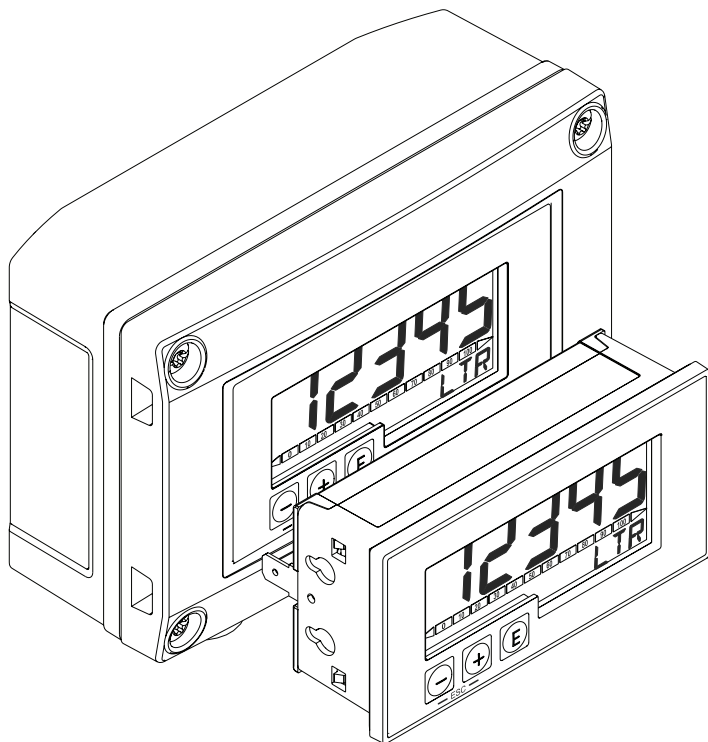


PROSENSE LPM1 SERIES METER

Loop-powered 4 to 20mA process display unit



OPERATING INSTRUCTIONS

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1 Document Information






1.1 Document function

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.



1.2 Document conventions

1.2.1 Safety symbols












Symbol	Meaning
	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.

Symbol	Meaning
	Direct current A terminal to which DC voltage is applied or through which direct current flows.
	Alternating current A terminal to which alternating voltage is applied or through which alternating current flows.
	Direct current and alternating current <ul style="list-style-type: none"> • A terminal to which alternating voltage or DC voltage is applied. • A terminal through which alternating current or direct current flows.
	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.




1.2.2 Electrical symbols

Symbol	Meaning
	Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.
	ESD - Electrostatic discharge Protect the terminals against electrostatic discharge. Failure to comply with this instruction can result in the destruction of parts or malfunction of the electronics.





1.2.3 Symbols for certain types of information

Symbol	Meaning
	Permitted Indicates procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
	Forbidden Indicates procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to documentation Refers to the corresponding device documentation.
	Reference to page Refers to the corresponding page number.
	Reference to graphic
	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.4 Symbols for graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
1., 2., 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
	Flow direction
	Hazardous area Indicates a hazardous area.
	Safe area (non-hazardous area) Indicates a non-hazardous area.

1.2.5 Symbols for tools

Symbol	Meaning
	Flat blade screwdriver
	Allen key
	Open-ended wrench
	Torx screwdriver

2 Basic Safety Instructions

2.1 Requirements for personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- Trained, qualified specialists must have a relevant qualification for this specific function and task
- Are authorized by the plant owner/operator
- Are familiar with federal/national regulations
- Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)

- Following instructions and basic conditions

The operating personnel must fulfill the following requirements:

- Being instructed and authorized according to the requirements of the task by the facility's owner/operator
- Following the instructions in these Operating Instructions

2.2 Designated use

The process display unit displays analog process variables on its screen.

The device is powered via the 4 to 20 mA current loop and does not require an additional power supply.

- The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated. It is not permitted to convert or modify the device in any way.
- Panel-mounted device (LPM1-A-PNL): The device is designed for installation in a panel and must only be operated in an installed state.
- Field device (LPM1-A-ENC and LPM1-A-HAZ): The device is designed for installation in the field.
- The device may only be operated under the permitted ambient conditions

2.3 Workplace safety

For work on and with the device:

- Wear the required personal protective equipment according to federal/national regulations.

2.4 Operational safety

Risk of injury!

- Operate the device in proper technical condition and fail-safe condition only.
- The operator is responsible for interference-free operation of the device.

Conversions to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.

2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Confirmed by the affixing of the CE mark to the device.

The measuring devices have also been tested by UL or CSA. See “Technical data” section.

3 Scope of Delivery

The scope of delivery of the device comprises:

- Panel mounted device (LPM1-A-PNL)
 - Process display unit
 - Operating Instructions
 - Fastening fixtures
- Field mounted device (LPM1-A-ENC, LPM1-A-HAZ)
 - Process display unit
 - Operating Instructions
 - CSA Control Drawing (LPM1-A-HAZ only)

4 Installation

4.1 Incoming acceptance, transport, storage

Compliance with the permitted environmental and storage conditions is mandatory. Precise specifications for this are provided in the “Technical data section”.

4.1.1 Incoming acceptance

On receipt of the goods, check the following points:

- Is the packaging or the content damaged?
- Is the delivery complete? Compare the scope of delivery against the information on your order form.

4.1.2 Transport and storage

Please note the following:

- Pack the device so that it is protected against impact for storage and transport. The original packaging provides optimum protection.
- The permitted storage temperature is -40 to $+85$ °C (-40 to $+185$ °F); it is possible to store the device at borderline temperatures for a limited period (48 hours maximum).

4.2 Installation conditions

i At temperatures below -25 °C (-13 °F) the readability of the display can no longer be guaranteed.

4.2.1 Display unit in the panel-mount housing

Permitted ambient temperature range -40 to 60 °C (-40 to 140 °F), horizontal orientation. IP65 protection at front, IP20 at rear

See “Technical data” section.

4.2.2 Display unit in the field housing

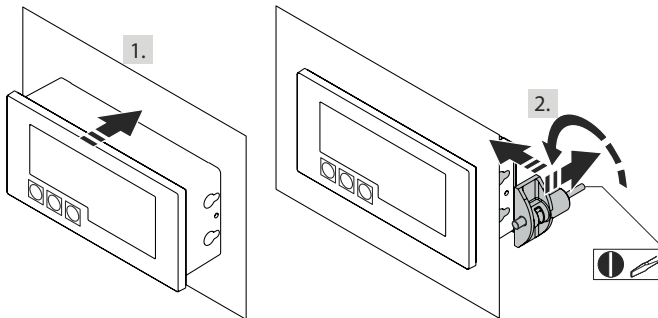
Permitted ambient temperature range -40 to 60 °C (-40 to 140 °F). IP67 protection, NEMA 4x (aluminum housing).

See “Technical data” section.

4.3 Installation instructions

For the dimensions of the device, see “Technical data section”

4.3.1 Panel housing (LPM1-A-PNL)



Installation in a panel with a panel cutout 92×45 mm (3.62×1.77 in), max. panel thickness 13 mm (0.51 in).

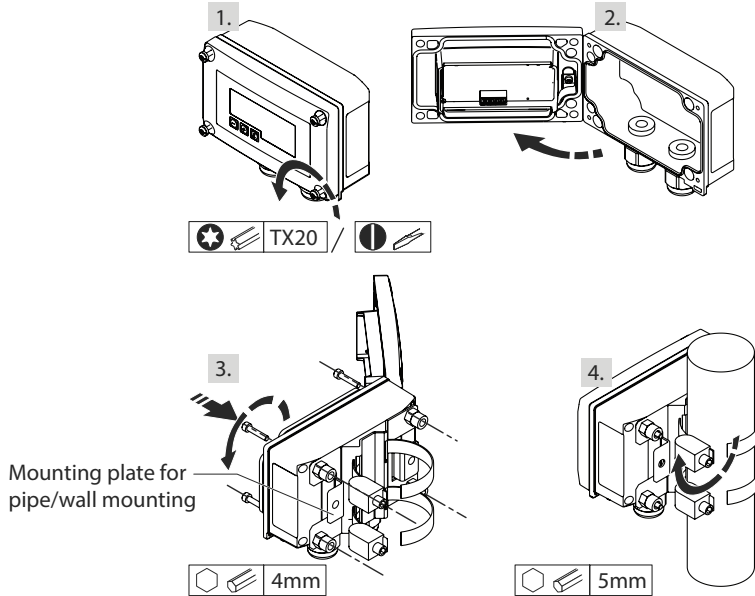
1. Insert the device into the panel cutout from the front.

2. Fit the mounting clips on the side of the housing and tighten the set screws. Tightening screw torque: 0.4 to 0.6 Nm

4.3.2 Field housing (LPM1-A-ENC and LPM1-A-HAZ)

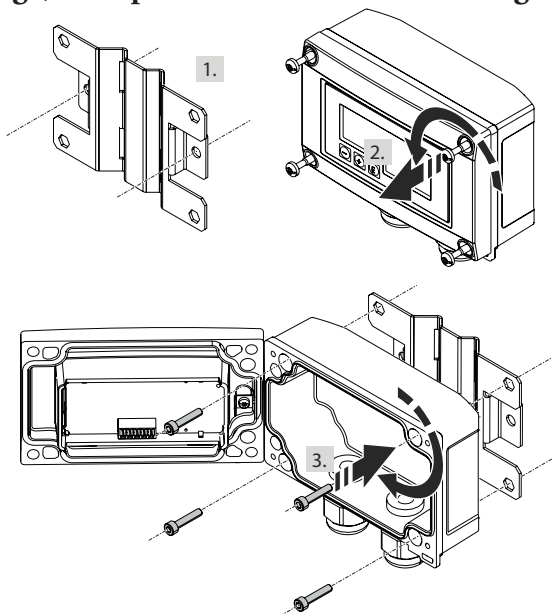
Pipe mounting (with optional LPM1-BKT mounting kit)

The device can be mounted on a pipe with a diameter of up to 50.8 mm (2 in) with the mounting kit (sold separately).



1. Release the 4 housing screws.
2. Open the housing
3. Secure the mounting plate to the rear of the device with 4 screws supplied.
4. Guide the two gripper clamps through the mounting plate, fit them around the pipe and tighten.

Wall mounting (with optional LPM1-BKT mounting kit)



1. Use the mounting plate as a stencil and make two 6mm (0.24 in) bore holes, 82mm (3.23 in) apart. Secure the plate on the wall with 2 screws (not supplied).
2. Open the housing.
3. Secure the display unit on the mounting plate with the 4 screws supplied.
4. Close the cover and tighten the screws.

Without a mounting kit.

1. Open the housing.
2. Use the device as a stencil, four 6 mm (0.24 in) bore holes, 99 mm (3.9 in) apart on the horizontal plane, 66 mm (2.6 in) apart on the vertical plane.
3. Secure the display unit on the wall with 4 screws.
4. Close the cover and tighten the housing screws.

4.4 Post-installation check

4.4.1 Display unit in the panel-mount housing

- Is the seal undamaged?
- Are the mounting clips securely fastened on the housing of the device?
- Are the set screws properly tightened?
- Is the device located in the center of the panel cutout?

4.4.2 Display unit in the field housing

- Is the seal undamaged?
- Is the housing firmly screwed to the mounting plate?
- Is the mounting bracket firmly secured on the wall/pipe?
- Are the housing screws firmly tightened?

5 Wiring

WARNING

Danger! Electric voltage!

- The entire connection of the device must take place while the device is de-energized.

Only certified devices may be connected in the hazardous area

- Observe corresponding notes and wiring diagrams in the CSA-control drawing supplement to these Operating Instructions. If you have any questions, please do not hesitate to contact AutomationDirect.com 1-800-633-0405.

NOTICE

SELV/Class 2 device

- The device may only be powered by a power unit with an energy-limited circuit in accordance with IEC 61010-1: 'SELV or Class 2 circuit'.

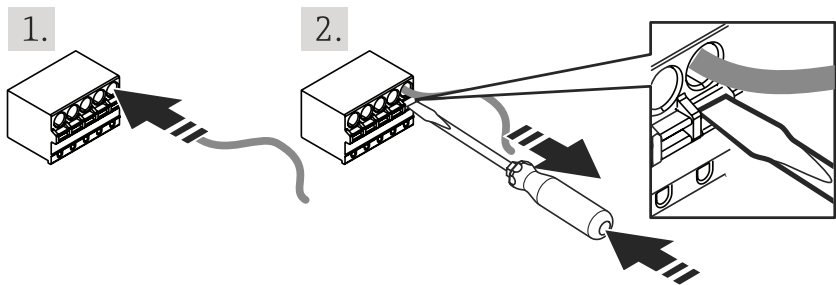
Device destroyed if current too high

- Do not operate the device at a voltage source without a current limiter. Instead, operate the device only in the current loop with a transmitter.

Panel housing (LPM1-A-PNL): The terminals are located on the rear of the housing.

Field housing (LPM1-A-ENC and LPM1-A-HAZ): The terminals are located inside the housing. The device has two M16 cable entries. The housing must be opened for wiring purposes.

Operation of the spring terminals



1. When using rigid cables with a ferrule, just plug the cable into the terminal. No tools required. With flexible wires the spring mechanism of the terminal must be operated as shown in step 2.
2. In order to loosen the cable, push the spring mechanism in completely using a screwdriver or other suitable tool and pull out the cable.

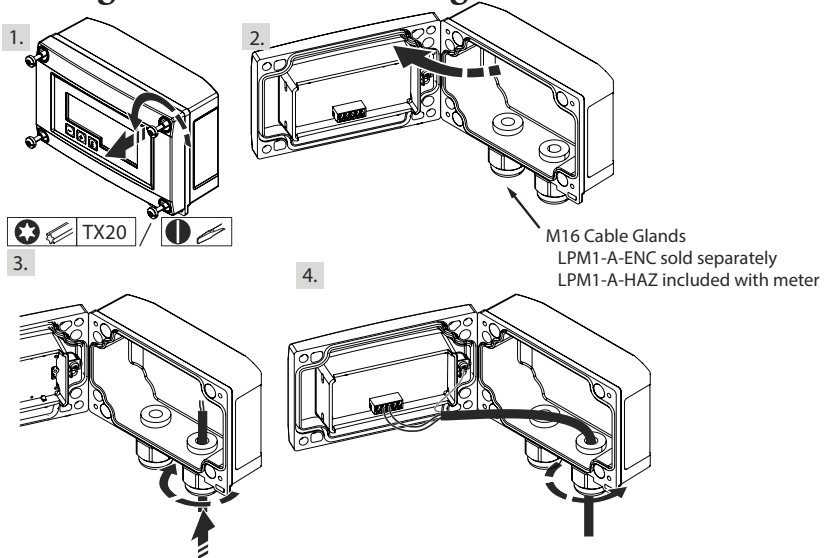
5.1 Quick wiring guide

Terminal	Description
+	Positive connection, current measurement
-	Negative connection, current measurement (without backlighting)
LED	Negative connection, current measurement (with backlighting)
□	Auxiliary terminals (electrically connected internally)
⏏	Functional grounding: <ul style="list-style-type: none">• Panel-mounted device: Terminal on the rear of the housing• Field device: Terminal in the housing

	Connection without backlighting	Connection with backlighting
Connection with transmitter power supply and transmitter (sinking)	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>
Connection with transmitter power supply and transmitter (sourcing)	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>
Connection with transmitter power supply and transmitter using the auxiliary terminal (sinking)	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>
Connection with transmitter power supply and transmitter using the auxiliary terminal (sourcing)	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>	<p>1 Transmitter power supply 2 4 to 20mA transmitter</p>
Connection without transmitter power supply directly in the 4 to 20 mA circuit	<p>2 4 to 20 mA current source</p>	<p>2 4 to 20 mA current source</p>

Note: Always refer to the CSA control drawing (LPM1-A-HAZ-DWG) when installing a LPM1-A-HAZ in a hazardous location.

5.2 Inserting the cable, field housing



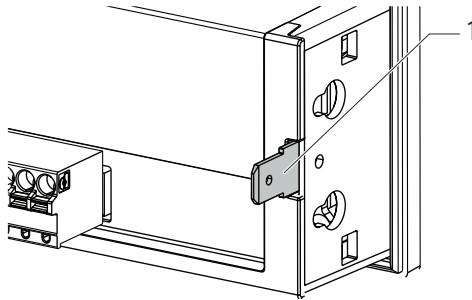
Inserting the cable, field housing, connection without transmitter power supply (example)

1. Release the housing screws
2. Open the housing
3. Open the cable gland (M16 Cable Glands, LPM1-A-ENC sold separately, LPM1-A-HAZ included with meter) and insert the cable
4. Connect the cable including functional grounding and close the cable gland

5.3 Connecting to functional grounding

5.3.1 Panel-mounted device (LPM1-A-PNL)

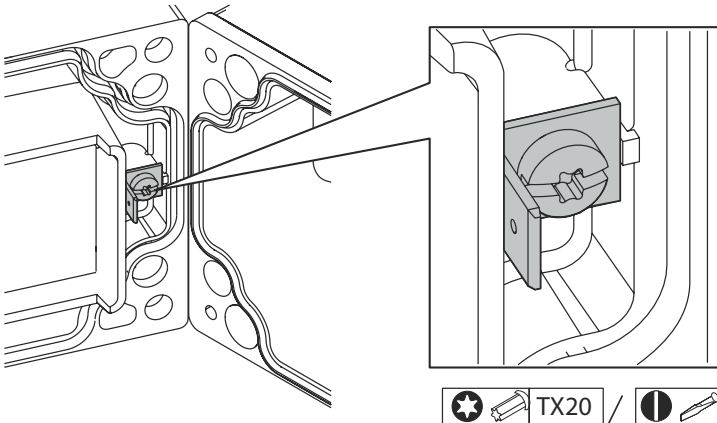
For EMC reasons, the functional grounding should always be connected.



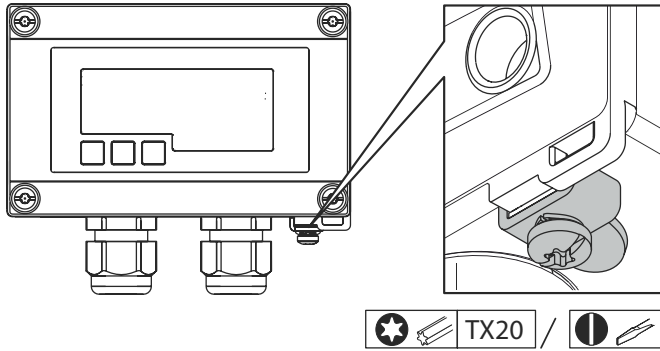
Functional grounding terminal (1) on panel-mounted LPM1-A-PNL

5.3.2 Field device (LPM1-A-ENC and LPM1-A-HAZ)

For EMC reasons, the functional grounding should always be connected. When used in a hazardous area (LPM1-A-HAZ with CSA approval), the connection is obligatory and the field housing must be grounded via a grounding screw fitted on the outside of the housing.



Functional grounding terminal in field housing



Ground terminal on field housing

5.4 Degree of protection

5.4.1 Field housing (LPM1-A-ENC and LPM1-A-HAZ)

The devices meet all the requirements of IP67. It is absolutely essential to comply with the following points to ensure this protection is guaranteed after mounting or servicing the device:

- The housing seal must be clean and undamaged when inserted into the groove. The seal must be cleaned, dried or replaced if necessary.
- The cables used for connection must be of the specified outside diameter (e.g. M16 x 1.5, cable diameter 5 to 10 mm (0.2 to 0.39 in)).
- Mount the measuring device in such a way that the cable entries point downwards.
- Fill unused cable entries with plugs.
- The housing cover and the cable entries must be firmly tightened.

5.4.2 Panel housing (LPM1-A-PNL)

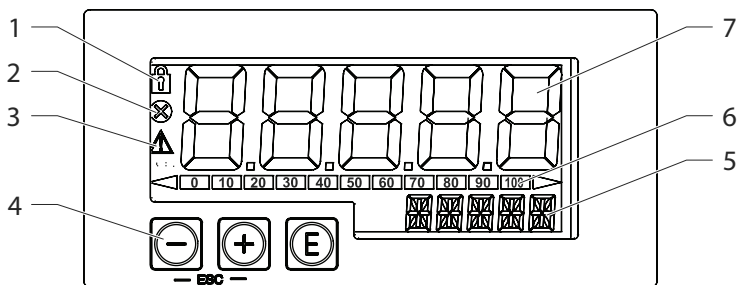
The front of the device meets the requirements of IP65. It is absolutely essential to comply with the following points to ensure this protection is guaranteed after mounting or servicing the device:

- The seal between the front of the housing and the panel must be clean and undamaged. The seal must be cleaned, dried or replaced if necessary.
- The set screws of the panel mounting clips must be firmly tightened.

5.5 Post-connection check

Device condition and specifications	Notes
Are cables or the device damaged?	Visual inspection
Electrical connection	Notes
Does the supply current match the specifications on the nameplate?	-
Are the cables, incl. functional grounding, connected correctly and strain-relieved?	-
Field housing (LPM1-A-ENC and LPM1-A-HAZ): Are the cable glands securely closed?	-




6 Operation



Display and operating elements of the process display unit


1. Symbol: operating menu disabled
2. Symbol: error
3. Symbol: warning
4. Operating keys “-”, “+”, “E”
5. 14-segment display for unit/TAG
6. Bar graph with indicators for under range and over range
7. 5-digit 7-segment display for measured value, digit height 17 mm (0.67 in)

The device is operated using three operating keys on the front of the housing. The device setup can be disabled with a 4-digit user code. If the setup is disabled, a padlock symbol appears on the display when an operating parameter is selected.

	Enter key; calling up the operating menu, confirming the option/setting parameters in the operating menu
	Selecting and setting/changing values in the operating menu; pressing the '-' and '+' keys simultaneously takes the user back up a menu level. The configured value is not saved.
	

6.1 Operating functions

The operating functions of the process display unit are divided into the following menus. The individual parameters and settings are described in the “Commissioning” section.

 If the operating menu is disabled by means of a user code, the individual menus and parameters can be displayed but not changed. To change a parameter, the user code must be entered. As the display unit can only display digits in the 7-segment display and not alphanumeric characters, the procedure for number parameters is different to that for text parameters.

If the operating position contains only numbers as parameters, the operating position is displayed in the 14-segment display and the configured parameter is displayed in the 7-segment display. To edit, press the ‘E’-button followed by the user code.

If the operating position contains text parameters, only the operating position is initially displayed in the 14-segment display. If the ‘E’ button is pressed again, the configured parameter is displayed in the 14-segment display. To edit, press the ‘+’ button followed by the user code.

Setup (SETUP)	Basic device settings
Diagnostics (DIAG)	Device information, display of error messages
Expert (EXPT)	Expert settings for the device setup The Expert menu is protected from editing by an access code (default 0000).

7 Commissioning

7.1 Post-installation check and switching on the device

Perform the final checks before commissioning the device:

- Checklist for “post-installation check”
- Checklist for “post-connection check”

The device starts after being connected to the 4 to 20 mA circuit. The firmware version appears on the display during the start-up phase.

When the device is being commissioned for the first time, program the setup in accordance with the descriptions in the Operating Instructions.

If you are commissioning a device that is already configured or preset, the device immediately starts measuring the current as defined in the settings.



Remove the protective film from the display as this would otherwise affect the readability of the display.

7.2 Operating matrix

Setup menu (SETUP)			
Parameters	Values	visible at	Description
DECIM	0 DEC 1 DEC 2 DEC 3 DEC 4 DEC		Number of decimal places for display
SC__4	Numerical value -19 999 to 99 999 Default: 0.0		5-digit value (number of decimal places as configured under DECIM) for scaling the measured value at 4 mA Example: SC__4 = 0.0 displays 0.0 at 4 mA measuring current The unit selected under UNIT is used to display the value.
SC_20	Numerical value -19 999 to 99 999 Default: 100.0		5-digit value (number of decimal places as configured under DECIM) for scaling the measured value at 20 mA Example: SC_20 = 100.0 displays 100.0 at 20 mA measuring current The unit selected under UNIT is used to display the value.
UNIT	% °C °F K USER		Use this function to select the unit for displaying the value. If "USER" is selected, a user-defined unit can be entered in the TEXT parameter.
TEXT	Customized text, 5-digit		User-defined unit, only visible if the "USER" option has been selected under UNIT.

Diagnostics menu (DIAG)		
Parameters	Values	Description
AERR	Read only	The current diagnostic message appears on the display. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.
LERR	Read only	The last diagnostic message with the highest priority appears on the display.
FWVER	Read only	The firmware version appears on the display.

Expert menu (EXPERT); a code must be entered			
In addition to all the parameters in the Setup menu, the Expert menu also contains the parameters described in this table. If you call up the Expert menu, you will be asked to enter the user code (UCODE, default: 0000).			
Parameters	Values	visible at	Description
SYSTEM			
UCODE	Numerical value 0000 to 9999 Default: 0000		4-digit user code With the user code it is possible to protect the device setup from unauthorized modifications. If the setup is disabled, a padlock symbol appears on the display when an operating parameter is selected. The user code is not active with the default setting "0000". This means that setup parameters can be changed without entering the code. The code must always be entered for the Expert menu, even for the default setting.
FRSET	NO YES		Resets the device setup. The values are reset to the preset values for preconfigured devices, and to the default values for all other devices. Select "YES" and press "E" by way of confirmation to reset the device.
INPUT			
CURV	LINAR SQRT		Use this to select the calculation function for the process value LINAR (scaling with SC_4 and SC_20): Process value = (mA value - 4)/16 * (SC_20 - SC_4) + SC_4 + OFFST SQRT (square root extraction and scaling): Process value = Square root((mA value - 4)/16) * (SC_20 - SC_4) + SC_4 + OFFST Negative values when calculating the square root are set to 0. Example for SQRT: <ul style="list-style-type: none"> • mA value = 8.0 • SC_4 = 0.0 • SC_20 = 100.0 • OFFST = 0.0 Display value = 50.0
NAMUR	NO YES		Use this function to define the error limits in accordance with standard NAMUR NE 43
RNGLO	Numerical value	NAMUR = NO	Lower range limit. An error message is displayed if the measured current falls below this limit.
RNGHI	Numerical value	NAMUR = NO	Upper range limit. An error message is displayed if the measured current exceeds this limit.
OFFST	Numerical value -19 999 to 99 999		Use this function to enter an offset value to display the measured value.


8 Troubleshooting

8.1 Error limits as per NAMUR NE 43

The device can be configured for error limits as per NAMUR NE 43.
The device displays an error message if a value is outside these limits.

Current value	Error	Diagnostic code
$\leq 3.6 \text{ mA}$	Under range	F100
$3.6 \text{ mA} < x \leq 3.8 \text{ mA}$	Unpermitted measured value	S901
$20.5 \text{ mA} \leq x < 21.0 \text{ mA}$	Unpermitted measured value	S902
$> 21.0 \text{ mA}$	Over range	F100

8.2 Diagnostic messages

 If several errors are pending simultaneously, the device always displays the error with the highest priority.
1 = Highest priority

Diagnostic number	Short text	Corrective measure	Diagnostic behavior	Priority
Diagnostics for the sensor				
F100	Sensor error	<ul style="list-style-type: none">• Check electrical wiring• Check sensor• Check sensor settings	Alarm	6
S901	Input signal too small	<ul style="list-style-type: none">• Check transmitter output	Warning	4

Diagnostic number	Short text	Corrective measure	Diagnostic behavior	Priority
S902	Input signal too large	Check transmitter for incorrect configuration	Warning	5
Diagnostics for the electronics				
F261	Electronics module	Replace display	Alarm	1
F283	Memory content	<ul style="list-style-type: none"> Restart device Reset device Reset display 	Alarm	2
F431	Factory calibration	Replace display	Alarm	3
Diagnostics for the configuration				
M561	Display overshoot	Check scaling	Warning	7

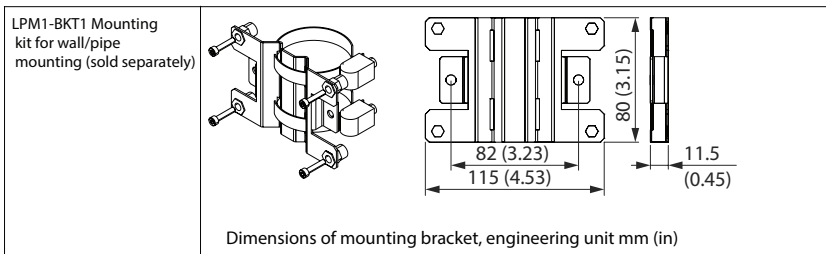
9 Maintenance

No special maintenance work is required on the device.

10 Disposal

The device contains electronic components and must therefore be disposed of as electronic waste. Comply with local disposal regulations.

11 Mounting Kit



12 Technical data

12.1 Input

Voltage drop	
Without Backlight	≤ 1.0 V
Backlight Enabled	Additional 2.9 V

12.1.1 Measured variable

The 4 to 20 mA current signal input variable.

12.1.2 Measuring range

4 to 20 mA (scalable, reverse polarity protection) Max. input current 200 mA

12.2 Power supply

12.2.1 Supply voltage

The display unit is loop-powered and does not require any external power supply. The voltage drop is ≤1 V at 4 to 20 mA and an additional 2.9 V if display lighting is used.

12.3 Performance characteristics

12.3.1 Reference operating conditions

Reference temperature 25 °C ±5 °C (77 °F ±9 °F)
Humidity 20 to 60% relative humidity

12.3.2 Maximum measured error

Input	Range	Measured error of measuring range
Current	4 to 20 mA Over range up to 22 mA	±0.1 %

12.3.3 Resolution

Signal resolution > 13 bit

12.3.4 Influence of ambient temperature

< 0.02 %/K (0.01 %/°F) of measuring range

12.3.5 Warm-up period

10 minutes

12.4 Installation

12.4.1 Mounting location

Panel housing (LPM1-A-PNL)

The device is designed for use in a panel.

Required panel cutout 45x92 mm (1.77x3.62 in)

Field housing (LPM1-A-ENC, LPM1-A-HAZ)

The field housing version is designed for use in the field. The unit is mounted directly on a wall, or on a pipe with a diameter of up to 2 inches with the aid of an optional mounting bracket (LPM1-BKT1).

12.4.2 Orientation

Panel housing

The orientation is horizontal.

Field housing

The device must be mounted in such a way that the cable entries point downwards.

12.5 Environment

12.5.1 Ambient temperature range

−40 to 60 °C (−40 to 140 °F)



At temperatures below −25 °C (−13 °F) the readability of the display can no longer be guaranteed.

12.5.2 Storage temperature

−40 to 85 °C (−40 to 185 °F)

12.5.3 Climate class

IEC 60654-1, Class B2

12.5.4 Altitude

Up to 5,000 m (16,400 ft) above MSL in accordance with IEC61010-1

12.5.5 Degree of protection

As per IEC60529:

Panel housing

IP65 at front, IP20 at rear

Field housing

IP67, NEMA4x (aluminum housing)

12.5.6 Electromagnetic compatibility

- Interference immunity:

As per IEC61326 (Industrial Environments) / NAMUR NE 21 Maximum measured error < 1 % of MR

- Interference emission:

As per IEC61326, Class B

12.5.7 Electrical safety

Class III, overvoltage protection category II, pollution degree 2

12.5.8 Certifications

- cULus Listed, E311366 (LPM1-A-PNL and LPM1-A-ENC only):

UL 61010-1

UL 61010-2-201

UL 50 / UL 50E

- cCSAus, 601711 (LPM1-A-HAZ only):

Intrinsically Safe Entity - For Hazardous Locations

Ex ia IIC T6 Ga

AEx ia IIC T6 Ga

Class I, Division 1, Groups A, B, C & D

Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations

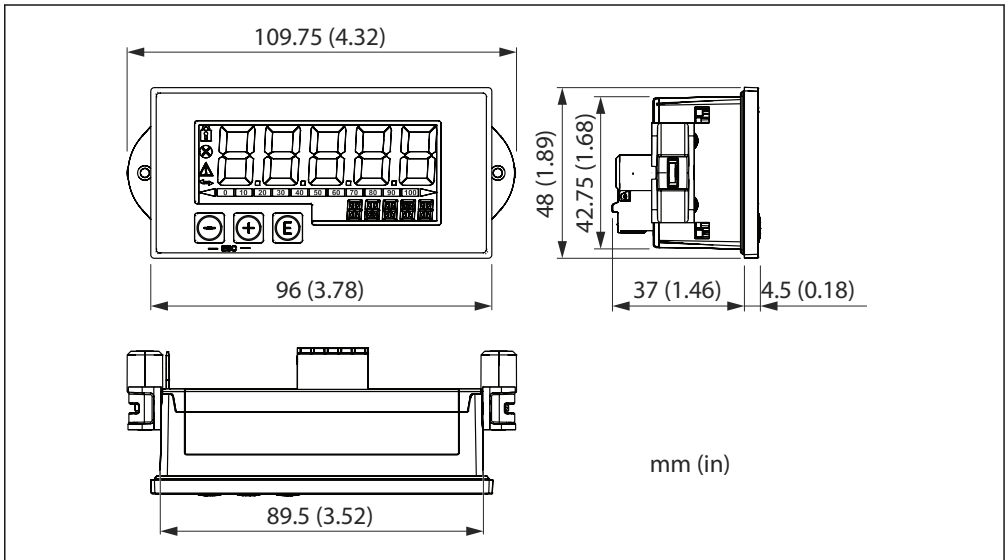
Class I, Division 2, Groups A, B, C and D

• CE

12.6 Mechanical construction

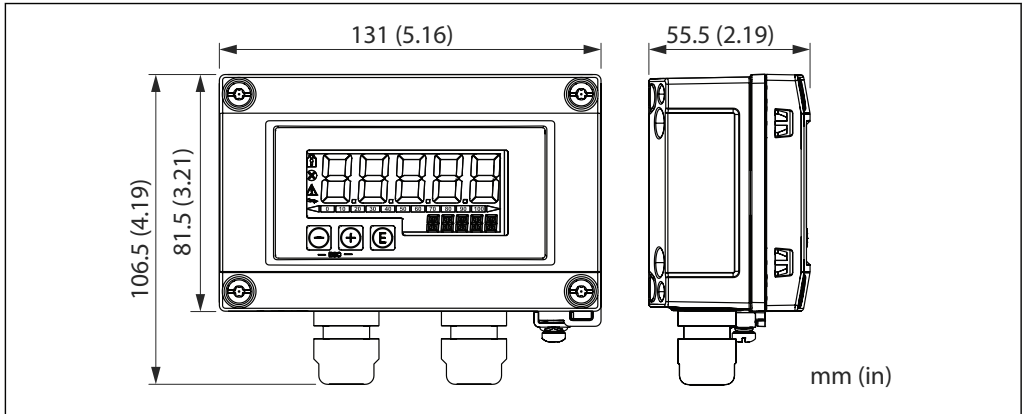
12.6.1 Design, dimensions

Panel-mount housing (LPM1-A-PNL)



Required panel cutout 45x92 mm (1.77x3.62 in), max. panel thickness 13 mm (0.51 in).

Field housing (LPM1-A-ENC, LPM1-A-HAZ)



LPM1-A-ENC: M16 cable glands sold separately

LPM1-A-HAZ: M16 cable glands included (M16 x 1.5, cable diameter 5 to 10 mm (0.2 to 0.39 in))

12.6.2 Weight

Panel-mount housing

115 g (0.25 lb.)

Field housing

520 g (1.15 lb)

12.6.3 Materials

Panel-mount housing

Front: Aluminum

Rear panel: Polycarbonate PC

Field housing

Aluminum



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