Technical Data

6.1 LMI Indicator Unit

6.1.1 Identification

The label is helpful for the identification of the unit. It is located on the indicator unit housing. It provides information about the exact type designation (= order reference; see section 7) with the corresponding item number.

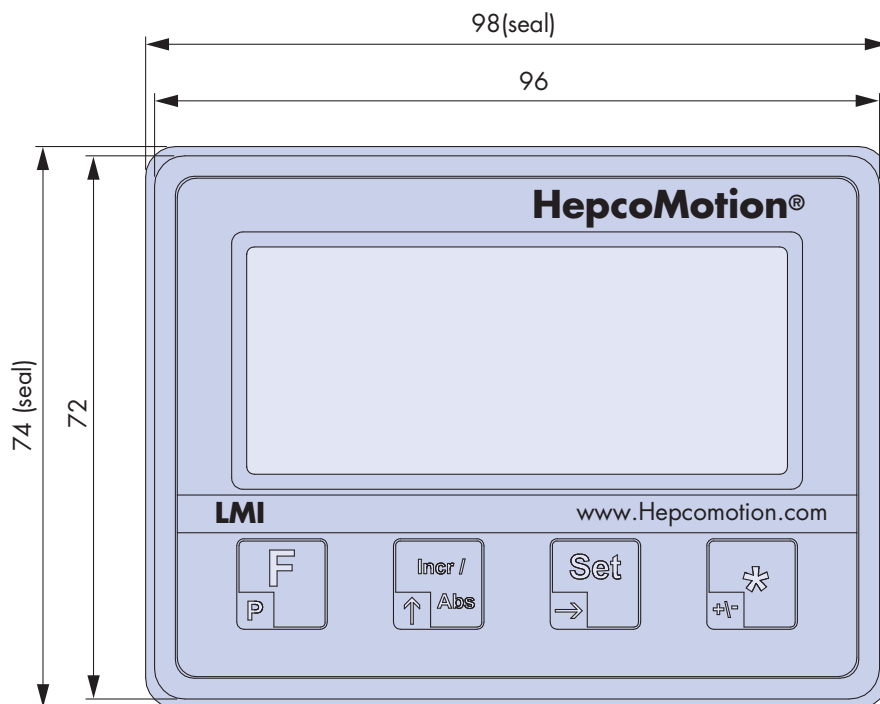
Furthermore, the label contains a unique, traceable unit number and production date. Please supply this information if you contact us.

LMI RE 2400			HepcoMotion®
244595	20101201	701161009	

6.1.2 Dimensions Indicator Unit

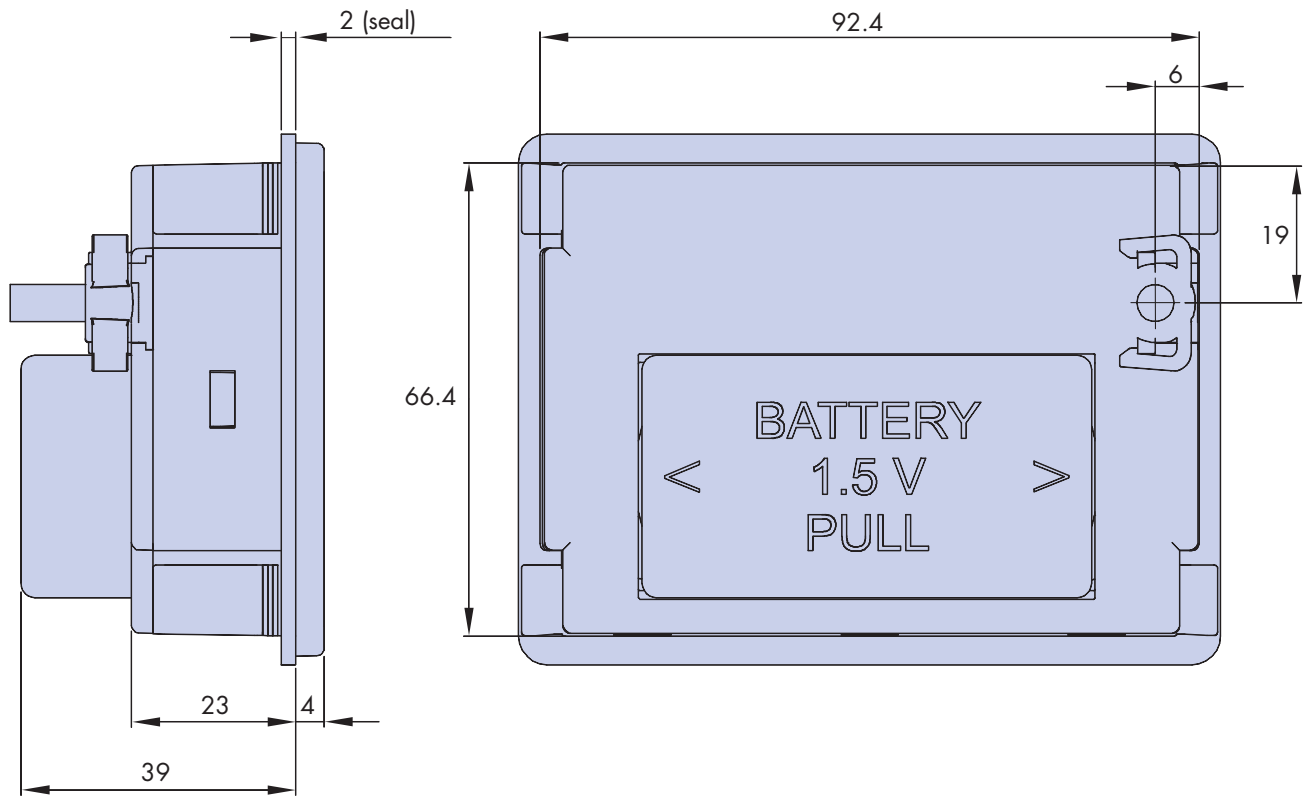
6.1.2.1 Not applicable

6.1.2.2 Version LMI-PM



Front panel cut out:	(W x H) = 93mm x 67mm
Correct front panel thickness:	1.0, 1.5, 2.0, 2.5 mm (with mounted seal) 2.5, 3.0, 3.5 mm (without seal)

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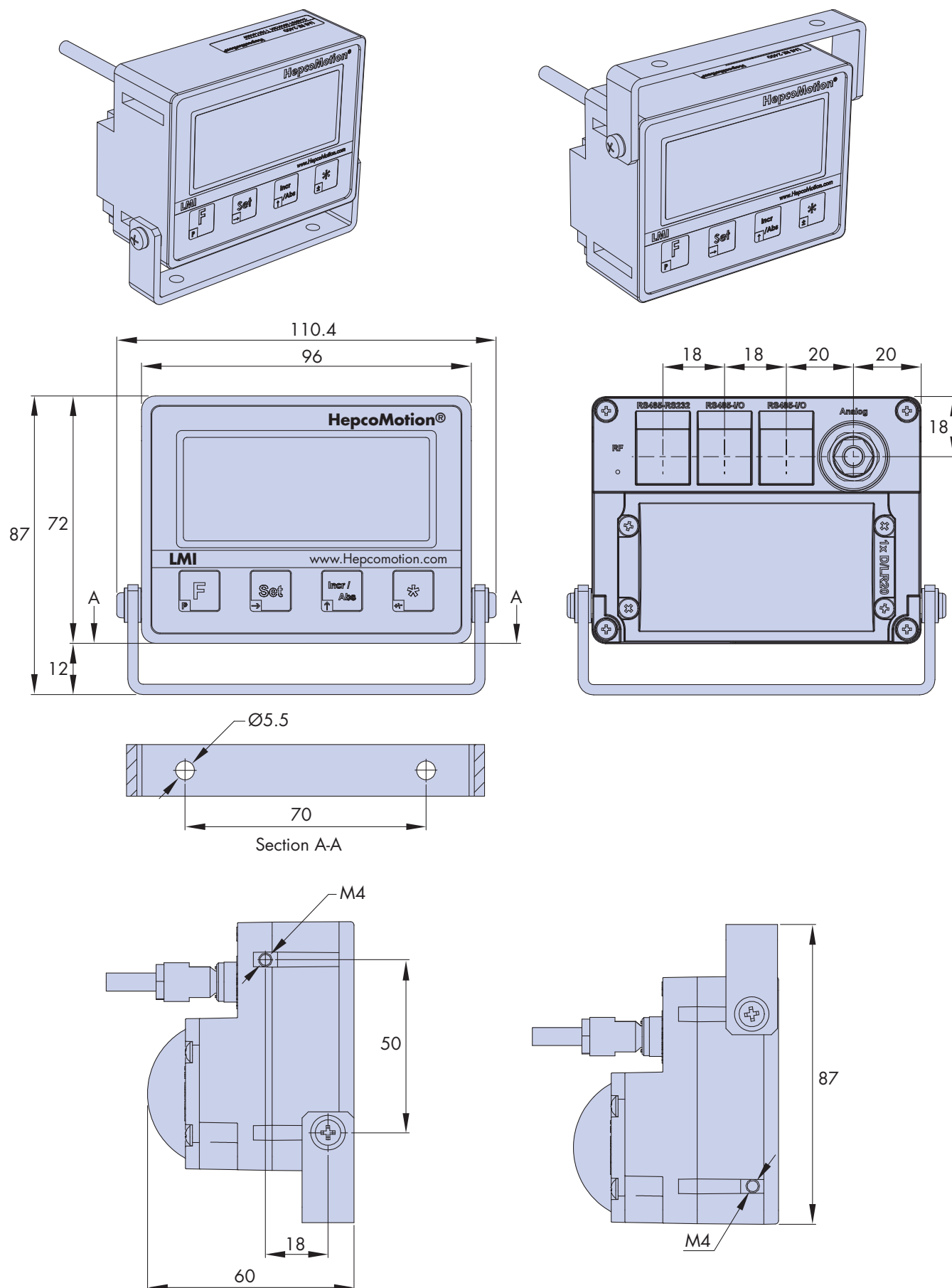
6.1.2.3 Not applicable

6.1.2.4 Not applicable

6.1.2.5 Not applicable

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6.1.2.6 Version LMI-RE



The mounting holder is adjustable in the angle, allows also lateral adjustment and can be mounted above or below.

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6.1.3 Technical Data Indicator Unit

LMI Indicator Unit	
LCD-Display	7 digits (digit height 14mm) With sign, battery status and measurement units
Measuring unit	mm, m, inch or °
Keyboard	Foil with softkeys
Measuring principle	Incremental
Measurement	Linear or rotative
Power supply	1.5 V or 3.0 V (+24V on request)
Power consumption (with measuring system)	< 1 mA with 1.5V
Battery life	1-3 years (depending on the battery type)
Operating temperature	0 °C ... + 50 °C
Storage temperature	-10 °C ... +60 °C
Humidity	Maximum 80 %, non-condensing
Velocity	Maximum 4 m/s
Housing	Norm panel housing, ABS plastic, black
Housing dimensions	W x H = 96 x 72 mm
Installation depth	39 mm -> LMI-PM version, see section 6.1.2.2 60 mm -> LMI-RE version, see section 6.1.2.6
Front panel cut out	W x H = 93 x 67 mm
Protection class front	IP 54 LMI-PM installed with sealing IP 43 LMI-PM installed without sealing IP 50 LMI-RE
Protection class back	IP 40 LMI-PM IP 50 LMI-RE

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6.1.4 Battery Data



NOTE

For an adequate battery life, the use of a known commercial brand of battery is recommended.

If all the battery icons on the LCD-display are extinguished (see also section 10.1) a battery change should be made as soon as possible.

When changing the batteries strictly observe the polarity, refer to the markings on the battery-case!

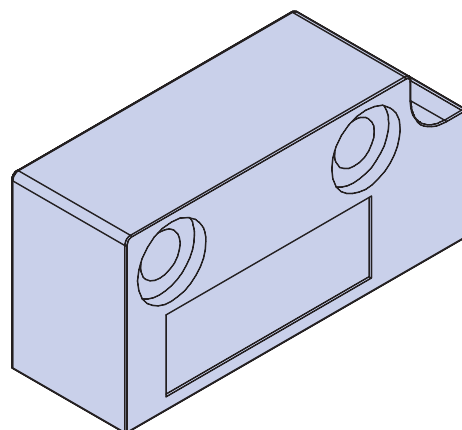
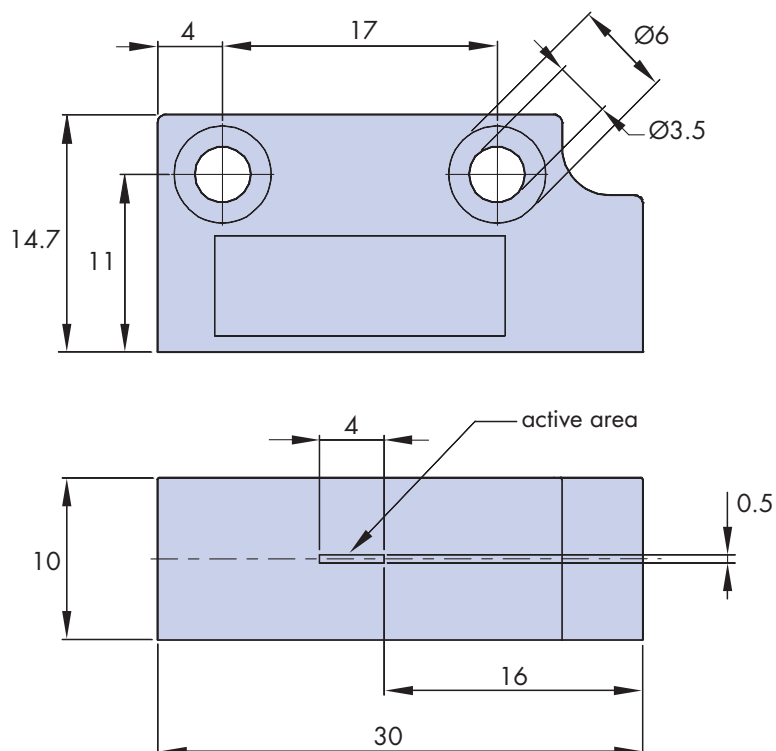
All data and parameters are retained when changing the battery, apart from the current measurement value.

All LMI-PM units have a built-in battery holder for a battery of the type C, LR14 (supplied).

All LMI-RE units have a built-in battery holder with bolt down cover for a battery of the type D, LR20 (supplied).

6.2 Magnetic Sensor

6.2.1 Dimensions Magnetic Sensor



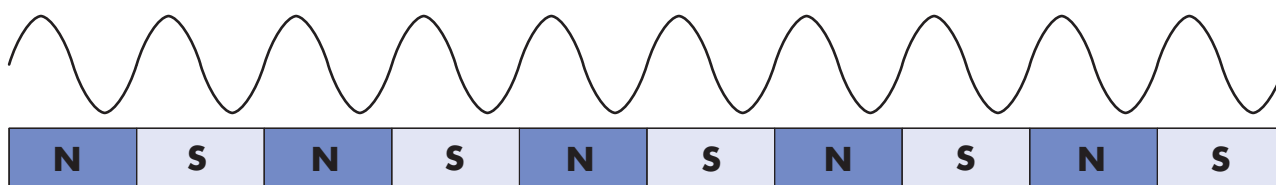
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6.2.2 Technical Data Magnetic Sensor

Magnetic Sensor	
Pole length	2.5 mm
Sensor cable length	0.1 m ... max. 2.0 m
Sensor cable	Drag-chain suitable, 6-wires, twisted pairs and double shielded
Housing	Zinc die cast
Protection class	IP67
Operating temperature	0°C ... +50°C
Storage temperature	-10°C ... +60°C
Mounting position	User defined
Bending Radius (Cable)	Minimum 60mm
Repeat accuracy	+/- 2 increments
Gap Sensor/Tape	Maximum 1.0mm (without cover band)
Influence of external magnetic fields	External Magnetic fields > 1 mT, which directly impinge upon the sensor, can affect the system accuracy.

6.3 Magnetic Tape

The magnetic tape contains the necessary digital information needed for linear length measurement with the HepcoMotion linear measuring indicator. The system senses any change in incremental measure and updates a calculated absolute value. The system scans the north and south poles on the magnetic tape and receives an electronic sine wave signal.



These signals are electronically interpolated; the resolution of the measuring system depends upon the interpolation rate and the pole length.

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6.3.1 Components

As standard the magnetic tape is delivered as described. It is installed by gluing it to the respective mounting surface.

The magnetic tape consists of 2 pre-assembled components (see Figure 1):

- A magnetized, flexible plastic tape (Pos. 3), which is connected with a magnetically conductive steel tape as inference band (Pos. 4) and is supplied with an adhesive tape (Pos. 5).
- A magnetized permeable cover band (Pos. 1), which serves for the mechanical protection of the plastic tape (not required for the measurement) and is supplied with an adhesive tape (Pos. 2).

See section 7 for ordering details.

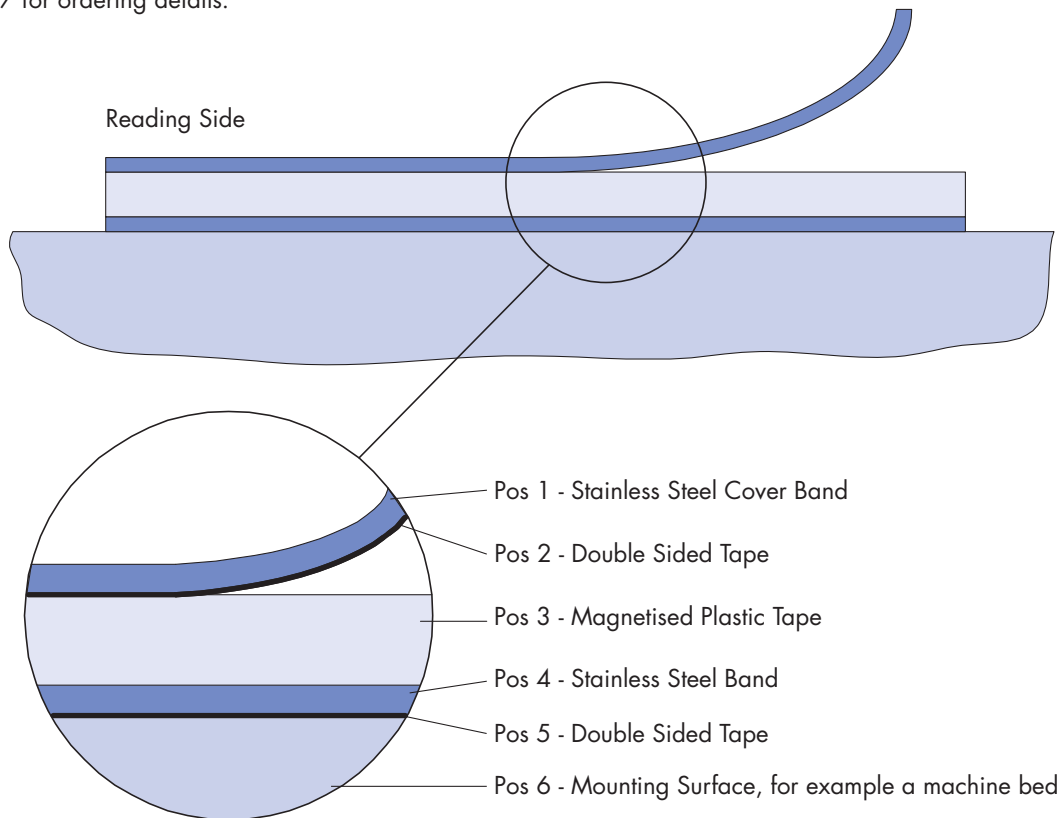
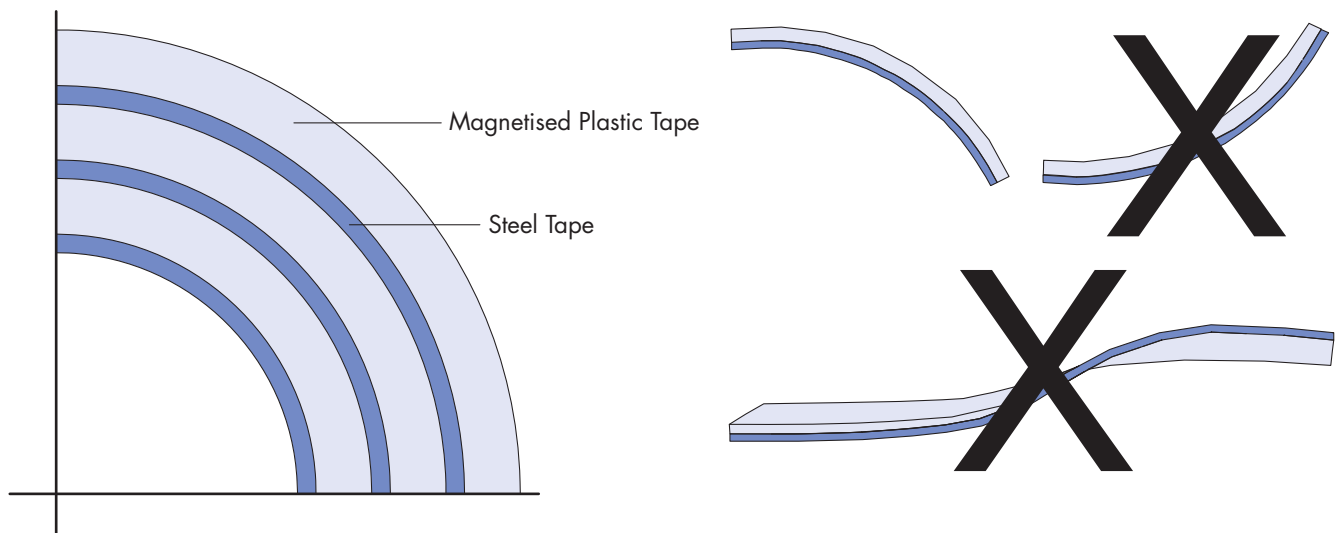


Figure 1: Components of the magnetic tape

6.3.2 Handling

In order to avoid tension in the tape, it must not be stretched, compressed or twisted. It should be stored with the magnetized plastic tape to the outside (see Figure 2), the minimum bending radius must be noted here (see section 6.3.5).

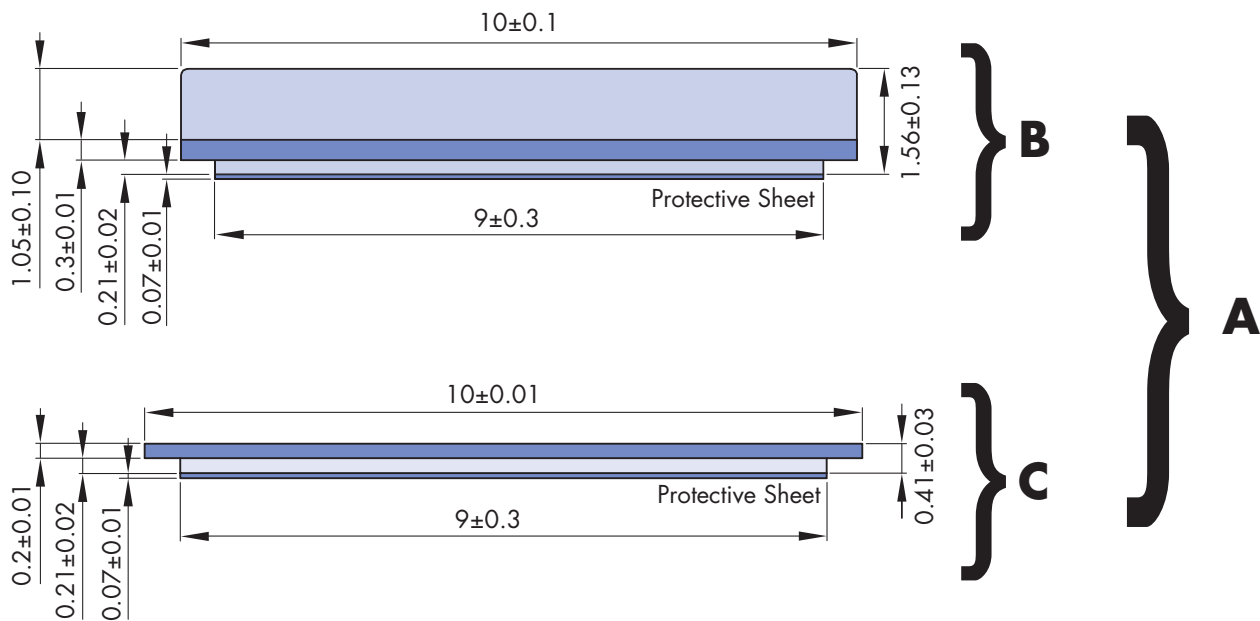


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6.3.3 Identification

The tape is marked at regular intervals with its unique serial number and type of tape.

6.3.4 Dimensions Magnetic Tape



A) Magnetic tape set:

Components:

B) Magnetic Tape

C) Cover band

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6.3.5 Technical Data Magnetic Tape

Magnetic tape	
Coding	Incremental, single track
Pole length	2.5mm
Operating temperature	0 °C ... +50 °C
Storage temperature	Short term: -10 °C ... +60 °C Medium term: 0 °C ...+40 °C Long term: +18 °C
Relative humidity	Maximum 95 %, non-condensing
Accuracy at 20°C in mm	+/- (0.025 + 0.02 x L[m]) (L = measuring length in metres)
Thermal expansion	$\Delta L[m] = L[m] \times [1/K] \times \Delta T[K]$ (L = tape length in metres, ΔT = relative temperature change)
Linear expansion coefficient	$\alpha \approx 16 \times 10^{-6} \text{ 1/K}$
Bending Radius	Minimum 150 mm
Available lengths	32m (up to 70m on request)
Weight of the magnetic tape	Approximately 62 g/m (includes adhesive tape + protective sheet)
Weight of the cover band	Approximately 19 g/m (includes adhesive tape + protective sheet)
Influence of external magnetic fields	External magnetic fields must not exceed 64 mT (640 Oe; 52 kA/m) at the magnetic tape surface, otherwise the magnetic tape code can be damaged or destroyed.
Protection class	IP67
Width	10mm
Number of tracks	Single track

6.3.6 Chemical Resistance of Magnetic Tape

Chemicals that show little or no impact:

- | | | | |
|--------------------|-----------------|---------------|---------------|
| - Formic acid | - Glycerol 93°C | - Linseed oil | - Soybean oil |
| - Cotton oil | - Iso-Octane | - N-Hexane | - Lactic acid |
| - Formaldehyde 40% | - Petroleum | | |

Chemicals that show weak to moderate effects:

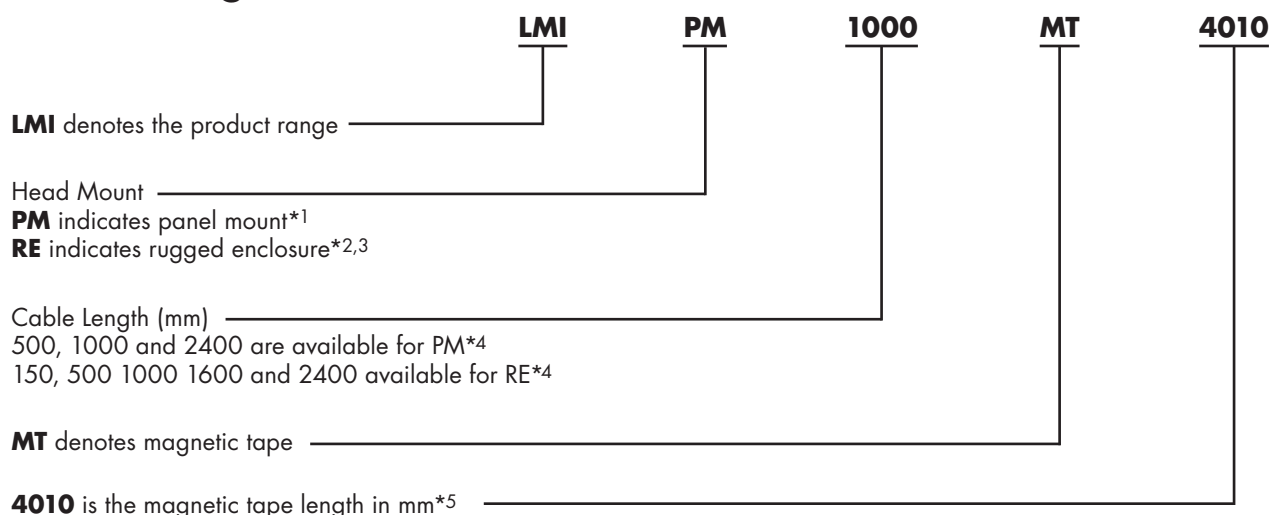
- | | | | |
|------------|-------------|-------------------------|------------------------------------|
| - Acetone | - Petrol | - Acetic acid 20%...30% | - Oleic acid |
| - Kerosene | - Acetylene | - Steam | - Acetic acid, glacial acetic acid |
| - Seawater | - Ammonia | - Isopropyl ether | - Stearic acid 70°C |

Chemicals that show a strong impact:

- | | | | |
|------------------------|--------------------|----------------|-------------------------------|
| - Benzene | - Nitric acid | - Turpentine | - Paint solvents |
| - Carbon tetrachloride | - Trichlorethylene | - Nitrobenzene | - Hydrochloric acid 37%, 93°C |
| - Tetrahydrofuran | - Toluene | - Xylene | |

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7 Ordering Details



Notes

1. Integrated battery case and cover (for 1 x 1.5V, C/LR14 cell, supplied).
2. Integrated battery case and cover (for 1 x 1.5V, D/LR20 cell, supplied).
3. Rugged enclosures are supplied complete with mounting clamp.
4. Alternative cable lengths are available on request, maximum 2400mm.
5. When specifying the order length for the magnetic tape a minimum of 100mm (50mm per end) must be added to the measuring distance required. Customers are advised to specify slightly more length than seems necessary; as it is easy to trim off any excess, for example with tin snips. Cover band is supplied to this same length along with 2 end caps and securing screws.

Examples

LMI PM 500 MT 2650 comprises -

- Panel mount indicator unit with hard-wired sensor, 500mm cable length
- 2650mm of magnetic tape (allowing a measurement range of 2550mm)
- 2650mm of cover tape
- 2 end caps and securing screws
- C type battery
- Panel mount gasket and dust protection stickers
- Operation manual

LMI RE 150 MT 990 comprises -

- Rugged enclosure indicator unit with integral sensor cable connector
- Mounting clamp for indicator unit and enclosure-clamp fixings
- Sensor with 150mm of cable and plug
- 990mm of magnetic tape (allowing a measurement range of 890mm)
- 990mm of cover tape
- 2 end caps and securing screws
- D type battery, cover and screws
- Operation manual



NOTE!

For technical reasons, the unit cannot record measurements at the end of the tape; there should always be 50mm of tape at each end beyond the range of measurement.

→ Tape length = Measuring length + 100 mm ←

8 Not applicable

9 Installation and Initial Start-Up

**NOTE**

Please read the operating instructions carefully before using this unit! Installation instructions must be observed! In case of damage caused by failure to observe the installation instructions, the warranty will be invalidated.

HepcoMotion and its subsidiaries are not liable for injury to persons, property or financial loss, due to faulty material on the unit and / or incurred by related components.

We assume no liability for damages!

The operator is obliged to take appropriate safety measures and implement them.

Commissioning should only be performed by qualified and authorised personnel.

9.1 Operational Environment

**WARNING!**

Do not use the unit in explosive or corrosive environments!

**ATTENTION!**

Electrical connections must be made by suitably qualified personnel in accordance with local regulations.

The LMI-PM unit is designed for switchboard mounting. During any work on the switchboard, all components must be powered off and if necessary discharged, if the danger exists that energized parts can be touched. (Finger protection)



Residual voltages may be present!



Thin wire cable strands must be fitted with ferrules!

Before switching on, all ports and connectors must be reviewed!



The unit must be mounted so that it is protected against harmful environmental influences such as splashing water, solvent, vibration, shock and severe pollution and the operating temperature kept within the required range.

9.2 Interference

If errors cannot be corrected with the following instructions please contact the manufacturer (see last page).



NOTE

The unit and its connection and signal cables must not be installed next to components likely to cause interference, (those having strong inductive or capacitive interference or strong electrostatic fields)!

External interference can be avoided by a suitable cable routing.



Signal wires and cables must be laid separately from power cables and kept at least 0.5m from inductive or capacitive interference sources such as contactors, relays, motors, switching power supplies, clocked controllers, etc!

If faults occur despite compliance with all the above requirements, proceed as follows:

1. Attach capacitors to the contactor coils of AC contactors (e.g. 0.1 μ F / 100 Ω)
2. Attach free-wheeling diodes to strong DC inductances
3. Attach capacitors to individual motor phases (in the terminal box of the motor)
4. Do not connect safety ground and reference potential
5. Fit a mains filter on the external power supply
6. Use sheet metal or metalized shielding housings

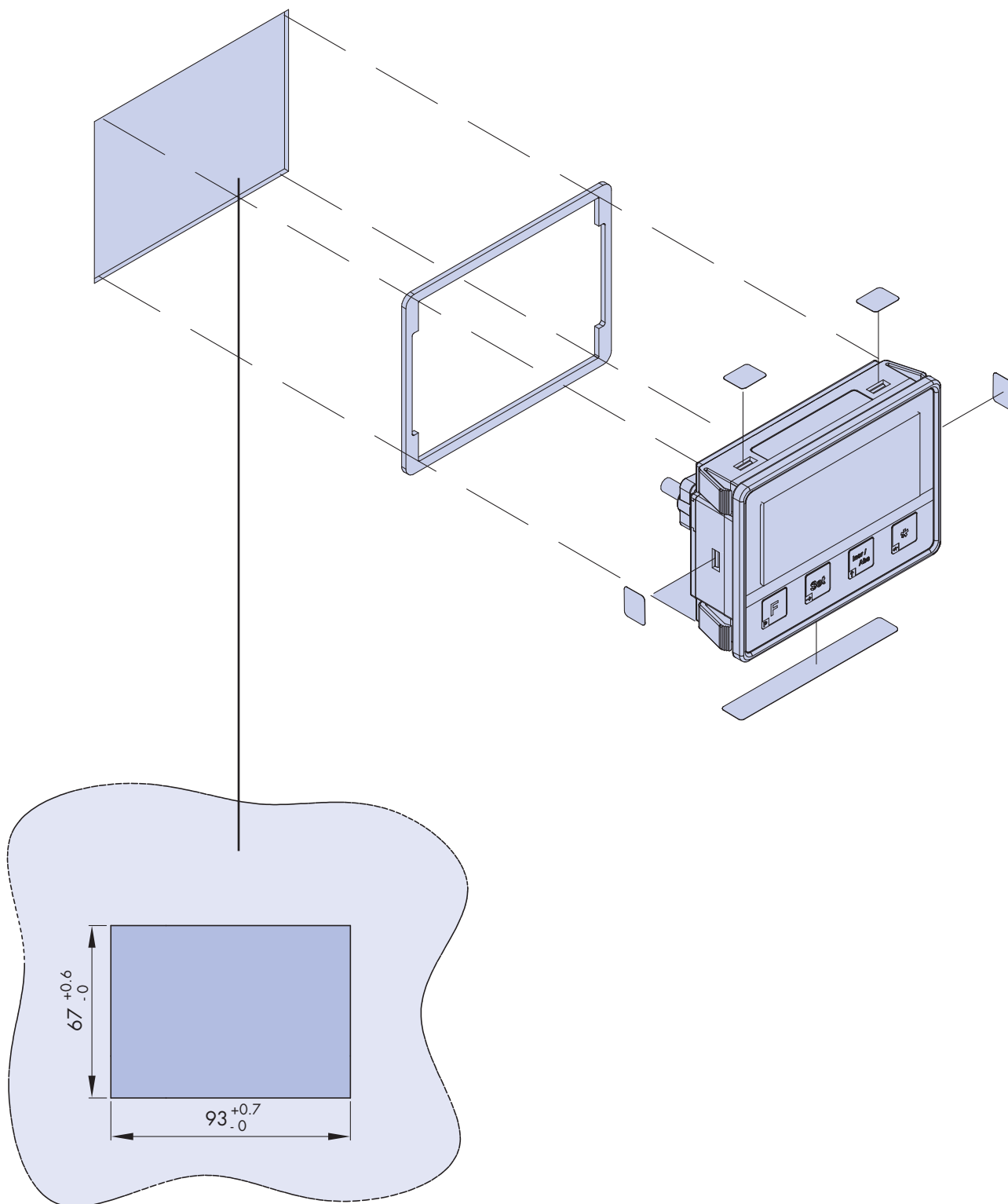
9.3 Mounting Description / Installation of the Indicator

9.3.1 Installation of LMI-PM Unit in a Panel

The mounting of the unit in the front panel is achieved by four slide clips ('Snap-In Mounting').

For this purpose no tools or special tools are needed.

The LMI-PM unit comes with a separate seal. Though optional, mounting with the seal increases the protection class for splashed water and dust protection. Where the installation is open at the back, the openings on the side of the LMI-PM unit must be closed with the stickers supplied (dust protection).



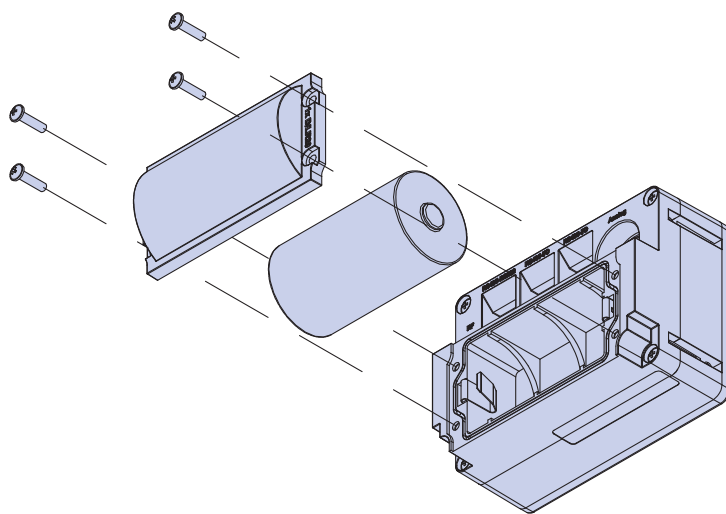
LMI Operation Manual

9.3.2 Not applicable

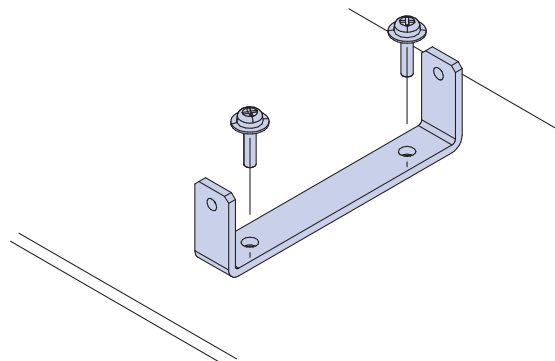
9.3.3 Installation of LMI-RE Unit

The LMI-RE unit can be mounted above or below the supplied bracket, adjusted laterally across it and adjusted for angle.

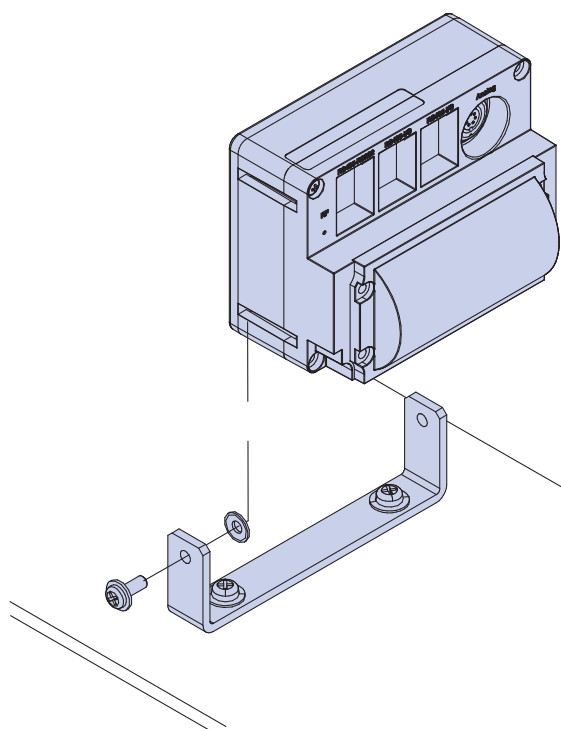
Step 1: Mounting the battery



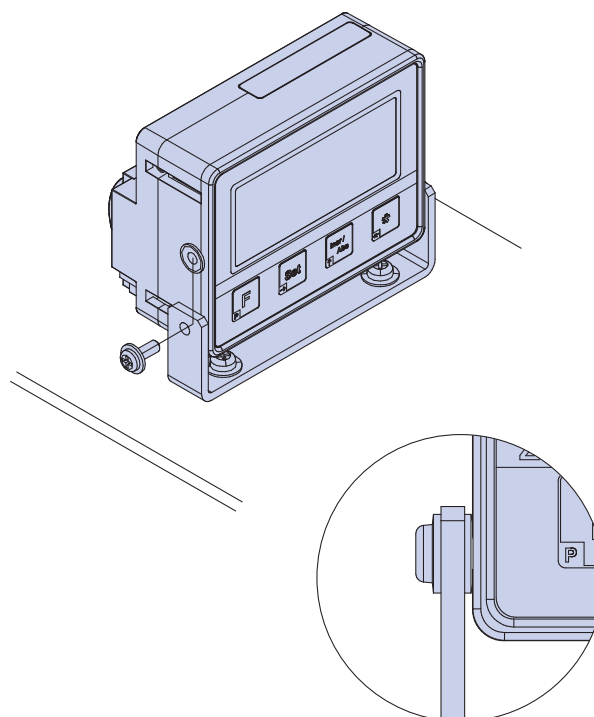
Step 2: Fixing the mounting clamp



Step 3: Screw & underlay right



Step 4: Screw & underlay left



9.4 Activating the Unit

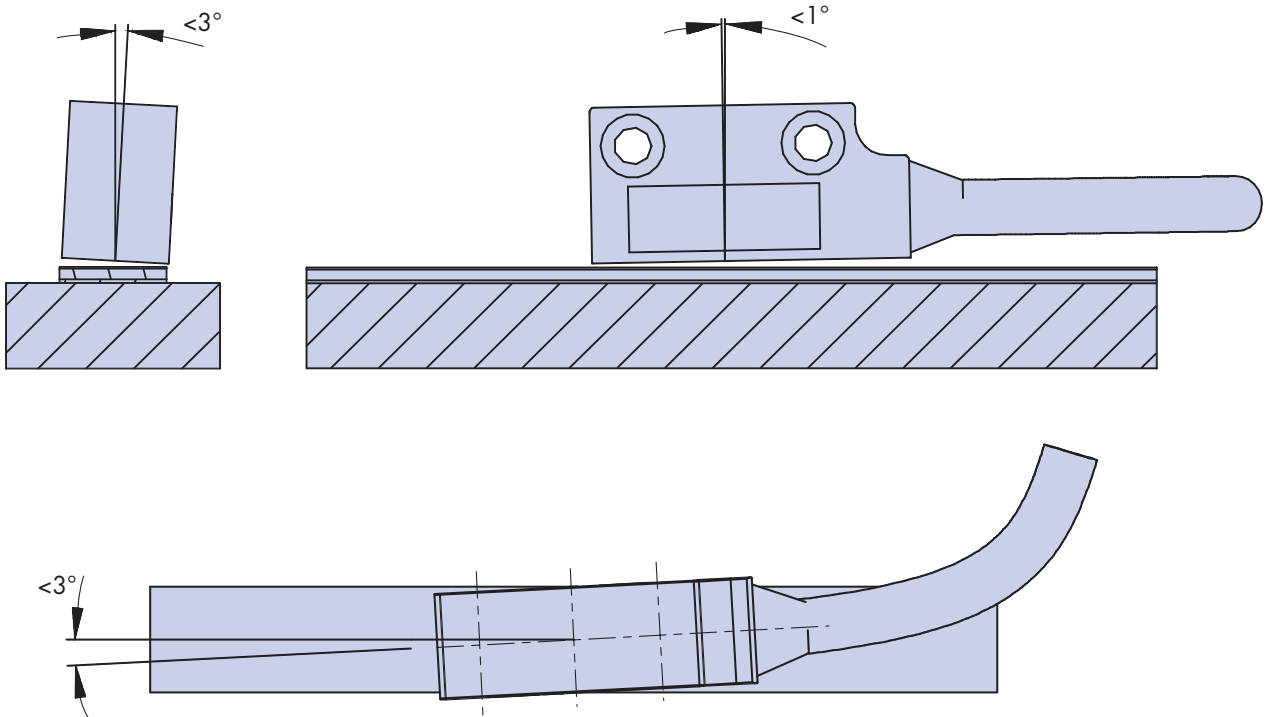
On supply of the operating voltage (i.e. Inserting the battery) the unit starts automatically.

9.5 Description of Mounting / Installation of the Magnetic Sensor

The magnetic sensor is mounted using the two M3 screws in the fastening holes (See section 6.2.1).

The required distance from the sensor to the magnetic tape surface is stated in the technical information (See section 6.2.2).

The following maximum tolerances of angles, must be ensured over the complete range of measurements:



The cable must be placed so that there is no risk of damage (e.g. Through pulling or crushing).

Where necessary use a drag chain or a protective tube to achieve strain relief.

9.6 Installation of the Magnetic Tape

**NOTE** External Magnetic Fields

Avoid exposing the magnetic tape to magnetic fields!

The magnetic tape should not come into direct contact with other magnetic fields (e.g. permanent magnets, holding magnets, electromagnets, magnetic stands)! Irreparable damage is likely to occur, affecting the accuracy and even the function!

9.6.1 Processing Note for Bonding

The included adhesive tapes are coated on both sides with a modified acrylic adhesive which sticks well on clean, dry and smooth surfaces. The adhesive is characterized by a high initial tack and good adhesive strength to high and low energy surfaces (e.g. PE, PP), high shear and peel strength and good resistance to humidity, UV and ageing. The surface should be very clean if the surroundings are very dirty.

**NOTE** Surface treatment

In order to guarantee optimum adhesion all anti-adhesive contaminants (e.g. oil, grease, dust, release agents, etc) must be removed with a residue free evaporating solvent.

Suitable for this are for example Ketones (acetone) or alcohols. Typical solvents for cleaning are a 50/50 Isopropyl alcohol/water-mixture or heptanes. LOCTITE or 3M offer such solvents as a substrate cleaner.

Note when dealing with solvents follow all the manufacturer's instructions and warnings!

For materials such as copper, brass, etc, the surfaces should be sealed to prevent oxidation.

**NOTE** Pressure

The adhesive strength is directly dependent on the contact the adhesive develops to the bonded surface.

Therefore, join with the maximum possible pressure; aids such as pressure rollers or rollers are recommended (Optimum pressure 4-5 kg/cm² adhesive surface).

**NOTE** Adhesive temperature

For adhesion the best application temperature is between +18 °C and +30 °C. Avoid sticking surfaces colder than +10°C, as the adhesive then becomes too hard and sufficient immediate adhesion might be difficult to achieve. Once properly stuck the stability of the connection is ensured even if the temperature subsequently falls below zero. The final adhesive power is typically achieved after approximately 72 hours at a temperature of + 21°C.

LMI Operation Manual

9.6.2 Cutting and Sticking

Before starting the gluing, the magnetic tape and the cover band need to be cut to the exact length:

Length of the magnetic tape = Measuring length + 100 mm

Length of the cover band = Measuring length + 100 mm



NOTE

Unless fixed at the ends the cover band is likely to peel!

Therefore:

Use the magnetic tape end caps supplied (or if necessary further extend the cover band overlap and fix laterally with screws, and ideally butt up to a new or existing fastener or edge.)

When bonding the magnetic tape the required positioning of the tape in relation to the sensor head must be achieved. Improper installation will not provide accurate values. The mounting must be coplanar to the mounting area and the place you intend to measure. Ripples deteriorate the measurement accuracy!

Installation steps:

1. Clean and degrease the surface thoroughly
2. Remove the protective tape from the magnetic tape adhesive
3. Glue the magnetic tape under high sustained pressure
4. Carefully clean the magnetic tape surface
5. Remove the protective sheet from the cover band adhesive
6. Stick the cover band under high sustained pressure
7. Secure the ends of the cover band against detachment



TIP

When applying a long magnetic tape the protective sheet of the adhesive tape should be removed for a short distance and this portion of the magnetic tape fixed at the desired position.

The protective sheet can then be gradually removed from the remaining length of the tape while simultaneously applying pressure to the tape.



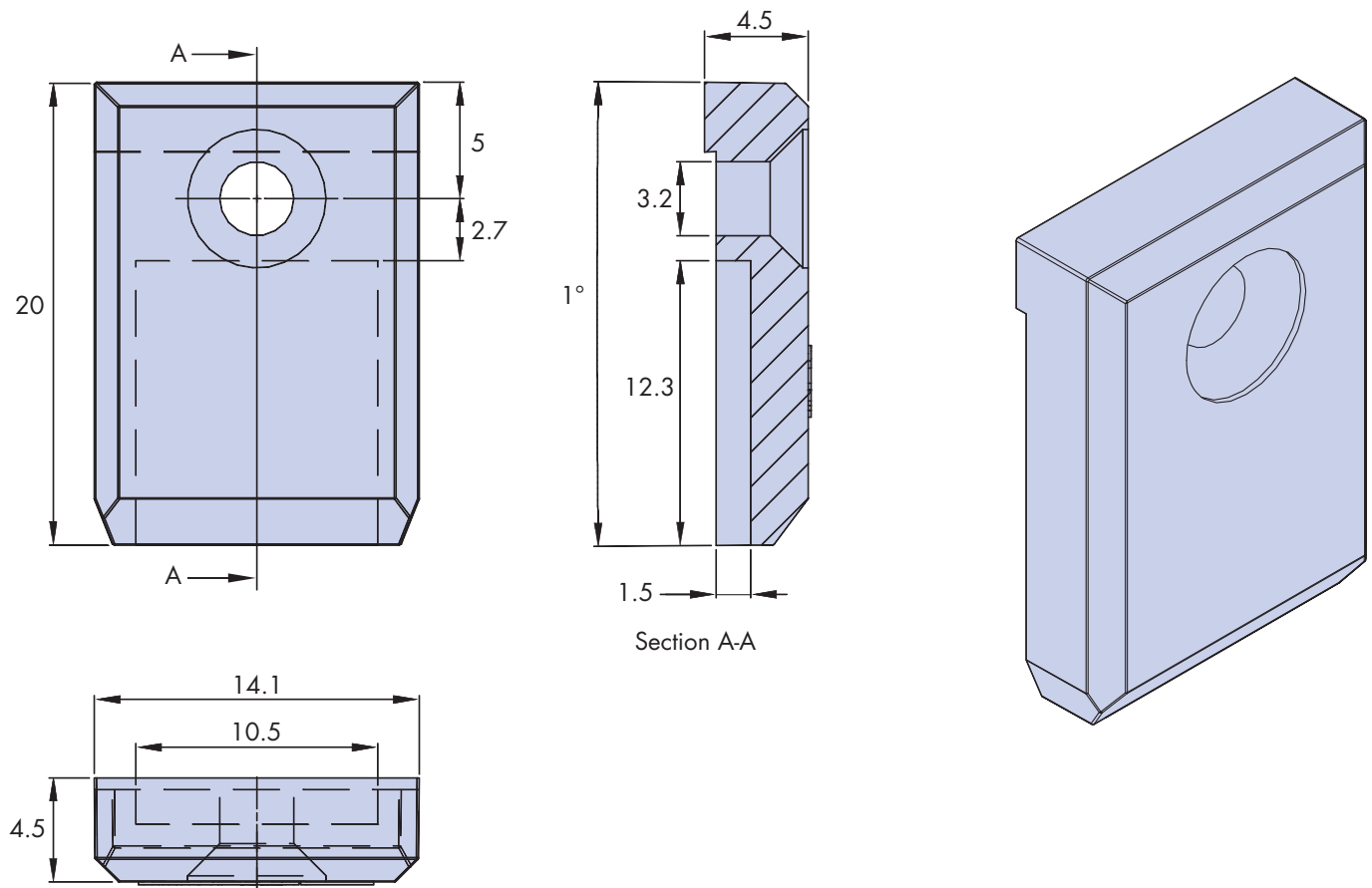
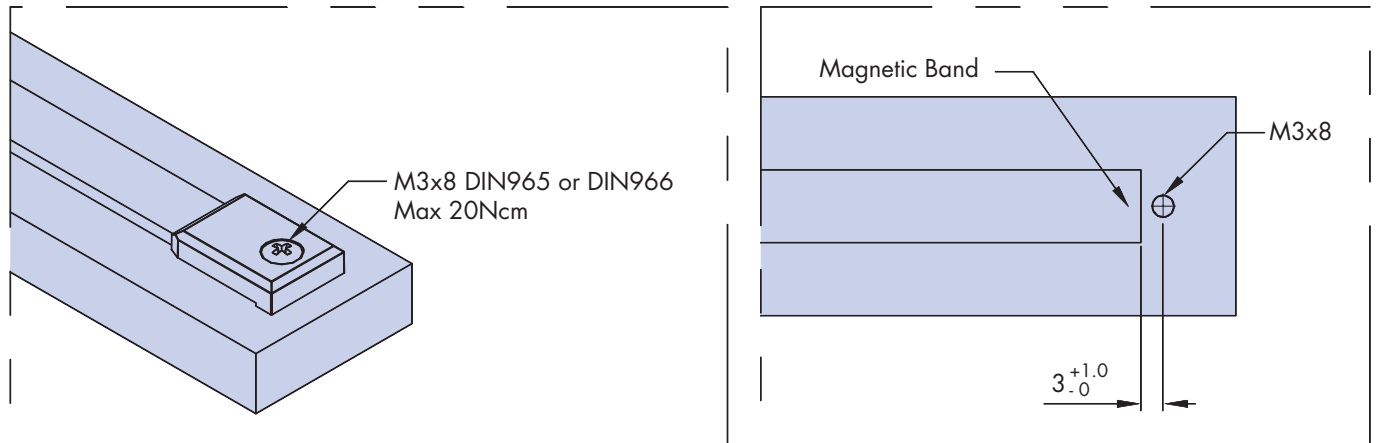
NOTE

Once a magnetic tape is glued it is destroyed on removal and cannot be used again!

LMI Operation Manual

9.7 Magnetic Tape End Cap

The magnetic tape end caps offer optimal protection against peeling of the magnetic tape/cover band (see section 9.6.2). The end caps also minimise any risk of injury due to sharp edges. A pair of end caps and fixing screws are supplied with each LMI unit.



10 Programming and Operation

The operation of the unit is divided into the parameter level (see section 10.3), the operator level (see section 10.5) and the initialization level (see section 10.4).

All operating parameters can be entered via the parameter level (see section 10.3.6).

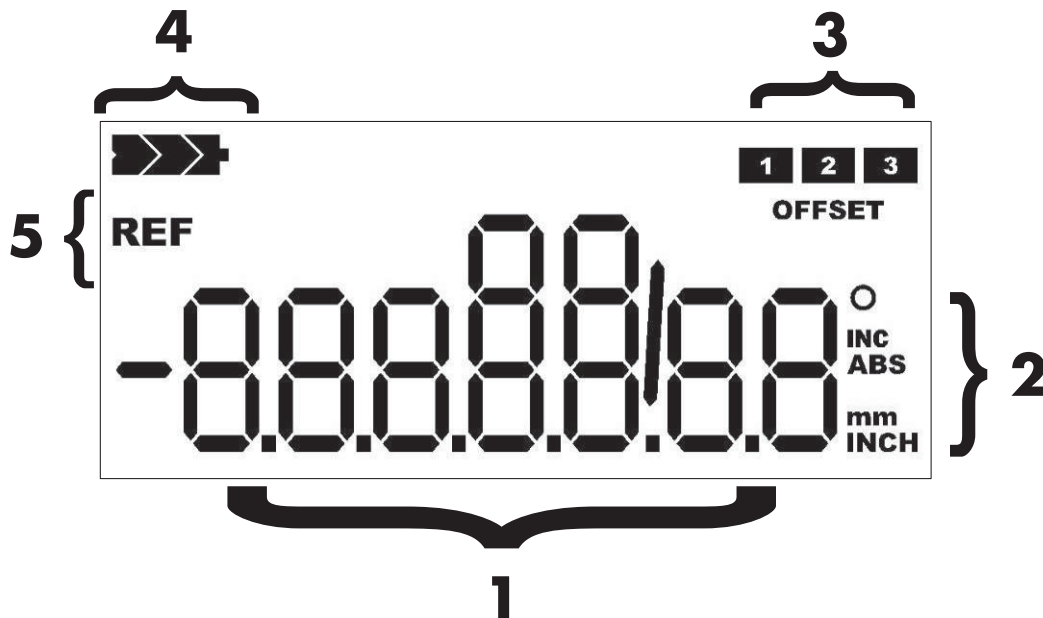
At the operator level the basic functions are available (depending on the firmware version).

In the initialization level only the basic operations such as sensor calibration or resetting the unit will run on default parameters (company setting).

All entries are made solely on the 4 front-mounted buttons or keyboard shortcuts of those, the displays occur via the integrated LCD.

10.1 Overview-Display

The following display icons or segments of the LCD-display are used in this firmware version:



1	Segments for numeric and text display (including signs, decimal points, fraction display)
2	Symbols for units and display mode
3	Icons for active tool-offsets 1 ... 3 and OFFSET
4	Battery Status Icon
5	REF symbol: (shows unit needs to be referenced)

For different applications the units symbol can be changed via the P02 parameter, e.g. the "°" symbol for angle measurement (see section 10.3.6).





The standardization of the indicator value must be done manually with the corresponding multiplication factor (P08) and the position of the decimal point (P03) (see section 10.3.6).



In inch mode an additional fraction display is available.

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10.2 Key-Overview

The function of each key in the parameter level is shown on the button in the small dark box on the left below. Its function at the operating level is shown in the main area of each button:

Keys	Function -Operating level (section 10.5)	Function - Parameter level (section 10.3)
	Base keys for keyboard shortcuts	Parameter level enable/disable
	Fraction display in inch mode	Next digit (decades) select
	Incremental enable/disable	Increases the value by 1
	Tool offsets enable/disable	Sign change

Keys	Function at the initialization level
	If the unit is activated the calibration is triggered.
	If the unit is activated the parameters are reset to factory settings and calibration is triggered.

LMI Operation Manual

10.3 Parameter Level

→ Adjusting settings

10.3.1 Entering Parameter Level



Hold it for about 3 seconds, then press repeatedly to cycle.

The parameter level is activated with this key. After about 3 seconds the display shows "P01" for the first parameter. When the button is actuated again, the corresponding parameter value is displayed, which can then be changed. Press the key again to cycle through each parameter and then its value (see section 10.3.6 for a list of parameters).

10.3.2 Select Digit



Press once.

Where the parameter has multiple digits this key shifts the changeable flashing digit rightward.

10.3.3 Change Value



Press once.

This key increases the value of the selected digit in increments of one.

10.3.4 Change Sign



With this key the sign can be changed for some parameters. (Negative sign is only possible if the value is not ZERO).

10.3.5 Leave Parameter Level



Press for about 3 seconds in the parameter level.

All parameters will be saved in the internal flash memory when leaving the parameter level.

LMI Operation Manual

10.3.6 Parameter List

Parameter:	Description:	Default:
P01: A	System configuration: A = 0: Counting positively A = 1: Counting negatively	0
P02: A	Display mode (affect only the display of symbols!) A = 0: mm mode / Display symbol " mm " A = 1: Inch mode / Display symbol " INCH " A = 2: mm mode / Display symbol " m " A = 3: mm mode / Display symbol " ° " A = 4: mm mode / Display non symbol	0
P03: A	Decimal point (0 ... 5) → only for mm mode	2
P05: ABC	Key lock: A: Key "Set" (0= activated / 1= deactivated) B: Key "Incr/Abs" (0= activated / 1= deactivated) C: Key "*" (0= activated / 1= deactivated)	000
P07: A	Resolution: (starting with Firmware V1.50) A = 0: Resolution 0.01 mm A = 1: Resolution 0.1mm	0
P08:	Multiplication factor (0,0001 ... 9,9999)	1,0000
P09:	Reference value (-9999999 ... +9999999)	0
P10:	Offset 1 (-9999999 ... +9999999)	0
P11:	Offset 2 (-9999999 ... +9999999)	0
P12:	Offset 3 (-9999999 ... +9999999)	0
P13: A	Configuration Offset (0...3) A = 0: offset cannot be activated A = 1: offset 1 can be activated A = 2: offset 1 & 2 can be activated A = 3: offset 1 & 2 & 3 can be activated	3
P90:	(Without function)	0
P99:	Firmware version of indicator unit	x.xx

10.3.7 Parameter values for common units of measure and resolutions

Units	Decimal places	P02	P03	P08
mm	2	0	2	1
mm	1	0	1	0.1
mm	0	0	0	0.01
m	5	2	5	1
m	4	2	4	0.1
m	3	2	3	0.01
inches	3 (unless fractions set)	1	(3)	(1)

LMI Operation Manual

10.4 Initialization Level

→ Resetting the parameter and calibration

10.4.1 Calibration



NOTE

The unit is calibrated at the factory and does not normally need to be calibrated again.

In a few cases a re-calibration of the unit after the installation can achieve an improvement in accuracy, because with a re-calibration the additional mounting factors (angular deviation, parallelism, etc) are included.

Caution:

The magnetic sensor must be within the measuring range from the tape throughout calibration.

Switch off the unit (remove battery or remove plug).



Hold down the key.

The unit turns back on while the key is being held down.

The sensor calibration is initiated and "CAL 0" is displayed. The sensor must now be moved slowly in one direction on the magnetic tape. The progress of the calibration is shown by the display "CAL 1 ... CAL 4". After finishing its calibration the unit will start automatically in the operator level.

If you receive an error code "ERROR 1... ERROR 10" after the calibration, then check the installation of the sensor and repeat the calibration.

10.4.2 Load Default Parameters and Simultaneous Calibration



NOTE

Any amended parameters will be overwritten by reloading the default parameter set! If necessary write down any required settings prior to reloading.

Switch off the unit (remove battery or remove plug).



Hold down the key.

The unit turns back on while the key is being held down.

All parameters are reset to factory settings. Then the sensor calibration is triggered.

→ Approach see section 10.4.1

LMI Operation Manual

10.5 Function at Operator Level

Working with the unit

10.5.1 Setting Display to Reference Value



Press keys simultaneously.

After start-up the displayed value will be an arbitrary one. To indicate this the display shows REF, see section 10.1. In order to reference / zero the unit move it to your required zero position and press the keys indicated. The display will now take the value of P09 and REF will no longer be displayed.

10.5.2 Direct Entry to Reference Value



Press keys simultaneously.

By default the reference value is zero. Installations may have a known position that requires a different value. Press and hold this combination of keys for 3 seconds to access the value of parameter P09 without switching to parameter level, (see section 10.3) This parameter can also be changed in parameter level.



Press key to save the reference value.

10.5.3 Switching Incremental and Absolute Values



Press once.

With this key the indicator is switched from absolute mode to incremental mode:
 ➔ The display value is temporarily set to ZERO, the symbol "INC" appears in the display.
 Actuate the key again the absolute is activated and the symbol "ABS" is displayed.

10.5.4 Activating Offset Measurements



Press once.

This key selects one of the three adjustable offset dimensions (only possible in the absolute mode). In each case an offset is added to the display value.

The activation of an offset level is indicated by the symbols **1**, **2** or **3** and **OFFSET**.

The offset measurements are entered as parameters P10, P11 and P12. Additionally, parameter P13 allows you to enable/disable access to these offsets.

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10.5.5 Fraction Display in Inch-Mode

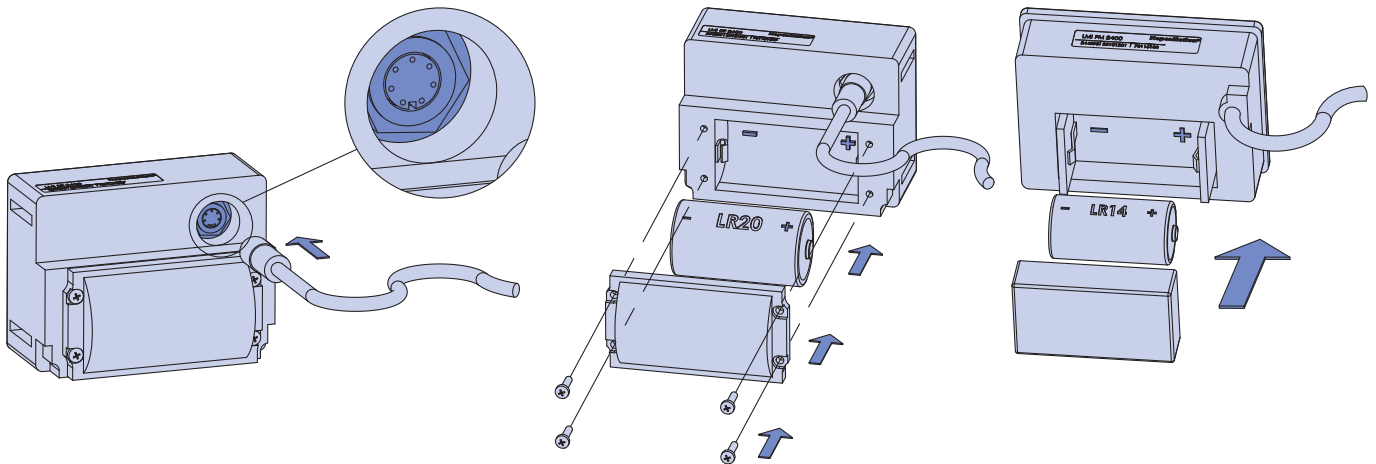


With this key the display can be changed but only in inch-mode (parameter P02 = 1) as follows:

1 x key pressed:	Display INCH -	fraction display	1/64 inch
1 x key pressed:	Display INCH -	fraction display	1/32 inch
1 x key pressed:	Display INCH -	fraction display	1/16 inch
1 x key pressed:	Display INCH -	decimal display	0.001 inch
etc.			

10.6 Indicator Unit Tutorial 1, Common Parameters

With magnetic tape, sensor and indicator unit fitted, if applicable connect the sensor cable to the indicator unit (noting the required orientation between plug and socket). Now fit the battery (observing polarity; reference the markings on the battery compartment). This will cause the indicator unit to power up and it should then only need to be given its reference position (see section 10.6.2) and for any other user specific parameters to be set. Only in the event of an unforeseen fault should it be necessary to re calibrate the unit or to load the default parameters. (These actions are described in section 10.4.1 and section 10.4.2.).



The indicator unit consists of an LCD display and a 4 button touch pad. The function of each key is described in section 10.2. The display has provision for 7 digits plus some additional characters and symbols.



LMI Operation Manual

10.6.1 Check the Battery Status

Check the top left corner of the display to ensure the battery is in good condition. If no icons show then the battery should be replaced promptly. The two indicator unit types use different batteries - see section 6.1.4 (Ensure correct polarity, referencing the markings on the battery compartment.)



10.6.2 Reference / Zero the Unit

(Note that after start-up the unit displays an arbitrary measurement value and shows REF near to the top left of the display. This indicates that it has not yet been referenced/zeroed. If an error message is displayed instead of a measurement then refer to section 10.5).



Move the unit to an imaginary zero position



Press keys simultaneously. The display will zero and REF will no longer show.

10.6.3 Change the Reference Value

A unit could need to display a non-zero value in its 'known' position. To access this parameter;



Press keys simultaneously for 3 seconds.

To illustrate its effect, set the parameter to be about four tenths of the available travel of the unit:



Press to change the value of the blinking digit as necessary.



Press to select the next digit rightward (and from rightmost back to left).



Pressing will allow the sign to be changed, as long as the value is non-zero.



Press to save the value and exit.

Now move the unit to an imaginary 'known' position



Press simultaneously to see the display show the new reference value.

(The above combination of keys is a shortcut to the reference value. This value is parameter P09; which can also be amended at parameter level, see section 10.6.4).

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10.6.4 Go to Parameter Level

When initialised (and not at parameter level) the unit is at 'operation level' (and the battery icons display).

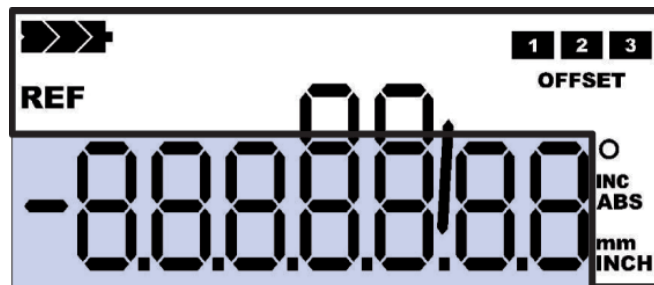


Hold down for 3 seconds, P01 is displayed. This is now Parameter level, note that some icons do not display.

Press briefly once more and the value of parameter P01 is displayed. Press repeatedly and the unit displays every parameter, then its value in turn. These are listed in section 10.3.6. The unit will cycle through the parameters and values repeatedly.



Hold down for 3 seconds at any time to exit back to the operation level and in doing so save any new values.



10.6.5 Change the Positive Direction

(In operation level) move the unit and note which way is currently set as the positive direction (default is zero). Enter parameter level,



Press to observe the value of P01.



Press to change the value from 0 to 1 or vice versa.

Then exit parameter level. Move the carriage and note the new positive direction.

10.6.6 Set Tool Offset Values

Enter parameter level and step through to the value for P10, which is Offset 1.



As before this allows each digit value to be changed.



Press to move to the next digit rightward.



Press to change the sign (as long as the value is non-zero).

P11 and P12 are Offsets 2 and 3 respectively, and are adjusted in the same way. To illustrate, change these to one tenth, two tenths and three tenths approximately of the available travel of the unit. Then exit.

LMI Operation Manual

10.6.7 Apply a Tool Offset

(In operation level) note the initial measurement value.



Press once.

The display will now show OFFSET and 1 and a measurement that is the sum of the initial measurement and the P10 value you set. Pressing again will show OFFSET and 2 and the sum of the initial measurement + P11. Pressing again will show OFFSET and 3 with the sum of the initial measurement + P12. Pressing again displays the initial measurement. (This will not be possible if incremental values are being shown, see section 10.6.8).

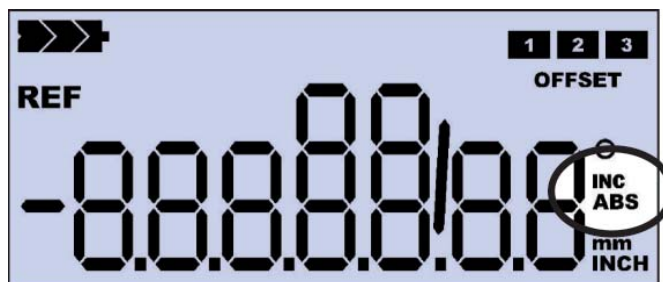


10.6.8 Show Incremental Value



(In operation level) press once.

The display will now show a value of zero and INC. Moving the unit will give measurements from this position. Press again and the display will return to absolute values and ABS will show.



10.6.9 Reset Default Parameter Values

Return the following parameters to their default values (or you could take the opportunity to change them to your desired ones):

Parameter	Description	Default value
P01	Positive direction	0
P09	Reference	0
P10	Offset 1	0
P11	Offset 2	0
P12	Offset 3	0

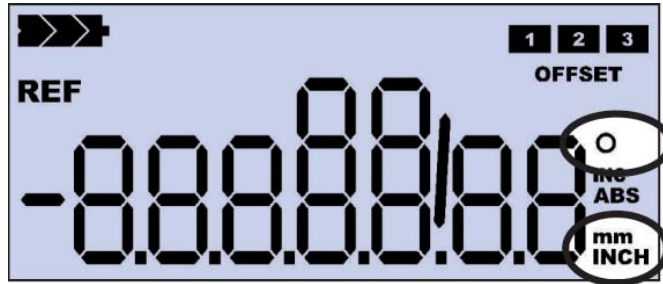
This tutorial was designed to familiarise you with the majority of the unit's features and the most commonly changed parameters. The following tutorial looks at the remaining features and parameters; which are used to change units and scale factors, plus selectively disable keys and tool offsets.

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10.7 Indicator Unit Tutorial 2, Other Features and Parameters

10.7.1 Change the Units Symbol

Go into parameter level and change from zero to a different value of P02, which controls the display of the units symbol. 0 displays mm, 1 displays INCH, 2 displays m, 3 displays ° and 4 displays nothing. Then exit to operation level to trial this. Reset P02 to its default value of zero. Note that P02 does not change the multiplication factor (see later) to match the units; except when set to inch.

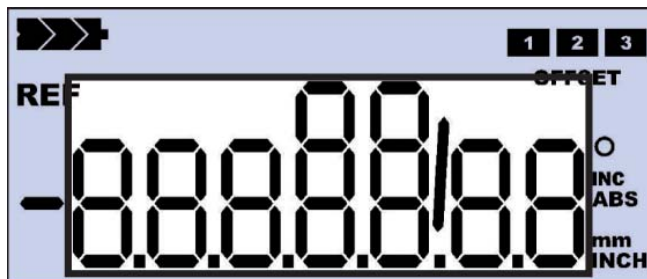


10.7.2 Display Inch Values

Change the units symbol to inch (P02 = 1) then exit parameter level.



Pressing will now cycle the display of inch values from initially thousandths (0.001) of an inch through 64ths, 32nds, 16ths and so on. Reset P02 to its default value of zero.



10.7.3 Change The Position of the Decimal Point

Change parameter P03 to 5; this will place the decimal point so that the measured value displays in metres. To display the m units symbol P02 must be set to 2 also. Then exit into operation level to trial this (there will be no effect if the display is in inches). The parameter can range from 0 to 5; 0 puts the decimal point to the far right and 5 puts it after the first digit. Reset P02 to zero and P03 to 2.

10.7.4 Change the Multiplication Factor

To illustrate this; ensuring P02 is set to zero and P03 is set to 2, change parameter P08 to 0.5 and exit parameter level. Move the carriage and note the measurement changes by half the actual. The default P08 value of 1.0000 outputs millimetres of direct measure. (Note; when P02 is set to 1, any multiplication factor set is ignored and inches are measured directly).

The multiplication factor parameter is useful where measurement is indirect, there are examples in section 5.1.2, section 5.2.1 and section 5.2.2. Now reset P08 to 1.0000 and P02 back to zero (if changed).

10.7.5 Resolution/Centimetre Factor

Ensuring P02 is set to zero and P03 is set to 2, observe the display; the resolution is 0.01 and the readout is in mm of direct measure. Now change parameter P07 to 1 and exit parameter level. The value displayed now has a resolution of 0.1mm, though the position of the decimal point has also shifted (giving centimetres of direct measure). Note there is no provision for a cm units symbol, though P02 could be set to 4 - blank. To give the read-out in millimetres, also change P03 to 1. (Note neither P03, P07 or P08 override each other, values are the result of all - unless P02 is set to 1, where each parameter is ignored and inches are measured directly). Now change P07 and P02 (if changed) back to their default values of 0 and P03 (if changed) back to 2.

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10.7.6 Disable Tool Offsets

Enter parameter level and change the value of P13: 0 - no offsets can be activated, 1 - only offset 1 can be activated, 2 - offsets 1 and 2 can be activated, 3 - offsets 1, 2 and 3 can be activated (default). Then exit to operation level to trial this. Reset P13 to its default value of 3.

10.7.7 Key Locks

Alter the values of parameter P05 to disable/enable the following keys;



000 activates all and 111 disables all.



The first digit controls this key.



The second digit controls this key.



The third digit controls this key.

Exit into operation level to trial this. Now reset P05 to its default value of 000.

10.7.8 Firmware Version

View the value of P99; this is the firmware version. This manual relates to version 1.50. The value cannot be changed.

10.7.9 Parameter P90

The unit also has a parameter P90, with a value of zero and no function. This value cannot be changed.

10.7.10 Reset Default Parameter Values

Return the following parameters to their default values (or, if decided, you could take the opportunity to change them to your desired ones):

Parameter	Description	Default value
P02	Units symbol	0
P03	Position decimal point	2
P05	Key locks	000
P07	Centimetre factor	0
P08	Multiplication factor	1.0000
P13	Offset locks	3

11 Not Applicable

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12 Troubleshooting

The following sections describe possible causes for malfunction and the instructions to correct them.

12.1 Safety



WARNING!

Risk of injury by improper disposal!

Improper disposal can lead to severe disturbance to persons or property.

Therefore:

- Any work to rectify faults should be performed only by qualified and adequately instructed personnel.
- Before starting work ensure a safe and adequate work space.
- Pay attention to orderliness and to cleanliness in the work area. Loose parts and tools, lying on each other or lying around, are sources of accidents.

If components need to be replaced:

- Fit spare parts correctly, in the correct orientation.
- Reinstall all fasteners correctly.
- Before restarting ensure that all covers and guards are properly installed and working correctly.

12.2 Restarting After Fault Clearance

Once you have resolved the failure:

1. Where appropriate, reset the emergency stop
2. Where appropriate reset the fault message to the parent system
3. Ensure that there are no persons in the danger zone
4. Proceed in accordance with the instructions in section 9

13 Maintenance

The unit is maintenance-free.



WARNING!

Hazard due to improper maintenance!

Improper maintenance can result to serious personal injury or property damage.

Therefore:

Maintenance work must be performed only by qualified and authorised by the operator and instructed personnel.

14 Cleaning



WARNING!

The system should be cleaned with a damp cloth, do not use aggressive cleaning products.



NOTE

When necessary clean the surface of the magnetic tape with a soft cloth to remove dust, shavings, humidity, etc.

Appreciable quantities of magnetic swarf can cause errors and malfunctions.

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EC Declaration of Conformity

This is to confirm that the products listed:

LMI Linear Measuring Indicator

Fulfils the basic requirements of the European guidelines:

EMC 2004/108/EC

This equipment also complies with the following standards:

EN 61000-6-2:2005

EN 61000-6-4:2007

EN 61010-1:2010

The person named below is authorised to compile the relevant technical documentation, and to complete this declaration.



Peter Fanshawe
Technical Director
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8th September 2011



INVESTOR IN PEOPLE



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