

PIRANI GAUGE HEAD TPR 010

A product of BALZERS AG, Balzers

No. A 51 - 9853 e

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1. APPLICATION

The pirani gauge head TPR 010 is used as pressure sensor in the medium-vacuum range between 100 and 1×10^{-3} mbar with BALZERS measuring control and regulating units such as TPG, PKG and TPW.

Working range and measuring range of the gauge head can differ depending on the indicator unit used.

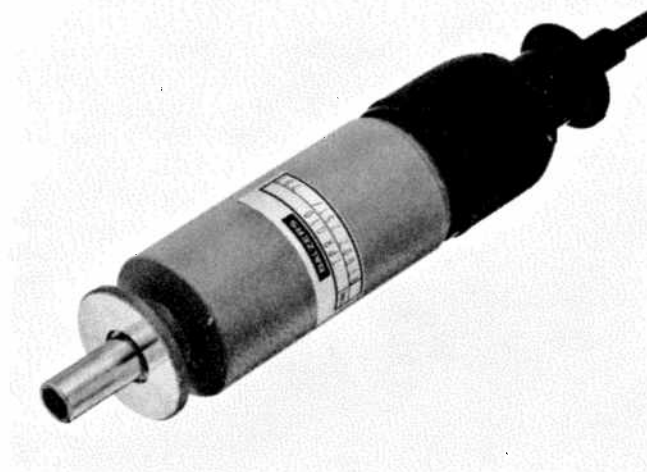


Fig. 1

2. FUNCTION

The thermal conductance of gases is - within certain limits - pressure-dependent. This physical phenomenon is used for pressure measurement by the Pirani-type thermal conductance vacuummeter. Two types of circuits can be used:

a) Simple Bridge Circuit (Fig. 2)

(e.g. BALZERS TPG 031, TPG 010, refer to the separate operating instructions)

A measuring wire with high resistance/temperature coefficient supplied with constant input changes its temperature and resistance according to the surrounding gas pressure.

The measuring wire is one leg of a Wheatstone bridge which is balanced at pressure of less than 10^{-4} mbar.

Increased pressure unbalances the bridge and results in a pressure-proportionate deflection at an indicator intercalated in the bridge.

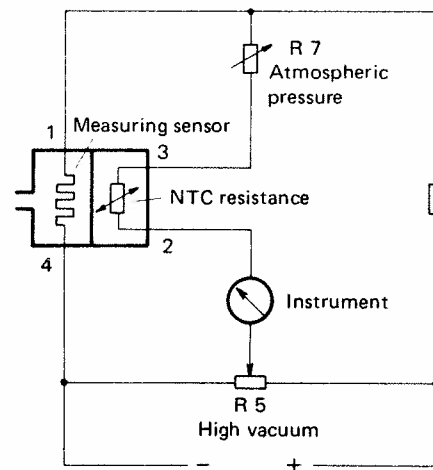


Fig. 2

b) Circuit with balanced Bridge (Fig. 3)

(e.g. BALZERS TPG 022, TPG 060 and TPW 010 etc.)

The electrically heated measuring wire is a leg of a self-balancing bridge circuit. An automatic control amplifier corrects the bridge voltage U_B automatically so that the filament temperature is kept constant at 120 °C throughout the whole measuring range. Thus, the required bridge voltage U_B is a measure for the pressure surrounding the measuring wire.

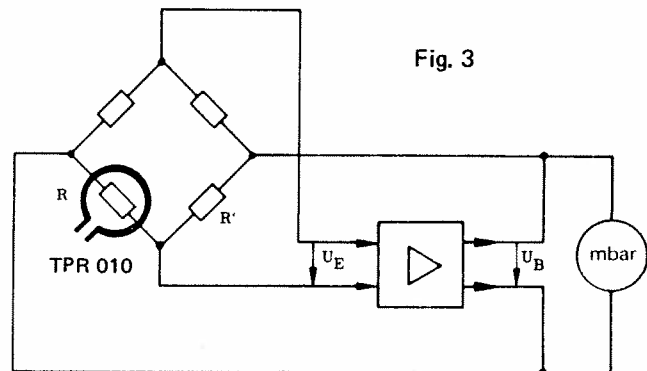


Fig. 3

3. DESCRIPTION

The gauge head TPR 010 consists of a cylindrical light metal housing and contains a tungsten spiral as temperature-dependent measuring wire (measuring sensor) which is installed in a protection tube. The measuring tube is closed on its vacuum side by a dust filter of sintered bronze. The filter may be removed for cleaning and for the achievement of very short response time. The gauge head is provided with a small flange connection NW 10 KF. A hose of I.D. 8 - 9 mm can be connected to the protruding pipe stub.

The indication of changes in pressure is very fast due to the use of a very thin measuring wire with small thermal capacity. The time constant is always less than 0,5 second, less than 10 ms with self-balancing bridge.

An NTC resistance also built-into the gauge head is used for compensating the ambient temperature. The measured value is virtually independent of the ambient temperature.

4. TECHNICAL DATA

Vacuum connection small flange	NW 10 KF
hose inner diameter	8 - 9 mm
Measuring range total	100 - 10 ⁻³ mbar
(depends of control units used)	
Permissible ambient temperature	
when measuring without re-calibration	50°C
when measuring with re-calibration	60°C
for bake-out with cable	70°C
for bake-out, with cable removed	100°C
Filament temperature	
with self-balancing bridge	max. 130°C
with simple bridge	max. 300°C
Weight	140 g
Code No.:	
gauge head (without cable)	BG G02 250
gauge head with special balance	BG G02 251 *)
Cable: see section 11. ACCESSORIES	

*) This gauge head is balanced within narrow tolerances. This allows several gauge heads to be controlled by the same control unit (e.g. TPG 010 and TPG 031) without special adjustment.

1 torr = 1,33 mbar
1 mbar = 0,75 torr = 100 Pa

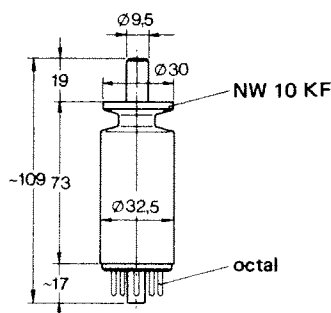


Fig. 4

5. VACUUM CONNECTION

- The connection to a small flange NW 10 KF is effected by means of a centering ring and a clamping ring (refer to the section ACCESSORIES).
- The TPR 010 can also be connected to pumps and vacuum system by means of a PVC or rubber vacuum hose. A suitable hose is pushed over the free protruding pipe stub.
- The gauge heads NV 4 or NVR 4 can be used for connection to BALZERS measuring flanges NW 27B (refer to the separate operating instruction) or the TPR 010 can be provided with an adapter NW 10 KF - NW 27B (refer to the section ACCESSORIES).

A plastic cap available as accessory can be used as protection for the KF flange during transport, or as protection for the octal plug against contamination or mechanical damage.

6. ELECTRICAL CONNECTION

The TPR 010 is provided with a standard Octal plug (8-pole) and is connected to the gauge through a cable. Fig. 5 shows the connections. The mass is led insulatedly to the pin 8 allowing for proper earthing conditions in all cases. The control units TPG 010 and TPG 031 (refer to the separate operating instructions) are provided with a five-conductor cable, the coupling of which fits the TPR 010. Refer to the section ACCESSORIES for cables suitable for connection to other control and measuring units.

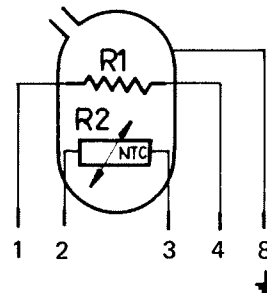


Fig. 5

R1: measuring wire
R2: temperature compensator

Attention:

The cross section of the conductors to the connections 1 and 4 (measuring wire) must be chosen so large that the resistance of one conductor does not exceed 1 Ohm.

Conductor cross-sections:

up to 40 m (single cable length)	0,75 mm ²
40 - 50 m	1 mm ²
50 - 85 m	1,5 mm ²

Connection cables to Pirani gauge heads should not be installed parallel to high current leads. The interference could impair the function especially if a vacuum relay is connected. Leads of more than 5 m length may have to be screened. (A normal screen of copper braiding protects against electric but not against magnetic fields).

7. OPERATION

The gauge head is ready for operation upon connection. All further questions are dealt with in the operating instructions for the pertaining control units and relays.

8. MAINTENANCE

The occasional replacement of the porous filters in the measuring tube is the only maintenance work necessary.

9. CLEANING

Remove the O-ring and the porous filter.

Fill the measuring chamber half with a solvent e.g. trichloroethylen, gasoline etc. Stop the opening with a finger and shake the gauge head thoroughly. Drain the solvent. Repeat the process several times. Badly contaminated gauge heads must be exposed tentatively to solvent for a longer time. Fill the measuring chamber completely with solvent and rest the gauge head for some longer time with the opening upwards.

Certain deposits cannot be removed from the measuring sensor by the methods described. In such cases a brutal method is open as a last resort:

Evacuate the gauge head to the lowest possible pressure. Connect a foreign voltage of about 10 Volts to the plug pins 1 and 4 and operate it for about 10 seconds. The measuring sensor becomes red hot which may cause the deposited film of contaminations to evaporate.

The gauge head must be replaced if this last method does not provide satisfactory results.

As disorders can also arise in the control units used, the pertaining operating instructions must also be referred to.

11. ACCESSORIES

Code No.

Cable to connect the TPR 010 to TPG 040/060/070, PKG 020, TPW 010:

2 m long BG 520 407 -T
1 m long BG 520 406 -T

These cables can also be used as extension cables.

Centerring ring / O-ring NW 10 KF

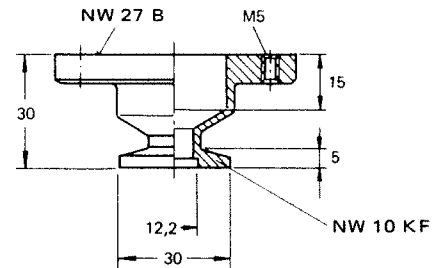
Alu/Neopren BP 213 314 -T
Alu/Viton BP 213 326 -T

Clamping ring NW 10 KF

BP 217 426 -T

Adapter NW 10 KF to BALZERS NW 27 B

BN 808 852 -R



10. DISORDERS AND THEIR CORRECTIONS

Disorder:	Possible cause:	Correction:
The gauge head indicates too high pressure.	Gauge head contaminated.	a) Small deviations can be corrected by re-calibration (refer to the operating instruction of the control unit used). b) Cleaning as per section 9.
No indication.	Measuring wire broken. An undamaged measuring sensor has a resistance of about 100 Ohm between the connections 1 and 4. Gauge head cable damaged, interruption or short circuit.	Replace the gauge head. Repair the cable.

Protective cap

B 3687 141 -A

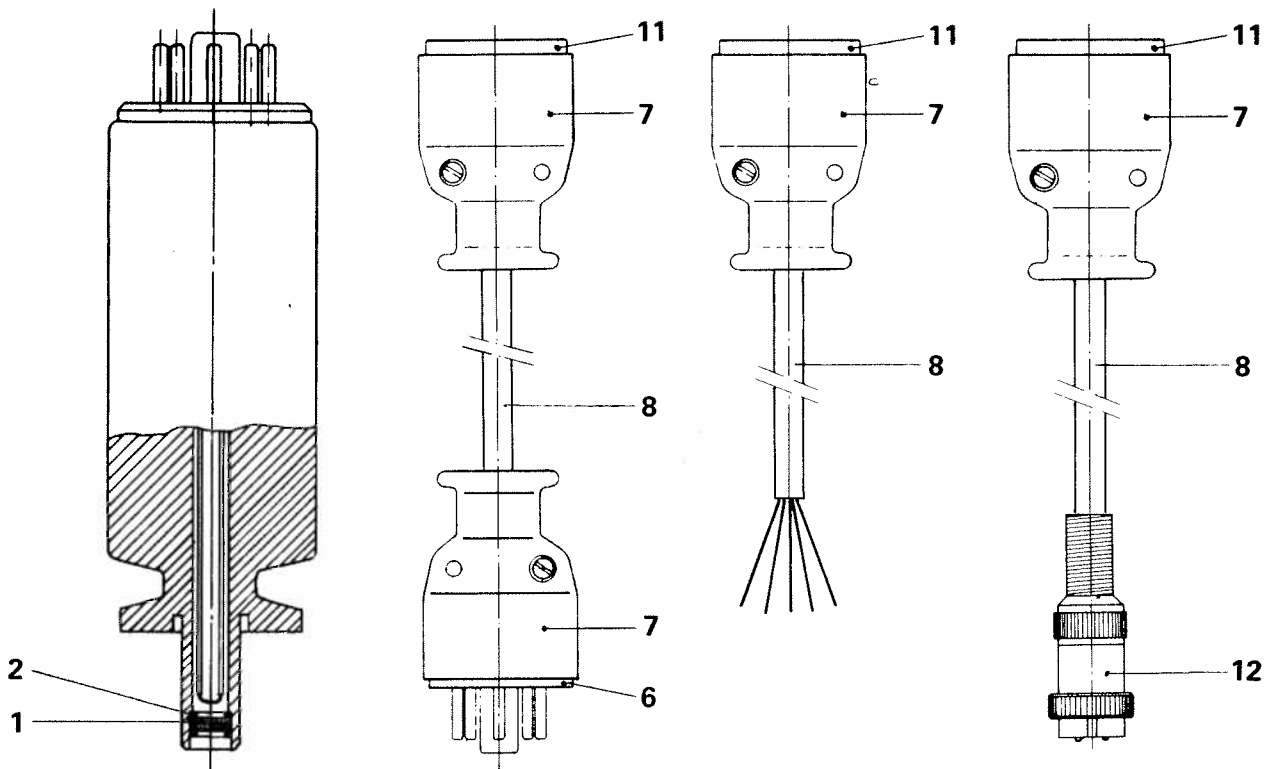
12. SPARE PARTS

The essential replacement parts mentioned in the attached spare parts list are available from stock.

Order Example

1 O-ring, neoprene, ϕ 7 x 1, Code No. B 4070 063 PN, as per spare parts list Z 51-127 b, Pos. 2.

R4	R3	R2	R1	Description Teil	Item Pos.	Code-No. Bestell-Nr.	S	Remarks Bemerkungen
-	-	-	1	Poralfilter, ϕ 6 x 3, Bz	1	B 4161 200 3G		
-	-	-	2	O-Ring, Neoprene, ϕ 7 x 1	2	B 4070 063 PN		
					3			
					4			
					5			
-	-	1	-	Plug / Stecker, 8 P, oktal	6	B 4722 071 SA		
1	1	2	-	Cover / Abdeckhaube	7	BG 519 161 -R		
1	1	1	-	Cable / Apparatkabel, 5 x 0,75 mm ² x L	8	B 4551 733 J4		
					9			
					10			
1	1	1	-	Female plug / Kupplung, 8 P, oktal	11	B 4722 072 SA		
1	-	-	-	Plug / Stecker 4 P	12	B 4722 024 CC		



Version/Rubrik 1

Version/Rubrik 2

Version/Rubrik 3

Version/Rubrik 4

Version 1: Spare parts to TPR 010

Version 2: Connection- and extension cable

Version 3: Like version 2, however for connection to terminals, e.g. VWG 5, NE 4

Version 4: Cable for connecting the TPR 010 to the KVG 403-1

Rubrik 1: Ersatzteile zu TPR 010

Rubrik 2: Verbindungs- und Verlängerungskabel

Rubrik 3: Wie Rubrik 2, für Klemmanschluss, z.B. an VWG 5, NE 4

Rubrik 4: Kabel für den Anschluss der TPR 010 an das KVG 403-1

Spare Parts for / Ersatzteile zu

Gauge head TPR 010 with cable
Messröhre TPR 010 mit Kabel

Z 51 - 127 b