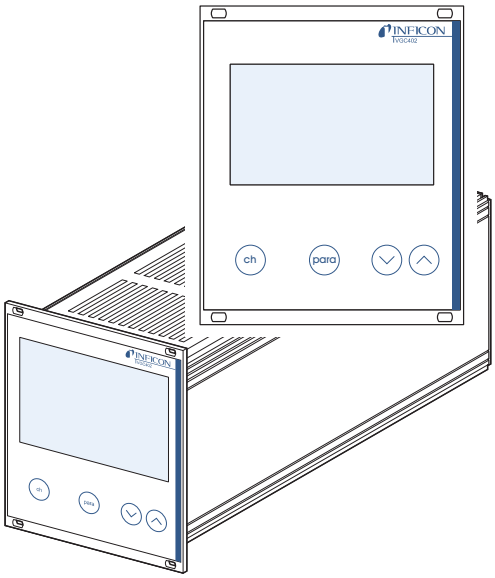
Operating Manual
Incl. EC Declaration of Conformity

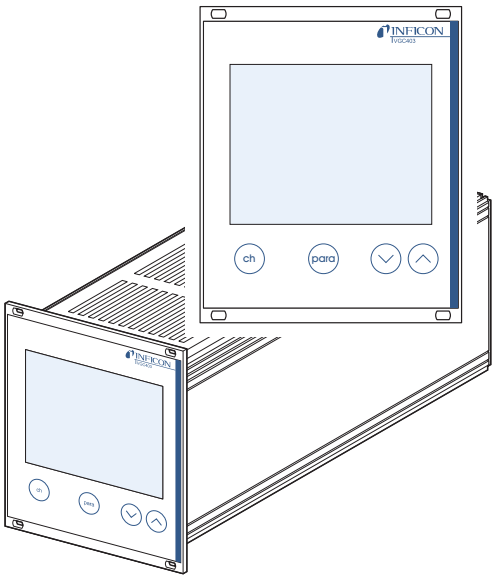
VGC402

Two-Channel Measurement and Control Unit



VGC403

Three-Channel Measurement and Control Unit



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Contents

1 Introduction

1.1 Validity

1.1.1 Part number

This document applies to the following products:

Part number	Product
398-020	VGC402
398-021	VGC403

The part number can be found on the type label which is attached to one side of the unit.

1.1.2 Firmware version

This Operating Manual is based on the firmware version 302-534-D.

If the unit does not work as described, please check if it is equipped with this firmware version. See Chapter 5.4.2 Firmware version (Pnr), 🗎 29.

1.1.3 Type label

There is a type label attached to one side of the unit. In all communication with INFICON, please state the information on the type label. For this purpose you may want to copy the information into the space provided below:

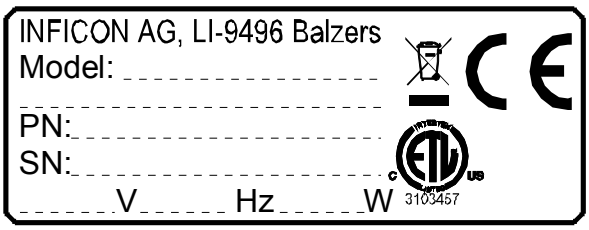

Fig. 1-1 Type label (example)

1.2 Intended use

The VGC402 and VGC403 Vacuum Gauge Controller is a display and control unit for vacuum gauges made by INFICON.

It is used together with vacuum gauges of the PSG, PCG, PEG, MPG, CDG, BPG, BCG and HPG series and is used for total pressure measurements. The vacuum gauges must be operated in accordance with their respective operating manuals.

In the following, the VGC402 or VGC403 Vacuum Gauge Controller will be referred to as «Vacuum Gauge Controller».

1.2.1 Liability and warranty

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

- Disregard the information in this document
- Use the product in a non-conforming manner
- Make any kind of alterations (modifications, repair work, etc.) to the product
- Use the product with accessories not listed in the corresponding product documentation

We reserve the right to make technical changes without prior notice. The figures are non-committal.

1.3 Product versions

The Vacuum Gauge Controller is available in two different versions: VGC402 and VGC403. The two products differ from each other with regard to:

- Number of channels
- Number of switching functions
- Power consumption
- Weight

See Chapter 2 Technical data, 🗎 7.

This Operating Manual describes both the VGC402 and the VGC403.

1.4 Safety

1.4.1 Personnel qualifications

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

1.4.2 Illustration of residual dangers

This Operating Manual illustrates safety notes concerning residual dangers as follows:

⚠DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or severe injury.

⚠WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or severe injury.

⚠CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury or in property damage.

NOTE:
A note such as this one indicates particularly important, but not safety-relevant information.

1.4.3 General safety instructions

For all work you are going to do, adhere to the applicable safety regulations.

Also observe all safety notes given in this document and forward the information to all other users of the product.

In particular, pay attention to the following safety notes:

⚠DANGER

Mains power.

The Vacuum Gauge Controller contains parts which are connected to the mains supply.

Make sure that no objects enter through the louvers of the unit. Keep the unit dry. Do not open the unit.

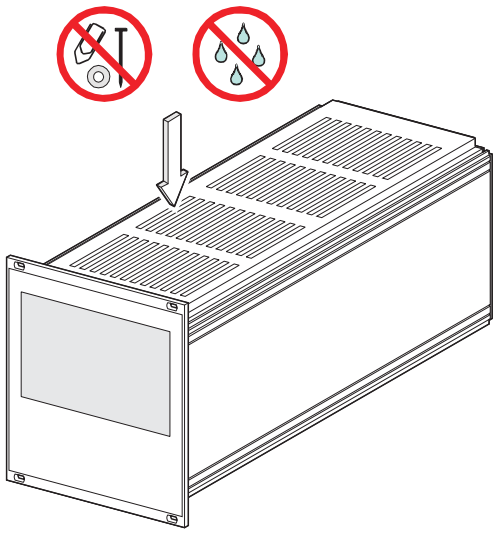

Fig. 1-2 Do not insert objects through louvers and keep unit dry

⚠WARNING

Improper use.

Improper use can damage the Vacuum Gauge Controller.

Use the Vacuum Gauge Controller only as intended by the manufacturer. See Chapter 1.2 Intended use, 📄 4.

⚠WARNING

Improper installation and operation data.

Improper installation and operation data may damage the Vacuum Gauge Controller.

Strictly adhere to the stipulated installation and operation data.

1.4.4 Disconnecting device

The Vacuum Gauge Controller is equipped with a disconnecting device according to EN 61010-1.

The disconnecting device is located at the back of the Vacuum Gauge Controller. See Fig. 1-3, 6.

The disconnecting device must be readily identifiable and easily reached by the user.

In order to disconnect the Vacuum Gauge Controller from mains, you must unplug the mains cable.

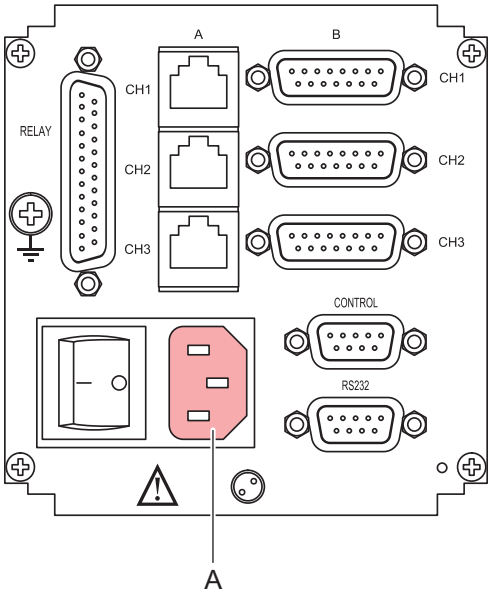

Fig. 1-3 Back side of the VGC403

A Disconnecting device

2 Technical data

2.1 General data

2.1.1 Mechanical data

Dimensions	Width: 106.3 mm Height: 128.5 mm (3 HE) Depth: 207 mm See Fig. 2-1, 🗎 7
Weight	VGC402: 1.04 kg VGC403: 1.16 kg
Use	Desktop unit Control panel mounted Mounting the unit in a rack

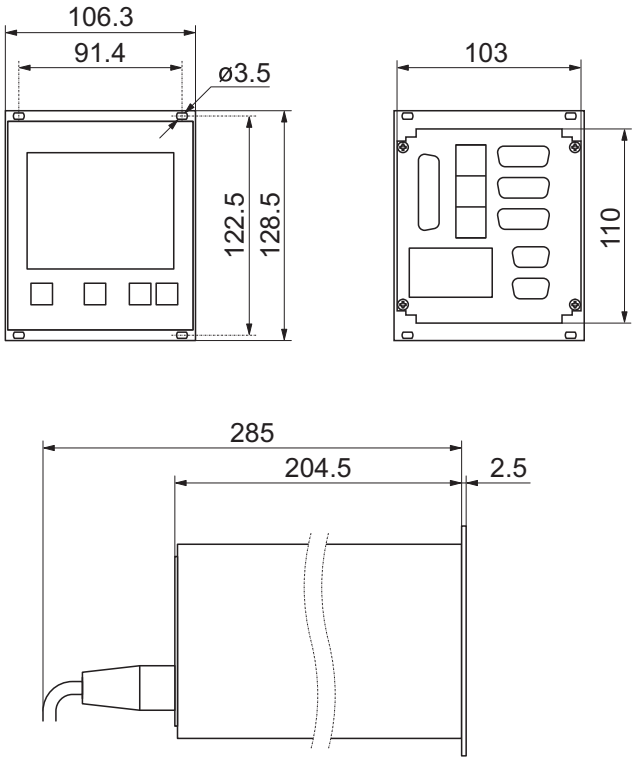

Fig. 2-1 Dimensions (in mm)

2.1.2 Ambience

Temperature	Storage: -20…+60 °C Operation: +5…+50 °C
Relative humidity	Max. 80 % (bis 31 °C), decreasing to max. 50 % (above 40 °C)
Use	Indoors only Altitude max. 2000 m NN
Pollution degree	II
Protection type	IP20

2.1.3 Operation

Manually	Via 4 control buttons on the front panel
Remote control	Via RS232C interface

2.2 Mains connection

Voltage	90…250 VAC
Frequency	50…60 Hz
Power consumption	VGC402: Max. 45 W VGC403: Max. 65 W
Overvoltage category	II
Protection class	1
Connection	European appliance connector IEC 320 C14

2.3 Channels

2.3.1 Sensor connections

Number of channels	VGC402: 2 VGC403: 3
Sensor connections per channel	RJ45 (FCC 68) D-Sub, 15 pins, female (connected in parallel)
Compatible sensors	Pirani: PSG400, PSG400-S, PSG100-S, PSG101-S, PSG500, PSG500-S, PSG502-S, PSG510-S, PSG512-S, PSG550, PSG552, PSG554
	Pirani / Capacitance: PCG400, PCG400-S, PCG550, PCG552, PCG554
	Cold cathode: PEG100
	Cold cathode / Pirani: MPG400, MPG401
	Capacitance: CDG025, CDG025D, CDG045, CDG045D, CDG100, CDG100D, CDG160D
	Hot ionization / Pirani: BPG400, BPG402 HPG400
	Hot ionization / Pirani / Capacitance: BCG450

2.3.2 Sensor supply

Voltage	+24 VDC ±5 %
Current	500 mA (750 mA short-time)
Fuse	900 mA via PTC element
	Self-resetting after switching the unit off or unplugging the sensor.
	The supply meets the requirements of a ground protective extra low voltage (SELV).

2.3.3 Measuring technique

Measuring ranges	Sensor dependent
Error of measurement	Gain error: ≤ 0.005 % FS
	Offset error: ≤ 0.01 % FS
Measuring rate	50 s^{-1}
Display rate	10 s^{-1}
Filter time constant	Slow: Approx. 1.0 s (f_g = 0.16 Hz)
	Normal (nor): Approx. 0.3 s (f_g = 0.53 Hz)
	Fast: Approx. 0.06 s (f_g = 2.65 Hz)
Unit of measurement	mbar, Pa, Torr, Micron
Possible adjustments	Linear sensors (CDG): Zero-adjust
	Logarithmic sensors (PSG, PCG, PEG, MPG, BPG, BCG, HPG): Fixed correction factors for N_2, Ar, H_2, or a variable correction factor in the range 0.10…9.99
A/D converter	Resolution > 16 bit

NOTE:
The measurements of the BPG/BCG/HPG/CDGxxxD are transferred digitally.

2.4 Switching functions

Number of switching functions	VGC402: 4 VGC403: 6
Assignment	Can be configured any way
Delay time	Filter time constant dependent
Adjustment range	Sensor dependent
Hysteresis	Linear sensors (CDG): ≥ 1 % FS
	Logarithmic sensors (PSG, PCG, PEG, MPG, BPG, BCG, HPG): ≥ 10 % of measurement

2.4.1 Switching function relay

Contact type	Change-over contact, floating
Load (ohmic)	Max. 60 VDC, 0.5 A Max. 30 VAC, 1 A
Lifetime	Mechanical: 10^7 cycles Electrical: 10^5 cycles at maximum load
Connection	D-sub, 25 pins, female. See Fig. 3-8, 🗎 13.

2.4.2 Error signal relay

Number	1
Delay time	≤ 20 ms
Contact type	Change-over contact, floating
Load (ohmic)	Max. 60 VDC, 0.5 A Max. 30 VAC, 1 A
Lifetime	Mechanical: 10^7 cycles Electrical: 10^5 cycles at maximum load
Connection	D-sub, 25 pins, female. See Fig. 3-8, 🗎 13.

2.5 Outputs

2.5.1 Analog output

Number	1 per channel
Voltage range	0…10 VDC
Deviation from displayed value	± 50 mV
Internal resistance	47 Ω
Relation between voltage and pressure	Sensor dependent
Connection	D-Sub, 9 pins, male. See Fig. 3-9, 🗎 14.

2.5.2 Recorder output

Number	1
Voltage range	0…10 VDC
Resolution	1 mV
Accuracy	± 20 mV
Internal resistance	3300 Ω
Relation between voltage and pressure	Programmable
Connection	D-Sub, 9 pins, male. See Fig. 3-9, 🗎 14.

2.5.3 Computer interface

Default	RS232C
Protocol	ACK/NAK ASCII with 3-character mnemonics. Bidirectional data flow.
Signals	Only TXD and RXD used
Baud rate	9600, 19200, 38400
Connection	D-Sub, 9 pins, female. See Fig. 3-10, 🗎 14.

2.6 Scope of delivery

Designation	Number
Vacuum Gauge Controller	1
Mains cable	1
Rubber strip Rubber feet	1 2
Collar screws Plastic sleeves	4 4
CD-ROM manual	1
EC Declaration of Conformity	1
Installation manual	1

3 Installation

3.1 Unpacking

1 Visually inspect the transport packaging for signs of external damage

2 Unpack the Vacuum Gauge Controller and put the packaging material aside

NOTE:
Keep the packaging material for later use. The Vacuum Gauge Controller must be stored and transported in the original packaging material only.

3 Examine the Vacuum Gauge Controller for completeness

4 Visually inspect the Vacuum Gauge Controller for signs of damage

⚠WARNING

Damaged product.

Putting a damaged product into operation can be extremely dangerous.

Never attempt to put a damaged product into operation. Secure the damaged product from unintended operation. Send a damage report to the haulage company or the insurer.

3.2 Mechanical installation

The Vacuum Gauge Controller can be used as follows: As a desk-top unit, mounted in a control panel, or mounted in a 19" rack. In each of these cases you must pay attention to the following safety note:

⚠CAUTION

Too high ambient temperature.

Exceeding the maximum permitted ambient temperature may damage the unit.

Make sure that the maximum permitted ambient temperature is not exceeded and that the air can flow freely through the louvers. Do not expose the unit to direct sunlight.

3.2.1 Desktop unit

In order to use the Vacuum Gauge Controller as a desk-top unit, proceed as follows:

1 Turn the Vacuum Gauge Controller upside down as shown in Fig. 3-1, 10

2 Push the supplied rubber strip onto the lower edge of the front panel

3 Stick the supplied rubber feet to the bottom of the casing

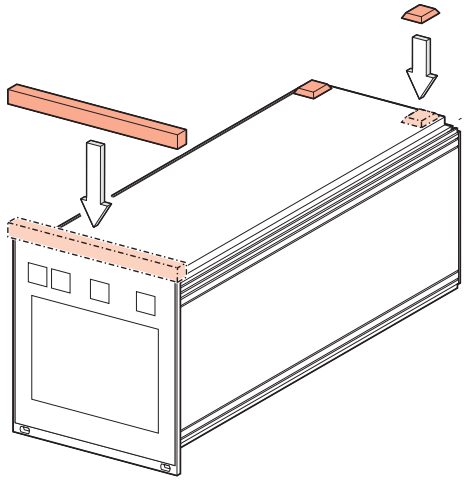

Fig. 3-1 Using the product as a desk-top unit

4 Turn the Vacuum Gauge Controller back to normal orientation and place it on the required location

3.2.2 Control panel mounted

In order to mount the unit in a control panel, the following cutout is required:

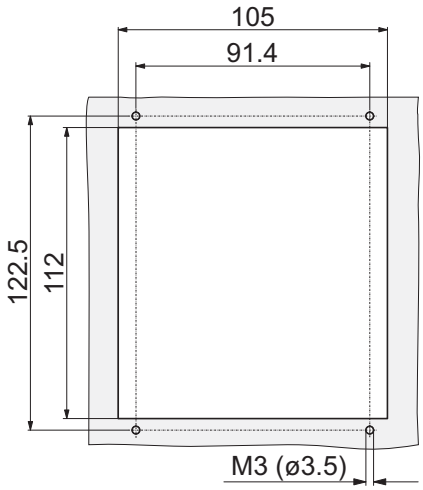

Fig. 3-2 Control panel cutout (in mm)

1 Insert the Vacuum Gauge Controller into the cutout

2 Fasten the unit with four M3 screws

NOTE:
In order to reduce the strain on the front panel it is recommended to support the bottom of the unit.

3.2.3 Mounting the unit in a rack

The Vacuum Gauge Controller is designed for installation into a rack chassis adapter according to DIN 41 494 (19", 3 HE). For this purpose, 4 collar screws and 4 plastic sleeves are supplied with the unit.

⚠WARNING

Lower protection class of the rack.

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection from foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.

Take appropriate measures to restore the required protection class of the rack.

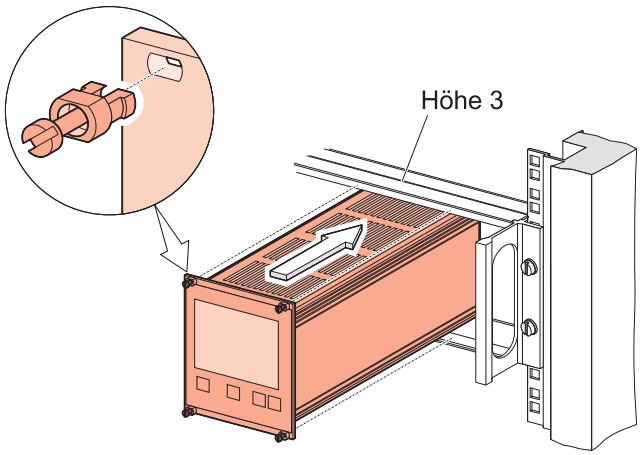

Fig. 3-3 Mounting the unit in a rack

NOTE:
In order to reduce the strain on the front panel it is recommended to equip the rack chassis adapter with a guide rail.

NOTE:
For safe and easy installation of heavy rack chassis adapters, it is recommended to equip the rack frame with slide rails.

1 Fasten the rack chassis adapter in the rack

2 Insert the Vacuum Gauge Controller into the rack chassis adapter

3 Fasten the Vacuum Gauge Controller with the supplied collar screws and plastic sleeves to the rack chassis adapter

3.3 Connecting

3.3.1 Back side of the device

Fig. 3-4, 🗎 11 shows the back side of the VGC403. The connection for channel 3 (Pos. C) is not available in the VGC402.

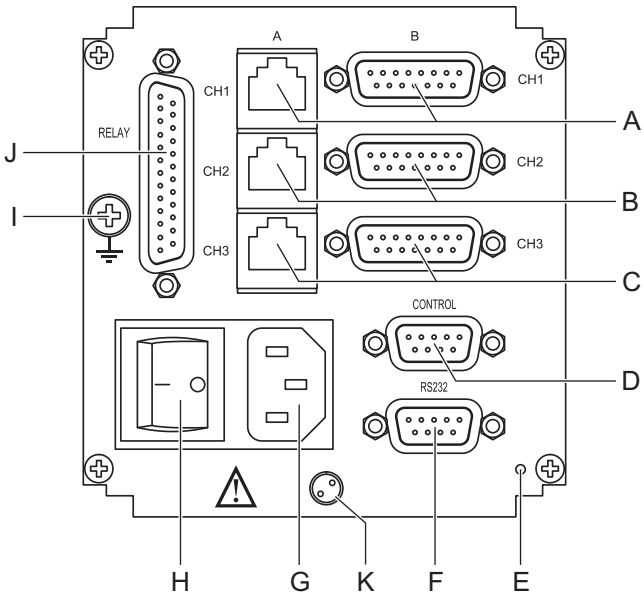

Fig. 3-4 Back side of the VGC403

A Sensor connection, channel 1
B Sensor connection, channel 2
C Sensor connection, channel 3
D CONTROL connection
E Switch for program transfer mode
F RS232C connection
G Mains connection / disconnecting device
H Mains switch
I Ground screw
J RELAY connection
K Screw for internal protective conductor. Do not loosen this screw!

⚠WARNING

Screw for internal protective conductor.

The internal protective conductor is connected to the casing with a screw (Pos. K).

Do not turn or loosen this screw.

The configuration of the available connections is described in the following sections.

3.3.2 Mains connection

The mains connection (Fig. 3-4, 🗎 11, Pos. G) is designed for a mains cable which contains a European appliance connector on the device side.

A mains cable is supplied with the unit. If the plug is not compatible with your wall socket, you have to get a suitable mains cable:

- Three-conductor cable with protective ground
- Conductor cross-section 3 × 1.5 mm^2 or larger

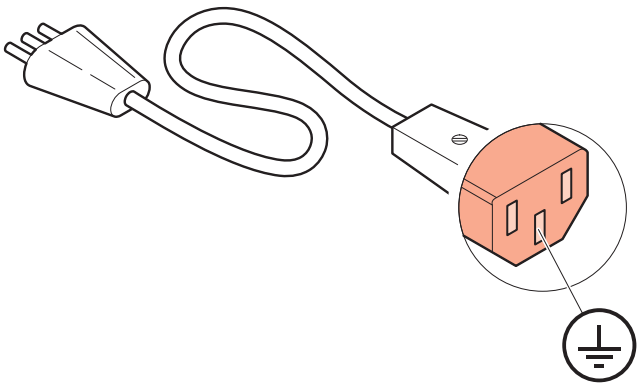

Fig. 3-5 Three-conductor cable with protective ground (example)

⚠WARNING

Mains power.

Improperly grounded devices can be extremely dangerous in the event of a fault.

Use three-wire mains or extension cables with protective ground only. Plug the mains cable into wall sockets with protective ground only.

⚠WARNING

No mains fuse.

The Vacuum Gauge Controller is not equipped with a mains fuse.

The wall socket must be protected with a fuse (max. 10 A).

1 Connect the European appliance connector of the mains cord with the mains connection of the unit

2 Connect the plug of the mains cable with the wall socket

NOTE:
If the unit is installed in a switching cabinet, the mains power can be supplied via a switchable central power distributor.

3.3.3 Ground

The ground screw (Fig. 3-4, 🗎 11, Pos. I) can be used to connect the Vacuum Gauge Controller with the protective ground of the pumping station.

1 If required: Connect the protective ground of the pumping station with the ground screw. Use a protective conductor.

3.3.4 SENSOR

The SENSOR connection is used to connect the sensors.

For each channel, there are two connections available which are connected in parallel: An 8-pin RJ45 appliance socket and a 15-pin D-Sub appliance socket. See Fig. 3-4, 🗎 11, Pos. A…C.

Pin assignment

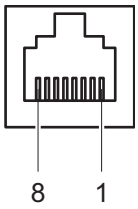

Fig. 3-6 SENSOR appliance socket (RJ45)

1 +24 VDC	*5 Signal-GND*
2 PGND	*6 Status*
3 Signal	*7 HV_L*
4 Ident	*8 HV_EMI*

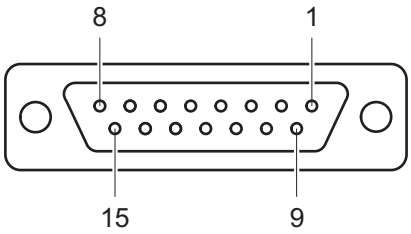

Fig. 3-7 SENSOR appliance socket (D-Sub, 15-pin)

1 EMI-Status	*9 n.c.*
2 Signal	*10 Ident*
3 Status	*11 Supply_CDG*
4 HV_EMI	*12 Signal-GND*
5 PGND	*13 RXD*
6 n.c.	*14 TXD*
7 Degas	*15 Chassis*
8 Supply	

⚠CAUTION

Improper sensor.

Sensors which are not designed for use with the Vacuum Gauge Controller may damage the unit.

Operate the Vacuum Gauge Controller with proper sensors only. See Chapter 2.3.1 Sensor connections, 🗎 8.

⚠CAUTION

Multiple connection.

Only one sensor may be connected to each of the channels. Otherwise the connected sensors will be damaged.

Never connect more than one sensor per channel.

Connecting

1 Channel 1: Connect the sensor with to the CH1-A or CH1-B connection. Use a shielded 1:1 cable.

2 Channel 2: Connect the sensor with to the CH2-A or CH2-B connection. Use a shielded 1:1 cable.

3 Channel 3: Connect the sensor with to the CH3-A or CH3-B connection. Use a shielded 1:1 cable.

3.3.5 RELAY

The switching functions and the error monitoring system influence the state of several relays inside of the Vacuum Gauge Controller. The RELAY connection (Fig. 3-4, 🗎 11, Pos. J) allows to utilize the relay contacts for switching purposes. The relay contacts are potential-free (floating).

Pin assignment

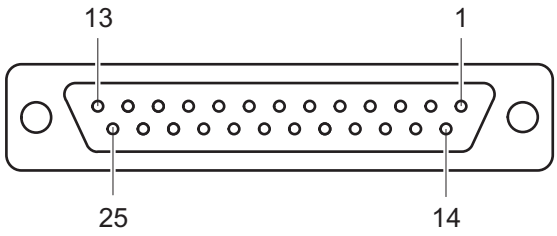

Fig. 3-8 RELAY appliance socket (D-Sub, 25-pin)

1 GND
2 n.c.
3 Error break contact (NC)
4 SP 1 break contact (NC)
5 SP 1 common contact (COM)
6 SP 1 make contact (NO)
7 GND
8 SP 2 break contact (NC)
9 SP 2 common contact (COM)
10 SP 2 make contact (NO)
11 SP 3 break contact (NC)
12 SP 3 common contact (COM)
13 SP 3 make contact (NO)
14 Error make contact (NO)
15 Error common contact (COM)
16 SP 4 break contact (NC)
17 SP 4 common contact (COM)
18 SP 4 make contact (NO)
19 SP 5 break contact (NC)
20 SP 5 common contact (COM)
21 SP 5 make contact (NO)
22 SP 6 break contact (NC)
23 SP 6 common contact (COM)
24 SP 6 make contact (NO)
25 +24 VDC, 200 mA. Meets the requirements of a ground protective extra low voltage (SELV)

n.c. not connected
COM common contact
NC break contact (normally closed)
NO make contact (normally open)

NOTE:
Pin 25 is used for supplying relays with a higher breaking capacity. The supply contact is protected at 200 mA with a PTC element. The element is self-resetting when switching the unit off or unplugging the RELAY connector.

⚠WARNING

Hazardous voltage.

Voltages above 60 VDC or 30 VAC pose a shock hazard.

The RELAY connection may be used for switching voltages of max. 60 VDC or 30 VAC only. These voltages must meet the requirements of a ground protective extra low voltage (SELV).

1 Connect the peripheral components with the RELAY connection. Use a shielded connection cable.

3.3.6 CONTROL

The CONTROL connection (Fig. 3-4, 🗎 11, Pos. D) contains the following signal pins:

- Analog outputs for the signals of the individual channels
- Recorder output. This is a programmable analog output which can be assigned to one of the three channels.
- HV-EMI. Used to switch the high-vacuum circuit of the PEG sensor on and off. The signal levels are: On = +24 V. Off = 0 V. See Reference [7].

Pin assignment

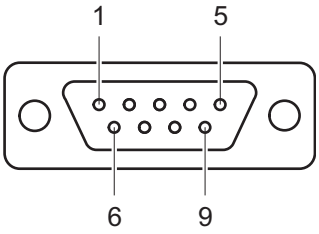

Fig. 3-9 CONTROL appliance plug (D-Sub, 9-pin)

1 Analog output 1	*6 Analog output 2*
2 Analog output 3	*7 Recorder output*
3 GND	*8 GND*
4 HV-EMI 3	*9 HV-EMI 2*
5 HV-EMI 1	

1 Connect the peripheral components with the CONTROL connection. Use a shielded connection cable.

NOTE:
The analog outputs (pins 1, 2, 6) differ from the displayed values by no more than ±50 mV.

3.3.7 RS232C

The RS232C serial interface (Fig. 3-4, 🗎 11, Pos. F) allows remote control of the unit via a computer or a terminal. See Chapter 6 Computer interface, 🗎 32.

In addition, the interface may be used for firmware updates. See Chapter 7.2 Program transfer mode, 🗎 45.

Pin assignment

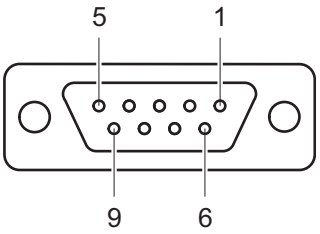

Fig. 3-10 RS232C appliance socket (D-Sub, 9-pin)

1 n.c. / SUP	*6 DSR*
2 TXD	*7 n.c.*
3 RXD	*8 CTS*
4 n.c.	*9 GND*
5 GND	

1 Connect the serial interface of the computer with the RS232C connection. Use a shielded cable.

NOTE:
Use a serial extension cable with a 9-pin plug and a 9-pin socket. The cable must not contain any crossed wires.

4 Operation

4.1 Front panel

Fig. 4-1, 🗎 15 shows the front panel of the VGC403. The VGC402 is not equipped with the switching points SP5 and SP6 (Pos. A) and the display for the channel 3 (Pos. F).

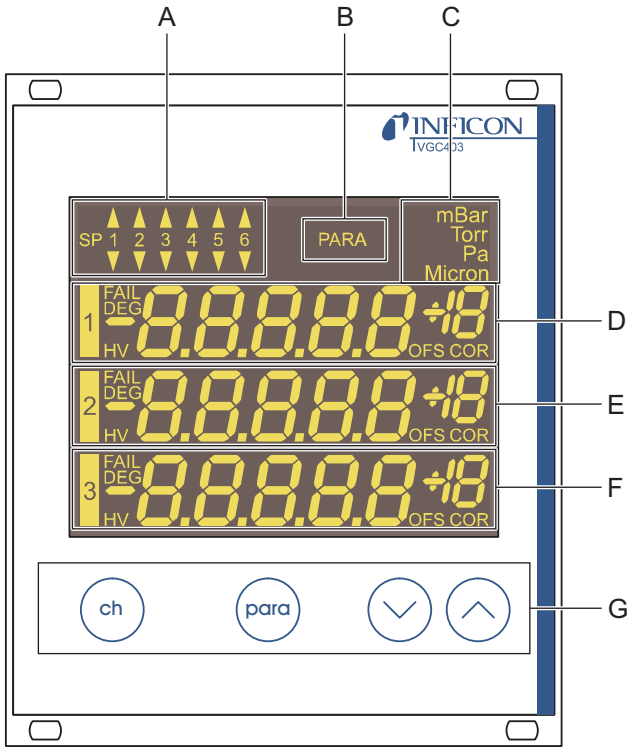

Fig. 4-1 Front panel of the VGC403

A Switching function indicator
B Parameter mode
C Pressure unit
D Display area for channel 1
E Display area for channel 2
F Display area for channel 3
G Control buttons

4.1.1 Display

Switching functions
The top left corner (Pos. A) of the display indicates the switching function states. An illuminated triangle above a number indicates that the pressure is above the lower threshold value. An illuminated triangle below a number indicates that the pressure is below the upper threshold value. See Fig. 5-1, 🗎 21.

Parameter mode
The PARA indicator (Pos. B) is illuminated when the unit is set to the parameter mode.

Pressure unit
The top right corner (Pos. C) of the display indicates the pressure unit: mbar, Torr, Pa, or Micron.

Channels
There is a separate display area for each of the available channels (Pos. D, E, F). From the left to the right, this area displays the following information:

Display	Significance
1, 2, 3	Channel number
FAIL (flashing)	Error
DEG (illuminated)	Degas function is activated
HV (illuminated)	High-vacuum circuit is activated
-8.8.8.8.8^{+18}	Measurement or status message
OFS (illuminated)	Offset correction is activated
COR (illuminated)	Gas type correction is activated

4.1.2 Control buttons

CH
The CH button is used to select a channel. This may be necessary e.g. if you want to switch a particular sensor on or off, or if you want to modify the sensor parameters. The number of the currently selected channel is flashing for a few seconds.

PARA
The PARA button is used to select the parameter mode. The PARA indicator (Pos. B) is illuminated and you can modify various parameters. See Chapter 4.5 Parameter mode, 🗎 19.

Arrow buttons (DOWN/UP)
The arrow buttons are required for entering data in the parameter mode. Pressing one of these buttons will decrease or increase the currently displayed value. In the following, these buttons will be referred to as DOWN and UP, respectively.

4.2 Switching on and off

4.2.1 Switching on

1 Switch the mains switch on. See Fig. 3-4, 🗎 11, Pos. H.

After switching on, the Vacuum Gauge Controller will perform the following actions:

- Self test
- Identify all sensors
- Restore the previously set parameters
- Activate measurement mode
- Adapt parameters (if a sensor type has changed meanwhile)

4.2.2 Switching off

1 Switch the mains switch off. See Fig. 3-4, 🗎 11, Pos. H.

4.2.3 Waiting time

⚠CAUTION

Delay time.

After switching off, the Vacuum Gauge Controller requires approximately 10 seconds to initialize again.

Wait for at least 10 seconds before you switch the Vacuum Gauge Controller on again.

NOTE:
If the Vacuum Gauge Controller has been installed in a control panel or a rack, it can also be switched on and off via the central power distributor.

4.3 Operating modes

The Vacuum Gauge Controller can be set to one of the following operating modes:

Measurement mode
The measurement mode is the standard operating mode. It displays the pressure readings of the sensors. In case of an error, a status message is displayed instead. See Chapter 4.4 Measurement mode, 🗎 17.

Parameter mode
The parameter mode gives you access to various parameters. You can check the parameter settings or modify them using the arrow buttons. This allows you to configure the Vacuum Gauge Controller. See Chapter 4.5 Parameter mode, 🗎 19.

Program transfer mode
The program transfer mode is used to transfer the latest version of the firmware to the Vacuum Gauge Controller. See Chapter 7.2 Program transfer mode, 🗎 45.

4.4 Measurement mode

4.4.1 Selection

The Vacuum Gauge Controller automatically selects the measurement mode after it has been switched on.

When the unit is set to the parameter mode, it will automatically return to the measurement mode if no button is pressed for 10 seconds.

4.4.2 Description

The measurement mode is the standard operating mode. It displays the pressure readings of the sensors. A status message is displayed if the pressure exceeds the permissible range. See Tab. 4-1, 🗎 17.

Display	Pressure
Er Hi	Significantly above the permissible range The FAIL indicator flashes The error signal relay switches
Reading	In the permissible range
Er Lo	Significantly below the permissible range The FAIL indicator flashes The error signal relay switches
Er x	Error message of BPG400/HPG x = Error code (High-Byte)
Er xx	Error message of BCG, BPG402 xxH = Error code
noSEn	See Tab. 4-2, 🗎 18
noid	See Tab. 4-2, 🗎 18
oFF	See Tab. 5-14, 🗎 30
Hot	See Chapter 5.2.6, 🗎 25
SELF	See Chapter 5.2.8, 🗎 25
CH 1	See Chapter 5.2.8, 🗎 25
CH 2	See Chapter 5.2.8, 🗎 25
CH 3	See Chapter 5.2.8, 🗎 25
LoC	See Chapter 5.4.5, 🗎 30

Tab. 4-1 Display when in measurement mode

Channels which are not connected to a sensor display noSEn. This status message disappears after approximately two minutes.

4.4.3 Control button functions

4.4.3.1 Selecting a channel

1 Press the CH button

Fig. 4-2 Pressing the CH button

The unit selects the next channel. The number of the selected channel is flashing for a few seconds.

4.4.3.2 Selecting parameter mode

1 Press the PARA button

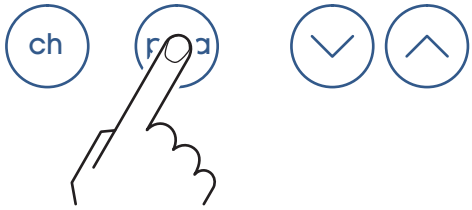

Fig. 4-3 Pressing the PARA button

The unit changes to the parameter mode. See Chapter 4.5 Parameter mode, 🗎 19. It will automatically return to the measurement mode if no button is pressed for 10 seconds.

4.4.3.3 Switching high-vacuum circuit on

The high-vacuum circuit of the following sensors can be switched on manually: PEG.

For this purpose the sensor control must be set to HAnd. See Chapter 5.2.6 Sensor activation (S-on), 🗎 25.

1 Press the CH button to select the required channel

2 Keep the UP button pressed for approximately 1 second

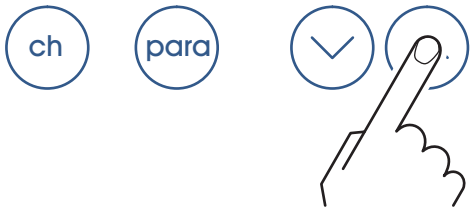

Fig. 4-4 Press the UP button for 1 second

The sensor on the selected channel is switched on. The HV indicator is illuminated. The display shows the pressure reading or a status message. See Tab. 4-1, 🗎 17.

4.4.3.4 Switching degas function on

The degas function of the following sensors can be switched on manually: BPG, BCG.

1 Press the CH button to select the required channel

2 Keep the UP button pressed for approximately 1 second. See Fig. 4-4, 🗎 17.

The degas function of the sensor on the selected channel is switched on. The DEG indicator is illuminated.

4.4.3.5 Switching high-vacuum circuit off

The high-vacuum circuit of the following sensors can be switched off manually: PEG.

For this purpose the sensor control must be set to HAnd. See Chapter 5.2.8 Sensor deactivation (S-oFF), 🗎 25.

1 Press the CH button to select the required channel

2 Keep the DOWN button pressed for approximately 1 second

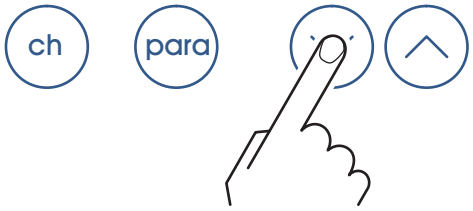

Fig. 4-5 Press the DOWN button for 1 second

The sensor on the selected channel is switched off. The HV indicator is dark. The display shows the status oFF.

4.4.3.6 Switching degas function off

The degas function of the following sensors can be switched off manually: BPG, BCG.

1 Press the CH button to select the required channel

2 Keep the DOWN button pressed for approximately 1 second. See Fig. 4-5, 🗎 18.

The degas function of the sensor on the selected channel is switched off. The DEG indicator is dark.

4.4.3.7 Identifying a sensor

1 Keep the UP and DOWN buttons pressed for approximately 1 second

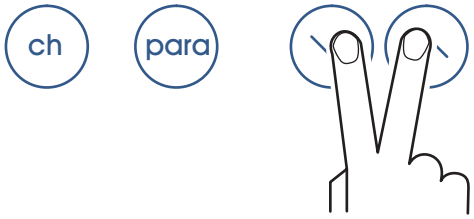

Fig. 4-6 Press the UP and DOWN buttons for 1 second

The display area of the individual sensor shows the connected sensors. See Tab. 4-2, 🗎 18.

Display	Significance
PSG	Pirani gauge (PSG)
PCG	Combined gauge Pirani / Capacitance (PCG)
PEG	Cold cathode gauge (PEG)
MPG	Combined gauge Cold cathode / Pirani (MPG)
CDG	Capacitive analog gauge, linear (CDG025, CDG045, CDG100)
CDG d	Capacitive digital gauge, linear (CDG025D, CDG045D, CDG100D, CDG160D)
bPG	Combined gauge Hot ionization / Pirani (BPG400)
bPG2	Combined gauge Hot ionization / Pirani (BPG402)
bCG	Combined gauge Hot ionization / Pirani / Capacitance
HPG	Combined gauge Hot ionization / Pirani (HPG)
noSEn	No sensor found
noid	No sensor identification found

Tab. 4-2 Sensor identification

NOTE:
In the case of BPG/BCG/HPG sensors, the software version number of the sensor is also shown (e.g. 1.20).

4.5 Parameter mode

4.5.1 Selection

Pressing the PARA button switches from the measurement mode to the parameter mode. The PARA indicator is illuminated.

When the unit is set to the parameter mode, it will automatically return to the measurement mode if no button is pressed for 10 seconds. The PARA indicator is dark.

4.5.2 Parameter groups

The parameter mode gives you access to various parameters. You can check the parameter settings or modify them using the arrow buttons. This allows you to configure the Vacuum Gauge Controller.

Tab. 4-3, 🗎 19 shows all available parameters.

Parameter group	Parameter
PArA SP	SP1-L SP1-H SP2-L SP2-H SP3-L SP3-H SP4-L SP4-H SP5-L SP5-H SP6-L SP6-H
PArA SEn	FiLt GAS FS oFS dEGAS S-on S-oFF EMi FiL PrE
PArA GEn	unit bAud diGit dEF Ao Err-r
PArA tESt	Pnr dt-C tr-L LoC rA-t EP-t EE-t di-t Ad-S Ad-i CALib io-t rS-t

Tab. 4-3 Parameter groups and their parameters

The available parameters are subdivided into the following parameter groups:

Switching function parameters (PArA SP)
These parameters are used to assign pressure dependent switching functions to the channels. The switching points 5 and 6 are only available in the VGC403. See Chapter 5.1 Switching function parameters (PArA SP), 🗎 21.

Sensor parameters (PArA SEn)
These parameters concern the sensor on the currently selected channel only. There is an individual set of parameters for each channel. See Chapter 5.2 Sensor parameters (PArA SEn), 🗎 23.

General parameters (PArA GEn)
These parameters are used for general configuration of the unit. The parameters affect all channels. See Chapter 5.3 General parameters (PArA GEn), 🗎 27.

Test parameters (PArA tESt)
This parameter group is used to check individual system functions. The parameter group is not required during normal operation. For this reason it must be accessed in a special way. See Chapter 5.4 Test parameters (PArA tESt), 🗎 29.

4.5.3 Basic operation

Starting at the measurement menu, you can select and modify a specific parameter as follows:

1 Press the CH button to select the required channel. (This is only necessary if you want to modify a sensor parameter.)

2 Press the PARA button
- The parameter menu is selected
- The PARA indicator is illuminated

3 Use the arrow buttons to select the required parameter group
- The name of the parameter group is displayed

4 Press the PARA button to select the required parameter
- The name and the value of the parameter are displayed

5 Use the arrow keys (and the CH button, if necessary) to modify the parameter value
- The value of the parameter is changed

6 Repeat the steps 4 and 5 to change further parameters of the same parameter group

The unit returns to the measurement mode after the last parameter of a parameter group has been accessed. Parameter modifications are effective immediately, and they are saved in the EEPROM automatically.

5 Parameter

5.1 Switching function parameters (PArA SP)

This parameter group allows you to configure the switching functions. The following switching function parameters are available in the VGC402:

- SP1-L
- SP1-H
- SP2-L
- SP2-H
- SP3-L
- SP3-H
- SP4-L
- SP4-H

In addition, the VGC403 is equipped with the following switching function parameters:

- SP5-L
- SP5-H
- SP6-L
- SP6-H

5.1.1 Fundamental terms

Switching functions
The VGC402 is equipped with four relays which switch in dependance of the measured pressure. The relay contacts are potential-free and can be used for switching via the RELAY connection. See Chapter 3.3.5 RELAY, 13. In this context we speak of the switching functions 1…4.

The VGC403 contains a total of six switching function relays, i.e. the switching functions 1…6 are available in this unit.

Threshold values
The switching behavior of the individual relays is determined by two parameters each: The lower threshold value and the upper threshold value of the switching function.

- Lower threshold value SP-L:
  The lower threshold value is responsible for activating the assigned switching function. The relay switches on as soon as the pressure falls below the lower threshold value. This means that the common contact of the relay is connected to the make contact.
- Upper threshold value SP-H:
  The upper threshold value is responsible for deactivating the assigned switching function. The relay switches off as soon as the pressure rises above the upper threshold value. This means that the common contact of the relay is connected to the make contact.

Hysteresis
In the pressure range between the two threshold values, the previous relay state is maintained. The relay does not switch in this range, and the relay state depends on the pressure curve history. See Fig. 5-1, 21.

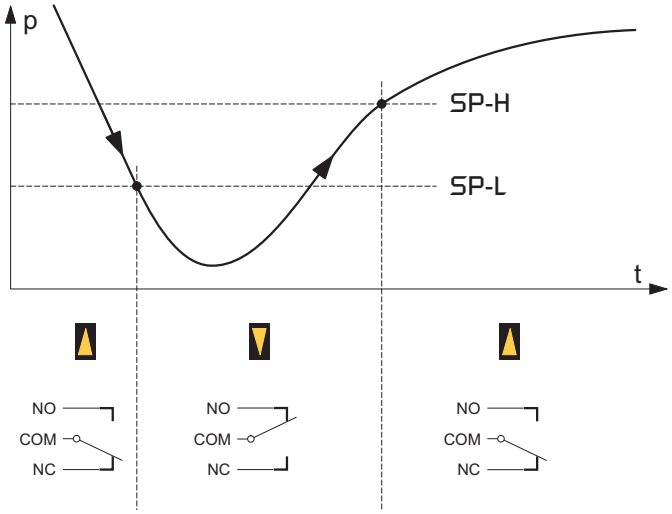

Fig. 5-1 Behaviour of a switching function when the pressure changes

p Pressure
t Time
NO make contact (normally open)
COM common contact
NC break contact (normally closed)

The region between the threshold values generates a hysteresis (lag) between activating and deactivating of the relay. The hysteresis prevents the switching function from rapidly switching on and off when the pressure is close to one of the threshold values.

5.1.2 Configuring switching functions

Prerequisite: The parameter group SP-P is selected

1 Press the PARA button to select the required parameter
- The name and the value of the parameter are displayed

2 Use the CH button to assign the switching function to a channel
- The switching functions can be assigned to the channels any way
- The two threshold values of the switching function are always assigned to the same channel

3 Use the arrow buttons to modify the threshold value
- The value of the parameter is changed

4 Repeat the steps 1 to 3 to change further parameters of the same parameter group

5.1.3 Adjustment range

Adjustment range of the lower threshold value
The lower threshold value of a switching function can be set in the following pressure range:

Sensor	SP-L min. [mbar]	SP-L max. [mbar]
PSG	2×10^{-3} *)	5×10^{2}
PCG	2×10^{-3} *)	1.5×10^{3}
PEG	1×10^{-9}	1×10^{-2}
MPG	5×10^{-9}	5×10^{2}
CDG/CDG d	FS/1000	FS
bPG/bPG2	1×10^{-8}	5×10^{2}
HPG	1×10^{-6}	1×10^{3}
bCG	1×10^{-8}	1.5×10^{3}

Tab. 5-1 Adjustment range of the lower threshold values

**) 2×10^{-4} mbar if PrE is activated (see Chapter 5.2.12, 26)*

Adjustment range of the upper threshold value
The upper threshold value of a switching function can be set in the following pressure ranges:

Sensor	SP-H min. [mbar]	SP-H max. [mbar]
PSG	1.1 SP-L	5×10^{2}
PCG	1.1 SP-L	1.5×10^{3}
PEG	1.1 SP-L	1×10^{-2}
MPG	1.1 SP-L	5×10^{2}
CDG/CDG d	SP-L + 0.01 FS	FS
bPG/bPG2	1.1 SP-L	5×10^{2}
HPG	1.1 SP-L	1×10^{3}
bCG	1.1 SP-L	1.5×10^{3}

Tab. 5-2 Adjustment range of the upper threshold values

This means that the hysteresis amounts to 10 % of the lower threshold value (logarithmic sensors) or to 1 % of the full-scale range (linear sensors) at least. If another sensor type is connected to a channel, the respective threshold values will be adjusted automatically if necessary.

5.2 Sensor parameters (PArA SEn)

There is an individual set of sensor parameters for each channel. Select the required channel before you change to the parameter menu and modify the sensor parameters.

The number of available parameters depends on the sensor type which is connected to the selected channel. See Tab. 5-3, 🗎 23.

Sensor	FiLt	GAS	FS	oFS	dEGAS	S-on	S-oFF	EMi	FiL	PrE
PSG	✓	✓								✓
PCG	✓	✓								✓
PEG	✓	✓				✓	✓			
MPG	✓	✓								
CDG	✓		✓	✓						
CDG d	✓		✓	✓						
bPG		✓			✓					
bPG2		✓			✓			✓	✓	
bCG		✓			✓			✓		
HPG		✓								

Tab. 5-3 Available sensor parameters

5.2.1 Measurement filter (FiLt)

The measurement filter improves measurements when the signal is noisy or disturbed. The filter affects the readings on the display, the RS232C output, the recorder output, and the switching functions. The analog outputs, however, are not affected.

The filter can be set to one of the following values:

FASt
Fast. The Vacuum Gauge Controller responds quickly to signal changes. This makes it rather sensitive to signal noise.

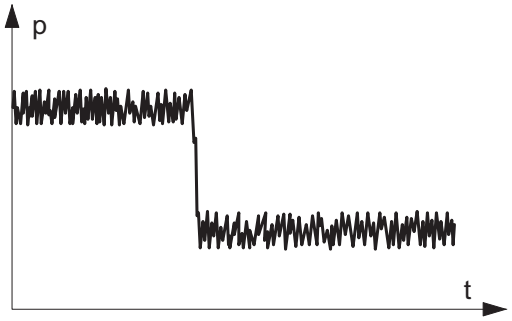

Fig. 5-2 Measurement with filter set to FASt (example)

nor
Normal. This is the default setting. It offers a good compromise between the response time and the sensitivity to noise.

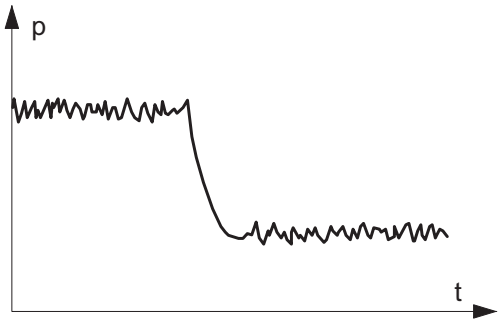

Fig. 5-3 Measurement with filter set to nor (example)

SLo
Slow. The Vacuum Gauge Controller responds slowly to signal changes. This makes it less sensitive to signal noise. This setting is recommended for precise comparison measurements.

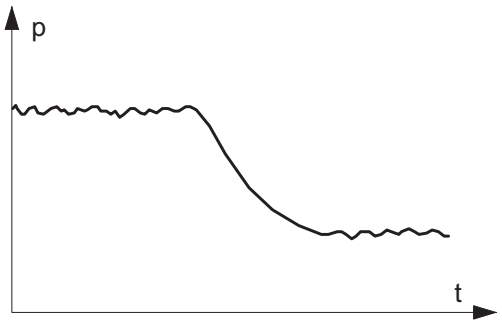

Fig. 5-4 Measurement with filter set to SLo (example)

5.2.2 Gas type (GAS)

Sensors are normally calibrated for a measurement in nitrogen or in air. The GAS parameter is used to configure the channel to other gas types.

Display	Significance
n2	Nitrogen or air. No correction of any kind is required.
Ar	Argon. The pressure reading is determined utilizing a correction factor for argon. COR is illuminated.
H2	Hydrogen. The pressure reading is determined utilizing a correction factor for hydrogen. COR is illuminated.
Cor	Other gases. The pressure reading is determined utilizing a variable correction factor. COR is illuminated.

Tab. 5-4 GAS parameter settings

Cor
If you want to perform pressure measurements in a gas type without a fixed correction factor, you may multiply the pressure reading with a variable correction factor. To this end proceed as follows:

1 Set the GAS parameter to Cor

2 Press the PARA button
- The correction factor is displayed

3 Use the arrow buttons the modify the correction factor
- The value of the parameter is changed
- The COR indicator is illuminated

You can adjust the correction factor of a sensor in the range 0.10…9.99. The setting 1.00 returns the uncorrected pressure reading.

NOTE:
The gas type correction is effective only for the following pressures: p < 10^{-2} mbar (BPG/HPG/MPG sensor), p < 10 mbar (PCG sensor), p < 1 mbar (BCG sensor).

5.2.3 Measuring range (FS)

Linear sensors (CDG) require specification of the full-scale range. You can set this value using the cursor buttons. The following values are available:

- 0.01 mbar
- 0.01 Torr, 0.02 Torr, 0.05 Torr
- 0.10 mbar, 0.25 mbar, 0.50 mbar
- 0.10 Torr, 0.25 Torr, 0.50 Torr
- 1 mbar, 2 mbar, 5 mbar
- 1 Torr, 2 Torr, 5 Torr
- 10 mbar, 20 mbar, 50 mbar
- 10 Torr, 20 Torr, 50 Torr
- 100 mbar, 200 mbar, 500 mbar
- 100 Torr, 200 Torr, 500 Torr
- 1000 mbar, 1100 mbar
- 1000 Torr
- 2 bar, 5 bar, 10 bar, 50 bar

5.2.4 Offset (oFS)

When the offset correction is activated, a previously specified offset value will be subtracted from each pressure reading. This allows to conveniently measure the relative pressure with respect to a reference pressure.

The offset correction affects the readings on the display, the RS232C output, the recorder output, and the switching functions. The analog outputs, however, are not affected.

Establishing an offset value and activating the offset correction

1 Select the oFS parameter

2 Keep the UP button pressed for approximately 2 seconds
- The current pressure reading becomes the new offset value
- The offset correction is activated
- The OFS indicator is illuminated

Deactivating the offset correction

1 Select the oFS parameter

2 Press the DOWN button
- The offset correction is deactivated
- The display shows oFF
- The OFS indicator is dark

Activating the offset correction

1 Select the oFS parameter

2 Press the UP button
- The offset correction is activated
- The OFS indicator is illuminated

NOTE:
Always deactivate the offset correction before adjusting the offset of a sensor.

Adjusting the zero point of a digital CDG

1 Select the oFS parameter

2 Keep the DOWN button pressed for approximately 2 seconds
- The zero point of the sensor is adjusted
- The OFS indicator is illuminated after >2 s and as long as the button is being pressed

NOTE:
First adjust the sensor, then the Vacuum Gauge Controller.

NOTE:
After adjusting the zero point, a zero value is displayed. Due to the measuring resolution of the CDG (noise, drift), a zero with plus/minus several digits are displayed.

5.2.5 Degas function (dEGAS)

Ionization sensors with a hot cathode are sensitive with regard to depositions on the electrodes. These depositions can cause signal fluctuations.

The dEGAS function is to bakeout and thereby clean the electrode system of the sensor. See Reference [11].

BPG402 gauge:
The dEGAS function only affects the currently active filament. See Reference [15].

Activating the degas function

1 Select the dEGAS parameter

2 Press the UP button
- The degas function is activated
- The display shows on
- The DEG indicator is illuminated

The cleaning process takes approximately 3 minutes. Then the degas function switches off automatically. You may also deactivate this function manually.

Deactivating the degas function

1 Select the dEGAS parameter

2 Press the DOWN button
- The degas function is deactivated
- The display shows oFF
- The DEG indicator is dark

5.2.6 Sensor activation (S-on)

This parameter determines how the sensor is switched on. The sensor activation can be set to one of the following values:

HAnd
Manually. The sensor can be switched on by pressing the UP button. See Chapter 4.4.3.3 Switching high-vacuum circuit on, 🗎 17.

Hot
Hot start. The sensor automatically switches on when the unit is switched on. After a power failure the measurement will be resumed automatically.

CH 1
By channel 1. The subsequent parameter t-on is used to specify the switch-on threshold. The sensor is switched on when the pressure on channel 1 falls below the switch-on threshold.

CH 2
By channel 2. The subsequent parameter t-on is used to specify the switch-on threshold. The sensor is switched on when the pressure on channel 2 falls below the switch-on threshold.

CH 3
By channel 3. This setting is only available if the unit is equipped with three channels. The subsequent parameter t-on is used to specify the switch-on threshold. The sensor is switched on when the pressure on channel 3 falls below the switch-on threshold.

5.2.7 Switch-on threshold (t-on)

This parameter is only available if the sensor activation parameter is set to CH 1, CH 2 or CH 3. See Chapter 5.2.6 Sensor activation (S-on), 🗎 25.

The t-on parameter is used to specify a switch-on threshold. The sensor is switched on when the pressure on the respective channel falls below the switch-on threshold.

5.2.8 Sensor deactivation (S-oFF)

This parameter determines how the sensor is switched off. The sensor deactivation can be set to one of the following values:

HAnd
Manually. The sensor can be switched off by pressing the DOWN button. See Chapter 4.4.3.5 Switching high-vacuum circuit off, 🗎 18.

SELF
Self control. The subsequent parameter t-off is used to specify the switch-off threshold. The sensor is switched off when the pressure at the sensor exceeds the switch-off threshold.

CH 1
By channel 1. The subsequent parameter t-off is used to specify the switch-off threshold. The sensor is switched off when the pressure on channel 1 exceeds the switch-off threshold.

CH 2
By channel 2. The subsequent parameter t-off is used to specify the switch-off threshold. The sensor is switched

off when the pressure on channel 2 exceeds the switch-off threshold.

CH 3
By channel 3. This setting is only available if the unit is equipped with three channels. The subsequent parameter t-oFF is used to specify the switch-off threshold. The sensor is switched off when the pressure on channel 3 exceeds the switch-off threshold.

5.2.9 Switch-off threshold (t-oFF)

This parameter is only available if the sensor deactivation parameter is set to CH 1, CH 2 or CH 3. See Chapter 5.2.8 Sensor deactivation (S-oFF), 🗎 25.

The t-oFF parameter is used to specify a switch-off threshold. The sensor is switched off when the pressure on the respective channel exceeds the switch-off threshold.

5.2.10 Emission (EMi)

This parameter defines the rules for switching the emission on.

Display	Significance
Auto	Emission is switched on and off by the sensor electronics
MAn	Emission is switched on and off manually

Tab. 5-5 EMi parameter values

5.2.11 Filament selection (FiL)

This parameter defines the rules for selecting the active filament.

Display	Significance
Auto	The sensor alternately selects one of the two filaments
Fil 1	Filament 1 ist active
Fil 2	Filament 2 ist active

Tab. 5-6 FiL parameter values

5.2.12 Pirani range extension (PrE)

Extend the display and the setpoint adjustment range.

Display	Significance
oFF	Normal operation
on	Range extension: • Display down to 5×10^{-5} mbar • Setpoint adjustment range down to 2×10^{-4} mbar

Tab. 5-7 PrE parameter values

5.3 General parameters (PArA GEn)

These parameters are used for general configuration of the unit. The parameters affect all channels.

5.3.1 Unit of measurement (unit)

Unit of measurement for pressure values. The unit affects displayed pressure readings, threshold values, etc.

Display	Significance
bAr	Pressure unit mbar or bar
torr	Pressure unit Torr
PASC	Pressure unit Pascal
uC	Pressure unit Micron

Tab. 5-8 unit *parameter values*

The unit of measurement is indicated on the display. See Fig. 4-1, 🗎 15, Pos. C. For information on common pressure units refer to Section «Conversion tables», 🗎 50.

NOTE:
The pressure unit «Torr» can be locked. In this case torr is not available for selection. See Chapter 5.4.4 Torr lock (tr-L), 🗎 30.

5.3.2 Baud rate (bAud)

Transfer rate of the RS232C interface.

Display	Significance
9600	9600 Baud
19200	19200 Baud
38400	38400 Baud

Tab. 5-9 bAud *parameter values*

5.3.3 Display format (diGit)

Number of digits shown in the display.

Display	Significance
2	Two digits e.g. 2.5^{-1} or 370
3	Three digits e.g. 2.47^{-1} or 373

Tab. 5-10 diGit *parameter values*

NOTE:
The diGit parameter has no effect on CDG sensors.

NOTE:
When PrE is enabled, the display of PSG and PCG gauges in the pressure range p < 10^{-4} mbar is reduced by one digit.

5.3.4 Default parameters (dEF)

Reset all parameters to the default values (factory settings). Please note that this action cannot be undone.

Proceed as follows to reset the parameters:

1. Select the dEF parameter
2. Press both the UP and the DOWN button at the same time
   - The display shows SEt
   - All parameters are reset to the default values

5.3.5 Recorder output (Ao)

The recorder output is a programmable analog output. The recorder output voltage is a function of the pressure on the sensor. The relation between the pressure and the voltage is called the characteristic curve of the output. It can be selected.

Modifying parameter

1. Select the Ao parameter
2. Use the CH button to assign the recorder output to a channel
3. Use the arrow buttons to select the characteristic curve of the output
   - The value of the parameter is changed

Characteristic curves
Fundamentally we have to distinguish between logarithmic and linear characteristic curves. A logarithmic characteristic curve is useful if the pressure range covers several orders of magnitude in the measurement. In this case it is appropriate to take the logarithm of the pressure and then scale the result in a suitable manner.

A linear characteristic curve is useful if the pressure range covers only a few orders of magnitude in the measurement. In this case the recorder output voltage is proportional to the pressure value. You can specify which pressure value will result in the maximum output voltage.

The available characteristic curves will be described in the following. In each case it is shown how to calculate the pressure p (in mbar) from the recorder output voltage U (in volts).

LoG
Logarithmic representation of the entire measuring range.

Sensor	Pressure (in mbar)
PSG	p = 10^[U/(10/7) - 4]
PCG	p = 10^[U/(10/7) - 4]
PEG	p = 10^[U/(10/7) - 9]
MPG	p = 10^[U/(10/12) - 9]
CDG/CDG d	p = 10^[U/(10/4) - 4] * FS
bPG/bPG2	p = 10^[U/(10/12) - 9]
bCG	p = 10^[U/(10/12) - 9]
HPG	p = 10^[U/(10/9) - 6]

LoG A
Logarithmic representation of the entire measuring range (compatible with VGC012, VGC023, VGC032).

Sensor	Pressure (in mbar)
PSG	p = 10^[U/(10/6) - 3]
PCG	p = 10^[U/(10/7) - 4]
PEG	p = 10^[U/(9/7) - 9 - 7/9]
MPG	p = 10^[U/(10/11) - 8]
CDG/CDG d	p = 10^[U/(10/4) - 4] * FS
bPG	p = 10^[(U - 7.75)/0.75]
bPG2	p = 10^[U - 8]
bCG	p = 10^[(U - 7.75)/0.75]
HPG	p = 10^[U/(10/9) - 6]

LoG -6
Logarithmic representation of a part of the measurement range (2.5 V/decade).

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

LoG -3
Logarithmic representation of a part of the measurement range (2.5 V/decade).

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

LoG +0
Logarithmic representation of a part of the measurement range (2.5 V/decade).

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

LoG +3
Logarithmic representation of a part of the measurement range (2.5 V/decade).

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

LoGC1
Logarithmic representation matched to the following sensor combination:

- PSG on channel 1
- PEG on channel 2

Sensor	Pressure (in mbar)
PSG + PEG	p = 10^[U/(10/12) - 9]

LoGC2
Logarithmic representation matched to the following sensor combination:

- CDG on channel 1
- CDG on channel 2

This characteristic curve is only useful if the sensors have different measuring ranges. The total measuring range of the sensor combination is represented logarithmically in the range 0…10 V.

LoGC3
Logarithmic representation matched to the following sensor combination:

- CDG on channel 1
- CDG on channel 2
- CDG on channel 3

This characteristic curve is only useful if the sensors have different measuring ranges. The total measuring range of the sensor combination is represented logarithmically in the range 0…10 V.

NOTE:
The three sensors must be sorted with regard to their measuring range (FS). The sort order may be increasing or decreasing.

Lin n
Linear representation. U = 10 V is equivalent of $p = 10^n$ mbar. The exponent n may be any integer value in the range -10…+3.

Sensor	Pressure (in mbar)
All types	$p = U/10 * 10^n$

iM221
Logarithmic representation of the IM221 controller (1 V/decade) U = 8 V is equivalent of $p = 10^{-2}$ mbar.

Controller	Pressure (in mbar)
IM221	p = 10^[U - 10]

LoGCY
Logarithmic representation of 12 decades (0.83 V / decade) matched to the following sensor combination:

- PCG on channel 1
- BPG402 on channel 2

Sensor	Pressure (in mbar)
PCG+BPG402	p = 10^[U/(10/12) - 9]

U = 10 V is equivalent of p = 1000 mbar. The switching point between the sensors is 10^{-2} mbar.

PM411
Nonlinear characteristic curve of the output as with the PM411 board.

5.3.6 Error signal relay (Err-r)

The Err-r parameter is used to specify what kind of error will trigger the error signal relay.

Display	Significance
ALL	All errors
no SE	Device errors
CH 1	Sensor 1 and device errors
CH 2	Sensor 2 and device errors
CH 3	Sensor 3 and device errors

Tab. 5-11 Err-r *parameter values*

5.4 Test parameters (PArA tESt)

This parameter group is intended for test and service purposes. It is used to examine additional system data, to set basic system parameters, and to check individual system functions.

The parameter group tESt is not required for normal operation. For this reason it is not accessible normally.

5.4.1 Selection

When switching on
The parameter group tESt becomes available if you switch on the Vacuum Gauge Controller as follows:

1 Press the PARA button and keep it pressed

2 Switch the mains switch on. See Fig. 3-4, 🗎 11, Pos. H.
- The Vacuum Gauge Controller is switched on
- The parameter group tESt is selected
- The PARA indicator is illuminated

During normal operation
During normal operation it is also possible to activate the parameter group tESt from the measurement mode:

1 Press the PARA button
- The parameter menu is selected
- The PARA indicator is illuminated

2 Keep the UP and DOWN buttons pressed for approximately 5 seconds
- The firmware version is displayed
- The parameter group tESt is selected

NOTE:
When the parameter group tESt **is selected, the Vacuum Gauge Controller will not automatically return to the measurement mode. In order to return to the measurement mode, press the PARA button repeatedly until all test parameters have been run through.**

5.4.2 Firmware version (Pnr)

Displays the firmware version number. The last character represents the modification index.

Example: 302-534-D

5.4.3 Watchdog control (dt-C)

Behavior of the system monitoring system (watchdog control) in the event of an error.

Display	Significance
Auto	An error message from the watchdog control is acknowledged automatically after 2 seconds

Display	Significance
oFF	An error message from the watchdog control must be acknowledged by the user

Tab. 5-12 dt-C parameter values

5.4.4 Torr lock (tr-L)

This parameter affects the general parameter unit. When the lock is activated, the unit of measurement «Torr» cannot be selected. See Chapter 5.3.1 Unit of measurement (unit), 27.

Display	Significance
oFF	Unit of measurement «Torr» can be selected
on	Unit of measurement «Torr» cannot be selected

Tab. 5-13 tr-L parameter values

5.4.5 Parameter setup lock (LoC)

This parameter affects the parameter mode. When the lock is activated, the user can inspect but not modify parameter values.

Display	Significance
oFF	Parameters can be inspected and modified
on	Parameters can be inspected only

Tab. 5-14 LoC parameter values

5.4.6 RAM test (rA-t)

Test the main memory. Press the UP button to start the test.

Display	Significance
run	Test is running
PASS	Test completed without errors
Err	Test completed and errors detected

Tab. 5-15 RAM test

Please contact your local INFICON service center if the test fails repeatedly.

5.4.7 EPROM test (EP-t)

Test the program memory.
Press the UP button to start the test.

Display	Significance
run	Test is running
PASS	Test completed without errors
Err	Test completed and errors detected. A four-digit checksum is displayed.

Tab. 5-16 EPROM test

Please contact your local INFICON service center if the test fails repeatedly.

5.4.8 EEPROM test (EE-t)

Test the parameter memory.
Press the UP button to start the test.

Display	Significance
run	Test is running
PASS	Test completed without errors
Err	Test completed and errors detected

Tab. 5-17 EEPROM test

Please contact your local INFICON service center if the test fails repeatedly.

5.4.9 Display test (di-t)

Test the display. In this test all segments of the display are illuminated simultaneously at first. Then the individual segments of the display are activated one after the other.

Press the UP button to start the test.

5.4.10 A/D converter signal (Ad-S)

Display the A/D converter output signal (in volts) for each of the channels. When applying a reference voltage to the input signal pin of the SENSOR connection, this allows you to check the A/D converters of the respective channel. See Chapter 3.3.4 SENSOR, 12.

NOTE:
When the signal input is not connected, a quickly fluctuating value is displayed because of the high measurement sensitivity of the unit.

Press the UP button to start the test.

5.4.11 A/D converter ID (Ad-i)

For each channel, display a signal (in volts) which is caused by a resistor inside the connected sensor. This signal is used for identification of the connected sensors.

Press the UP button to start the test.

5.4.12 I/O test (io-t)

Test all relays. In this test the relays are switched on and off one after the other, and the relay states are shown on the display. A circuit indicator or an ohmmeter may be used to verify the relay states on the RELAY connection. See Chapter 3.3.5 RELAY, 🗎 13.

Press the UP button to start the test.

⚠CAUTION

Relay test.

In this test the relays switch irrespective of the actual pressure. This may cause unintended switching of devices.

Unplug the RELAY connection before performing a relay test.

Display	Significance
off	All relays switched off
r1-H r1-L	Switching function 1 relay on Switching function 1 relay off
r2-H r2-L	Switching function 2 relay on Switching function 2 relay off
r3-H r3-L	Switching function 3 relay on Switching function 3 relay off
r4-H r4-L	Switching function 4 relay on Switching function 4 relay off
r5-H r5-L	Switching function 5 relay on Switching function 5 relay off
r6-H r6-L	Switching function 6 relay on Switching function 6 relay off
r7-H r7-L	Error signal relay on Error signal relay off

Tab. 5-18 Relay test

5.4.13 RS232C test (rS-t)

Test the RS232C interface. In this test, the Vacuum Gauge Controller echoes each character received from from the serial interface back to the interface.

The test starts as soon as the rS-t parameter has been selected. You may e.g. use a terminal program and input characters via the keyboard. Each of the input characters is returned to the terminal from the Vacuum Gauge Controller. The data transfer between the two units is visible on the terminal screen only.

Press the PARA button to quit the test and to return to the measurement mode.

6 Computer interface

6.1 Basics

6.1.1 Connection

The Vacuum Gauge Controller is able to communicate with a computer via a serial interface (RS232C). The connection socket and the required connection cable are described in Chapter 3.3.7 RS232C, 🗎 14.

6.1.2 Nomenclature

The following terms and symbolic styles will be used in the description of the computer interface:

Term	Significance
Host	Computer or terminal
Sending (S)	Data transfer from the Host to the Vacuum Gauge Controller
Receiving (R)	Data transfer from the Vacuum Gauge Controller to the Host
ASCII	American Standard Code for Information Interchange

Tab. 6-1 Terms

Square brackets [...]
Square brackets identify optional parameters. The items enclosed by the brackets may appear, but they are not essential. The brackets are not actually used in the command.

Angle brackets <...>
Abbreviations enclosed by angle brackes identify control characters. The entire expession including the brackets is replaced by a numerical value. See Tab. 6-2, 🗎 32.

Term	Value	Significance
<EXT>	03h	End of text (Ctrl-C). Reset the interface. Delete the input buffer.
<ENQ>	05h	Enquiry (Ctrl-E). Request data transmission.
<ACK>	06h	Acknowledge. Positive acknowledge.
<LF>	0Ah	Line feed. Line feed.
<CR>	0Dh	Carriage return. Carriage return.
<NAK>	15h	Negative acknowledge. Negative acknowledge.

Tab. 6-2 Control characters

6.2 Communication

6.2.1 Protocol

The following protocol is used in the communication:

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

The baud rate can be selected. See Chapter 5.3.2 Baud rate (bAud), 🗎 27. Hardware handshake is not used.

Messages are transferred as ASCII strings. Blanks (spaces) in the string are ignored. The information is exchanged bidirectionally, i.e. data and control commands can be exchanged in both directions.

The input buffer of the Host must have a capacity of at least 75 bytes.

6.2.2 Sending (Host --> Unit)

Messages of the Host are composed of mnemonics and parameters. Mnemonics are command abbreviations and always consist of three ASCII characters. See Chapter 6.3 Mnemonics, 🗎 34. The control characters <CR> or <CR><LF> signal the end of the message.

The Vacuum Gauge Controller checks every message it receives. Afterwards it sends a positive or a negative acknowledgement to the Host.

In a symbolic representation this process can be illustrated as follows:

S: Mnemonic [parameters]<CR>[<LF>]

R: <ACK><CR><LF> or <NAK><CR><LF>

6.2.3 Receiving (Unit --> Host)

The Host may request data from the unit. To this end the Host first sends a message which describes what kind of data is requested. The Vacuum Gauge Controller then stores the requested data in the output buffer of the interface.

Afterwards the Host sends the control character <ENQ> to the unit. This prompts the unit to send to contents of the output buffer to the Host.

In a symbolic representation this process can be illustrated as follows:

S: Mnemonic [parameters]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: Data<CR><LF>

If the Vacuum Gauge Controller receives a message which cannot be interpreted (syntax error) it stores the respective error status in the output buffer. See Chapter 6.3.9 ERR, 36.

6.2.4 Examples

Inquiring the sensor identification

S: TID<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: PSG,CDG,noSen<CR><LF>

Inquiring the sensor status

S: HVC<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: 0,0,0<CR><LF>

Inquiring parameters of the switching function 1

S: SP1<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: 0,2.0000E-01,5.0000E+00<CR><LF>

Inquiring parameters of the switching function 2

S: SP2,0,9E-1,2.2E0<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: 0,9.0000E-01,2.2000E+00<CR><LF>

Setting the filter

S: FIL,1,2,1<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: 1,2,1<CR><LF>

Behavior in case of a syntax error

S: FOL,1,2,1<CR>[<LF>]

R: <NAK><CR><LF>

S: <ENQ>

R: 0001<CR><LF>

6.2.5 Number formats

The following data is always stored in the exponential format in the Vacuum Gauge Controller:

- Pressure values
- Offset values
- Threshold values

Output
The above data is always output in the exponential format. A five-digit mantissa and a two-digit exponent are used. Both parts of the number may contain a sign.

Symbolic representation: ±a.aaaaE±aa
Example: 1.2500E-01

In the case of logarithmic sensors (PSG, PCG, PEG, MPG, BPG, BCG, HPG) the last two digits of the mantissa are always zero. Linear sensors (CDG) use all digits of the mantissa.

Input
The above data may be input either in the exponential format or in the fixed point format. The input data is automatically converted to the exponential format by the unit.

Example: 1.25E-1 and 0.125 are both valid input data.

6.2.6 Continuous transmission of measurements

After the unit has been switched on, it starts to continuously send measurements to the serial interface. By default one set of measurements is sent every second.

The continuous measurement transmission stops when the Host sends a character to the serial interface. The transmission can be resumed with the COM command. See Chapter 6.3.4 COM, 35.

6.3 Mnemonics

6.3.1 Overview

Mnemonic	Significance
AOM	Analog output mode. Characteristic curve of the recorder output.
BAU	Baud rate. Transfer rate of the RS232C interface.
COM	Continuous mode. Continuous transmission of measurements to the serial interface.
COR	Correction factor.
DCD	Display control digits. Number of digits shown in the display.
DGS	Degas.
ERA	Error relay allocation.
ERR	Error status.
EUM	Switch the emmision.
FIL	Filter. Measurement filter.
FUM	Select the filament.
FSR	Full scale range. Full scale range of linear sensors (CDG).
GAS	Gas type correction.
HVC	High vacuum circuit on/off. Switch the high vacuum circuit of sensors on/off.
ITR	Read a data string from the BPG/BCG/HPG/CDGxxxD sensor.
LOC	Parameter setup lock.
OFC	Offset correction. Offset correction function for linear sensors (CDG).
OFD	Offset display. Offset correction values for linear sensors (CDG).
PNR	Program number. Firmware version number.
PR1	Pressure sensor 1. Pressure reading of sensor 1.
PR2	Pressure sensor 2. Pressure reading of sensor 2.
PR3	Pressure sensor 3. Pressure reading of sensor 3.
PRE	Pirani range extension.
PRX	Pressure sensors. Pressure readings of all sensors.
RES	Reset. Reset the serial interface.
SAV	Save parameters to EEPROM.
SC1	Sensor 1 control.
SC2	Sensor 2 control.
SC3	Sensor 3 control.
SP1	Setpoint 1. Switching function 1.
…	…
SP6	Setpoint 6. Switching function 6.
SPS	Setpoint status. Switching function status.
TAD	Test A/D converter. Test the A/D converter.
TDI	Test display. Test the display.
TEE	Test EEPROM. Test the EEPROM.
TEP	Test EPROM. Test the EPROM.
TID	Transmitter identification. Sensor identification.
TIO	Test I/O. Test the relays.
TKB	Test keyboard. Test the keyboard.
TLC	Torr lock.
TRA	Test RAM. Test the RAM.
TRS	Test RS232C interface. Test the RS232C interface.
UNI	Unit of measurement.
WDT	Watchdog control.

Tab. 6-3 Mnemonics

6.3.2 AOM

Analog output mode. Characteristic curve of the recorder output. See Chapter 5.3.5 Recorder output (Ao), 27.

S: AOM[,a,b]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b<CR><LF>

Parameter	Significance
a	Channel number 0 = Channel 1 1 = Channel 2 2 = Channel 3
b	Characteristic curve 0 = Logarithmic LoG 1 = Logarithmic LoG A 2 = Logarithmic LoG -6 3 = Logarithmic LoG -3 4 = Logarithmic LoG +0 5 = Logarithmic LoG +3 6 = Logarithmic LoGC1 7 = Logarithmic LoGC2 8 = Logarithmic LoGC3 9 = Linear Lin -10 10 = Linear Lin -9 11 = Linear Lin -8 12 = Linear Lin -7 13 = Linear Lin -6 14 = Linear Lin -5 15 = Linear Lin -4 16 = Linear Lin -3 17 = Linear Lin -2 18 = Linear Lin -1 19 = Linear Lin +0 20 = Linear Lin +1 21 = Linear Lin +2 22 = Linear Lin +3 23 = iM221 24 = Logarithmic LoGC4 25 = PM411

6.3.3 BAU

Baud rate. Transfer rate of the RS232C interface. See Chapter 5.3.2 Baud rate (bAud), 27.

S: BAU[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Transfer rate 0 = 9600 baud (default) 1 = 19200 Baud 2 = 38400 Baud

NOTE:
The acknowledgement of the BAU command will already be sent with the changed transfer rate.

6.3.4 COM

Continuous mode. Continuous transmission of measurements to the serial interface.

S: COM,a<CR>[<LF>]

R: <ACK><CR><LF>

The acknowledgement is immediately followed by the continuous measurement transmission. The measurements are always output in the exponential format.

R: b,±c.ccccE±cc,d,±e.eeeeE±ee,f,±g.ggggE±gg <CR><LF>

Parameter	Significance
a	Period 0 = 100 milliseconds 1 = 1 second (default) 2 = 1 minute
b	Status of channel 1 0 = Measurement data ok 1 = Underrange 2 = Overrange 3 = Sensor error 4 = Sensor switched off 5 = No sensor 6 = Identification error 7 = BPG/BCG/HPG error
±c.ccccE±cc	Reading of sensor 1 in current unit of measurement
d	Status of channel 2 (see above)
±e.eeeeE±ee	Reading of sensor 2 in current unit of measurement
f	Status of channel 3 (see above)
±g.ggggE±gg	Reading of sensor 3 in current unit of measurement

6.3.5 COR

Correction factor. See Chapter 5.2.2 Gas type (GAS), 24.

S: COR[,a.aa,b.bb,c.cc]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a.aa,b.bb,c.cc<CR><LF>

Parameter	Significance
a.aa	Correction factor of channel 1 0.10…9.99 (default: 1.00)
b.bb	Correction factor of channel 2 (see above)
c.cc	Correction factor of channel 3 (see above)

NOTE:
The correction factor is only used when the gas type is set to «Other gas». See Chapter 6.3.14 GAS, 38.

6.3.6 DCD

Display control digits. Number of digits shown in the display. See Chapter 5.3.3 Display format (diGit), 27.

S: DCD[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Number of digits 2 = 2 digits (default) 3 = 3 digits

NOTE:
When PrE **is enabled, the display of PSG and PCG gauges in the pressure range p < 10^{-4} mbar is reduced by one digit.**

6.3.7 DGS

Degas. See Chapter 5.2.5 Degas function (dEGAS), 25.

S: DGS[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Sensor 1 0 = Degassing off (default) 1 = Degassing on
b	Sensor 2 (see above)

NOTE:
The degas function is switched off automatically after 3 minutes. It may be also be stopped prematurely.

6.3.8 ERA

Error relay allocation. See Chapter 5.3.6 Error signal relay (Err-r), 29.

S: ERA[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Error relay allocation 0 = All errors 1 = Device errors 2 = Sensor 1 and device errors 3 = Sensor 2 and device errors 4 = Sensor 3 and device errors

6.3.9 ERR

Error status.

S: ERR<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: aaaa<CR><LF>

Parameter	Significance
aaaa	Error status 0000 = No error 1000 = Device error (FAIL illum.) 0100 = Hardware not installed 0010 = Parameter invalid 0001 = Syntax error

NOTE:
The error status is a binary number. It may be com-

bined by the logical operator OR. Example: 1001 = Device error and syntax error.

6.3.10 EUM

Switch the emmision. See Chapter 5.2.10 Emission (EMi), 🗎 26.

S: EUM[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Emission for channel 1 0 = Manually 1 = Automatic (default)
b	Emission for channel 2 (see above)
c	Emission for channel 3 (see above)

6.3.11 FIL

Filter. Measurement filter. See Chapter 5.2.1 Measurement filter (FiLt), 🗎 23.

S: FIL[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Filter for channel 1 0 = Fast 1 = Medium (default) 2 = Slow
b	Filter for channel 2 (see above)
c	Filter for channel 3 (see above)

6.3.12 FSR

Full scale range. Full scale range of linear sensors (CDG). See Chapter 5.2.3 Measuring range (FS), 🗎 24.

S: FSR[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Full scale range of sensor 1 0 = 0.01 mbar 1 = 0.01 Torr 2= 0.02 Torr 3 = 0.05 Torr 4 = 0.10 mbar 5 = 0.10 Torr 6 = 0.25 mbar 7 = 0.25 Torr 8 = 0.50 mbar 9 = 0.50 Torr 10 = 1 mbar 11 = 1 Torr 12 = 2 mbar 13 = 2 Torr 14 = 5 mbar 15 = 5 Torr 16 = 10 mbar 17 = 10 Torr 18 = 20 mbar 19 = 20 Torr 20 = 50 mbar 21 = 50 Torr 22 = 100 mbar 23 = 100 Torr 24 = 200 mbar 25 = 200 Torr 26 = 500 mbar 27 = 500 Torr 28 = 1000 mbar 29 = 1100 mbar 30 = 1000 Torr 31 = 2 bar 32 = 5 bar 33 = 10 bar 34 = 50 bar
b	Full scale range of sensor 2 (see above)
c	Full scale range of sensor 3 (see above)

6.3.13 FUM

Select the filament. See Chapter 5.2.11 Filament selection (FiL), 🗎 26.

S: FUM[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Filament for channel 1 0 = Automatic (default) 1 = Filament 1 2 = Filament 2
b	Filament for channel 2 (see above)
c	Filament for channel 3 (see above)

6.3.14 GAS

Gas type correction. See Chapter 5.2.2 Gas type (GAS), 🗎 24.

S: GAS[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Gas type for channel 1 0 = Nitrogen/air (default) 1 = Argon 2 = Hydrogen 3 = Other gas
b	Gas type for channel 2 (see above)
c	Gas type for channel 3 (see above)

NOTE:
When «Other gas» is selected, the gas type dependence of the measurements will be corrected by a variable correction factor. See Chapter 6.3.5 COR, 🗎 36.

6.3.15 HVC

High vacuum circuit on/off. Switch the high vacuum circuit of sensors on/off. See Chapter 4.4.3 Control button functions, 🗎 17.

S: HVC[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Sensor 1 0 = Off 1 = On
b	Sensor 2 (see above)
b	Sensor 3 (see above)

NOTE:
In order to switch a sensor on/off, the sensor control must be set to «Hand». See Chapter 6.3.26 SC1, 🗎 41.

6.3.16 ITR

Read a data string from the BPG/BCG/HPG/CDGxxxD sensor.

The measurements of the BPG/BCG/HPG/CDGxxxD are transferred digitally. A data string consists of 8 bytes (hexadecimal numbers) which are separated from each other by a comma. See Reference [11]. The data strings of the sensors are separated from each other by double space characters.

S: ITR<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: aa,aa,aa,aa,aa,aa,aa,aa bb,bb,bb,bb,bb,bb, bb,bb cc,cc,cc,cc,cc,cc,cc<CR><LF>

Parameter	Significance
aa,aa,aa,aa,aa,aa,aa,aa	Data string of sensor 1
bb,bb,bb,bb,bb,bb,bb,bb	Data string of sensor 2
cc,cc,cc,cc,cc,cc,cc,cc	Data string of sensor 3

6.3.17 LOC

Parameter setup lock. See Chapter 5.4.5 Parameter setup lock (LoC), 🗎 30.

S: LOC[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Parameter setup lock 0 = Off (default) 1 = On

6.3.18 OFC

Offset correction. Offset correction function for linear sensors (CDG). See Chapter 5.2.4 Offset (oFS), 🗎 24.

S: OFC[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Offset correction of channel 1 0 = Off (default) 1 = On 2 = Determine the offset value and activate offset correction function 3 = Adjust the zero point of a CDGxxxD
b	Offset correction of channel 2 (see above)
c	Offset correction of channel 3 (see above)

6.3.19 OFD

Offset display. Offset correction values for linear sensors (CDG). See Chapter 5.2.4 Offset (oFS), 🗎 24.

S: OFD[,±a.aaaaE±aa,±b.bbbbE±bb,±c.ccccE±cc]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: ±a.aaaaE±aa,±b.bbbbE±bb,±c.ccccE±cc<CR><LF>

Parameter	Significance
±a.aaaaE±aa	Offset value of sensor 1 in current unit of measurement Default: 0.0000E+00
±b.bbbbE±bb	Offset value of sensor 2 in current unit of measurement (see above)
±c.ccccE±cc	Offset value of sensor 3 in current unit of measurement (see above)

6.3.20 PNR

Program number. Firmware version number. See Chapter 5.4.2 Firmware version (Pnr), 🗎 29.

S: PNR<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Firmware version Example: 302-534-D

6.3.21 PR1

Pressure sensor 1. Pressure reading of sensor 1.

S: PR1<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,±b.bbbbE±bb<CR><LF>

Parameter	Significance
a	Status of channel 1 0 = Measurement data ok 1 = Underrange 2 = Overrange 3 = Sensor error 4 = Sensor switched off 5 = No sensor 6 = Identification error 7 = BPG/HPG error
±b.bbbbE±bb	Pressure reading of sensor 1 in the current unit of measurement

NOTE:
The commands PR2 and PR3 concern the sensors 2 and 3, respectively. The commands are analogous to the PR1 command.

6.3.22 PRE

Pirani range extension. See Chapter 5.2.12 Pirani range extension (PrE), 26.

S: PRE[,a,b,c]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Range extension for Sensor 1 0 = Off (default) 1 = On
b	Range extension for sensor 2 (see above)
c	Range extension for sensor 3 (see above)

6.3.23 PRX

Pressure sensors. Pressure readings of all sensors.

S: PRX<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,±b.bbbbE±bb,c,±d.ddddE±dd,e,±f.fffffEff<CR><LF>

Parameter	Significance
a	Status of channel 1 0 = Measurement data ok 1 = Underrange 2 = Overrange 3 = Sensor error 4 = Sensor switched off 5 = No sensor 6 = Identification error 7 = BPG/BCG/HPG error
±b.bbbbE±bb	Pressure reading of sensor 1 in the current unit of measurement
c	Status of channel 2 (see above)
±d.ddddE±dd	Pressure reading of sensor 2 in the current unit of measurement
e	Status of channel 3 (see above)
±f.fffffE±ff	Pressure reading of sensor 3 in the current unit of measurement

6.3.24 RES

Reset. Reset the serial interface.

Deletes the input buffer. All queued error messages are sent to the Host. The unit returns to the measurement mode.

S: RES[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: b,c,d,...<CR><LF>

Parameter	Significance
a	1 = Perform reset
b,c,d...	Queued error messages 0 = No error 1 = Watchdog control has been triggered 2 = Task(s) not executed 3 = EPROM error 4 = RAM error 5 = EEPROM error 6 = Display error 7 = A/D converter error 8 = UART error 9 = Sensor 1 general error 10 = Sensor 1 ID error 11 = Sensor 2 general error 12 = Sensor 2 ID error 13 = Sensor 3 general error 14 = Sensor 3 ID error

6.3.25 SAV

Save parameters to EEPROM.

The command SAV,0 resets all parameters to their default values (factory settings). See Chapter 5.3.4 Default parameters (dEF), 27.

The command SAV,1 saves parameter values which have been changed via the serial interface in the EEPROM. These values will be preserved even when the unit is switched off.

S: SAV,a<CR>[<LF>]

R: <ACK><CR><LF>

Parameter	Significance
a	Save parameters 0 = Save default parameters 1 = Save user parameters

NOTE:
Parameters which have been changed manually (control buttons) are saved in the EEPROM automatically. The SAV command is not required in this case.

6.3.26 SC1

Sensor 1 control. See Chapter 5.2.6 Sensor activation (S-on), 🗎 25 and Chapter 5.2.8 Sensor deactivation (S-oFF), 🗎 25.

S: SC1[,a,b,c.ccE±cc,d.ddE±dd]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c.ccE±cc,d.ddE±dd<CR><LF>

Parameter	Significance
a	Sensor activation 0 = Manual (default) 1 = Hot start 2 = By channel 1 3 = By channel 2 4 = By channel 3
b	Sensor deactivation 0 = Manual (default) 1 = Self control 2 = By channel 1 3 = By channel 2 4 = By channel 3
c.ccE±cc	Activation value in the current unit of measurement
d.ddE±dd	Deactivation value in the current unit of measurement

NOTE:
The commands SC2 and SC3 concern the sensors 2 and 3, respectively. The commands are analogous to the SC1 command.

6.3.27 SP1

Setpoint 1. Switching function 1. See Chapter 5.1 Switching function parameters (PArA SP), 🗎 21.

S: SP1[,a,b.bbbbE±bb,c.ccccE±cc]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b.bbbbE±bb,c.ccccE±cc<CR><LF>

Parameter	Significance
a	Switching function assignment 0 = Channel 1 1 = Channel 2 2 = Channel 3
b.bbbbE±bb	Lower threshold value in the current unit of measurement
c.ccccE±cc	Upper threshold value in the current unit of measurement

NOTE:
The commands SP2…SP6 concern the switching functions 2…6, respectively. The commands are analogous to the SP1 command.

6.3.28 SPS

Setpoint status. Switching function status. See Chapter 5.1 Switching function parameters (PArA SP), 🗎 21.

S: SPS<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c,d,e,f<CR><LF>

Parameter	Significance
a	Status of switching function 1 0 = Off 1 = On
b	Status of switching function 2 (see above)
c	Status of switching function 3 (see above)
d	Status of switching function 4 (see above)
e	Status of switching function 5 (see above)

Parameter	Significance
f	Status of switching function 6 (see above)

6.3.29 TAD

Test A/D converter. Test the A/D converter. See Chapter 5.4.10 A/D converter signal (Ad-S), 🗎 30 and Chapter 5.4.11 A/D converter ID (Ad-i), 🗎 31.

S: TAD<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: ±a.aaaa,±b.bbbb,±c.cccc,±d.dddd,±e.eeee,±f.ffff <CR><LF>

Parameter	Significance
±a.aaaa	ADC channel 1 Reading of sensor 1 in volts. 0.0000…+11.0000
±b.bbbb	ADC channel 2. Reading of sensor 2 in volts. 0.0000…+11.0000
±c.cccc	ADC channel 3. Reading of sensor 3 in volts. 0.0000…+11.0000
±d.dddd	ADC channel 4. Identification of sensor 1 in volts. 0.0000…+5.0000
±e.eeee	ADC channel 5. Identification of sensor 2 in volts. 0.0000…+5.0000
±f.ffff	ADC channel 6. Identification of sensor 3 in volts. 0.0000…+5.0000

6.3.30 TDI

Test display. Test the display. See Chapter 5.4.9 Display test (di-t), 🗎 30.

S: TDI[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Test status 0 = Off 1 = On

6.3.31 TEE

Test EEPROM. Test the EEPROM. See Chapter 5.4.8 EEPROM test (EE-t), 🗎 30.

⚠CAUTION

EEPROM life.

A large number of write operations will reduce the EEPROM life.

Do not repeat the EEPROM test more often than necessary (e.g. in program loops).

S: TEE<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: aaaa<CR><LF>

The control character <ENQ> starts the test. It takes approximately one second to complete the test.

Parameter	Significance
aaaa	Error status. See Chapter 6.3.9 ERR, 🗎 36.

6.3.32 TEP

Test EPROM. Test the EPROM. See Chapter 5.4.7 EPROM test (EP-t), 🗎 30.

S: TEP<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: aaaa,bbbb<CR><LF>

The control character <ENQ> starts the test. It takes approximately 5 seconds to complete the test.

Parameter	Significance
aaaa	Error status. See Chapter 6.3.9 ERR, 🗎 36.
bbbb	Check sum (hexadecimal)

6.3.33 TID

Transmitter identification. Sensor identification. See Chapter 4.4.3.7 Identifying a sensor, 18.

S: TID<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,b,c<CR><LF>

Parameter	Significance
a	Identification of sensor 1 PSG PCG PEG MPG CDG BPG BPG402 BCG HPG noSen noid
b	Identification of sensor 2 (see above)
c	Identification of sensor 3 (see above)

6.3.34 TIO

Test I/O. Test the relays. This command allows to switch a single relay or several relays at a time.

⚠CAUTION

Relay test.

In this test the relays switch irrespective of the actual pressure. This may cause unintended switching of devices.

Unplug the RELAY connection before performing a relay test.

S: TIO[,a,bb]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a,bb<CR><LF>

Parameter	Significance
a	Test status 0 = Off 1 = On
bb	Relay status 00 = All relays off 01 = Switching function 1 relay on 02 = Switching function 2 relay on 04 = Switching function 3 relay on 08 = Switching function 4 relay on 10 = Switching function 5 relay on 20 = Switching function 6 relay on 40 = Error signal relay on 7F = All relays on

NOTE:
The relay status is a hexadecimal number. It may be combined by the logical operator OR. Example: 24 = Switching functions relays 3 and 6 on.

6.3.35 TKB

Test keyboard. Test the keyboard.

S: TKB<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: aaaa<CR><LF>

The control character <ENQ> starts the test. The Vacuum Gauge Controller polls the keyboard and sends a message to the computer.

Parameter	Significance
aaaa	Keyboard status 0000 = No button pressed 1000 = CH pressed 0100 = PARA pressed 0010 = DOWN pressed 0001 = UP pressed

NOTE:
The keyboard status is a binary number. It may be combined by the logical operator OR. Example: 0011 = DOWN and UP pressed at the same time.

6.3.36 TLC

Torr lock. See Chapter 5.4.4 Torr lock (tr-L), 🗎 30.

S: TLC[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Torr lock 0 = Off (default) 1 = On

6.3.37 TRA

Test RAM. Test the RAM. See Chapter 5.4.6 RAM test (rA-t), 🗎 30.

S: TRA<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: aaaa<CR><LF>

The control character <ENQ> starts the test. It takes approximately one second to complete the test.

Parameter	Significance
aaaa	Error status. See Chapter 6.3.9 ERR, 🗎 36.

6.3.38 TRS

Test RS232C interface. Test the RS232C interface. See Chapter 5.4.13 RS232C test (rS-t), 🗎 31.

S: TRS<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

The control character <ENQ> starts the test. The test can be stopped by pressing Ctrl-C.

6.3.39 UNI

Unit of measurement. See Chapter 5.3.1 Unit of measurement (unit), 🗎 27.

S: UNI[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Unit of measurement 0 = mbar/bar (default) 1 = Torr 2 = Pascal 3 = Micron

6.3.40 WDT

Watchdog control. See Chapter 5.4.3 Watchdog control (dt-C), 🗎 29.

S: WDT[,a]<CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a<CR><LF>

Parameter	Significance
a	Error acknowledgement 0 = Manually 1 = Automatic (default)

7 Maintenance and service

7.1 Maintenance

The Vacuum Gauge Controller does not require any special maintenance work.

7.1.1 Cleaning

For cleaning the outside of the unit, a slightly moistened cloth will usually do. Do not use any aggressive or scouring cleaning agents.

⚠DANGER

Mains power.

The Vacuum Gauge Controller contains parts which are connected to the mains supply.

Make sure that no objects enter through the louvers of the unit. Keep the unit dry. Do not open the unit.

7.2 Program transfer mode

If your Vacuum Gauge Controller requires an updated firmware version, e.g. for using a new sensor type, please contact your local INFICON service center. You may also visit our website www.inficon.com where firmware updates are available for download.

The user parameters set by you are generally still available after the firmware update. It is however recommended that you make a note of the settings before updating. See Section «Default parameters», 🗎 51.

7.2.1 Preparations and selection

1 Switch the Vacuum Gauge Controller off

2 Connect the RS232C socket (Fig. 3-4, 🗎 11, 2 10, Pos. F) with a serial interface of the PC (e.g. COM1). See Chapter 3.3.7 RS232C, 🗎 14.

3 Press the button behind the opening (Fig. 3-4, 🗎 11, Pos. E) with a pencil and switch the Vacuum Gauge Controller on

NOTE:
The display remains dark. The Vacuum Gauge Controller is set to the program transfer mode.

7.2.2 Program transfer

The firmware for the Vacuum Gauge Controller is delivered as a self-extracting *.exe file or as a packed *.zip file.

1 Copy the *.exe or the *.zip file into an empty directory

2 Unpack the file. One of the extracted files is a batch file *.bat.

3 By default, the program transfer is assumed to run via the COM1 serial interface. Proceed as follows if you want to use another serial interface:

- **3.1** Click the batch file with the right mouse button
  - A menu appears
- **3.2** From the menu, select the option «Edit»
  - The batch file is loaded into a text editor
- **3.3** Change the COM1 entry to the interface you want to use (e.g. COM2)
- **3.4** Save and close the modified batch file

4 Execute the batch file by double-clicking it with the mouse

The new firmware is being transferred to the Vacuum Gauge Controller. You can monitor the individual steps on the PC screen. After approximately 1 minute the transfer is completed.

7.2.3 Restarting

Proceed as follows after the firmware has been transferred completely:

1 Switch the Vacuum Gauge Controller off

2 Wait at least 10 seconds to make sure that the Vacuum Gauge Controller can initialize

3 Switch the Vacuum Gauge Controller on again

4 Check if the current parameter settings still agree with the previous ones. See Section «Default parameters», 🗎 51.

The Vacuum Gauge Controller is ready for operation again.

7.3 Calibration

7.3.1 Basics

The Vacuum Gauge Controller can only measure with high accuracy when it is calibrated precisely. The Vacuum Gauge Controller is calibrated by INFICON before it is shipped. Normally there is no need to change the calibration data.

⚠CAUTION

Calibration.

If you input incorrect calibration data, the Vacuum Gauge Controller cannot perform accurate measurements anymore.

The interface commands for calibrating the unit are intended for service technicians of INFICON only.

The calibration affects the A/D converters of the individual channels. The measuring curve of an ideal A/D converter is a straight line which has a slope of one and runs through the origin, i.e.:

- Factor = 1 (slope of the line)
- Offset = 0 (intersection with the y axis)

The curves of real A/D converters differ slightly from these ideal values. Calibrating the unit means to determine the gain factors and the offset voltages of the individual A/D converters and to store these calibration values.

The interface commands CAF and CAO are used to access the calibration data of the unit.

7.3.2 CAO

Calibration offset. Calibration offset of the A/D converter. The command is intended for service technicians of INFICON only.

S: CAO[,±a.aaaaE±aa,±b.bbbbE±bb,±c.ccccE±cc] <CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: ±a.aaaaE±aa,±b.bbbbE±bb,±c.ccccE±cc<CR><LF>

Parameter	Significance
±a.aaaaE±aa	Calibration offset of channel 1
±b.bbbbE±bb	Calibration offset of channel 2
±c.ccccE±cc	Calibration offset of channel 3

NOTE:
The CAO command can also be used with other parameters. See Chapter 7.3.4 Calibrating the unit, 🗎 46.

7.3.3 CAF

Calibration factor. Calibration factor of the A/D converter. The command is intended for service technicians of INFICON only.

S: CAF[,a.aaaaE±aa,b.bbbbE±bb,c.ccccE±cc] <CR>[<LF>]

R: <ACK><CR><LF>

S: <ENQ>

R: a.aaaaE±aa,b.bbbbE±bb,c.ccccE±cc<CR><LF>

Parameter	Significance
a.aaaaE±aa	Calibration factor of channel 1
b.bbbbE±bb	Calibration factor of channel 2
c.ccccE±cc	Calibration factor of channel 3

NOTE:
The CAF command can also be used with other parameters. See Chapter 7.3.4 Calibrating the unit, 🗎 46.

7.3.4 Calibrating the unit

The Vacuum Gauge Controller can be calibrated automatically with the interface commands CAF and CAO. The following auxiliary tools are required:

- D-Sub plug, 15-pin
- Soldering equipment
- High-precision voltage source for 10 volts (10.000 V)

Calibration offset

1 Unplug the sensor of the respective channel

2 Connect pin 2 (Signal) and Pin 12 (Signal-GND) of a 15-pin D-Sub plug with a wire strap. See Chapter 3.3.4 SENSOR, 🗎 12.

3 Put the D-Sub plug with the wire strap onto the sensor connection of the respective channel
- The input of the A/D converter is short-circuited

4 Use the serial interface to send the command CAO,a to the unit. For the parameter a, use:
- 0 = Channel 1
- 1 = Channel 2
- 2 = Channel 3

The calibration offset of the respective channel is determined and stored in the EEPROM.

Calibration factor

5 Remove the D-Sub plug with the wire strap from the sensor connection of the respective channel

6 Connect pin 2 (Signal) and pin 12 (Signal-GND) of a 15-pin D-Sub plug with a high-precision voltage source. See Chapter 3.3.4 SENSOR, 🗎 12.
- Pin 2 = +10.000 V
- Pin 12 = GND

7 Put the D-Sub plug with the voltage source connections onto the sensor connection of the respective channel

8 Use the serial interface to send the command CAF,a to the unit. For the parameter a, use:
- 0 = Channel 1
- 1 = Channel 2
- 2 = Channel 3

The calibration factor of the respective channel is determined and stored in the EEPROM. Now the channel is calibrated.

8 Troubleshooting

8.1 Fault indication

A fault in the Vacuum Gauge Controller is indicated as follows:

- FAIL flashes and the display shows an error message. See Chapter 8.2 Error messages, 🗎 48.
- The error signal relay opens

8.2 Error messages

Display	Possible cause and corrective action
SE	Sensor error. Error in the connection of the respective sensor. Press PARA to acknowledge. If the cause has not been removed, then noSEn or noid will be displayed.
dt	The watchdog control has been triggered. Severe electrical fault or an operating system error. Or: The Vacuum Gauge Controller has been switched off and on without sufficient delay. Press PARA to acknowledge. The Vacuum Gauge Controller will acknowledge automatically after 2 s if the watchdog control is set to auto.
rA	Error in the main memory (RAM). Press PARA to acknowledge.
EP	Error in the program memory (EPROM). Press PARA to acknowledge.
EE	Error in parameter memory (EEPROM). Press PARA to acknowledge.
di	Error in the display driver. Press PARA to acknowledge.
Ad	Error in the A/D converter. Press PARA to acknowledge.
tF	Task fail. Error in the operating system. Press PARA to acknowledge.
UA	Error in UART. Press PARA to acknowledge.
Er x	Error message of BPG400 / HPG. 0 = No communication with the sensor x = Error code (High-Byte). See Reference [11], Reference [12].
Er xx	Error message of BCG, BPG402. xxH = Error code. See Reference [13], Reference [15].

8.3 Technical support

If the fault persists even after the message has been acknowledged several times and/or the sensor has been exchanged, please contact your local INFICON service center.

9 Storage and disposal

9.1 Packaging

Please keep the original packaging. The packaging is required for storing the Vacuum Gauge Controller and for shipping it to an INFICON service center.

9.2 Storage

The Vacuum Gauge Controller may only be stored in a dry room. The following requirements must be met:

Ambient temperature	-20…+60 °C
Humidity	As low as possible. Preferably in an air-tight plastic bag with a desiccant.

9.3 Disposal

The product must be disposed of in accordance with the relevant local regulations for the environmentally safe disposal of systems and electronic components.

Appendix

Conversion tables

Weights

1 ↓ = ...→	kg	lb	oz	slug
kg	1	2.205	35.27	6.852×10^{-2}
lb	0.454	1	16	3.108×10^{-2}
oz	28.35×10^{-3}	62.5×10^{-3}	1	1.943×10^{-3}
slug	14.59	32.17	514.8	1

Pressure

1 ↓ = ...→	Pa (= N/m^2)	mbar	Torr (= mm Hg)	psi (= lb/in^2)
Pa	1	10^{-2}	0.987×10^{-5}	1.45×10^{-4}
mbar	10^2	1	0.75	1.45×10^{-2}
Torr	1.333×10^2	1.333	1	1.934×10^{-2}
psi	6.895×10^3	68.95	51.71	1

Linear measures

1 ↓ = ...→	mm	m	inch	ft
mm	1	10^{-3}	3.937×10^{-2}	3.281×10^{-3}
m	1000	1	39.37	3.281
inch	25.4	2.54×10^{-2}	1	8.333×10^{-2}
ft	304.8	0.3048	12	1

Temperature

↓ = ...→	Kelvin	Celsius	Fahrenheit
Kelvin	1	°C + 273.15	(°F + 459.67) × 5/9
Celsius	K - 273.15	1	(°F × 5/9) - 17.78
Fahrenheit	(K × 9/5) - 459.67	(°C + 17.78) × 9/5	1

Default parameters

Display	Default	User
SP -L	1×10^{-11} mbar	
SP -H	9×10^{-11} mbar	
FiLt	nor	
GAS	n2	
Cor	1.00	
FS	1000 mbar	
oFS	oFF 0.0000E+00 mbar	
S-on	HAnd 1.00E-03 mbar	
S-oFF	HAnd 1.00E-03 mbar	
PrE	oFF	
unit	bAr	
bAud	9600	
diGit	2	
Ao	LoG	
Err-r	ALL	
dt-C	Auto	
tr-L	oFF	
LoC	oFF	
EMi	Auto	
FiL	Auto	

Literature

The operating manuals listed below can be downloaded from the website www.inficon.com in the PDF file format.

[1] Operating Manual
Pirani Standard Gauge PSG400, PSG400-S
tina04e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[2] Operating Manual
Pirani Standard Gauge PSG100-S, PSG101-S
tina17e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[3] Operating Manual
Compact Pirani Gauge PSG500/-S, PSG502-S, PSG510-S, PSG512-S
tina44e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[4] Operating Manual
Pirani Standard Gauge PSG550, PSG552, PSG554
tina60e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[5] Operating Manual
Pirani Capacitance Gauge PCG400, PCG400-S
tina28e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[6] Operating Manual
Pirani Capacitance Diaphragm Gauge PCG550, PCG552, PCG554
tina56e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[7] Operating Manual
Penning Gauge PEG100
tina14e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[8] Operating Manual
Capacitance Diaphragm Gauge CDG025
tina01e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[9] Operating Manual
Capacitance Diaphragm Gauge CDG045, CDG045-H
tina07e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[10] Operating Manual
Capacitance Diaphragm Gauge CDG100
tina08e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[11] Operating Manual
Bayard-Alpert Pirani Gauge BPG400
tina03e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[12] Operating Manual
High Pressure / Pirani Gauge HPG400
tina31e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[13] Operating Manual
Triple Gauge BCG450
tina40e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[14] Operating Manual
Inverted Magnetron Pirani Gauge
MPG400, MPG401
tina48e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[15] Operating Manual
Bayard-Alpert Pirani Gauge
BPG402
tina46e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[16] Operating Manual
Capacitance Diaphragm Gauge CDG025D
tina49e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[17] Operating Manual
Capacitance Diaphragm Gauge CDG045D
tina51e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[18] Operating Manual
Capacitance Diaphragm Gauge CDG100D
tina52e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[19] Operating Manual
Capacitance Diaphragm Gauge CDG160D, CDG200D
tina53e1
INFICON AG, LI–9496 Balzers, Liechtenstein

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ETL Certification

ETL LISTED

The products VGC402 and VGC403 comply with the requirements of the following standards:

UL 61010-1, Issued: 2004/07/12 Ed: 2
Rev: 2005/07/22

CAN/CSA C22.2#61010-1, Issued: 2004/07/12

EC Declaration of Conformity

CE

We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electrical equipment designed for use within certain voltage limits 2006/95/EC and the Directive relating to electromagnetic compatibility 2004/108/EC.

Products
VGC402, VGC403
Vacuum Gauge Controller

Part numbers
398-020
398-021

Standards
Harmonized and international/national standards and specifications:

EN 61010-1:2001 (Safety requirements for electrical equipment for measurement and control use)

EN 61000-3-2:2006 (EMC, limits for harmonic current emissions)

EN 61000-3-3:1995 + A1:2001 + A2:2005 (EMC, limitation of voltage changes, voltage fluctuations and flicker)

EN 61000-6-2:2005 (EMC, generic immunity standard)

EN 61000-6-3:2007 (EMC, generic emission standard)

Signatures

INFICON AG, Balzers

November 19, 2008 November 19, 2008

Markus Truniger
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