VACUUM SOLUTIONS

Analog Transmitter

Vacuum Measurement Equipment
VACTEST GRP 100-200

Instruction Manual

SERVICE
AND SPARE PARTS, INSTRUCTION MANUALS ...
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CE UK CA

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Table of Contents

1 Safety

- Read and follow the instructions of this manual.
- Inform yourself regarding hazards, which can be caused by the product or arise in your system.
- Comply with all safety instructions and regulations for accident prevention.
- Check regularly that all safety requirements are being complied with.
- Take account of the ambient conditions when installing your gauge. The protection class is IP 40 for GPR 100 and IP 54 for GPR 200.
- Adhere to the applicable regulations and take the necessary precautions for the process media used.
- Consider possible reactions between materials and process media.
- Consider possible reactions of the process media due to the heat generated by the product.
- Before you start working, find out whether any of the vacuum components are contaminated.
- Do not carry out any unauthorized conversions or modifications on the unit.
- Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.
- When returning the unit to us, please enclose a declaration of contamination.
- Communicate the safety instructions to other users.

This instruction manual highlights potential hazards where appropriate. Safety notes and warning messages are tagged with one of the keywords DANGER, WARNING, CAUTION, NOTICE and NOTE as follows:

DANGER

... indicates an imminent dangerous situation that will result in death or serious injuries if not prevented.

WARNING

... indicates a potentially dangerous situation that could result in death or serious injuries.

CAUTION

... indicates a potentially dangerous situation that could result in minor injuries.

NOTICE

... indicates a potentially dangerous situation that could result in damage to property.

NOTE

... indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

2 VACTEST GRP 100-200

2.1 For Orientation

These operating instructions describe installation and operation of the GRP 100 or GRP 200.

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

2.2 Delivery Content

Included in the delivery consignment are:

- Analog Transmitter GRP 100 or GRP 200
- Protective flange cover
- Instruction manual

2.3 Product Description

The Analog Transmitter GRP 100 or GRP 200 is measuring total gas pressure in the range of 1400 - 1 mbar. The transmitter can be connected to customer related power supply and evaluation units in compliance with pin assignment.

The analog output signal for GRP 100 is 0 – 10 V and for GRP 200, it is 4 - 20 mA. Both have a linear dependence on pressure over the whole range.

The Analog Transmitter GRP 100 or GRP 200 is equipped with a piezo-resistive ceramic sensor and temperature compensated. It can be mounted to suitable flange connectors.

2.4 Proper Use

NOTE

The device is not designed for use in a corrosive atmosphere!

Dust, oil or condensing vapours will affect sensor performance and may cause malfunctions!

Aggressive media such as halogenides, carbon or oxygen plasma can reduce the devices lifetime!

The GRP 100 or GRP 200 serves exclusively to provide absolute pressure measurements in gaseous media in the range of 1400 - 1 mbar. It may only be connected to components specifically provided for such purpose. Please respect the admissible overload.

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

2.5 Improper Use

The use for purposes not mentioned above is regarded as improper, in particular:

- Connection to pumps or units which are not suitable for this purpose according to their operating instructions.
- Connection to components containing touchable, voltage carrying parts.

No liability or warranty will be accepted for claims arising from improper use.

The user bears the responsibility with respect to the used process media.

3 Installation

CAUTION

Unauthorized modifications.

Risk to injury!

- Modifications or conversions of the gauge are not allowed.

3.1 Notes for Installation

Installation location: Indoor

For not fully air conditioned open buildings and operation rooms:

Temperature: +5 °C ... +60 °C

Rel. humidity: max. 80% up to 30 °C, max. 50% at 40 °C, non-condensing

Air pressure: 860 - 1060 hPa (mbar)

3.2 Vacuum Connection

CAUTION

Unintended opening of clamp with an overpressure in the vacuum system over 1000 mbar.

Risk to injury!

Damage to your health!

- Parts may fly around.
- Unsecured hose connections can release process media.

CAUTION

Overpressure in the vacuum system over 1500 to 4000 mbar

Damage to your health!

The elastomer washers cannot withstand the pressure and can release process media.

- Use sealing rings with an outer centering ring.

NOTE

When mounting the VACTEST avoid forced twisting or violent opening. This can damage the device.

NOTICE

Dirt and damage at the vacuum flange and/or thread connection.

Impairs the function of the gauge!

- Make sure that the flange and/or thread connection is/are clean, dry and free of grease.
- When handling the instrument, make sure that the flange and/or thread connection is/are protected against dirt and damage.

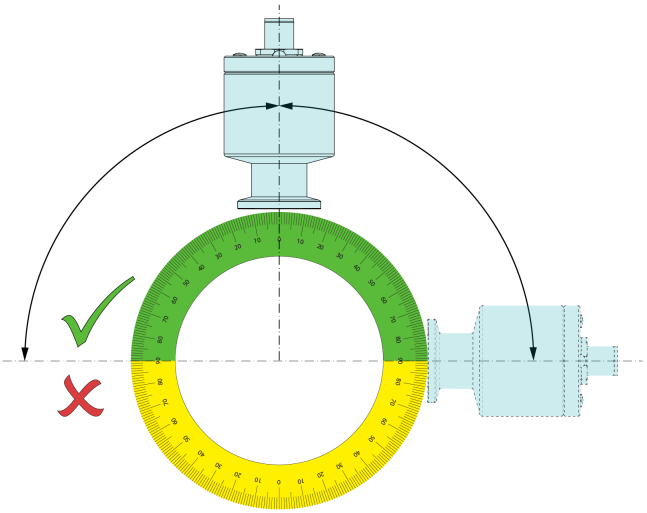
- Remove the protective cover (is required again during maintenance work!).
- Make vacuum connection via ISO KF small flange.
- For small flange connection use clamps that can be opened and closed with appropriate tools only, use sealing rings with a centering ring.
- Make sure that the sensor flange is connected to ground, e.g. by having electrical contact to grounded vacuum chamber (use metallic clamps).

3.2.1 Gauge Mounting Orientation

You can mount the device in any orientation. However, mounting the device from below with the flange facing upwards, can lead to premature contamination and failure of the device. It is recommended to mount the device from upright position with the flange facing downwards to prevent dust and condensate from accumulating in the sensor cell.

NOTE

The device is adjusted ex-factory with the flange facing downwards position.



3.3 Electrical Connection

DANGER

Live wires.

Risk of electrical shock!

- Electrical installation work must only be executed by qualified personnel.

NOTICE

Establish a connection using a live cable.

Risk of damage to the device!

- Only connect cables when de-energized.

3.3.1 Connecting to the Active Sensor Controller

DANGER

Live wires!

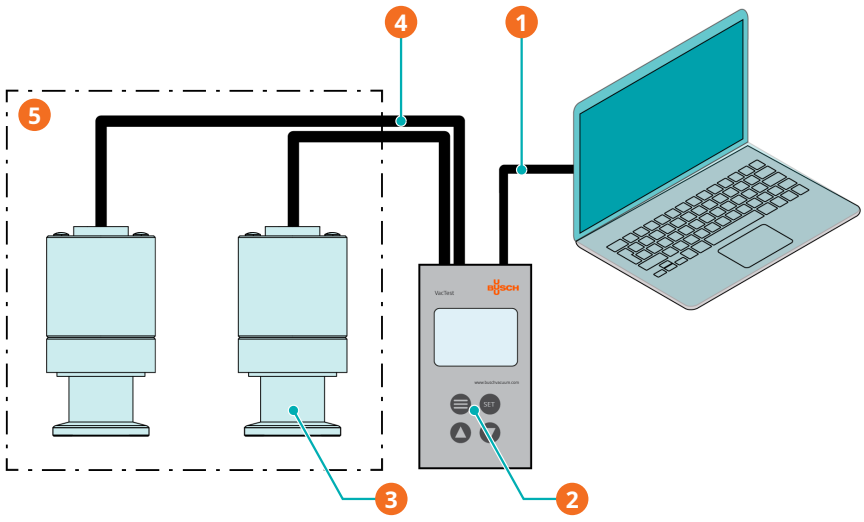
Risk of electrical shock!

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

For operation of the gauge with controller, a suitable measurement connection cable must be used (see accessories).

NOTE

Connection to the controller can only be done with 0 ... 10 V analog transmitters.



Description			
1	USB	2	Active sensor controller

Description			
3	Transmitter	4	Cable
5	With the controller CTR 002: up to 2 gauges can be connected.		

- Connect the cable from the controller to the gauge.
- Switch on the controller.

3.3.2 I/O and Communication Port Schematic

NOTICE

Incorrect supply voltage.

Risk of damage to the device!

- Make sure to supply a correct and admissible voltage.

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

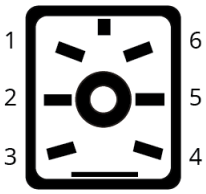
The electrical connection is to be made by means of suitable cables considering EMI demands and according to the pin description shown below:

Connector and Schematic of GRP 100:

NOTE

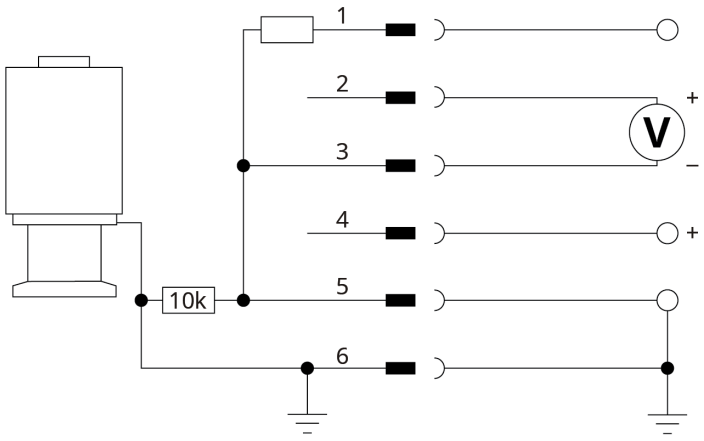
"Ground" (Pin 6) and supply common (Pin 5) must always be grounded.

Connector Type: Hirschmann, 6-pin, male



Pin No.	Description	Pin No.	Description
Pin 1	Identification: 10.1 kΩ	Pin 4	Voltage supply 9 ... 30 VDC
Pin 2	Signal output 0 - 10 VDC	Pin 5	Supply GND
Pin 3	AGND	Pin 6	Ground

Schematic diagram of electrical connection:



Pin No.	Description	Pin No.	Description
Pin 1	Identification: 10.1 kΩ	Pin 4	Voltage supply 9 ... 30 VDC
Pin 2	Signal output 0 - 10 VDC	Pin 5	Supply GND
Pin 3	AGND	Pin 6	Ground

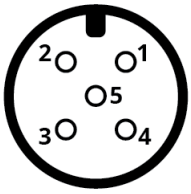
Connector and Schematic of GRP 200:

NOTE

Maximum admissible load resistor in Ω :

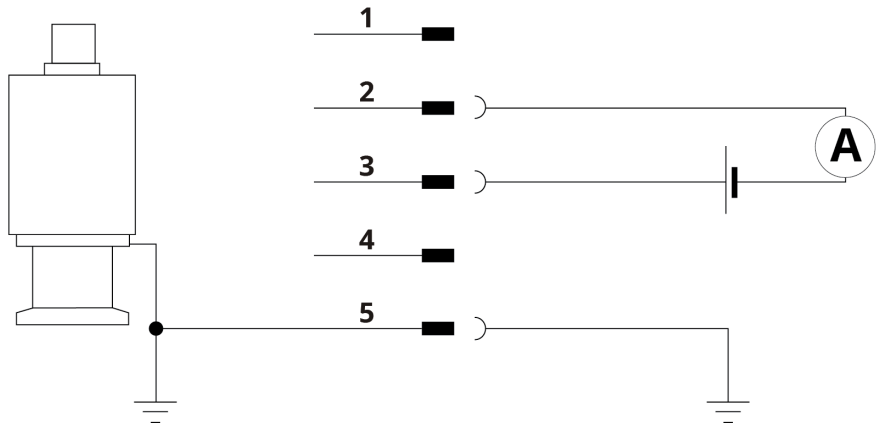
(supply voltage (V) – 9 V) / 0.02 A

Connector Type: M12, A-coded, 5-pin, male



Pin No.	Description	Pin No.	Description
Pin 1	Do not connect	Pin 4	Do not connect
Pin 2	Signal output 4 - 20 mA	Pin 5	Ground
Pin 3	Voltage supply 9 ... 30 VDC		

Schematic diagram of electrical connection:



Pin No.	Description	Pin No.	Description
Pin 1	Do not connect	Pin 4	Do not connect
Pin 2	Output 4 - 20 mA	Pin 5	Ground
Pin 3	+ 9 ... 30 VDC		

4 Operation

4.1 General

The Analog Transmitter is equipped with an internal piezo-resistive ceramic diaphragm sensor.

Under the influence of pressure, the thin diaphragm of the piezo-resistive sensor is bent, on the back of which a resistor-bridge is applied. The bending forces the measuring bridge to come out of tune, which is a measure for the applied pressure.

Output Signal for GRP 100

The output signal 1.0 V – 8.0 V of the GRP 100 has a linear dependency on pressure over the whole measurement range 1400 - 1 mbar (5 mV per mbar). Conversion of output signal and pressure is done according to the following formula:

$V_{out}(V) = 0.005 \times p(mbar) + 1.0$

$p(mbar) = (V_{out}(V) - 1.0) \times 200$

Output Signal for GRP 200

The output signal 4.0 – 20 mA of the Analog Transmitter has a linear dependency on pressure over the whole measurement range 1400 - 1 mbar. Conversion of output signal and pressure is done according to the following formula:

$I_{out}(mA) = 2/175 \times p(mbar) + 4.0$

$p(mbar) = (I_{out}(mA) - 4.0) \times 175/2$

Warm-Up Time

The signal output is available approx. 2 seconds after the device is switched on. To take advantage of the maximum accuracy of the unit it is appropriate to allow for a stabilization time of 5 minutes, especially when extreme pressure changes have occurred.

Accuracy

The gauge is adjusted ex-factory in upright position with a supply voltage of 24 VDC. Through contamination, aging, extreme climatic conditions, or other installation orientations may require readjustment.

4.2 Readjustment

The gauge is adjusted ex-factory in upright position with a supply voltage of 24 V with the flange facing down. Other orientations, different climatic conditions, extreme temperature changes, ageing or contamination may necessitate readjustment.

NOTE

Conduct adjustment at the same ambient temperature at which the device is typically operated.

NOTE

To achieve optimum results of the adjustment we recommend to consider a warm-up of at least 15 minutes at the appropriate calibration pressure before any adjustment.

4.2.1 Readjustment by Pushbutton

Digital readjustment at zero or atmosphere pressure can be done by means of the »up« and »down« pushbuttons. The transducer will notice automatically which adjustment point is relevant.

NOTE

The zero pressure adjustment corrects the measurement signal offset and, consequently, also affects the atmospheric pressure reading.

For zero adjustment, the actual pressure must be less than 0.1 mbar and the gauge pressure reading must be below 100 mbar.

At zero pressure, the output signal of the GRP 100 must be adjusted to 1.000 V, and for the GRP 200, it must be adjusted to 4.000 mA.

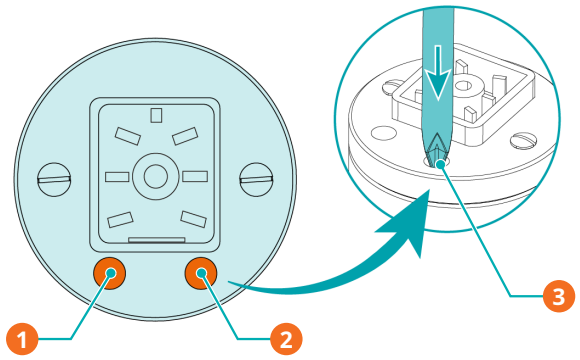
NOTE

For an adjustment at atmosphere pressure, the actual pressure and pressure reading of the transmitter must be above 800 mbar.

The adjustment of the gauge should be done according its corresponding output function described in the technical data.

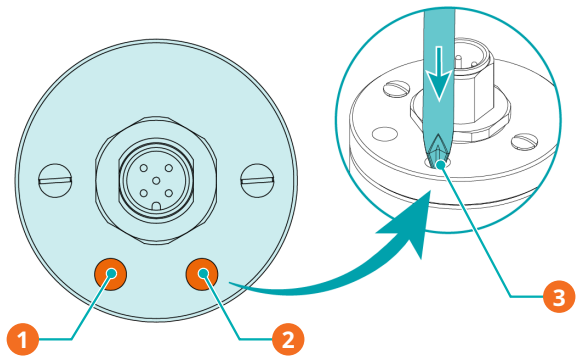
When atmospheric pressure is applied, the output signal is set to a value according to the formula in *General* [➔ 12], depending on the actual applied pressure.

GRP 100:



Description			
1	"UP" Pushbutton	3	Pressure adjustment with screwdriver
2	"Down" Pushbutton		

GRP 200:



Description			
1	"UP" Pushbutton	3	Pressure adjustment with screwdriver
2	"Down" Pushbutton		

Adjust the gauge pressure as follows:

- Remove the rubber caps from the »UP« and »Down« pushbuttons.
- Press the button “UP” to increase the transmitter’s output signal or the button “Down” to decrease the transmitter’s output signal by means of a small screwdriver or similar tool.

If no further button is pressed after 5 s, the adjusted signal value is set.

- Insert the rubber caps again to their initial positions.

5 Maintenance and Service

DANGER

Danger of possibly contaminated parts!

Contaminated parts can cause personal injuries.

- Inform yourself regarding possible contamination before you start working.
- Be sure to follow the relevant instructions and take care of necessary protective measures.

CAUTION

The unit is not prepared for customer repair!

NOTE

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

The unit requires no maintenance. External dirt and soiling can be removed by a damp cloth.

When returning the gauge for service please fill out a declaration of contamination form and include it in the shipment. This document is mandatory to protect our service staff.

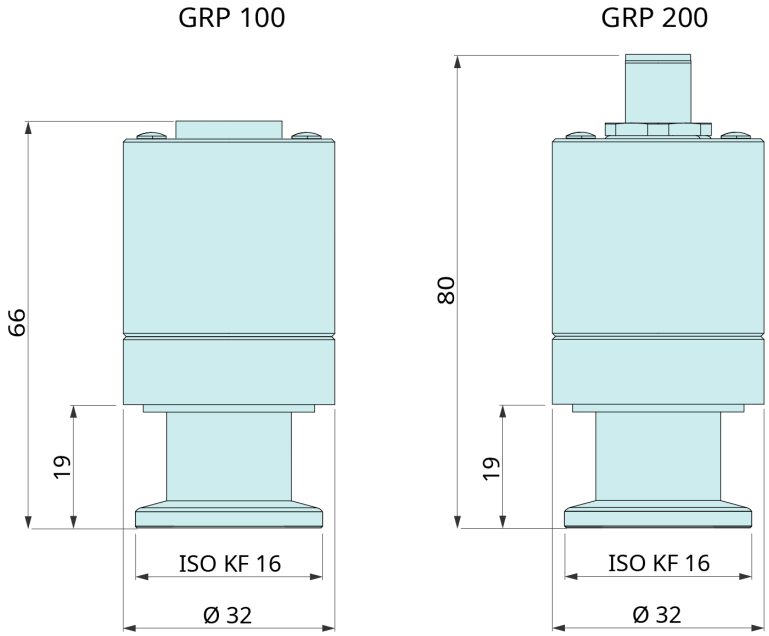
For downloading the declaration of contamination form, *click here*.

5.1 Errors and Malfunctions

The device will show error messages as plain text on the display. Additionally, the following typical issues can appear:

Problem	Possible Cause	Correction
High measurement error	Contamination, ageing, extreme temperature, maladjustment	Readjustment
GRP 200: Output signal < 3.6 mA or > 21 mA or, **GRP 100:** Output signal < 0.5V	Defective electronics or sensor	Send unit for repair
Adjustment not possible	measurement error exceeds possible range of readjustment	Send unit for repair

6 Technical Data



	VACTEST GRP 100	VACTEST GRP 200
Measurement principle	Piezo-resistive, independent of gas type	
Measuring range	1400 - 1 mbar (1050 - 1 Torr)	
Max. overload	4 bar abs.	
Accuracy	0.3% full scale end (linearity, hysteresis, repeatability)	
Materials in contact with vacuum	Stainless steel 1.4305, Al_2O_3 ceramic, FKM	
Setting time	< 20 ms	
Operating temperature	5 ... 60 °C	
Storage temperature	-40 ... +70 °C	
Voltage supply	15 – 30 VDC	9 – 30 VDC
Power consumption	max. 0.6 W	
Output signal	0 – 10 VDC, linear, min. 10 kΩ	4 - 20 mA, linear
Electrical connection	Type Hirschmann, 6-pin, male, lockable	M12 round type A-coded, 5-pin, male, lockable
Vacuum connection	Small flange DN16 ISO KF with G1/4 female thread	
Protection class	IP 40	IP 54
Weight	Approx. 120 g	

7 EU Declaration of Conformity

This Declaration of Conformity and the CE-markings affixed to the nameplate are valid for the gauge within the Busch scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

The manufacturer

Busch Produktions GmbH
Schauinslandstr. 1
DE-79689 Maulburg

declares that the gauge: VACTEST GRP 100; VACTEST GRP 200

fulfill(s) all the relevant provisions from EU directives:

– 'Electromagnetic Compatibility' (EMC) 2014/30/EU
– 'RoHS' 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (incl. all related applicable amendments)

and comply(-ies) with the following harmonized standards that have been used to fulfill those provisions:

Standard	Title of the Standard
EN 61326-1 : 2013 Group 1 / Class B	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements
EN IEC 63000 : 2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Legal person authorized to compile the technical file and authorized representative in the EU (if the manufacturer is not located in the EU):

Busch Dienste GmbH
Schauinslandstr. 1
DE-79689 Maulburg

Maulburg, 2025.01.02

Dr. Martin Gutmann

General Manager

Busch Produktions GmbH

8 UK Declaration of Conformity

This Declaration of Conformity and the UKCA-markings affixed to the nameplate are valid for the gauge within the Busch scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

The manufacturer

Busch Produktions GmbH
Schauinslandstr. 1
DE-79689 Maulburg

declares that the gauge: VACTEST GRP 100; VACTEST GRP 200

fulfill(s) all the relevant provisions from UK legislations:

– Electromagnetic Compatibility Regulations 2016

– Restriction of the use of certain hazardous substances in Electrical and Electronic Equipment Regulations 2012

and comply(-ies) with the following designated standards that have been used to fulfill those provisions:

Standard	Title of the Standard
EN 61326-1 : 2013 Group 1 / Class B	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements
EN IEC 63000 : 2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Legal person authorized to compile the technical file and importer in the UK (if the manufacturer is not located in the UK):

Busch (UK) Ltd
30 Hortonwood
Telford – UK

Maulburg, 2025.01.02

Dr. Martin Gutmann
General Manager
Busch Produktions GmbH

Notes

BUSCH GROUP

The Busch Group is one of the world's largest manufacturers of vacuum pumps, vacuum systems, blowers, compressors and gas abatement systems. Under its umbrella, two well-known brands: Busch Vacuum Solutions and Pfeiffer Vacuum +Fab Solutions. Together, they offer solutions to a wide range of industries. A global network of highly competent local teams in 44 countries ensures that expert, tailor-made support is always available near you. Wherever you are. Whatever your business.

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