



PIEZOVAC

PV 101

Operating Instructions 300622111_002_C0

Part-No.: 230080V01 (PV 101 incl. 9V battery and
adapter DN 16 ISO-KF)

Part-No.: 230082V01 (accessory set)



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Original operating instructions

1 Safety Instructions

- Read and follow the instructions of this manual
- Inform yourself regarding hazards, which can be caused by the product or arise in your system
- Comply with all safety instructions and regulations for accident prevention
- Check regularly that all safety requirements are being complied with
- Take account of the ambient conditions when installing your PV 101. The protection class is IP 40, which means the unit is protected against penetration of foreign bodies.
- Adhere to the applicable regulations and take the necessary precautions for the process media used
- Consider possible reactions between materials and process media
- Consider possible reactions of the process media due to the heat generated by the product
- Do not carry out any unauthorized conversions or modifications on the unit
- Before you start working, find out whether any of the vacuum components are contaminated
- Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts
- When returning the unit to us, please enclose a declaration of contamination
- Communicate the safety instructions to other users

Pictogram-Definition



Danger of personal injury



Danger of damage to the unit or system



Important information about the product, its handling or about a particular part of the documentation, which requires special attention

2 The PV 101

2.1 For Orientation

These operating instructions describe installation and operation of products with part number 230080V01 and 230082V01.

The article number can be found on the product's type label. Technical modifications are reserved without prior notification.

2.2 Delivery Content

230081V01:

- Piezovac PV 101
- Operating instructions PV 101
- AIMn block battery 9V
- Adapter G1/4-DN 16 ISO-KF with protective cover

230082V01 (accessory set):

- Protective case
- Windows™ software VacuGraph™ with online help function
- USB interface cable
- Power supply 15V for mains voltage 100 – 240 VAC, 50/60 Hz, incl. exchangeable AC plugs type EURO, US, UK and AUS
- AIMn block battery 9V
- Operating instructions for power supply



2.3 Product Description

The PV 101 Piezovac is measuring total pressure in the range 1200 - 0.1 mbar. The unit is equipped with a piezo-resistive sensor and temperature compensated. As required it can be mounted to suitable G1/4 connections or to DN16KF flanges by means of the included adapter. When using a suitable battery (e.g. 9V Panasonic Powerline Industrial Alkaline 6LR61), the PV 101 can also be operated completely under vacuum.

Due to the integrated data logger functionality it is possible to store up to 2000 measurements in the vacuum meter. By means of the USB interface you can transmit the stored measurement data to a PC or record measurements online on PC as well.

Measurement Principle

The PV 101 is equipped with an internal piezo-resistive silicon sensor. Under the influence of pressure a thin diaphragm is bent, on it's back a resistor-bridge is applied. The bending forces the measurement-bridge to come out of tune, which is a measure for the applied pressure.

Warm-up-time

Pressure is displayed immediately after the unit is switched on. To take advantage of the maximum accuracy in fine vacuum range it can be appropriate to allow for stabilization time of 1 minute, especially when extreme pressure changes have occurred.

Accuracy

The unit is factory adjusted. Through contamination, ageing or extreme climatic conditions the need for readjustment may arise.

Dependency on gas type

Pressure reading is independent of composition and type of the gas.

Proper Use

The PV 101 serves exclusively to provide total pressure measurements in the range 1200 - 0.1 mbar. It may only be connected to components specifically provided for such purpose.

Improper Use

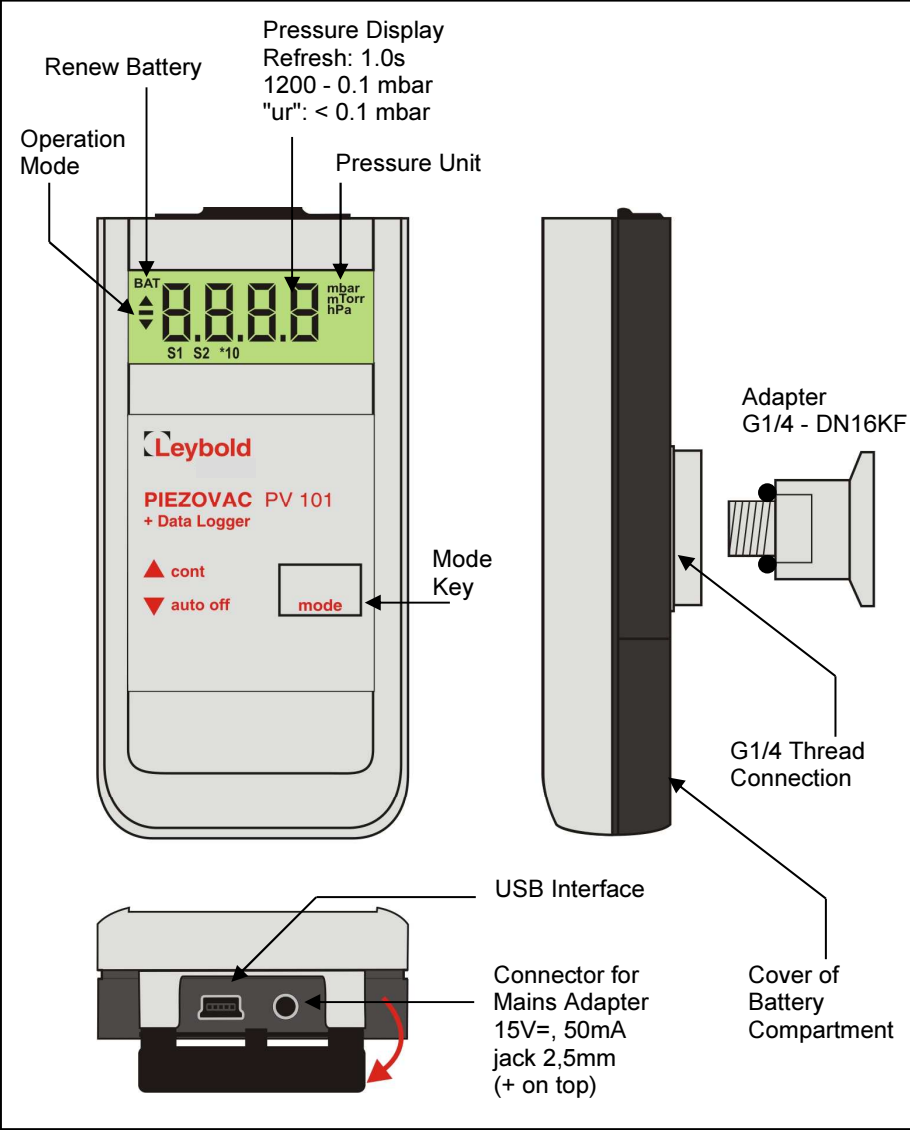
The use for purposes not covered above is regarded as improper, in particular:

- the connection to components not allowed for in their operating instructions
- the connection to components containing touchable, voltage carrying parts.

No liability or warranty will be accepted for claims arising from improper use.

The user bears the responsibility with respect to the used process media.

2.4 Overview



3 Installation

3.1 Installation Notes



Unauthorized modifications or conversions of the instrument are not allowed!

Installation location: Indoor

For not fully air conditioned open buildings and operation rooms:

Temperature: +5°C ... +50°C

Rel. Humidity: 5 - 85%, not condensing

3.2 Vacuum Connection

The entire device can be operated under vacuum. As required it can also be mounted to a G1/4 connection or by means of the included adapter it can be connected to a DN 16 ISO-KF small flange.



Dirt and damage, especially at the vacuum flange, have an adverse effect on the function of this vacuum component.

Please take account of the necessary instructions with regard to cleanliness and damage prevention when using vacuum components.

Thread Connection:

- Use a suitable O-ring sealing
- Mind the maximum screw-in depth

Connection by small flange adapter:

- Remove the protective cover (is required again during maintenance work!)
- Make vacuum connection via small flange DN16 ISO KF; it is recommended to have the vacuum vessel electrically grounded
- Use metal clamps, that can be opened and closed with appropriate tools only (e.g. strap retainer-tension-ring)
- Use sealing rings with a centering ring



Overpressure in the vacuum system

Accidental or unintended opening of clamp elements under stress can lead to injuries due to parts flying around!

KF flange connections with elastomer sealings cannot withstand pressures above 1.5 bar. Process media thus can leak and possibly damage your health.

3.3 Electrical Connection

Battery operation

Before operating the PV 101 a suitable battery or rechargeable battery must be inserted.

For this purpose pull the battery cover on the back of the unit downwards and insert the battery as shown on the pictures below. Close the cover again by pushing it upwards until it snaps into position.

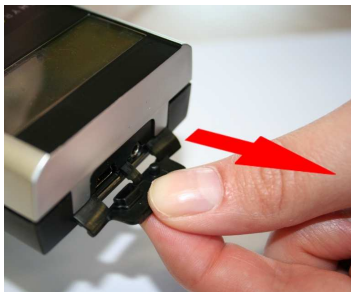


Battery types:

- 9V AlMn block battery type 6LR 61; lifetime max. 2500 h



Poor battery power is indicated by the "BAT"-prompt in the upper left corner of the display. The device still can be used. Only when the battery is flat the vacuum meter is switched off. Rechargeable batteries have to be removed for charging. Please use suitable, commercially available chargers.

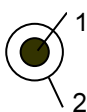


The sockets for the plug-in power supply and USB are located behind a protective rubber lid.

To access the sockets please carefully open the lid and pull it out slightly!

Operation with external mains adapter

Alternatively to battery operation the PV 101 can be supplied by an external 15 V plug-in mains adapter (accessory).

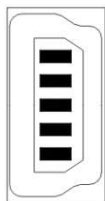


- jack plug 2.5 mm
- 1: 15 VDC
- 2: AGND



An inserted battery can be left in the PV 101 when a plug-in mains adapter is used.
For the recharging of batteries suitable, commercially available chargers have to be used.

3.4 USB Interface



- Mini Jack Type B
- 1: VCC, +5 V
- 2: Data –
- 3: Data +
- 4: GND
- 5: GND

The USB interface can be connected to a PC. In combination with the VacuGraph™ Windows™ software, for instance, you can read-out the data memory of your PV 101, transmit measurements online to the computer or configure the vacuum meter.

4 Operation

4.1 Short Time Pressure Display / Auto-Off Mode

Switch-on the gauge by pressing the Mode-Key:

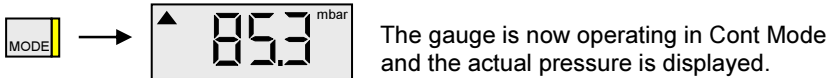


After 20 seconds the vacuum meter is automatically switched off.

4.2 Continuous Pressure Display / Cont Mode

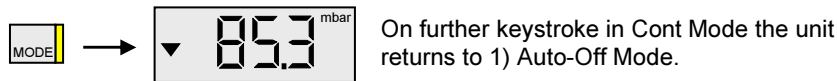
(Available only when data logger function is disabled!)

Switch-on the gauge by pressing the Mode-Key, then Press Mode-Key again within 20 seconds:



In Cont Mode the instrument keeps operating continuously, until it is switched-off manually or, after the maximum operation time has elapsed, automatically (see chapter 5.4)

Switch-off the gauge:



4.3 Pressure Display with Data Logging

To operate your PV 101 as a pressure display with data logger functionality activate the logging function as described in chapter 5.1.



Before a new data logging is started the internal memory of the gauge must be cleared! This means that only one continuous measuring process can be saved at a time!

1) Short-Term Operation (Auto-Off Mode)

Press Mode-Key:

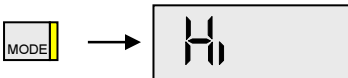


The actual pressure is displayed.

After 20 seconds the vacuum meter is automatically switched off.

2) Stored Maximum Pressure:

Press Mode-Key again:



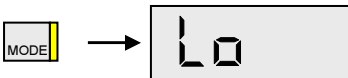
After two more seconds the stored maximum pressure is displayed:



Without further keystroke: return to 1) after 4s.

3) Stored Minimum Pressure:

Press Mode-Key again:



After two more seconds the stored minimum pressure is displayed:



Without further keystroke: return to 1) after 4s.

4) Delete Memory:

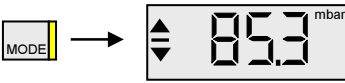


"clr" flashes in the display.

On further keystroke the stored Min-/Max-values as well as the data memory are deleted.

Without further keystroke: return to 1) after 4s.

5) Data Logger Mode:



The device is in data logger operation. The actual pressure is displayed.

The data memory is deleted. The PV 101 is in Data Logger Mode and from now on stores new extremal pressure values and -if applicable- up to 2000 measurements with the preset logging rate (see chapter 5.1).

The maximum time span for data recording arises from the capacity of the gauge's internal memory and the selected logging rate, e.g.:

Logging rate 0.1 s → approx. 3.3 min

Logging rate 10 min → approx. 13 days 21 hours

For data storage a battery-independent memory-IC is used whereas the stored minimum and maximum values are lost when the battery is exchanged.

Data logging is stopped if no further memory is available, when the vacuum meter is switched-off or when it is connected to a PC via USB (see chapter 4.4).

In the Data Logger Mode the PV 101 keeps operating continuously until it is switched-off manually or automatically after the maximum operation time has elapsed (see chapter 5.4).

Switch-off the vacuum meter during data logging:



Press Mode-Key twice: return to 1) Auto-Off Mode.

4.4 PC Mode

For data transmission the PV 101 can be connected to a PC via USB interface. The VacuGraph™ Windows™ Software (accessory) supports online recording of measurements as well as the read-out of the PV 101 data memory. Measurements are plotted as a diagram and can be exported as text file for further analysis.

The separately saved values of minimum and maximum pressure cannot be transmitted to the PC.

Further you can perform any parameter settings such as logging rate, display unit or gas correction factor easily by means of the VacuGraph™ software.

The PV 101 is switched into PC Mode as soon as a cable connection with a free PC USB port is established:

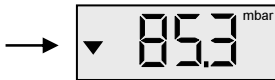


The PV 101 is now ready for bidirectional data transmission.



When the PV 101 is switched into PC Mode, actual pressure display as well as any data logging is stopped!

When an online measurement is started on the PC, the PV 101 will display the actual pressure after each data query sent by the PC:



The display is switched-off automatically after 20 seconds if no further data queries are sent by the PC.

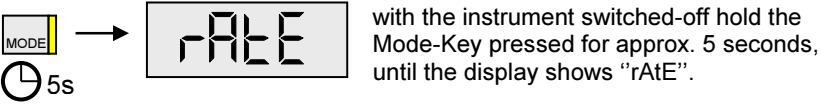


The injection of disturbing signals from the PC over the USB cable can give rise to a shift of the measurement signal in the range of a digit step! The effect can be reduced by having the instrument's flange connected to ground.

After the USB cable is disconnected the PV 101 switches into Auto-Off Mode.

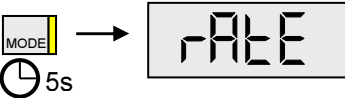
5 Configuration

To switch the PV 101 into Configuration Mode:

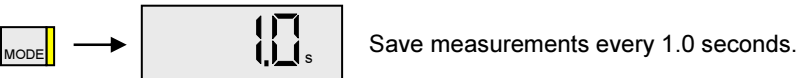
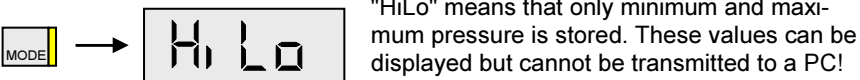
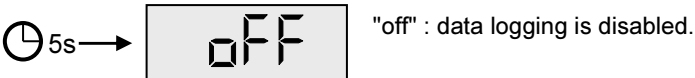


5.1 Logging Rate

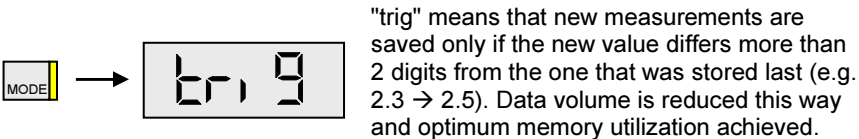
To set the logging rate of your PV 101 and thereby activate the data logging functionality, switch the unit into Configuration Mode. For this the instrument must be switched-off. Hold the Mode-Key pressed then, until the display shows "rAtE":



After additional 5s the current rate setting for internal data logging is displayed and can now be adjusted by means of the Mode-Key:
off, HiLo, 0.1s / 1.0s / 2.0s / 10s / 1min / 10min und trig.



...



When data logging is active minimum and maximum pressure are recorded simultaneously.



Via USB interface the user can set logging rates between 100 ms and 6000 s arbitrarily! The logging rate which was set last this way is also available for choice in the PV 101 display and shown after "trig".

Without further keystroke the vacuum meter is switched into Auto-Off Mode after 5 seconds. The last settings are saved.

5.2 Adjustment

The instrument is factory adjusted. Through use under different climatic conditions, through extreme temperature changes, ageing or contamination readjustment can become necessary.

To adjust your PV 101, switch the unit into Configuration Mode. For this the instrument must be switched-off. Hold the Mode-Key pressed then, until the display shows "rAtE".

Then press Mode-Key several times, until the display shows "CAL":



Adjustment on Atm



Consider altitude and use a trustable reference pressure! Adjustment on atmosphere pressure is possible only if the displayed actual pressure is above 800 mbar. Otherwise adjustment is denied and the error message "Err" displayed (see chapter 6, error messages and malfunction).

After 5 more seconds the display shows:



Press Mode-Key, the actual atmosphere pressure is displayed:

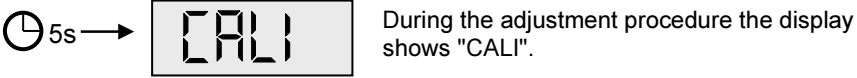


If "mTorr" is selected as pressure unit, the display will automatically change to "Torr" during the adjustment!



Using the Mode-Key you can now adjust the reference pressure: very keystroke changes the displayed value for another 1 mbar alternating up- and downwards.

After 5s without further keystroke adjustment is performed:



Afterwards the unit switches to Auto-Off Mode.

Adjustment on Zero Pressure



For adjustment on zero pressure the actual pressure inside the sensor has to be less than 5×10^{-2} mbar!
The pressure reading must be less than 100 mbar, otherwise adjustment is denied and the error message "Err" displayed (see chapter 6, error messages and malfunction).

Switch the unit to Configuration Mode like described above and press Mode-Key several times, until "CAL" is displayed.

After 5 more seconds the display shows:



After 5 more seconds the display shows:



Press Mode-Key for adjustment. During the adjustment procedure the display shows "CALI".

When the adjustment procedure is finished, the unit switches to Auto-Off Mode.

5.3 Pressure Units

To set the displayed pressure unit, switch the PV 101 into Configuration Mode. For this the instrument must be switched-off. Hold the Mode-Key pressed then, until the display shows "rAtE".

Then press Mode-Key several times, until the display shows "unit":



After 5 more seconds the current unit setting is displayed:



Using the Mode-Key you can now select "mbar", "Torr", "mTorr" or "hPa".

Without further keystroke, the unit switches to Auto-Off Mode after approx. 5 seconds. The last settings are saved.

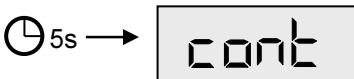
5.4 Maximum Operation Time

When operating continuously in Cont Mode or Data Logger Mode the unit stays switched-on, until a selected maximum operation time has elapsed. To set this maximum operation time, after which the unit is automatically turned-off anyway, switch the PV 101 into Configuration Mode. Therefore the instrument must be switched-off. Hold the Mode-Key pressed then, until the display shows "rAtE".

Then press Mode-Key several times, until the display shows "hour":



After 5 more seconds the current setting of maximum operation time is displayed:



Using the Mode-Key you can now select a timespan from 1h to 24h or cont (no switch-off).

Without further keystroke, the unit switches to Auto-Off Mode after approx. 5 seconds. The last settings are saved.



Important note:

If a maximum operation time other than "cont" is set, the gauge will be switched-off anyway after the selected time span has elapsed. An active data logging will be stopped!

6 Maintenance and Service



Danger of possibly contaminated parts!
Contaminated parts can cause personal injuries. Inform yourself regarding possible contamination before you start working. Be sure to follow the relevant instructions and take care of necessary protective measures.

The unit requires no maintenance. External dirt and soiling can be removed by a damp cloth.

Should a defect or damage occur on the PV 101, please send the instrument to us for repair.



The unit is not planned for customer repair!



Malfunction of the unit, which is caused by contamination or a broken sensor, is not covered by warranty.

Error messages and malfunction

Problem	Possible Cause	Correction
high measurement error	contamination, ageing, extreme temperature, maladjustment	readjustment
display shows "or"	pressure over range	(pressure > 1200 mbar)
display shows "ur"	pressure under range	(pressure < 0.1 mbar)
error message "Err"	adjustment done at wrong pressure	displayed pressure must be >800 mbar f. atmosphere adjustment, <100 mbar f. zero adjustment
	measurement error out of adjustment range	send unit for repair
error message "Err1"	defective sensor	send unit for repair

Declaration of Contamination of Compressors, Vacuum Pumps and Components

The repair and / or servicing of compressors, vacuum pumps and components will be carried out only if a correctly completed declaration has been submitted. Non-completion will result in delay. The manufacturer can refuse to accept any equipment without a declaration.

A separate declaration has to be completed for each single component.

This declaration may be completed and signed only by authorized and qualified staff.

Customer/Dep./Institute : _____ Address : _____ _____ Person to contact: _____ Phone : _____ Fax: _____ End user: _____	Reason for return: ☒ applicable please mark Repair ☐ chargeable ☐ warranty Exchange : ☐ chargeable ☐ warranty ☐ Exchange already arranged / received Return only : ☐ rent ☐ loan ☐ for credit Calibration : ☐ DKD ☐ Factory-calibr. ☐ Quality test certificate DIN 55350-18-4.2.1																																																																
A. Description of the Leybold product: _____ Failure description: _____ Material description : _____ Catalog number: _____ Additional parts: _____ Serial number: _____ Application-Tool: _____ Type of oil (ForeVacuum-Pumps): _____ Application- Process: _____																																																																	
B. Condition of the equipment <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;">No¹⁾</th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> <th style="width: 10%;"></th> <th style="width: 10%;"></th> <th style="width: 10%; text-align: center;">No¹⁾</th> <th style="width: 10%; text-align: center;">Yes</th> </tr> </thead> <tbody> <tr> <td>1. Has the equipment been used</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td>toxic</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>2. Drained (Product/service fluid)</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td>corrosive</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>3. All openings sealed airtight</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td>flammable</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>4. Purged</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td>explosive ²⁾</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td colspan="5">If yes, which cleaning agent</td> <td>radioactive ²⁾</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td colspan="5">and which method of cleaning</td> <td>microbiological ²⁾</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td colspan="5">¹⁾ If answered with "No", go to D. ←</td> <td>other harmful substances</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> </tbody> </table>			No ¹⁾	Yes	No			No ¹⁾	Yes	1. Has the equipment been used	☐	☐	☐	☐	toxic	☐	☐	2. Drained (Product/service fluid)	☐	☐	☐	☐	corrosive	☐	☐	3. All openings sealed airtight	☐	☐	☐	☐	flammable	☐	☐	4. Purged	☐	☐	☐	☐	explosive ²⁾	☐	☐	If yes, which cleaning agent					radioactive ²⁾	☐	☐	and which method of cleaning					microbiological ²⁾	☐	☐	¹⁾ If answered with "No", go to D. ←					other harmful substances	☐	☐
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C. Description of processed substances (Please fill in absolutely) 1. What substances have come into contact with the equipment ? Trade name and / or chemical term of service fluids and substances processed, properties of the substances According to safety data sheet (e.g. toxic, inflammable, corrosive, radioactive) <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">X</td> <td style="width: 40%;">Tradename:</td> <td style="width: 50%;">Chemical name:</td> </tr> <tr> <td style="text-align: center;">a)</td> <td colspan="2"></td> </tr> <tr> <td style="text-align: center;">b)</td> <td colspan="2"></td> </tr> <tr> <td style="text-align: center;">c)</td> <td colspan="2"></td> </tr> <tr> <td style="text-align: center;">d)</td> <td colspan="2"></td> </tr> </table>		X	Tradename:	Chemical name:	a)			b)			c)			d)																																																			
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2. Are these substances harmful ? ← 3. Dangerous decomposition products when heated ? If yes, which ? _____ 2) Components contaminated by microbiological, explosive or radioactive products/substances will not be accepted without written evidence of decontamination.																																																																	

D. Legally binding declaration

I / we hereby declare that the information supplied on this form is accurate and sufficient to judge any contamination level.

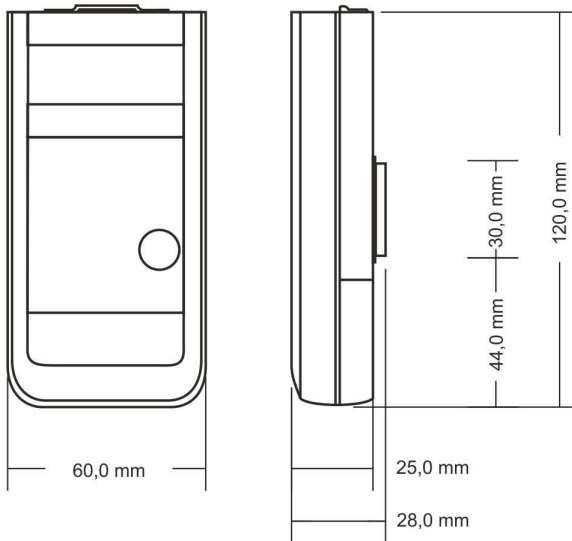
Name of authorized person (block letters) : _____

Date _____

signature of authorized person _____

firm stamp

7 Technical Data



Measurement Principle	piezo-resistive
Materials with vacuum contact	stainl. steel 1.4305, Viton®, silicone gel
Measuring Range	1200 - 0.1 mbar (900 - 0.1 Torr) admissible overload 2 bar abs.
Resolution	1200 - 1000 mbar: 1 mbar 1000 - 0.1 mbar: 0.1 mbar
Accuracy	± 0.3% f.s. (f. scale end)
Repeatability	± 0.15% f.s. (f. scale end)
Measuring Rate	100 ms
Logging Rate	100 ms ... 6000 s
Operating Temperature	+5...+50 °C
Storage Temperature	-20...+60 °C
Power Supply	9 V battery or 15 VDC external
Electrical Connection	mini-jack 2.5 mm for plug-in power supply
Power Consumption	approx. 2 mW (clocked)
Operation Time	6LR61Alkali: < 2500 h
Serial Interface	Mini-USB, Type B, 5pin, female, Virtual COM Port protocol
Vacuum Connection	G1/4 female thread (DN16 ISO KF with adapter)
Display	LCD 12 mm
Protection Class	IP 40
Weight	200 g (incl. battery)

Declaration of Conformity



EU Declaration of Conformity

(Translation of original Declaration of Conformity)

The manufacturer: Leybold GmbH
Bonner Strasse 498
D-50968 Köln
Germany

herewith declares that the products specified and listed below which we have placed on the market, comply with the applicable EU Council Directives. This declaration becomes invalid if modifications are made to the product without agreement of Leybold GmbH.

Product designation:	Compact Vacuum Meter		
Type designation:	TM101	and	PV 101
Part numbers:	230081V01	and	230080V01

The products complies to the following European Council Directives:

Electromagnetic Compatibility (2014/30/EU)

RoHS Directive (2011/65/EU)

The following harmonized standards have been applied:

EN 61326-1:2013	"Electrical equipment for measurement, control and laboratory use — EMC requirements — Part 1: General requirements Emissions: Group 1, Class B Immunity: Industrial electromagnetic environment"
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Documentation officer:	Herbert Etges T: +49(0)221 347 0 F: +49(0)221 347 1250 documentation@leybold.com
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Cologne, September 07, 2016

Cologne, September 07, 2016

ppa. Martin Tollner
VP / Head of Product Lines

ppa. Dr. Monika Mattern-Klosson
Head of Quality & Business Process Management

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Headquarter
Leybold GmbH
Bonner Strasse 498
D-50968 Cologne
T: +49-(0)221-347-0
F: +49-(0)221-347-1250
info@leybold.com



www.leybold.com