

PRESSURE SENSORS

- Type HPL with mA or V Switching Output
- Type HPLT with mA or V Switching Output + Temperature Sensor

High Performance Safety Certified



OPERATION & MAINTENANCE MANUAL

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1. INTRODUCTION

Gräff Pressure Transmitters are precise measuring probes which obtain measuring accuracy and long life span only if they are properly handled. These operating instructions should be studied carefully before installing the sensor, thus ensuring a trouble-free operation. Nevertheless, should you encounter any difficulties, please feel free to contact our service technicians, who will be happy to offer any assistance.

2. OPERATING RANGE & FIELD OF APPLICATION

Gräff Pressure Transmitters are designed exclusively for measuring and monitoring the pressure of liquid, dough-like, or pasty materials at high temperatures, provided the medium is homogeneous.

Use of the sensor as a safety-relevant component applies only to the fixed threshold value and the switching output. When the sensor is used for pressure control of a plant component in accordance with Section 5.2.5 of EN 1114-1:2012, the analogue measuring channel must not be used simultaneously for pressure regulation or control of that same component (see Section 8 for details).

The installation location must be selected so that the maximum differential pressure does not exceed 2% of the Transmitter's measuring range, relative to the membrane surface. The temperature of both the sensing element and the electronics must remain within the limits specified in the technical data during operation. Exceeding the permissible operating temperature, even briefly, may impair the Transmitter's safety function. If this occurs, the Transmitter must be inspected by the manufacturer.

Any use outside the operating range described above is considered improper use.

3. DANGER AREAS

There is a risk of burns across the entire heated area of the Pressure Transmitter. Incorrect assembly or disassembly of the Transmitter while the system is pressurised can cause hot material to escape at high pressure, posing a serious hazard.

4. WASTE DISPOSAL

Gräff Pressure Transmitters are mercury-free, so they can be disposed of through standard metal recycling channels.



5. TRANSPORT & STORAGE

Gräff Pressure Transmitters are shipped individually packaged, with the front diaphragm protected by a cap to prevent mechanical damage. This protective cap should always be re-fitted for any form of interim storage.

6. CLEANING / MAINTENANCE

To clean the membrane, sealing surface, and thread, the sensor must be heated to at least the melting temperature of the plastic in that area. The membrane and sealing surface can be cleaned with a soft cloth, while the thread may be cleaned using a small brass brush.

Never touch the membrane during this process.

7. INSTALLING / UNINSTALLING

Installing

When installing the Pressure Transmitter, ensure that the Transmitter bore matches the dimensions specified in Section 11. The fit can be verified using a test pin. Before installation, apply a heat-resistant grease to the Transmitter thread. If the machine component containing the bore is still at operating temperature, allow the Transmitter to warm up before installation. Failing to do so may cause the Transmitter to seize due to thermal expansion. When screwing the Transmitter into place, ensure it does not tilt or snag in the bore. Apply turning force only to the hexagonal shaft. The Transmitter head must not be rotated relative to the shaft.

Starting torque for 1/2-20 UNF = 30Nm (max.)

Starting torque for M18 x 1.5 = 50Nm (max.)

Uninstalling

The Pressure Transmitter must be removed while the system is heated to at least the plastic's melting temperature. During removal, ensure that the membrane does not come into contact with any surfaces. As with installation, apply all turning force only to the hexagonal shaft. The Transmitter head must not be rotated relative to the shaft. The most common cause of failure for this type of Pressure Transmitter is membrane damage caused by contact with molten material during installation or removal. Even minor damage can impair sensor performance. If any visible damage is present on the membrane, the Transmitter must be inspected by the manufacturer before further use.

8. SWITCHING OUTPUT FOR PRESSURE MONITORING

The Transmitter's pressure monitoring channel meets the requirements of Performance Level C (PL 'c') in accordance with EN 13849-1:2023 and can therefore be used for overpressure protection in compliance with EN 1114-1:2012, provided it is correctly integrated into the machine control system.

The switching output is closed during normal operation and opens under any of the following conditions:

- The pressure exceeds the limit value set by the manufacturer
- Loss of supply voltage
- Interruption or short-circuit within the measuring element
- Fault in the measuring element's power supply



The switching function must be tested regularly - at least once per year - and the Transmitter inspected for wear on melt-contacting parts, mechanical damage, and measurement accuracy. It is recommended that this inspection be carried out by the manufacturer.

When integrating the switching output into the machine control system, the following points must be observed:

- We recommend limiting the maximum current of the switching output to 500 mA using a semiconductor fuse, unless this is already ensured by the system's "EMERGENCY STOP" function (e.g., a safety-rated frequency converter, protective emergency stop device, or the extruder's safety circuit).
- The semiconductor switching output is additionally protected internally against short-circuits.
- The machine control system must prevent any automatic restart of pressure-producing equipment after the pressure falls back below the switching threshold. The sensor's switching output does not have a latching function.
- When the safety output is used to monitor maximum pressure, the analogue output may be used for pressure indication, but must not be used for pressure regulation or control of the component being safeguarded. (It may, for example, be used for downstream pressure display, general signal logging, or for regulating upstream or downstream equipment such as melt pumps, provided these are not part of the safety-relevant system component.)

9. CONNECTIONS & COMMISSIONING

Once the Pressure Transmitter has been installed as outlined in Section 7, the electrical connection must be made according to the pin assignment provided on the following page. Gräff Pressure Transmitters are fitted with high-quality, robust plug connectors. If soldering the connecting cable is required, it must be carried out with great care to avoid signal transmission faults. We recommend using pre-assembled cables from Gräff, which are available from stock.

HPL-type Pressure Transmitters are equipped with an integrated measuring amplifier that provides a standard output signal corresponding to the specified pressure range. Before commissioning, the sensor must be calibrated to the associated evaluation system. Calibration must be performed with the system heated and unpressurised. The procedure is described below.

After installation and once the Pressure Transmitter has reached operating temperature, the zero point must be adjusted using the AUTO ZERO function.

The AUTO ZERO function is activated by briefly connecting the designated lines (see pin assignment).

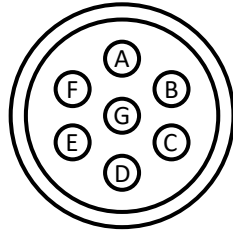
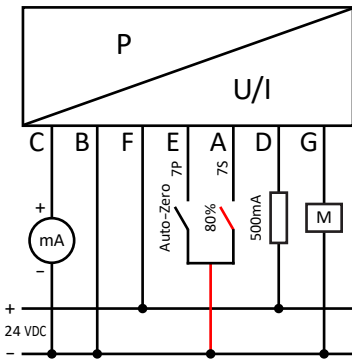
The integrated amplifier will thereafter transmit the starting value of its output scale (0V @ 0-10V, 0mA @ 0-20mA, and 4mA @ 4-20mA) output signal. Function is suppressed if the output signal is more than 5% of the maximum value.

Afterwards an 80% inspection of the output signal can be performed. All corresponding leads wires need to be connected for this procedure (see wiring diagram). The pressure sensor will now supply a signal which is according to 80% of the measuring value.



Electrical wiring configuration: **3-Wire sensor (0-10V, 0/4-20mA)**

Connector type: **62IN-5016-10-7P-4-M**



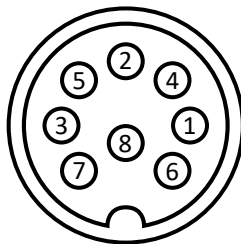
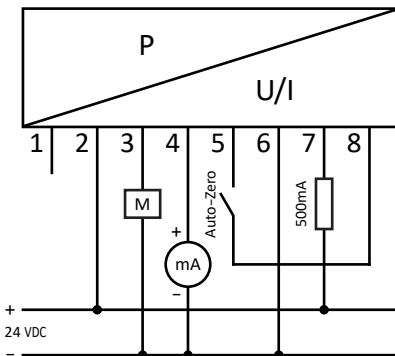
Pin	Function	Colour Coding
A	Auto Zero (7P) / 80% (7S)	YELLOW
B	Supply / Signal -	GREY
C	Signal +	WHITE
D	Switching Output (SSR)	GREEN
E	Auto-Zero / to - (7S)	BROWN
F	Supply +	PINK
G	Switching Output (SSR)	BLUE

Please check colour code in order confirmation.

To activate the Auto Zero function, connect PIN A to PIN E (Order Code 7P) or PIN A to Signal Minus (Order Code 7S). To activate the 80% calibration (Order Code 7S), connect PIN A to Signal Minus. Only the zero point is adjusted; the signal amplification remains unchanged, as it shifts linearly relative to the zero point.

Electrical wiring configuration: **3-Wire sensor (4-20mA)**

Connector type: **09-0173-00-08**



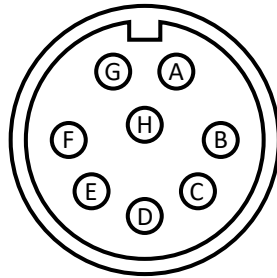
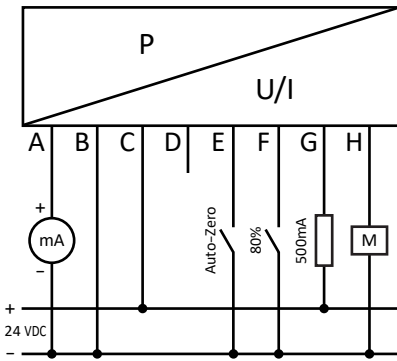
Pin	Function	Colour Coding
1	N/A	YELLOW
2	Supply +	WHITE
3	Switching Output (Semiconductor)	BROWN
4	Signal +	GREEN
5	Auto-Zero	PINK
6	Supply / Signal -	GREY
7	Switching Output (Semiconductor)	RED
8	Auto-Zero	BLUE

In order for the Auto-Zero function to be activated, pins 5 and 8 have to be connected with each other.



Electrical wiring configuration: **3-Wire sensor** (0-10V, 0/4-20mA)

Connector type: **PC06A-12-8P**



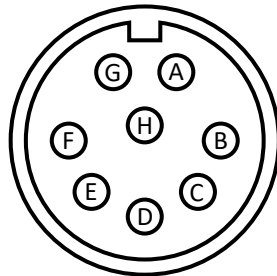
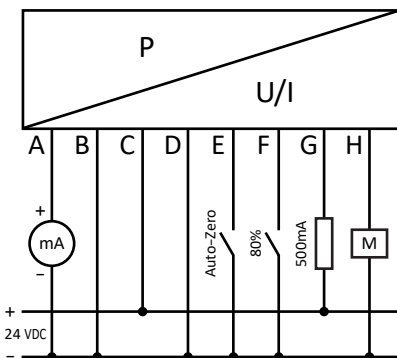
Pin	Function	Colour Coding
A	Signal +	YELLOW
B	Supply / Signal -	GREY
C	Supply +	BROWN
D	N/A	GREEN
E	Auto-Zero	PINK
F	80%	GREY
G	Switching Output (Semiconductor)	RED
H	Switching Output (Semiconductor)	BLUE

To activate the Auto Zero function, connect Pin E to Supply -. This adjusts only the zero point; the signal amplification remains unchanged, as it shifts linearly with the zero point.

To generate the 80% signal, connect Pin F to Supply -.

Electrical wiring configuration: **4-Wire sensor** (0-10V, 0/4-20mA)

Connector type: **PC06A-12-8P**



Pin	Function	Colour Coding
A	Signal +	YELLOW
B	Supply / Signal -	GREY
C	Supply +	BROWN
D	Supply -	GREEN
E	Auto-Zero	PINK
F	80%	GREY
G	Switching Output (Semiconductor)	RED
H	Switching Output (Semiconductor)	BLUE

To activate the Auto Zero function, connect Pin E to Supply -. This adjusts only the zero point; the signal amplification remains unchanged, as it shifts linearly with the zero point.

To generate the 80% signal, connect Pin F to Supply -.



10. TECHNICAL DATA

Pressure range:	50 – 2000 Bar, 750 – 10,000 PSI
Supply voltage:	12 – 36V [DC]
Output signal:	4 – 20mA, 0 – 10V, 2 – 10V
Bridge resistance:	350 Ω
Insulation Resistance:	1000 MΩ @ 50C°
Calibration point:	80% of measuring range
Accuracy:	≤ ± 0.50% FSO
Maximum load:	150% of measuring range
Zero deviation with temperature variations at the diaphragm:	≤ ± 0.003% from final value / C°
Zero deviation with temperature variations at the measuring head:	≤ ± 0.003% from final value / C°
EMC:	Electromagnetic disturbances and electromagnetic susceptibility according to EN 61326
Housing Material:	Stainless Steel [1.4571]
Diaphragm Material:	Stainless Steel (with high flexible special non-stick coating)
Capillary Extension Material:	Stainless Steel
Storage Temperature:	-20°C to 125°C
Maximum Temperature (Diaphragm):	300°C (No filling fluid) / 450°C (NaK filling fluid)
Maximum Temperature (Measuring Head):	125°C
Relative Humidity:	20% to 95% condensation
Maximum Overload Pressure:	2x final value
Calibration Point:	80% of final value
Maximum calibration deviation:	5% of final value
Reproducibility:	± 0.10% of final value
Filling Liquid:	Mercury free, Silicone free, NaK free*
Ingress Protection:	Housing = IP65, Plug = IP55

**Unless specified otherwise*



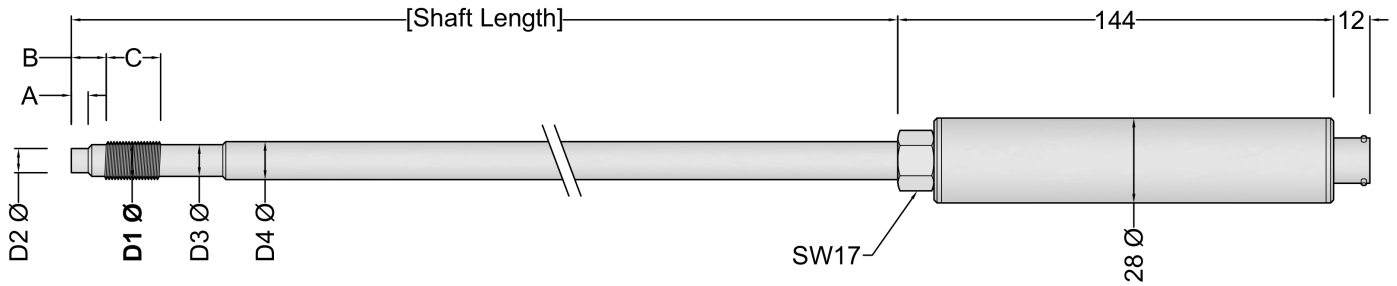
Switching output: <i>(Semiconductor, potential-free)</i>	Max. 48V AC/DC Max. 500 mA On site, current limiting must be ensured via semiconductor fuses (fast, fast acting). One site, the switching point will be set according to customer specifications up to a max. 100%!
Guidelines:	2006/42/EG, machine guideline 2002/95/EG, RoHS guideline 2004/108/EG, EMV guideline
Harmonised Standards:	EN 1114-1:2011, Section 5.2.5 EN ISO 13849-1:2008 (PL c/Cat.1) EN 13849-2:2012 EN 50178:1997 EN 61326-3-1 EN ISO 9001:2008
Security Data:	PFH (1/h):3,76E-08 PFDavg:3,29E-03 MTTFd:2469 years DC: no diagnosis
Self-diagnosis test:	Bridge voltage Supply voltage Bridge resistance Bridge adjustment Diaphragm condition Electronics self-test Output signal Security shutdown



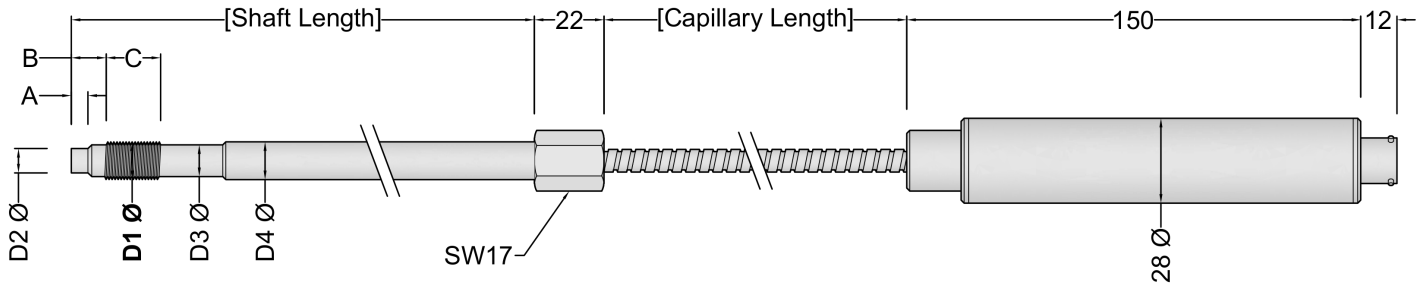
11. DIMENSIONS

D1	D2	D3	D4	A	B	C
M18 x 1.5	10.1 \varnothing [+0.05]	16.1 \varnothing [+0.1]	20.0 \varnothing [+0.2]	6.1 [-0.1]	4.0 [-0.2]	25.0
½" UNF 2A	7.9 \varnothing [+0.05]	10.7 \varnothing [+0.1]	13.0 \varnothing [+0.2]	5.7 [-0.1]	3.2 [-0.2]	19.0

Fixed Shaft



Flexible Shaft



Flexible Shaft + Thermocouple

