Leybold

GRAPHIX ONE
GRAPHIX TWO
GRAPHIX THREE

Vacuum Gauge Controller

Instruction Manual GA300550402_002_C1

Catalog No.

230680V01
230681V01
230682V01

0. Table of Contents

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1. Legal Notices

1.1 Validity

1.1.1 Part Numbers

This document applies to the following products:

Part Number	Product	Version	Serial Number
230680V01	GRAPHIX ONE controller Single-channel measuring instrument for active vacuum sensors	1.11.00 et seq.	1 et seq.
230681V01	GRAPHIX TWO controller Two-channel measuring instrument for active vacuum sensors	1.11.00 et seq.	1 et seq.
230682V01	GRAPHIX THREE controller Three-channel measuring instrument for active vacuum sensors	1.11.00 et seq.	1 et seq.

Table 1 – Part numbers

1.1.2 Label

A label is located on the left-hand side of the instrument. When communicating with Leybold GmbH, the information given on this label is important. Therefore, enter this information here:

Figure 1 – Label (example)

1.2 Conforming Utilisation

The GRAPHIX controller is a display and operating unit with a graphic user interface for sensors with an analogue or digital interface of the company Leybold GmbH or from other manufacturers.
Depending on the version, the unit offers one or several channels, and it is used in combination with the sensors from the series THERMOVAC, IONIVAC, PENNINGVAC and CERAVAC as well as DU sensors for the measurement of pressures above and below atmospheric pressures (vacuum).
It is also possible to use sensors made by other manufacturers by entering a variable analogue logarithmic or analogue linear characteristic ranging from 0 – 10 Volt.
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 Instrument Versions

The GRAPHIX controller is available in three different versions:

GRAPHIX ONE	(single-channel measuring instrument)
GRAPHIX TWO	(two-channel measuring instrument)
GRAPHIX THREE	(three-channel measuring instrument)

The three versions differ as to the following:

- Number of measurement channels
- Power consumption
- Weight

☞🕮 Chapter 4 -Technical Data, page 16

Described in these Operating Instructions are all three versions of the GRAPHIX controller.

1.4 Assuming of Responsibility and Warranty

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.

1.5 Shipping Damage

- 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 Information

The GRAPHIX is supplied ready for immediate operation. Even so, we recommend that you carefully read these Operating Instructions so as to ensure optimum working conditions right from the start.
These Operating Instructions contain important information as to understanding, placing, commissioning, operating and troubleshooting the GRAPHIX controller.

2.2 Key to the 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 Information

- 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 of the Instrument

3.1 GRAPHIX controller

The GRAPHIX controller is a display and operating unit with a graphic user interface for sensors with an analogue or digital interface of the company Leybold GmbH or from other manufacturers. Depending on the version, the unit offers one or several channels, and it is used in combination with the sensors from the series THERMOVAC, IONIVAC, PENNINGVAC and CERAVAC as well as DU sensors for the measurement of pressures above and below atmospheric pressures (vacuum). It is also possible to use sensors made by other manufacturers by entering a variable analogue logarithmic or analogue linear characteristic ranging from 0 – 10 Volt. Operate all connected sensors in agreement with the information given in the corresponding Operating Instructions.

3.2 Suitable Sensors

The following sensors can be operated with the GRAPHIX controller:

Sensor	Typ	Anzeige
THERMOVAC	TTR81N TTR90 / TTR91 / TTR91N TTR96S / TTR96SN TTR211 / TTR216S TTR911 / TTR911N TTR916 / TTR916N	TTR… (TTR?)
	TTR911N (RS232)	TTR911N_D
THERMOVAC	TTR100 / TTR100S2 TTR101 / TTR101N TTR101S2 / TTR101S2N	TTR… (TTR10X)
	TTR101N (RS232)	TTR101N_D
	TTR200N (RS232)	TTR200N
IONIVAC	ITR90 / ITR90N ITR200S / ITR200SN ITR200SL / ITR200SLN	ITR…
PENNINGVAC	PTR81N PTR225 / PTR225N PTR225S / PTR225SN PTR237 / PTR237N	PTR… (PTR?)
	PTR225N (RS232)	PTR225N_D
PENNINGVAC	PTR82N PTR90 / PTR90N	PTR… (PTR90?)
	PTR90N (RS232)	PTR90N_D
	PTR200N (RS232)	PTR200N
CERAVAC	CTR90 / CTR91 CTR100 / CTR100N CTR101 / CTR101N	CTR… (CTR?)
DU sensor	DU200 / DU201 DU2000 / DU2001	DU…
DU relative pressure sensor	DU2001 rel.	DUrel
Further sensors	Corresponding to characteristics	CUSTOM

Table 2 – Suitable sensors

4. Technical Data

4.1 General Data

4.1.1 Mechanical Data

Dimensions:	Width: 106.4 mm (1/4 19“) Height: 128.4 mm (3 HU) Depth: 174.0 mm
Mass:	≤ 1.7 kg
Installation depth:	≤ 230 mm (including connected plug)
Installation:	Rack installation Front panel installation Benchtop instrument

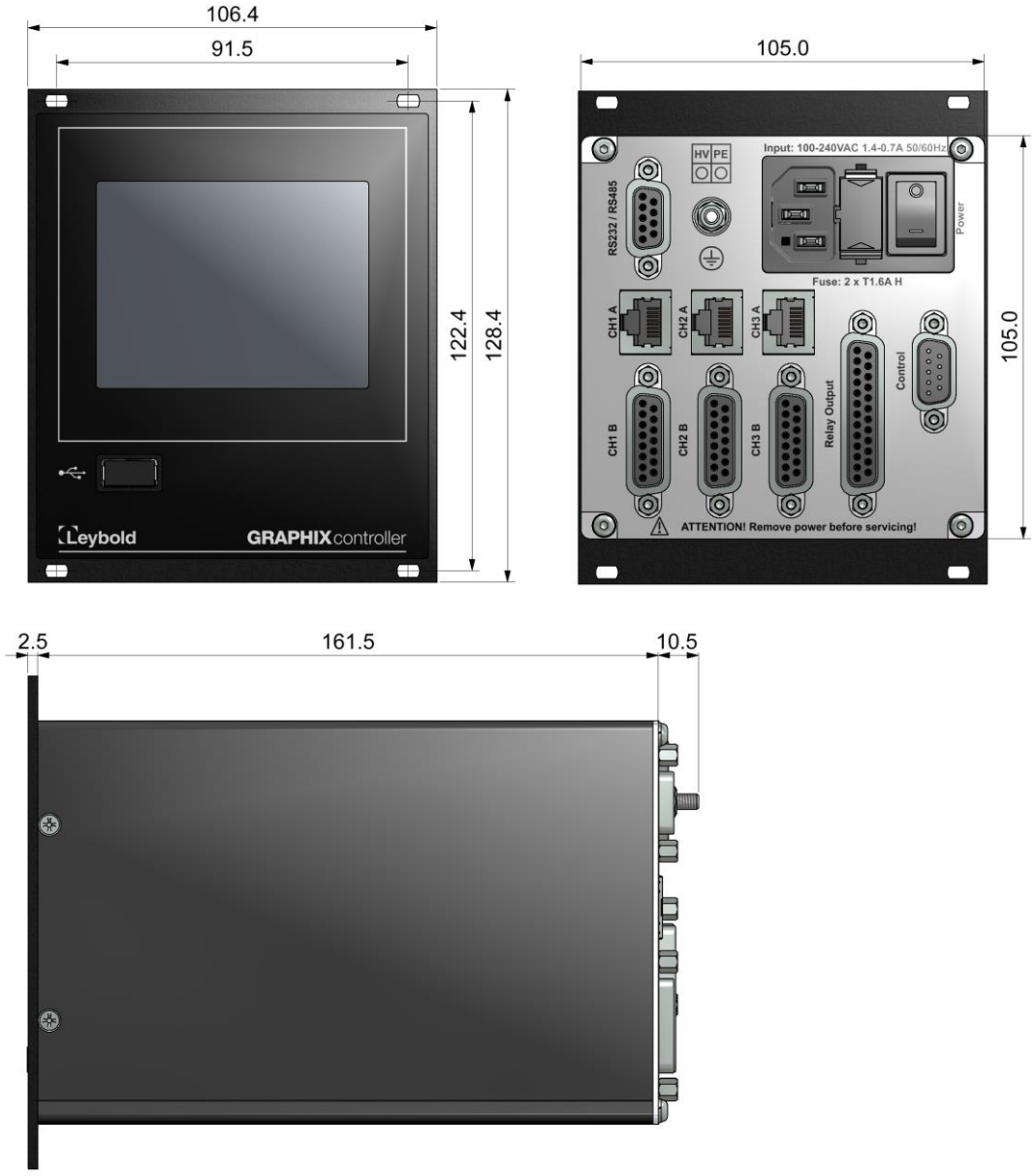


Figure 2 – Dimensions of the GRAPHIX controller (in mm)

4.1.2 Default Parameters (factory defaults)

Parameter Group	Parameter	Selection
Channel 1 … 3	Sensor Type	• TTR? • TTR10X • PTR? • PTR90? • CTR?
	Detection	• Auto
	Sensor Name	• no value
	Filter	• Slow
	Gas Type	• N2
	Correction Factor	• 1.00
	Emission	• Auto
	Filament	• Auto
	Offset On / Off	• Off
	Offset Value	• 0.000
	Sensor On	• Manual
	Sensor Off	• Manual
Setpoints	Channel	• Off
System	Unit	• mbar
	Key Sound	• Off
	Error Relay	• All
	Data Rate	• 38400
	Com Port	• RS232
Display	Display Mode	• Normal
	Resolution	• Standard
	Brightness	• Medium
Logging	Interval (s)	• 1
	File Size (h)	• 24
Recorder	Analog Mode	• Log
	Channel	• 1
Chart	Interval (s)	• 1
	Channel 1	• On
	Channel 2	• On
	Channel 3	• On
Leak Test	Interval (min)	• 10
	Volume (l)	• 1.0
	Channel	• 1
Language	Language	 EN (English)

Table 3 – Default parameters (factory defaults)

4.1.3 Ambient

Temperature:	Storage:	-20 – +60 °C
	Operating:	+5 – +45 °C (sea level)
		+5 – +30 °C (2000 m above sea level)
Relative atmospheric humidity:	80 % max. (up to 30 °C)	
	decreasing to 50 % max. (over 40 °C)	
Use:	indoors (altitude 2000 m max. above sea level)	
Ingress protection type:	IP20	
Contamination level:	2	

4.1.4 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 Power Connection

Voltage:	100 – 240 VAC	
Frequency:	50/60 Hz	
Fuses:	2 x T1.6A H	
Power consumption:	GRAPHIX ONE	< 50 W
	GRAPHIX TWO	< 70 W
	GRAPHIX THREE	< 100 W
Current consumption:	1.4 – 0.7 A max.	
Overvoltage category:	II	
Protection class:	1	
Connection:	Cold-device plug IEC 320 C14	

4.3 Measurement Channels

Number:	GRAPHIX ONE	1
	GRAPHIX TWO	2
	GRAPHIX THREE	3
Connection:	analogue sensors:	RJ45 (FCC 68)
	IONIVAC, CERAVAC:	SUB-D, 15-way, socket
Suitable sensors:	THERMOVAC	TTR81N
		TTR90 / TTR91 / TTR91N
		TTR96S / TTR96SN
		TTR211 / TTR216S
		TTR911 / TTR911N
		TTR911N (RS232)
		TTR916 / TTR916N
	THERMOVAC	TTR100 / TTR100S2
		TTR101 / TTR101N
		TTR101S2 / TTR101S2N
		TTR101N (RS232)
		TTR200N (RS232)
	IONIVAC	ITR90 / ITR90N
		ITR200S / ITR200SN
		ITR200SL / ITR200SLN
	PENNINGVAC	PTR81N
		PTR225 / PTR225N
		PTR225S / PTR225SN
		PTR225N (RS232)
		PTR237 / PTR237N
	PENNINGVAC	PTR82N
		PTR90 / PTR90N
		PTR90N (RS232)
		PTR200N (RS232)
	CERAVAC	CTR90 / CTR91
		CTR100 / CTR100N
		CTR101 / CTR101N
	DU sensor	DU200 / DU201
		DU2000 / DU2001
	DU relative pressure sensor	DU2001 rel.
	further sensors with 0 – 10 V characteristic	CUSTOM

4.3.1 Sensor Powering

Voltage:	+24 VDC ±5 %
Current:	500 mA (1000 mA briefly)
Fusing:	1000 mA, self-resetting after switching the instrument off or pulling the sensor plug

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

4.3.2 Measurement Technology

Measurement ranges:	Sensor dependent
Measurement error:	Gain error ≤ 0.02 % FS
	Offset error ≤ 0.05 % FS
Measurement rate:	Analogue ≥ 15 s^{-1}
	Digital ≥ 50 s^{-1}
Display rate:	4 s^{-1}
Filter time constant:	Fast, Medium, Slow
Unit of measurement:	mbar, Torr, Pa, psi, Micron
Correction options:	Zero alignment for linear sensors
	correction factor 0.10 – 10.0 for logarithmic sensors
A/D converter resolution:	> 16 bit

4.4 TFT Touch Display

Implementation:	3.5-in. TFT display with resistive touchscreen (glove operation is possible)
Resolution:	320 x 240 pixels

4.5 Switching Functions / Relay Outputs

4.5.1 Relay Switching Functions

Number:	6
Assignment:	freely assignable
Response time:	< 50 ms
Adjustment range:	Sensor dependent
Hysteresis:	Adjustable ≥ 10 % of measured value of for sensors with a logarithmic characteristic;
	0.1 % FS for sensors with a linear characteristic
Contact type:	Changeover contact, floating
Load (resistive)	Switched current: 1 A max.
	Switched voltage: 30 VAC / 30 VDC max.
Service life:	Mechanical: $5 \cdot 10^6$ switching cycles
	Electrical: 10^5 switching cycles at maximum load
Connection:	SUB-D, 25-way, plug

4.5.2 Error Signal Relay

Number:	1
Response time:	< 50 ms
Contact type:	Changeover contact, floating
Load (resistive):	Switched current: 1 A max.
	Switched voltage: 30 VAC / 30 VDC max.
Service life:	Mechanical: $5 \cdot 10^6$ switching cycles
	Electrical: 10^5 switching cycles at max. load
Connection:	SUB-D, 25-way, plug

4.6 Outputs and Inputs

4.6.1 Analogue Output

Number:	1 per measurement channel
Voltage range:	0 – 10 VDC (limit values 0 – 10.5 VDC)
Output voltage in case of error:	10.3 – 10.5 VDC
Deviation of displayed value:	± 0.2 %
Internal resistance:	100 Ohm
Characteristic curve:	Sensor dependent
Response time:	100 ms approx.
Resolution:	12 bit
Connection:	SUB-D, 9-way, plug (jointly used with external control connection)

4.6.2 Chart Recorder Output

Number:	1
Voltage range:	0 – 10 VDC (limit values 0 – 10.5 VDC)
Deviation of displayed value:	± 0.2 %
Internal resistance:	100 Ohm
Characteristic curve:	Programmable
Response time:	100 ms approx.
Resolution:	12 bit
Connection:	SUB-D, 9-way, plug (shared with external control connection)

4.6.3 External Control

Signal level:	Low = 0 VDC High = 24 VDC
Contact input via relay:	24 VDC approx., is provided by the instrument via a self-resetting fuse (100 mA)
Connection:	SUB-D, 9-way, plug (shared with external control connection)

4.6.4 Serial Interface

4.6.4.1 RS232

Standard:	RS232
Parameters:	8 data bits, 1 stop bit, no parity, no protocol
Signals:	RXD and TXD
Baud rate:	9600, 19200, 38400 Baud
Connection:	SUB-D, 9-way, socket (shared with RS485)

4.6.4.2 RS485

Standard:	RS485 (half duplex)
Parameters:	8 data bits, 1 stop bit, no parity, no protocol
Signals:	A and B
Baud rate:	9600, 19200, 38400 Baud
Connection:	SUB-D, 9-way, socket (shared with RS232)

4.6.5 USB-A Interface (front side)

Connection: USB-A, socket

NOTICE: Storage Media.
For proper operation, we recommend that you use a USB memory stick compliant with USB standard 2.0 and a memory capacity of 1 – 4 GB.

5. Installation

5.1 Supplied Equipment

Designation	Quantity
GRAPHIX controller	1
Mains power cord with safety plug (EU)	1
Mains power cord with safety plug (US)	1
Operating Instructions (each EN and DE)	1
USB stick with operating instructions (multi-language)	1
Spare fuse	2
Collar screw	4
Plastic sleeve	4
Edge protection rubber	2
Rubber foot	2
Dust protection cap for USB socket	1

Table 4 – Supplied equipment

5.2 Mechanical Installation

The GRAPHIX controller 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 GRAPHIX controller has been designed for installation in a module rack in accordance with DIN 41 494 (19-in., 3 HU) (☞🕮 Figure 3, page 24). For this, the delivery scope includes 4 collar screws and four plastic sleeves.

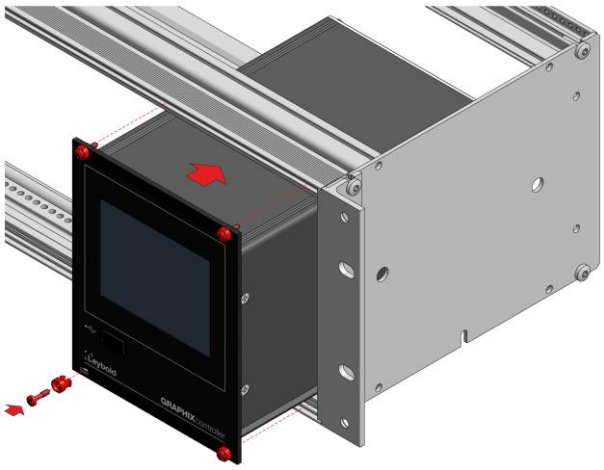


Figure 3 – Rack installation

- Affix the module rack.
- Push the GRAPHIX controller into the module rack.
- Affix the instrument in the module rack with the collar screws and plastic sleeves included in the delivery.

5.2.2 Front Panel Installation

Installation in a front panel requires a cut-out as given below (☞🕮 Figure 4, page 24):

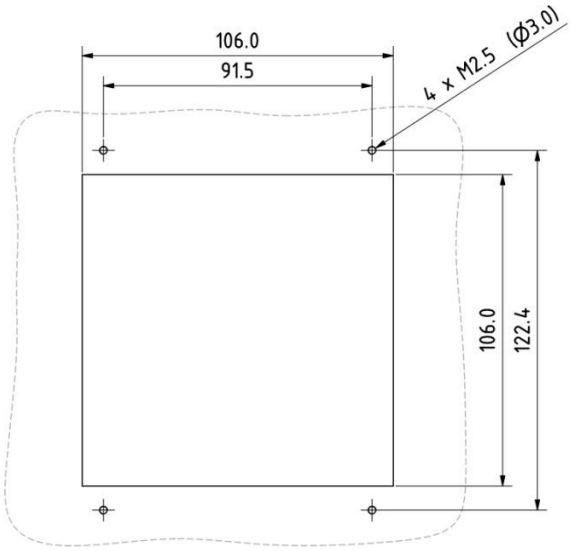


Figure 4 – Front panel cut-out (in mm)

- Guide the GRAPHIX controller into the cut-out.
- Affix the instrument to the sub-rack with the neck collar screws and the plastic sleeves included in the delivery.

5.2.3 Benchtop Instrument

When planning to use the GRAPHIX controller as a benchtop instrument, proceed as follows:

- Push one of the two edge protection rubber pieces included in the delivery over the top edge of the front panel (☞🕮 Figure 5, page 25)
- Place the GRAPHIX controller on its back (☞🕮 Figure 6, page 25)
- 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 GRAPHIX controller 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.

Figure 5 – Preparing the top side of the instrument for utilisation as a benchtop unit

Figure 6 – Preparing the bottom side of the instrument for utilisation as a benchtop unit

- Turn the GRAPHIX controller over again and move it to the desired place.

5.3 Connections

5.3.1 Rear of the Instrument

Depicted in Figure 7, page 26 is the rear side of the GRAPHIX controller. The pin assignment of the different connectors is described in the following sections.

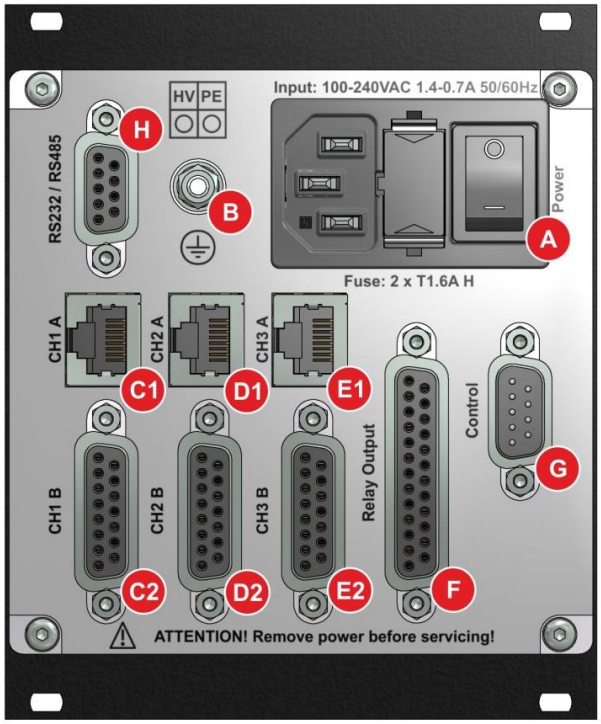


Figure 7 – Rear of the instrument

A	Mains power connection with mains switch and instrument fuses
B	Earth connection
C1/C2	Connection of measurement channel 1 for sensors (CH1 A and CH1 B)
D1/D2	Connection of measurement channel 2 (for GRAPHIX TWO and THREE only) for sensors (CH2 A and CH2 B)
E1/E2	Connection of measurement channel 3 (for GRAPHIX THREE only) for sensors (CH3 A and CH3 B)
F	Relay output connection (Relay Output)
G	Analogue output, chart recorder output and external control connection (Control)
H	RS232 or RS485 interface connection (RS232/RS485)

5.3.2 Mains Power Connection

The mains connection on the rear side (☞📖 Figure 7, A, page 26) has been designed to accept a mains cord which on the instrument side is equipped with a cold-device plug.

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.

- Insert the plug of the mains cord into the mains socket provided on the instrument.
- Insert the mains plug of the mains cord into the mains outlet.

5.3.3 Earthing

Through the earthing screw (☞📖 Figure 7, B, page 26) the GRAPHIX controller is connected to the Earth connection on the vacuum chamber.

NOTICE: Earthing
Connect the Earth connection on the vacuum chamber by means of a protective earth conductor to the earthing screw on the instrument

5.3.4 Measurement Channel (CH1 … CH3)

The connector marked Channel serves the purpose of connecting sensors. For each measurement channel two sockets connected in parallel are available: one each 8-way modular socket (☞📖 Figure 7, C1, D1, E1, page 26 and Figure 8, page 27) and a 15-way SUB-D- socket (☞📖 Figure 7, C2, D2, E2, page 26 and Figure 9, page 27).

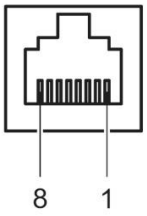


Figure 8 – Sensor connection (modular socket, 8-way)

1	+24 VDC	5	Signal ground
2	Ground	6	Status
3	Signal	7	Not available
4	Identification resistor	8	HV On

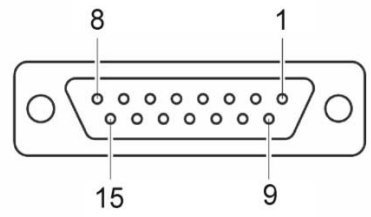


Figure 9 – Sensor connection (SUB-D socket, 15-way)

1	Not available	9	Not available
2	Signal	10	Identification resistor
3	Not available	11	+24 VDC
4	HV On	12	Signal ground
5	Ground	13	RXD
6	Not available	14	TXD
7	Degas	15	Ground
8	+24 VDC		

CAUTION: Impermissible Sensors.
Connecting sensors which have not been designed to be operated in connection with the GRAPHIX controller or which do not comply with current EMC guidelines can impair operation of the instrument or even damage it. Always operate the GRAPHIX controller with approved sensors. ☞📖 Chapter 3.2 Suitable Sensors, page 15.

CAUTION: Multiple Sensors.
Only a single sensor may be connected to each measurement channel. Otherwise, the connected sensors will suffer damage. Connect to each measurement channel precisely one sensor only.

Connecting:
Measurement channel 1: Connect the sensor using a shielded straight through (1:1) cable to connector CH1 A or CH1 B.
Measurement channel 2: Connect the sensor using a shielded straight through (1:1) cable to connector CH2 A or CH2 B (for two- and three-channel instruments only).
Measurement channel 3: Connect the sensor using a shielded straight through (1:1) cable to connector CH3 A or CH3 B an (for three-channel instruments only).

NOTICE: Sensor exchange.
Switch the GRAPHIX controller off for the change of the configuration of the attached sensors (sensor exchange).

5.3.5 Relay Output

Through the connector marked Relay Output (☞🕮 Figure 7, F, page 26 and Figure 10, page 28) you may utilise the floating relay contacts for switching functions and for error monitoring.

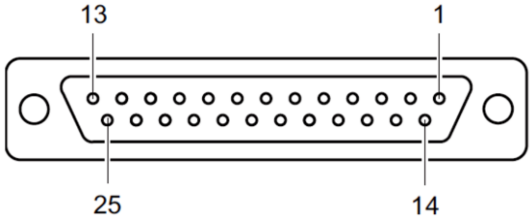


Figure 10 – Connection socket for relay output (SUB-D, 25-way)

1	Ground	11	SP3 NC	21	SP5 NO
2	Not available	12	SP3 COM	22	SP6 NC
3	Error NC	13	SP3 NO	23	SP6 COM
4	SP1 NC	14	Error NO	24	SP6 NO
5	SP1 COM	15	Error COM	25	+ 24 VDC, 200 mA Corresponds to the requirements of a protected safety extra-low voltage (SELV-E in accordance with EN 61010).
6	SP1 NO	16	SP4 NC		
7	Ground	17	SP4 COM		
8	SP2 NC	18	SP4 NO		
9	SP2 COM	19	SP5 NC		
10	SP2 NO	20	SP5 COM		

COM	Common
NC	Normally closed contact
NO	Normally open contact

NOTICE:
Contact 25 serves the purpose of powering relays with a higher switching capacity. The contact is protected by means of a PTC resistor limiting the maximum current to 200 mA. The PTC resistor is self-resetting when switching the instrument off or pulling the plug out of the socket marked Relay Output.

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 connecting cable to the connector marked Relay Output on the rear of the GRAPHIX controller.

5.3.6 Analogue Output, Chart Recorder Output and External Control (Control)

The connector marked Control (☞🕮 Figure 7, G, page 26 and Figure 11, page 29) provides the connections for the analogue outputs for the signals of the individual measurement channels, the chart recorder output (programmable analogue output) as well as the inputs for externally controlling the IONIVAC sensors and PENNINGVAC sensors PTR81N, PTR225, PTR225N, PTR225S, PTR225SN, PTR237 and PTR237N.

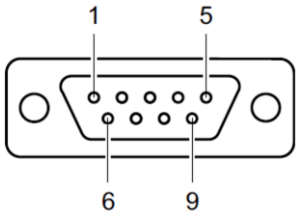


Figure 11 – Connection plug for analogue output, chart recorder output and external control (SUB-D, 15-way)

1	Analogue output CH1	6	Analogue output CH2
2	Analogue output CH3	7	Chart recorder output
3	Analogue ground	8	Analogue ground
4	HV On CH3	9	HV On CH2
5	HV On CH1		

Connecting:

- Connect the peripheral components using a shielded connecting cable to the connector marked Control on the rear of the GRAPHIX controller.

5.3.7 Interfaces RS232/RS485 (RS232/RS485)

The connector marked RS232/RS485 (☞🕮 Figure 7, H, page 26 and Figure 12, page 29) allows you to operate the instrument by means of a computer or a terminal.

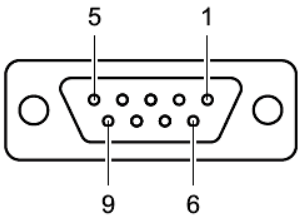


Figure 12 – Connection socket for interface (SUB-D, 9-way)

1	B (RS485)	6	Link to 4
2	TxD (RS232)	7	Link to 8
3	RxD (RS232)	8	Link to 7
4	Link to 6	9	A (RS485)
5	Ground		

Connecting:

- Connect the serial interface of the computer using a shielded connecting cable to the connector marked RS232/RS485 on the rear of the GRAPHIX controller.

WARNING:
When using the RS232 interface, use a serial extension cable equipped with a 9-way plug and a 9-way socket. The cable must be of the straight through type.
To utilise the RS485 interface, a special cable will be required.

6. Operation

6.1 Front Panel

Figure 13, page 30 depicts the front panel of the GRAPHIX controller.

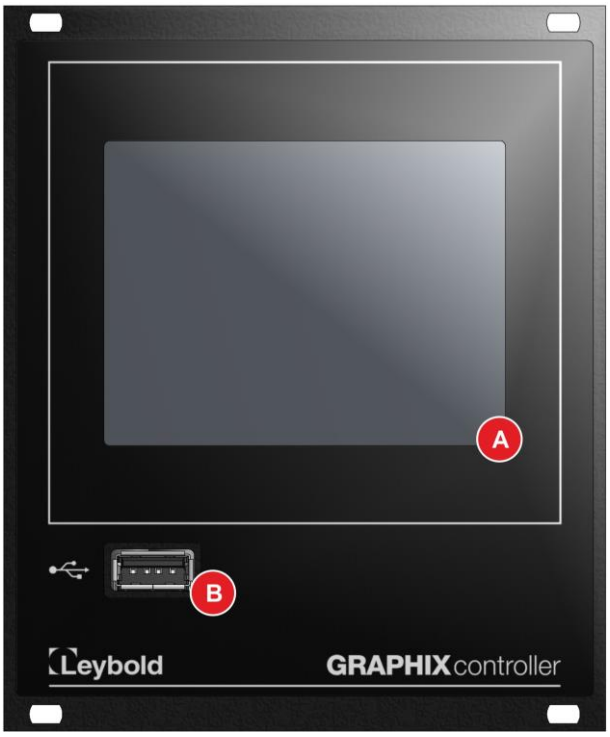


Figure 13 – Front panel

A Graphic TFT touch display (resistive)
B USB-A interface

6.1.1 USB-A Interface

Located on the front of the instrument is an USB-A socket for connecting suitable USB storage media (☞🕮 Chapter 4.6.5 USB-A Interface (front side), page 22) for recording data and software updating.

6.1.2 Display

The GRAPHIX controller makes different display modes possible. You may select between the following display modes:

Normal
Default display mode, which provides all important information on the connected sensors.

Chart
Graphic display of the pressure history of the connected sensors. Besides the pressure history, also the measured values for the individual channels are displayed.

Big
The display is limited to displaying the measured values of the connected sensors using a large font.

Speedo

Pressure reading for the connected sensor of one selected channel is in the shape of a speedometer. The mantissa is displayed as a round progress, whereas the exponent is displayed centrally.

Leak Test

Display mode for the Leak Test function. Besides the leak rate, current pressure, total time and remaining time are displayed.

The selection is made using the channel menu button (☞📖 Chapter 6.4.2.2 Changing Display Mode, page 41) or the parameter Display Mode in the parameter group Display of the main menu (☞📖 Chapter 7.4.1 Display Mode, page 84).

6.1.2.1 Display Mode – Normal

The display mode Normal is the default display mode of the GRAPHIX controller. Here all important information on the connected sensors can be viewed at a glance.

Figure 14 – Display mode Normal

A Display field for measurement channel 1
B Display field for measurement channel 2 (GRAPHIX TWO and THREE only)
C Display field for measurement channel 3 (GRAPHIX THREE only)

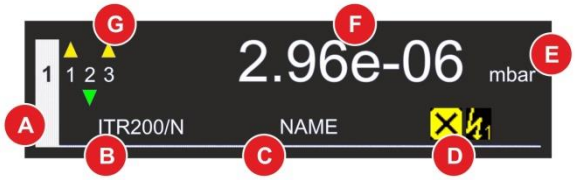


Figure 15 – Display field for a measurement channel

A Measurement channel
B Sensor type (automatic detection)
C Sensor name (can be entered freely)
D Status or warning symbols
E Display unit
F Measured value or status message
G Switching function status

Measurement Channel

For each measurement channel, a separate display field is provided (☞📖 Figure 14, A, B, C, page 31).

Sensor Type

The sensor type for the measurement channel is displayed on the left at the bottom of the display field (☞📖 Figure 15, B, page 31). The GRAPHIX controller will automatically detect the connected sensors or sensor groups of the respective measurement channel by means of an identification resistor.

Sensor Name

At the centre bottom area of the display field for the measurement channel, the sensor name (☞🕮 Figure 15, C, page 31) is displayed. Through the main menu, you may describe the connected sensor in greater detail or label it by entering information as to where it is installed.

Status or Warning Symbols

At the right-hand bottom area of the display field for the measurement channel, the status or warning symbols (☞🕮 Figure 15, D, page 31) are displayed. The status and warning symbols are explained in Table 7, page 38.

Display Unit

At the right-hand top area of the display field for the measurement channel, the unit of measurement is displayed directly after the measured value (☞🕮 Figure 15, E, page 31). Through the main menu, you may select the unit of measurement. The unit of measurement is the same for all channels.

Measured value or status message

In the central upper area of the display field for the measurement channel, the measured value or a status message (☞🕮 Figure 15, F, page 31) are displayed. In the case of linear sensors, negative measured values can be displayed depending on the measurement range or the zero adjustment. For further information, refer to the manual for the respective sensor.

Switching Function Status

In the left-hand upper area of the display field for the measurement channel, the status of the switching functions (☞🕮 Figure 15, G, page 31) is displayed. When the yellow triangle comes on above the number, then the pressure is higher than the switching threshold. The switching threshold is not yet active. When the green triangle under the number comes on, then the pressure is lower than the switching threshold. The switching threshold is still active. Through the main menu, you may configure the switching functions. The entry range for the values will depend on the connected sensor. The switching functions can be freely assigned to the channels. Only those switching thresholds, which have been assigned to the channel, are displayed.

6.1.2.2 Display Mode – Chart

The display mode Chart allows you to graphically display the pressure history of the connected sensors by way of a chart.
Here in the chart the y-axis (pressure in the preselected unit of measurement) is scaled automatically. The scale for the x-axis (time) defaults to the scale 1:1. Through the buttons and you may change the scale in steps of 1:2, 1:4 or 1:8.
Besides the pressure history, also the measured values or status messages for the individual channels are displayed. Error messages are shown in red font. If a notice is present for the attached sensor, the measured value is presented in yellow font.

Figure 16 – Display mode Chart

A	Measured value or status message for channel 1
B	Measured value or status message for channel 2 (GRAPHIX TWO and THREE only)
C	Measured value or status message for channel 3 (GRAPHIX THREE only)
D	Pressure in the selected unit of measurement (automatic scaling)
E	Scaling option for timescale (Default scale = 1:1, scale 1:2, 1:4 or 1:8 selectable through buttons or
F	Pressure history for the active channels
G	Time scale

6.1.2.3 Display Mode – Big

The display mode Big is limited to displaying the measured values or a status message for the connected sensors. Measured value or status message are displayed in a larger font. Error messages are shown in red font. If a notice is present for the attached sensor, the measured value is presented in yellow font.

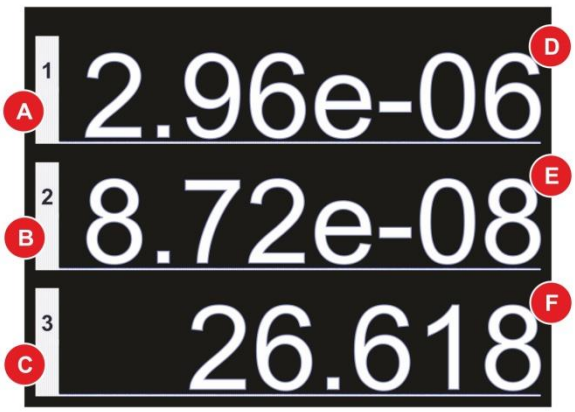


Figure 17 – Display mode Big

A	Display field for measurement channel 1
B	Display field for measurement channel 2 (GRAPHIX TWO and THREE only)
C	Display field for measurement channel 3 (GRAPHIX THREE only)
D	Measured value or status message for channel 1
E	Measured value or status message for channel 2 (GRAPHIX TWO and THREE only)
F	Measured value or status message for channel 3 (GRAPHIX THREE only)

6.1.2.4 Display Mode Speedo

The display mode Speedo allows you to display the measured value in the shape of a speedometer. The mantissa is displayed as a round progress, whereas the exponent and the display unit are displayed centrally. Additionally, measured values and status messages of the sensors connected to the other channels are displayed at the bottom.
If an error occurs, the warning symbol appears at the right-hand top area of the display field. In case of a notice the warning symbol appears.
Error messages for the other channels are shown in red font. If a notice is present, the measured value is presented in yellow font.

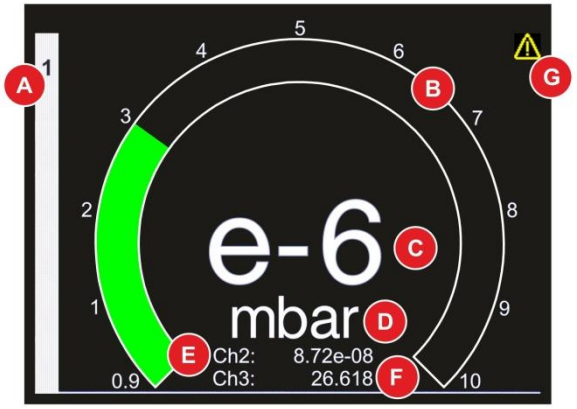


Figure 18 – Display mode Speedo

A	Display field for measurement channel
B	Mantissa of the measured value as progress
C	Exponent of the measured value or warning symbol
D	Display unit
E	Measured value or status message for one further channel (GRAPHIX TWO and THREE only)
F	Measured value or status message for one further channel (GRAPHIX THREE only)
G	Warning symbol

6.1.2.5 Display Mode Leak Test

The display mode Leak Test allows you to display the leak rate determination using pressure rise method. Besides the current, last and next-to-last leak rate, current pressure, total time since start of the procedure and remaining time for the current interval are displayed.
Error messages are shown instead of the current pressure in red font. If a notice is present for the connected sensor, the current pressure is presented in yellow font.

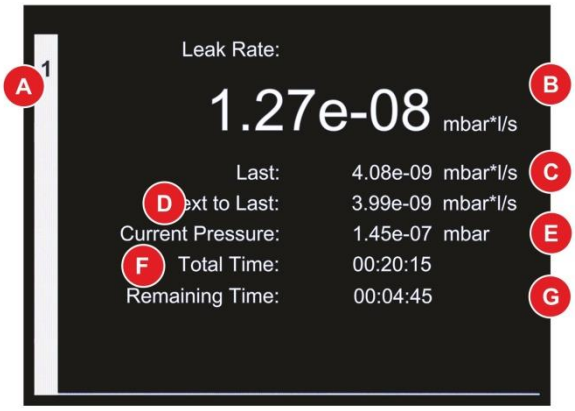


Figure 19 – Display mode Leak Test

A	Display field for measurement channel
B	Currently determined leak rate
C	Last determined leak rate
D	Next-to-last determined leak rate
E	Currently measured pressure or status message
F	Total time since start of the procedure [hh:mm:ss]
G	Remaining time for current interval [hh:mm:ss]

6.1.3 Controls

The GRAPHIX controller is operated through the buttons displayed on the graphic TFT touch display. Since this is a resistive type of touchpanel, entries are possible even when using gloves.

Main Menu Buttons

Pressing the touchscreen for a duration of approximately 1 second displays the main menu (☞🕮 Figure 20 and Figure 21, page 35). You can also use the display mode selection window (☞🕮 Chapter 6.4.2.2 Changing Display Mode, page 41). Here you may access different parameters and instrument functions. These have been arranged by way of parameter groups within which you can view or change the corresponding parameters or enable functions. In this way, you may configure your GRAPHIX controller and also utilise further functions offered by the instrument.

Channel Menu Buttons

Briefly touching the desired channel invokes the channel menu (☞🕮 Figure 22, page 35) of the respective channel. Here you can control the sensor connected to the respective channel. The available setup options depend on the connected type of sensor. Moreover, you can change in the channel menu the display mode from Measured values display Normal to Chart.

Figure 20 – Main menu 1/2

Figure 21 – Main menu 2/2

Figure 22 – Channel menu (example)

- To select, tap the centre of the buttons or symbols.

NOTICE:
The touchscreen is capable of processing only one input at a time. It is not permissible to simultaneously tap the touchscreen at several points since then no defined control will be possible.

6.1.4 Symbols

6.1.4.1 Symbols for the Controls

Symbol	Designation	Explanation
	Next	Next menu page
	Previous	Previous menu page
	Up	Scroll upward in the selection list
	Down	Scroll downward in the selection list
	Return	Return to the previous display
	OK	Accept / confirm
	Configuration	Start the main menu
	Display Mode	Change display mode
	Normal	Enabling display mode Normal
	Big	Enabling display mode Big
	Chart	Enabling display mode Chart
	Leak Test	Enabling display mode Leak Test
	Speedo Channel 1	Enabling display mode Speedo for channel 1
	Speedo Channel 2	Enabling display mode Speedo for channel 2
	Speedo Channel 3	Enabling display mode Speedo for channel 3
	Scale up	Zoom out time scale
	Scale down	Zoom in time scale
	Start	Start a function
	Stop	Stop a function
	HV On	Switch high vacuum measurement circuit on
	HV Off	Switch high vacuum measurement circuit off

Symbol (continued)	Designation	Explanation
	HV On/Off n.a.	It is not possible to turn on or off the high vacuum measurement circuit manually because of parameter settings.
	Degas On	Switch degas on
	Degas Off	Switch degas off
	Help	Start help for current function or operation of the instrument

Table 5 – Symbols for the controls

6.1.4.2 Symbols for the Language Selection

Symbol	Designation	Explanation
	Language selection	Start language selection menu
	English	Select menu language EN (English)
	German	Select menu language DE (German)
	Chinese	Select menu language CN (Chinese)
	French	Select menu language FR (French)
	Italian	Select menu language IT (Italian)
	Japanese	Select menu language JP (Japanese)
	Spanish	Select menu language ES (Spanish)
	Korean	Select menu language KN (Korean)
	Russian	Select menu language RU (Russian)
	Polish	Select menu language PL (Polish)
	Turkish	Select menu language TR (Turkish)

Table 6 – Symbols for language selection

6.1.4.3 Status and Warning Symbols

Symbol	Designation	Explanation
	Status Calibration Factor	Gas type correction factor differs from 1
	Status Offset	Offset differs from 0
	Status HV On	PENNINGVAC sensor is on
	Status HV 1 On	Filament 1 of the IONIVAC sensor is on
	Status HV 2 On	Filament 2 of the IONIVAC sensor is on
	Status Degas	Degassing is active
	Notice	Sensor status indicates “Notice”
	Error	Sensor status indicates “Error”
	SP Off	Switching threshold disabled (pressure high)
	SP On	Switching threshold enabled (pressure low)

Table 7 – Status indicating and warning symbols

6.2 Switching ON and OFF

6.2.1 Switching ON

- Switch the instrument on through its main switch.

After switching on, the GRAPHIX controller will run the following:

- Display of the start screen with the version number.
- Re-establishing of the most recently setup parameters.
- Identification of the connected measuring instruments.
- Enabling of the measurement mode in the display mode specified in the parameter group (depending on the most recent setting).

6.2.2 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.

6.3 Operating Modes

The GRAPHIX controller can be run in one of the following operating modes:

Measurement Mode
The Measurement mode is the default operating mode. Here the measured values of the sensors are displayed in the display modes Normal, Chart, Big, Speedo or Leak Test. In the case of an error, a status message is output instead and/or a symbol is displayed. Further symbols are used to indicate the status of different operating and/or error modes of the sensors.

Parameter and Function Mode
In the parameter and function mode, you may access through the main menu different parameters and instrument functions. These have been arranged in parameter groups within which you may view or change the corresponding parameters or enable specific functions. In this way, you may configure your GRAPHIX controller and utilise further functions offered by the instrument.

6.4 Measurement Mode

6.4.1 Description

The measurement mode is the default operating mode. Here the measured values of the sensors are displayed in the different display modes. Additionally status messages (☞📖 Table 8, page 40) and/or error messages (☞📖 Table 74, page 111) can be displayed.

Display	Explanation
....	No sensor connected.
FS?	Full Scale? Connected analogue CERAVAC sensor has not been specified. Make a selection, in order to specify the sensor.
S-OFF	High vacuum measurement circuit of the PENNINGVAC sensors PTR81N, PTR225, TR225N, PTR225S, PTR225SN, PTR237 or PTR237N has been switched off.
Measuring value	Connected sensor is identified and in specified measuring range.
Measuring value and additional warning symbol ⚠ in the display mode Normal and Speedo or **Measuring value** displayed by a yellow font in the display modes Chart, Big and Leak Test as well as for the other channels in the display mode Speedo	Description depends on the connected sensor: • Pirani adjustment of the connected IONIVAC sensor of ITR90 series is insufficient. • Filament 1 of the connected IONIVAC sensor of ITR200 series is defective. • Connected CERAVAC sensor of CTR101 series is in the heating phase.

Table 8 – Status messages in the measured values display

After switching on, the GRAPHIX controller will automatically resume the last measurement display mode, which was selected. When running the main menu and not making an entry for more than 60 seconds, then the instrument will revert back to the measured values display.

6.4.2 Button Functions

6.4.2.1 Invoking the Help Function

- Invoke the channel menu by briefly tapping on the desired channel.
- Tap on the button ?.
  - The help function starts.

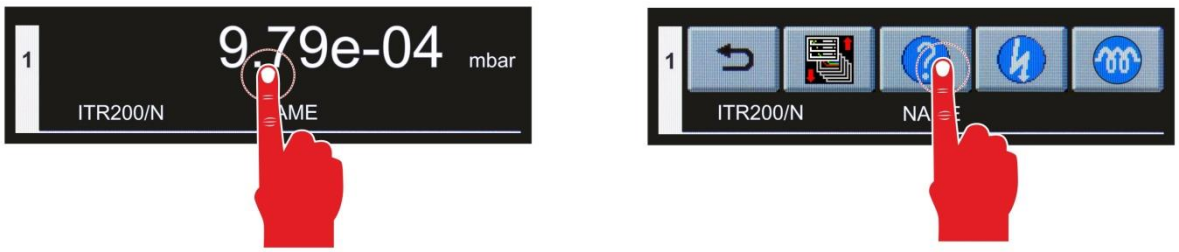


Figure 23 – Invoking the Help function

- To exit the help function tap on the button ⮌.

6.4.2.2 Changing Display Mode

- Invoke the channel menu by briefly tapping on the desired channel in the display modes Normal, Big or Leak Test.
- Tap on button .
  - The selection of display modes starts.
- Tap on display window in the display modes Chart or Speedo.
  - The selection of display modes starts.

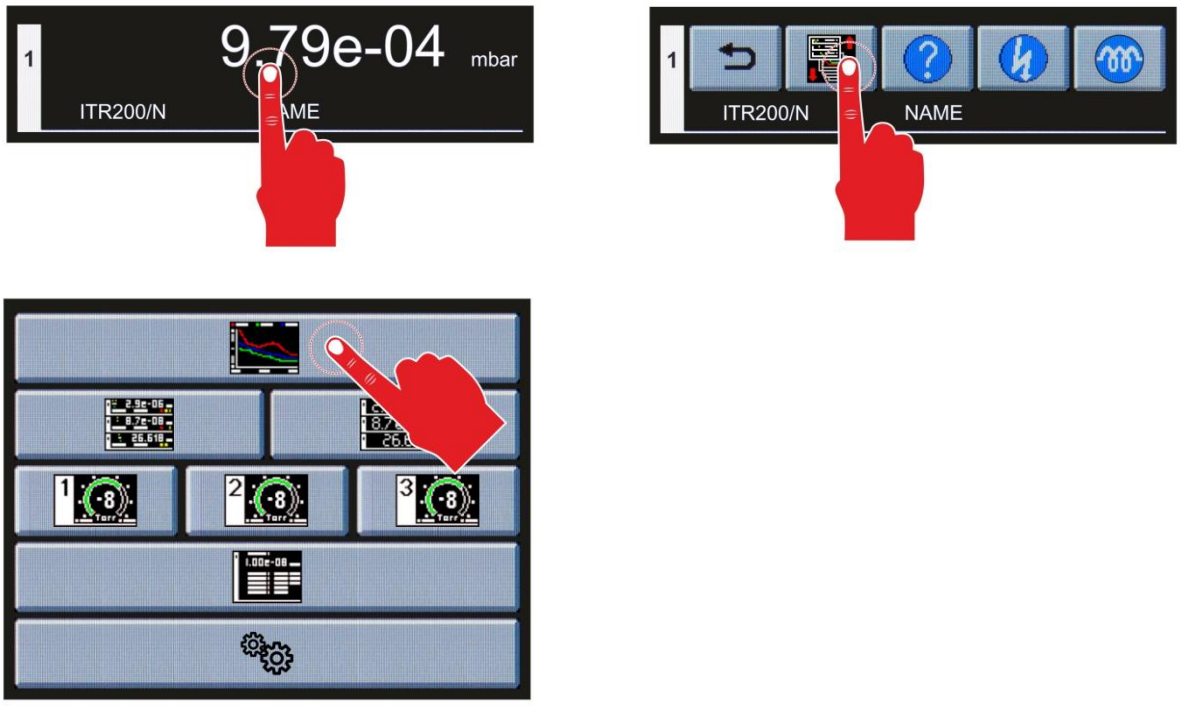


Figure 24 – Changing display mode

- For choosing display mode Chart tap on button .
  - Display mode Chart starts.
- For choosing display mode Normal tap on button .
  - Display mode Normal starts.
- For choosing display mode Big tap on button .
  - Display mode Big starts.
- For choosing display mode Speedo Channel 1 tap on button .
  - Display mode Speedo Channel 1 starts.
- For choosing display mode Speedo Channel 2 tap on button .
  - Display mode Speedo Channel 2 starts.
- For choosing display mode Speedo Channel 3 tap on button .
  - Display mode Speedo Channel 3 starts.
- For choosing display mode Leak Test tap on button .
  - Display mode Leak Test starts.
- For choosing parameter and function mode tap on button .
  - Main menu starts.

NOTICE:
After turning it off and on again, the GRAPHIX Controller returns back to the display mode specified in the parameter group Display.

6.4.2.3 Switching the High Vacuum Measurement Circuit On

For the PENNINGVAC sensors PTR81N, PTR225, PTR225N, PTR225S, PTR225SN, PTR237 and PTR237N, the high vacuum measurement circuit can be switched on manually.

For this, the parameter Sensor on in parameter group Channel 1 … 3 must be set to Manual (☞🕮 Chapter 7.1.13 Sensor Switch-on Type (Sensor On), page 72).

- Invoke the channel menu by briefly tapping on the desired channel.
- Tap on the button .
  - The high vacuum measurement circuit is enabled. In the display field for the corresponding measurement channel the yellow status symbol will come on.

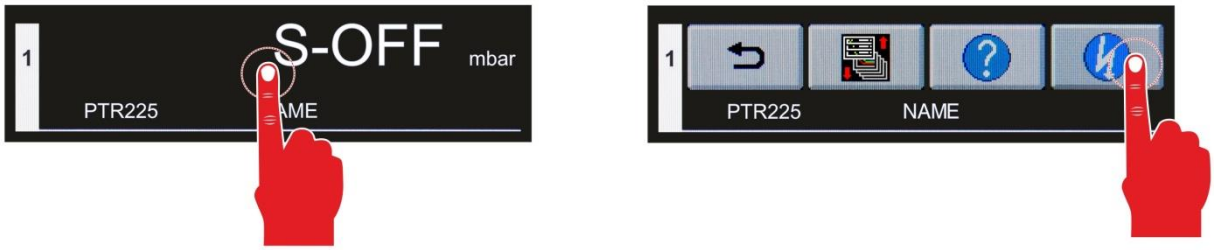


Figure 25 – Switching the high vacuum measurement circuit on

6.4.2.4 Switching the High Vacuum Measurement Circuit Off

For the PENNINGVAC sensors PTR81N, PTR225, PTR225N, PTR225S, PTR225SN, PTR237 and PTR237N, the high vacuum measurement circuit can be switched off manually.

For this, the parameter Sensor off in parameter group Channel 1 … 3 must be set to Manual (☞🕮 Chapter 7.1.15 Sensor Switch-off Type (Sensor Off), page 73).

- Invoke the channel menu by briefly tapping on the desired channel.
- Tap on the button .
  - The high vacuum measurement circuit is disabled. In the display field for the corresponding measurement channel the yellow status symbol will turned off.

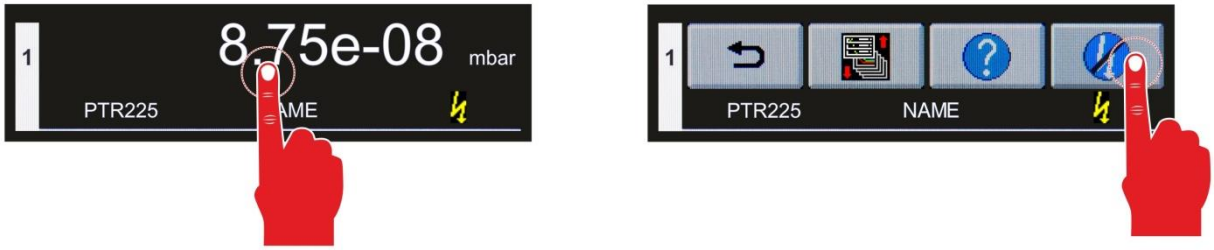


Figure 26 – Switching the high vacuum measurement circuit off

6.4.2.5 Switching the Emission On

For the IONIVAC sensors of ITR200 series, the emission can be switched on manually.

For this, the parameter Emission in parameter group Channel 1 … 3 must be set to Manual (☞🕮 Chapter 7.1.7 Emission Switching On and Switching Off Type (Emission), page 69).

- Invoke the channel menu by briefly tapping on the desired channel.
- Tap on the button .
  - The emission is enabled. In the display field for the corresponding measurement channel the yellow status symbol or will come on depending on the active filament.

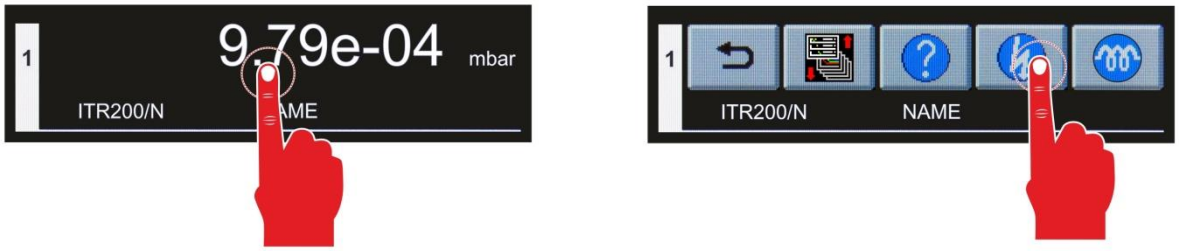


Figure 27 – Switching the emission on

6.4.2.6 Switching the Emission Off

For the IONIVAC sensors of ITR200 series, the emission can be switched off manually anytime, independent of the settings of the parameter Emission in the parameter group channel 1 … 3.

- Invoke the channel menu by briefly tapping on the desired channel.
- Tap on the button .
  - The emission is disabled. In the display field for the corresponding measurement channel the yellow status symbol or will turn off depending on the active filament.

Figure 28 – Switching the emission off

6.4.2.7 Switching the Degas Function On

For the IONIVAC sensors of ITR90 series and ITR200 series the degas function can be switched on manually.

This requires that the emission has been enabled and that the sensor is operating within a pressure range permissible for running the degas function (☞🕮 See sensor manual).
In the display field for the corresponding measurement channel the yellow status symbol $\lightning_1$ or $\lightning_2$ must be on, depending on the active filament.

- Invoke the channel menu by briefly tapping on the desired channel.
- Tap on the button .
  - The degas function is enabled. For the corresponding measurement channel, the yellow status symbol will come on.

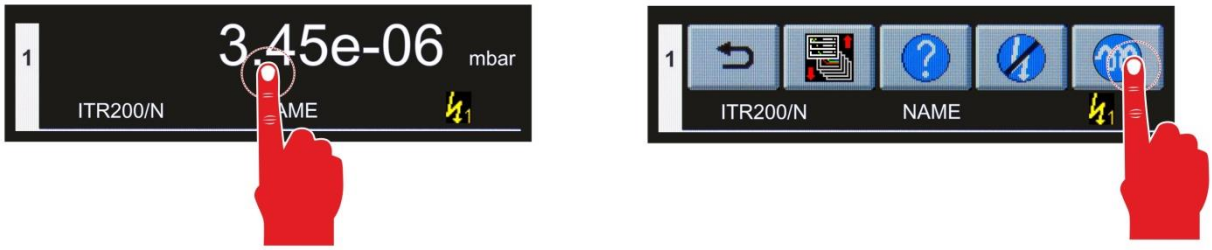


Figure 29 – Switching the degas function On

6.4.2.8 Switching the Degas Function Off

For the IONIVAC sensors of ITR90 series and ITR200 series the degas function can be switched off manually.

- Invoke the channel menu by briefly tapping on the desired channel.
- Tap on the button .
  - The degas function is disabled. In the display field for the corresponding measurement channel the yellow status symbol will turn off.

Figure 30 – Switching the degas function Off

6.4.2.9 Starting the Leak Test Function

The leak test function can be started manually in the display mode Leak Test.

- Invoke the channel menu by briefly tapping on the display window.
- Tap on the button ▶.
  - The leak test function starts.

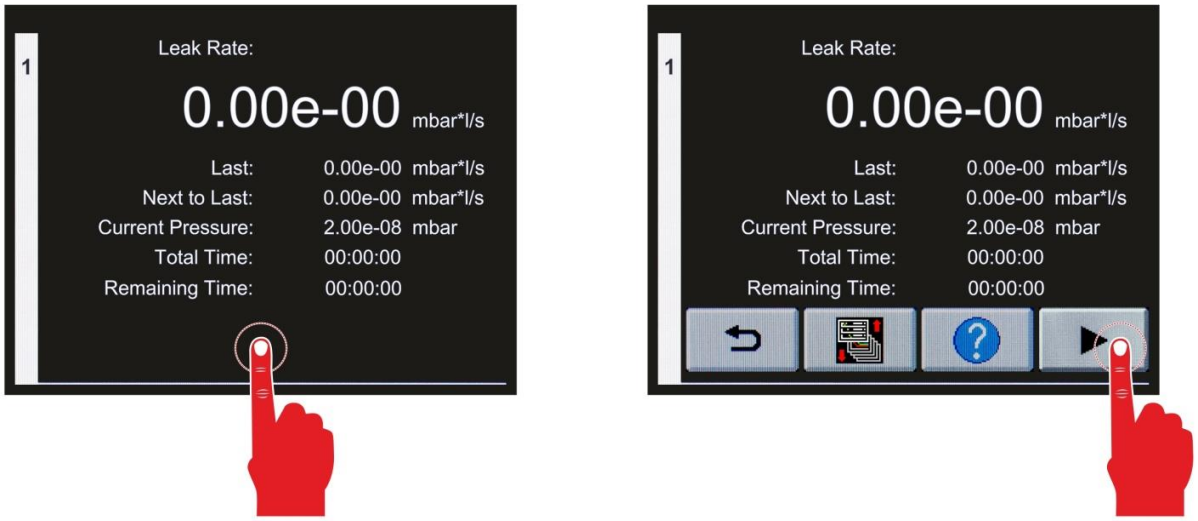


Figure 31 – Starting Leak Test

- The procedure is canceled automatically, if it comes to an error message.
- Eliminate the malfunction.
- Invoke the channel menu by briefly tapping on the display window.
- Acknowledge the elimination of malfunction by tapping on the button ⮌.
  - The leak test function can be started new.

6.4.2.10 Stopping the Leak Test Function

The leak test function can be stopped manually in the display mode Leak Test.

- Invoke the channel menu by briefly tapping on the display window.
- Tap on the button ■.
  - The leak test function stops.

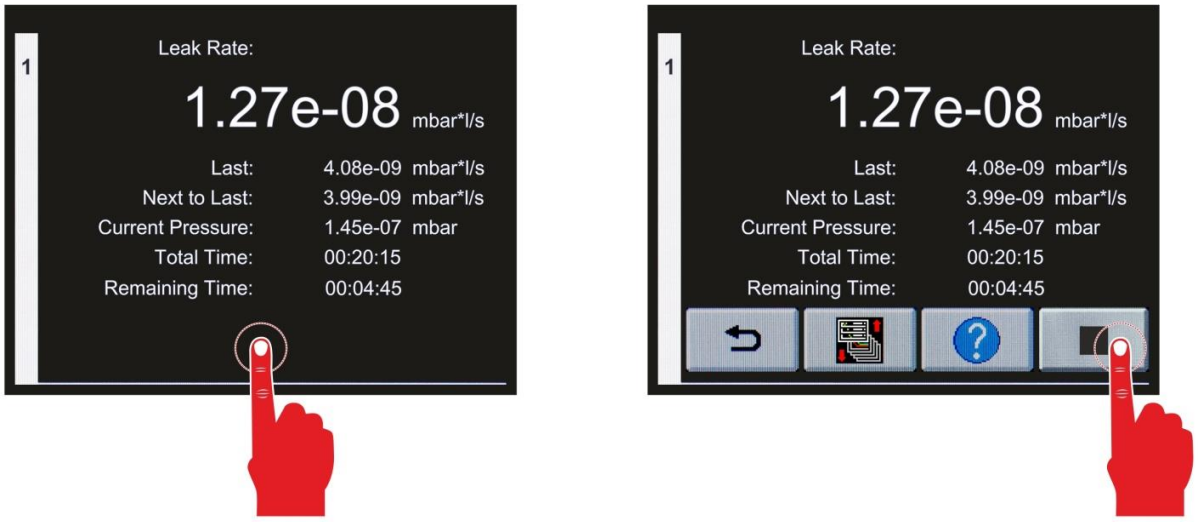


Figure 32 – Stopping Leak Test

6.5 Parameter and Function Mode

In the parameter and function mode, you may access through the main menu different parameters and instrument functions. These have been arranged in parameter groups within which you may view or change the corresponding parameters or enable specific functions. In this way, you may configure your GRAPHIX controller and utilise further functions offered by the instrument.

6.5.1 Operating Concept

- In the measurement mode, touch the touchscreen surface for approximately 1 second.
  - You will now see the main menu with an overview of the parameter groups.
- To scroll, use the buttons ◁ and ▷.
  - You will then see the each case preceding or following page. In the upper area of the display field, you can see which page is just being displayed.
- To exit the parameter and function mode tap on the button ⮌.
  - The instrument will now be running the measurement mode again.

Figure 33 – Parameter groups in the main menu

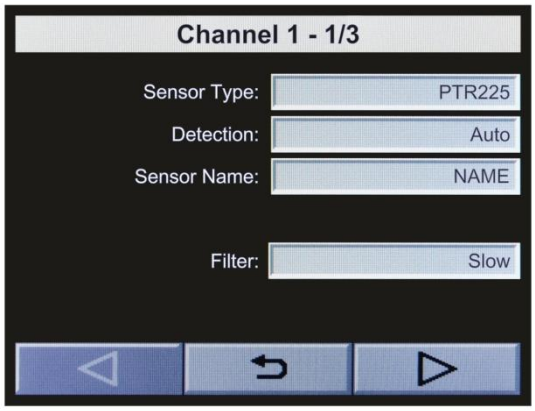


Figure 34 – Parameters of a parameter group

- In the main menu, tap on the desired parameter group in order to display the parameters of this parameter group, to change these or enable specific functions.
  - The parameters or functions available for this parameter group are displayed.
- To scroll use the buttons ◁ and ▷
  - You will then see the each case preceding or following page. In the upper area of the display field, you can see which page is just being displayed.
- To exit the parameter and function mode tap on the button ⮌.
  - The instrument will now display the main menu again.
- Tap on the entry window on the right beside the name of the parameter to change the value of this parameter or to start or terminate specific functions.
- Depending on the parameter, there are different ways for displaying and changing it.

NOTICE:
When the instrument is running in the parameter and function mode, and when not entering a change for more than 60 seconds, then the instrument will automatically return back to the measurement mode.
Any changes, which have been entered and confirmed up to this point of time, are automatically saved in the EEPROM.

Entering Values or Text

- Enter the value by way of numbers or characters.
  - The entered value is displayed in the upper area of the display field.
- To delete the entire value, tap on the button CLR.
  - The displayed value is deleted.
- To delete the character, which was entered last, tap on the button DEL.
  - The last character is deleted.
- To save and accept, tap on the button OK.
  - The entered value is saved.
  - The parameter selection display is displayed once more.
- To exit it without saving, tap on the button ESC.
  - The initially set up value is retained.
  - The parameter selection display is displayed once more.

Figure 35 – Values entry field

Figure 36 – Text entry field

Selection List

- To select in the list, use the buttons △ and ▽ or enter the value directly.
  - The each case selected value is displayed with a green background.
- To save, tap on the button OK.
  - The entered value is saved.
- To accept, tap on the button ⮌.
  - The parameter selection display is displayed once more.

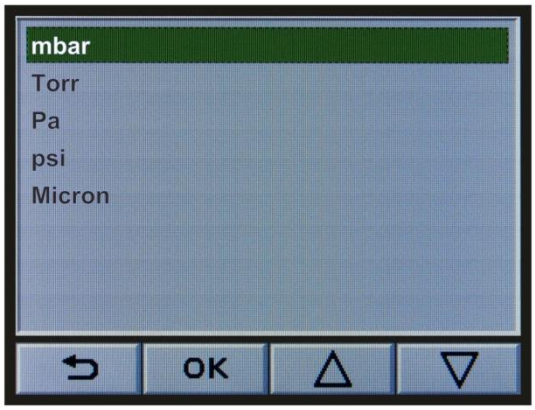


Figure 37 – Selection list

6.5.2 Parameter Groups

In the parameter and function mode, you may access via the main menu all available parameters depend on the number of channels and the connected sensor. You may view or change these parameters. In this way, you may configure your GRAPHIX controller. Depicted in Table 9, page 52 are all parameters available by the instrument.

Parameter Group	Parameter	Selection
Channel 1 … 3	Sensor Type	• TTR? • TTR81N • TTR90 • TTR91 • TTR91N • TTR96 • TTR96N • TTR211 • TTR216 • TTR911 • TTR911N • TTR916 • TTR916N • TTR10X • TTR100 • TTR101 • TTR101N • PTR? • PTR81N • PTR225 • PTR225N • PTR237 • PTR237N • PTR90? • PTR82N • PTR90 • PTR90N • CTR? • CTR90-0.1 • CTR90-1 • CTR90-10 • CTR90-20 • CTR90-100 • CTR90-1000 • CTR91-0.1 • CTR91-1 • CTR91-10 • CTR91-20 • CTR91-100 • CTR91-1000 • CTR100/N-0.1 • CTR100/N-1 • CTR100/N-10 • CTR100/N-20 • CTR100/N-100 • CTR100/N-1000

Parameter Group (continued)	Parameter	Selection
Channel 1 … 3	Sensor Type	• CTR101/N-0.1 • CTR101/N-1 • CTR101/N-10 • CTR101/N-20 • CTR101/N-100 • CTR101/N-1000
	Detection	• Auto • Manual
	Sensor Name	• Text entry
	Filter	• Fast • Medium • Slow
	Gas Type	• N2 • Ar • H2 • Cor
	Correction Factor	• Entry of values
	Emission	• Auto • Manual
	Filament	• Auto • Filament 1 • Filament 2
	Offset On / Off	• Off • On
	Offset Value	• Entry of values
	Take Current Pressure	**Set**
	Zero Adjust	**Set**
	Sensor On	• Manual • External • Hot • Channel 1 • Channel 2 • Channel 3
	T-On	• Entry of values (display unit)
	Sensor Off	• Manual • External • Self • Channel 1 • Channel 2 • Channel 3
	T-Off	• Entry of values (display unit)
	Curve Type	• Analog Lin • Analog Log
	U-Start	• Entry of values (Volt)
	p-Start	• Entry of values (display unit)
	U-End	• Entry of values (Volt)
	p-End	• Entry of values (display unit)
	F-Start	• Entry of values (Volt)
	F-End	• Entry of values (Volt)

Parameter Group (continued)	Parameter	Selection
Setpoints	Channel	• Off • 1 • 2 • 3
	SP-On	• Entry of values (display unit)
	SP-Off	• Entry of values (display unit)
System	Unit	• mbar • Torr • Pa • psi • Micron
	Key Tone	• Off • On
	Error Relay	• All • Only Device • Channel 1 & Device • Channel 2 & Device • Channel 3 & Device • All N.C. • Only Device N.C. • Channel 1 & Device N.C. • Channel 2 & Device N.C. • Channel 3 & Device N.C.
	Data Rate	• 9600 • 19200 • 38400
	Com Port	• RS232 • RS485 • Center
	Address	• Entry of values
	Time	• Entry of values (hh:mm:ss)
	Date	• Entry of values (YYYY-MM-DD)
	System Information	
Display	Display Mode	• Normal • Big • Chart • Leak Test • Speedo Channel 1 • Speedo Channel 2 • Speedo Channel 3
	Resolution	• Standard • High
	Brightness	• Low • Medium • High
Logging	Interval (s)	• Entry of values (seconds)
	File Size (h)	• Entry of values (hours)
	Enable / Disable Logging	• ▶ • ■

Parameter group (continued)	Parameter	Selection
Recorder	Analog Mode	• Log • Log A • Log -6 • Log -3 • Log +0 • Log +3 • LogC1 • LogC2 • LogC3
Recorder	Analog Mode	• Lin -10 • Lin -9 • Lin -8 • Lin -7 • Lin -6 • Lin -5 • Lin -4 • Lin -3 • Lin -2 • Lin -1 • Lin +0 • Lin +1 • Lin +2 • Lin +3 • IM221 • LogC4 • PM411
	Channel	• 1 • 2 • 3
Chart	Interval (s)	• Entry of values (in seconds)
	Channel 1	• Off • On
	Channel 2	• Off • On
	Channel 3	• Off • On
Leak Test	Interval (min)	• Entry of values (Minutes)
	Volume (l)	• Entry of values (Liter)
	Channel	• 1 • 2 • 3
Language	Language	EN (English)
		DE (German)
		CN (Chinese)
		FR (French)
		IT (Italian)
		JP (Japanese)
		ES (Spanish)
		KR (Korean)
		RU (Russian)
		PL (Polish)
		TR (Turkish)

Parameter group (continued)	Parameter	Selection
Configuration	Save Data	• Save Data
	Restore Data	• Restore Data
	Factory Setup	• Reset Data
Update	Start Update	• Start Update
Error Log	Read Error Log (Error 1 – 20)	

Table 9 – Parameter groups and corresponding parameters

7. Parameters

7.1 Channel 1 … 3

For each measurement channel there is a separate set of sensor parameters. Depending on which sensor is connected to the respective measurement channel, different parameters will be available (☞🕮 Table 10 to Table 17, page 53 to 55). The parameters available for the respective sensor are marked in the table through the symbol ✓.
For more details on the selection and set up options for the individual sensor parameters see Chapter 7.1.1 Sensor Type to 7.1.17 Entering the Characteristics for Further Sensors, page 56 to 73.

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
TTR81N	✓	✓	✓	✓	✓	✓										
TTR90	✓	✓	✓	✓	✓	✓										
TTR91	✓	✓	✓	✓	✓	✓										
TTR91N	✓	✓	✓	✓	✓	✓										
TTR96	✓	✓	✓	✓	✓	✓										
TTR96N	✓	✓	✓	✓	✓	✓										
TTR211	✓	✓	✓	✓	✓	✓										
TTR216	✓	✓	✓	✓	✓	✓										
TTR911	✓	✓	✓	✓	✓	✓										
TTR911N	✓	✓	✓	✓	✓	✓										
TTR911N (RS232)	✓	✓	✓	✓	✓	✓										
TTR916	✓	✓	✓	✓	✓	✓										
TTR916N	✓	✓	✓	✓	✓	✓										

Table 10 – Available sensor parameters for THERMOVAC sensors

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
TTR100	✓	✓	✓	✓	✓	✓										
TTR101	✓	✓	✓	✓	✓	✓										
TTR101N	✓	✓	✓	✓	✓	✓										
TTR101N (RS232)	✓	✓	✓	✓	✓	✓										
TTR200N (RS232)	✓	✓	✓	✓	✓	✓										

Table 11 – Available sensor parameters for THERMOVAC sensors (combination sensors)

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
ITR90/N		✓	✓		✓	✓										
ITR200/N		✓	✓		✓	✓	✓	✓								

Table 12 – Available sensor parameters for IONIVAC sensors (combination sensors)

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
PTR81N		✓	✓	✓	✓	✓							✓	✓	✓	✓
PTR225		✓	✓	✓	✓	✓							✓	✓	✓	✓
PTR225N		✓	✓	✓	✓	✓							✓	✓	✓	✓
PTR225N (RS232)		✓	✓	✓	✓	✓							✓	✓	✓	✓
PTR237		✓	✓	✓	✓	✓							✓	✓	✓	✓
PTR237N		✓	✓	✓	✓	✓							✓	✓	✓	✓

Table 13 – Available sensor parameters for PENNINGVAC sensors

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
PTR82N		✓	✓	✓	✓	✓										
PTR90		✓	✓	✓	✓	✓										
PTR90N		✓	✓	✓	✓	✓										
PTR90N (RS232)		✓	✓	✓	✓	✓										
PTR200N (RS232)		✓	✓	✓	✓	✓										

Table 14 – Available sensor parameters for PENNINGVAC sensors (combination sensors)

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
CTR90-0.1	✓	✓	✓	✓					✓	✓	✓					
CTR90-1	✓	✓	✓	✓					✓	✓	✓					
CTR90-10	✓	✓	✓	✓					✓	✓	✓					
CTR90-20	✓	✓	✓	✓					✓	✓	✓					
CTR90-100	✓	✓	✓	✓					✓	✓	✓					
CTR90-1000	✓	✓	✓	✓					✓	✓	✓					
CTR91-0.1	✓	✓	✓	✓					✓	✓	✓					
CTR91-1	✓	✓	✓	✓					✓	✓	✓					
CTR91-10	✓	✓	✓	✓					✓	✓	✓					

Sensor (continued)	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
CTR91-20	✓	✓	✓	✓					✓	✓	✓					
CTR91-100	✓	✓	✓	✓					✓	✓	✓					
CTR91-1000	✓	✓	✓	✓					✓	✓	✓					
CTR100/N-0.1	✓	✓	✓	✓					✓	✓	✓	✓				
CTR100/N-1	✓	✓	✓	✓					✓	✓	✓	✓				
CTR100/N-10	✓	✓	✓	✓					✓	✓	✓	✓				
CTR100/N-20	✓	✓	✓	✓					✓	✓	✓	✓				
CTR100/N-100	✓	✓	✓	✓					✓	✓	✓	✓				
CTR100/N-1000	✓	✓	✓	✓					✓	✓	✓	✓				
CTR101/N-0.1	✓	✓	✓	✓					✓	✓	✓	✓				
CTR101/N-1	✓	✓	✓	✓					✓	✓	✓	✓				
CTR101/N-10	✓	✓	✓	✓					✓	✓	✓	✓				
CTR101/N-20	✓	✓	✓	✓					✓	✓	✓	✓				
CTR101/N-100	✓	✓	✓	✓					✓	✓	✓	✓				
CTR101/N-1000	✓	✓	✓	✓					✓	✓	✓	✓				

Table 15 – Available sensor parameters for CERAVAC sensors

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	Emission	Filament	Offset On / Off	Offset Value	Take Current Pressure	Zero Adjust	Sensor on	T-On	Sensor off	T-Off
DU200		✓	✓	✓					✓	✓	✓					
DU201		✓	✓	✓					✓	✓	✓					
DU2000		✓	✓	✓					✓	✓	✓					
DU2001		✓	✓	✓					✓	✓	✓					
DU2001 rel.		✓	✓	✓					✓	✓	✓					

Table 16 – Available sensor parameters for DU sensors

Sensor	Sensor type	Detection	Sensor Name	Filter	Gas Type	Correction Factor	…	…	…	Curve Type	U-Start	p-Start	U-End	p-End	F-Start	F-End
Further sensors			✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓

Table 17 – Available sensor parameters for further sensors

7.1.1 Sensor Type

The parameter Sensor Type displays the type designation of the connected sensor. The type of sensor is detected through the identification resistor in the connected sensor in the case of automatic sensor detection or by entering the sensor type in the case of manual sensor detection.

NOTICE:
THERMOVAC sensors have depending on the type different measurement and display ranges. During first-time commissioning, only a default measurement range of 1000 to 5.00e-04 mbar is displayed. The sensor type TTR? or TTR10X will be displayed automatically.
For full utilisation of the sensor type, dependent measurement and display range specify the type (☞📖 Chapter 7.1.1.1 Specifying the Sensor Type for THERMOVAC Sensors, page 57).

NOTICE:
PENNINGVAC sensors have depending on the type different measurement and display ranges. During first-time commissioning, only a default measurement range of 5.00e-02 to 1.00e-09 mbar for the types PTR81N, PTR225, PTR225N, PTR225S, PTR225SN, PTR237 and PTR237N is displayed. The sensor type PTR? will be displayed automatically.
For the types PTR82N, PTR90 and PTR90N a default measurement range of 1000 – 1.00e-08 mbar is displayed. The sensor type PTR90? will be displayed automatically.
For full utilisation of the sensor type, dependent measurement and display range specify the type (☞📖 Chapter 7.1.1.2 Specifying the Sensor Type for PENNINGVAC Sensors, page 61).

NOTICE:
CERAVAC sensors have different measurement ranges. When connecting the sensors of CTR100 series and CTR101 series through the connectors C2, D2 and E2 on the rear of the instrument (☞📖 Figure 7, page 26) these are automatically detected. During first-time commissioning of the sensors through the connections C1, D1 and E1 on the rear of the instrument (☞📖 Figure 7, page 26) the user is requested to specify the measurement range.
Specify the sensor type (☞📖 Chapter 7.1.1.3 Specifying the Sensor Type for CERAVAC Sensors, page 65).

The sensor type is displayed in the left bottom area of the display field for the measurement channel (☞📖 Figure 15, B, page 31).

7.1.1.1 Specifying the Sensor Type for THERMOVAC Sensors

Sensor Type TTR?

When connecting the following THERMOVAC sensors then during first-time commissioning TTR? is displayed as the sensor type in the left bottom area of the display field for the measurement channel:

- TTR81N
- TTR90
- TTR91
- TTR91N
- TTR96S
- TTR96SN
- TTR211
- TTR216S
- TTR911
- TTR911N
- TTR916
- TTR916N

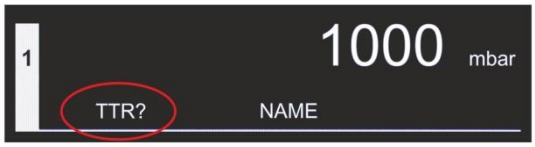


Figure 38 – Display of sensor type TTR?

To specify the connected sensor proceed as follows:

- Press in the measurement mode the touchscreen surface for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.

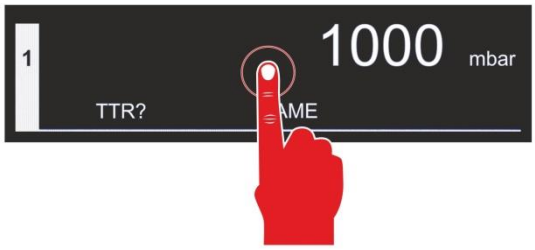


Figure 39 – Opening the main menu

- Tap in the main menu on the parameter group of the desired channel.
  - The parameters available for this parameter group are displayed.

Figure 40 – Selection of parameter group Channel

- Tap on the entry window on the right beside the parameter Sensor type to change the value of this parameter.
  - The selection list with different sensor types opens.

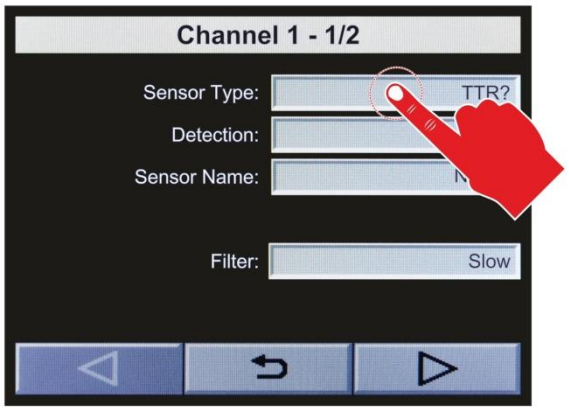


Figure 41 – Selection of parameter Sensor Type

- To select from the list, use the buttons △ and ▽ or enter the value for the desired sensor directly.
  - The in each case selected value is displayed with a green background.
- To save, tap the button OK.
- The setup value is saved.
- To exit, tap the button ⮌.
  - The parameter selection display is displayed again.

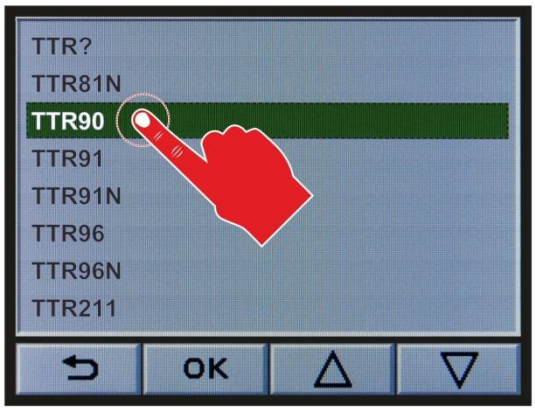


Figure 42 – Selection of the desired sensor

- To exit the parameter selection display, tap the button ⮌.
  - The main menu with an overview of the parameter groups is displayed again.
- To exit the main menu, tap the button ⮌.
  - Now the previously selected measured values display mode of the measurement mode is displayed.
  - As sensor type, the selected sensor is displayed in the left bottom area of the display field of the measurement channel.

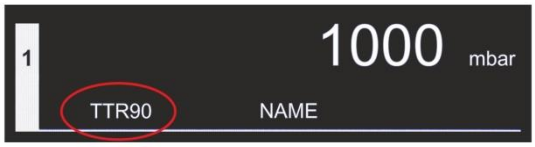


Figure 43 – Display of selected sensor type

Sensor Type TTR10X

When connecting the following THERMOVAC sensors, then during first-time commissioning TTR10X is displayed as the sensor type in the left bottom area of the display field for the measurement channel:

- TTR100
- TTR100S2
- TTR101
- TTR101N
- TTR101S2
- TTR101S2N

Figure 44 – Display of sensor type TTR10X

To specify the connected sensor proceed as follows:

- Press in the measurement mode the touchscreen surface for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.

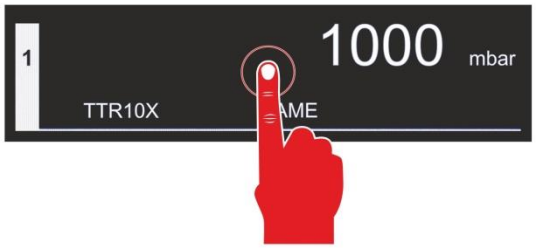


Figure 45 – Opening the main menu

- Tap in the main menu on the parameter group of the desired channel.
  - The parameters available for this parameter group are displayed.

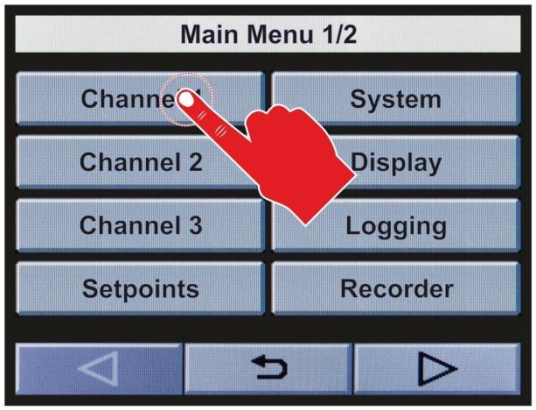


Figure 46 – Selection of the parameter group Channel

- Tap on the entry window on the right beside the parameter Sensor type to change the value of this parameter.
  - The selection list with different sensor types opens.

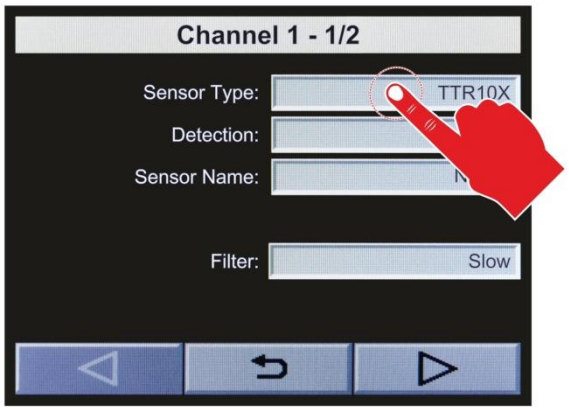


Figure 47 – Selection of parameter Sensor Type

- To select from the list, use the buttons △ and ▽ or enter the value for the desired sensor directly.
  - The in each case selected value is displayed with a green background.
- To save, tap the button OK.
- The setup value is saved.
- To exit, tap the button ⮌.
  - The parameter selection display is displayed again.

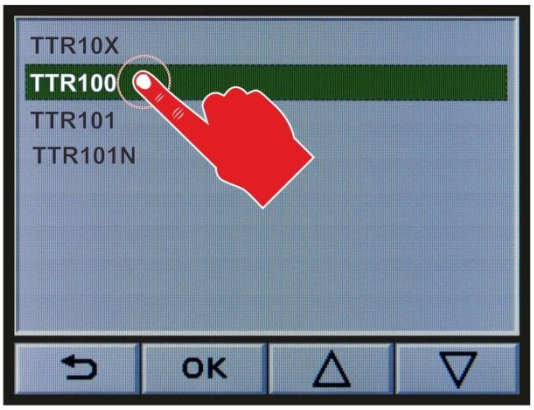


Figure 48 – Selection of desired sensor

- To exit the parameter selection display, tap the button ⮌.
  - The main menu with an overview of the parameter groups is displayed again.
- To exit the main menu, tap the button ⮌.
  - Now the previously selected measured values display mode of the measurement mode is displayed.
  - As sensor type, the selected sensor is displayed in the left bottom area of the display field of the measurement channel.

Figure 49 – Display of selected sensor type

7.1.1.2 Specifying the Sensor Type for PENNINGVAC Sensors

Sensor Type PTR?

When connecting the following PENNINGVAC sensors then during first-time commissioning PTR? is displayed as the sensor type in the left bottom area of the display field for the measurement channel:

- PTR81N
- PTR225
- PTR225N
- PTR225S
- PTR225SN
- PTR237
- PTR237N

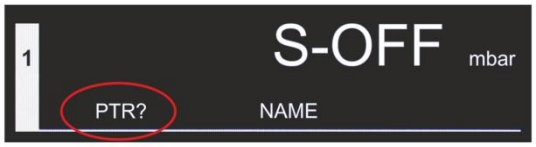


Figure 50 – Display of sensor type PTR?

To specify the connected sensor proceed as follows:

- Press in the measurement mode the touchscreen surface for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.

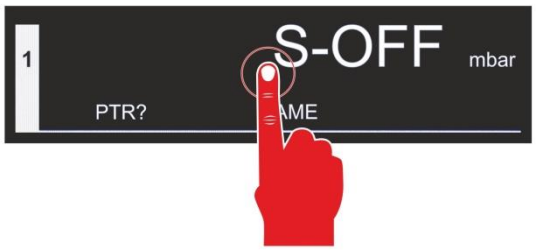


Figure 51 – Opening the main menu

- Tap in the main menu on the parameter group of the desired channel.
  - The parameters available for this parameter group are displayed.

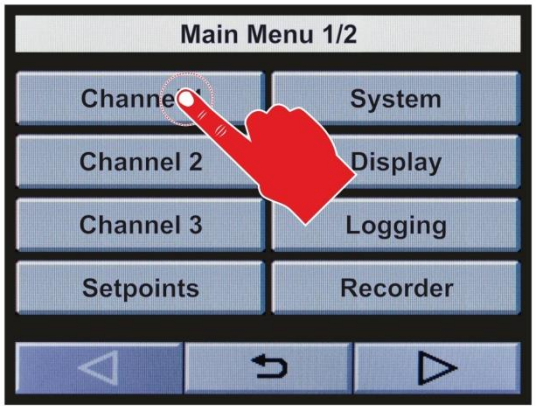


Figure 52 – Selection of parameter group Channel

- Tap on the entry window on the right beside the parameter Sensor type to change the value of this parameter.
  - The selection list with different sensor types opens.

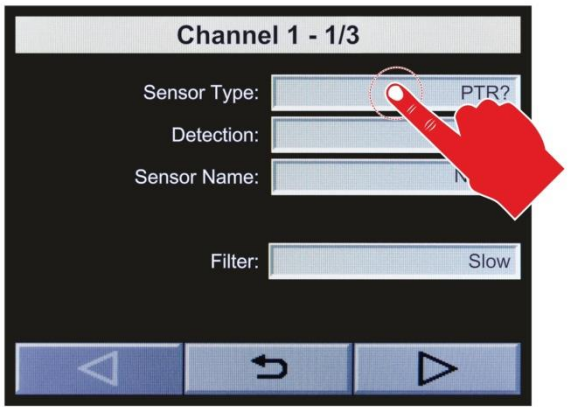


Figure 53 – Selection of parameter Sensor Type

- To select from the list, use the buttons △ and ▽ or enter the value for the desired sensor directly.
  - The in each case selected value is displayed with a green background.
- To save, tap the button OK.
- The setup value is saved.
- To exit, tap the button ⮌.
  - The parameter selection display is displayed again.

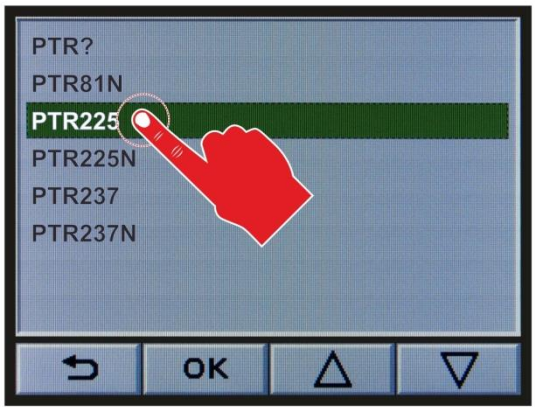


Figure 54 – Selection of the desired sensor

- To exit the parameter selection display, tap the button ⮌.
  - The main menu with an overview of the parameter groups is displayed again.
- To exit the main menu, tap the button ⮌.
  - Now the previously selected measured values display mode of the measurement mode is displayed.
  - As sensor type, the selected sensor is displayed in the left bottom area of the display field of the measurement channel.

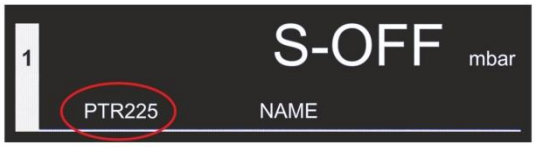


Figure 55 – Display of selected sensor type

Sensor Type PTR90?

When connecting the following PENNINGVAC sensors, then during first-time commissioning PTR90? is displayed as the sensor type in the left bottom area of the display field for the measurement channel:

- PTR82N
- PTR90
- PTR90N

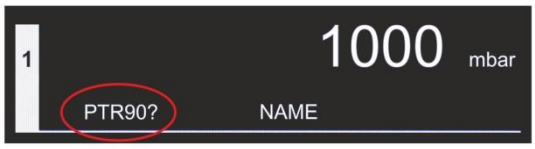


Figure 56 – Display of sensor type PTR90?

To specify the connected sensor proceed as follows:

- Press in the measurement mode the touchscreen surface for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.

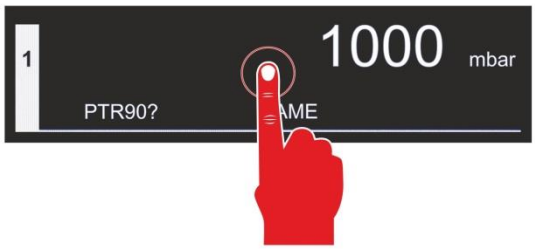


Figure 57 – Opening the main menu

- Tap in the main menu on the parameter group of the desired channel.
  - The parameters available for this parameter group are displayed.

Figure 58 – Selection of the parameter group Channel

- Tap on the entry window on the right beside the parameter Sensor type to change the value of this parameter.
  - The selection list with different sensor types opens.

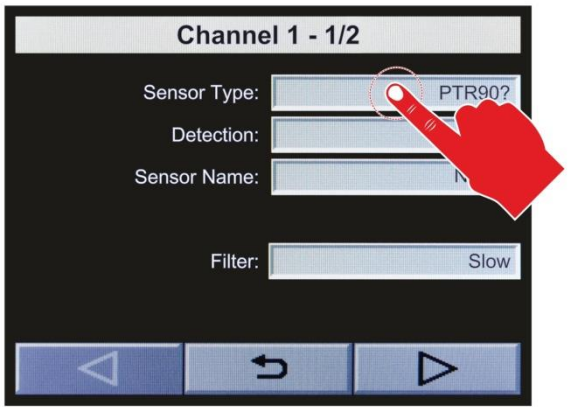


Figure 59 – Selection of parameter Sensor Type

- To select from the list, use the buttons △ and ▽ or enter the value for the desired sensor directly.
  - The in each case selected value is displayed with a green background.
- To save, tap the button OK.
- The setup value is saved.
- To exit, tap the button ⮌.
  - The parameter selection display is displayed again.

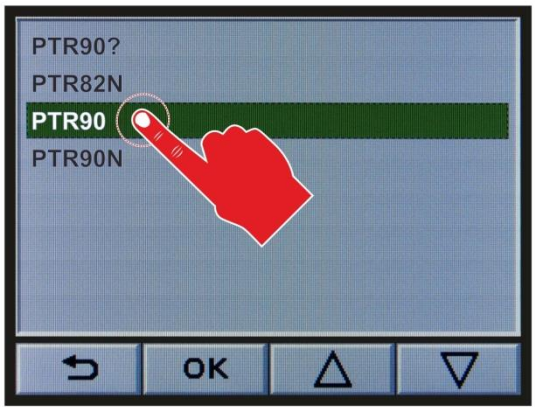


Figure 60 – Selection of desired sensor

- To exit the parameter selection display, tap the button ⮌.
  - The main menu with an overview of the parameter groups is displayed again.
- To exit the main menu, tap the button ⮌.
  - Now the previously selected measured values display mode of the measurement mode is displayed.
  - As sensor type, the selected sensor is displayed in the left bottom area of the display field of the measurement channel.

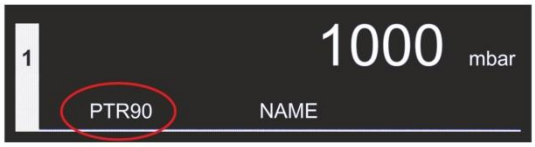


Figure 61 – Display of selected sensor type

7.1.1.3 Specifying the Sensor Type for CERAVAC Sensors

When connecting all CERAVAC sensors (☞📖 Chapter 3.2 Suitable Sensors, page 15) through the connections C1, D1 and E1 on the rear of the instrument (☞📖 Figure 7, page 26) then during first-time commissioning the status message Range? and as sensor type CTR? is displayed in the left bottom area of the display field for the measurement channel. Also when connecting the following CERAVAC sensors through connections C2, D2 and E2 on the rear of the instrument (☞📖 Figure 7, page 26), then during first-time commissioning the status message Range? and as sensor type CTR? is displayed in the left bottom area of the display field for the measurement channel:

- CTR90-0.1Torr
- CTR90-1Torr
- CTR90-10Torr
- CTR90-20Torr
- CTR90-100Torr
- CTR90-1000Torr
- CTR91-0.1Torr
- CTR91-1Torr
- CTR91-10Torr
- CTR91-20Torr
- CTR91-100Torr
- CTR91-1000Torr

Figure 62 – Display of sensor type CTR?

To specify the connected sensor proceed as follows:

- Press in the measurement mode the touchscreen surface for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.

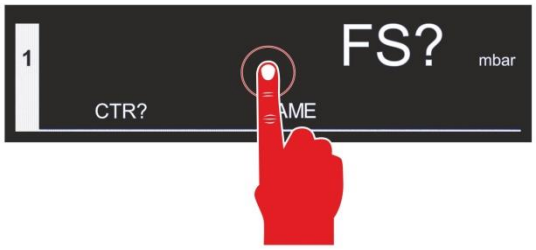


Figure 63 – Opening the main menu

- Tap in the main menu on the parameter group of the desired channel.
  - The parameters available for this parameter group are displayed.

Figure 64 – Selection of parameter group Channel

- Tap on the entry window on the right beside the parameter Sensor type to change the value of this parameter.
  - The selection list with different sensor types opens.

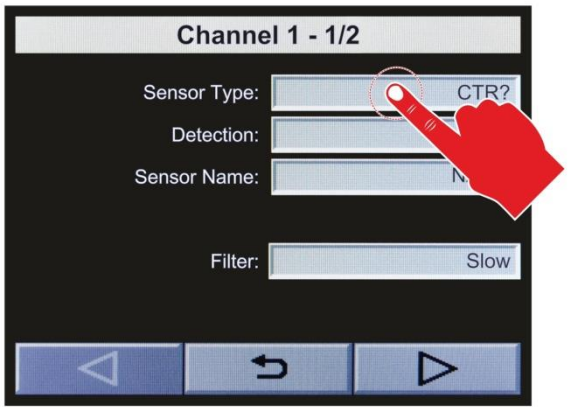


Figure 65 – Selection of parameter Sensor Type

- To select from the list, use the buttons △ and ▽ or enter the value for the desired sensor directly.
  - The in each case selected value is displayed with a green background.
- To save, tap the button OK.
- The setup value is saved.
- To exit, tap the button ⮌.
  - The parameter selection display is displayed again.

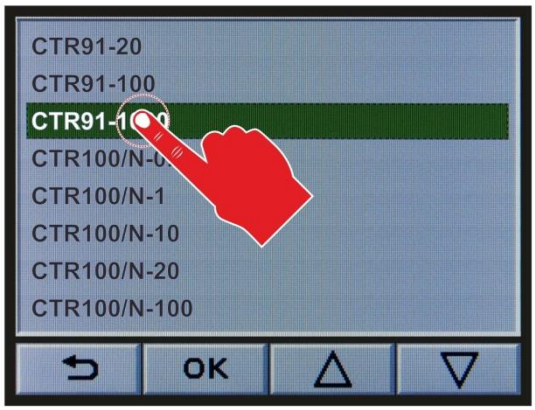


Figure 66 – Selection of desired sensor

- To exit the parameter selection display, tap the button ⮌.
  - The main menu with an overview of the parameter groups is displayed again.
- To exit the main menu, tap the button ⮌.
  - Now the previously selected measured values display mode of the measurement mode is displayed.
  - As sensor type, the selected sensor is displayed in the left bottom area of the display field of the measurement channel.

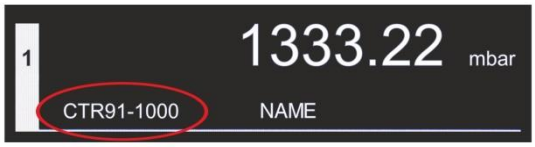


Figure 67 – Display of selected sensor type

7.1.2 Sensor Detection (Detection)

Through the parameter Sensor detection (Detection) you may define in which way the sensor type shall be detected.

Auto
Automatic. The detection is effected automatically through the identification resistor of the connected sensor.

Manual
Manual. The type of sensor is entered manually.

7.1.3 Sensor Name

The parameter Sensor name allows you to freely enter a term describing the connected sensor in greater detail or the place where it has been installed.

The length of the sensor name is limited to 10 characters.

The sensor name is displayed in the middle bottom area of the display field for the measurement channel (☞📖 Figure 15, C, page 31).

7.1.4 Measured Values Filter (Filter)

The measured values filter (Filter) allows you to better evaluate noisy signals or signals suffering from interference. This filter is applied to the displayed values, the switching functions and the analogue outputs.

You may set up the measured values filter to the following values:

Fast
The GRAPHIX controller will respond rapidly to signal fluctuations. In this mode, it will be relatively sensitive with respect to any signal interferences.

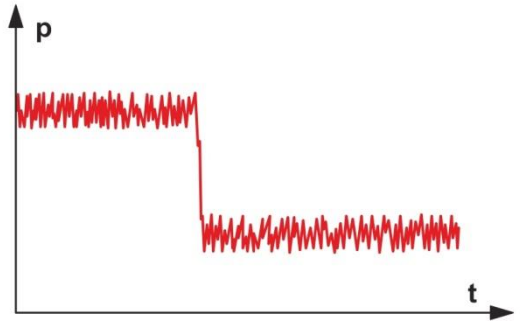


Figure 68 – Measured values filter Fast (example)

Medium
This is the default setting. It offers a good compromise between speed of response and interference immunity.

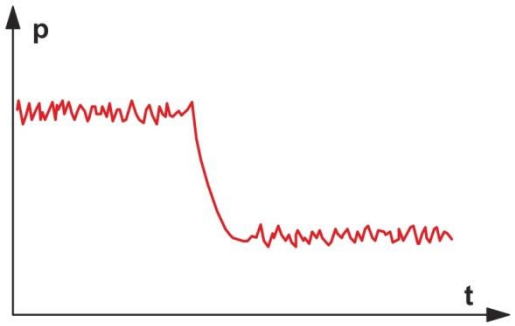


Figure 69 – Measured values filter Medium (example)

Slow
The GRAPHIX controller responds slowly to signal fluctuations. Because of this, it is less sensitive with respect to any signal interferences. This setting is recommended for precise comparative measurements.

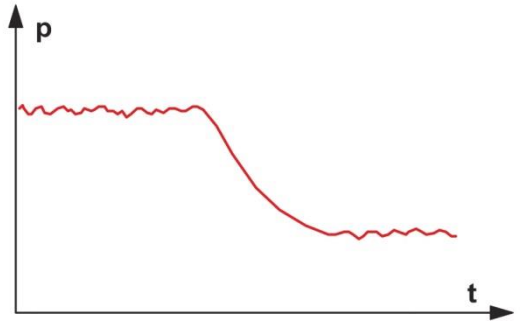


Figure 70 – Measured values filter Slow (example)

NOTICE:
This parameter has an effect only to analogue input signals. It is available therefore only for analogue sensors, which are operated through the connections C1, D1 and E1 on the rear of the instrument (☞🕮 Figure 7, page 26).

7.1.5 Gas Typ Correction (Gas Type)

The sensors are normally calibrated for a measurement in nitrogen or air. With the aid of the parameter Gas type correction (Gas Type), you may set up the measurement channel for other types of gas.

N2
Nitrogen, no correction is necessary. No status indicator will come on.

Ar
Argon. The pressure is converted with the aid of the correction factor for argon (0.830). The status indicator ☒ will come on in the display field of the selected channel.

H2
Hydrogen. The pressure is converted with the aid of the correction factor for hydrogen (2.440). The status indicator ☒ will come on in the display field of the selected channel.

Cor
Other gases. The pressure is converted with the aid of a variable correction factor. The status indicator ☒ will come on in the display field of the selected channel. Entering a gas type correction factor through the parameter Gas type correction factor (Correction factor) is possible.

7.1.6 Gas Type Correction Factor (Correction Factor)

This parameter can only be changed when the gas type correction has been set to Cor (☞🕮 Chapter 7.1.5 Gas Typ Correction (Gas Type), page 69).

You may set up the gas type correction factor (correction factor) for a sensor in the range of 0.10 to 1.00 to 10.0. The setting of 1.00 will provide the uncorrected measured value.

NOTICE:
With IONIVAC sensors of ITR90 series and ITR200 series as well as PENNINGVAC sensors of the type PTR82N, PTR90 and PTR90N the gas type correction is only for $p < 1 \cdot 10^{-2}$ mbar effectively, with THERMOVAC sensors of TTR100 series and TTR101 series only for p < 1 mbar.

7.1.7 Emission Switching On and Switching Off Type (Emission)

This parameter defines the rules according to which the emission is switched on.

Display	Explanation
Auto	Automatic. The emission is switched on and off by the sensor electronics.
Manual	Manual. The emission is switched on and off manually.

Table 18 – Values for the parameter Emission

7.1.8 Filament Selection (Filament)

This parameter defines the rules according to which the active filament is selected.

Display	Explanation
Auto	The sensor electronics selects one of the two filaments in alternation.
Filament 1	Filament 1 is active.
Filament 2	Filament 2 is active.

Table 19 – Values for the parameter Filament

NOTICE:
Filament selection is only possible for IONIVAC sensors of ITR200 series.

7.1.9 Offset On / Off

With enabled offset correction, a saved offset value is subtracted from the current measured value. This permits a relative measurement with reference to a reference pressure. The offset correction affects the displayed values, the RS232 output, the chart recorder output and the switching functions. However, the analogue outputs are not influenced.

Off
The offset correction is switched off. This status indicator + goes out in the display field of the selected channel.

On
The offset correction is switched on. The status indicator + comes on in the display field of the selected channel.

7.1.10 Offset Value

You may set up the offset value for a sensor. The adjustment range will be sensor dependent. A setting of 0.000 supplies the uncorrected measured value.

As soon as setting up an offset value > 0.000, the offset correction will be switched on. The status indicator + comes on in the display field of the selected channel.

7.1.11 Take Current Pressure

By operating the button **Set**, the current pressure value is carried over as the offset value. The offset correction facility is switched on. The status indicator + comes on in the display field of the selected channel.

7.1.12 Zero Alignment (Zero Adjust)

Pressing the button **Set**, aligns the zero level of the connected sensor.

	**NOTICE:** Switch the offset correction facility off before setting up the zero level for a sensor.

	**NOTICE:** To utilise this function, CERAVAC sensors of CTR100 series and CTR101 series must be connected using a 15-way SUB-D cable connected to the connections C2, D2 or E2 at the rear of the instrument (☞🕮 Figure 7, page 26).

7.1.13 Sensor Switch-on Type (Sensor On)

This parameter defines how the sensor is switched on.

You can set the switch-on type to the following values:

Manual
The sensor can be switched on in the channel menu by tapping the button  .

External
Externally via optocoupler (static signal +12 – +24 VDC)

Hot
Warm start. The sensor is switched on automatically upon switching on the instrument. After a power failure, the measurement is started automatically.

Channel 1
Through measurement channel 1. With the aid of the then following parameter Sensor switch-on value you may define a switch-on value. When the pressure in measurement channel 1 drops below the switch on value, the sensor is switched on.

Channel 2
Through measurement channel 2. With the aid of the then following parameter Sensor switch-on value you may define a switch-on value. When the pressure in measurement channel 2 drops below the switch-on value, the sensor is switched on. Selecting measurement channel 2 is only available for GRAPHIX TWO and THREE.

Channel 3
Through measurement channel 3. With the aid of the then following parameter Sensor switch-on value you may define a switch-on value. When the pressure in measurement channel 3 drops below the switch-on value, the sensor is switched on. Measurement channel 3 is only available for GRAPHIX THREE.

7.1.14 Sensor Switch-on Value (T-On)

This parameter can only be changed provided the sensor switch-on type has been set for Channel 1, Channel 2 or Channel 3 (☞🕮 Chapter 7.1.13 Sensor Switch-on Type (Sensor On), page 72).

With the aid of parameter Sensor switch-on value T-On, you may define a switch-on value for the sensor. When the pressure in the affected measurement channel drops below the switch-on value, the sensor is switched on.

7.1.15 Sensor Switch-off Type (Sensor Off)

This parameter defines how the sensor is switched off. You can set the switch-off type to the following values:

Manual
The sensor can be switched off in the channel menu by tapping the button  .

External
Externally via optocoupler (static signal +12 – +24 VDC)

Self
Self-monitoring. With the aid of the then following parameter Sensor switch-off value you may define a switch-off value. When the pressure at the sensor exceeds the switch-off value then the sensor is switched off.

Channel 1
Through measurement channel 1. With the aid of the then following parameter Sensor switch-off value you may define a switch-off value. When the pressure in measurement channel 1 exceeds the switch-off value, then the sensor is switched off.

Channel 2
Through measurement channel 2. With the aid of the then following parameter Sensor switch-off value you may define a switch-off value. When the pressure in measurement channel 2 exceeds the switch-of value, then the sensor is switched off. Selecting measurement channel 2 is only available for GRAPHIX TWO and THREE.

Channel 3
Through measurement channel 3. With the aid of the then following parameter Sensor switch-off value you may define a switch-off value. When the pressure in measurement channel 3 exceeds the switch-of value, then the sensor is switched off. Selecting measurement channel 3 is only possible for GRAPHIX THREE.

7.1.16 Sensor Switch-off Value (T-Off)

This parameter can only be changed provided the sensor switch-off type has been set for Channel 1, Channel 2 or Channel 3 (☞🕮 Chapter 7.1.15 Sensor Switch-off Type (Sensor Off), page 73).

With the aid of parameter Sensor switch-off value T-Off you may define a switch-off value for this sensor. When the pressure in the affected measurement channel exceeds the switch-off value, the sensor is switched off.

7.1.17 Entering the Characteristics for Further Sensors

The GRAPHIX controller offers the possibility of connecting besides the sensors detailed in “Chapter 3.2 Suitable Sensors”, page 15 further sensors by entering a variable analogue logarithmic or analogue linear characteristic.

This parameter can only be changed when sensor detection has been set to Manual (☞🕮 Chapter 7.1.2 Sensor Detection (Detection), page 67).

7.1.17.1 Curve Type

First, define through the parameter Type of characteristic, the specific type of characteristic needed.

Display	Explanation
Analog Log	Characteristic of the sensor is analogue logarithmic.
Analog Lin	Characteristic of the sensor is analogue linear.

Table 20 – Values for the parameter Type of Characteristic

7.1.17.2 Characteristic Curve (U-Start, p-Start, U-End, p-End, F-Start, F-End)

You configure the sensor characteristic by entering the following data for the characteristic specifying the relationship between voltage (data in V) and pressure (pressure value in the current display unit). In addition, the error limits are defined.

U-Start
Voltage at the lower end of the characteristic. This voltage value defines the start point of the characteristic at the lower end.

p-Start
Pressure at the lower end of the characteristic. This pressure value defines the start point of the characteristic at the lower end.

U-End
Voltage at the upper end of the characteristic. This voltage value defines the endpoint of the characteristic at the upper end.

p-End
Pressure at the upper end of the characteristic. This pressure value defines the endpoint of the characteristic at the upper end.

F-Start
Error voltage at the lower end of the characteristic. When the voltage drops below the voltage defined here, the error signal for the sensor is output.

F-End
Error voltage at the upper end of the characteristic. When the voltage exceeds the voltage defined here, the error signal for this sensor is output.

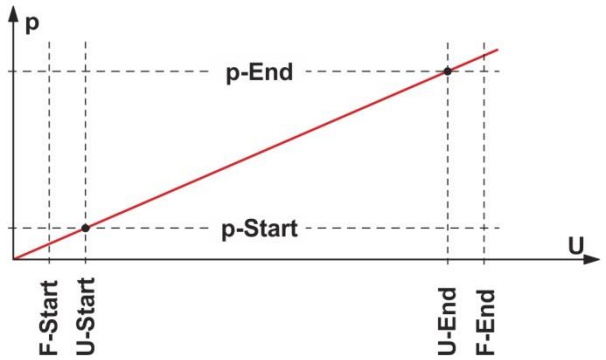


Figure 71 – Configuration for the specific characteristics of further sensors

p	Pressure [display unit]
U	Voltage [V]
U-Start	Voltage lower characteristic end
p-Start	Pressure lower characteristic end
U-End	Voltage upper characteristic end
p-End	Pressure upper characteristic end
F-Start	Error voltage lower characteristic end
F-End	Error voltage upper characteristic end

7.2 Setpoints

In this parameter group, you may configure the switching functions. The GRAPHIX controller is equipped with the following switching function parameters:

- SP1-On to SP6-On
- SP1-Off to SP6-Off

7.2.1 Basic Terms

Switching Functions

The GRAPHIX controller provides a total of six switching function relays, which may be freely assigned to the three measurement channels maximum. The relays switch over depending on the measured pressure. The contacts of the relays are floating and may be used through the connection marked Relay Output for switching purposes (☞🕮 Chapter 5.3.5 Relay Output, page 28).

Threshold Values

The switching action of the individual relays is defined through two parameters in each case: the lower threshold value and the upper threshold value of the switching function.

Lower Threshold Value SPx-On

The lower threshold value controls switching on of the related switching function. When the pressure drops below the lower threshold value, the relay switches on. The common contact of the relay is then connected to the normally open contact.

Upper Threshold Value SPx-Off

The upper threshold value controls switching off of the related switching function. When the pressure exceeds the upper threshold value, the relay switches off. The common contact of the relay is then connected to the normally closed contact.

Hysteresis

In the pressure range between the two threshold values, the current relay status is maintained. Within this range, the relay will not switch over and the relay status will depend on the previous switching function (☞🕮 Figure 72, page 75).

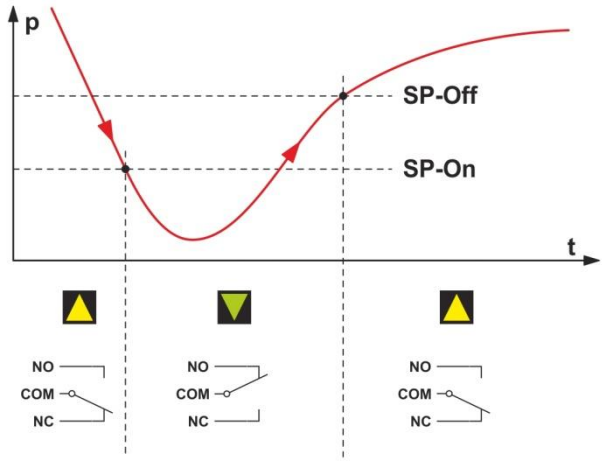


Figure 72 – Response of the switching function in case of pressure changes

p	Pressure]
t	Time
NO	Normally open contact
COM	Common contact
NC	Normally closed contact

The range between the lower and the upper threshold value produces a certain degree of hysteresis between switching on and switching off of the relay. Hysteresis prevents rapid cycling between on and off when the pressure is close to a switching threshold.

7.2.2 Configuring the Switching Functions

Proceed as follows to configure the switching thresholds:

- In the measurement mode, touch the touchscreen surface for approximately 1 second.
  - You will now see the main menu with an overview of the parameter groups.

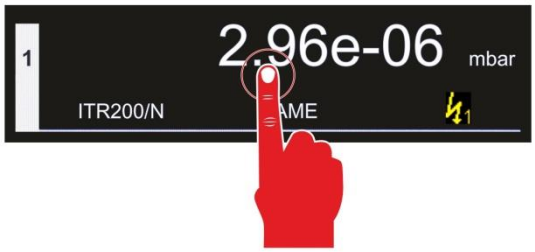


Figure 73 – Opening the main menu

- Tap in the main menu on the parameter group Setpoints.

Figure 74 – Selection of parameter group Setpoints

- Tap on the entry window on the right beside the parameter SP1 – SP6, in order to assign the corresponding switching threshold to a channel.
  - The selection list for the channel assignments opens.

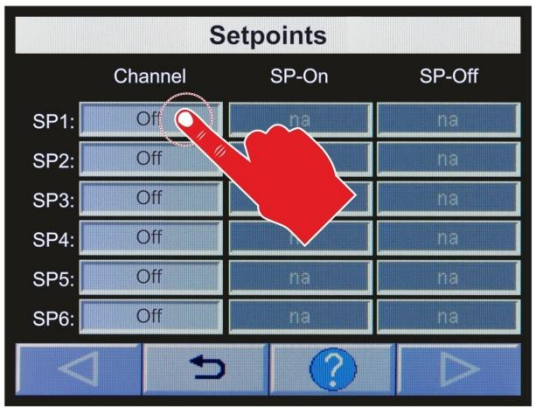


Figure 75 – Selection of the parameter Channel

- To select from the list, use the buttons ∆ and ∇ or directly enter the value for the desired sensor.
  - The in each case selected value is displayed with a green background..
- To save, tap the button OK.
- The setup value is saved.

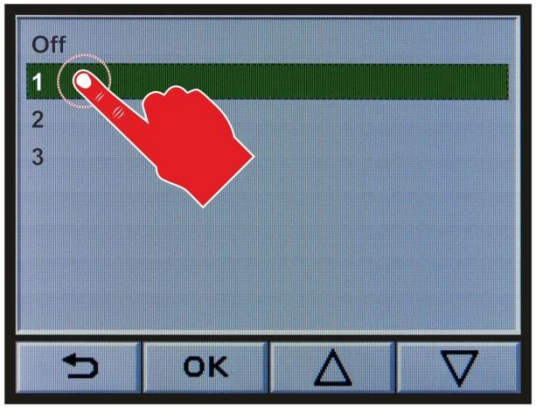


Figure 76 – Selection of the desired channel

- To accept, tap the button ⮌.
  - Now the parameter selection display is displayed again.
  - In the entry windows for the parameters SP-ON and SP-OFF automatically the smallest possible values for these parameters are displayed corresponding to the connected sensor.
- Tap on the entry window in order to configure the values for the parameters SP-ON and SP-OFF according to your requirements.
  - The window for entering the values for the switching thresholds opens.

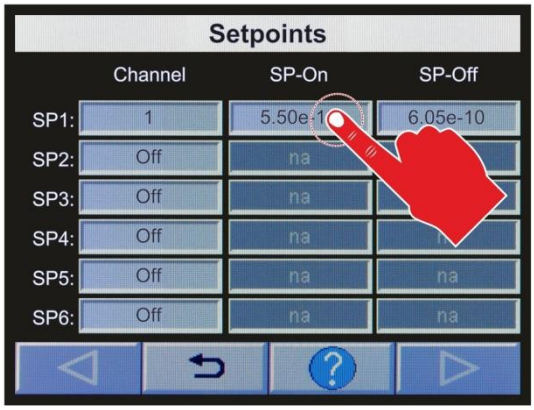


Figure 77 – Selection for parameter SP-On / SP-Off

- Enter the value by way of numbers and characters.
  - The entered value is displayed in the upper area of the display field.
- To delete the entire value tap the button CLR.
  - The displayed value is deleted.
- To delete the last character, which was entered, tap the button DEL.
  - The last character is deleted.
- To save and accept, tap the button OK.
  - The set up value is saved.
  - The parameter selection menu is displayed again.
- To exit without saving, tap the button ESC.
  - The initially set up value is retained.
  - The parameter selection menu is displayed again.

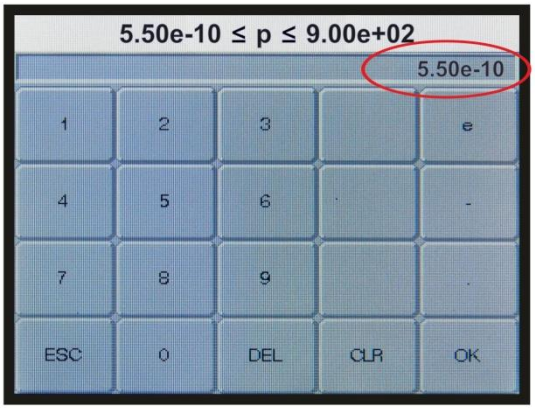


Figure 78 – Selection of the switching threshold value

- To exit the parameter selection menu, tap the button ⮌.
  - The main menu with an overview of the parameter groups is displayed again.
- To exit the main menu, tap the button ⮌.
  - You are now returned to the previously selected measured value display type of the measurement mode.
  - The configured switching threshold is displayed in the left at the top of the display field for the in each case assigned measurement channel.

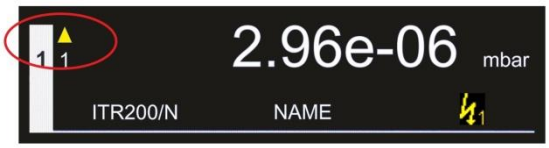


Figure 79 – Display switching threshold

NOTICE:
In case of a sensor fault or a connection fault between sensor and GRAPHIX controller, the switching thresholds assigned to the sensor, respectively channel are disabled. The pressure values for the parameters SP-On and SP-Off persist in the instrument's memory.
When reassigning these switching thresholds to a channel, the saved values for the parameters SP-On and SP-Off are automatically taken over provided these are within the adjustment range for the type of sensor connected to the channel. Otherwise values are proposed which match the adjustment range of the sensor type.

7.2.3 Adjustment Range

The lower and the upper threshold value may be selected depending on the sensor. The possible entry range (☞🕮 Table 21 to Table 28, page 79 to 81) results automatically through the connected sensor. Hysteresis amounts to at least 10% of the lower threshold value for sensors with a logarithmic characteristic and 0.1% of the FS for sensors with a linear characteristic.

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
TTR81N	5.50e-04	9.00e+02
TTR90	5.50e-04	9.00e+02
TTR91	5.50e-04	9.00e+02
TTR91N	5.50e-04	9.00e+02
TTR96	5.50e-04	9.00e+02
TTR96N	5.50e-04	9.00e+02
TTR211	5.50e-04	9.00e+02
TTR216	5.50e-04	9.00e+02
TTR911	5.50e-04	9.00e+02
TTR911N	5.50e-04	9.00e+02
TTR911N (RS232)	5,50e-04	9,00e+02
TTR916	5.50e-04	9.00e+02
TTR916N	5.50e-04	9.00e+02

Table 21 – Adjustment range for the threshold value of THERMOVAC sensors

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
TTR100	5.50e-04	1.35e+03
TTR101	5.50e-04	1.35e+03
TTR101N	5.50e-04	1.35e+03
TTR101N (RS232)	5,50e-04	1,35e+03
TTR200N (RS232)	5,50e-04	1,35e+03

Table 22 – Adjustment range for the threshold value of THERMOVAC sensors (combination sensors)

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
ITR90/N	5.50e-10	9,00e+02
ITR200/N	5.50e-10	9,00e+02

Table 23 – Adjustment range for the threshold value of IONIVAC sensors (combination sensors)

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
PTR81N	1.10e-09	9.00e-03
PTR225	1.10e-09	9.00e-03
PTR225N	1.10e-09	9.00e-03
PTR225N (RS232)	1,10e-09	9,00e-03
PTR237	1.10e-09	9.00e-03
PTR237N	1.10e-09	9.00e-03

Table 24 – Adjustment range for the threshold value of PENNINGVAC sensors

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
PTR82N	1.10e-08	9.00e+02
PTR90	5.50e-09	9.00e+02
PTR90N	5.50e-09	9.00e+02
PTR90N (RS232)	5,50e-09	9,00e+02
PTR200N (RS232)	5,50e-09	9,00e+02

Table 25 – Adjustment range for the threshold value of PENNINGVAC sensors (combination sensors)

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
CTR90-1000 **CTR91-1000** **CTR100/N-1000** **CTR101/N-1000**	1.300e-01	1.320e+03
CTR91-100 **CTR91-100** **CTR100/N-100** **CTR101/N-100**	1.300e-02	1.320e+02
CTR90-20 **CTR91-20** **CTR100/N-20** **CTR101/N-20**	2.700e-03	2.640e+01
CTR90-10 **CTR91-10** **CTR100/N-10** **CTR101/N-10**	1.300e-03	1.320e+01
CTR90-1 **CTR91-1** **CTR100/N-1** **CTR101/N-1**	1.300e-04	1.320e+00
CTR90-0.1 **CTR91-0.1** **CTR100/N-0.1** **CTR101/N-0.1**	1.300e-05	1.320e-01

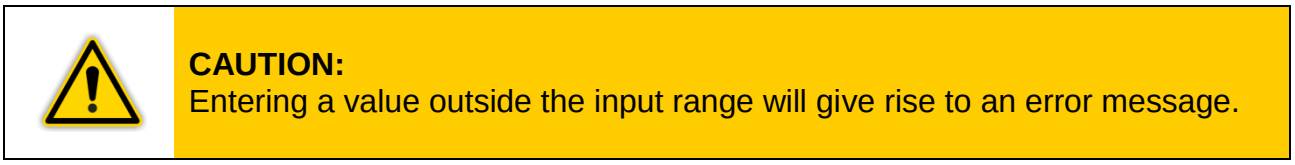
Table 26 – Adjustment range for the threshold value of CERAVAC sensors

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
DU200	2.00e-01	1.98e+02
DU201	2.00e-01	1.98e+02
DU2000	2.00e+00	1.98e+03
DU2001	2.00e+00	1.98e+03
DU2001 rel.	-9.00e+02	9.90e+02

Table 27 – Adjustment range for the threshold value of DU sensors

Sensor type	Lower threshold value [Data in mbar]	Upper threshold value [Data in mbar]
CUSTOM	1.00e±xx	1.00e±xx

Table 28 – Adjustment range for the threshold value of further sensors



7.3 System

Through the parameters of this parameter group you may generally configure your instrument. The parameters apply to all measurement channels.

7.3.1 Displayed Unit of Measurement (Unit)

This parameter defines the unit of measurement for displayed pressure values, threshold values etc.

Display	Explanation
mbar	Unit of measurement mbar
Torr	Unit of measurement Torr
Pascal	Unit of measurement Pascal
psi	Unit of measurement psi
Micron	Unit of measurement Micron

Table 29 – Values for the parameter Unit

The unit of measurement is in each case displayed in the right upper field of the display field for the meas. channel directly after the measured value (☞🕮 Figure 15, E, page 31).

7.3.2 Key Tone

Through this parameter you define whether or not an audible signal shall be output when operating a button.

Display	Explanation
Off	Key tone Off
On	Key tone On

Table 30 – Values for the parameter Key Tone

7.3.3 Error Relay

With the aid of this parameter you define for which error type the error signal relay shall switch. Select the required relay output: no separate labelling = N.O. (Normally Open) or N.C. (Normally Closed).

Display	Explanation
All	All errors
Only Device	Device errors only
Channel 1 & Device	Sensor at Channel 1 and device error
Channel 2 & Device	Sensor at Channel 2 and device error (for GRAPHIX TWO and THREE only)
Channel 3 & Device	Sensor at Channel 3 and device error (for GRAPHIX THREE only)
All N.C.	All errors
Only Device N.C.	Device errors only
Channel 1 & Device N.C.	Sensor at Channel 1 and device error
Channel 2 & Device N.C.	Sensor at Channel 2 and device error (for GRAPHIX TWO and THREE only)
Channel 3 & Device N.C.	Sensor at Channel 3 and device error (for GRAPHIX THREE only)

Table 31 – Values for the parameter Error Relay

7.3.4 Baud Rate (Data Rate)

The baud rate defines the communication speed for the serial interface.

Display	Explanation
9600	9600 Baud
19200	19200 Baud
38400	38400 Baud

Table 32 – Values for the parameter Data Rate

7.3.5 Com Port

Selection of interface type.

Display	Explanation
RS232	Com port RS232
RS485	Com port RS485
Center	Com port compatible with RS232 interface of the multi-channel measuring instruments CENTER TWO and THREE

Table 33 – Values for the parameter Com Port

NOTICE: Utilising the Com port Center
When using the Com port Centre please observe the information given in Chapter 6 Computer Interface, page 57 in the Operating Instructions GA 09.035/7.01 of the multi-channel measuring instruments CENTER TWO and THREE.

7.3.6 Address

This parameter can only be changed when the parameter Interface has been set to RS485 (☞🕮 Chapter 7.3.5 Com Port, page 83).

You may assign any address within the range from 1 to 126 for the RS485 Interface.

7.3.7 Clock (Time)

Set the time in the format hh:mm:ss (h = hour, m = minute, s = second).

7.3.8 Date

Set the date in the format YY:MM:DD (YY = year, M = month, D = day).

7.3.9 System Information

In this window you receive important information to the device. The following system information are shown to you:

- Description
- Part Number
- Serial Number
- Version

NOTICE:
Use these information, if in case of service the information of the label is not available.

7.4 Display

7.4.1 Display Mode

This parameter controls the way in which data is displayed.

Display	Explanation
Normal	Measured values and status display
Big	Large display of measured data
Chart	Graph of the pressure history
Leak Test	Leak rate determination
Speedo Channel 1	Speedometer-shaped display of channel 1 pressure
Speedo Channel 2	Speedometer-shaped display of channel 2 pressure
Speedo Channel 3	Speedometer-shaped display of channel 3 pressure

Table 34 – Values for the parameter Display mode

7.4.2 Resolution

This parameter controls the resolution for the measured values display.

Display	Explanation
Standard	Default resolution
High	High resolution

Table 35 – Values for the parameter Display digits

7.4.3 Brightness

This parameter controls the brightness of the display.

Display	Explanation
Low	Low display brightness
Medium	Medium display brightness
High	High display brightness

Table 36 – Values for the parameter Brightness

7.5 Logging

Through this parameter group you can configure the rules controlling the way in which data are logged. For this, a suitable storage device must be connected to the USB interface (☞🕮 Figure 13, B, page 30). The memory requirements depend on the specified interval and the file size. For a logging interval of 1 s and a file size of 24 h the memory requirements are approx. 4 MB. In this case you can record the data of 250 days with a storage device of 1 GB.

7.5.1 Interval (s)

This parameter defines the data logging interval.
The value is here entered in seconds. You may set up a data recording interval in the range between 1 – 900 seconds. The default setting is one second.

7.5.2 File Size (h)

This parameter restricts the length of the recorded data per created file.
The value is here entered in hours. You may set up a data recording length in the range between 1 – 999 hours. The default setting is 24 hours.

NOTICE:
After reaching the value entered for this parameter, a new file is created automatically which will then hold data for the given time span.

7.5.3 Enable / Disable Logging

- Start to record data by tapping the button **Start**.
  - The directory DATALOG is created on the storage device connected to the USB interface.
  - Measured values and important data relating to the recording of data are saved in a file having the format YYYYMMDD_hhmmss_snXXXXXX.txt
    (Y = year, M = month, D = day, h = hour, m = minute, s = second,
    snXXXXXX = 6-digit serial number) to the USB memory in the directory DATALOG.
- Stop the recording of data by tapping the button **Stop**.
- The file created, respectively saved to the USB storage device will then be available for further data processing.

```
Leybold GmbH
S/N = 000001
sw-version = 1.11.00
samplingtime[s] = 1
unit = mbar
Setpoints;Channel;SP-On;SP-Off
1;1;0.00013;0.00146
2;1;1.30;1.31
3;2;3.00;3.30
4;2;8.00e-03;8.80e-03
5;3;5.50e-04;6.05e-04
6;3;6.00e-02;6.60e-02
Leak test parameter
unit = mbar*l/s
Interval[min] = 10
Volume[l] = 1.00
Channel = 3

date time;ch1 =  ;ch2 =  ;ch3 =  ;leak rate
;CTR91-1;ITR200/N;TTR100
2015-10-19 14:12:38;0.62548;2.21e-06;6.63e-04;2.72e-06
2015-10-19 14:12:39;0.62548;1.85e-06;6.63e-04;2.72e-06
2015-10-19 14:12:40;0.62548;5.34e-07;6.63e-04;2.72e-06
2015-10-19 14:12:41;0.62548;3.45e-07;6.63e-04;2.72e-06
2015-10-19 14:12:42;0.62548;1.25e-07;6.63e-04;2.72e-06
```

Figure 80 – Sample file of recorded data

7.6 Recorder

The chart recorder output is a programmable analogue output. The voltage at the chart recorder output is a function of the pressure at the sensor. The relationship between pressure and voltage is termed output characteristic. It may be selected through the parameter Analogue mode.

7.6.1 Analog Mode

Through the parameter Analog Mode you can define at which pressure value the maximum voltage shall be reached. In the following, the available output characteristics are described. Here information is provided in each case how the pressure p (in mbar) is calculated from the output voltage U (in Volt).
Note here that a difference is made between a logarithmic and linear output characteristic. Using a logarithmic characteristic is preferred when the measurement range extends over many decades of pressure. In this case, the pressure value is logarithmized and thereafter scaled suitably. Using a linear characteristic is preferred when the measurement range extends only over a few pressure decades. In this case, the voltage at the chart recorder output is proportional to the pressure value.

Log
Logarithmic representation of the entire measurement range.

Sensor	Pressure [mbar]
TTR	p = 10^[U/(10/7) – 4]
TTR100	p = 10^[U/(10/7) – 4]
ITR	p = 10^[U/(10/12) – 9]
PTR	p = 10^[U/(10/7) – 9]
PTR90	p = 10^[U/(10/12) – 9]
CTR	p = 10^[U/(10/4) – 4] * FS
DU	p = 10^[U/(10/4) – 4] * FS

Table 37 – Chart recorder output – Calculation formula for the parameter Log

Log A
Logarithmic representation of the entire measurement range (compatible to A-series).

Sensor	Pressure [mbar]
TTR	p = 10^[U/(10/6) – 3]
TTR100	p = 10^[U/(10/7) – 4]
ITR90	p = 10^[(U – 7.75)/0.75]
ITR200	p = 10^[U – 8]
PTR	p = 10^[U/(9/7) – 9 – 7/9]
PTR90	p = 10^[U/(10/11) – 8]
CTR	p = 10^[U/(10/4) – 4] * FS
DU	p = 10^[U/(10/4) – 4] * FS

Table 38 – Chart recorder output – Calculation formula for the parameter Log A

Log -6
Logarithmic representation of a partial measurement range (2.5 V/decade).

Sensor	Pressure [mbar]
All sensor types	p = 10^[U/(10/4) – 10]

Table 39 – Chart recorder output – Calculation formula for the parameter Log -6

Log -3
Logarithmic representation of a partial measurement range (2.5 V/decade).

Sensor	Pressure [mbar]
All sensor types	p = 10^[U/(10/4) – 7]

Table 40 – Chart recorder output – Calculation formula for the parameter Log -3

Log +0
Logarithmic representation of a partial measurement range (2.5 V/decade).

Sensor	Pressure [mbar]
All sensor types	p = 10^[U/(10/4) – 4]

Table 41 – Chart recorder output – Calculation formula for the parameter Log +0

Log +3
Logarithmic representation of a partial measurement range (2.5 V/decade).

Sensor	Pressure [mbar]
All sensor types	p = 10^[U/(10/4) – 1]

Table 42 – Chart recorder output – Calculation formula for the parameter Log +3

LogC1
Logarithmic representation for the following combination:
- TTR connected to measurement channel 1
- PTR connected to measurement channel 2

Sensor	Pressure [mbar]
TTR + PTR	p = 10^[U/(10/12) – 9]

Table 43 – Chart recorder output – Calculation formula for the parameter LogC1

LogC2
Logarithmic representation for the following combination:
- CTR or DU connected to measurement channel 1
- CTR or DU connected to measurement channel 2

This output characteristic is only preferred when the sensors offer different measurement ranges. The total measurement range supplied by the combination is displayed in the range of 0 to 10 V logarithmically. This parameter can only be selected for GRAPHIX TWO and THREE.

LogC3

Logarithmic representation for the following combination:

- CTR or DU connected to measurement channel 1
- CTR or DU connected to measurement channel 2
- CTR or DU connected to measurement channel 3

This output characteristic is only preferred when the sensors offer different measurement ranges. The total measurement range supplied by the combination is displayed in the range of 0 to 10 V logarithmically. This parameter can only be selected for GRAPHIX THREE.

NOTICE:
The three sensors need to be sorted as to the end value of their measurement range. The sorting sequence may be either increasing or decreasing.

Lin -9

Linear representation, U = 10 V corresponds to p = 10^{-10} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-10}

Table 44 – Chart recorder output – Calculation formula for the parameter Lin -10

Lin -9

Linear representation, U = 10 V corresponds to p = 10^{-9} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-9}

Table 45 – Chart recorder output – Calculation formula for the parameter Lin -9

Lin -8

Linear representation, U = 10 V corresponds to p = 10^{-8} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-8}

Table 46 – Chart recorder output – Calculation formula for the parameter Lin -8

Lin -7

Linear representation, U = 10 V corresponds to p = 10^{-7} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-7}

Table 47 – Chart recorder output – Calculation formula for the parameter Lin -7

Lin -6

Linear representation, U = 10 V corresponds to p = 10^{-6} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-6}

Table 48 – Chart recorder output – Calculation formula for the parameter Lin -6

Lin -5

Linear representation, U = 10 V corresponds to p = 10^{-5} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-5}

Table 49 – Chart recorder output – Calculation formula for the parameter Lin -5

Lin -4

Linear representation, U = 10 V corresponds to p = 10^{-4} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-4}

Table 50 – Chart recorder output – Calculation formula for the parameter Lin -4

Lin -3

Linear representation, U = 10 V corresponds to p = 10^{-3} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-3}

Table 51 – Chart recorder output – Calculation formula for the parameter Lin -3

Lin -2

Linear representation, U = 10 V corresponds to p = 10^{-2} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-2}

Table 52 – Chart recorder output – Calculation formula for the parameter Lin -2

Lin -1

Linear representation, U = 10 V corresponds to p = 10^{-1} mbar.

Sensor	Pressure [mbar]
All sensor types	p = U/10 * 10^{-1}

Table 53 – Chart recorder output – Calculation formula for the parameter Lin -1

Lin +0

Linear representation, U = 10 V corresponds to $p = 10^0$ mbar.

Sensor	Pressure [mbar]
All sensor types	$p = U/10 * 10^0$

Table 54 – Chart recorder output – Calculation formula for the parameter Lin +0

Lin +1

Linear representation, U = 10 V corresponds to $p = 10^1$ mbar.

Sensor	Pressure [mbar]
All sensor types	$p = U/10 * 10^1$

Table 55 – Chart recorder output – Calculation formula for the parameter Lin +1

Lin +2

Linear representation, U = 10 V corresponds to $p = 10^2$ mbar.

Sensor	Pressure [mbar]
All sensor types	$p = U/10 * 10^2$

Table 56 – Chart recorder output – Calculation formula for the parameter Lin +2

Lin +3

Linear representation, U = 10 V corresponds to $p = 10^3$ mbar.

Sensor	Pressure [mbar]
All sensor types	$p = U/10 * 10^3$

Table 57 – Chart recorder output – Calculation formula for the parameter Lin +3

IM221

Logarithmic representation IM221 Controller (1 V / decade). U = 8 V corresponds to $p = 10^{-2}$ mbar.

Controller	Pressure [mbar]
IM221	p = 10^[U – 10]

Table 58 – Chart recorder output – Calculation formula for the parameter IM221

LogC4

Logarithmic representation over 12 decades (0.83 V/decade) for the following combination:

- TTR100 or TTR101 connected to measurement channel 1
- ITR200 connected to measurement channel 2

Sensor	Pressure [mbar]
TTR100 + ITR200	p = 10^[U/(10/12) – 9]
TTR101 + ITR200	p = 10^[U/(10/12) – 9]

Table 59 – Chart recorder output – Calculation formula for the parameter LogC4

U = 10 V corresponds to p = 1000 mbar. The switchover level between the sensors is at 10^{-2} mbar. This parameter can only be selected for GRAPHIX TWO and THREE.

PM411

Non-linear output characteristic as for the PM411 plug-in board.

7.6.2 Channel

Through this parameter you define which measurement channel shall be assigned to the chart recorder output.

Display	Explanation
1	Assigned to measurement channel 1
2	Assigned to measurement channel 2 (GRAPHIX TWO and THREE only)
3	Assigned to measurement channel 3 (GRAPHIX THREE only)

Table 60 – Values for the parameter Channel

7.7 Chart

7.7.1 Interval (s)

This parameter defines the interval for the display of pressure values in the measured values display mode Chart.

The value here is entered in seconds. You may set up the interval for recording of data within the range from 1 – 900 seconds. The default setting is one second.

Table 61, page 92 gives an overview for temporally maximally possible representation within the visible chart range as a function of interval and scaling.

Scale / Interval [s]	1:1	1:2	1:4	1:8
1	00:04:48	00:09:36	00:19:12	00:38:24
30	02:24:00	04:48:00	09:36:00	19:12:00
60	04:48:00	09:36:00	19:12:00	38:24:00
120	09:36:00	19:12:00	38:24:00	76:48:00
300	24:00:00	48:00:00	96:00:00	192:00:00
600	48:00:00	96:00:00	192:00:00	384:00:00
900	72:00:00	144:00:00	288:00:00	576:00:00

Table 61 – Overview for display duration [hh:mm:ss]

7.7.2 Channel 1

Through this parameter you define whether the measured values of measurement channel 1 shall be displayed in the chart.

Display	Explanation
Off	The measured values of measurement channel 1 are not shown in the chart.
On	The measured values of measurement channel 1 are shown in the chart.

Table 62 – Values for the parameter Channel 1

7.7.3 Channel 2

Through this parameter you define whether the measured values of measurement channel 2 shall be displayed in the chart. Selecting measurement channel 2 is available only for GRAPHIX TWO and THREE.

Display	Explanation
Off	The measured values of measurement channel 2 are not shown in the chart.
On	The measured values of measurement channel 2 are shown in the chart.

Table 63 – Values for the parameter Channel 2

7.7.4 Channel 3

Through this parameter you define whether the measured values of measurement channel 3 shall be displayed in the chart. Selecting measurement channel 3 is available only for GRAPHIX THREE.

Display	Explanation
Off	The measured values of measurement channel 3 are not shown in the chart.
On	The measured values of measurement channel 3 are shown in the chart.

Table 64 – Values for the parameter Channel 3

7.8 Leak Test

The leak test function integrated into the GRAPHIX Controller operates on the principle of pressure rise method over a known time interval at a known volume.

The leak rate Q_L in $\frac{mbar \cdot l}{s}$ calculated as follows: $Q_L = \frac{\Delta p \cdot V}{\Delta t}$

Where

- Δp is the pressure rise, the difference between the pressure at time t_e = end of the time interval and the pressure at the beginning t_0
- V is the volume
- Δt is the time interval $t_e - t_0$

The device calculates the leak rate using this function after each time interval and displays the value.

Examble:

Once the vacuum vessel with a volume of 20 l has been isolated from the pump, the pressure in the apparatus rises from 30 mbar to 40 mbar during a measuring time of 30 minutes (= 1800 seconds). Thus, in accordance with the above-mentioned equation, the leak rate will be:

$$Q_L = \frac{(40 - 30) \cdot 20}{1800} = \frac{10 \cdot 20}{1800} = 1.1 \cdot 10^{-1} \frac{mbar \cdot l}{s}$$

To evaluate the measurement quality, besides the recently determined value (☞🕮 Figure 19, B, page 34), the two previously determined values (☞🕮 Figure 19, C, D, page 34) are also displayed. If the values are continuously dropping, this can be a hint for a variable contribution to the leak rate through outgassing which adds to the actual leak rate by a leak (constant value). The result can be improved by waiting until this variable contribution is becoming small, compared to the actually sought leak rate.
However, if the values are jumpy and perhaps increasing or even negative, this is an evidence for a too short time interval.

Further usages for the leak test function emerge:

- Principally, with a known test leak you can reversely conduct a volume determination. For this purpose, enter a volume of 1 l and calculate the volume by division of the known leak rate by the measured leak rate. For the choice of the time interval the afore-mentioned applies. It is not considered for volume calculation.
- For a test volume known to be sufficiently tight you can document the outgassing behaviour. This can be very helpful, especially for the examination of residual humidity.
- When utilising pressure measuring principles with high gas type dependence (e.g. THERMOVAC sensors in the range > 5 mbar), besides an integral leak test you can also carry out a local leak detection – with limited possibilities – by external sprinkling of the suspect spot. However, for this, a certain amount of experience is required.

- Principally, a leak test in the overpressure range would also be possible with the pressure rise method. The leak rate would then be negative, since the leakage is leaving the test volume. Because of the principal temperature dependence of the test pressure large measuring errors can thereby arise, which require an experienced operator, so that all in all the pressure rise method in the vacuum range is more recommendable.

7.8.1 Interval (min)

Through this parameter you define the duration of the leak test.

The value is entered in minutes. You may set up the interval for leak test within the range from 1 – 1999 minutes. The default setting is 10 minutes.

7.8.2 Volume (l)

Enter the volume of the test vessel.

The value is entered in liter. You may set up the volume within the range from 0.1 – 100000.0 liter. The default setting is 1.0 liter.

7.8.3 Channel

Through this parameter you define which channel shall be used for the leak test.

Display	Explanation
1	Assigned to measurement channel 1
2	Assigned to measurement channel 2 (GRAPHIX TWO and THREE only)
3	Assigned to measurement channel 3 (GRAPHIX THREE only)

Table 65 – Values for the parameter Channel

7.9 Menu Language (Language)

Always the currently selected menu language is indicated through a symbolic flag typical for the specific language (☞🕮 Chapter 6.1.4.1 Symbols for the Controls, page 36).

The desired menu language is selected by tapping the button showing the symbolic flag typical for the specific language.

Display	Explanation
	Menu language EN (English)
	Menu language DE (German)
	Menu language CN (Chinese)
	Menu language FR (French)
	Menu language IT (Italian)
	Menu language JP (Japanese)
	Menu language ES (Spanish)
	Menu language KN (Korean)
	Menu language RU (Russian)
	Menu language PL (Polish)
	Menu language TR (Turkish)

Table 66 – Values for the parameter Language

8. Computer Interface

8.1 Basic Information

8.1.1 Connection

The GRAPHIX controller is capable of communicating with a computer via a serial interface. Either a RS232 or an RS485 interface is available.
The pin assignment of the corresponding connection socket and the necessary connection cable are described in Chapter 5.3.7 Interfaces RS232/RS485 (RS232/RS485), page 29.

8.1.2 Nomenclature

To describe the computer interface, the following terms and symbolic notations are used.

Terms	Explanation
Send	Data transfer from the host to the device
Receive	Data transfer from the device to the host
Host	Terminal (Computer)
ASCII	American Standard Code for Information Interchange

Table 67 – Computer interface terms

Terms	Value	Explanation
‘;‘	0x3B	Separating character
EOT	0x04	End character
SI	0x0F	Read detection
SO	0x0E	Write detection
ACK	0x06	Parameter value is accepted
NACK	0x15	Parameter value is not accepted

Table 68 – Control characters of the computer interface

8.2 Communication

8.2.1 Protocol

The following protocol is used for communication:

- 8 data bits
- No parity bit
- 1 stop bit

The baud rate is selectable (☞🕮 Chapter 7.3.4 Baud Rate (Data Rate), page 82).

No hardware handshake is used. Messages are transferred by way of ASCII strings. A semicolon (0x3B) in the string is processed as a separating character. Space characters (0x20) or tab stop characters (0x09) may be contained in the string. As to communication, the computer is always the master. The input buffer of the computer must offer a capacity of at least 512 bytes.

8.2.2 General String Structure

When using the interfaces RS232 or RS485, the send and receive strings differ inasmuch when using the RS485 interface the respective string is preceded by the address of the RS485 interface. For the send string, state the address in hexadecimal notation (for example address 10 = 0A). You may assign an address from the range of 1 to 126.

8.2.2.1 Send String Structure (as seen from the Master)

Read:

Address RS485 (Only necessary for RS485!)	Read (0x0F) [SI]	Parameter group	Separating character	Parameter No.	CRC	[EOT]

Write:

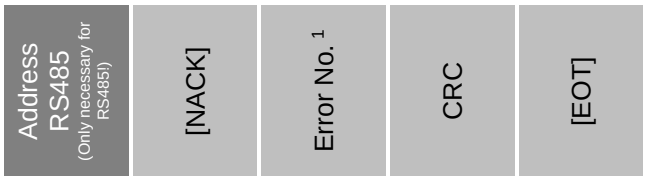
Address RS485 (Only necessary for RS485!)	Write (0x0E) [SO]	Parameter group	Separating character	Parameter No.	Separating character	Value	Space character	CRC	[EOT]

8.2.2.2 Receiving String Structure (as seen from the Master)

Read:

The requested value is readable.

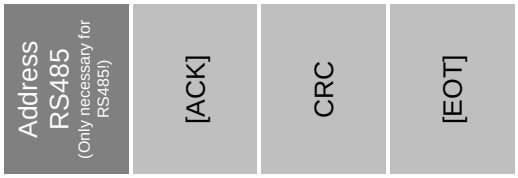
The requested value is not readable.



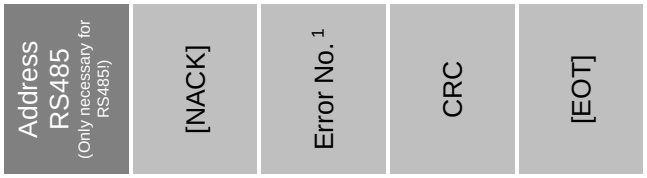
[1] (☞🕮 Table 69 – Error numbers of receiving string, page 100)

Write:

Value has been successfully written.



Value has not been written.



[1] (☞🕮 Table 69 – Error numbers of receiving string, page 100)

8.2.2.3 Error Number (Receiving String)

Error-No.	Explanation
-6	CRC sum error
-8	Format error
-9	Group not available
-10	Parameter not available for sensor type
-11	Parameter read-only
-12	Parameter value incorrect
-13	Number of parameter values wrong
-14	Value currently not changeable
-15	Parameter generally not available
-16	Error data handling with USB

Table 69 – Error numbers of receiving string

8.2.2.4 Calculation of the Checksum

The checksum (CRC) consists of an ASCII character, the byte value of which results as follows from the preceding characters of the send or receive string (without address RS485):

CRC = 255 – [(Byte sum of all preceding characters) mod 256]

If this value is lower than 32 (control character of the ASCII code), then 32 must be added.

Example:

Send string ahead of CRC designating the first channel: [SO]1;5;vacuum[space character]
CRC = 255 – [(14+49+59+53+59+118+97+99+117+117+109+32) mod 256]
= 255 – [923 mod 256]
= 255 – 155
= 100
In this case the checksum character is a “d”.

8.3 The Command Set (Mnemonics)

8.3.1 Parameter Group

Parameter group	Explanation
1	Parameters Channel 1
2	Parameters Channel 2
3	Parameters Channel 3
4	Setpoint parameters
5	System parameters

Table 70 – Parameter groups

8.3.2 Parameter Number

For each parameter group there exist a certain number of parameters

NOTICE:
Same parameter numbers have within the different parameter groups a different effect.

Parameter group	Parameter No.	Read	Write	Explanation	Value
1 … 3	1	✓	✓	Filter factor	• Fast • Medium • Slow
1 … 3	2	✓	✓	Sensor detection	• Auto • Manual
1 … 3	3	✓	✓	Port	• Analog Log • Analog Lin • Digital Log • Digital Lin
1 … 3	4	✓	✓	Sensor type	• TTR? • TTR81N • TTR90 • TTR91 • TTR91N • TTR96 • TTR96N • TTR211 • TTR216 • TTR911 • TTR911N • TTR916 • TTR916N • TTR10X • TTR100 • TTR101 • TTR101N

Parameter group (continued)	Parameter No.	Read	Write	Explanation	Value
1 … 3	4	✓	✓	Sensor Type	• PTR? • PTR81N • PTR225 • PTR225N • PTR237 • PTR237N • PTR90? • PTR82N • PTR90 • PTR90N • CTR? • CTR90-0.1 • CTR90-1 • CTR90-10 • CTR90-20 • CTR90-100 • CTR90-1000 • CTR91-0.1 • CTR91-1 • CTR91-10 • CTR91-20 • CTR91-100 • CTR91-1000 • CTR100/N-0.1 • CTR100/N-1 • CTR100/N-10 • CTR100/N-20 • CTR100/N-100 • CTR100/N-1000 • CTR101/N-0.1 • CTR101/N-1 • CTR101/N-10 • CTR101/N-20 • CTR101/N-100 • CTR101/N-1000
1 … 3	5	✓	✓	Sensor Name	• Text input
1 … 3	6	✓	✓	F-Start	• Voltage value [V]
1 … 3	7	✓	✓	U-Start	• Voltage value [V]
1 … 3	8	✓	✓	p-Start	• Pressure value
1 … 3	9	✓	✓	U-End	• Voltage value [V]
1 … 3	10	✓	✓	p-End	• Pressure value
1 … 3	11	✓	✓	F-End	• Voltage value [V]
1 … 3	12	✓	✓	Sensor switch-on type	• Manual • External • Hot • Channel 1 • Channel 2 • Channel 3

Parameter group (continued)	Parameter No.	Read	Write	Explanation	Value
1 … 3	13	✓	✓	Sensor switch-off type	• Manual • External • Self • Channel 1 • Channel 2 • Channel 3
1 … 3	14	✓	✓	Sensor switch-on value	• Pressure value [display unit]
1 … 3	15	✓	✓	Sensor switch-off value	• Pressure value [display unit]
1 … 3	16	✓	✓	Offset for linear sensors On / Off	• Off • On
1 … 3	17	✓	✓	Offset value for linear sensors	• Pressure value [display unit]
1 … 3	18		✓	Take Current Pressure	
1 … 3	19		✓	Zero Adjust	
1 … 3	20	✓	✓	Gas Type	• N2 • Ar • H2 • Cor
1 … 3	21	✓	✓	Correction factor for gas type	• Entry of values
1 … 3	22	✓	✓	Emission current mode	• Auto • Manual
1 … 3	23	✓	✓	Filament mode	• Auto • Filament 1 • Filament 2
1 … 3	24	✓		Sensor status	• NO-SEN • OK • Range? • S-OFF • Error-H • Error-L • Error-S
1 … 3	25	✓		Signal input voltage	• Voltage value [V]
1 … 3	29	✓		Pressure value rounded and corrected with unit of measurement	• Pressure value
1 … 3	32	✓	✓	HV On / Off	• Off • On
1 … 3	33	✓	✓	Degas On / Off	• Off • On
1 … 3	34		✓	Reset for error information	
1 … 3	37	✓		SP-Lower threshold value for sensor	• Pressure value [display unit]
1 … 3	38	✓		SP-Upper threshold value for sensor	• Pressure value [display unit]

Table 71 – Parameter numbers for parameter groups 1 … 3 (Parameter Channel 1 … 3)

Parameter group	Parameter No.	Read	Write	Explanation	Value
4	1	✓	✓	SP1 Channel assignment	• Off • 1 • 2 • 3
4	2	✓	✓	SP1-On	• Pressure value [display unit]
4	3	✓	✓	SP1-Off	• Pressure value [display unit]
4	4	✓		SP1 Status	• Off • On
4	5	✓	✓	SP2 Channel assignment	• Off • 1 • 2 • 3
4	6	✓	✓	SP2-On	• Pressure value [display unit]
4	7	✓	✓	SP2-Off	• Pressure value [display unit]
4	8	✓		SP2 Status	• Off • On
4	9	✓	✓	SP3 Channel assignment	• Off • 1 • 2 • 3
4	10	✓	✓	SP3-On	• Pressure value [display unit]
4	11	✓	✓	SP3-Off	• Pressure value [display unit]
4	12	✓		SP3 Status	• Off • On
4	13	✓	✓	SP4 Channel assignment	• Off • 1 • 2 • 3
4	14	✓	✓	SP4-On	• Pressure value [display unit]
4	15	✓	✓	SP4-Off	• Pressure value [display unit]
4	16	✓		SP4 Status	• Off • On
4	17	✓	✓	SP5 Channel assignment	• Off • 1 • 2 • 3
4	18	✓	✓	SP5-On	• Pressure value [display unit]
4	19	✓	✓	SP5-Off	• Pressure value [display unit]
4	20	✓		SP5 Status	• Off • On
4	21	✓	✓	SP6 Channel assignment	• Off • 1 • 2 • 3
4	22	✓	✓	SP6-On	• Pressure value [display unit]
4	23	✓	✓	SP6-Off	• Pressure value [display unit]

Parameter group (continued)	Parameter No.	Read	Write	Explanation	Value
4	24	✓		SP6 Status	• Off • On

Table 72 – Parameter numbers for parameter group 4 (Setpoint parameters)

Parameter group	Parameter No.	Read	Write	Explanation	Value
5	1	✓		Hardware and software version	• HW:X.XX SW:X.XX
5	2	✓		Serial number of the instrument	• XXXXXX
5	3	✓		Part number of the instrument (P/N)	• XXXXXXXXX
5	4	✓	✓	Displayed unit of measurement	• mbar • Torr • Pa • psi • Micron
5	5	✓	✓	Resolution	• Standard • High
5	6	✓	✓	Display brightness	• Low • Medium • High
5	7	✓	✓	Display mode	• Normal • Big • Chart • Leak Test • Speedo Channel 1 • Speedo Channel 2 • Speedo Channel 3
5	8	✓		Number of channels in the instrument	• 1 • 2 • 3
5	9	✓	✓	Baud rate	• 9600 • 19200 • 38400
5	10	✓	✓	Interface (RS232 or RS485)	• RS232 • RS485
5	11	✓	✓	Address for RS485	• Value
5	12	✓	✓	Data logging enabled	• Off • On
5	13	✓	✓	Interval for data logging	• Value [s]
5	14	✓	✓	File size	• Value [h]
5	15	✓	✓	Interval for period in display mode Chart	• Value [s]
5	16	✓	✓	Display Channel 1 in display mode Chart	• Off • On
5	17	✓	✓	Display Channel 2 in display mode Chart	• Off • On

Parameter group (continued)	Parameter No.	Read	Write	Explanation	Value
5	18	✓	✓	Display Channel 3 in display mode Chart	• Off • On
5	19	✓	✓	Display language	• EN • DE • CN • FR • IT • JP • ES • KR • RU • PL • TR
5	20	✓	✓	Time	• Value [hh:mm:ss]
5	21	✓	✓	Date	• Value [JJJJ-MM-TT]
5	22	✓	✓	Key tone ON/OFF	• Off • On
5	23	✓	✓	Error relay mode	• All • Only Device • Channel 1 & Device • Channel 2 & Device • Channel 3 & Device • All N.C. • Only Device N.C. • Channel 1 & Device N.C. • Channel 2 & Device N.C. • Channel 3 & Device N.C.
5	24	✓	✓	Recorder mode	• Log • Log A • Log -6 • Log -3 • Log +0 • Log +3 • LogC1 • LogC2 • LogC3 • Lin -10 • Lin -9 • Lin -8 • Lin -7 • Lin -6 • Lin -5 • Lin -4 • Lin -3 • Lin -2 • Lin -1 • Lin +0 • Lin +1 • Lin +2 • Lin +3 • IM221 • LogC4 • PM411

Parameter group (continued)	Parameter No.	Read	Write	Explanation	Value
5	25	✓	✓	Chart recorder output channel assignment	• 1 • 2 • 3
5	26		✓	Update	
5	27		✓	Configuration	• No Action • Reset • Save • Recovery
5	28	✓	✓	Channel assignment for leak test	• 1 • 2 • 3
5	29	✓	✓	Duration leak test	• Value [min]
5	30	✓	✓	Recipient's volume	• Value [l]
5	31	✓	✓	Leak test on / off	• Off • On
5	32	✓		Current leak rate	• Value [display unit]
5	33	✓		Starting pressure for leak test	• Value [display unit]
5	34	✓		Total elapsed time since start of the leak test	• Value [hh:mm:ss]
5	35	✓		Remaining time within interval	• Value [hh:mm:ss]
5	36	✓		Current device error number	• Value (☞🕮 Table 75, page 112)
5	37	✓	✓	Error log list	• 1 – 20

Table 73 – Parameter numbers for parameter group 5 (System parameters)

9. Maintenance and Servicing

9.1 Maintenance

The GRAPHIX controller does not require any special maintenance work.

9.1.1 Cleaning

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.

9.2 Configuration

With the help of this parameter group they have the possibility of securing and of restoring your system parameters. In addition a suitable memory at the USB interface must be. (☞🕮 Figure 13, B, page 30). Further resetting of the system parameters is possible on factory-installed settings.

9.2.1 Save Data

To save the configuration parameters of your GRAPHIX controller proceed as follows:

- Connect the USB stick with the USB socket at the front side of the equipment (☞🕮 Figure 13, B, page 30).
- In the measurement mode, tap the touchscreen for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.
- To scroll, use the button ▷.
  - On the next page, main menu page 2/2 is displayed. The current page number is displayed in the upper section of the display.
- In the main menu 2/2, tap on the parameter group Configuration.
- In the parameter group Configuration, tap on the button **Save Data**.
  - The rest process starts.
  - On the memory at the USB interface the folder RECOVERY is installed.
  - Configuration data are stored in a file with the format rescue.txt on the USB stick in the folder RECOVERY.
  - After the reset process has been completed the instrument will automatically restart with the default parameters.
  - The GRAPHIX controller will now be ready for operation again.
- When not wanting to run the reset, tap the button ⮌ to cancel the reset process.
  - The main menu is then displayed again.

9.2.2 Restore Data

To restore the saved configuration parameters secured on an USB stick in the listing RECOVERY in the file rescue.txt proceed as follows:

- Connect the USB stick with the USB socket at the front side of the equipment (☞📖 Figure 13, B, page 30).
- In the measurement mode, tap the touchscreen for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.
- To scroll, use the button ▷.
  - On the next page, main menu page 2/2 is displayed. The current page number is displayed in the upper section of the display.
- In the main menu 2/2, tap on the parameter group Configuration.
- In the parameter group Configuration, tap on the button **Restore Data**.
  - The question „Are you sure?" is displayed to ensure that you really want to run the reset.
- When not wanting to run the reset, tap the button ⮌ to cancel the reset process.
  - The main menu is then displayed again.
- To run the process, tap the button **Restore now**.
  - The rest process starts.
  - After the reset process has been completed the instrument will automatically restart with the default parameters.
  - The GRAPHIX controller will now be ready for operation again.

9.2.3 Factory Setup

Use it this function, in order to put the equipment back to default parameters (☞📖 4.1.2 Default Parameters (factory defaults), page 17).

NOTICE:
Any parameters, which you have set up, will no longer be available after the reset. Therefore before updating save the parameters you have specifically set up (☞📖 Chapter 9.2.1 Save Data, page 108).

To reset your GRAPHIX controller proceed as follows:

- In the measurement mode, tap the touchscreen for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.
- To scroll, use the button ▷.
  - On the next page, main menu page 2/2 is displayed. The current page number is displayed in the upper section of the display.
- In the main menu 2/2, tap on the parameter group Configuration.
- In the parameter group Configuration, tap on the button **Factory Setup**.
  - The question „Are you sure?" is displayed to ensure that you really want to run the reset.
- When not wanting to run the reset, tap the button ⮌ to cancel the reset process.
  - The main menu is then displayed again.
- To run the update, tap the button **Reset now**.
  - The rest process starts.
  - After the reset process has been completed the instrument will automatically restart with the default parameters.
  - The GRAPHIX controller will now be ready for operation again.

9.3 Update Function

Should your GRAPHIX controller require a more current firmware, for example, in order to utilise new functions or sensors, please contact your next Leybold service office or inform yourself through the Leybold homepage.

9.3.1 Preparations

The firmware for the GRAPHIX controller is made available by way of a compressed *.zip file on the Leybold homepage.

- Unpack the file to the root directory of a suitable USB stick (☞📖 Chapter 4.6.5 USB-A Interface (front side), page 22).
- Connect the USB stick to the USB socket provided for it on the front side of the instrument (☞📖 Figure 13, B, page 30)

9.3.2 Updating

To update your GRAPHIX controller proceed as follows:

- In the measurement mode, tap the touchscreen for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.
- To scroll, use the button ▷.
  - On the next page, main menu page 2/2 is displayed. The current page number is displayed in the upper section of the display.
- In the main menu 2/2, tap on the parameter group Update.
- In the parameter group Update, tap on the button **Start update**.
  - The question „Are you sure?” is displayed to ensure that you really want to run the update.
- When not wanting to run the update, tap the button ⮌ to cancel the update process.
  - The main menu is then displayed again.
- To run the update, tap the button **Start update**.
  - On the memory at the USB interface is installed the folder RECOVERY.
  - Configuration data are stored in a file with the format rescue.txt on the USB memory in the folder RECOVERY.
  - The update process starts.
  - After the update process has been completed the instrument will automatically restart.
  - The GRAPHIX controller will now be ready for operation again.

NOTICE:
Wait for the instrument to restart automatically after the update process has run. While the update process is running do not switch the instrument off. Avoid an interruption of the voltage supply of the system. Avoid powering down the instrument while updating is in progress.

After having run the update, all parameter settings will have been reset to their factory defaults (☞📖 4.1.2 Default Parameters (factory defaults), page 17). Restore configuration data stored automatically with the update procedure (☞📖 Chapter 9.2.2 Restore Data, page 109).

10. Troubleshooting

10.1 Indication of Errors

A malfunction in the GRAPHIX Controller is displayed by an error message on the screen or issued by an error number via the serial interface. Additionally, an entry is made into the error memory list, from which the 20 most recently registered errors can be displayed on the screen (☞🕮 Chapter 10.2 Error Log, page 112) as well as read out via serial interface (☞🕮 Table 73, page 107).
The following tables give a survey on all recognisable sensor errors (☞🕮 Table 74, page 111) and device errors (☞🕮 Table 75, page 112).

10.1.1 Sensor Errors

Error description (Error Log)	Display (TFT display)	Error number (Interface)	Cause and remedy
no error	Measuring value	0	Attached sensor is recognized and in the specified measuring range.
Sensor-ID short circuit	….	1	Error in the electric circuit of sensor identification.
Sensor-ID unknown or not available	….	2	Identification resistor of sensor identification unknown or missing.
No sensor signal	Error-S [1]	3	Fault affecting the connection to the sensor. The message will only be displayed in the display field of the affected measurement channel. Acknowledge this message by selecting and terminating the channel menu at the corresponding channel.
Analog sensor signal out of range - too high	Error-H [1]	4	The measurement signal from the sensor is significantly above the permissible range.
Analog sensor signal out of range - too low	Error-L [1]	5	The measurement signal from the sensor is significantly below the permissible range.
Communication error digital sensor signal	Error-00 [1]	6	Communication error. Failure in the data transfer to IONIVAC sensors of ITR90, ITR200 and CTR-N series.
Error electronic/eeprom	Error-40 [1]	7	Electronics/EEPROM error with IONIVAC sensors of ITR200 series.
Error pirani	Error-04 [2]	8	Pirani error with IONIVAC sensors of ITR90 series.
Both filaments broken	Error-10 [1]	9	Hot cathode error (both filaments defectively) with IONIVAC sensors of ITR200 series.
One filament broken	Error-20 [2]	10	Hot cathode error (filament 1 defectively) with IONIVAC sensors of ITR200 series.
Error pirani	Error-90 [1]	11	Pirani error with IONIVAC sensors of ITR90 series.
Pirani adjustment out of range	Error-50 [2]	12	Pirani adjustment deficient with IONIVAC sensors of ITR90 series.
Error ion gauge	Error-80 [1]	13	Hot cathode error (filament defectively) with IONIVAC sensors of ITR90 series.

Table 74 – Sensor errors

[1] In addition to display of the error in place of the measured value, the warning symbol blinks in display modes Normal or Speedo. The error message is displayed in red font for the display modes Chart, Big and Leak Test as well as for the other channels in display mode Speedo. The error signal relay toggles according to the settings.

[2] In addition to the measured value, the warning symbol glows in display modes Normal or Speedo. The error message is displayed in yellow font for the display modes Chart, Big and Leak Test as well as for the other channels in display mode Speedo.

10.1.2 System Errors

Error description (Error Log)	**Display** (TFT display)	**Error number** (Interface)	**Cause and remedy**
no errror	none	0	System works error-free.
Error usb file open	none	1	File on USB stick cannot be opened. Check the attached USB memory stick.
Error usb folder open	none	2	Folder on USB stick cannot be opened. Check the attached USB memory stick.
Error usb file closing	none	3	File on USB stick cannot be stored. Check the attached USB memory stick.
Error usb write	none	4	USB stick not recordably. Check the attached USB memory stick.
Error usb read	none	5	USB stick not readably. Check the attached USB memory stick.
Error read eeprom	none	6	EEPROM of the equipment not readably. Contact your next Leybold GmbH service office.
Error write eeprom	none	7	EEPROM of system not recordably. Contact your next Leybold GmbH service office.
Error init eeprom	none	8	EEPROM error of system. Contact your next Leybold GmbH service office.

Table 75 – System errors

10.2 Error Log

The GRAPHIX CONTROLLER stores the errors recognized by the system. They have the possibility of being able to be been noticeable the last 20 errors. Important information on the display area is represented (☞🕮 Figure 81, page 113).

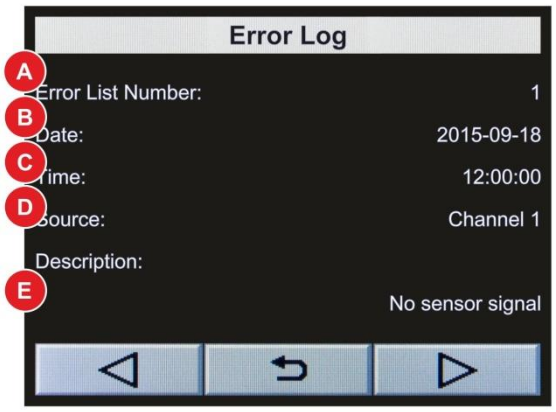


Figure 81 – Error log

A	Error number 1 – 20 (1 = freshest error)
B	Date of displayed error
C	Time of displayed error
D	Error source: Channel 1 = Sensor error at channel 1 Channel 2 = Sensor error at channel 2 Channel 3 = Sensor error at channel 3 Device = System error
E	Error description (☞🕮 Table 74, page 111 and Table 75, page 112)

To select the error log of your GRAPHIX controller proceed as follows:

- In the measurement mode, tap the touchscreen for approximately 1 second.
  - The main menu with an overview of the parameter groups is displayed.
- To scroll, use the button ▷.
  - On the next page, main menu page 2/2 is displayed. The current page number is displayed in the upper section of the display.
- In the main menu 2/2, tap on the parameter group Error Log.
  - The display with error number 1 (last error) is opened.
- To select from the list, use the buttons ◁ and ▷ or enter the value for the desired sensor directly.
  - The in each case selected value is displayed with a green background.
- To save, tap the button OK.
- The setup value is saved.
- To exit, tap the button ⮌.
  - The parameter selection display is displayed again.

10.3 Help in Case of Malfunctions

If the malfunction persists even after having exchanged the sensor or there is an error, which you cannot do according to the specifications in Table 74, page 111 or Table 75, page 112, please contact your next Leybold service office.

10.4 Replacing the Built-in Fuses

To replace blown instrument fuses, use only the type of fuse 1.6 A H as printed on the rear of the instrument. The two instrument fuses are located in the fuse insert at the mains filter (☞🕮 Figure 7, page 26), The fuse insert can be prised out with a small screwdriver.

10.5 Repair

Send any defective products for repair to the next Leybold service office. The Leybold GmbH will not assume any responsibility or warranty in case of repair work done by the operator or third persons on the GRAPHIX controller.

11. Storing and Waste Disposal

11.1 Packaging

Please retain the original packaging. You will need this packaging when storing your GRAPHIX controller or shipping it back to the Leybold GmbH.

11.2 Shelving

The multichannel gauge 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.

11.3 Waste Disposal

As to waste disposal of the instrument, the branch specific and local waste disposal and environmental regulations for systems and electronic components apply.
When returning the instrument, proper waste separation and waste disposal is ensured by the Leybold GmbH.

Notes:

Notes:

Notes:

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:	GRAPHIX ONE, GRAPHIX TWO, GRAPHIX THREE
Part numbers:	230680V01, 230681V01, 230682V01

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

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Cologne, September 01, 2016

ppa. Martin Tollner
VP / Head of Product Lines

Cologne, September 01, 2016

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, va cuum pumps and components will be carried out only if a correctly completed de claration 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:

Material description :
Catalog number:
Serial number:
Type of oil (ForeVacuum-Pumps) :

Failure description:
Additional parts:
Application-Tool:
Application- Process:

B. Condition of the equipment

	No [1]	Yes	No
1. Has the equipment been used	☐	☐	
2. Drained (Product/service fluid)		☐	☐
3. All openings sealed airtight		☐	
4. Purged		☐	☐

If yes, which cleaning agent
and which method of cleaning

[1] If answered with "No", go to D.

Contamination :	No [1]	Yes
toxic	☐	☐
corrosive	☐	☐
flammable	☐	☐
explosive [2]	☐	☐
radioactive [2]	☐	☐
microbiological [2]	☐	☐
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)

X	Tradename:	Chemical name:
a)		
b)		
c)		
d)		

	No	Yes
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

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