



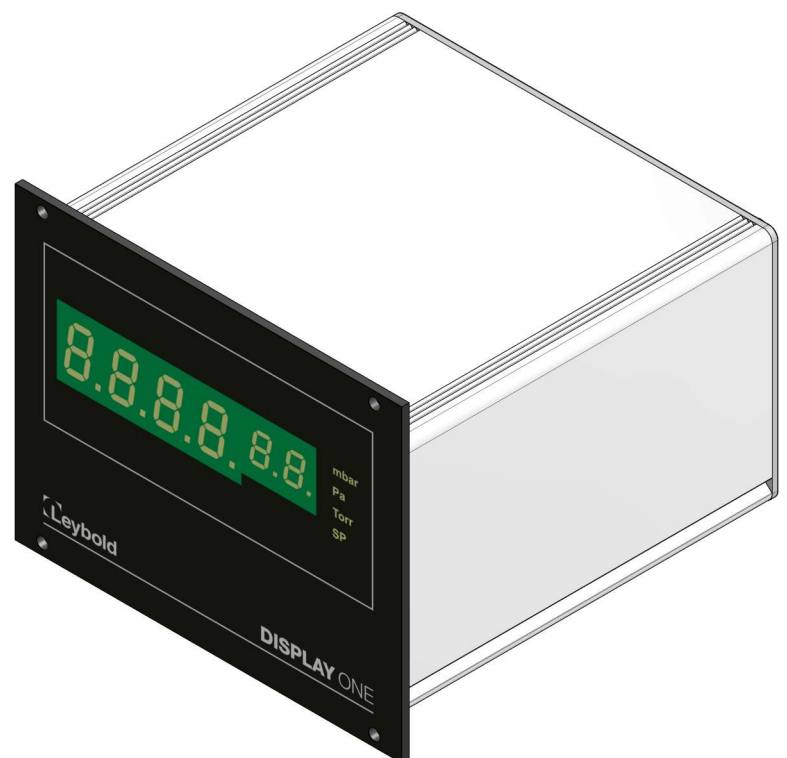
DISPLAY ONE

Vacuum Gauge Controller

Instruction Manual GA09034_002_C0

Catalog No.

230001



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1. Description

1.1 Validity

1.1.1 Catalog Number

This document is valid for the following products:

Part Number	Product	Version	Serial Number
230001	DISPLAY ONE Single-channel measuring instrument for active vacuum sensors	5.1 et seq.	20000 et seq.

Table 1 – Part numbers

1.1.2 Nameplate

A nameplate is located on the bottom side of the instrument. When communicating with Leybold GmbH, the information on the nameplate will be needed. For this reason enter the information here:



Figure 1 – Nameplate (example)

1.2 Conforming Utilisation

The DISPLAY ONE is a display and operating unit for sensors with an analogue or digital interface of the company Leybold GmbH.

The single channel unit is used in combination with the sensors from the series THERMOVAC and PENNINGVAC as well as DU sensors for the measurement of pressures above and below atmospheric pressures (vacuum).

Operate all connected sensors in agreement with the information given in the corresponding Operating Instructions.



NOTICE:

Based on the technical data please check first whether your measuring instrument is suited to your kind of application.

1.3 Assuming of Responsibility and Warrenty

Leybold GmbH will not assume any responsibility or warranty in case the operator or third persons

- do not observe the information given in this document.
- do not use the product as intended.
- modify the product in any way (conversions, repair work etc).
- operate the product with accessories not listed in the corresponding product documentation.

Subject to technical alterations without prior notice. The figures are not binding.

1.4 Transport Damages

- Examine the shipping package as to any external damage.
- In case any damage is determined, file a damage report to the forwarding agent and the insurer.
- Retain the packaging material since damages can only be claimed when returning the instrument in the original packaging of the manufacturer.
- Examine the delivery to ensure that it is complete.
- Examine the instrument as to any visually apparent damage.



DANGER: Damaged product.

Commissioning or operating a damaged product is dangerous to life.

2. Safety

2.1 General

The DISPLAY ONE is supplied ready for operation. Even so, we recommend that you carefully read these Operating Instructions so as to ensure optimum operating conditions right from the start.

These Operating Instructions contain important information on the functions, installation, commissioning, operation and troubleshooting of the DISPLAY ONE.

2.2 Signs and Symbols

Important instructions relating to technical safety and safe operation are emphasised by symbols.



DANGER or WARNING:

Information designed to prevent any kind of injury to persons.



DANGER:

Information designed to prevent injury to persons and damage to equipment in connection with electricity.



NOTICE:

General information pointing to further information, respectively reference sections.

2.3 Basic Safety Regulations

- During all work like installation, maintenance and repair activities, comply with the pertinent safety regulations.



DANGER: Mains Voltage

Coming into contact with components at mains voltage level within the instrument can be dangerous to life when inserting objects or allowing liquids to enter the instrument.



WARNING: Improper usage.

Improper usage can damage the instrument. Use the instrument only in agreement with the specifications issued by the manufacturer.



WARNING: Wrong Connection and Operating Data.

Wrong connection and operating data can damage the instrument. Comply with all specified connection and operating data.

3. General Description

3.1 General Functional Characteristics

The DISPLAY ONE is a display and operating unit for sensors with an analogue or digital interface of the company Leybold GmbH.

The single channel unit is used in combination with the sensors from the series THERMOVAC and PENNINGVAC as well as DU sensors for the measurement of pressures above and below atmospheric pressures (vacuum).

3.2 Applicable Sensors

The following sensors can be operated with the DISPLAY ONE:

Sensor	Typ	Anzeige
THERMOVAC	TTR81N TTR90 / TTR91 / TTR91N TTR96S / TTR96SN TTR211 / TTR216S TTR911 / TTR911N TTR916 / TTR916N	p_{tr} (p_{tr}^E)
THERMOVAC	TTR100 / TTR100S2 TTR101 / TTR101N TTR101S2 / TTR101S2N	$p_{tr} I$ ($p_{tr} I^E$)
PENNINGVAC	PTR82N PTR90 / PTR90N	p_{tr90}
DU-Sensor	DU200 / DU201 DU2000 / DU2001	$du200$ $du2000$
DU-Relativdruck-Sensor	DU2001 rel.	$durEL$

Table 2 – Applicable Sensors

4. Technical Data

4.1 General Data

4.1.1 Mechanical Data

Dimensions:	Width: 106.0 mm (1/4 19")
	Height: 84.5 mm (2 HE)
	Depth: 108.0 mm
Weight:	0.5 kg
Build-in depth:	ca. 170 mm (including connected plug)
Application:	Rack installation
	Panel mounting
	Benchtop instrument

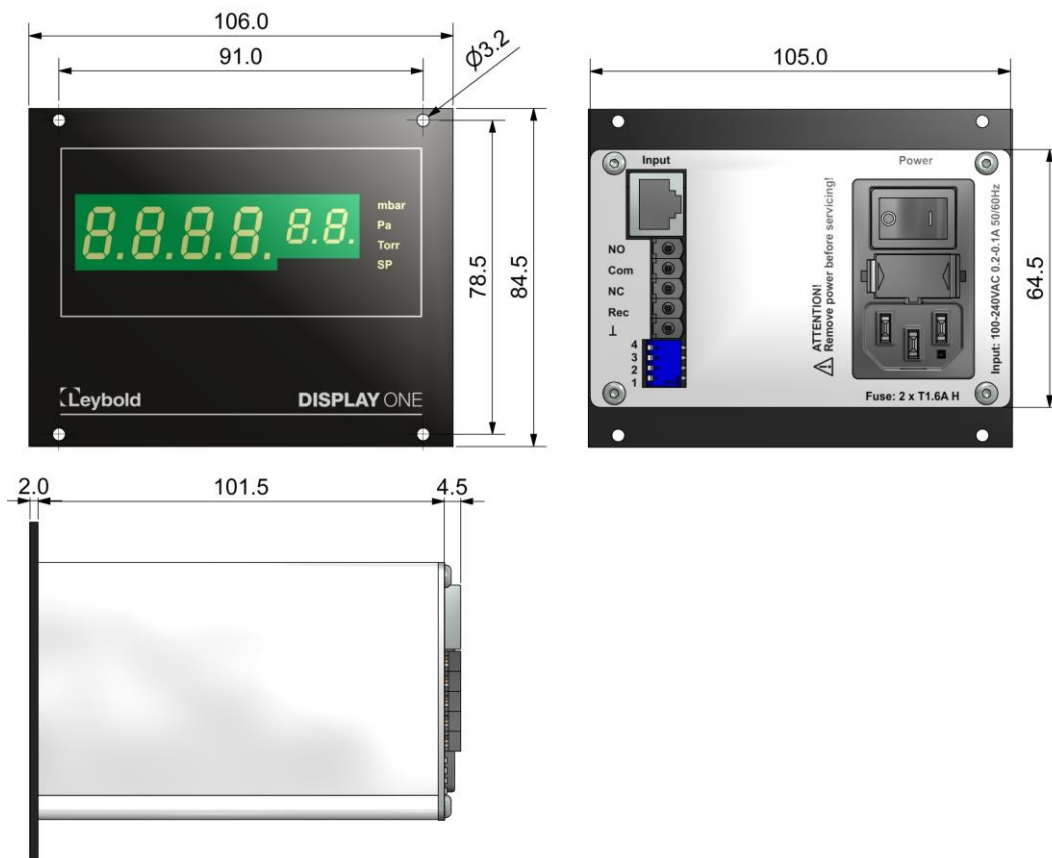


Figure 2 – Dimensions DISPLAY ONE (mm)

4.1.2 Environment

Temperature:	Storage: -20 – +60 °C
	Operation: +5 – +50 °C (sea level)
	+5 – +30 °C (2000 m above sea level)
Relative humidity of the air:	max. 80 % (to 30 °C)
	decreasing to max. 50 % (over 40 °C)
Usage:	indoors (altitude 2000 m above sea level)
Contamination class:	II
Protection class:	IP20

4.1.3 Standards

- Conformity with respect to Low Voltage Directive 2014/35/EU
- Conformity with respect to EMC Directive 2014/30/EU
- Conformity with respect to RoHS Directive 2011/65/EU

International/national standards as well as specifications:

- DIN EN 61010-1 (2011)
(Safety requirements for electrical equipment for measurement, control and laboratory use).
- DIN EN 61326-1 (2013)
(Electrical equipment for measurement, control and laboratory use – EMC requirements. Industrial interference immunity; electromagnetic emissions household sector Class B).

4.2 Mains Connection

Voltage:	100 – 240 VAC
Frequency:	50/60 Hz
Device fuses:	2 x T1.6A H
Power consumption:	max. 6.5 W
Current consumption:	0.2 – 0.1 A max.
Overvoltage category:	II
Protection class:	1
Connection:	Rubber connector IEC 320 C14

4.3 Measuring Channel

Number:	1	
Connection:	RJ45 (FCC 68)	
Applicable sensors:	THERMOVAC	TTR81N TTR90 / TTR91 / TTR91N TTR96S / TTR96SN TTR211 / TTR216S TTR911 / TTR911N TTR916 / TTR916N TTR100 / TTR100S2 TTR101 / TTR101N TTR101S2 / TTR101S2N
	THERMOVAC	PTR82N PTR90 / PTR90N DU200 / DU201 DU2000 / DU2001
	PENNINGVAC	
	DU sensor	
	DU relative pressure sensor	DU2001 rel.

4.3.1 Sensor Powering

Voltage:	+24 VDC $\pm 5\%$
Current:	max. 100 mA
Fuse protection:	200 mA, self-resetting

Power feeding complies with the requirements of a safety extra-low voltage (SELV-E in accordance with EN 61010).

4.3.2 Measuring Technique

Measuring ranges:	Sensor dependent (max. $2000 - 5 \cdot 10^{-9}$ mbar)
Measuring rate:	50 s^{-1}
Display rate:	4 s^{-1}
Units of measuring:	mbar, Pa, Torr

4.4 Switching Function

Type of contact:	Changeover contact, potential-free
Load (resistive):	Switching current: max. 1 A Switching voltage: max. 30 VAC / 60 VDC
Service life:	Mechanical: 10^7 actuations Electrical: 10^4 actuations at maximum load
Connection:	Plug-in terminals, Screw terminals

4.5 Analog Output

Number:	1
Voltage range:	0 – 10 V DC
Deviation from the displayed Value :	$\pm 0,1\%$
Internal resistance:	100 Ohm
Relation between voltage and pressure:	sensor dependent
Connection:	Plug-in terminals, Screw terminals

5. Installation

5.1 Supplied Equipment

Designation	Quantity
DISPLAY ONE	1
Mains cord with shockproof plug (EU)	1
Mains cord with shockproof plug (US)	1
Operating Instructions (each GER and ENG)	1
Edge protection	1
Rubber feet	2
Spare fuses	2
Mating connector	2

Table 3 – Supplied equipment

5.2 Mechanical Installation

The DISPLAY ONE can be used as follows:

- Rack installation
- Front panel installation
- Benchtop instrument



WARNING: Powering down

Install the instrument or place it so that you are in a position to operate the mains power switch at any time or ensure that the instrument can be deenergised at any time.

5.2.1 Rack Installation

The DISPLAY ONE is designed for being installed into a rack according (19", 2 HU).

- Affix the sub rack within the rack
- Insert the DISPLAY ONE into the sub rack
- Affix the DISPLAY ONE with 4 M2.5 screws with the instrument

5.2.2 Panel Mounting

When wanting to install the instrument in a front panel, the following panel cut is required ( Figure 2, page 10):

- Insert the DISPLAY ONE into the cut-out
- Affix the instrument with 4 M2.5 screws

5.2.3 Benchtop Instrument

When wanting to use the DISPLAY ONE as bench top instrument, please proceed as followed:

- Push one of the two edge protection rubber pieces included in the delivery over the top edge of the front panel
- Place the DISPLAY ONE on its back
- Push the second edge protection rubber piece included in the delivery onto the bottom edge of the front panel



WARNING: Risk of suffering injury.

When using the DISPLAY ONE as a benchtop instrument fit the two edge protection rubber pieces onto the top and bottom edge of the front panel so as to avoid injury by sharp edges.

- Stick the two rubber feet included in the delivery onto the bottom of the housing.
- Turn the DISPLAY ONE over again and move it to the desired place.

5.3 Connections

5.3.1 Rear of the Instrument

Figure 3, page 14 shows the rear of the DISPLAY ONE. The pin assignment of the individual connections is described in the following chapters.

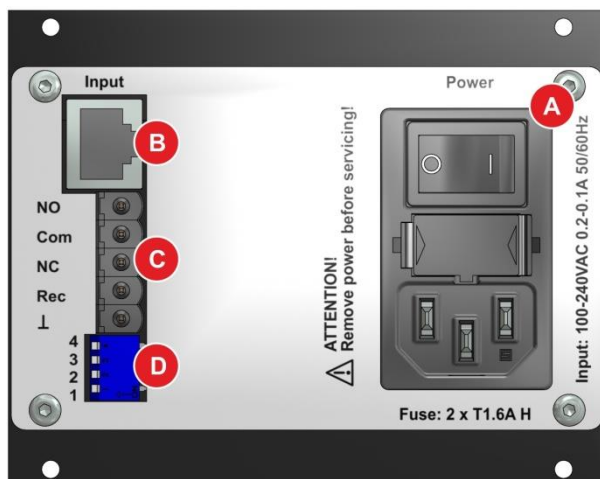


Figure 3 – Rear of the instrument

- A Mains connection with mains switch and device fuses
- B Connection for sensor (🔗📖 Figure 4, page 15)
- C Connection for relay output and analogue output (🔗📖 Figure 5, page 15)
- D Configuration switch

5.3.2 Mains Connection

The mains connection on the rear of the instrument (🔗📖 Figure 3, A, page 14) is intended for a mains cord which on the instrument side has been fitted with a rubber connector.



NOTICE: Mains cord

Included in the delivery of the instrument is a mains cord. If the plug on the mains power side is not compatible with your mains power outlets, you will need a mains cord which meets the following specifications:

- Three-wire cable with protective earthing.
- Conductor cross-section: 3 x 0.75 mm² or greater.
- Cable length 2.5 m maximum.



DANGER: Mains voltage

Appliances, which have not been professionally connected to Earth, can be life-threatening in the event of a malfunction. For this reason use three-wire mains cords, respectively extension cords with protective earthing only. Insert the mains plug into a mains power socket, which provides an Earth contact.

5.3.3 Input

The connector Input ( Figure 3, B, page 14 and Figure 4, page 15) is designed for the connection of a sensor ( Chapter 3.2 Applicable Sensors, page 9). For the measuring channel an 8-pole RJ45 socket is available.

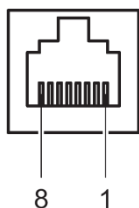


Figure 4 – Connector for Sensor (RJ45)

1	+24 V	5	Signal ground
2	Ground	6	Ground
3	Signal	7	free
4	Ident resistor	8	Status SP



CAUTION: Impermissible Sensors.

Connecting sensors which have not been designed to be operated in connection with the DISPLAY ONE or which do not comply with current EMC guidelines can impair operation of the instrument or even damage it. Always operate the DISPLAY ONE with approved sensors ( Chapter 3.2 Applicable Sensors, page 9).

Connecting:

- Connect the sensor using a shielded 1:1-cable to the connector Input on the rear of the DISPLAY ONE.

5.3.4 Analogue Output and Relay Output

The connection ( Figure 3, C, page 14 and Figure 5, page 15) contains the analogue output of the sensor and if at the sensor available, its relay output.

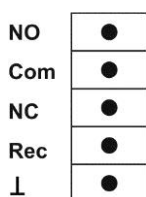


Figure 5 – Connection for Analogue Output and Relay Output (Plug-in terminals, Screw terminals)

NO	SP Normally open contact (NO)
Com	SP Central contact (COM)
NC	SP Normally close contact (NC)
Rec	Analogue signal 0 – 10 VDC
⊥	Analogue ground



DANGER: Dangerous voltage

Voltages exceeding 60 VDC or 30 VAC are dangerous when touched. You may only switch at the connector marked Relay Output voltages of 30 VDC or 30 VAC with a maximum current of 1 A. The voltage must comply with the requirements of a safety extra-low voltage (SELV-E in accordance with EN 61010).

Connecting:

- Connect the peripheral components using a shielded cable.

6. Operation

6.1 Front Panel

Figure 6, page 16 shows the front panel of the DISPLAY ONE.



Figure 6 – Front Panel

- A Display of measuring value and status message
- B Display unit and Set point status

6.2 Display

Display	Description
8.8.8.8. ^{8.8.}	Measured value or status message
mbar, Pa, Torr	Pressure unit
SP	Switching function status When the icon lights up the pressure is below the lower threshold. If the icon does not light up the pressure is above the upper threshold.

Table 4 – Display Structure and Description

6.3 Switching On and Switching OFF

6.3.1 Switching On

- Switch the instrument on through its main switch.

After switching on the DISPLAY ONE will operate the following:

- Self test
- Display test
- Display of the used software version
- Identify sensor
- Activate the measurement mode

6.3.2 Switching Off

- Switch the instrument off through its main switch.



CAUTION: Waiting Time

Wait for at least five seconds before switching the instrument on again.

6.4 Operation Modes

The DISPLAY ONE may be operated in the following modes:

Measurement Mode

The measuring mode is the standard operating mode. Here the measured values of the sensors are displayed. Chapter 6.5 Measurement Mode, page 17

Parameter Mode

In the parameter mode you have the possibility of changing over the configuration switch at the rear of instrument different parameters of the DISPLAY ONE. Chapter 6.6 Parameter Mode, page 18

6.5 Measurement Mode

6.5.1 Selection

After switching on the DISPLAY ONE it will automatically run the measuring mode.

6.5.2 Description

The measuring mode is the standard mode of operation. Here the measured values of the sensors are indicated. If no measured values can be indicated, a status message is spent (Table 5, page 17).

If no sensor is attached at the measuring channel, noSEn indicated. This status message expires after 30 seconds.

Display	Pressure
oooo	Above the measurement range (DU Sensors only)
8.888 ⁻⁸	Within the permissible range.
c8.88 ⁻⁸	Below the measurement range (DU Sensors excluded)
c0	Lowly below the measurement range (DU Sensors only)
cc0	Middle below the measurement range (DU Sensors only)
ccc0	Large below the measurement range (DU Sensors only)

Table 5 – Display of the Measuring Mode

6.6 Parameter Mode

6.6.1 Selection

The selection of the parameters is made by the configuration switch (🔑📖 Figure 3, D, page 14) on rear of the DISPLAY ONE. Proceed in addition as follows:

- Switch the instrument off
- Set the DIP switches as required
- Switch the unit on once more



IMPORTANT INFORMATION:

When changing the DIP switch settings while the instrument is on, this will initially have no effect. Any changes to the DIP switch settings will only come into effect after switching the instrument on once more.

6.6.2 Description

Over the configuration switch with DIP switches 1 and 2 the mass unit is stopped as well as selected with DIP switch 3 between two or three-figure measured value announcement. With DIP switch 4 the measuring range extension for the THERMOVAC sensors is activated.

6.6.3 Mass Unit

The mass unit is stopped over the DIP switches 1 and 2 of the configuration switch.

Mass unit	DIP switch 1	DIP switch 2
mbar	OFF	OFF
Pa	ON	OFF
Torr	OFF	ON

Table 6 – Parameter Mass unit

- Configure the mass unit according to the Table 6 on page 18 .

6.6.4 Display Format

The display format is stopped over the DIP switch 3 of the configuration switch.

Display Format	DIP switch 3
3 digits	OFF
2 digits	ON

Table 7 – Parameter Display Format

- Configure the display format according to the Table 7 on page 18.

6.6.5 Pirani Range Extension

The Pirani range extension for the THERMOVAC sensors is activated with DIP switch 4.

Pirani Range Extension	DIP switch 4	Display
deactivated	OFF	t_{tr} or $t_{tr} I$
activated	ON	t_{tr}^E or $t_{tr} I^E$

Table 8 – Parameter Pirani Range Extension

- Activate the Pirani range extension for the THERMOVAC sensors according to the Table 8 on page 19.

7. Maintenance and Servicing

7.1 Maintenance

7.1.1 General Maintenance Advices

For external cleaning please only use a dry piece of cotton cloth. Do not use any aggressive or abrasive cleaning agents.



DANGER: Mains voltage

The instrument contains voltage carrying components inside. Do not insert any objects into the openings of the instrument. Protect the instrument against moisture. Do not open the instrument.

7.2 Troubleshooting

7.2.1 Trouble Indication and Error Messages

A malfunction within the DISPLAY ONE is shown by an error message on the display (🔑📖 Table 9, page 20).

Error (Display)	Cause and Remedy
5-Err	Sensor error. Malfunction in the connection to the sensor. This message will only be displayed on the display of the measuring channel.
Err Hi	Significantly above the measurement range. Replace the sensor.
Err Lo	Significantly below the measurement range. Replace the sensor.

Table 9 – Error Messages

7.2.2 Help in Case of Malfunctions

If the malfunction persists even after having replaced the sensor, please get in touch with your nearest Leybold GmbH Service Centre.

7.2.3 Exchange of fuses

Use for the exchange of defective device fuses exclusively the fuse type T1.6A H indicated on the rear site of controller. The both device fuses you can find in the fuse holder of mains connection (🔑📖 Figure 3, A, page 14), which can be pried off with a small screwdriver.

7.2.4 Repair

Defective products must be sent to your nearest Leybold Service Centre for repair. The Leybold GmbH cannot assume any responsibility or warranty if the operator or third persons do repair work on the DISPLAY ONE.

8. Shelving and Waste Disposal

8.1 Packaging

Please keep the original packaging. You will need this packaging in case of storing the DISPLAY ONE or shipping to the Leybold GmbH.

8.2 Shelving

The DISPLAY ONE must only be stored in dry room. During storage, the following ambient conditions need to be maintained:

- Ambient temperature: -20 – +60 °C
- Humidity of the air: As low as possible.
Preferably in a sealed plastic bag with desiccant.

8.3 Waste Disposal

Regarding waste disposal the branch specific and local waste disposal and environment protection regulation for systems and electronics components are valid.

In case of return Leybold GmbH will execute the professional resource separation and disposal.

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: Vacuum gauge controller
Type designation: DISPLAY ONE
Part numbers: 230001, 235001

The products complies to the following European Council Directives:

Low Voltage Directive (2014/35/EU)

Electromagnetic Compatibility (2014/30/EU)

RoHS Directive (2011/65/EU)

The following harmonized standards have been applied:

EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements
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

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 01, 2016

Cologne, September 01, 2016



ppa. Martin Tollner
VP / Head of Product Lines



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

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
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A. Description of the Leybold product: Material description : _____ Catalog number: _____ Serial number: _____ Type of oil (ForeVacuum-Pumps) : _____	Failure description: _____ _____ Additional parts: _____ Application-Tool: _____ Application- Process: _____
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B. Condition of the equipment <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%;"></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> </tr> <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> </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> </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> </tr> <tr> <td>4. Purged</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> </table> If yes, which cleaning agent _____ and which method of cleaning _____ ¹⁾ If answered with "No", go to D.		No ¹⁾	Yes	No	1. Has the equipment been used	☐	☐	☐	2. Drained (Product/service fluid)	☐	☐	☐	3. All openings sealed airtight	☐	☐	☐	4. Purged	☐	☐	☐	Contamination : <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%;"></th> <th style="width: 10%; text-align: center;">No¹⁾</th> <th style="width: 10%; text-align: center;">Yes</th> </tr> <tr> <td>toxic</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>corrosive</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>flammable</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>explosive ²⁾</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>radioactive ²⁾</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>microbiological ²⁾</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>other harmful substances</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> </table>		No ¹⁾	Yes	toxic	☐	☐	corrosive	☐	☐	flammable	☐	☐	explosive ²⁾	☐	☐	radioactive ²⁾	☐	☐	microbiological ²⁾	☐	☐	other harmful substances	☐	☐
	No ¹⁾	Yes	No																																										
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other harmful substances	☐	☐																																											

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 style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 5%;">X</th> <th style="width: 30%;">Tradename:</th> <th style="width: 65%;">Chemical name:</th> </tr> <tr><td style="text-align: center;">a)</td><td></td><td></td></tr> <tr><td style="text-align: center;">b)</td><td></td><td></td></tr> <tr><td style="text-align: center;">c)</td><td></td><td></td></tr> <tr><td style="text-align: center;">d)</td><td></td><td></td></tr> </table>	X	Tradename:	Chemical name:	a)			b)			c)			d)		
X	Tradename:	Chemical name:													
a)															
b)															
c)															
d)															
2. Are these substances harmful ? No ☐ Yes ☐ 3. Dangerous decomposition products when heated ? No ☐ Yes ☐ 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

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