



LINXON



Operating Manual
Incl. EU Declaration of Conformity

LCM025

Capacitance Manometer

Table of Contents

1	General	3
1.1	Product Identification	3
1.2	Validity	3
1.3	Intended Use.....	4
1.4	Functional Principle.....	4
1.5	Trademark.....	4
1.6	Patents.....	5
2	Safety	5
2.1	Symbols Used.....	5
2.2	Personnel Qualifications	6
2.3	General Safety Instructions.....	6
2.4	Liability and Warranty	6
3	Technical Data	7
4	Installation	12
4.1	Vacuum Connection.....	12
4.2	Power Connection.....	14
5	Operation	17
5.1	Displays	17
5.2	Zeroing the Manometer.....	17
5.2.1	<ZERO> Adjustment.....	18
5.2.2	<ZERO> Adjustment with Ramp Function.....	20
5.3	Activating the Factory Setting (Factory Reset)	22
6	Deinstallation	23
7	Maintenance, Repair	24
8	Returning the Product	24
9	Disposal	25
	Literature	26
	EU Declaration of Conformity	27

Symbol for cross-references within this document:

→  XY




Symbol for references to literature list:

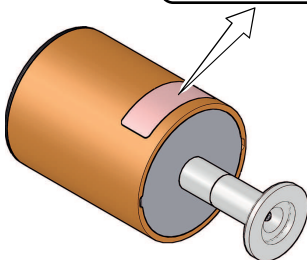
→  [Z]

1 General

1.1 Product Identification

In all communications with LIXON, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below.

INFICON AG, LI-9496 Balzers		 
Model:	
PN:	
SN:	
V.....W.....	



1.2 Validity

This document applies to products of the LCM025 series.

Part number	Torr	Flange
L11-000	1000 FS	DN 16 ISO-KF
L11-002	100 FS	DN 16 ISO-KF
L11-003	20 FS	DN 16 ISO-KF
L11-004	10 FS	DN 16 ISO-KF

Part number	Torr	Flange
L11-006	1 FS	DN 16 ISO-KF
L11-010	1000 FS	8 VCR female
L11-012	100 FS	8 VCR female
L11-014	10 FS	8 VCR female
L11-016	1 FS	8 VCR female

The part number (PN) can be taken from the product nameplate.

If not indicated otherwise in the legends, the illustrations in this document correspond to a manometer with the DN 16 ISO-KF vacuum connection. They apply to the other manometers by analogy.

We reserve the right to make technical changes without prior notice.

All dimensions in mm.

1.3 Intended Use

The Capacitance Manometers of the LCM025 series are intended for absolute pressure measurement of gases in their respective pressure ranges.

The manometers can be operated with a customer-specific control unit.

1.4 Functional Principle

A ceramic diaphragm is deflected by pressure. The deflection is measured capacitively and converted into an analog linear output signal by the digital electronics.

The output signal is independent of the gas type.

1.5 Trademark

VCR® Swagelok Marketing Co.

1.6 Patents

EP 1070239 B1, 1040333 B1
US Patents 6528008, 6591687, 7107855, 7140085

2 Safety

2.1 Symbols Used



DANGER

Information on preventing any kind of physical injury.



WARNING

Information on preventing extensive equipment and environmental damage.



Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.



Notice



Labeling

2.2 Personnel Qualifications



Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

2.3 General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
Consider possible reactions with the product materials.
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

2.4 Liability and Warranty

INFICON assumes no liability and the warranty becomes null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product

- use the product with accessories not listed in the corresponding product documentation.


The end-user assumes the responsibility in conjunction with the process media used.

Manometer failures due to contamination are not covered by the warranty.

3 Technical Data

Measurement range	→ "Validity"
Accuracy ¹⁾	0.50% of reading
Temperature effect on zero ≥10 Torr (FS) 1 Torr (FS)	0.0050% FS/ °C 0.015% FS/ °C
Temperature effect on span	0.01% of reading / °C
Resolution	0.003% FS
Gas type dependence	none
Output signal analog (measurement signal) Measurement range Voltage range Voltage vs. pressure	0 ... +10 V -5 ... +10.24 V linear
Output impedance	0 Ω (short-circuit proof)
Loaded impedance	>10 kΩ
Response time	30 ms
Identification Resistance R_{ident}	13.2 kΩ referenced to supply common

¹⁾ Non linearity, hysteresis, repeatability in the calibrated range at 23 °C ambient operating temperature without temperature effects after operation of 2 h.

RS232C interface Transmission rate Data format	9600 Baud binary, 8 data bits, one stop bit, no parity bit, no handshake
For further information on the RS232C interface →  [1]	

Supply



DANGER

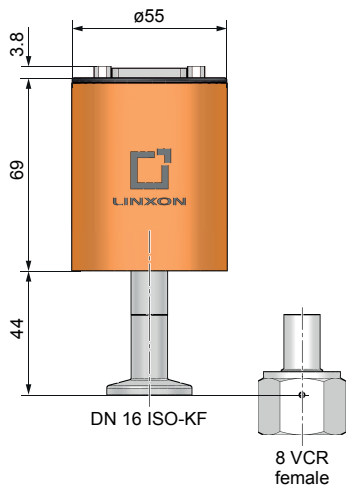
The manometer may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV) and limited power source (LPS), Class 2.

- The connection to the gauge has to be fused.

Supply voltage at the manometer Ripple	Class 2 / LPS +14 ... +30 V (dc) $\leq 1 V_{pp}$
Current consumption (max. starting current)	<500 mA
Power consumption (depending on supply voltage)	$\leq 1 W$
Fuse to be connected	1 AT (slow), automatic re- set (Polyfuse)
The manometer is protected against reverse polarity of the supply voltage.	
Electrical connection	D-sub 15-pin, male
Sensor cable	13-pin plus shielding
Cable length	$\leq 100 m$ (0.14 mm ² /conductor)
For longer cables, larger conductor cross-sections are required ($R_{cable} \leq 1.0 \Omega$).	

Grounding concept Vacuum flange–signal common Supply common–signal common	see "Power Connection" conducted separately; for differential measurement (10 Ω)
Materials exposed to vacuum Flange, tube Sensor and diaphragm	stainless steel AISI 316L ceramics (Al ₂ O ₃ ≥99.5%)
Internal volume	≤4.0 cm ³
Leak rate	<1×10 ⁻⁹ mbar l/s
Admissible pressure (absolute) 1000 Torr (FS) 1 ... 100 Torr (FS)	4 bar 2.6 bar
Bursting pressure (absolute)	5 bar
Admissible temperature Storage Operation Bakeout (not in operation)	-40 °C ... +65 °C +5 °C ... +50 °C ≤110 °C at the flange
Relative humidity	≤80% at temperatures ≤+31 °C decreasing to 50% at +40°C
Use	indoors only, altitude up to 2000 m NN
Pollution degree	2
Degree of protection	IP30

Dimensions [mm]

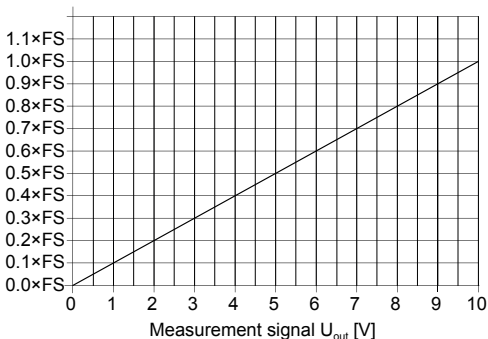


Weight

300 g ... 342 g

Analog Measurement Signal vs. Pressure

Pressure p



$$p = (U_{out} / 10 \text{ V}) \times p(\text{FS})$$

Conversion Torr \leftrightarrow Pascal

Torr	mbar ²⁾	Pa ²⁾
1.00	1013.25 / 760 = 1.3332...	101325 / 760 = 133.3224...

Example: Manometer with 10 Torr FS
Measurement signal $U_{out} = 6 \text{ V}$

$$\begin{aligned} p &= (6 \text{ V} / 10 \text{ V}) \times 10 \text{ Torr} \\ &= 0.6 \times 10 \text{ Torr} = \mathbf{6 \text{ Torr}} \end{aligned}$$

²⁾ Source: NPL (National Physical Laboratory)
Guide to the Measurement of Pressure and Vacuum, ISBN 0904457x / 1998

4 Installation



WARNING

Fragile components

The ceramic sensor may be damaged by impacts.

- Do not drop the product and prevent shocks and impacts.



DANGER

Leaking process media

High-intensity mechanical, chemical or thermal impacts can cause leaks in the measuring sensor. Process media can thus leak and possibly cause hazards, if overpressure is in the vacuum system.

- Avoid high-intensity mechanical, chemical or thermal impacts and overpressure in the vacuum system.
- Take appropriate measures (e.g. shut off gas supply, extraction, leak test) to avoid hazards or damage due to leaking process media.

4.1 Vacuum Connection



DANGER

Overpressure in the vacuum system >1 bar

Injury caused by released parts and harm caused by escaping process gases can result if clamps are opened while the vacuum system is pressurized.

- Do not open any clamps while the vacuum system is pressurized. Use the type of clamps which are suited to overpressure.

**DANGER**

Overpressure in the vacuum system >2.5 bar
KF flange connections with elastomer seals (e.g. O-rings) cannot withstand such pressures. Process media can thus leak and possibly damage your health.

- Use O-rings provided with an outer centering ring.

**DANGER**

Protective ground

Products that are not correctly connected to ground can be extremely hazardous in the event of a fault. The manometer must be electrically connected to the grounded vacuum chamber. This connection must conform to the requirements of a protective connection according to EN 61010:

- VCR connections fulfill this requirement.
- For manometers with a KF vacuum connection, use a conductive metallic clamping ring.

**Caution**

Vacuum component

Dirt and damages impair the function of the vacuum component.

- When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

**Caution**

Dirt sensitive area

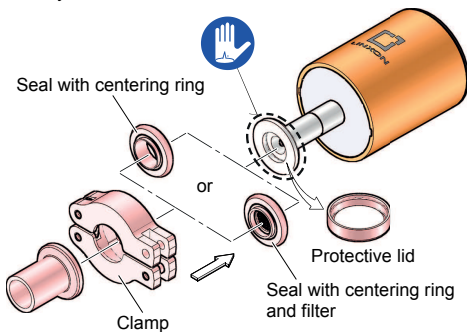
Touching the product or parts thereof with bare hands increases the desorption rate.

- Always wear clean, lint-free gloves and use clean tools when working in this area.



Mount the manometer so that no vibrations occur. The manometer may be mounted in any orientation. To keep condensates and particles from getting into the measuring chamber preferably choose a horizontal to upright position and possibly use a seal with a centering ring and filter. If adjustment should be possible after the manometer has been installed, be sure to install it so that the buttons can be accessed with a pin.

Remove the protective lid and connect the product to the vacuum system.



Keep the protective lid.

4.2 Power Connection



Make sure the vacuum connection is properly made.

**DANGER**

The manometer may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV) and limited power source (LPS), Class 2.

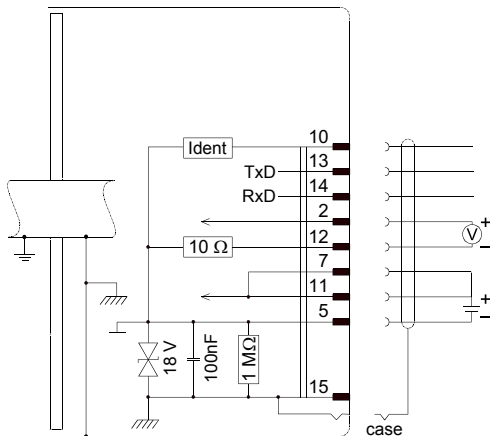
- The connection to the gauge has to be fused.



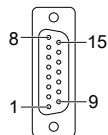
Ground loops, differences of potential, or EMC problems may affect the measurement signal. For optimum signal quality, please do observe the following notes:

- Connect the cable shield to ground on one side via the chassis ground. Do not connect the other side of the shield.
- Connect the supply common with protective ground directly at the power supply.
- Use differential measurement input (signal common and supply common conducted separately).
- Potential difference between supply common and housing ≤ 18 V (overvoltage protection).

If no sensor cable is available, make one according to the following diagram. Connect the sensor cable.



Pin 2	Signal output (measurement signal)
Pin 5	Supply common
Pin 7, 11	Supply
Pin 10	Manometer identification
Pin 12	Signal common
Pin 13	RS232, TxD
Pin 14	RS232, RxD
Pin 15	Housing (Chassis Ground)
case	Connector case



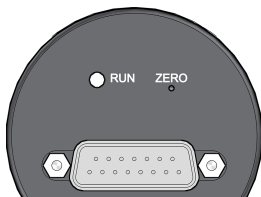
D-sub, 15-pin
female
soldering side

5 Operation

Put the manometer into operation.

Warm-up time	
<ul style="list-style-type: none"> for general purpose reading (within specifications) 	>¼ hour
<ul style="list-style-type: none"> for precision measurement and zero adjustment 	>2 hours

5.1 Displays



LED	State	Meaning
<RUN>	lit blinking	measurement mode other mode, warning, over-/ under-range, error

5.2 Zeroing the Manometer

The manometer is factory calibrated while "standing upright" (→ "Calibration Test Report").



We recommend performing a zero adjustment, when the gauge is operated for the first time.

Due to long time operation or contamination, a zero drift could occur and zero adjustment may become necessary.

For adjusting the zero, operate the manometer under the same constant ambient conditions and in the same mounting orientation as normally.

The output signal (measurement signal) is depending on the mounting orientation. The signal difference between the vertical and horizontal mounting orientation is:

FS	$\Delta U / 90^\circ$
1000 Torr	$\approx 2 \text{ mV}$
100 Torr	$\approx 10 \text{ mV}$
10 Torr	$\approx 50 \text{ mV}$
1 Torr	$\approx 300 \text{ mV}$

5.2.1 <ZERO> Adjustment



The zero can be adjusted via

- the <ZERO> button on the manometer
- the RS232C interface



If the manometer is operated via a controller, the zero of the whole measuring system has to be adjusted on the controller:

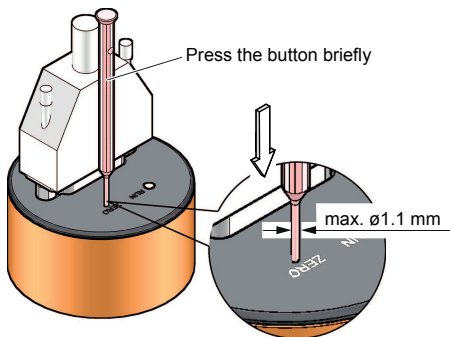
- First, adjust the zero of the manometer and then, the zero of the controller.

- 1 Evacuate the manometer to a pressure according to the table below:

FS	Recommended final pressure for zero adjustment		
	[Torr]	[Pa]	[mbar]
1000 Torr	$<5 \times 10^{-2}$	$<7 \times 10^0$	-
100 Torr	$<5 \times 10^{-3}$	$<7 \times 10^{-1}$	$<7 \times 10^{-3}$
20 Torr	$<1 \times 10^{-3}$	$<1 \times 10^{-1}$	$<1 \times 10^{-3}$
10 Torr	$<5 \times 10^{-4}$	$<7 \times 10^{-2}$	$<7 \times 10^{-4}$
1 Torr	$<5 \times 10^{-5}$	$<7 \times 10^{-3}$	$<7 \times 10^{-5}$

If the final pressure is too high for zero adjustment (>25% of the FS), the zero cannot be reached and the <RUN> LED blinks green. If this is the case, activate the factory setting and adjust the zero again (Activating the Factory Setting (Factory Reset)).

- 2 Operate the manometer for at least 2 hours under constant ambient conditions (until the signal is stable).
- 3 Briefly press the <ZERO> button with a pin (max. $\varnothing 1.1$ mm). The zero adjustment runs automatically. The <RUN> LED blinks until the adjustment (duration ≤ 8 s) is completed.



After zero adjustment, the manometer automatically returns to the measurement mode. The <RUN> LED lid solid.

The <RUN> LED blinks,

- the signal output is negative (< -20 mV) when the final pressure has been attained
- the zero adjustment has failed.

5.2.2 <ZERO> Adjustment with Ramp Function

The ramp function allows to adjust the zero at a known reference pressure within the measurement range of the manometer.

It also permits to adjust an offset of the characteristic curve in order to

- compensate for the offset of the measuring system or
- obtain a slightly positive zero for a 0 ... 10 V AD converter.

The offset should not exceed 2% of the FS (+200 mV). At a higher positive offset, the upper limit of the measurement range is exceeded.



Zero adjustment using the ramp function can be performed via

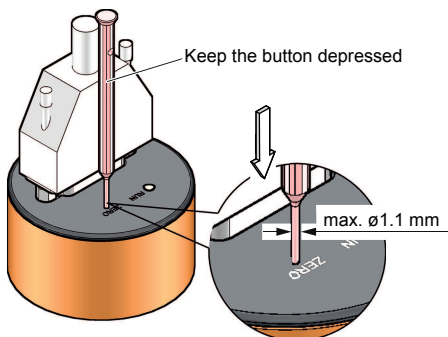
- the <ZERO> button on the manometer
- the RS232C interface



If the manometer is operated via a controller, the zero of the whole measuring system has to be adjusted on the controller:

- First, adjust the zero of the manometer and then, the zero of the controller.

- 1 Operate the manometer for at least 2 hours under constant ambient conditions (until the signal is stable).
- 2 Push the <ZERO> button with a pin (max. $\varnothing 1.1$ mm) and keep it depressed. The <RUN> LED starts blinking. After 5 s, the zero adjustment value, starting at the current output value, keeps continually changing (ramp) until the button is released or until the setting limit (max. 25% FS) is reached. The corresponding output signal is delayed by about 1 s.



- Fine adjustment of the zero adjustment value: Release the button. Briefly press it again within 3 s. The value changes by one unit (push <ZERO> button in intervals of 1 s).
- Change of direction (inverse ramp): Release the button. Press and keep it depressed again within 3...5 s (the blinking frequency of the <RUN> indicator changes briefly).



If the <ZERO> button is released for more than 5 s, the manometer returns to the measurement mode.

The <RUN> LED blinks if the signal output is negative (< -20 mV).

5.3 Activating the Factory Setting (Factory Reset)

All user defined parameters (e.g. zero, filter) are restored to their default values.



Loading of the default parameters is irreversible.

Loading the default parameters:

- 1 Put the manometer out of operation.
- 2 Keep the <ZERO> button depressed for at least 5 s while the manometer is being put into operation (Power ON).

6 Deinstallation



WARNING

Fragile components

The ceramic sensor may be damaged by impacts.

- Do not drop the product and prevent shocks and impacts.



DANGER

Contaminated parts

Contaminated parts can be detrimental to health and environment.

- Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



Caution

Vacuum component

Dirt and damages impair the function of the vacuum component.

- When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.



Caution

Dirt sensitive area

Touching the product or parts thereof with bare hands increases the desorption rate.

- Always wear clean, lint-free gloves and use clean tools when working in this area.

- 1 Vent the vacuum system.
- 2 Put the manometer out of operation and disconnect the sensor cable.
- 3 Remove the manometer from the vacuum system and install the protective lid.

7 Maintenance, Repair

Under clean operating conditions, the product requires no maintenance.



Manometer failures due to contamination are not covered by the warranty.

- We recommend checking the zero at regular intervals.

INFICON assumes no liability and the warranty becomes null and void if any repair work is carried out by the end-user or third parties.

8 Returning the Product



WARNING

Forwarding contaminated products

Contaminated products (e.g. radioactive, toxic, caustic or biological hazard) can be detrimental to health and environment.

- Products returned should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a duly completed declaration of contamination (form under www.inficon.com).

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

9 Disposal



DANGER

Contaminated parts

Contaminated parts can be detrimental to health and environment.

- Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



WARNING

Substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.

- Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

- Contaminated components

Contaminated components (radioactive, toxic, caustic or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

- Other components
Such components must be separated according to their materials and recycled.

Literature

-  [1] Communication Protocol
RS232C, LCM025
tira49e1
LINXON, www.linxon.net

EU Declaration of Conformity



Manufacturer: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Product: LCM025

The product of the declaration described above is in conformity with following Union harmonization legislation:

- 2014/30/EU, OJ L 96/79, 29.3.2014
(EMC Directive; Directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011
(RoHS Directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Harmonized and international/national standards and specifications:

- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class B (EMC requirements for electrical equipment for measurement, control and laboratory use)

Signed for and on behalf of: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

Balzers, 2024-02-21

Balzers, 2024-02-21

Rolf Enderes
Director Development &
Software

Michael Wildi
Director Marketing



LINXON

LINXON is a Brand of INFICON
www.linxon.net

Original: English tlna57e1 (2024-04)



TLNA57E1