



Vacuum Transducer

DI2000
DI2001

DU2000
DU2001

Operating Instructions 300360490_002_C0

Cat-No.: 15813V01 (DI2000)
Cat-No.: 15815V01 (DI2001)

Cat-No.: 230502V01 (DU2000)
Cat-No.: 230503V01 (DU2001)



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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 instrument. The protection class is IP 54, 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 an electric shock when touching



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 Vacuum Transducer DI2000

2.1 For Orientation

These operating instructions describe installation and operation of products with article numbers

- 15813V01 (DI2000 with FPM sealing)
- 15815V01 (DI2001 with EPDM sealing)
- 230502V01 (DU2000 with FPM sealing) and
- 230503V01 (DU2001 with EPDM sealing)

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

The product versions differ in the applied sealing material, the electrical connector as well as the analog output signal. Unless these different features are described explicitly only model DI2000 is exemplarily mentioned in the following.

2.2 Delivery Content

Included in the delivery consignment are:

- Transducer
- Protective cover
- Operating instructions

Available Accessories DI2000 / DI2001:

- Cable extension, 10m, 200 04 112
- Cable extension, 20m, 200 02 645
- Adapter f. CENTER-Series, 245009V01

Available Accessories DU2000 / DU2001:

- Cable extension, 10m, 230505V01
- Cable extension, 20m, 230506V01
- Display and control unit Display One, 230001
- Display and control unit Display Two, 230024
- Display and control unit Display Three, 230025
- Display and control unit Center One, 230002 / 235002
- Display and control unit Center Two, 230004 / 235004
- Display and control unit Center Three, 230003 / 235003

2.3 Product Description

The vacuum transducer is measuring total pressure in the range of 1 - 2000 mbar. It can be connected to display and control units or to customer related power supply and evaluation units. The output signal has a linear dependence on pressure over the whole range. DI series transducers have a 4 - 20 mA signal output, DU series transducers have a 2 - 10 V output.

The transducer is equipped with a piezoresistive ceramic sensor and compensated for temperature drift. Sensors of DI2000 and DU2000 transducers are equipped with a FPM o-ring sealing, sensors of DI2001 and DU2001 transducers use EPDM as sealing material.

The transducer can be mounted to suitable flange connectors or by means of the G1/4 female thread.

Proper Use

The DI2000 serves exclusively to provide total pressure measurements in the range 1 - 2000 mbar. It may only be connected to components specifically provided for such purpose.

The DI2000 is classified in electromagnetic interference class A and therefore can cause radio interference in living quarters.

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.

3 Installation

3.1 Notes for Installation



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 ... +60°C
Rel. Humidity: 5 - 85%, not condensing
Air pressure: 860 - 1060 hPa (mbar)

3.2 Vacuum Connection



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.

- Remove the protective cover (is required again during maintenance work!)
- Make vacuum connection via small flange DN16 ISO KF
- If you use a hose barb be sure to secure the hose connection, e.g. by a suitable tensioning belt
- Use clamps, that can be opened and closed with appropriate tools only (e.g. strap retainer-tension-ring)
- Use sealing rings with a centering ring.

The transducer may be mounted in any orientation. Mounting with the flange to the top, however, can lead to early contamination. In order to keep particles and condensates out of the sensor cell it is recommended to mount the sensor in an upright position. The transducer is adjusted in this orientation ex works.



When mounting the transducer avoid forced twisting or violent opening. The housing can be mechanically damaged this way!



Overpressure in the vacuum system > 1 bar

Accidental or unintended opening of clamp elements under stress can lead to injuries due to parts flying around! Leaking process media can cause damage to your health. Attend to the maximum pressure load of small flange connections (2,5 bar abs.). Use clamps that are suitable for overpressure operation.

3.3 Electrical Connection

3.3.1 Operation with Display Unit

The transducer can be connected to suitable Leybold display units. For DU series transducers display units of the DISPLAY and CENTER series are available.



Do not connect or disconnect the transducer when the cable is on circuit!

Connect the cable plug to the transducer and secure it. Connect the other end of the cable to the display unit and secure the plug. Only now connect your display unit to mains power or switch it on respectively.

3.3.2 Operation with Other Supply And Evaluation Units

The transducer can be operated with other customer related display units or voltage supplies.

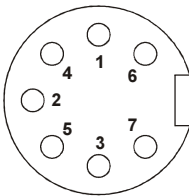


Incorrect connection or inadmissible supply voltage can damage the transducer.

The electrical connection is to be made in compliance with EMI requirements (double-shielded cable) and according to the pin description shown below:

DI2000 / DI2001

Pin description Diode plug, 7-pin, male
connector topview:



Pin 1:	do not connect
Pin 2 brown+white/brown:	Output 4 - 20 mA
Pin 3 blue+white/blue:	1,91 MΩ to PIN 6
Pin 4:	do not connect
Pin 5 green+white/green:	453 kΩ to PIN 6
Pin 6 orange+white/orange:	Voltage supply: +12 to +30 VDC
Pin 7 Schirm:	Shield

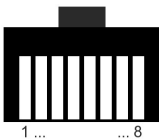


Maximum admissible load resistor in Ω:

$(\text{Supply Voltage(V)} - 12\text{V}) / 0,02\text{A}$

DU2000 / DU2001

FCC68, 8-pin, male



Pin 1 white/orange:	Voltage supply: +14,5 to +30 VDC
Pin 2 orange:	GND
Pin 3 white/green:	Output 2 - 10 VDC
Pin 4 blue:	8,2 kΩ to Pin 2
Pin 5 white/bue:	Signal ground
Pin 6,7,8:	do not connect

4 Operation

4.1 General

Measurement Principle

The DI2000 vacuum transducer has an internal piezoresistive ceramic 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.

Output Signal

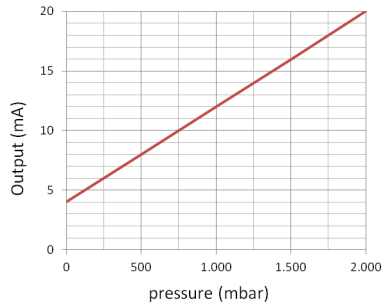
The analog output signal of the transducer is available immediately after the voltage supply has been connected. The output of 4.0 - 20 mA of a DI2000 / DI2001 and 2 - 10 V of a DU2000 / DU2001 has a linear dependence on pressure over the whole measurement range 1 - 2000 mbar.

Conversion of the output signal to pressure is done according to the following formulas:

DI2000 / DI2001

$$I_{out} \text{ (mA)} = 0.008 \times p \text{ (mbar)} + 4.0$$

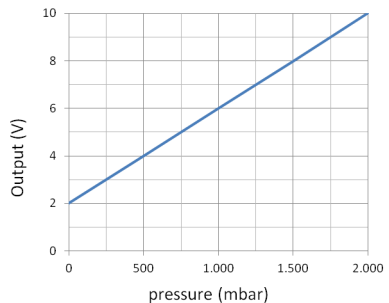
$$p \text{ (mbar)} = (I_{out} \text{ (mA)} - 4.0) \times 125$$



DU2000 / DU2001

$$V_{out} \text{ (V)} = 0.004 \times p \text{ (mbar)} + 2.0$$

$$p \text{ (mbar)} = (V_{out} \text{ (V)} - 2.0) \times 250$$



4.2 Adjustment

The transducer is adjusted ex works in upright position with 24V voltage supply. Through contamination, ageing or extreme climatic conditions the need for readjustment may arise.

Readjustment on atmosphere or zero pressure is done digitally by means of the "up" and "down" buttons. The transducer will notice automatically which adjustment point is relevant.



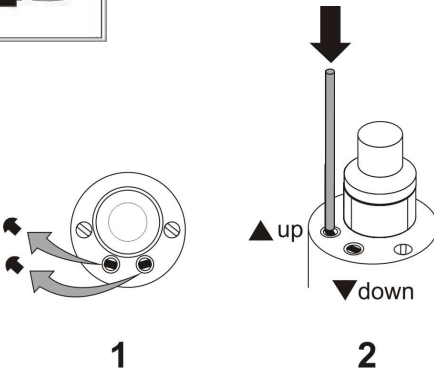
To achieve optimum results of the adjustment consider a warm-up of at least 10 minutes at the appropriate calibration pressure before any adjustment.

4.2.1 Zero Adjustment

The adjustment at zero pressure is an offset compensation of the measurement signal.



For zero adjustment real pressure must be less than 0.1 mbar. An adjustment at zero pressure is only possible, if the DI2000 pressure reading is below 100 mbar.



The output signal at zero pressure should equal 4.000 mA (DI2000 / DI2001) or 2,000 V (DU2000 / DU2001).

For adjustment first remove the rubber caps from both buttons (1), then -by means of a screw driver or other suitable tool- push button "up" to increase the output signal or button "down" to decrease the output signal (2). If a button is permanently pressed the signal will change continuously in the respective direction.

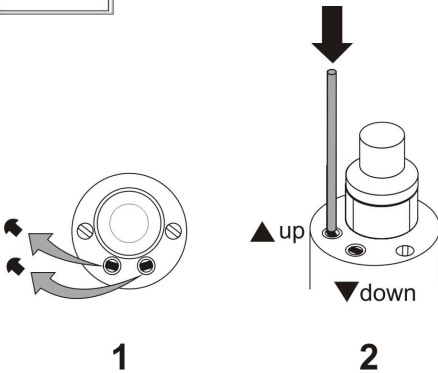
If no further button is pressed for an interval of 5s, the adjusted value is set. Now insert the rubber cap again.

4.2.2 Zero Adjustment DU2000 / DU2001 With Display Unit

The adjustment at zero pressure is an offset compensation of the measurement signal.



For zero adjustment real pressure must be less than 0.1 mbar. An adjustment at zero pressure is only possible, if the DI2000 pressure reading is below 100 mbar.



The DU2000 / DU2001 can be used in combination with display units of the DISPLAY or CENTER series. After the adjustment the pressure reading at the display unit at applied zero pressure should be 0 mbar.

For adjustment first remove the rubber caps from both buttons (1).

If the pressure reading is "0" in case of a DISPLAY unit or "ccc0", "cc0" or "c0" in case of a CENTER unit, the output signal is too low. Then - by means of a screw driver or other suitable tool - push the "up" button(2) to increase the output signal until a pressure above zero is displayed.

Afterwards -or also if the displayed zero pressure is higher than "0"- push the "down" button to decrease the pressure reading just to the point when "0" is displayed.

If a button is permanently pressed the signal will change continuously in the respective direction.

If no further button is pressed for an interval of 5s, the adjusted value is set. Now insert the rubber cap again.

4.2.3 Full Scale Adjustment



The full scale adjustment is a span-correction of the measurement signal. Real pressure and pressure reading of the transducer must be above 800 mbar. If applicable a zero adjustment should be carried out before any full scale adjustment!

For full scale adjustment a calibrated pressure gauge is needed as standard. According to the formula in chapter 4.1 the output signal of your DI2000 or DU2000 should equal the pressure reading $p(\text{mbar})$ of the standard gauge.

For adjustment first remove the rubber caps from both buttons, then adjust the signal output by means of the "up" and "down" buttons. If a button is permanently pressed the signal will change continuously in the respective direction. If no further button is pressed for an interval of 5s, the adjusted value is set. Now insert the rubber cap again.

4.2.4 Full Scale Adjustment DU2000 / DU2001 With Display Unit



The full scale adjustment is a span-correction of the measurement signal. Real pressure and pressure reading of the transducer must be above 800 mbar. If applicable a zero adjustment should be carried out before any full scale adjustment!

The DU2000 / DU2001 can be used in combination with display units of the DISPLAY or CENTER series.

For full scale adjustment a calibrated pressure gauge is needed as standard. The pressure reading of the display unit should equal the pressure reading of the standard gauge.

For adjustment first remove the rubber caps from both buttons, then adjust the signal output by means of the "up" and "down" buttons. If a button is permanently pressed the signal will change continuously in the respective direction. If no further button is pressed for an interval of 5s, the adjusted value is set. Now insert the rubber cap again.

5 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 your DI2000, please send the instrument to us for repair and enclose a decontamination declaration.



The unit is not prepared for customer repair!

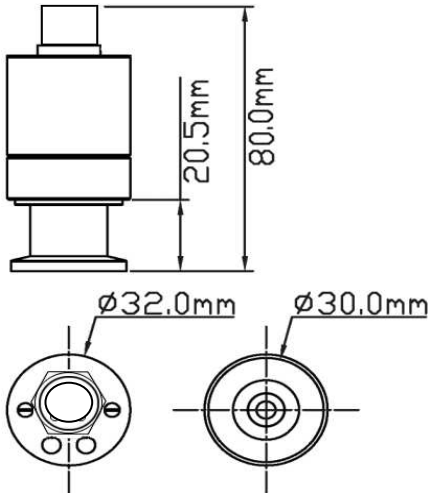


Malfunction of the unit, which is caused by contamination, wear and tear or a broken sensor is not covered by warranty.

Error messages and malfunction

Problem	Possible Cause	Correction
high measurement error	contamination, ageing, extreme temperature, maladjustment	readjustment
output signal $\leq 3,8$ mA (DI) output signal $\leq 1,5$ V (DU)	defective sensor	return sensor for repair
output signal ≥ 21 mA (DI) output signal $\geq 10,5$ V (DU)	pressure overrange or defective sensor	actual pressure too high or return sensor for repair
adjustment not possible	measurement error exceeds possible range of readjustment	return sensor for repair

6 Technical Data



Measuring principle	piezo-resistive
Measuring range	2000 - 1 mbar (1500 - 1 Torr)
Max. overload	5 bar abs.
Uncertainty	0.25 % FS (linearity, hysteresis, reproducibility)
Reproducibility	0.05 % FS
TC* Zero	0.1 % FS/10K
TC* Sensitivity	0.15 % FS/10K
Materials in contact with media	stainl. steel 1.4305, Al ₂ O ₃ ceramic, FPM (DI2000, DU2000), EPDM (DI2001, DU2001)
Operating temperature	0 ... +60 °C
Storage temperature	-40...+70 °C
Response time	< 20 ms
Voltage supply	DI: 12 – 30 VDC (two-wire) DU: 14,5 - 30 VDC (four-wire)
Electrical connection	DI: 5m cable with diode plug, 7pin, male DU: 5m cable with plug type FCC68, 8pin
Output signal	DI: 4 - 20 mA, linear max. load in Ω: (supply voltage – 12V) / 0.02A DU: 2 - 10 VDC, linear
Dead volume	1.8 cm ³
Vacuum connection	small flange DN16 ISO KF with G1/4 female thread
Protection class	IP 54
Weight	DI: 260 g DU: 240 g

* Temperature coefficient

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: Vacuum Transducer
Type designation: DU 2000, DI 2000, DU 2001, DI 2001, DU 2001 rel., DI 2001 rel.
Part numbers: 230502V01, 15813V01, 230503V01, 15815V01, 230504V01, 245000V01

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

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