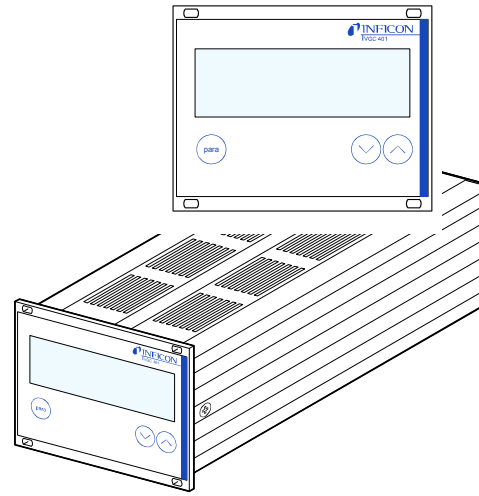
Operating Manual
Incl. EC Declaration of Conformity

Single-Channel Controller

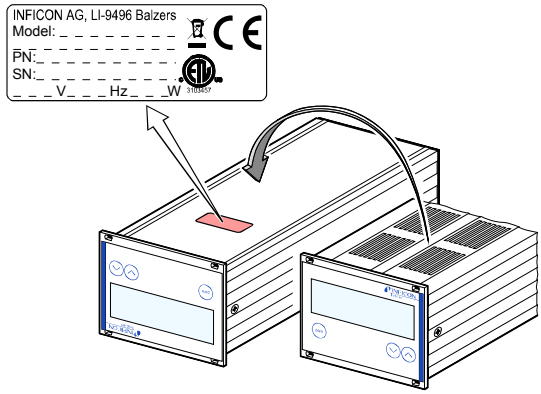
VGC401



CE

Product Identification

In all communications with INFICON, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below:



Validity

This document applies to products with part number 398-010.

The part number (PN) can be taken from the product nameplate.

This document is based on firmware number 302-519-E.

If your unit does not work as described in this document, please check that it is equipped with the above firmware version (→ 🗎 49).

We reserve the right to make technical changes without prior notice.

All dimensions are indicated in mm.

Intended Use

The VGC401 is used together with INFICON Transmitters (in this document referred to as gauges) for total pressure measurement. All products must be operated in accordance with their respective Operating Manuals.

Scope of Delivery

1× Single-Channel Controller
1× Power cord
1× Rubber bar
2× Rubber feet
4× Collar screws
4× Plastic sleeves
1× CD-ROM (Operating Manuals)
1× EC Declaration of Conformity
1× Installation Manual

Contents

For cross-references within this document, the symbol (→ 🗎 XY) is used, for cross-references to further documents listed under "Literature", the symbol (→ 🕮 [Z]).

1 Safety

1.1 Symbols Used

Symbols for residual risks

DANGER

Information on preventing any kind of physical injury.

WARNING

Information on preventing extensive equipment and environmental damage.

Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.

Further symbols


The lamp/display is lit.


The lamp/display flashes.


The lamp/display is dark.

Press the key (example: 'para' key).


Do not press any key

1.2 Personnel Qualifications

Skilled personnel

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.

1.3 General Safety Instructions

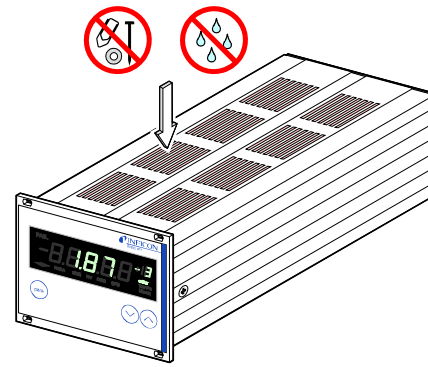
Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.

DANGER

DANGER: mains voltage

Contact with live parts is extremely hazardous when any objects are introduced or any liquids penetrate into the unit.

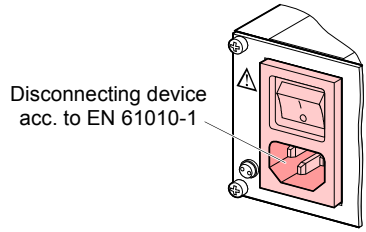
Make sure no objects enter through the louvers and no liquids penetrate into the equipment.



Disconnecting device

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

To disconnect the controller from mains, you must unplug the mains cable.



Communicate the safety instructions to all other users.

1.4 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 interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding documentation.

2 Technical Data

Mains specifications	Voltage	90 … 250 VAC	
	Frequency	50 … 60 Hz	
	Power consumption	≤30 VA	
	Overvoltage category	II	
	Protection class	1	
	Connection	European appliance connector IEC 320 C14	
Ambiance	Temperature		
	storage	–20 … +60 °C	
	operation	+ 5 … +50 °C	
	Relative humidity	≤80% up to +31 °C, decreasing to 50% at +40 °C	
	Use	indoors only max. altitude 2000 m NN	
	Pollution degree	II	
	Protection type	IP30	
Compatible gauges	Number	1	
	Compatible types		
	Pirani	PSG	(PSG400, PSG400-S, PSG100-S, PSG101-S, PSG500, PSG500-S, PSG502-S, PSG510-S, PSG512-S, PSG550, PSG552, PSG554)
	Pirani/Capacitive	PCG	(PCG400, PCG400-S, PCG550, PCG552, PCG554)
	Cold cathode	PEG	(PEG100)
	Cold cathode/Pirani	MPG	(MPG400, MPG401)
	Hot cathode	BAG	(BAG100-S, BAG101-S)
	Hot cathode/Pirani	BPG HPG	(BPG400, BPG402) (HPG400)
	Capacitive	CDG	(CDG025, CDG025D, CDG045, CDG045-H, CDG045D, CDG100, CDG100D, CDG160D)
	TripleGauge™ Hot cathode/Pirani/ Capacitive	BCG	(BCG450)

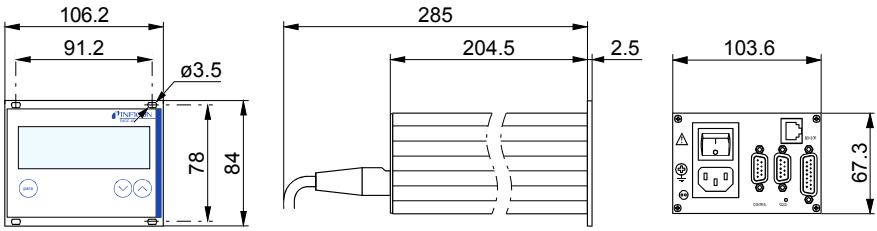
Gauge connection	Number	2 (parallel)
		Caution Do not connect more than one gauge at the same time.
	SENSOR connector	15-pin D-Sub, female RJ45 (FCC68), female (pin assignment → 🗎 23)
Operation	Front panel	via 3 keys
	HOST (remote control)	via RS232C interface
Measurement values	Measurement ranges	depending on gauge (→ 🕮 [1] … [21])
	Measurement error	
	gain error	≤0.02% FSr
	offset error	≤0.05% FSr
	Measurement rate	
	analog	100 / s
	digital	50 / s (BPG, HPG, BCG, CDGxxxD[1)]) 10 / s (BAG)
	Display rate	10 / s
	Filter time constant	
	slow	750 ms (f_g = 0.2 Hz)
	normal (nor)	150 ms (f_g = 1 Hz)
	fast	20 ms (f_g = 8 Hz)
	Pressure units	mbar, Pa, Torr, Micron
	Zero adjust	for linear gauges
	Correction factor	for logarithmic gauges 0.10 … 10.00
	A/D converters	resolution >0.001% FSr (The measurement values of BPG, HPG, BCG, BAG and CDGxxxD are transmitted digitally.)

1) CDG025D, CDG045D, CDG100D, CDG160D

Gauge supply	Voltage	+24 VDC ±5%
	Current	750 mA
	Power consumption	18 W
	Fuse protection	900 mA with PTC element, self-resetting after turning the VGC401 off or disconnecting the gauge
Switching function	Number	1
	Reaction delay	≤10 ms if switching threshold close to measurement value (for larger differences consider filter time constant).
	Adjustment range	depending on gauge (→ 🕮 [1] … [21])
	Hysteresis	≥1% FSr for linear gauges ≥10% of measurement value for logarithmic gauges
Switching function relay	Contact type	floating changeover contact
	Load max.	60 VDC, 1 A (ohmic) 30 VAC, 2 A (ohmic)
	Service life mechanic electric	 10^8 cycles 10^5 cycles (at maximum load)
	Contact positions	→ 🗎 24
	CONTROL connector	9-pin D-Sub, male (pin assignment → 🗎 24)
Error signal	Number	1
	Reaction time	≤20 ms
Error signal relay	Contact type	floating normally open contact
	Load max.	60 VDC, 1 A (ohmic) 30 VAC, 2 A (ohmic)
	Service life mechanic electric	 10^8 cycles 10^5 cycles (at maximum load)
	Contact positions	→ 🗎 24
	CONTROL connector	9-pin D-Sub, male (pin assignment → 🗎 24)

Analog output	Number	1
	Voltage range	0 … +10 V
	Internal resistance	660 Ω
	Measurement signal vs. pressure	depending on gauge (→ 🕮 [1] … [21])
	CONTROL connector	9-pin D-Sub, male (pin assignment → 🗎 24)
Interface	Standard	RS232C
	Protocol	ACK/NAK, ASCII with 3-character mnemonics, bi-directional data flow, 8 data bits, no parity bit, 1 stop bit
	RS232C	only TXD and RXD used
	Transmission rate	9600, 19200, 38400 baud
	RS232 connector	9-pin D-Sub, female (pin assignment → 🗎 25)

Dimensions [mm]



Use	For incorporation into a rack or control panel or as desk-top unit
Weight	0.85 kg

3 Installation

3.1 Personnel

Skilled personnel

The unit may only be installed by persons who have suitable technical training and the necessary experience.

3.2 Installation, Setup

The VGC401 is suited for incorporation into a 19" rack or a control panel or for use as desk-top unit.

DANGER

DANGER: damaged product

Putting a damaged product into operation can be extremely hazardous.

In case of visible damages, make sure the product is not put into operation.

3.2.1 Rack Installation

The VGC401 is designed for installation into a 19" rack chassis adapter according to DIN 41 494. For this purpose, four collar screws and plastic sleeves are supplied with it.

DANGER

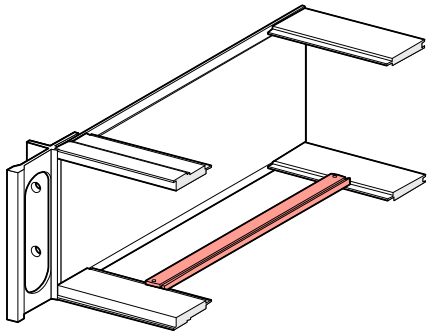
DANGER: protection class of the rack

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

Take appropriate measures for the rack to meet the specifications of the protection class.

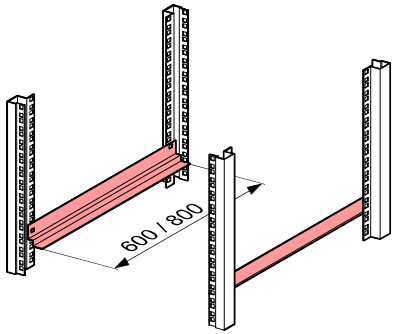
Guide rail

In order to reduce the mechanical strain on the front panel of the VGC401, preferably equip the rack chassis adapter with a guide rail.

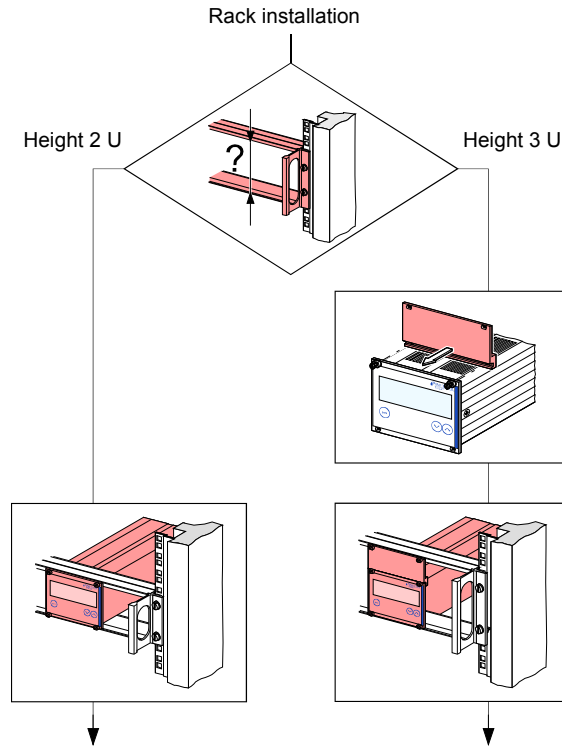


Slide rails

For safe and easy installation of heavy rack chassis adapters, preferably equip the rack frame with slide rails.



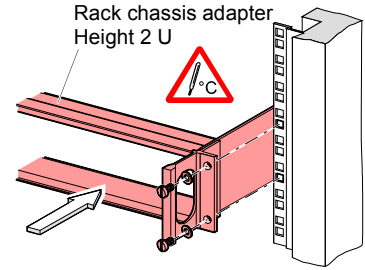
Mounting height



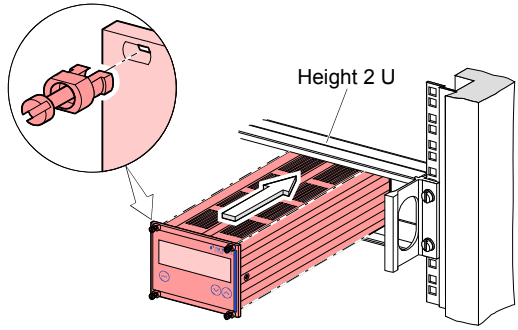
Height 2 U rack chassis adapter

❶ Secure the rack chassis adapter in the rack frame.

The admissible maximum ambient temperature (→ 🗎 9) must not be exceeded neither the air circulation obstructed.



❷ Slide the VGC401 into the adapter …



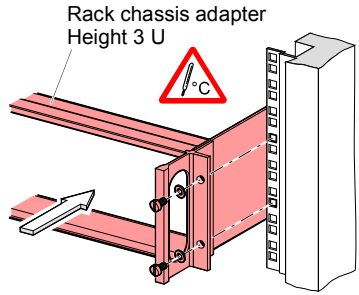
… and fasten the VGC401 to the rack chassis adapter using the screws supplied with it.

Height 3 U rack chassis adapter

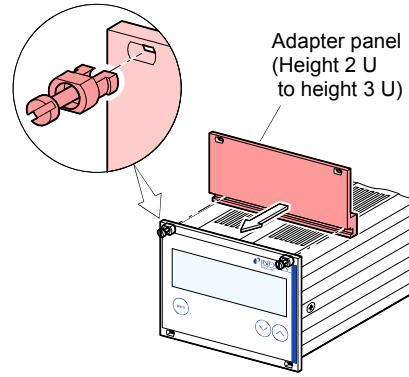
For incorporation into a 19" rack chassis adapter, height 3, an adapter panel (incl. two collar screws and plastic sleeves) is available (→ 🗎 79).

❶ Secure the rack adapter in the rack frame.

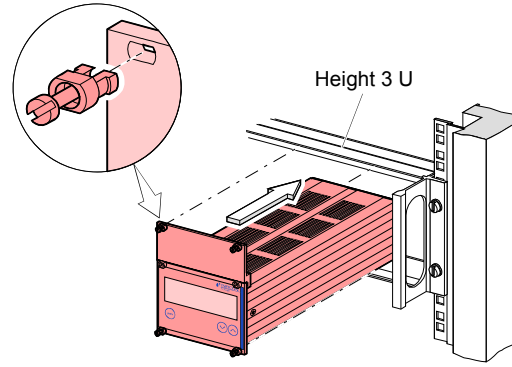
The admissible maximum ambient temperature (→ 🗎 9) must not be exceeded neither the air circulation obstructed.



❷ Mount the adapter panel as upper extension to the front panel of the VGC401 using the screws supplied with the adapter panel.



❸ Slide the VGC401 into the rack chassis adapter …



…and fasten the adapter panel to the rack chassis adapter using the screws supplied with the VGC401.

3.2.2 Installation in a Control Panel

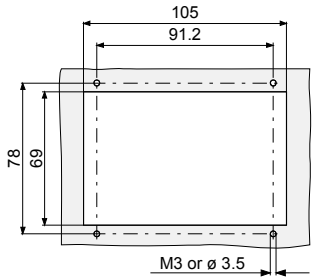
DANGER

DANGER: protection class of the control panel

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

Take appropriate measures for the control panel to meet the specifications of the protection class.

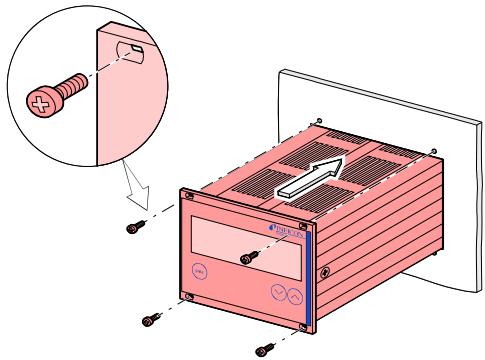
For mounting the VGC401 into a control panel, the following cut-out is required:



The admissible maximum ambient temperature (→ 9) must not be exceeded neither the air circulation obstructed.

For reducing the mechanical strain on the front panel, preferably support the unit.

❶ Slide the VGC401 into the cut-out of the control panel …

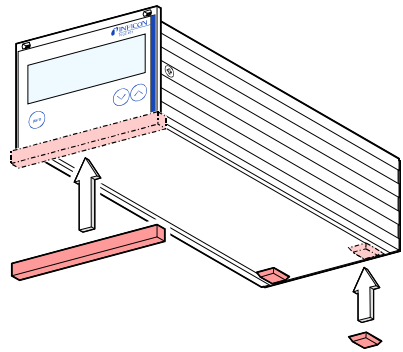


… and secure it with four M3 or equivalent screws.

3.2.3 Use as Desk-Top Unit

The VGC401 is also suited for use as desk-top unit. For this purpose, two self-adhesive rubber feet as well as a slip-on rubber bar are supplied with it.

❶ Stick the two supplied rubber feet to the rear part of the bottom plate …



… and slip the supplied rubber bar onto the bottom edge of the front panel.

Select a location where the admissible maximum ambient temperature (→ 9) is not exceeded (e.g. due to sun irradiation).

3.3 Mains Power Connector

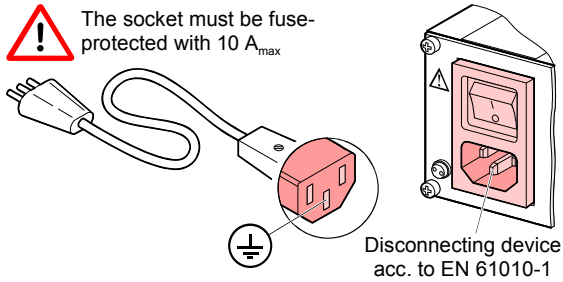
DANGER

DANGER: line voltage

Incorrectly grounded products can be extremely hazardous in the event of a fault.

Use only a 3-conductor power cable (3×1.5 mm^2) with protective ground. The power connector may only be plugged into a socket with a protective ground. The protection must not be nullified by an extension cable without protective ground.

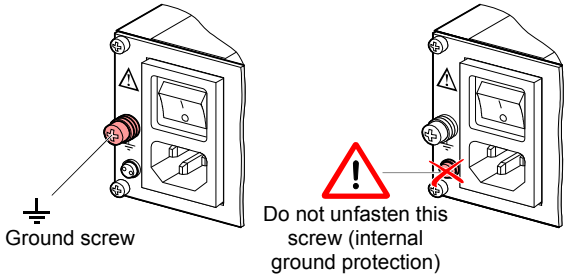
The unit is supplied with a 2.5 m power cord. If the mains cable is not compatible with your system, use your own, suitable cable with protective ground.



If the unit is installed in a switch cabinet, the mains voltage should be supplied and turned on via a central power distributor.

Grounding

On the rear of the unit, there is a screw which can be used to connect the unit to ground, e.g. using the grounding of the pumping station.



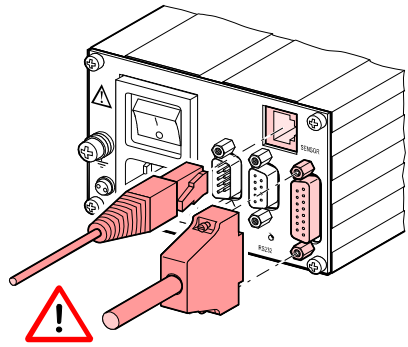
3.4 SENSOR Connector

The VGC401 is equipped with two different gauge connectors.

Caution

Caution: one channel measurement unit

Connecting more than one gauge at the same time may lead to gauge destruction.



1 only at once

Make sure that there is never more than one gauge connected to the VGC401 at the same time.

Connect the gauge to one of the two SENSOR connectors on the rear of the unit. Use a screened 1:1 cable (electromagnetic compatibility). Make sure the gauge is compatible (→ 9).

DANGER

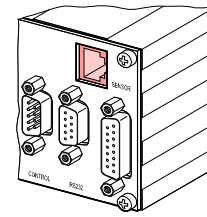
DANGER: protective low voltage

According to EN 61010, voltages exceeding 30 VAC or 60 VDC are hazardous.

Only connect a protective low voltage (SELV).

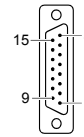
Pin assignment
SENSOR

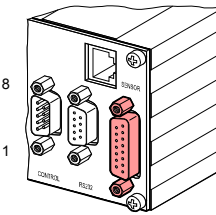
Pin assignment of the 8-pin RJ45 appliance connector:



Pin	Signal	
4	Identification	
1	Supply	+24 VDC
2	Supply common	GND
3	Signal input	(Measurement signal+)
5	Signal common	(Measurement signal–)
6	Status	
7	HV_L	
8	HV_H	

Pin assignment of the female 15-pin D-Sub appliance connector:





Pin	Signal	
10	Identification	
8	Supply for BPG, HPG, BCG and BAG	
11	Supply for CDG	
5	Supply common	GND
2	Signal input	(Measurement signal+)
12	Signal common	(Measurement signal–)
3	Status	
1	Emission status	
7	Degas	
4	HV_H	
13	RXD	
14	TXD	
15	Screening = chassis	
6, 9	not connected	

3.5 CONTROL Connector

This connector allows to read the measurement signal, to evaluate state of the floating switching function and error contacts, and to activate/deactivate the high vacuum measurement circuit (only for PEG cold cathode gauge and BAG ionization vacuum gauge).

Connect the peripheral components to the CONTROL connector on the rear of the unit. Use a screened cable (electromagnetic compatibility).

DANGER

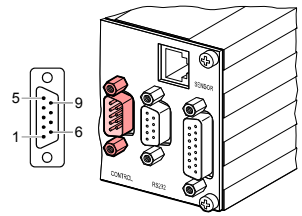
DANGER: protective low voltage

According to EN 61010, voltages exceeding 30 VAC or 60 VDC are hazardous.

Only connect a protective low voltage (SELV).

Pin assignment
Contact positions
CONTROL

Pin assignment of the male 9-pin D-Sub appliance connector:



Pin	Signal
1	Analog output 0 … +10 VDC
7	Chassis = GND
5	HV_H on +24 V off 0 V
	The control over this signal is placed superior to the key operation.
4 3 2	Pressure below threshold Pressure above threshold or power supply turned off
	Error signal
9 8	No error Error or power supply turned off
	Supply for relays with higher switching power
6 7	+24 VDC, 200 mA Chassis = GND Fuse-protected at 300 mA with PTC element, self-resetting after power off or pulling the CONTROL connector. Meets the requirements of a grounded protective extra low voltage (SELV).

The analog output (pin 1) differ from the displayed value by no more than ±50 mV.

3.6 RS232 Interface Connector

The RS232C interface allows for operating the VGC401 via a HOST or terminal. It can also be used for updating the firmware (→ 🗎 83).

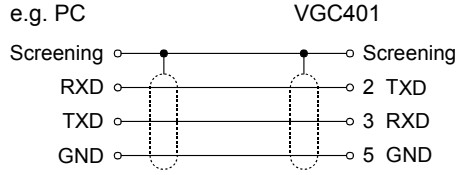
Connect the serial interface to the RS232 connector on the rear of the unit using your own, screened (electromagnetic compatibility) cable.

DANGER

DANGER: protective low voltage

According to EN 61010, voltages exceeding 30 VAC or 60 VDC are hazardous.

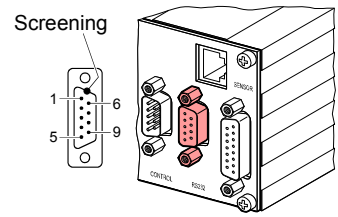
Only connect a protective low voltage (SELV).



(Minimum configuration)

Pin assignment RS232

Pin assignment of the female 9-pin D-Sub appliance connector:



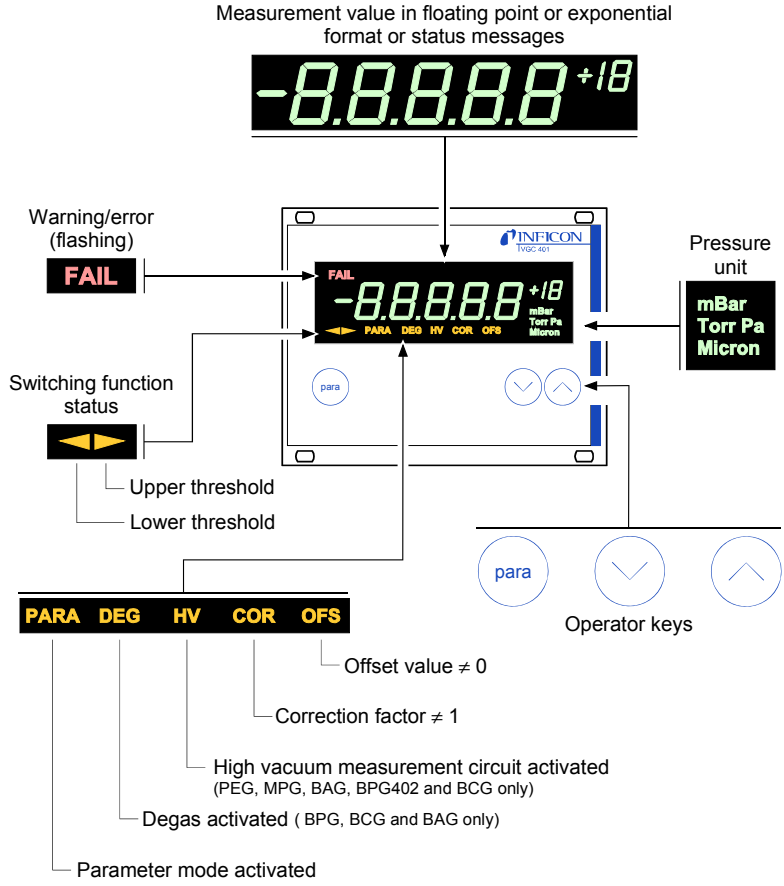
Pin	Signal
2	TXD
3	RXD
5	GND
6	DSR
8	CTS
9	GND

Pin	Signal
1	not connected
4	not connected
7	not connected

Chassis = screening

4 Operation

4.1 Front Panel



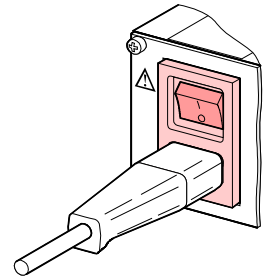
4.2 Turning the VGC401 On and Off

Make sure the VGC401 is correctly installed and the specifications in the Technical Data are met.

Turning the VGC401 on

The power switch is on the rear of the unit.

Turn the VGC401 on with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).



After power on, the VGC401 …

- automatically performs a self-test
- identifies the connected gauge
- activates the parameters that were in effect before the last power off
- switches to the Measurement mode
- adapts the parameters if required (if another gauge was previously connected).

Turning the VGC401 off

Turn the VGC401 off with the power switch (or centrally, via a switched power distributor, if the unit is incorporated in a rack).

Wait at least 10 s before turning the VGC401 on again in order for it to correctly initialize itself.

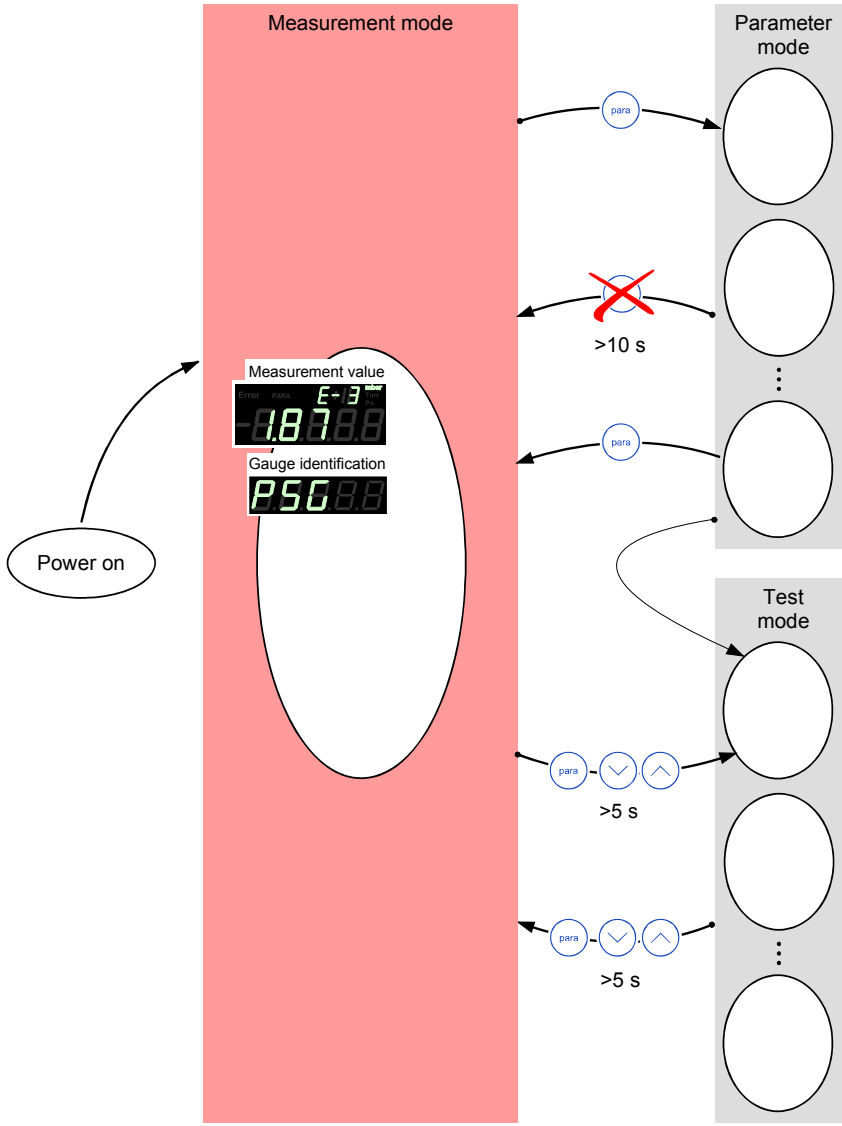
4.3 Operating Modes

The VGC401 works in the following operating modes:

- Measurement mode
  for displaying measurement values or status messages (→ 🗎 28)
- Parameter mode
  for entering or displaying parameters (→ 🗎 31)
- Test mode
  for running internal test programs (→ 🗎 47)
- Program transfer mode
  for updating the firmware (→ 🗎 83)

4.4 Measurement Mode

The Measurement mode is the standard operating mode of the VGC401. Measurement values and status messages as well as the gauge identification are displayed in this mode.

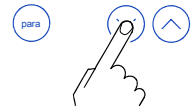


Turning the gauge on and off

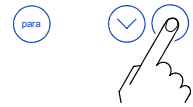
Available for:

- ☐ Pirani (PSG)
- ☐ Pirani/Capacitive (PCG)
- ☑ Cold cathode (PEG)
- ☐ Cold cathode/Pirani (MPG)
- ☑ Hot cathode (BAG)
- ☐ Hot cathode/Pirani (BPG, HPG)
- ☐ Capacitive (CDG)
- ☐ Hot cathode/Pirani/Capacitive (BCG)

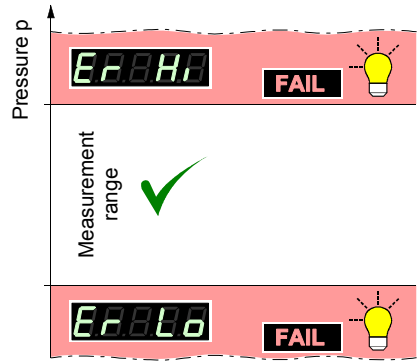
HV



⇨ Press key >1 s: The gauge is turned off. oFF is displayed instead of the measurement value.



⇨ Press key >1 s: The gauge is turned on. A status message may be displayed instead of the measurement value:



The high vacuum measurement circuit of these gauges can be activated in both, the Measurement and the Parameter mode (→ 🗎 43).

Displaying the gauge identification

⇨ Press keys >0.5 s:
The type of the connected gauge is automatically identified and displayed for 5 s:

Pirani gauge
(PSG400, PSG400-S, PSG100-S, PSG101-S, PSG500, PSG500-S, PSG502-S, PSG510-S, PSG512-S, PSG550, PSG552, PSG554)

Pirani/Capacitive gauge
(PCG400, PCG400-S, PCG550, PCG552, PCG554)

Cold cathode gauge
(PEG100)

Cold cathode/Pirani gauge
(MPG400, MPG401)

Hot cathode gauge
(BAG100-S, BAG101-S)

Hot cathode/Pirani gauge
(BPG400)

Hot cathode/Pirani gauge
(BPG402)

Hot cathode/Pirani gauge
(HPG400)

Hot cathode/Pirani/Capacitive gauge (BCG450)

Linear gauge (capacitive. analog)
(CDG025, CDG045, CDG045-H, CDG100)

Linear gauge (capacitive. digital)
(CDG025D, CDG045D, CDG100D, CDG160D)

No gauge connected
(no Sensor)

Connected gauge cannot be identified (no Identifier)

Getting to the Parameter mode

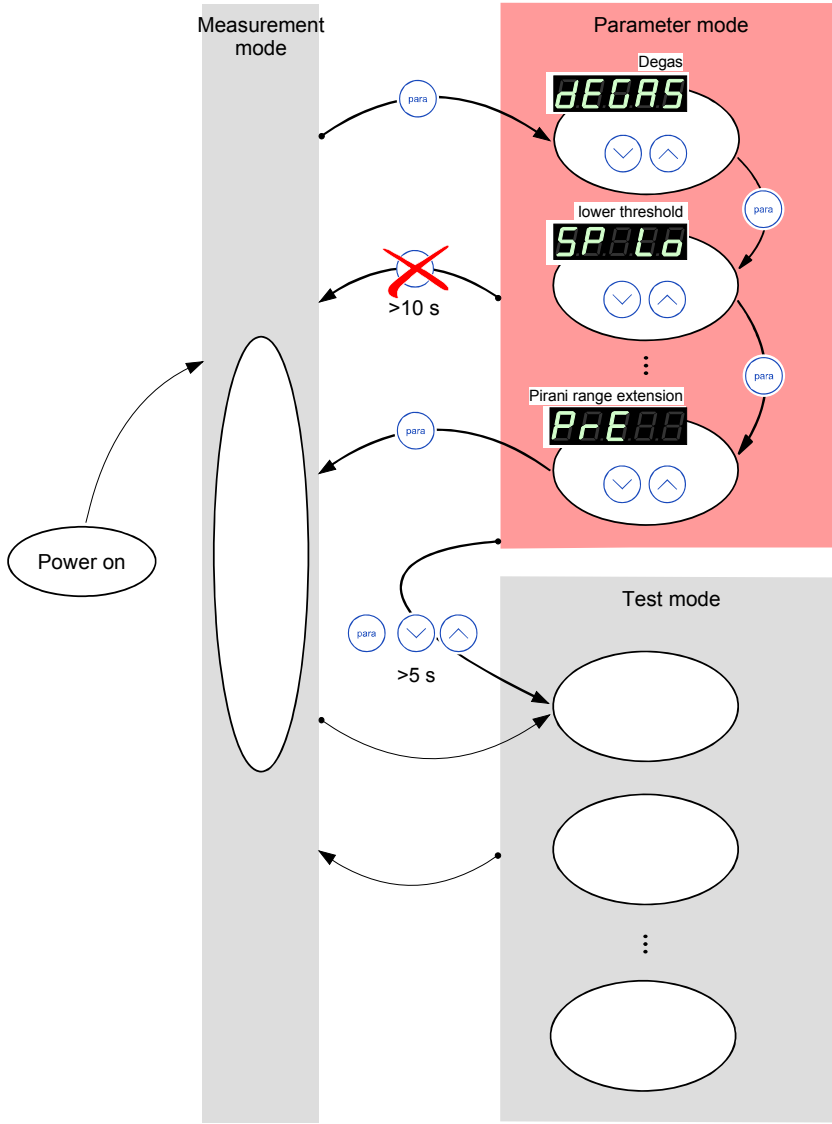
→ 🗎 31

Getting to the Test mode

Press keys >5 s
(→ 🗎 47)

4.5 Parameter Mode

The Parameter mode is used for displaying, editing and entering parameter values.



Selecting a parameter

⇨ The name of the parameter

e.g.: 
Degas

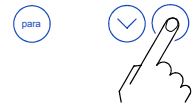
is displayed as long as the key is pressed or at least 2 s.

Afterwards, the currently valid parameter value is displayed.

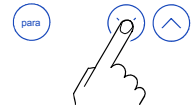
Some parameters are not available for all gauge types. They are only displayed if available.

Available for	→ 🗎 34	34	38	38	41	41	42	43	44	44	45	45	46
													
	–	✓	–	–	✓	✓	✓	–	✓	✓	–	–	✓
	–	✓	–	–	✓	✓	✓	–	✓	✓	–	–	✓
	–	✓	–	–	✓	✓	✓	✓	✓	✓	–	–	–
	–	✓	–	–	✓	✓	✓	–	✓	✓	–	–	–
	✓	✓	–	–	✓	✓	–	–	✓	✓	–	–	–
	✓	✓	–	–	✓	✓	–	–	✓	✓	✓	✓	–
	–	✓	–	–	✓	✓	–	–	✓	✓	–	–	–
	✓	✓	–	–	✓	✓	–	✓	✓	✓	–	–	–
	–	✓	✓	✓	✓	–	✓	–	–	✓	–	–	–
	–	✓	✓	✓	✓	–	✓	–	–	✓	–	–	–
	✓	✓	–	–	✓	✓	–	–	✓	✓	✓	–	–

Editing the parameter value



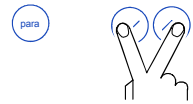
⇨ Press key <1 s:
The value is increased/ decreased by 1 increment.



Press key >1 s:
The value is increased/ decreased continuously.

Modifications of parameters come into effect immediately and are stored automatically. Exceptions are mentioned under the corresponding parameters.

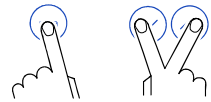
Loading the default parameters



⇨ Press keys >5 s:
All user-defined parameters are restored to their default values (→ 🗎 82).

Loading of the default parameter settings is irreversible.

Getting to the Test mode



Press keys >5 s
(→ 🗎 47)

4.5.1 Parameters

Degas

Contamination deposits on the electrode system of Hot cathode gauges may cause instabilities of the measurement values. The Degas function allows to clean the electrode system.

☞ BAG10X and BPG402 gauges: The Degas function acts only upon the active filament.

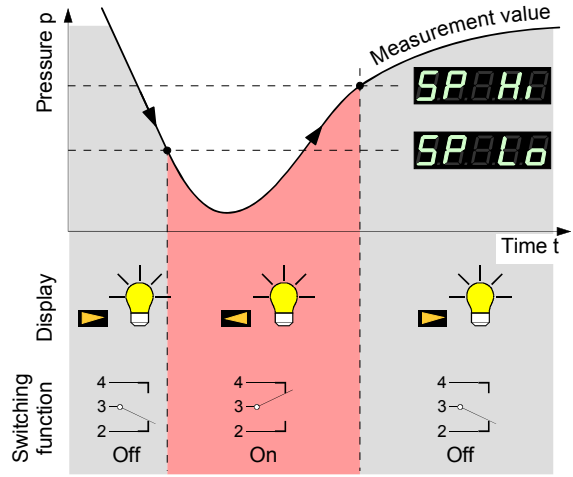
Available for:

☐	Pirani	(PSG)
☐	Pirani/Capacitive	(PCG)
☐	Cold cathode	(PEG)
☐	Cold cathode/Pirani	(MPG)
☑	Hot cathode	(BAG)
☑	Hot cathode/Pirani	(BPG)
☐	Hot cathode/Pirani	(HPG)
☐	Capacitive	(CDG)
☑	Hot cathode/Pirani/Capacitive	(BCG)

	Value
dEGAS	DEG
oFF	⇨ Normal operation. 
on	⇨ Degas: The electron collection grid is heated to ≈700 °C by electron bombardment and the electrode system is thus cleaned.  Duration of the Degas function: 3 min (can be aborted).

Lower/upper switching threshold

The VGC401 has a switching function with two adjustable thresholds. The status of the switching function is displayed on the front panel (→ 🗎 26) and can be evaluated via the floating contact at the CONTROL connector (→ 🗎 23).



	Value
SP.Lo	The lower switching threshold (Setpoint low) defines the pressure at which the switching function is activated when the pressure is dropping.
e.g.: 0.00	⇨ gauge dependent (→ table). If another gauge type is connected, the VGC401 automatically adjusts the switching threshold if required.

	lower threshold limit SP.Lo	upper threshold limit SP.Lo
PSG	2×10^{-3} *)	5×10^{2}
PCG	2×10^{-3} *)	1.5×10^{3}
PEG	1×10^{-9}	1×10^{-2}
nPG	5×10^{-9}	1×10^{3}
bPG	1×10^{-8}	1×10^{3}
bPG2	1×10^{-8}	1×10^{3}
HPG	1×10^{-6}	1×10^{3}
bAG	1×10^{-10}	1×10^{-1}
CdG	FSr / 1000	FSr
CdGd	FSr / 1000	FSr
bCG	1×10^{-8}	1.5×10^{3}

all values in mbar, Cor = 1

*) 2×10^{-4} mbar, if PrE is activated (→ 🗎 46)

The minimum hysteresis between the upper and lower switching threshold is at least 10% of the lower threshold or 1% of the set full scale value. If the value of the minimum hysteresis drops below these values, the upper threshold is automatically adjusted. This prevents unstable states.

	Value
SP.HI	The upper switching threshold (Setpoint high) defines the pressure at which the switching function is deactivated when the pressure is rising.
e.g.: 10.00	⇨ gauge dependent (→ table). If another gauge type is connected, the VGC401 automatically adjusts the threshold if required.

		lower threshold limit SP Hi	upper threshold limit SP Hi
PSG	lower threshold	+10% lower threshold	5×10^{2}
PCG	lower threshold	+10% lower threshold	1.5×10^{3}
PEG	lower threshold	+10% lower threshold	1×10^{-2}
nPG	lower threshold	+10% lower threshold	1×10^{3}
bPG	lower threshold	+10% lower threshold	1×10^{3}
bPG2	lower threshold	+10% lower threshold	1×10^{3}
HPG	lower threshold	+10% lower threshold	1×10^{3}
bAG	lower threshold	+10% lower threshold	1×10^{-1}
CdG	lower threshold	+1% measurement range (FSr)	FSr
CdG d	lower threshold	+1% measurement range (FSr)	FSr
bCG	lower threshold	+10% lower threshold	1.5×10^{3}

all values in mbar, Cor = 1

The minimum hysteresis between the upper and lower switching threshold is at least 10% of the lower threshold or 1% of the set full scale value. This prevents unstable states.

Measurement range of capacitive gauges

The full scale value of the measurement range (**F**ull **S**cale **r**ange) of the linear gauges has to be defined by the user; the full scale value of logarithmic gauges is automatically recognized.

Available for:

- ☐ Pirani (PSG)
- ☐ Pirani/Capacitive (PCG)
- ☐ Cold cathode (PEG)
- ☐ Cold cathode/Pirani (MPG)
- ☐ Hot cathode (BAG)
- ☐ Hot cathode/Pirani (BPG, HPG)
- ☑ Capacitive (CDG)
- ☐ Hot cathode/Pirani/Capacitive (BCG)

	Value
	
e.g.: 	⇨ 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

Conversion table → Appendix, 🗎 81

Offset correction of the controller

For displaying the offset correction and zero adjustment of the gauge and adjustment to the currently measured value (in the range -5 ... +110% of the full scale setting).

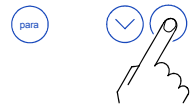
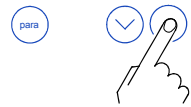
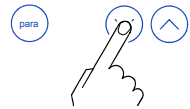
Available for:

☐	Pirani	(PSG)
☐	Pirani/Capacitive	(PCG)
☐	Cold cathode	(PEG)
☐	Cold cathode/Pirani	(MPG)
☐	Hot cathode	(BAG)
☐	Hot cathode/Pirani	(BPG, HPG)
☑	Capacitive	(CDG)
☐	Hot cathode/Pirani/Capacitive	(BCG)

When the offset correction is activated, the stored offset value is subtracted from the actual measurement value. This allows measuring relative to a reference pressure.

The offset correction affects:

☑ the displayed measurement value
☐ the displayed threshold value of the switching functions
☐ the analog output at the CONTROL connector (→ 23)

	Value
	
	⇨ Offset correction deactivated 
e.g.: 	⇨ Offset correction activated 
	⇨ Press briefly: Activate offset correction.
	⇨ Press key >2 s: The offset value is readjusted. The actual measurement value is accepted as new offset value.
	⇨ Press briefly: Deactivate offset correction.

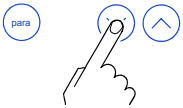
Zero adjustment of the gauge

Available for:

☐ Pirani	(PSG)
☐ Pirani/Capacitive	(PCG)
☐ Cold cathode	(PEG)
☐ Cold cathode/Pirani	(MPG)
☐ Hot cathode	(BAG)
☐ Hot cathode/Pirani	(BPG, HPG)
☑ Capacitive	(CDG)
☐ Hot cathode/Pirani/Capacitive	(BCG)

First adjust the gauge and then the controller.

When the zero of the gauge is readjusted, the offset correction must be deactivated.

	Value
	
e.g.: 	⇨ Zero adjustment activated  Lit solid after >2 s and as long as key remains pressed
	⇨ Press >2 s Zero adjustment of the gauge (CDGxxxD only).

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.

Pressure unit

Unit of measured values, thresholds etc. See Appendix (→ 🗎 81) for conversion.

	Value	
		
	⇨ mbar/bar	
	⇨ Torr (only available if Torr lock is not activated i.e. Torr is not suppressed → 🗎 50)	
	⇨ Pascal	
	⇨ Micron (=mTorr)	

A change of the pressure unit influences also the settings of the BPG, HPG and BCG gauges.

When selecting Micron, above 99000 Micron the readout automatically changes over to Torr. When the pressure drops below 90 Torr the instrument automatically switches back to Micron.

Correction factor

The correction factor allows the measured value to be calibrated for other gases than N_2 (→ respective manual, "Literature" 🗎 86).

Available for:

			Only for pressures
☑	Pirani	(PSG)	
☑	Pirani/Capacitive	(PCG)	<10 mbar
☑	Cold cathode	(PEG)	
☑	Cold cathode/Pirani	(MPG)	$<1\times10^{-2}$ mbar
☑	Hot cathode	(BAG)	
☑	Hot cathode/Pirani	(BPG)	$<1\times10^{-2}$ mbar
☑	Hot cathode/Pirani	(HPG)	
☐	Capacitive	(CDG)	
☑	Hot cathode/Pirani/Capacitive	(BCG)	<1 mbar

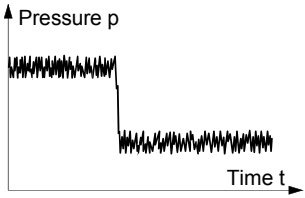
	Value
	
e.g.: 	⇨ No correction 
e.g.: 	⇨ Measurement value corrected by a factor of 0.10 … 10.00 

Measurement value filter

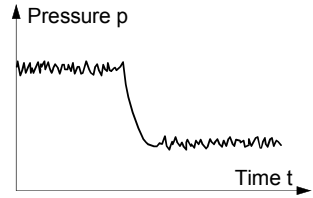
The measurement value filter permits a better evaluation of unstable or disturbed measuring signals.

The filter affects:

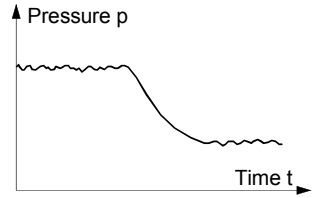
- ☑ the displayed measurement value
- ☐ the analog output
- ☐ the digitally transmitted measurement value of the Hot cathode gauges BPG, HPG, BCG and BAG

	Value
	
	⇨ Fast: The VGC401 responds quickly to fluctuations in measured values. As a result, it will be more sensitive to disturbed measurement signals. 

⇨ Normal:
Good relationship between response and sensitivity of the display and the switching functions to changes in the measured values.



⇨ Slow:
The VGC401 does not respond to small changes in measured values. As a result, it will respond more slowly to changes in the measured values.



Turning the gauge on/off

Activating/deactivating the high vacuum measurement circuit (→ also 🗎 29).

Available for:

☐	Pirani	(PSG)
☐	Pirani/Capacitive	(PCG)
☑	Cold cathode	(PEG)
☐	Cold cathode/Pirani	(MPG)
☑	Hot cathode	(BAG)
☐	Hot cathode/Pirani	(BPG, HPG)
☐	Capacitive	(CDG)
☐	Hot cathode/Pirani/Capacitive	(BCG)

	Value
	
	⇨ High vacuum measurement circuit activated 
	⇨ High vacuum measurement circuit deactivated 

Display resolution (digits)

Display resolution of measured values.

	Value
	
	⇨ Display • rounded to one decimal digit  • or two integrals 
	⇨ Display • rounded to two decimal digits  • or three integrals 

When the PrE (→ 🗎 46) is ON and the pressure is in the range p<1.0E-4 mbar the display resolution of the PSG and PCG Gauges is reduced by one decimal digit.

Transmission rate

Transmission rate of the RS232C interface.

	Value
	
e.g.: 	⇨ 9600 baud 19200 baud 38400 baud

Emission

Switching the emission on and off.

Available for:

- ☐ Pirani (PSG)
- ☐ Pirani/Capacitive (PCG)
- ☐ Cold cathode (PEG)
- ☐ Cold cathode/Pirani (MPG)
- ☐ Hot cathode (BAG)
- ☑ Hot cathode/Pirani (BPG402 only)
- ☐ Capacitive (CDG)
- ☑ Hot cathode/Pirani/Capacitive (BCG)

	Value
	
	⇨ the emission is switched on and off automatically by the gauge
	⇨ the emission is switched on and off by the user

Filament

Means of selection.

Available for:

- ☐ Pirani (PSG)
- ☐ Pirani/Capacitive (PCG)
- ☐ Cold cathode (PEG)
- ☐ Cold cathode/Pirani (MPG)
- ☐ Hot cathode (BAG)
- ☑ Hot cathode/Pirani (BPG402 only)
- ☐ Capacitive (CDG)
- ☐ Hot cathode/Pirani/Capacitive (BCG)

	Value
	
	⇨ the gauge automatically alternates between the filaments
	⇨ filament 1 aktive
	⇨ filament 2 aktive

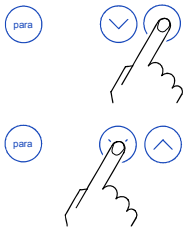
Pirani range extension

The display and setpoint adjustment range can be extended.

Available for:

			Measurement range
☑	Pirani Gauge	(PSG)	5×10^{-5}…1000 mbar
☑	Pirani Capacitance Gauge	(PCG)	5×10^{-5}…1500 mbar
☐	Cold Cathode Gauge	(PEG)	
☐	Cold cathode/Pirani	(MPG)	
☐	Hot cathode	(BAG)	
☐	Hot cathode/Pirani	(BPG, HPG)	
☐	Capacitive	(CDG)	
☐	Hot cathode/Pirani/Capacitive	(BCG)	

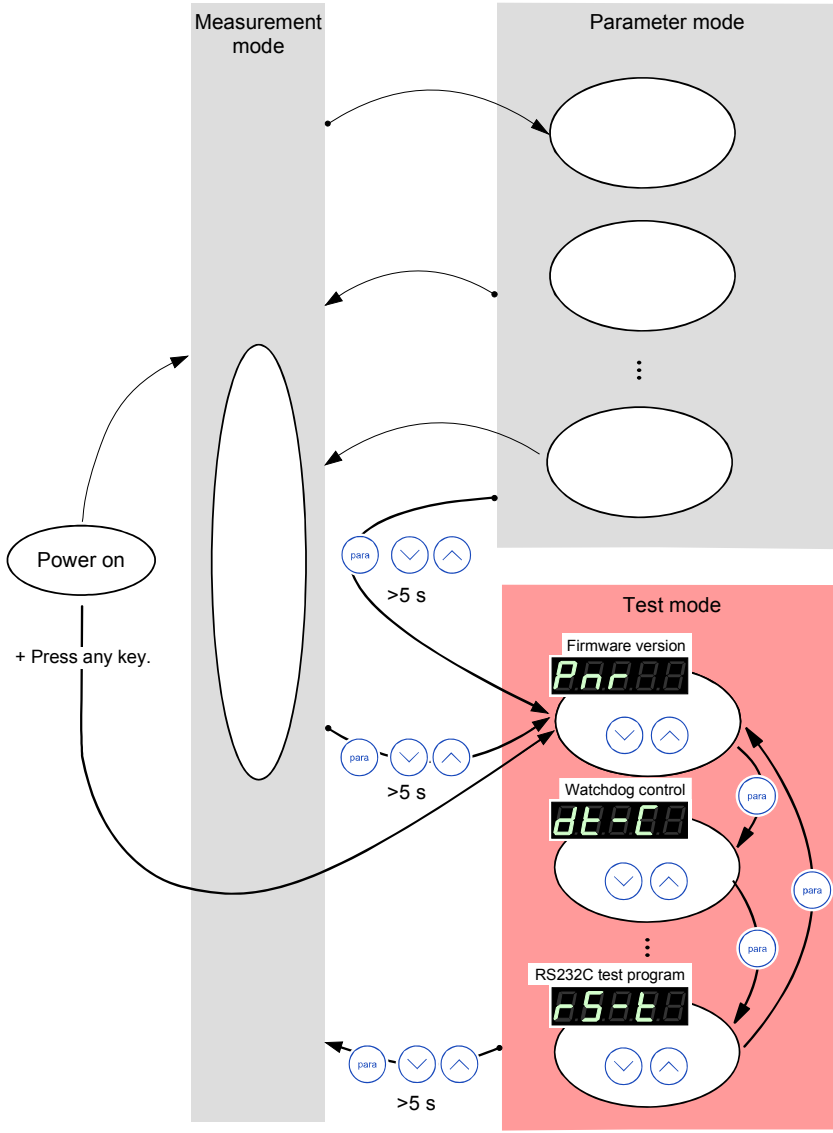
	Value
	
	⇨ Default.
	⇨ Display extended to 5×10^{-5} mbar, setpoint adjustment range extended to 2×10^{-4} mbar.



⇨ Activate/deactivate the Pirani range extension.

4.6 Test Mode

The Test mode is used for displaying, editing and entering special parameter values for testing the VGC401.



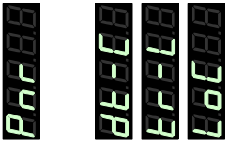
Selecting a parameter

⇨ The name of the parameter

e.g.: 
Firmware version

is displayed.

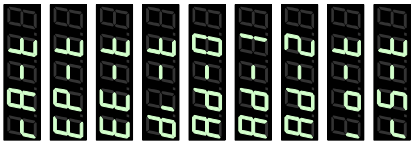
→ 49



The name of the parameter is displayed as long as the key is pressed or at least for 2 s.

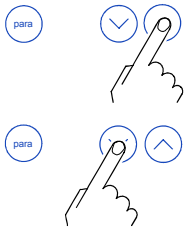
The firmware version is continuously displayed.

→ 50 51 51 52 52 53 53 54 54



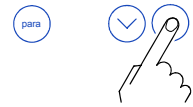
The name of the test program is displayed until it is started.

Modifying a parameter



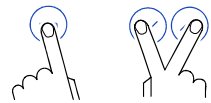
⇨ Increase/decrease the value by the defined increments.

Starting the test program



⇨ Start test program.

Changing to the Measurement mode



Press keys >5 s
(→ 🗎 28)
or
turn the unit off, wait for 10 s and then turn it on again.

4.6.1 Parameters

Firmware version

The firmware version (program version) is displayed.

	Version
	⇨ The two parts of the firmware number are displayed alternately.

The last character indicates the modification index (-, A … Z). Please mention this index when contacting INFICON in the event of a fault.

Watchdog control

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

	Setting
	⇨ The system automatically acknowledges error messages of the watchdog after 2 s.
	⇨ Error messages of the watchdog have to be acknowledged by the operator.

Torr lock

The pressure unit **Torr** can be suppressed in the corresponding parameter setting unit (→ 🗎 41).

	Setting
tr-L	
oFF	⇨ Pressure unit **Torr** available.
on	⇨ Pressure unit **Torr** not available.

Parameter setup lock

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

	Setting
LoC	
oFF	⇨ Parameters can be inspected and modified
on	⇨ Parameters can be inspected only.

4.6.2 Test Programs

RAM test

Test of the main memory.

	Test sequence
rA-t	The test runs automatically one time:
run	⇨ Test in process (very briefly).
PASS	⇨ Test finished, no error found.
Err	⇨ Test finished, error(s) found. The **FAIL** lamp flashes.

EPROM test

Test of the program memory.

	Test sequence
	The test runs automatically one time:
	⇨ Test in process
	⇨ Test finished, no error found. After the test, a four-digit checksum (hexadecimal format) is displayed.
	⇨ Test finished, error(s) found. After the test, a four-digit checksum (hexadecimal format) is displayed. The FAIL lamp flashes.

EEPROM test

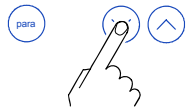
Test of the parameter memory.

	Test sequence
	The test runs automatically one time:
	⇨ Test in process (very briefly).
	⇨ Test finished, no error found.
	⇨ Test finished, error(s) found. The FAIL lamp flashes.

Display test

Test of the display.

	Test sequence
	The test runs automatically one time [1]: ⇨ First, all display elements are lit at the same time, ... ⇨ ... and then, each element is lit individually.

1) 

⇨ Stop the test sequence and activate one element after another by pressing the key once per element.

A/D converter test 0

Test of channel 0 of the analog/digital converter (with a reference voltage at the signal input of the SENSOR connector (→ 🗎 23)).

The measurement value filter affects the applied voltage. If the signal input is open, the VGC401 displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

	Test sequence
 e.g.: 	⇨ Positive portion of the measurement signal in Volt

A/D converter test 1

Test of channel 1 of the analog/digital converter (with a reference voltage at the signal input of the SENSOR connector (→ 🗎 23)).

The measurement value filter affects the applied voltage. If the signal input is open, the VGC401 displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

	Test sequence
	
e.g.: 	⇨ Negative portion of the measurement signal in Volt.

A/D converter test 2

Test of channel 2 of the analog/digital converter (with a reference voltage at the signal input of the SENSOR connector (→ 🗎 23)).

The measurement value filter affects the applied voltage. If the signal input is open, the VGC401 displays a default value that may easily fluctuate because of the high sensitivity of the open measurement circuit.

	Test sequence
	
e.g.: 	⇨ Gauge identification voltage
	⇨ No gauge connected

I/O test

Test of the two relays of the VGC401. The program tests their switching function.

Caution

Caution: The relays switch irrespective of the pressure

Starting a test program may cause unwanted effects in connected control systems.

Disconnect all sensor cables and control system lines to ensure that no control commands or messages are triggered by mistake.

The relays switch on and off cyclically. The switching operations are indicated optically and can be heard.

The contacts are connected to the CONTROL connector on the rear of the housing (→ 23). Check the switching function with an ohmmeter.

	Test sequence
	The test runs automatically one time:
	⇨ both relays deactivated
	⇨ switching function relay
	⇨ switching function relay
	⇨ error relay
	⇨ error relay

RS232C test

Test of the RS232C interface. The VGC401 repeats each sign transmitted by the communicating HOST.

The data transferred from/to the VGC401 can be displayed by the computer only (→ Section 5).

	Test sequence
	The test runs automatically.

5 Communication (Serial Interface)

5.1 RS232C Interface

The serial interface is used for communication between the VGC401 and a computer. A terminal can be connected for test purposes.

When the VGC401 is put into operation, it starts transmitting measured values in intervals of 1 s. As soon as the first character is transferred to the VGC401, the automatic transmission of measured values stops. After the necessary inquiries or parameter modifications have been made, the transmission of measured values can be started again with the **COM** command (→ 🗎 61).

Connection diagram, connection cable

Pin assignment of the 9-pin D-Sub connector and RS232 cable → 🗎 25.

5.1.1 Data Transmission

The data transmission is bi-directional, i.e. data and control commands can be transmitted in either direction.

Data format

1 start bit
8 data bits
No parity bit
1 stop bit
No hardware handshake

Definitions

The following abbreviations and symbols are used:

Symbol	Meaning	Dec	Hex
HOST	Computer or terminal		
[...]	Optional elements		
ASCII	American Standard Code for Information Interchange		
<ETX>	END OF TEXT (CTRL C) Reset the interface	3	03
<CR>	CARRIAGE RETURN Go to beginning of the line	13	0D
<LF>	LINE FEED Advance by one line	10	0A
<ENQ>	ENQUIRY Request for data transmission	5	05
<ACK>	ACKNOWLEDGE Positive report signal	6	06
<NAK>	NEGATIVE ACKNOWLEDGE Negative report signal	21	15

"Transmit": Data transfer from HOST to VGC401
"Receive": Data transfer from VGC401 to HOST

Format of pressure values

For pressure values, the following format is used:

```
sx.xxxxEsxx
| |     | └── Exponent
| |     └──── Sign exponent
| └──────── Mantissa
└────────── Sign mantissa
```

Flow Control

After each ASCII string, the HOST must wait for a report signal (<ACK><CR><LF> or <NAK> <CR><LF>).

The input buffer of the HOST must have a capacity of at least 25 bytes.

5.1.2 Communication Protocol

Transmission format

Messages are transmitted to the VGC401 as ASCII strings in the form of mnemonics and parameters. All mnemonics comprise three ASCII characters.

Spaces are ignored. <ETX> (CTRL C) clears the input buffer in the VGC401.

The input is terminated by <CR> or <LF> or <CR><LF> ("end of message"), and evaluation in the VGC401 is subsequently started.

The tables starting on 🗎 59 are applicable to the mnemonics and parameters. The maximum number of digits, the data formats and admissible value ranges are also specified there.

Transmission protocol

HOST VGC401	Explanation
Mnemonics [and parameters] ——————>	
<CR>[<LF>] ——————>	Receives message with "end of message"
<—————— <ACK><CR><LF>	Positive acknowledgment of a received message

Reception format

When requested with a mnemonic instruction, the VGC401 transmits the measurement data or parameters as ASCII strings to the HOST.

<ENQ> must be transmitted to request the transmission of an ASCII string. Additional strings, according to the last selected mnemonic, are read out by repetitive transmission of <ENQ>.

If <ENQ> is received without a valid request, the ERROR word is transmitted.

Reception protocol

HOST VGC401	Explanation
Mnemonics [and parameters] ——————> <CR>[<LF>] ——————>	Receives message with "end of message"
<——— <ACK><CR><LF>	Positive acknowledgment of a received message
<ENQ> ——————————>	Requests to transmit
<——————— Measurement values or parameters <——————— <CR><LF>	Transmits data with "end of message"
: :	
<ENQ> ——————————>	Requests to transmit
<——————— Measurement values or parameters <——————— <CR><LF>	Transmits data with "end of message"

Error processing

All strings received are verified in the VGC401. If an error is detected, a negative acknowledgment <NAK> is output. The appropriate flag is set in the ERROR word. Errors can be decoded when the ERROR word is read.

Error recognition protocol

HOST VGC401	Explanation
Mnemonics [and parameters] ——————> <CR>[<LF>] ——————>	Receives message with "end of message"
***** Transmission or programming error *****	
<——— <NAK><CR><LF>	Negative acknowledgment of a received message
Mnemonics [and parameters] ——————> <CR>[<LF>] ——————>	Receives message with "end of message"
<——— <ACK><CR><LF>	Positive acknowledgment of a received message

5.2 Mnemonics

Mnemonics

		→ 🗎
BAU	Baud rate	69
COM	Continuous mode	61
COR	Correction factor	68
DCD	Display control digits	68
DGS	BAG, BPG, BCG degas on/off	64
ERR	Error status	63
EUM	Emission user mode	69
FIL	Filter time constant	68
FSR	CDG full scale range	66
FUM	Filament user mode	69
HVC	HV, EMI on/off	61
ITR	BAG, BPG, HPG, BCG, CDGxxxD data output	62
LOC	Parameter setup lock	72
OFS	Offset correction	67
PNR	Program number	71
PRE	Pirani range extension	70
PR1	Pressure measurement	60
RES	Reset	63
SAV	Save parameters to EEPROM	69
SP1	Setpoint	64
SPS	Setpoint status	65
TAD	A/D converter test	73
TDI	Display test	73
TEE	EEPROM test	72
TEP	EPROM test	72
TID	Sensor identification	62
TIO	I/O test	74
TKB	Keyboard test	74
TLC	Torr lock	71
TRA	RAM test	72
TRS	RS232 test	74
UNI	Pressure unit	67
WDT	Watchdog control	71

5.2.1 Measurement Mode

Measurement data

Transmit: **PR1** <CR>[<LF>]

Receive: <ACK><CR><LF>

Transmit: <ENQ>

Receive: x,sx.xxxxEsxx <CR><LF>

- Measurement value [1] [in current pressure unit]
- Status, x =
  - 0 –> Measurement data okay
  - 1 –> Underrange
  - 2 –> Overrange
  - 3 –> Sensor error
  - 4 –> Sensor off (BAG, PEG)
  - 5 –> No sensor
  - 6 –> Identification error
  - 7 –> Error BAG, BPG, HPG, BCG

[1] The 3rd and 4th decimal are always 0, except for the CDG gauge.

Continuous output of measured values (RS232)

Transmit: **COM** [,x] <CR>[<LF>]

└ Mode x = 0 –> 100 ms
1 –> 1 s (default)
2 –> 1 min.

Receive: <ACK><CR><LF>

<ACK> is immediately followed by the continuous output of the measured value in the desired interval.

Receive: x,sx.xxxxEsxx y <CR><LF>

└ Measured value [1)] with pressure unit

└ Status, x =
0 –> Measurement data okay
1 –> Underrange
2 –> Overrange
3 –> Sensor error
4 –> Sensor off (BAG, PEG)
5 –> No sensor
6 –> Identification error
7 –> Error BAG, BPG, HPG, BCG

1) The 3rd and 4th decimal are always 0, except for the CDG gauge.

Activating/deactivating the HV circuit and EMI

Transmit: **HVC** [,x] <CR>[<LF>]

└ Mode x = 0 –> off (default)
1 –> on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

└ Mode

Data output BAG, BPG, HPG, BCG, CDGxxxD

Transmit: **ITR** <CR>[<LF>]

Receive: <ACK><CR><LF>

Transmit: <ENQ>

Receive: xxx...xxx,y <CR><LF> [1)]

- xxx...xxx: Transmission string (17 character) (→ 🕮 BAG)
- y: Gauge status ERS y (→ 🕮 BAG)

xx,xx,xx,xx,xx,xx,xx,xx <CR><LF> [2)]

- xx,xx,xx,xx,xx,xx,xx,xx: Transmission string byte 0 … 7 in hex format (→ 🕮 BPG, HPG, BCG, CDGxxxD)

1) Only for BAG

2) For BPG, HPG, BCG, CDGxxxD

Gauge identification

Transmit: **TID** <CR>[<LF>]

Receive: <ACK><CR><LF>

Transmit: <ENQ>

Receive: x <CR><LF>

- x: Identification, x =

PSG	(Pirani)
PCG	(Pirani/Capacitive)
PEG	(Cold cathode)
MPG	(Cold cathode/Pirani)
CDG	(Capacitive)
BAG	(Hot cathode)
BPG	(Hot cathode/Pirani)
BPG402	(Hot cathode/Pirani)
HPG	(Hot cathode/Pirani)
BCG	(Hot cathode/Pirani/ Capacitive)
noSEn	(no Sensor)
noid	(no identification)

Error status

Transmit: **ERR** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: xxxx <CR><LF>

└ x =
0000 –> No error
1000 –> Controller error
(See display on front panel)
0100 –> NO, HWR No hardware
0010 –> PAR, Inadmissible parameter
0001 –> SYN, Syntax error

The ERROR word is cancelled when read out. If the error persists, it is immediately set again.

Reset

Transmit: **RES** [,x] <CR>[<LF>]

└ x = 1 –> Reset

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: [x]x,[x]x,... <CR><LF>

└ List of all present error messages
xx =
0 –> No error
1 –> Watchdog has responded
2 –> Task fail error
5 –> EPROM error
6 –> RAM error
7 –> EEPROM error
9 –> DISPLAY error
10 –> A/D converter error
11 –> Sensor error (e.g. filament rupture, no supply)
12 –> Sensor identification error

5.2.2 Parameter Mode

Degas

Transmit: **DGS** [,x] <CR>[<LF>]

- x = 0 –> off (default)
- x = 1 –> on (3 min.)

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x <CR><LF>

- Degas status

Threshold value setting, allocation

Transmit: **SP1** [,x.xxEsx,x.xxEsx] <CR>[<LF>]

- Upper threshold [1)] [in current pressure unit] (default = depending on gauge)
- Lower threshold [1)] [in current pressure unit] (default = depending on gauge)

[1)] Values can be entered in any format. They are internally converted into the floating point format.

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x.xxxxEsxx,x.xxxxEsxx <CR><LF>

- Upper threshold [in current pressure unit]
- Lower threshold [in current pressure unit]

Switching function status

Transmit:	**SPS** <CR>[<LF>]
Receive:	<ACK><CR><LF>
Transmit:	<ENQ>
Receive:	x <CR><LF>

└ Switching function x = 0 –> off
1 –> on

Measurement range (F.S.) of capacitive gauges

The full scale value of the measurement range (Full Scale) of linear gauges has to be defined by the user; the full scale value of logarithmic gauges is automatically recognized.

Transmit: **FSR** [,x] <CR>[<LF>]

└ Measurement range, x =

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

Receive:
<ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

└ Measurement range (F.S.)

Offset correction

Transmit: **OFS** [,x,x.xxxEsx] <CR>[<LF>]

- Offset [1] [in current pressure unit] (default = 0.000E0)
- Mode, x =
  - 0 –> Off (default) No offset value needs to be entered.
  - 1 –> On If no offset value has been entered, the previously defined offset value is taken over.
  - 2 –> Auto (offset measurement) No offset value needs to be entered.
  - 3 –> Zero adjustment CDGxxxD No offset value needs to be entered.

[1] Values can be entered in any format. They are internally converted into the floating point format.

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x,sx.xxxxEsxx <CR><LF>

- Offset [in current pressure unit]
- Mode

Measurement unit

Transmit: **UNI** [,x] <CR>[<LF>]

- x = 0 –> mbar/bar (default)
  1 –> Torr
  2 –> Pascal
  3 –> Micron

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x <CR><LF>

- Measurement unit

Correction factor

Transmit: **COR** [,[x]x.xxx] <CR>[<LF>]
- 0.100 … 10.000 (default = 1.000)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: [x]x.xxx <CR><LF>
- Correction factor

Number of digits in the display

Transmit: **DCD** [,x] <CR>[<LF>]
- x = 2 –> 2 digits (default)
  3 –> 3 digits

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>
- Number of digits

When the PrE (→ 🗎 46) is ON and the pressure is in the range p<1.0E-4 mbar the display resolution of the PSG and PCG Gauges is reduced by one decimal digit.

Measurement value filter

Transmit: **FIL** [,x] <CR>[<LF>]
- x = 0 –> fast
  1 –> medium (default)
  2 –> slow

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>
- Filter time constant

Transmission rate

Transmit: **BAU** [,x] <CR>[<LF>]

└ x = 0 –> 9600 baud (default)
1 –> 19200 baud
2 –> 38400 baud

As soon as the new baud rate has been entered, the report signal is transmitted at the new transmission rate.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

└ Transmission rate

Emission

Transmit: **EUM** [,x] <CR>[<LF>]

└ x = 0 –> Manually
1 –> Automatically (default)

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

Filament

Transmit: **FUM** [,x] <CR>[<LF>]

└ x = 0 –> Automatically (default)
1 –> Filament 1
2 –> Filament 2

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

Save parameters to EEPROM

Transmit: **SAV** [,x] <CR>[<LF>]

└ x = 0 –> Save default parameters
1 –> Save user parameters

Receive: <ACK><CR><LF>

Pirani range extension

Transmit: **PRE** [,x] <CR>[<LF>]

└ x = 0 –> off (default)
1 –> on

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x <CR><LF>

PSG and PCG gauges only, measurement range up to 5×10^{-5} mbar.

5.2.3 Test Mode

(For service specialists)

Firmware version

Transmit: **PNR** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: xxx-xxx-x <CR><LF>

- -x = Modification index (-- = original version)
- Firmware number

Watchdog control

Transmit: **WDT** [,x] <CR>[<LF>]

- x = 0 –> Manual error acknowledgement
- 1 –> Automatic error acknowledgement [1] (default)

[1] If the watchdog has responded, the error is automatically acknowledged and cancelled after 2 s.

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

- Watchdog control

Torr lock

Transmit: **TLC** [,x] <CR>[<LF>]

- x = 0 –> off (default)
- 1 –> on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

- Torr lock status

Parameter setup lock

Transmit: **LOC** [,x] <CR>[<LF>]
- x = 0 –> off (default)
- 1 –> on

Receive: <ACK><CR><LF>
Transmit: <ENQ>
Receive: x <CR><LF>
- Parameter setup lock status

RAM test

Transmit: **TRA** <CR>[<LF>]
Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (duration <1 s)
Receive: xxxx <CR><LF>
- ERROR word

EPROM test

Transmit: **TEP** <CR>[<LF>]
Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (duration ≈10 s)
Receive: xxxx,xxxx <CR><LF>
- Check sum (hex)
- ERROR word

EEPROM test

Transmit: **TEE** <CR>[<LF>]
Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (duration <1 s)

Do not keep repeating the test (EEPROM life).

Receive: xxxx <CR><LF>
- ERROR word

Display test

Transmit: **TDI** [,x] <CR>[<LF>]

- x = 0 –> Stops the test – display according to current operating mode (default)
- 1 –> Starts the test – all LEDs on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

- Display test status

ADC test

Transmit: **TAD** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: [x]x.xxxx, x.xxxx, x.xxxx <CR><LF>

- ADC channel 2 Gauge identification [0.0000 … 5.0000 V]
- ADC channel 1 Measurement signal (negative portion) [0.0000 … 5.0000 V]
- ADC channel 0 Measurement signal (positive portion) [0.0000 … 11.0000 V]

I/O test

Transmit: **TIO** [,x] <CR>[<LF>]

- x =
  - 0 –> Stops the test (default)
  - 1 –> Setpoint relay off, error relay off
  - 2 –> Setpoint relay on, error relay off
  - 3 –> Setpoint relay off, error relay on
  - 4 –> Setpoint relay on, error relay on

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: x <CR><LF>

- I/O test status

Operator key test

Transmit: **TKB** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ>

Receive: xxx <CR><LF>

- Key 3 (^) x = 0 –> Not pushed, 1 –> Pushed
- Key 2 (v)
- Key 1 (para)

RS232 test

Transmit: **TRS** <CR>[<LF>]

Receive: <ACK><CR><LF>
Transmit: <ENQ> Starts the test (repeats each character, test is interrupted with <CTRL> C).

5.2.4 Example

"Transmit (T)" and "Receive (R)" are related to the host.

T:	**TID** <CR> [<LF>]	Request for gauge identification
R:	<ACK> <CR> <LF>	Positive acknowledgement
T:	<ENQ>	Request for data transmission
R:	PSG <CR> <LF>	Gauge identification
T:	**SP1** <CR> [<LF>]	Request for parameters of switching function (setpoint)
R:	<ACK> <CR> <LF>	Positive acknowledgement
T:	<ENQ>	Request for data transmission
R:	1.0000E-09,9.0000E-07 <CR> <LF>	Thresholds
T:	**SP1**,6.80E-3,9.80E-3 <CR> [<LF>]	Modification of threshold values of switching function (setpoint)
R:	<ACK> <CR> <LF>	Positive acknowledgement
T:	**FOL**,2 <CR> [<LF>]	Modification of filter time constant (syntax error)
R:	<NAK> <CR> <LF>	Negative acknowledgement
T:	<ENQ>	Request for data transmission
R:	0001 <CR> <LF>	ERROR word
T:	**FIL**,2 <CR> [<LF>]	Modification of filter time constant
R:	<ACK> <CR> <LF>	Positive acknowledgement
T:	<ENQ>	Request for data transmission
R:	2 <CR> <LF>	Filter time constant
T:	**PR1** <CR> [<LF>]	Request for measurement data
R:	<ACK> <CR> <LF>	Positive acknowledgement
T:	<ENQ>	Request for data transmission
R:	0,8.3400E-03 <CR> <LF>	Status and pressure
T:	<ENQ>	Request for data transmission
R:	1,8.0000E-04 <CR> <LF>	Status and pressure

6 Maintenance

The product requires no maintenance.

Cleaning the VGC401

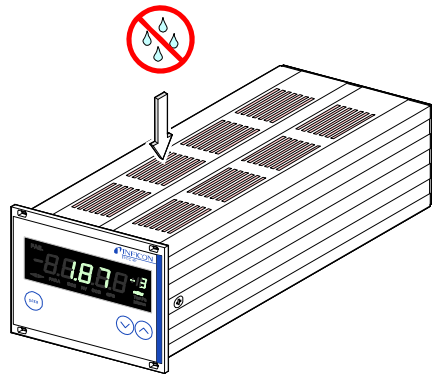
For cleaning the outside of the VGC401, a slightly moist cloth will usually do. Do not use any aggressive or scouring cleaning agents.

DANGER

DANGER: mains voltage

Contact with live parts is extremely hazardous when liquids penetrate into the unit.

Make sure no liquids penetrate into the equipment.



7 Troubleshooting

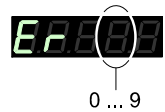
Signalization of errors

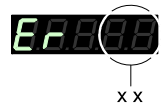
FAIL  and the error relay opens (→ 🗎 24).

Error messages

	Possible cause and remedy/ acknowledgement
	Parameter setup lock activated (→ 🗎 50).

	Possible cause and remedy/ acknowledgement
	Interruption or instability in sensor line or connector (Sensor error). ⇨ Acknowledge with the para key. If the problem persists, noSEn or hold is displayed

	Possible cause and remedy/ acknowledgement
	Error messages concerning BPG, BAG and HPG. Meaning → 🕮 [6], [7], [8], [14]. 0 = no communication to the gauge 1…9 = High-Byte of Error-Byte (BPG400, HPG) 1…6 = Error status (BAG)

	Possible cause and remedy/ acknowledgement
	Error messages concerning BCG and BPG402. Meaning → 🕮 [15], [21]. xx = Error byte (HEX)

	Possible cause and remedy/ acknowledgement
	The VGC401 has been turned on too fast after power off. ⇨ Acknowledge with the para key [1].
	The watchdog has tripped because of a severe electric disturbance or an operating system error. ⇨ Acknowledge with the para key [1].

[1] If the watchdog is set to  , the VGC401 acknowledges the message automatically after 2 s (→ 🗎 49).

	Possible cause and remedy/ acknowledgement
	Main memory (RAM) error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Program memory (EPROM) error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Parameter memory (EEPROM) error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Display driver error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	A/D converter error. ⇨ Acknowledge with the para key.

	Possible cause and remedy/ acknowledgement
	Operating system (Task Fail) error. ⇨ Acknowledge with the para key.

Technical support

If the problem persists after the message has been acknowledged for several times and/or the gauge has been exchanged, please contact your local INFICON service center.

8 Repair

Return defective products to your local INFICON service center for repair.

INFICON assumes no liability and the warranty becomes null and void if repair work is carried out by the end-user or third parties.

9 Accessories

	Ordering number
Adapter panel for installation into a 19" rack chassis adapter, height 3 U	398-499

10 Storage

Caution

Caution: electronic component

Inappropriate storage (static electricity, humidity etc.) can damage electronic components.

Store the product in a bag or container. Observe the corresponding specifications in the technical data (→ 9).

11 Disposal

WARNING

WARNING: substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.

Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

Non-electronic components

Such components must be separated according to their materials and recycled.

Electronic components

Such components must be separated according to their materials and recycled.

Appendix

A: Conversion Tables

Weights

		kg	lb	slug	oz
kg		1	2.205	68.522×10^{-3}	35.274
lb		0.454	1	31.081×10^{-3}	16
slug		14.594	32.174	1	514.785
oz		28.349×10^{-3}	62.5×10^{-3}	1.943×10^{-3}	1

Pressures

	N/m^2, Pa	bar	mbar	Torr	at
N/m^2, Pa	1	10×10^{-6}	10×10^{-3}	7.5×10^{-3}	9.869×10^{-6}
bar	100×10^{3}	1	10^{3}	750.062	0.987
mbar	100	10^{-3}	1	750.062×10^{-3}	0.987×10^{-3}
Torr	133.322	1.333×10^{-3}	1.333	1	1.316×10^{-3}
at	101.325×10^{3}	1.013	1.013×10^{3}	760	1

Pressure units used in the vacuum technology

	mbar	Pascal	Torr	mmWs	psi
mbar	1	100	750.062×10^{-3}	10.2	14.504×10^{-3}
Pascal	10×10^{-3}	1	7.5×10^{-3}	0.102	0.145×10^{-3}
Torr	1.333	133.322	1	13.595	19.337×10^{-3}
mmWs	9.81×10^{-2}	9.81	7.356×10^{-2}	1	1.422×10^{-3}
psi	68.948	6.895×10^{3}	51.715	703	1

Linear measures

		mm	m	inch	ft
mm		1	10^{-3}	39.37×10^{-3}	3.281×10^{-3}
m		10^{3}	1	39.37	3.281
inch		25.4	25.4×10^{-3}	1	8.333×10^{-2}
ft		304.8	0.305	12	1

Temperature

		Kelvin	Celsius	Fahrenheit
Kelvin		1	°C+273.15	(°F+459.67)×5/9
Celsius		K-273.15	1	5/9×°F-17.778
Fahrenheit		9/5×K-459.67	9/5×(°C+17.778)	1

B: Default Parameters

The following values are activated when the default parameters are loaded (→ 33):

	Default	User	
	oFF		
	5×10^{-4} mbar		
	1×10^{3} mbar		
	1000 Torr		
	oFF		
	mbar		
	1.00		
	nor		
	oFF		
	2 Digits		
	9600		
	oFF		
	Auto		
	oFF		
	oFF		
	Auto		
	Auto		

C: Firmware Update

If your VGC401 firmware needs updating, e.g. for implementing a new gauge type, please download it from our website (www.inficon.com) or contact your local INFICON service center.

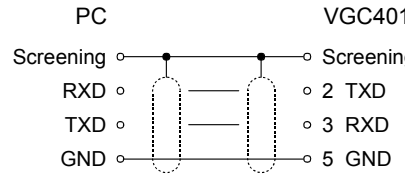
User parameters

Most of the settings you may have defined in the Parameter and Test mode will not be affected by a firmware update. To be sure, note your parameter settings before upgrading the firmware (→ 🗎 82).

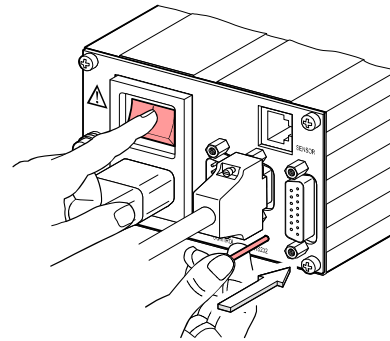
Preparing the VGC401 for a program transfer

❶ Turn the VGC401 off

❷ Connect the VGC401 with the serial COM1 (COM2) interface of your PC via a 9-pin D-Sub extension cable (the firmware of the VGC401 cannot be loaded from a Mac).



❸ With a pin (ø<2 mm) depress the switch behind the rear panel and turn the VGC401 on.

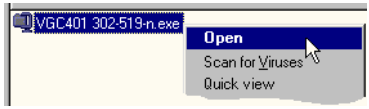


After power on, the display remains dark.

Program transfer

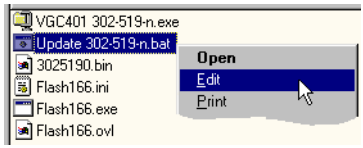
In the following instructions, the index -n is used instead of the actual index.

❶ Unpack the self extracting file *.exe or the packed file *.zip.

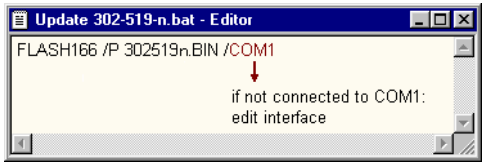


❷ If you have not connected the VGC401 to the COM1 interface:

Open the batch file *.bat …

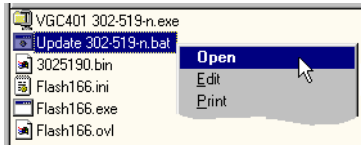


… edit the interface …

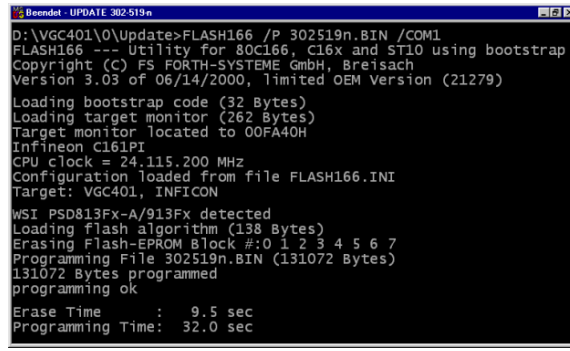


… and save the new setting.

❸ Start batch file *.bat.



⇨ The new firmware is transmitted to the VGC401.



Starting the VGC401 with the updated firmware

If the program transfer was successful, quit the Update mode by turning the VGC401 off.

Wait at least 10 s before turning the VGC401 on again in order for it to correctly initialize itself.

✓ The VGC401 is now ready for operation. To be sure, check that the current parameter settings are identical with the previously defined settings (→ 🗎 82).

D: Literature

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

[2] www.inficon.com
Operating Manual
Compact Pirani Gauge
PSG500/-S, PSG502-S, PSG510-S,
PSG512-S
tina44e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[3] www.inficon.com
Operating Manual
Pirani Standard Gauge PSG100-S, PSG101-S
tina17e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[4] www.inficon.com
Operating Manual
Pirani Standard Gauge
PSG550, PSG552, PSG554
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[5] www.inficon.com
Operating Manual
Penning Gauge PEG100
tina14e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[6] www.inficon.com
Operating Manual
Bayard-Alpert Pirani Gauge BPG400
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[7] www.inficon.com
Operating Manual
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[8] www.inficon.com
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[9] www.inficon.com
Operating Manual
Capacitance Diaphragm Gauge CDG025
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[10] www.inficon.com
Operating Manual
Capacitance Diaphragm Gauge
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[11] www.inficon.com
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[12] www.inficon.com
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[13] www.inficon.com
Operating Manual
Pirani Capacitance Diaphragm Gauge
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tina56e1
INFICON AG, LI–9496 Balzers, Liechtenstein

[14] www.inficon.com
Operating Manual
High Pressure / Pirani Gauge
HPG400
tina31e1
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[15] www.inficon.com
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TripleGauge™ BCG450
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[16] www.inficon.com
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MPG400, MPG401
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INFICON AG, LI–9496 Balzers, Liechtenstein

📖 [17] www.inficon.com
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tina46e1
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📖 [18] www.inficon.com
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Capacitance Diaphragm Gauge CDG025D
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📖 [19] www.inficon.com
Operating Manual
Capacitance Diaphragm Gauge CDG045D
tina51e1
INFICON AG, LI–9496 Balzers, Liechtenstein

📖 [20] www.inficon.com
Operating Manual
Capacitance Diaphragm Gauge CDG100D
tina52e1
INFICON AG, LI–9496 Balzers, Liechtenstein

📖 [21] www.inficon.com
Operating Manual
Capacitance Diaphragm Gauge
CDG160D, CDG200D
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INFICON AG, LI–9496 Balzers, Liechtenstein

E: Index

ETL Certification

ETL LISTED

The product VGC401 complies 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.

Product

Single-Channel Controller

VGC401

Part number

398-010

Standards

Harmonized and international/national standards and specifications:

- EN 61010-1:2001 (Safety requirements for electrical equipment for measurement, control and laboratory 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

28 November 2008

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28 November 2008

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