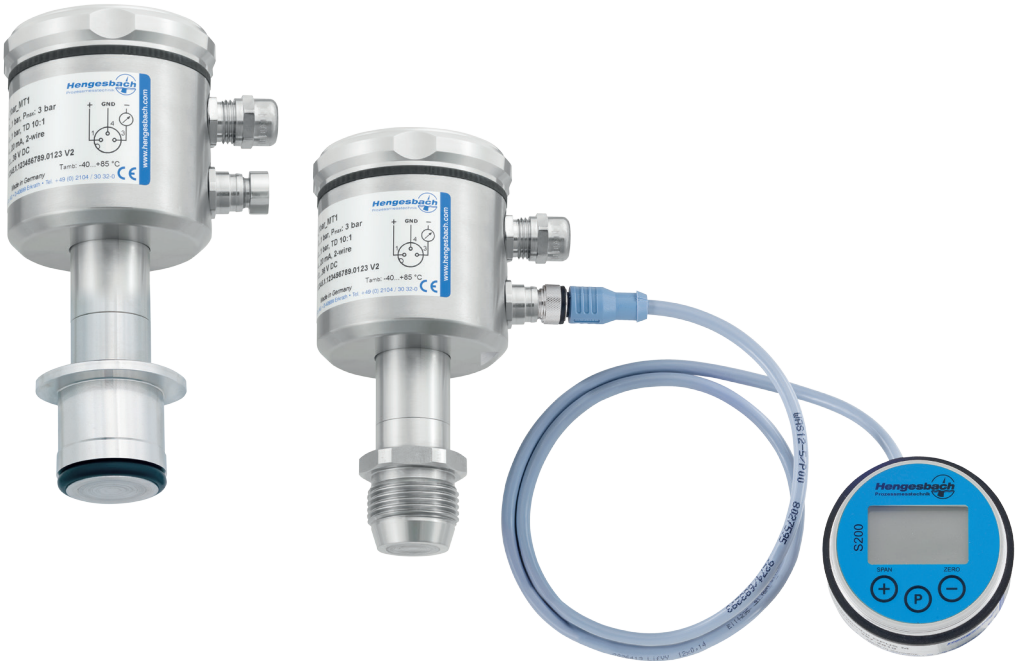
Flush-mounted pressure and level transmitters - TPF series 200/201 - *Superior Precision*

Hengesbach Prozessmesstechnik



Superior Precision
≤± 0,05% FS

FEATURES

- HIGH PRECISION 0.05% FS, TURN DOWN 10, VACUUM SAFE
- WIDE RANGE OF PROCESS CONNECTIONS FOR HYGIENIC APPLICATIONS
- OPTIONAL WITH HART® PROTOCOL
- TANK LINEARISATION FOR STANDARD TANK SHAPES AND SPECIAL DESIGNS THANKS TO VOLUMETRIC MEASUREMENT
- DIAGNOSIS FUNCTION FOR MONITORING OF DEVICES
- COPYING OF DEVICE PARAMETERS WITH EASY TRANSFER
- INTEGRATED ON-SITE DISPLAY OR EXTERNAL OPUS*i* DISPLAY AND OPERATING MODULE FOR PARAMETRISATION AND DISPLAY OF MEASURING VALUES
- APPLICATION STRENGTHS: MEASUREMENT OF CONTENT OF PRESSURISED TANKS / VACUUM MEASUREMENTS WITH HIGH TEMPERATURES

DESCRIPTION

The TPF pressure transmitters are suitable for taking pressure and filling level measurements in pipelines and containers. The wide range of hygienic process connections enables use in all applications in the food and pharmaceutical industries. Customer-specific process connections are also possible on request.

The vacuum-proof measuring cell with stainless steel membrane works on the basis of the piezoresistive measuring principle The TPF pressure transmitters are designed to measure from -1/0…0.35 to -1/0…100bar. Special measuring ranges are also available on request. Given the nature of the design for long-term medium temperatures of up to 125°C / 200°C, CIP and SIP cleaning methods can be used on the transmitters. The high protection classes of IP67 and IP69K also mean that the devices can be safely cleaned on the outside with foam and a high-pressure cleaner and that moisture is reliably prevented from entering into the device. For additional protection against moisture, the electronics are fully encapsulated in the housing.

All the pressure transmitters in series 200/201are highly precise and have been developed for difficult tank content measurements and, in particular, for applications with constantly high temperatures of up to 200°C. Furthermore, using the on-site display with series 200 and the display and operating module OPUS*i* in series 201, the pressure transmitters can be simply read out, configured and diagnosed. With the EASY TRANSFER function, the configuration data can be copied via the OPUS*i* module onto other pressure transmitters in series 201. This makes commissioning easier for the same applications. The option of programming in tank dimensions for standard tank designs as well as for special tanks using the volumes calculated by means of volumetric measurement means exact filling levels and tank content can be shown directly.

In addition to the features of the 200/201 series, the pressure transmitters in the 200H/201H series boast an integrated HART® modem. This also enables remote configuration and evaluation of the transmitters using the HART® protocol.

HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

Flush-mounted pressure and level transmitters - TPF series 200/201 - *Superior Precision*

Hengesbach Prozessmesstechnik

TECHNICAL DATA

General details				
Device type / measuring principle	TPF 200/201/200H/201H: piezoresistive			
Input				
Measuring ranges	TPF 200/201/200H/201H			
Standard nominal measuring ranges [bar]	relative	OP	absolute	OP
OP = overload protection [bar]	0...0.35	1		
	0...1	3	0...1	3
	-1/0...2.5	8	0...2.5	8
Special measuring ranges are available on request.	-1/0...5	15	0...5	15
All measuring cells are vacuum-proof	-1/0...10	30	0...10	30
	-1/0...30	90	0...30	90
	-1/0...100	250	0...100	250
Setting the measuring ranges	Via the keypad of the OPUS*i* display and operating module / via the integrated on-site display Optional: via HART®			
Setting ranges	Start the measuring zero: 0...90% of the sensor's nominal measuring span Measuring span span: 10...100% of the sensor's nominal measuring span			TD=10
Burst pressure DIN16086	≥ 4-fold measuring range			
Output				
Output signal	2-wire: 4...20mA with a test circuit connection in the device Optional: 4...20mA HART®			
Fault signal	Optional: 3.8mA, 22mA, hold (i.e. holding the last value)			
Current limitation	3.85mA and 21.5mA (normal operation)			
Integration time	Continuously selectable between 0 and 300s (setting time after a pressure leap)			
Measuring accuracy				
Reference conditions	acc. to DIN IEC 770			
Linearity, hysteresis and repeatability as per the limit point method DIN IEC 770	≤ ± 0.05% of the sensor's nominal measuring range			
Activation time	< 5s (the device will carry out a self-test.)			
Setting time (without damping)	< 200ms			
Long-time drift	≤ 0.2% of the span per year			
Thermal hysteresis	≤ ± 0.75% beginning of the measuring range / ≤ ± 0.8% end of the measuring range (VRM) ≤ ± 0.2% of the sensor's nominal measuring range / 10K (-20...+80°C) from 4 bar (PZM) ≤ ± 0.3% of the sensor's nominal measuring range / 10K (-20...+80°C) up to 0.6 bar (PZM)			
Conditions of use				
Installation position / calibration position	Any position / standing vertically (position-dependent zero point displacement)			
Medium temperature	T1: -40...+125°C (140°C over one hour at the most) T2: -40...+200°C (high-temperature version)			
Ambient storage temperature	Type 201/201H: -40...+85°C Type 200/200H: -30...+75°C (Below -20°C cable breakage might occur and the display's function may be impaired.)			
Protection class acc. to EN60529	IP 67 and IP 69K			
Electromagnetic compatibility	Sensitivity against interference: acc. to DIN IEC 61000-6-2 Interference radiation: acc. to DIN IEC 61000-6-4			
Construction				
Electrical connection	- Standard: cable screw connection M16x1.5, nickel-plated brass, stainless steel available on request - Optional: round plug-in connector M12x1, nickel-plated brass, stainless steel available on request - Optional: angle plug acc. to EN 175301-803 - Optional: reference cable			
Process connection	- All standard front-mounted process connections and those that are commonly used by the manufacturer - Membrane, flush-welded on the front, CrNiSt, other materials available on request			
Materials	- Field housing / lid: CrNiSt 1.4301 (304) - Housing seal: FPM (Viton®) - Pressure compensation element: polyamide - Inspection gauge (type 200/200H): polycarbonate - Process connection: CrNiSt 1.4404 (316L) - Process membrane: CrNiSt 1.4435/1.4404 (316L) - Locking screw (type 201/201H): CrNiSt 1.4301 (304) - Reference cable: 5-wire with reference tube: PUR (recommended: 80m maximum)			
Filling fluid	- Silicon oil (FDA)			

HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

Flush-mounted pressure and level transmitters - TPF series 200/201 - *Superior Precision*

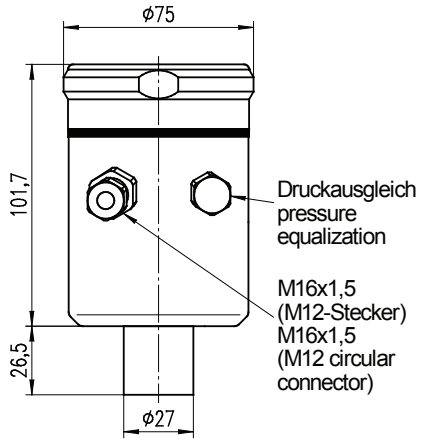
Hengesbach Prozessmesstechnik

TECHNICAL DATA

Display and operation	
Display	LCD, 4-digit numerical display and 5-digit alphanumerical display Type 200/200H: integrated on-site display (cannot be separated from device) Type 201/201H: external OPUS*i* display and operating module
Displayable units	Pressure: mbar, bar, psi, Pa, mH_2O, mmHg, Torr, atm, at, kg/cm² Temperature: °C, °F, K, °R, °Ré Volume: l, hl, dm³, m³, ft³, US gal, UK gal, US bl, UK bl Mass: kg, t, lbs, tn. sh., tn. l.
Additional displays	Output current in mA or % (in relation to the span)
Operation	200/200H: via the configuration menu with the integrated on-site display 201/201H: via the configuration menu with the external OPUS*i* display and operating module
Auxiliary energy resources	
Power supply / burden	12-36V DC, max. burden: (V_{supply} – 12V) / 24mA, with HART® resistance min. 18V DC
Accessories 200 series	
OPUS*i* display and operating module	external display and operating module, CrNiSt, IP 67, 41x70mm, 1m connection cable and M12x1 round plug-in connector, integrated memory for the parameter transfer to other devices (downwardly compatible with existing devices of the 100 series, but without a copying function between the transmitter and the display and operating module)
Certificates	Calibration certificate Declaration of conformity Material inspection certificates as per EN 10204

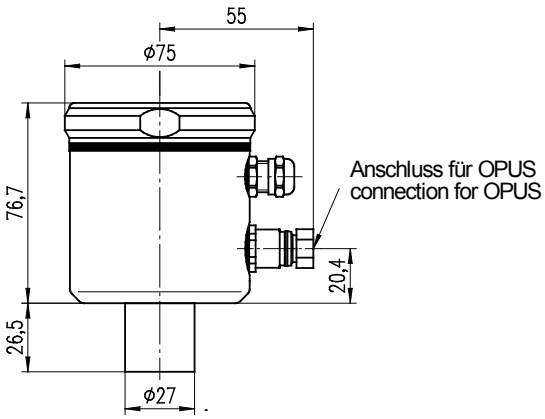
DIMENSIONED DRAWINGS (dimensions in mm)

TPF 200 ... _K(M)

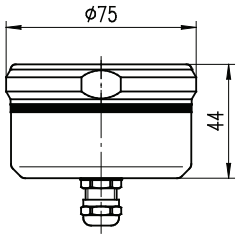


Feldgehäuse mit integrierter Anzeige
(Edelstahl, IP67 + IP69K EN 60529)
field-housing with integrated display
(stainless steel, IP67 + IP69K EN 60529)

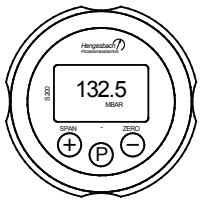
TPF 201 ... _K(M)



Feldgehäuse für OPUS
(Edelstahl, IP67 EN 60529)
field-housing for OPUS
(stainless steel, IP67 EN 60529)

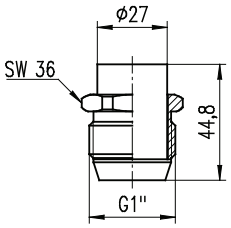


OPUS

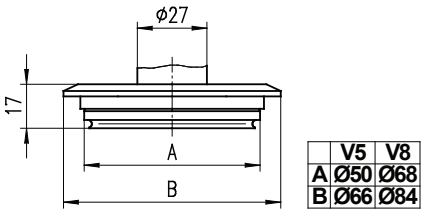


Anzeige
display

Prozessanschlüsse (weitere Ausführungen auf Anfrage)
process-connections (other constructions on request)

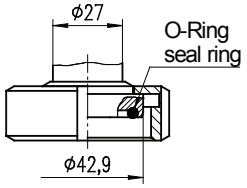


Einschraubgewinde ISO 228 - G1"
elastomerfreier Dichtkonus (K3)
external thread ISO 228 - G1"
cone for sealing without elastomer (K3)



	V5	V8
A	Ø50	Ø68
B	Ø66	Ø84

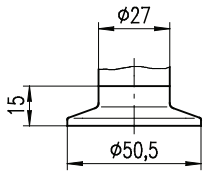
VARIVENT-Flansch - Ø50 (V5), Ø68 (V8)
VARIVENT-flange - Ø50 (V5), Ø68 (V8)



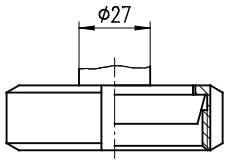
Bundstutzen DIN 11864-1
Form A, DN25 (A2)
collar nozzle DIN 11864-1
form A, DN25 (A2)

HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

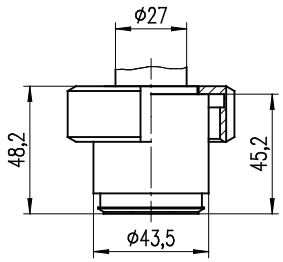
DIMENSIONED DRAWINGS (dimensions in mm)



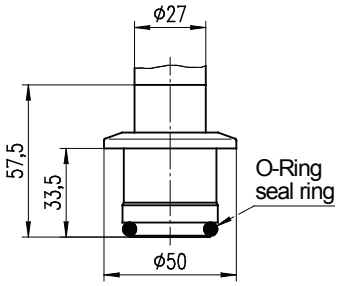
Clamp (C4)
DIN 32676 - DN25-40



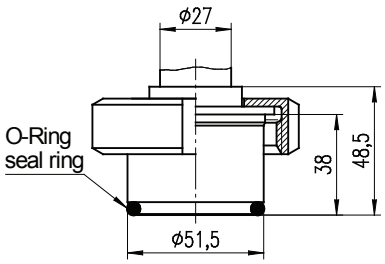
Kegelstutzen DIN 11851
conical nozzle DIN 11851
DN25 (M2), DN40 (M4), DN50 (M5)



UP00 mit Nutmutter DN25 (U2)
UP00 with slotted nut DN25 (U2)

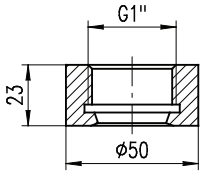


Clamp DN40 mit Tubus (CS)
clamp DN40 with nozzle (CS)

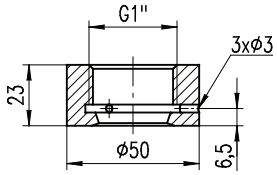


Tubus mit O-Ring und Nutmutter DN40 (T4)
nozzle with seal ring and slotted nut DN40 (T4)

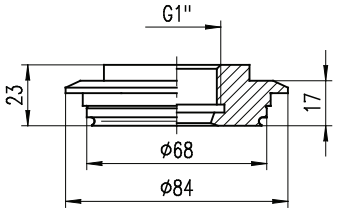
Adapter für Prozessanschluss K3
(Einschraubgewinde ISO 228 - G1"; metallisch dichtend)
adapters for process connection K3
(external thread ISO 228 - G1"; metallic sealed)



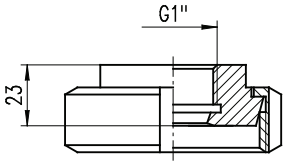
PEM1FPK3
Einschweißmuffe
welding socket



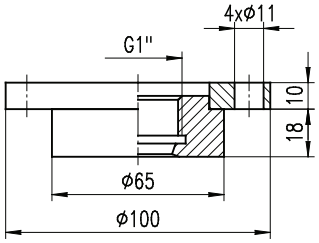
PEM1LPK3
Einschweißmuffe
mit 3 Leckagebohrungen
welding socket
with 3 leakage holes



PVA6FPK3
VARIVENT-Flansch Ø68
VARIVENT-flange Ø68



PMN5FPK3
Kegelstutzen DIN 11851 - DN50
conical nozzle DIN 11851 - DN50

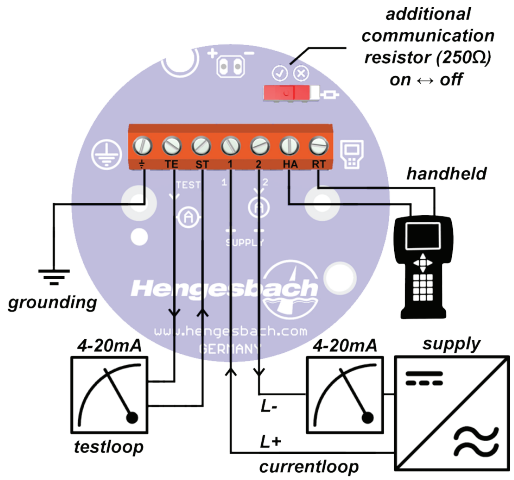


PDR6FPK3
DRD-Flansch Ø65
DRD-flange Ø65

HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

ELECTRICAL CONNECTION

The standard electrical connection is via a cable screw connection M16x1.5. On removing the device lid, the connection is created using screw terminals. The connection diagram in the transmitter head can be seen in the figure below (figure shows the connection for a type 200H/201H device with HART®):



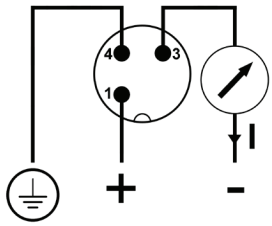
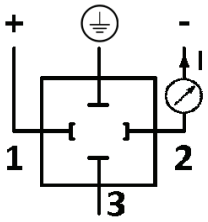
The supply voltage is connected via the two terminals 1 (+) and 2 (-). The current flowing in this loop represents the existing measuring value.

The terminals **TE** and **ST** provide a test circuit connection with which the actual loop current can be measured without interruption using an ammeter.

An operating device can be connected to terminals **HA** and **RT for on-site communication via the HART®protocol.** An additional communication resistor can be added via a sliding switch.

The ground terminal is for potential equalisation between the measuring device and the measuring point.

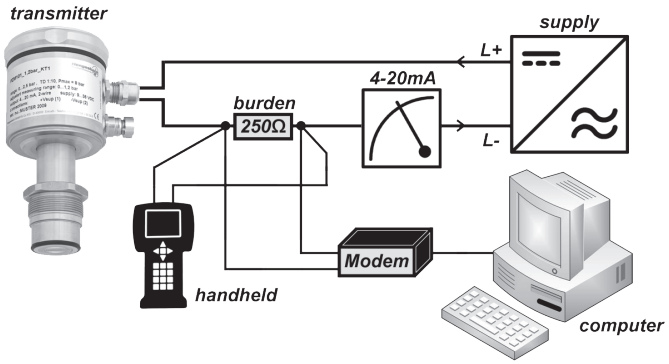
Alternative connection options are a round plug-in connector M12x1, an angle plug acc. to EN 175301-803 as well as a factory-fitted reference cable with integrated vent capillary. The reference cable comes in lengths of between 1...80m.
The electrical configurations are listed in the following:

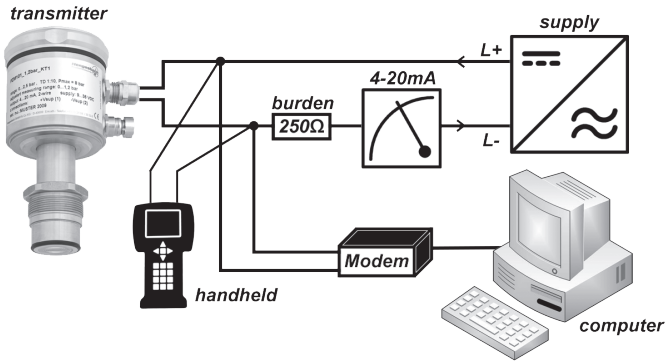
Round plug-in connector M12x1	Angle plug acc. to EN 175301-803	Connected reference cable
		

Brown	Supply +
Black	Supply -
White	Earth
Shield	Earth

CONNECTION FOR HART® COMMUNICATION

For communication via the HART® protocol a minimum burden resistor of 250Ω is required. The following figures show the various options for correct connection. The transmitters can be parametrised via the HART® protocol using universal and pressure transmitter-specific common practice commands.





HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

CALIBRATION / SETTING

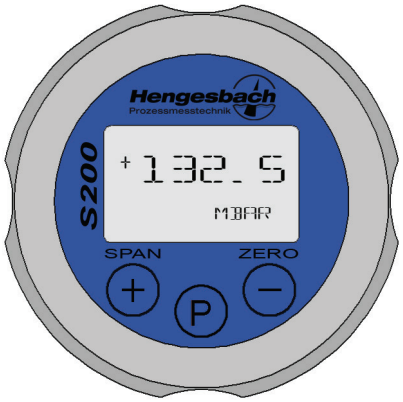
Factory configuration

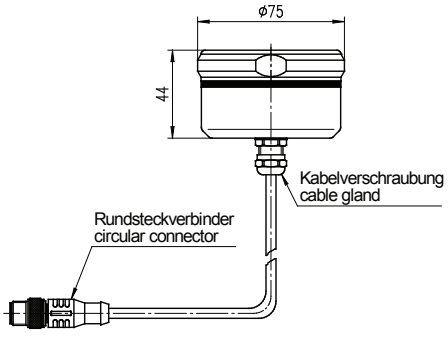
Measuring range calibrated:	Nominal measuring range or as per the order data
Current output:	4...20mA with extended span between 3.9 and 21mA
Damping:	0s
Mains frequency:	50Hz
Measuring value / measuring unit	Pressure / mbar
Current output in the event of a fault:	hold (last value is held)

Configuration menu / parameter list (basic settings of the first parameter level)

No.	Parameter	Explanation
P-0 OFSET	Offset	This parameter is used for setting the beginning of the measuring range. The value, which is set here, is assigned the output current of 4mA. The adjustable range is between 0...90% of the sensor's nominal measuring range.
P-1 SPAN	Span	The span sets the end value for the measuring range. The value, which is set here, represents an output current of 20mA. The adjustable range is within 10...100% of the sensor's nominal measuring range.
P-2 I OUT	Output current	The current range of 4...20mA can by inverted if required. The beginning of the measuring range, in its inverted state, corresponds to 20mA, and the end of the measuring range to 4mA accordingly.
P-3 DAMP	Damping	If the pressure conditions vary heavily, the measuring value can be settled by activating the damping function.
P-4 MAINS	Mains frequency	The setting of the mains frequency, which is used at the respective operating location, serves to suppress any interference inside the device. This way, the mains noise of the power supply unit can be cut out to a large extent.
P-5 UNIT	Measuring unit	This setting is used for selecting between different measuring units depending on the measuring value (pressure, temperature, volume, mass), which is currently displayed.
P-6 DISPL	Measuring value	This parameter allows the selection of the displayed measuring value. Depending on the device configuration, you can choose between the pressure, temperature, current, percentage, volume or mass.
P-7 BIAS	Inlet pressure	A possible offset pressure, which should not be included in the measuring result, can be hidden by entering an inlet pressure / bias. This is particularly useful for volume measurements in pressurised tanks.
P-8 SYSTM	System	In the system level you can change basic settings of the device, e.g, linearisation, current simulation etc.
P-9 INFO	Information	This information menus provides details on the device's various parameters. These serve, amongst other things, to aid diagnoses and, in the case of faults, with troubleshooting.

Configuration menu / parameter list (basic settings of the first parameter level)





externes Bedienmodul OPUS
external operation module OPUS

Parametrisation of the transmitter as well as of the measuring value display on site is handled by the on-site display integrated in the device (type 200/200H) or via the OPUS*i* display and operating module (type 201/201H) located in external housing.

Parameter data can be exchanged between the series 200 devices via the OPUS*i*. Operation and the measuring value display functions are also guaranteed in devices from earlier series thanks to the downward compatibility of OPUS*i*.

HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

Flush-mounted pressure and level transmitters - TPF series 200/201 - *Superior Precision*

Hengesbach Prozessmesstechnik

ORDER INFORMATION for TPF

Electronics

200	4...20mA, integrated LCD display, TD 10
201	4...20mA, can be operated with OPUS*i*, TD 10
200H	4...20mA, HART® protocol, integrated LCD display, TD 10
201H	4...20mA, HART® protocol, can be operated with OPUS*i*, TD 10

Process connection

A2	Female thread with a groove union nut DIN 11864-1 Form A, DN25, PN40, front-mounted, 316L
C4	Clamp DIN32676 DN25 to DN40, PN25, front-mounted, 316L
CS	Clamp DN40 with tube l=33.5mm and O-ring seal (EPM80, FDA-compliant), front-mounted, 316L
K3	Screw-in thread G1“ ISO 228 with elastomer-free sealing cone and union nut, adjustable, front-mounted, 316L
M2	Conical coupling with a groove union nut DIN 11851, DN25, PN40, front-mounted, 316L
M4	Conical coupling with a groove union nut DIN 11851, DN40, PN40, front-mounted, 316L
M5	Conical coupling with a groove union nut DIN 11851, DN50, PN25, front-mounted, 316L
T4	Tube with O-ring seal and groove union nut DIN11851 DN40, front-mounted, 316L
U2	UP00 groove union nut DN25, PN10, front-mounted, 316L
V5	VARIVENT® Ø=50mm, PN16, front-mounted, 316L
V8	VARIVENT® Ø=68mm, PN16, front-mounted, 316L
S9	Other process connections available on request.

Sensor's measuring range / pressure type

C		0.35bar max. overload 1bar
E		1bar max. overload 3bar
G		2.5bar max. overload 8bar
J		5bar max. overload 15bar
K		10bar max. overload 30bar
M		30bar max. overload 90bar
Q		100bar max. overload 250bar
	R	Relative pressure, overpressure (0...xxx bar)
	N	Relative pressure, vacuum (-1...xxx bar)
	A	Absolute pressure

Electrical connection

K	Cable screw connection M16x1.5
M	Round plug-in connector M12x1
W	Right-angle connector EN 175301-803 (not with 200/200H)
R05	Reference cable, 5m, securely fixed
R10	Reference cable, 10m, securely fixed
R15	Reference cable, 15m, securely fixed
R20	Reference cable, 20m, securely fixed
RXX	Reference cable, length in excess of 20m is to be stated in plain text (max. 80m)

Run options

T1	Normal temperature option
T2	High temperature option for average temperatures of up to 200°C

TPF [ ] [ ] [ ] [ ] [ ] [ ]

Nominal measuring range if different from sensor's measuring range

HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

ORDER INFORMATION for TPF accessories

Accessories/assembly parts (please order separately)	**Article number**
OPUS*i* external operating module, for 201/201H, electronics, 1.4301 (304)	OPUS*i*
Compression fitting for process connection K3, G1“ ISO 228 with elastomer-free sealing cone, 1.4404 (316L)	PEM1FPK3
Compression fitting for process connection K3, G1“ ISO 228 with elastomer-free sealing cone, with 3 leakage drills, 1.4404 (316L)	PEM1LPK3
Connection adapter for process connection K3, G1“ ISO 228 elastomer-free sealing cone, conical coupling with a groove union nut DIN 11851, DN50/PN25, 1.4404 (316L)	PMN5FPK3
Connection adapter for process connection K3, G1“ ISO 228 with elastomer-free sealing cone, DRD flange Ø 65 mm; 1.4404 (316L)	PDR6FPK3
Connection adapter for process connection K3, G1“ ISO 228 with elastomer-free sealing cone, VARIVENT® flange Ø 68 mm, DN40-125/PN40, 1.4404 (316L)	PVA6FPK3
DRD weld-in block flange for process connection PDR6FPZM, 1.4435 (316L)	ZEB1FDRD
Flat seal made of EPDM for DRD flange	ZFA1FDRD
Flat seal made of FPM (Viton®) for DRD flange	ZFC1FDRD
Flat seal made of PTFE (Gore™) for DRD flange (FDA)	ZFD1FDRD
4 x fastening screws for DRD flange, 1.4301 (304)	ZDS4FDRD
Pressure compensation element, "Gore™ prevent", IP69K	ZDAE69K
Locking screw for OPUS*i* connection with series 201/201H, 1.4301 (304)	ZVS1F101
Reference cable made of PUR with pressure compensation capillary	ZKP1FDMU
Approval certificate 3.1 acc. to EN 10204 for material assembly parts	WZ31M
Approval certificate 3.1 acc. to EN 10204 for surface quality ≤ 0.8µm or standard	WZ31R
Certificate of compliance 2.1 acc. to EN 10204	WZ2.1
Test report 2.2 acc. to EN 10204	WZ2.2

Please observe the permissible nominal pressure of the process connection selected.
All specifications and certifications specified are only guaranteed when Hengesbach original components are used.
Our devices are subject to constant development; subject to technical modification.

HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com