FEMA
by Honeywell

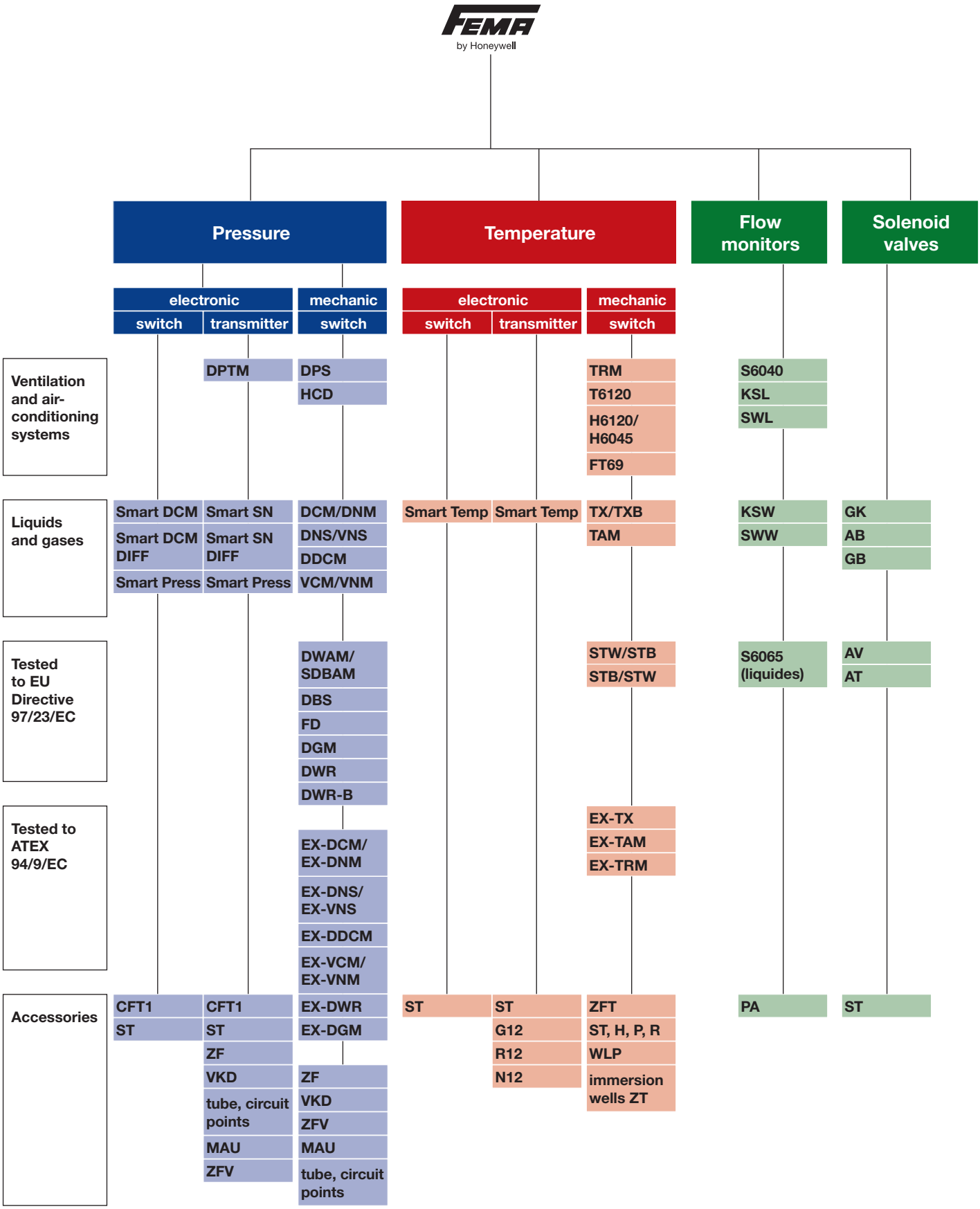
PRESSURE · TEMPERATURE · FLOW CONTROL

Product Catalogue 2013

FEMA-Controls

www.fema.biz

FEMA-Product range



For 75 years, we provide more safety for your systems!

Since the early FEMA worked closely with the technical inspection organization together to optimize the safety in the operation of steam systems.

A result, for systems with explosion risks was, we developed EX-certified components. Up to now these components are manufactured in our own German production.

In the current world wide safety standard SIL, FEMA provide a complete product portfolio.

In addition, FEMA presents the solutions for modern requirements (aspects) of machine safety (EN13849).

75 Years

Solutions For Your Safety

Functional Safety for your plants

The commonly used term Functional Safety has become a central concept for controlling unexpected disturbances in the areas of vehicle construction, power plant construction, the chemicals industry, and machine construction.

New standards have been introduced for plant construction. And for the construction of field devices. IEC 61508-2 (on the functional safety of safety-relevant electrical/electronic/programmable electronic systems) was also developed. It pertains to the manufacture of suitable safety-relevant components for the chemical engineering sector.

The introduction of the Machinery Directive RL/2006/42/EC homonizes DIN EN ISO 13849-1 (Safety of Machinery – Safety Ralated Parts of a Control System – Part 1: Gerneral principles for design) and also calls for „Functional Safety“.

FEMA by Honeywell, in cooperation with our service partner EXIDA, had the standards-compliant development of our PTS- and PTH..-A2 2-wire pressure transmitters verified. Further, in the context of an FMEDA in late 2011, we determined the parameters necessary for the calculation of Functional Safety for all our mechanical pressure switches and thermostats.

All SIL2-certified FEMA pressure switches, thermostats, and 2-wire transmitters at a glance:

Pressure switches -1 to 63 bar
· DCM, DNM, DNS, VCM, VNM, VNS

Differential pressure switches 4 mbar to 16 bar
· DDCM

Pressure monitors and limiters 15 mbar to 40 bar
· DWR, DWAM, DWAMV, SDBAM, FD, DGM

Thermostats -20 to 130 °C
· TAM, TRM, TX

All ex-pressure switches & thermostats
· Ex-DCM, Ex-DDCM, Ex-DGM, Ex-DNM, Ex-DNS, Ex-DWR, Ex-VCM, Ex-VNM, Ex-VNS, Ex-TAM, Ex-TRM, Ex-TX

2-wire pressure transmitters -1 bis 40 bar
· PTS…, PTH…-A2

Safety parameters according (IEC61508-2 and ISO13849-1)

Type	DC	PDF (Tproof = 1 year)	PDF (Tproof = 2 years)	PDF (Tproof = 5 years)	MTTFd (years)	SIL-Level	Performance Level (calc.)/ PFH
Pressure Switch							
DCM/DNM/DNS (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
DCM/DNM/DNS (max)	0 %	6,65E-04	9,81E-04	1,93E-03	1426	SIL2	8,01E-08 1/h
DDCM252-1602 (min/max)	0 %	7,34E-04	1,08E-03	2,13E-03	1282	SIL2	8,90E-08 1/h
DDCM014-16 (min/max)	0 %	6,53E-04	9,62E-04	1,89E-03	1445	SIL2	7,90E-08 1/h
VCM/VNM/VNS (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
VCM/VNM/VNS (max)	0 %	6,65E-04	9,81E-04	1,93E-03	1426	SIL2	8,01E-08 1/h
DWR/DGM (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
DWR/DGM (max)	0 %	6,40E-04	9,44E-04	1,85E-03	1482	SIL2	7,70E-08 1/h
DWAM/SDBAM	0 %	5,70E-04	8,39E-04	1,65E-03	1654	SIL2	6,90E-08 1/h
DBS-DWAM, FD	0 %	2,90E-04	4,29E-04	8,42E-04	3261	SIL2	3,50E-08 1/h
DBS-DWR (max)	0 %	3,62E-04	5,33E-04	1,05E-03	2594	SIL2	4,40E-08 1/h
DBS-DWR (min)	0 %	2,12E-04	3,13E-04	6,14E-04	4390	SIL2	2,60E-08 1/h
EX-Pressure Switch							
EX-DNM/-DNS (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
EX-DNM/-DNS (max)	0 %	6,65E-04	9,81E-04	1,93E-03	1426	SIL2	8,01E-08 1/h
EX-DDCM252-1602 (min/max)	0 %	7,34E-04	1,08E-03	2,13E-03	1282	SIL2	8,90E-08 1/h
EX-DDCM014-16 (min/max)	0 %	6,53E-04	9,62E-04	1,89E-03	1445	SIL2	7,90E-08 1/h
EX-VNM/-VNS (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
EX-VNM/-VNS (max)	0 %	6,65E-04	9,81E-04	1,93E-03	1426	SIL2	8,01E-08 1/h
EX-DWR/-DGM (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
EX-DWR/-DGM (max)	0 %	6,40E-04	9,44E-04	1,85E-03	1482	SIL2	7,70E-08 1/h
Thermostats							
TAM/TRM/TX/TXB (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
TAM/TRM/TX/TXB (max)	0 %	6,99E-04	1,03E-03	2,02E-03	1358	SIL2	8,41E-08 1/h
EX-Thermostats							
EX-TAM/TRM/TX/TXB (min)	0 %	4,91E-04	7,24E-04	1,42E-03	1934	SIL2	5,90E-08 1/h
EX-TAM/TRM/TX/TXB (max)	0 %	6,99E-04	1,03E-03	2,02E-03	1358	SIL2	8,41E-08 1/h

DC: Diagnosis Converage; **PDF:** Probability of Failure on Demand; **SIL:** Safety Integrity Level; **MTTFd:** Meantime to Failure dangerous; **PFH:** Probability of Failure per Hour

Explosion Protection means all-around safety

Explosion Protection is one of the most-important aspects for personal and environmental safety, in the context of continually changing process engineering and manufacturing technologies.

Numerous changes in standards – e.g., the new regulations pertaining to dust explosion protection – necessitate increased vigilance in rechecking design type approvals.

FEMA by Honeywell has taken this fact fully into account in re-approving its tested-and-proven EX-pressure switches and thermostats according to EN60079.

In doing so, customer demands were taken fully into account and both the expansion of Ex-zones and the inclusion of devices according to Ex-ia ("intrinsically safe") included in the certificate.

Dust explosion protection has been achieved with Ex-t ("protection by means of housing").

All of FEMA Ex-pressure switches and thermostats with new certification at a glance:

Ex-Pressure switches for liquid and gaseous media from -1 to 63 bar:
Ex-DCM, Ex-DDCM, Ex-DNM, Ex-DNS, Ex-DWR, DCM-, DDCM-, DNM-, DNS-, DWRxxx-513, -563, -574, -575, -576, -577

Ex-Pressure switches for flammable gases from 15...250mbar:
Ex-DGM, DGMxxx-513, -563, -574, -575, -576, -577

Ex-Thermostats from -20 to 130 °C:
Ex-TAM, Ex-TRM, Ex-TX
TAM, TRM, TXxxx-513, -563

IBExU Institut für Sicherheitstechnik GmbH
An-Institut der TU Bergakademie Freiberg

[1] EC-TYPE EXAMINATION CERTIFICATE
according to Directive 94/9/EC, Annex III

(Translation)

[2] Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres, Directive 94/9/EC

[3] EC-Type Examination Certificate Number: IBExU12ATEX1040

[4] Equipment: Pressure and temperature switches
Type Ex-* und *1413, -663, -674, -675, -676, -677, -226 and -227

[5] Manufacturer: Honeywell GmbH
Fema Regelgeräte

[6] Address: Böblinger Str. 17
71101 Schönaich, Germany

[7] The design of the equipment mentioned under [4] and any acceptable variation thereto are specified in the schedule to this EC-Type Examination Certificate.

[8] IBExU Institut für Sicherheitstechnik GmbH, NOTIFIED BODY number 0637 in accordance with article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that the under [4] mentioned equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The test results are recorded in the test report IB-11-3-226 of 11 December 2012.

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-0:2009, EN 60079-1:2007, EN 60079-7:2007, EN 60079-11:2012 and EN 60079-31:2009.

[10] If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified under [17] in the schedule to this EC-Type Examination Certificate.

[11] This EC-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this directive apply to the manufacture and supply of this equipment.

[12] The marking of the equipment mentioned in [4] shall include the following:

Type Ex-*: II 2G Ex d e IIC T6 Gb and II 1/2D Ex ta/tb IIIC T80 °C Da/Db
-20 °C ≤ T_a ≤ +40 °C

Type Ex-T/BP: II 2G Ex d e IIC T6 Gb and II 2D Ex tb IIIC T80 °C Db
-20 °C ≤ T_a ≤ +40 °C

Type *1413, -663, -674, -675, -676, -677, -226 and -227:
II 1/2G Ex ia IIC T6 Ga/Gb and II 1/2D Ex ia IIIC T80 °C
-20 °C ≤ T_a ≤ +40 °C

IBExU Institut für Sicherheitstechnik GmbH
Fuchsmühlenweg 7 - 09599 Freiberg, Germany
TF +49 (0) 3731 3805-0 - F +49 (0) 3731 23950

Authorised for certifications Explosion protection
By order

(Dr. Wagner)

Schedule

Freiberg, 11 December 2012

Certificates without signature and seal are not valid.
Certificates may only be duplicated completely and unchanged. In case of dispute, the German text shall prevail.

Page 1 of 4
IBExU-[ATEX1040]

NEW ASPECTS OF CERTIFICATION:

- **Alteration of the named certification body to "IBExU"**
- **Certification for dust explosion protection (Ex-t) as per EN60079-31**
- **Expansion of the temperature range from -15 to -20 °C**
- **Zone 20 in the sensor for use in permanently dusty atmospheres**
- **Inclusion of Ex-ia ("intrinsically safe") as per EN60079-11**

PRESSURE

Mechanical pressure switches

Pressure monitoring in areas with risk of explosion

Electronic pressure switches

Pressure transmitters

TEMPERATURE

Mechanical thermostats

Electronic thermostats

Temperature sensors

FLOW CONTROL

Flow monitors

Solenoid valves

ACCESSORIES

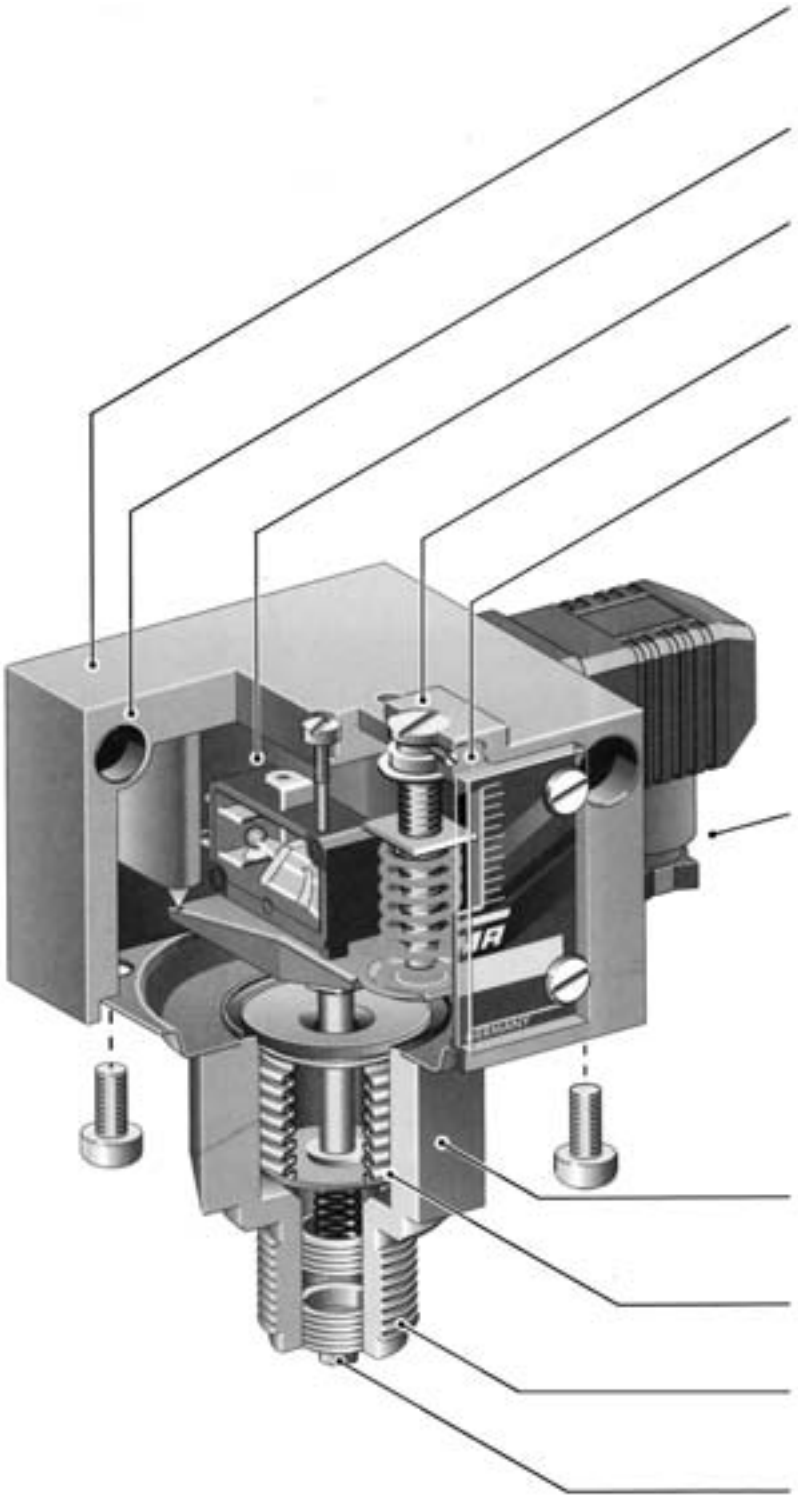
Mechanical pressure switches

FEMA
by Honeywell

Typ	Medium	Pressure ranges	European Directive	Testing basis	Comments	Page
HCD	Air and fuel gases	0.2 mbar to 150 mbar	2009/142/EC	DIN EN1854	Differential pressure monitor	67
DPS	Air and non-aggressive gases	20 Pa to 2500 Pa	2009/142/EC	DIN EN1854	Differential pressure monitor	68
DCM DNM	Non-aggressive liquids and gases	1 bar to 63 bar	RL 2006/95 EC	DIN EN60730	Mechanical pressure switches	36
Ex-DCM Ex-DNM	Non-aggressive liquids and gases	1 bar to 63 bar	ATEX 94/9 EC	DIN EN60730, DIN EN60079	Mechanical Ex-Pressure switches	61
DNS VNS	Non-aggressive liquids and gases	-1 bar to 16 bar	RL 2006/95 EC	DIN EN60730	Vacuum switches with 1.4571 stainless steel sensors	37–38
Ex-DNS Ex-VNS	Non-aggressive liquids and gases	-1bar to 16 bar	ATEX 94/9 EC	DIN EN60730, DIN EN60079	Ex-Pressure-/ Ex-Vacuum switches with 1.4571 stainless steel sensors	62
DDCM	Liquids and gases	4 mbar to 16 bar	RL 2006/95 EC	DIN EN60730	Differential pressure monitor	39
Ex-DDCM	Liquids and gases	4 mbar to 16 bar	ATEX 94/9 EC	DIN EN60730, DIN EN60079	Ex-Differential pressure monitor	63
VCM VNM	Liquids and gases	-1...0.5 bar	RL 2006/95 EC	DIN EN60730	Vacuum switches	40
Ex-VCM Ex-VNM	Liquids and gases	-1 bar to 0.5 bar	ATEX 94/9 EC	DIN EN60730, DIN EN60079	Ex-Vacuum switches	64
DWAM DWAMV SDBAM	Steam and hot water	0.1 bar to 32 bar	PED 97/23 EC	VdTÜV Memo Pressure 100, DIN EN12952-11, DIN EN12953-9	Pressure monitors and pressure limiters	49
DBS	Liquids and gases	0.1 bar to 40 bar	PED 97/23 EC	VdTÜV Memo Pressure 100, DIN EN 1854, EN 13611 DIN EN12952-11, DIN EN12953-9	Self-monitoring pressure sensors to be combined with isolating amplifiers	50–52
FD	Liquid gases	3 bar to 16 bar	PED 97/23 EC	VdTÜV Memo Pressure 100, DIN EN764-7	Self-monitoring pressure sensors to be combined with isolating amplifiers	53
DGM	Fuel gases	15 mbar to 1.6 bar	2009/142/EC	DIN EN1854, DIN EN13611	Pressure monitors Suitable for fuel gases	54
Ex-DGM	Fuel gases	15 mbar to 1.6 bar	ATEX 94/9 EC 2009/142/EC	DIN EN1854, DIN EN13611, DIN EN60079	Ex-Pressure monitors especially suitable for fuel gases	66
DWR	Steam, hot water, fuel gases and liquid fuels	0.1 bar to 40 bar	PED 97/23 EC	VdTÜV Memo Pressure 100, DIN EN1854, DIN EN12952-11, DIN EN12953-9	Pressure switches "of special construction" tested with 2 million cycles.	55–56
Ex-DWR	Steam, hot water, fuel gases and liquid fuels	0.1 bar to 40 bar	ATEX 94/9 EC PED 97/23 EC	VdTÜV Memo Pressure 100, DIN EN1854, DIN EN 12952-11, DIN EN12953-9, DIN EN60079	Ex-Pressure switches "of special construction" tested with 2 million cycles	65

Mechanical pressure switches

Technical features / Advantages



Diecast aluminium housing
IP 54 or IP 65
Ex version also available

Wall mounting
or directly on the pressure line

Switching element (microswitch)

Lead sealable setpoint adjustment

Setting spindle locking element

Terminal connection
or plug connection to
DIN EN175301 Form A

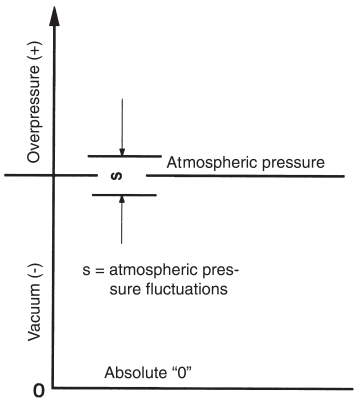
Stainless steel sensor housing

Stainless steel bellows
with internal stop

Pressure connection
G 1/2" external
G 1/4" internal

Centring pin

Definitions



Pressure data

Overpressure Pressure **over** the relevant atmospheric pressure. The reference point is atmospheric pressure.

Vacuum Pressure **under** the relevant atmospheric pressure. The reference point is atmospheric pressure.

Absolute pressure Overpressure relative to absolute vacuum.

Differential pressure Difference in pressure between 2 pressure measuring points.

Relative pressure Overpressure or vacuum relative to atmospheric pressure.

Pressure data in all FEMA documents refers to relative pressure.

That is to say, it concerns pressure differentials relative to atmospheric pressure.
Overpressures have a positive sign, vacuums a negative sign.

Permissible working pressure (maximum permissible pressure)
The maximum working pressure is defined as the upper limit at which the operation, switching reliability and water tightness are in no way impaired (for values see Product summary).

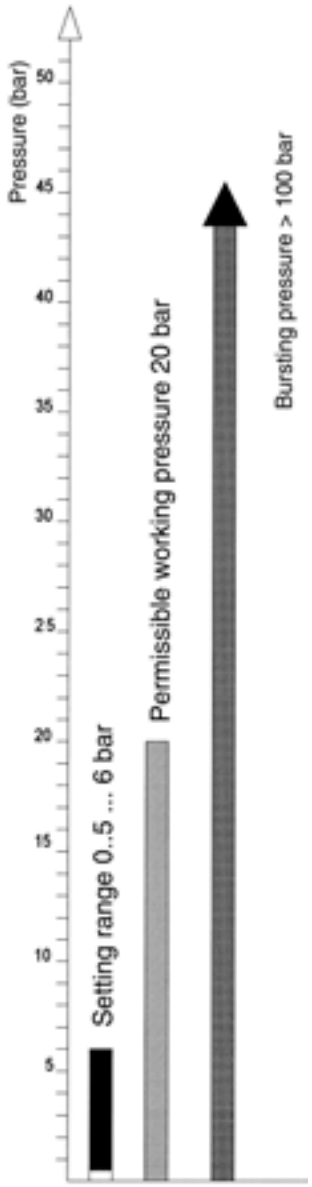
Bursting pressure (test pressure)
Type-tested products undergo a pressure test certified by TÜV affirming that the bursting pressure reaches at least the values mentioned in the Product summary. During the pressure tests the measuring bellows are permanently deformed, but the pressurized parts do not leak or burst. The bursting pressure is usually a multiple of the permissible working pressure.

Setting range
Pressure range in which the cutoff pressure can be set with the setting spindle.

Pressure units

Unit	bar	mbar	Pa	kPa	MPa	(psi) lb/m²
1 bar	1	1000	10^5	100	0.1	14.5
1 mbar	0.001	1	100	0.1	10^{-4}	0.0145
1 Pa	10^{-5}	0.01	1	0.001	10^{-6}	$1.45 \cdot 10^{-4}$
1 kPa	0,01	10	1000	1	0.001	0,145
1 MPa	10	10^4	10^6	1000	1	145

In FEMA documents pressures are stated in **bar** or **mbar**.

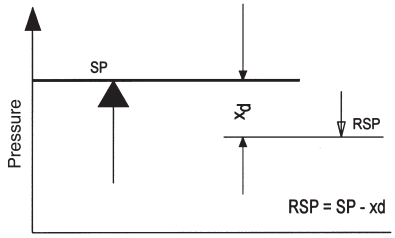


Pressure data for a pressure switchbased on the example of DWR625:
Setting range: 0.5-6 bar
Perm. working pressure: 20 bar
Bursting pressure: >100 bar

Important:
All pressure data refers to overpressures or vacuums relative to atmospheric pressure.
Overpressures have a positive sign, vacuums a negative sign.

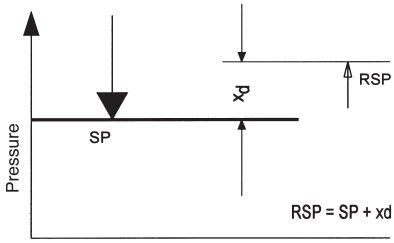
Definitions

Maximum pressure monitoring
RSP = SP – xd



SP = switching point RSP = reset point
xd = switching differential (hysteresis)

Minimum pressure monitoring
RSP = SP + xd



SP = switching point RSP = reset point
xd = switching differential (hysteresis)

Switching differential

The switching differential (hysteresis) is the difference in pressure between the **switching point (SP)** and the **reset point (RSP)** of a pressure switch. Switching differential tolerances occur due to tolerances in the microswitches, springs and pressure bellows. Therefore the data in the product summaries always refers to average values. In the case of limiter functions the switching differential has no significance, as one is only interested in the switching point at which cutoff occurs, not the reset point. For a **controller function**, i. e. in the case of pressure switches used to switch a burner, pump etc. **on and off**, a pressure switch with an **adjustable switching differential** should be chosen. The switching frequency of the burner or pump can be varied by changing the switching differential.

Adjustable switching differential/ calibration
In the case of pressure switches with adjustable switching differential, the hysteresis can be set within the specified limits. The switching point (SP) **and** reset point (RSP) are precisely definable. When setting the pressure switch, the switching differential situation and the type of factory calibration must be taken into account. Some pressure switches (e.g. minimum pressure monitors of the DCM series) are calibrated under "falling" pressure, i.e. switching under falling pressure takes place at the scale value with the switching differential being above it. The device switches back at scale value + switching differential. If the pressure switch is calibrated under rising pressure, switching takes place at the scale value and the device switches back at scale value - switching differential (see direction of action). The calibration method is indicated in the data sheets.

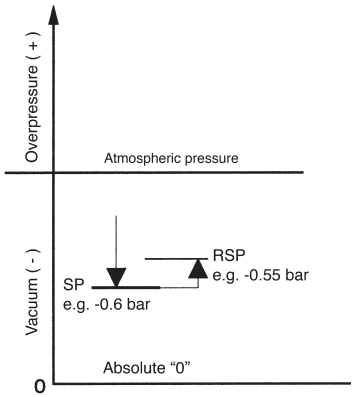
Direction of action

In principle, any pressure switch can be used for both maximum pressure and minimum pressure monitoring. This excludes pressure limiters, whose direction of action (maximum or minimum) is predefined. The only thing to remember is that the scale reading may deviate by the amount of the switching differential. See example at bottom left: The scale value is 2.8 bar.

Maximum pressure monitoring
With rising pressure, switching takes place once the preset switching pressure is reached (SP). The reset point (RSP) is lower by the amount of the switching differential.

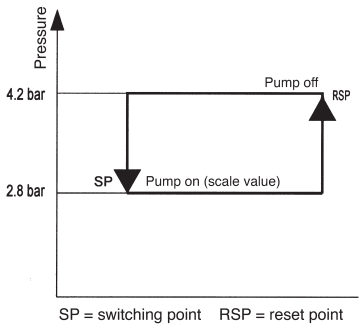
Minimum pressure monitoring
With falling pressure, switching takes place once the preset switching pressure is reached (SP). The reset point (RSP) is higher by the amount of the switching differential.

Direction of action in vacuum range
It is particularly important to define the direction of action in the vacuum range.
Rising does not mean a rising vacuum, but rising pressure (as viewed from absolute "0"). "Falling" pressure means a rising vacuum.
For example: Vacuum switch set to -0.6 bar falling means: Switching (SP) takes place under falling pressure (rising vacuum) at -0.6 bar. The reset point is higher by the amount of the switching differential (e.g. at -0.55 bar).



Setting a pressure switch

To define the switching point of a pressure switch exactly, it is necessary to determine the direction of action in addition to the pressure. "Rising" means that switching takes place at the set value when the pressure rises.
The reset point is then lower by the amount of the switching differential. "Falling" means exactly the opposite.



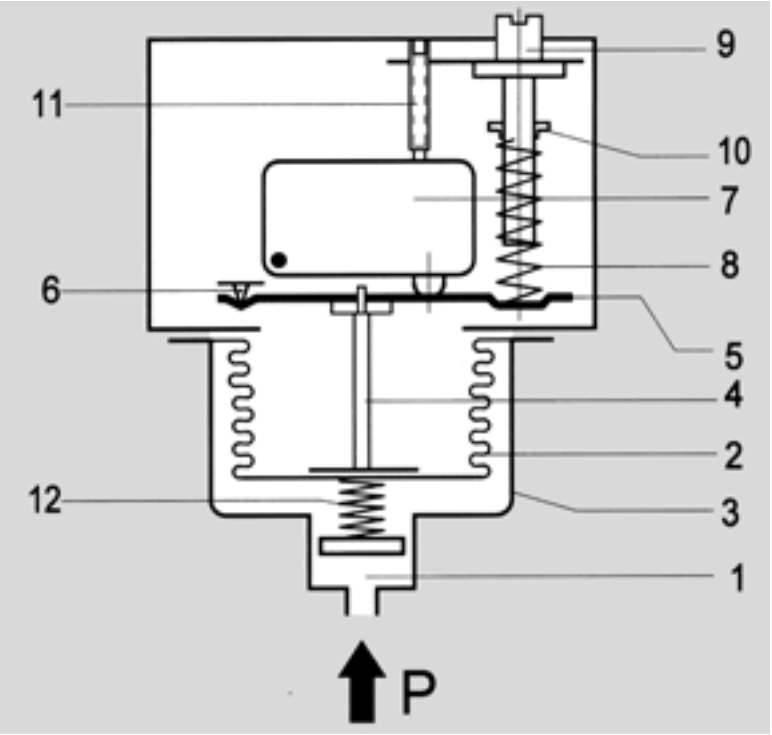
SP = switching point RSP = reset point

Please note when specifying the setting of a pressure switch:
In addition to the switching point it is also necessary to specify the direction of action (falling or rising).

Example for selection of a pressure switch:
A pump is to be turned on at 2.8 bar and off again at 4.2 bar.
Chosen type: DCMV6 according to data sheet DCM. Setting: Scale pointer to 2.8 bar (lower switching point). Switching differential to 1.4 bar (set according to pressure gauge).
Cutoff point: 2.8 bar +1.4 bar = 4.2 bar.

Operating mode
The pressure prevailing in the sensor housing (**1**) acts on the measuring bellows (**2**). Changes in pressure lead to movements of the measuring bellows (**2**) which are transmitted via a thrust pin (**4**) to the connecting bridge (**5**). The connecting bridge is frictionlessly mounted on hardened points (**6**). When the pressure rises the connecting bridge (**5**) moves upwards and operates the microswitch (**7**). A counter-force is provided by the spring (**8**), whose pre-tension can be modified by the adjusting screw (**9**) (switching point adjustment). Turning the setting spindle (**9**) moves the running nut (**10**) and modifies the pre-tension of the spring (**8**). The screw (**11**) is used to calibrate the microswitch in the factory. The counter pressure spring (**12**) ensures stable switching behaviour, even at low setting values.

1 = Pressure connection
2 = Measuring bellows
3 = Sensor housing
4 = Thrust pin
5 = Connecting bridge
6 = Pivot points
7 = Microswitch or other switching elements
8 = Setting spring
9 = Setting spindle (switching point adjustment)
10 = Running nut (switching point indicator)
11 = Microswitch calibration screw (factory calibration)
12 = Counter pressure spring



Pressure sensors
Apart from a few exceptions in the low-pressure range, all pressure sensors have measuring bellows, some made of copper alloy, but the majority of high-quality stainless steel. Measured on the basis of permitted values, the measuring bellows are exposed to a minimal load and perform only a small lifting movement. This results in a long service life with little switching point drift and high operating reliability. Furthermore, the stroke of the bellows is limited by an internal stop so that the forces resulting from the overpressure cannot be transmitted to the switching device. The parts of the sensor in contact with the medium are welded together without filler metals. The sensors contain no seals. Copper bellows, which are used only for low pressure ranges, are soldered to the sensor housing. The sensor housing and all parts of the sensor in contact with the medium can also be made entirely from stainless steel 1.4571 (DNS series). Precise material data can be found in the individual data sheets.

Pressure connection
The pressure connection on all pressure switches is executed in accordance with DIN 16288 (pressure gauge connection G 1/2A). If desired, the connection can also be made with a G 1/4 internal thread in accordance with ISO 228 Part 1.
Maximum screw-in depth on the G 1/4 internal thread = 9 mm.

Centring pin
In the case of connection to the G 1/2 external thread with seal in the thread (i.e. without the usual stationary seal on the pressure gauge connection), the accompanying centring pin is not needed. Differential pressure switches have 2 pressure connections (max. and min.), each of which are to be connected to a G 1/4 internal thread.

Principal technical data

Valid for all pressure switches of the DCM, DNM, DWAM, DWAMV, SDBAM, VCM, DWR, DGM, DNS and DDCM series that have a microswitch. The technical data of type-tested units may differ slightly (please refer to particular type sheet).

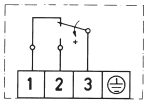
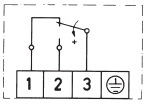
Standard version

Plug connection

…200

Terminal connection

…300

	Plug connection	Terminal connection
Switch housing	Diecast aluminium GDAlSi 12	Diecast aluminium GDAlSi 12
Pressure connection	G 1/2" external thread (pressure gauge connection) and G 1/4" internal thread. 1/4" internal thread for DDCM differential pressure switches	G 1/2" external thread (pressure gauge connection) and G 1/4" internal thread. 1/4" internal thread for DDCM differential pressure switches
Switching function and connection scheme (applies only to version with microswitch)	Floating changeover contact. With rising pressure single pole switching from 3–1 to 3–2. 	Floating changeover contact. With rising pressure single pole switching from 3–1 to 3–2 
Switching capacity (for microswitches with a silver contact)	8 A at 250 VAC 5 A at 250 VAC inductive 8 A at 24 VDC 0.3 A at 250 VDC min. 10 mA, 12 VDC	3 A at 250 VAC 2 A at 250 VAC inductive 3 A at 24 VDC 0.1 A at 250 VDC min. 2 mA, 24 VDC
Mounting position	Preferably vertical (see technical data sheet)	Vertical
Protection class (in vertical position)	IP 54 Plug connection	IP 65 Terminal connection
Electrical connection	Pg 11	M 16 x 1.5
Cabel entry	–25 to +70 °C (exceptions:	–25 to +70 °C (exceptions:
Ambient temperature	DA series –20 to +70 °C DGM and FD series: –25 to +60 °C DCM4016, 4025, 1000, VCM4156: –15 to +60 °C)	DA series –20 to +70 °C DGM and FD series: –25 to +60 °C DCM4016, 4025, 1000, VCM4156: –15 to +60 °C)
Switching point	Adjustable using the setting spindle (for 300 device: after removing switch housing cover)	Adjustable using the setting spindle once the switch housing cover is removed
Hysteresis	Adjustable or not adjustable (see Product Summary)	Adjustable or not adjustable (see Product Summary)
Medium temperature	Max. 70 °C, briefly 85 °C	Max. 70 °C, briefly 85 °C
Relative humidity	15 to 95 % (non-condensing)	15 to 95 % (non-condensing)
Vacuum	Higher medium temperatures are possible provided the above limits for the switching device are ensured by suitable measures (e.g. siphon). All pressure switches can operate under vacuum. This will not damage the device (exception DCM1000).	
Repetition accuracy of switching points	< 1 % of the working range (for pressure ranges > 1 bar).	
Vibration resistance	No significant deviations up to 4 g.	
Mechanical durability (pressure sensor)	With sinusoidal pressure application and room temperature, 10 x 10^6 switching cycles. The expected life depends to a very large extent on the type of pressure application, therefore this figure can serve only as a rough estimate. With pulsating pressure or pressure impacts in hydraulic systems, pressure surge reduction is recommended.	
Electronical durability (microswitch)	100.000 switching cycles at nominal current 8 A, 250 VAC. A reduced contact load increases the number of possible switching cycles.	
Isolation values	Overvoltage category III, contamination class 3, reference surge voltage 4000 V. Conformity to DIN VDE 0110 is confirmed.	
Oil and grease-free	The parts of all pressure switches in contact with the medium are oil and grease-free (except the HCD…and DPS…series). The sensors are hermetically sealed and contain no seals (also see ZF1979, special packing).	

Principal technical data

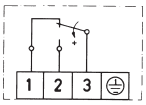
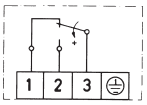
Valid for all pressure of the DCM, VCM, DNM, DWR, DGM, DNS and DDCM series that have a microswitch.
The technical data of type-tested units may differ slightly (please refer to particular type sheet).

Ex-ia-version

…500

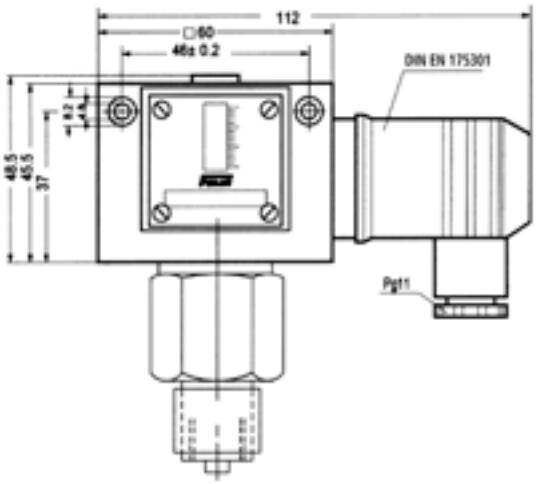
(Ex) version (Ex-d)

…700

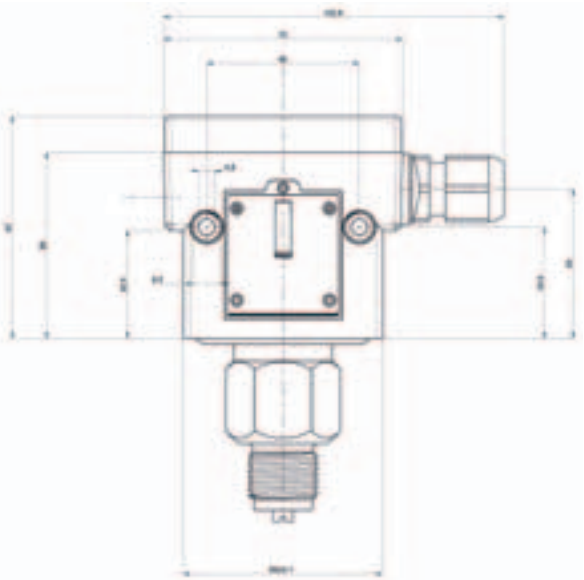
Switch housing	Diecast aluminium GDAlSi 12	Diecast aluminium GDAlSi 12
Pressure connection	G 1/2" external thread (pressure gauge connection) and G 1/4" internal thread. 1/4" internal thread for DDCM differential pressure switches	G 1/2" external thread (pressure gauge connection) and G 1/4" internal thread. 1/4" internal thread for DDCM differential pressure switches
Switching function and connection scheme (applies only to version with microswitch)	Floating changeover contact. With rising pressure single pole switching from 3–1 to 3–2 	Floating changeover contact. With rising pressure single pole switching from 3–1 to 3–2 
Switching capacity	max.: 100mA, 24VDC min.: 2mA, 5VDC	3 A at 250 VAC 2 A at 250 VAC inductive 3 A at 24 VDC 0.1 A at 250 VDC min. 2 mA, 24 VDC
Mounting position	Preferably vertical (see technical data sheet)	Vertical
Protection class (in vertical position)	IP 65	IP 65
Explosion protection Code	(Ex) II 1/2G Ex ia IIC T6 Ga/Gb (Ex) II 1/2D Ex ia IIC T80 °C	(Ex) II 2G Ex d e IIC T6 Gb (Ex) II 1/2D Ex ta/tb IIC T80 °C Da/Db
EC Type Examination Certificate Number	IBExU12ATEX1040	IBExU12ATEX1040
Electrical connection	Terminal connection	Terminal connection
Cabel entry	M 16 x 1.5	M 16 x 1.5
Ambient temperature	–25 to +60 °C (exceptions: DA series –20 to +60 °C DGM and FD series: –25 to +60 °C DCM4016, 4025, 1000, VCM4156: –15 to +60 °C)	–20 to +60 °C
Medium temperature	Max. 60 °C	Max. 60 °C
Relative humidity	15 to 95 % (non-condensing)	15 to 95 % (non-condensing)
Switching point	After removing switch housing cover	After removing switch housing cover
Hysteresis	Not adjustable	Not adjustable
Vacuum	Higher medium temperatures are possible provided the above limits for the switching device are ensured by suitable measures (e.g. siphon). All pressure switches can operate under vacuum. This will not damage the device (exception DCM1000).	
Repetition accuracy of switching points	< 1 % of the working range (for pressure ranges > 1 bar).	
Vibration resistance	No significant deviations up to 4 g.	
Mechanical durability (pressure sensor)	With sinusoidal pressure application and room temperature, 10 x 10^6 switching cycles. The expected life depends to a very large extent on the type of pressure application, therefore this figure can serve only as a rough estimate. With pulsating pressure or pressure impacts in hydraulic systems, pressure surge reduction is recommended.	
Electronical durability (microswitch)	100.000 switching cycles at nominal current 8 A, 250 VAC. A reduced contact load increases the number of possible switching cycles.	
Isolation values	Overvoltage category III, contamination class 3, reference surge voltage 4000 V. Conformity to DIN VDE 0110 is confirmed.	
Oil and grease-free	The parts of all pressure switches in contact with the medium are oil and grease-free (except the HCD…and DPS…series). The sensors are hermetically sealed and contain no seals (also see ZF1979, special packing).	

Dimensioned drawings of switch housings

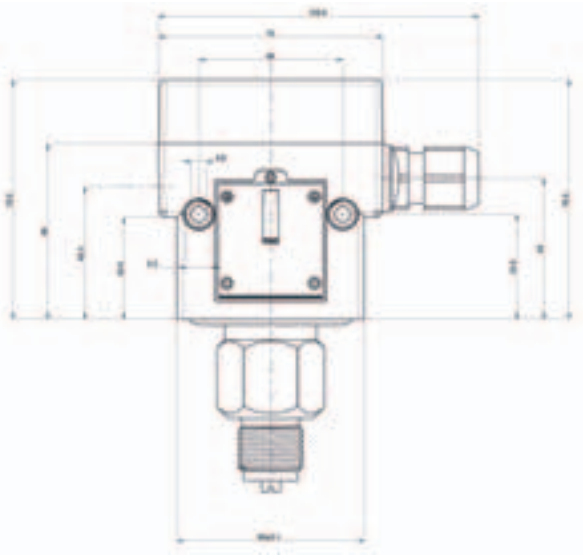
1 Housing 200 (plug connection)



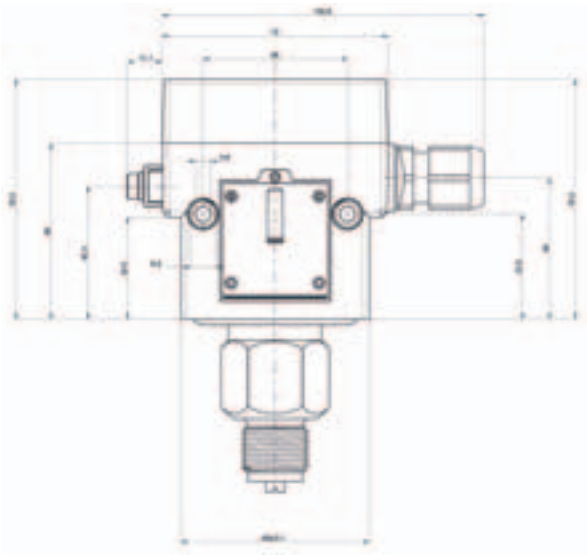
2 Housing 300 (terminal connection)



3 Housing 500 (terminal connection Ex-ia)

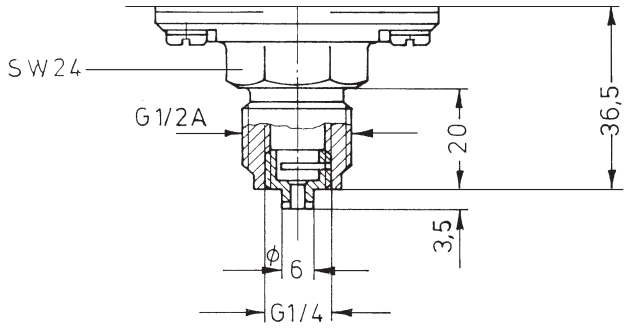


4 Housing 700 (terminal connection Ex-d)

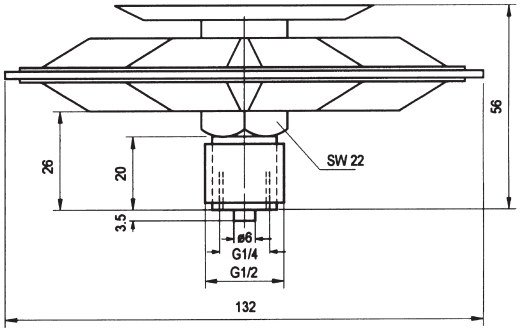


Dimensioned drawings of pressure sensors

10

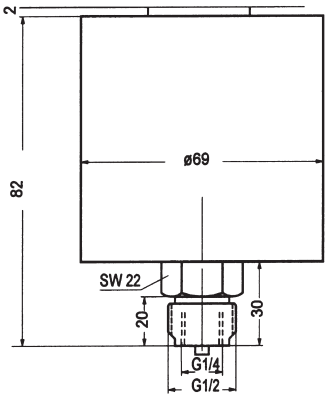


11

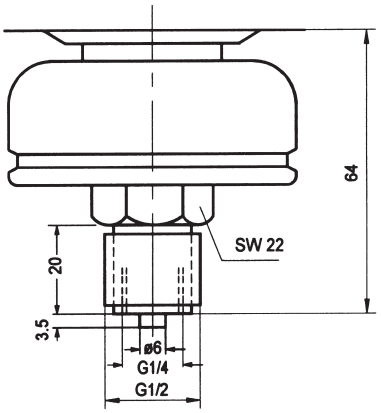


Dimensioned drawings of pressure sensors

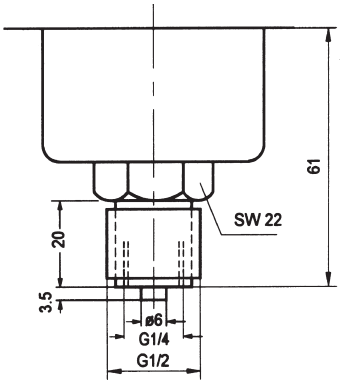
12



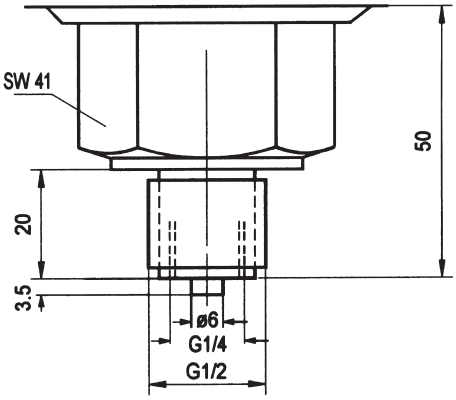
13



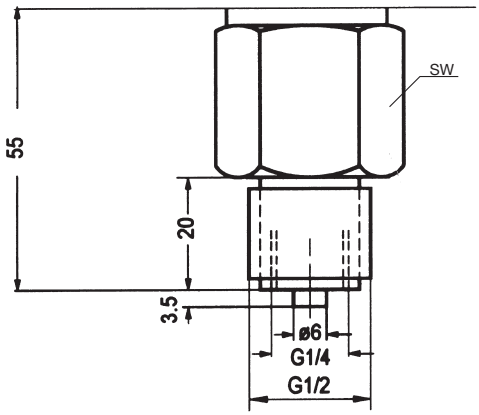
14



15

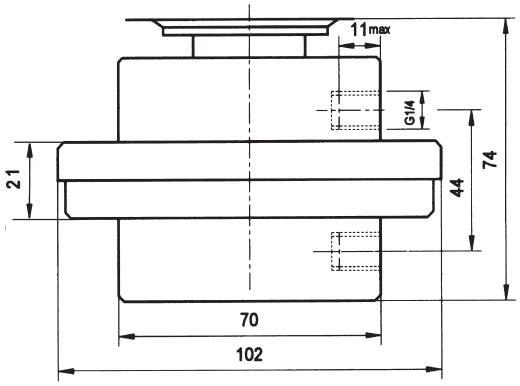


16 – 19

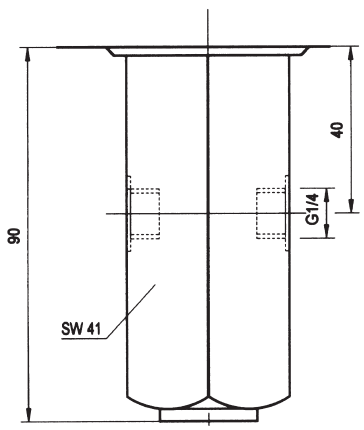


Dimensioned drawing	SW
16	22
17	24
18	30
19	32

20



21

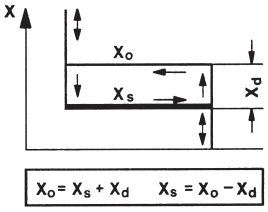


Setting instructions

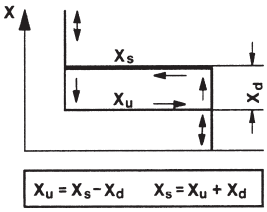
Factory calibration of pressure switches

In view of tolerances in the characteristics of sensors and springs, and due to friction in the switching kinematics, slight discrepancies between the setting value and the switching point are unavoidable. The pressure switches are therefore calibrated in the factory in such a way that the setpoint adjustment and the actual switching pressure correspond as closely as possible in the middle of the range. Possible deviations are equally distributed on both sides.
The device is calibrated either for falling pressure (calibration at lower switching point) or for rising pressure (calibration at higher switching point), depending on the principal application of the type series in question.
Where the pressure switch is used at other than the basic calibration, the actual switching point moves relative to the set switching point by the value of the average switching differential. As FEMA pressure switches have very small switching differentials, the customer can ignore this where the switching pressure is set only roughly. If a very precise switching point is needed, this must be calibrated and checked in accordance with normal practice using a pressure gauge.

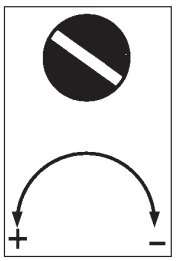
1. Calibration at lower switching point
Setpoint x_s corresponds to the lower switching point, the upper switching point x_o is higher by the amount of the switching differential x_d.



2. Calibration at upper switching point
Setpoint x_s corresponds to the upper switching point, the lower switching point x_u is lower by the amount of the switching differential x_d.



The chosen calibration type is indicated in the technical data for the relevant type series.



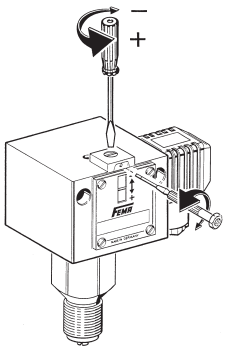
Clockwise: lower switching pressure

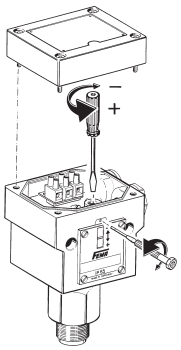
Anticlockwise: higher switching pressure

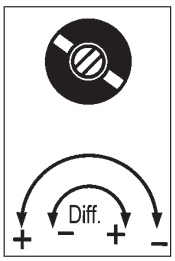
Direction of action of setting spindle

Setting switching pressures

Prior to adjustment, the securing pin above the scale must be loosened by not more than 2 turns and retightened after setting. The switching pressure is set via the spindle. The set switching pressure is shown by the scale.
To set the switching points accurately it is necessary to use a pressure gauge.







Clockwise: greater difference
Anticlockwise: smaller difference

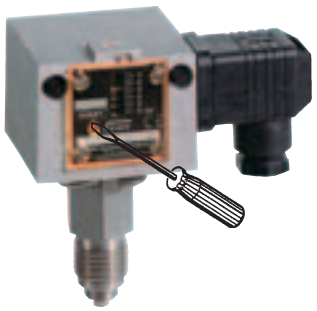
With pressure switches from the DWAMV and DWR...-203 series, the direction of action of the differential screw is reversed.

Changing the switching differential (only for switching device with suffix "V", ZF203)

By means of setscrew within the spindle. The lower switching point is not changed by the differential adjustment; only the upper switching point is shifted by the differential. One turn of the differential screw changes the switching differential by about 1/4 of the total differential range. The switching differential is the hysteresis, i.e. the difference in pressure between the switching point and the reset point.

Lead sealing of setting spindle (for plug connection housing 200 only)

The setting spindle for setting the desired value and switching differential can be covered and sealed with sealing parts available as accessories (type designation: P2) consisting of a seal plate and capstan screw. The sealing parts may be fitted subsequently. The painted calibration screws are likewise covered.

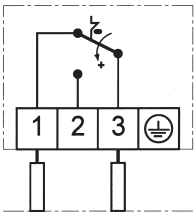


Pressure switch with switching state locking (reclosing lockout)

In the case of limiter functions, the switching state must be retained and locked, and it may be unlocked and the system restarted only after the cause of the safety shutdown has been eliminated. There are two ways of doing this:

1. Mechanical locking inside the pressure switch
Instead of a microswitch with automatic reset, limiters contain a "bi-stable" microswitch. If the pressure reaches the value set on the scale, the microswitch trips over and remains in this position. The lock can be released by pressing the unlocking button (identified by a red dot on the scale side of the switching device). The lock can operate with rising or falling pressure, depending on the version. **The device can only be unlocked when the pressure has been reduced (or increased) by the amount of the predefined switching differential.** When selecting a pressure limiter, it is necessary to distinguish between maximum and minimum pressure monitoring. Ex-d versions cannot be equipped with internal locking.

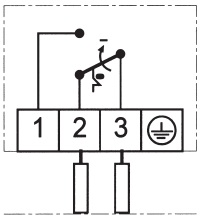
Maximum pressure limitation



Switching and interlocking with rising pressure. Additional function ZF205.

Connection of control current circuit to terminals 1 and 3.

Minimum pressure limitation

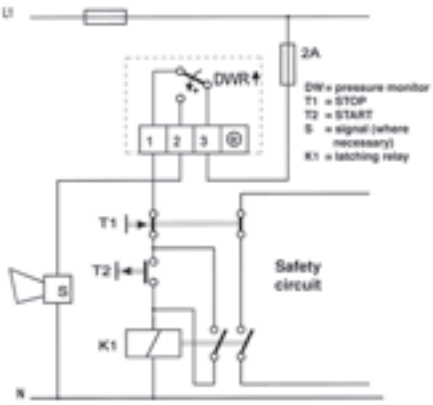


Switching and interlocking with falling pressure. Additional function ZF206.

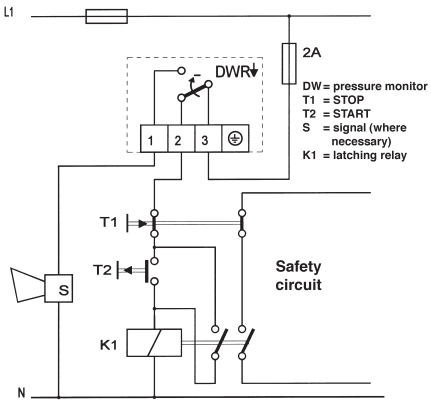
Connection of control current circuit to terminals 2 and 3.

2. External electrical interlock in the control cabinet (suggested circuits)
A pressure monitor (microswitch with automatic reset) can also be used as a limiter if an electrical interlock is added. For pressure limitation in steam and hot water boilers, an external interlock is only permitted if it has been ascertained that the pressure monitor is "of special construction".

Maximum pressure limitation with external interlock



Minimum pressure limitation with external interlock



Where the above lock circuit is used, the requirements of DIN 57 116/VDE 0116 are met if the electrical equipment (such as contactors or relays) of the external interlock circuit satisfy VDE 0660 or VDE 0435.

Explanation of type designations – type codes

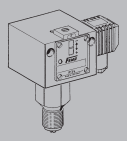
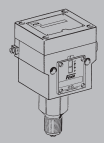
The type designations of FEMA pressure switches consist of a combination of letters followed by a number denoting the setting range. Additional functions and version variants are indicated by an extra code which is separated from the basic type by a hyphen. Ex versions (explosion protection Ex-d) are identified by the prefix "Ex" in front of the type designation.

Basic version (based on the example of DCM series) **DCMXXX**	**With additional function** **DCMXXX-YYY**	**Ex version** **Ex-DCMXXX**

DCM →	Series code (e. g. DCM)
XXX →	Codes for pressure range
YYY →	Code for additional function
Ex →	Code for Ex-version

Switch housing version	
DCMXXX	Basic version with plug connection housing
DCMXXX-2...	Basic version with plug connection housing
DCMXXX-3...	Terminal connection housing (300)
Ex-DCMXXX	Ex-d switching device (700)
DCMXXX-5...	Ex-ia version (500)

Which additional function goes with which pressure switch?

	Plug connection, 200 series  Additional function ZF			Terminal connection, 300 series  Additional function ZF					
	203	213	217	301 351	307	513	574 576	575 577	Ex-d
DCM/VCM	•[1]	•	•[1]	•	•[1]	•			•
VNM/DNS/VNS	•	•	•	•	•	•			•
DWAM		•		•		•	•	•	
DDCM		•	•[2]	•	•[2]	•			•
DWR	•	•		•		•	•	•	•
DGM		•		•		•	•	•	•

• available

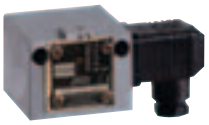
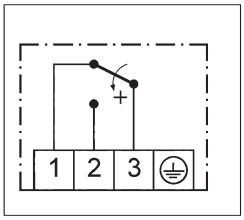
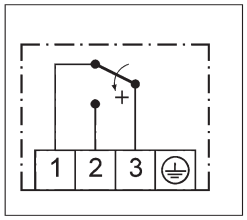
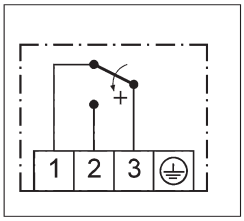
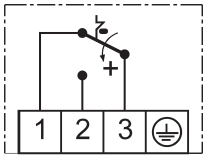
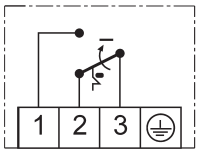
[1] except DCM4016, DCM4025, VCM4156 and DCM1000
[2] except DDCM252, 662, 1602, 6002

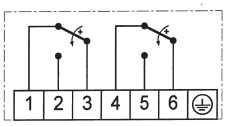
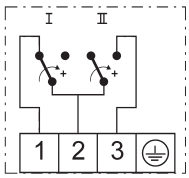
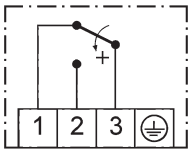
Combination of several additional functions not possible!

**Ex versions (Ex-d) can only be supplied in basic form.
Additional functions are not possible.**

Pressure switches and pressure monitors

Additional functions / Connection schemes

	Plug connection, 200 series (IP 54)	Terminal connection, 300 series (IP 65)	Connection scheme	
Standard version (plug connection) Microswitch, single pole switching, switching differential not adjustable				
Terminal connection housing (300)		**ZF301**		
Unit with adjustable switching differential	**ZF203**			
Maximum pressure limiter with reclosing lockout **Interlocking with rising pressure** see DWR series	**ZF205**			
Minimum pressure limiter with reclosing lockout **Interlocking with falling pressure** see DWR series	**ZF206**			

	Plug connection 200 series (IP 54)	Terminal connection 300 series (IP 65)	Connection scheme	
Two microswitches, switching in parallel or in succession. Fixed hysteresis, only possible with terminal connection housing. **State the hysteresis** (not possible with all pressure switches).		**ZF307**		
Two microswitches, 1 plug switching in succession, adjustable hysteresis. **State the switching scheme *** (not possible with all pressure switches).	**ZF217 ***		 Connection scheme selection, see page 26	
Gold-plated silver contact, single pole switching (not available with adjustable switching differential). **Switching capacity:** max. 24 VDC, 100 mA, min. 5 VDC, 2 mA	**ZF213**			
Switch Housing with surface protection (chemical version)		**ZF351**		

The prices shown are additional prices compared to the basic device of the 200 series (plug connection).
* Connection schemes for switching schemes, see page 26.
Please state when ordering!
Example for ordering: DCM10-217A-S.
Additional text: switching scheme A4

Example for ordering:
DCM 6 – 205
- 205: Code of additional function (e.g. maximum limiter)
- 6: Code for pressure range
- DCM: Sensor system

How to order:
Pressure switch
DCM6-205
or DCM6 with ZF205

Pressure switches and pressure monitors

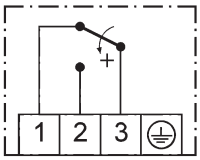
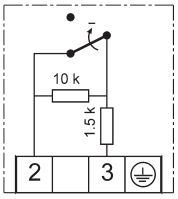
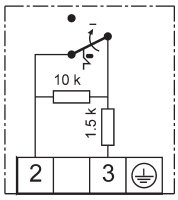
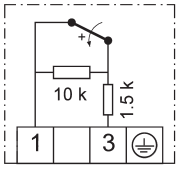
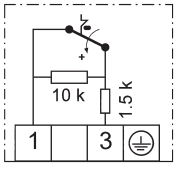
Additional functions for Ex-ia-equipment

DWAM6-576

· Housing (500) with terminal connection (IP 65), "blue" cable entry and terminals.
· Also available with resistor combination for line break and short-circuit monitoring (with isolating amplifier).

Important:
All pressure switches with the ZF5… additional functions listed here can only be operated in combination with a suitable isolating amplifier.

Additional information:
Our pressure switches and thermostats are considered to be "simple electrical equipment" within the meaning of standard EN60079-11: 2007. Testing is not mandatory for this type of equipment.

Additional functions for Ex-ia-equipment **Ⓔx II 1/2G Ex ia IIC T6 Ga/Gb** **Ⓔx II 1/2D Ex ia IIIC T80 °C**		**Connection scheme**	
Gold-plated contact single pole switching, fixed hysteresis, not adjustable **Switching capacity:** max. 24 VDC, 100 mA, min. 5 VDC, 2 mA **For the power supply circuit:** U_i 24 V DC I_i 100 mA C_i 1 nF L_i 100 µH	**ZF513**		
Versions with resistor combination for line break and short-circuit monitoring in control current circuit, see DBS series, pages 50–52: **For the power supply circuit:** U_i 14 V DC R_i 1500 Ohm C_i 1 nF L_i 100 µH			
Normally closed contact with resistor combination, for **minimum pressure monitoring,** gold-plated contact, plastic-coated housing (chemical version).	**ZF574**		
Normally closed contact **with reclosing lockout** and resistor combination, for **minimum pressure monitoring,** plastic-coated housing (chemical version).	**ZF575**		**see** **DBS series** **pages 50–52**
Normally closed contact with resistor combination, for **maximum pressure monitoring,** gold-plated contact, plastic-coated housing (chemical version).	**ZF576**		
Normally closed contact **with reclosing lockout** and resistor combination, for **maximum pressure monitoring,** plastic-coated housing (chemical version).	**ZF577**		

Service functions

Devices with service functions will be produced according to the customer's specifications.
The system requires that these product combinations are identified in such a way as to prevent any possibility of confusion. These combinations are characterised by a product code with the suffix "-S" on the packaging label as well as separate labels with barcodes for each service function.

Service functions	Plug connection 200 series	Terminal connection 300 series	Ex-i/ Ex-d
Adjustment according to customer's instruction:			
one switching point	**ZF1970***	**ZF1970***	**ZF1970***
two switching points or defined switching differential	**ZF1972***	**ZF1972***	**–**
Adjustment and lead sealing according to customer's instruction:			
one switching point	**ZF1971***	**–** **–**	
two switching points or defined switching differential	**ZF1973***	**–** **–**	
Labelling of units according to customer's instruction with sticker	**ZF1978**	**ZF1978**	**ZF1978**
Special packing for oil and grease-free storage	**ZF1979**	**ZF1979**	**ZF1979**
Test reports according to EN 10 204			
Certificate 2.2 based on non-specific specimen test	**WZ2.2**	**WZ2.2**	**WZ2.2**
Inspection test certificate 3.1 based on specific test	**AZ3.1**	**AZ3.1**	**AZ3.1**
Inspection test certificate for FV separating diaphragms	**AZ3.1-V**	**AZ3.1-V**	**AZ3.1-V**

*** Switching point adjustment:** Please specify **switching point and direction of action** (rising or falling pressure).

Service functions are available for the following type series (including Ex versions):
Pressure switches: DCM, DNM, DNS, VNS, VCM, VNM, DDCM, DWR, DWAM, DWAMV, SDBAM, DGM, FD

Ordering devices with service functions

Example:
Ordering 1 DCM6, set at 4 bar rising, identified with code PSH008 as requested by the customer and acceptance test certificate 3.1.
The order confirmation contains:

1 DCM6-S
1 ZF1970: set to 4 bar rising
1 ZF1978: PSH008
1 AZ3.1

Included items: Labels with barcodes on the packaging:
DCM6-S
ZF1970: set to 4 bar rising
ZF1978: PSH008
AZ3.1

Pack contents: 1 DCM6 (without "S" suffix) marked
1 ZF1970: set to 4 bar rising
1 ZF1978: PSH008
1 AZ3.1
1 Installation and operating instructions

S2 type series

Pressure switches with 2 microswitches - technical data

FEMA pressure switches of the **DCM** (except DCM1000, DCM4016 and DCM4025), **VCM** (except VCM4156), **VNM, DNS, VNS** series and the differential pressure monitor **DDCM** (except DDCM252, 662, 1602, 6002) can be equipped with 2 microswitches.

This is not possible with any other type series or with Ex versions.

Technical data

Standard equipment
The standard equipment of every two-stage pressure switch includes a switching device with 2 microswitches, both single-pole switching. Switch I monitors the low pressure, switch II the higher pressure. The setting ranges indicated in the data sheets for the basic types apply to the two-stage pressure switches as well. It should be noted that the switching differentials of the individual microswitches may not be exactly the same due to component tolerances.

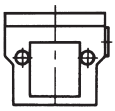
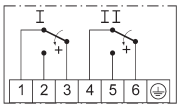
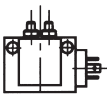
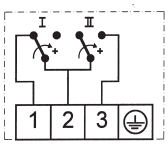
Switching interval
The switching interval of the two microswitches is the difference (in bar or mbar) between the switching points of the two microswitches.

Example for ZF307:
When the pressure rises (e.g. 2.8 bar), a two-stage pressure switch turns on a warning light, and if the pressure continues to rise (e.g. 3.2 bar) the system shuts down. The switching interval is 3.2-2.8 = 0.4 bar. The following applies to all versions:
The switching interval remains constant over the whole setting range of the pressure switch. If the switching pressure setting is changed with the setting spindle, the switching interval does not change - the switching points are moved in parallel.

Switching differential
The switching differential, i.e. the hysteresis of the individual microswitches, corresponds to the values of the relevant basic version referred to in the Product summary. In the case of two-stage pressure switches, **the switching differential of the individual microswitches is not adjustable.**

Versions
Two-stage pressure switches are available in three different versions, each identified by a ZF number. The versions differ in terms of their connection schemes and electrical connection types (terminal or plug connection).

The applicable data sheet for the basic types contains the technical data for the two-stage pressure switches. This includes all limits of use, such as temperature, maximum pressure, mounting position, degree of protection, electrical data etc. The principal dimensions are the same as for single-stage pressure switches with comparable pressure ranges and design features.

Additional function	Switching interval between the two microswitches	Electrical connection	Connection diagram	Ordering information required
ZF307 	**Factory setting** according to customer's instruction Switching interval fixed	**Terminal connection** (All terminals of both microswitches are accessible (6 terminals)	2 x single-pole switching 	1. Basic type with ZF 307 2. Switching points I and II, with direction of action in each case (rising or falling pressure) Example: DCM16-307 Switching point I: 10 bar falling Switching point II: 12 bar falling or switching interval only.
ZF217 	**Adjustable** via adjustment knobs I and II in accordance with "Switching intervals" table	**Plug connection** in accordance with DIN EN175301 (3-prong + earth conductor) Function-appropriate internal wiring in accordance with "Switching functions" table	Example selection in accordance with "Switching schemes" table, page 26. 	1. Basic type with ZF217 2. **Switching scheme** For example: DCM16-217/B 4 Since all values are adjustable within the specified limits, no further data is required.

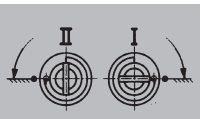
Note on ordering additional function ZF217

Switching scheme	Switching device	Ordering position	Additional text
A1	A	DCM6-217A-S	Switching scheme A1
A2	C	DCM6-217C-S	Switching scheme A2
A3	C	DCM6-217C-S	Switching scheme A3
A4	A	DCM6-217A-S	Switching scheme A4
B1	B	DCM6-217B-S	Switching scheme B1
B2	D	DCM6-217D-S	Switching scheme B2
B3	D	DCM6-217D-S	Switching scheme B3
B4	B	DCM6-217B-S	Switching scheme B4
C1	B	DCM6-217B-S	Switching scheme C1
C2	D	DCM6-217D-S	Switching scheme C2
C3	D	DCM6-217D-S	Switching scheme C3
C4	B	DCM6-217B-S	Switching scheme C4
D1	A	DCM6-217A-S	Switching scheme D1
D2	C	DCM6-217C-S	Switching scheme D2
D3	C	DCM6-217C-S	Switching scheme D3
D4	A	DCM6-217A-S	Switching scheme D4

S2 type series (selection)

ZF217 pressure switches with two microswitches and switching intervals

Switching intervals of two-stage pressure switches (ZF217, ZF307)

Type series S2 ZF217 ZF307			 Higher pressure			Lower pressure	
	min. switching interval		max. switching interval (mean values)				
Type	Factory default		Switching scheme A1/A3/B2/B4 C1/C3/D2/D4 + ZF307		Switching scheme A2/A4/C2/C4		Switching scheme B1/B3/D1/D3	
DCM06	40	mbar	165	mbar	190	mbar	140	mbar
DCM025	20	mbar	140	mbar	160	mbar	120	mbar
DCM1	40	mbar	240	mbar	280	mbar	200	mbar
DCM3	0.1	bar	0.65	bar	0.75	bar	0.55	bar
DCM6	0.15	bar	0.95	bar	1.2	bar	0.8	bar
DCM10	0.25	bar	1.6	bar	1.85	bar	1.35	bar
DCM16	0.3	bar	2.0	bar	2.3	bar	1.7	bar
DCM25	0.6	bar	4.0	bar	4.6	bar	3.4	bar
DCM40	0.9	bar	6.0	bar	6.9	bar	5.1	bar
DCM63	1.3	bar	8.5	bar	9.8	bar	7.2	bar
DDCM1	0.09	bar	0.55	bar	0.64	bar	0.46	bar
DDCM6	0.14	bar	0.94	bar	1.08	bar	0.8	bar
DNM025	35	mbar	215	mbar	240	mbar	180	mbar
VCM095	40	mbar	300	mbar	340	mbar	260	mbar
VCM101	40	mbar	260	mbar	300	mbar	220	mbar
VCM301	20	mbar	100	mbar	120	mbar	80	mbar
VNM111	50	mbar	310	mbar	360	mbar	260	mbar

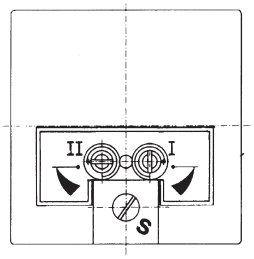
Switching devices with adjustable switching interval

Additional function ZF217

On switching devices with additional function ZF217, the switching interval is continuously adjustable via two adjustment knobs I and II accessible from outside. The maximum possible switching intervals are stated in the "Switching intervals" table.
Turning adjustment knob I clockwise produces a lower switching point for microswitch I
Turning adjustment knob II anticlockwise produces a higher switching point for microswitch II
Adjustment knobs I and II have an internal stop to prevent the microswitches from being adjusted beyond the effective range.

Adding together the adjustments on knobs I and II results in the switching interval between the two microswitches. Changes made with the setting spindle do not affect the switching interval. The switching interval remains constant over the whole setting range of the spindle. The two switching points are moved up or down in parallel.

Recommended adjustment method for switching devices with ZF217

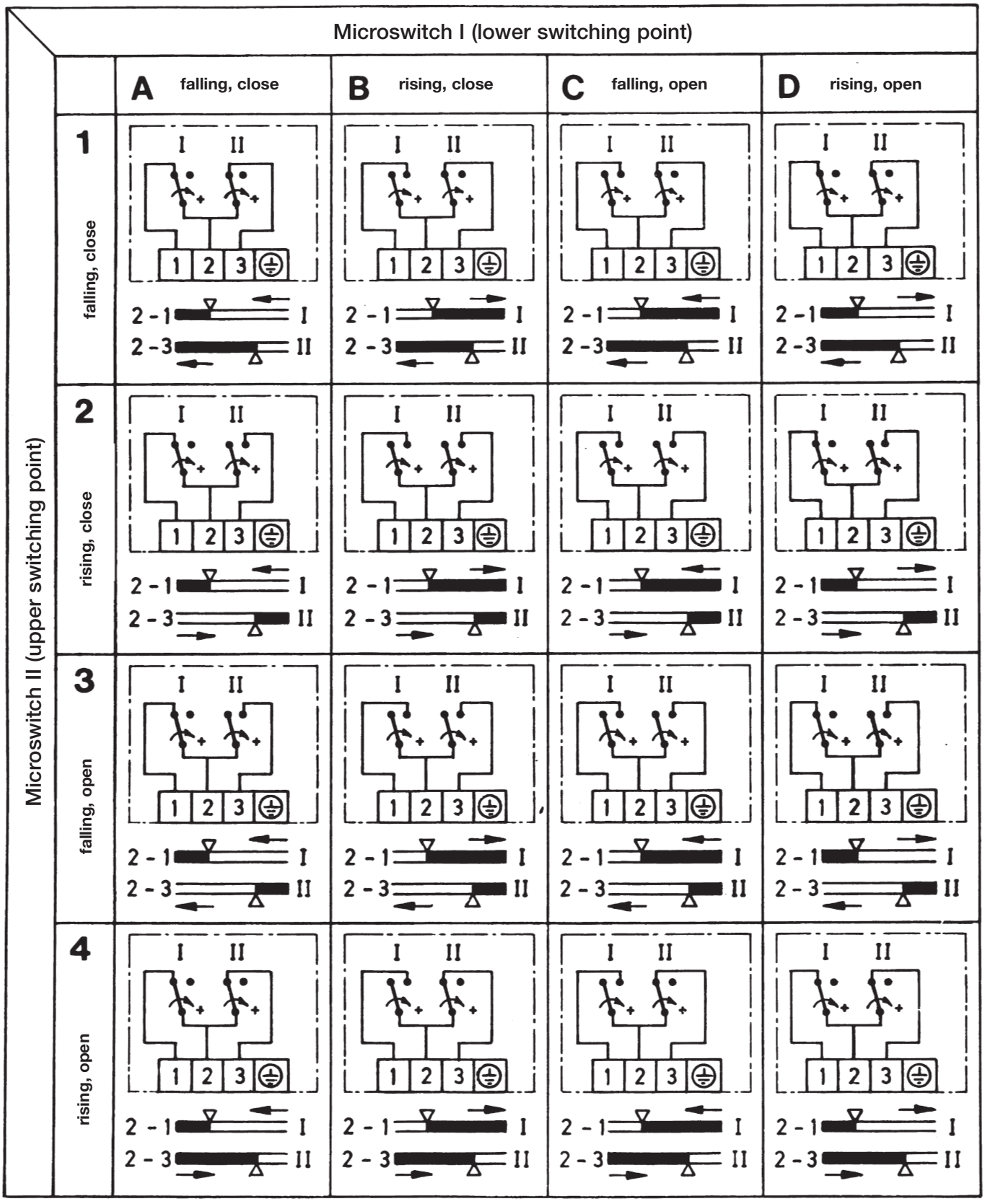


1. Set adjustment knobs I and II to their basic positions.
   Turn adjustment knob I anticlockwise as far as possible.
   Turn adjustment knob II clockwise as far as possible.
2. Adjust the setting spindle **S** by the scale to a value midway between the desired upper and lower switching points.
3. With pressure applied, set the lower switching point with adjustment knob I.
4. In the same way as in step 3, set the upper switching point with adjustment knob II.
5. If the desired upper and lower switching points cannot be reached, turn the setting spindle **S** in the appropriate direction and repeat steps 3 and 4.

S2 type series

Two-stage pressure switches, switching schemes for ZF217

Function-appropriate internal configuration of microswitches I and II, switching scheme selection table. The switch position shown corresponds to the pressureless state. On the horizontal axis is the switching function of microswitch I (A–D); on the vertical axis is the switching function of microswitch II (1–4). At the intersection is the switching scheme which satisfies both conditions (e.g. A 2).



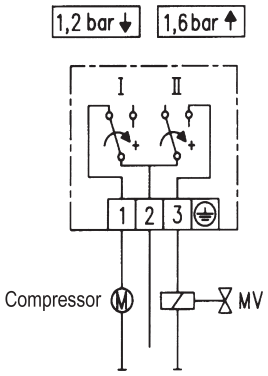
Information required when ordering:
As well as the basic type (e.g. DCM10) and the switching scheme (e.g. A 2), for factory setting it is also necessary to indicate the switching points and direction of action:
Example: DCM 10-217C-S, switching scheme: A2, Switch I: 6.5 bar falling, Switch II: 7.5 bar rising.

S2 type series

Examples of use for two-stage pressure switches

Pressure monitoring and controlling can be greatly simplified by using pressure monitors with two built-in microswitches which can be made to operate one after the other under rising or falling pressure. For example, minimum and maximum pressure monitoring can be achieved with only **one** pressure switch, doing away with the need for a second pressure switch (including the cost of installation). Step switching, e.g. pressure-dependent control of a two-stage pump, is of course also possible using this special series.

For pressure-dependent control of automatic expansion valves and pressure holding devices



Example 1:

Requirement
Pressure holding devices and automatic expansion valves usually have a gas cushion whose pressure must be kept constant within a certain range. If the pressure is too low, a compressor is switched on. If the pressure is too high, a solenoid valve must be opened to vent the gas. Between these two levels is a neutral zone, in which the compressor and the solenoid valve are at rest.

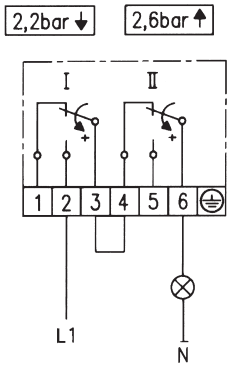
Solution
All pressure switches of types DCM, DNS, each with additional function ZF217 and switching scheme A 2, are suitable. All pressure ranges listed in the technical documents are possible. Example for ordering: see page 24

Switching function / connection scheme

Switch I: With falling pressure, contact 1–2 closes (compressor on)
With rising pressure, contact 1–2 opens (compressor off)

Switch II: With rising pressure, contact 2–3 closes (valve open)
With falling pressure, contact 2–3 opens (valve closed).
In between there is a neutral zone in which the compressor is not switched on and the solenoid coil is not energized (off position).

Minimum and maximum pressure monitoring in a nitrogen line

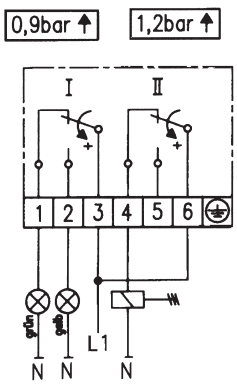


Example 2:

Requirement
In a process engineering system, the pressure in a nitrogen line has to be monitored. A green signal lamp indicates that the pressure in the line is between 2.2 and 2.6 bar. If the pressure goes below 2.2 bar or above 2.6 bar, the indicator lamp goes out and the system shuts down.

Solution
The first contact of a DCM3–307 pressure switch with 2 microswitches opens under falling pressure at 2.2 bar; the second microswitch opens under rising pressure at 2.6 bar. If the pressure is >2.2 bar or <2.6 bar, the circuit is closed via both microswitches and the signal lamp is lit.

Filter monitoring with a 2-stage differential pressure switch



Example 3:

Requirement
The gradual fouling of a filter system is to be monitored by a differential pressure switch. Increased fouling causes a higher differential pressure between the input and the output of the filter system. A green signal lamp indicates the normal operating state. If fouling reaches a certain value (differential pressure >0.9 bar), a yellow signal lamp warns the operator that it is time to change the filter elements. If this is not done and the differential pressure rises due to further fouling (e.g. to >1.2 bar), the system must be shut down.

Solution
A differential pressure switch DDCM6–307 operates under rising differential pressure (at 0.9 bar), the green control lamp goes out; at the same time the yellow lamp comes on (warning that it is time to clean the filter). If the differential pressure continues to rise (to >1.2 bar), the circuit opens via 4–6 of the second microswitch, the relay drops out and the system shuts down.

Liquids and gases

DCM025

DCM/DNM

Mechanical pressure switches

This universal pressure switch can be used in general mechanical engineering and the printing machine industry, as well as in pneumatics and hydraulics.

→ p.36
→ p.61

Liquids and gases

DNS6-351

DNS/VNS

Pressure and vacuum switches with stainless steel sensors (1.4571)

Pressure switches of the DNS series are suitable for monitoring and controlling pressures in chemical plants, process engineering and any situation where the pressure of aggressive liquids and gases must be monitored. All components of the sensor system are made made of high-quality stainless steel (1.4571) and welded using the latest methods without filler metals. The pressure sensor is gasket-free plasma-welded.

→ p.37–38
→ p.62

Liquids and gases

DDCM252

DDCM

Differential pressure switches

FEMA differential pressure monitors are suitable for monitoring and controlling differential pressures, flow monitoring and automatic supervision of filter systems. A double chamber system with stainless steel bellows or Perbunan diaphragm detects the difference between the two applied pressures. The desired switching pressure is continuously adjustable within the ranges mentioned in the product summary. All differential pressure monitors can also be used in the vacuum range. The hysteresis is not adjustable.

→ p.39
→ p.63

Liquids and gases

VCM301

VCM/VNM

Negative pressure switches (vacuum switches)

FEMA negative pressure switches detect the pressure difference relative to atmospheric pressure. All data relating to the switching pressure ranges and thus also the scale divisions on the switching devices are to be understood as the difference in pressure between the relevant atmospheric pressure and the set switching pressure. The "zero" reference point on the scale of the unit corresponds to the relevant atmospheric pressure.

→ p.40
→ p.64

10 selection criteria

CHECKLIST

1	**Medium**	Steam, hot water, fuel gases, air, flue gases, liquid gas, liquid fuels, other media
1a	**Sensor material**	Stainless steel, non-ferrous metals, plastics (e.g. Perbunan). Are all sensor materials resistant to the medium? Oil and grease-free for oxygen?
2	**Type approval**	Is type approval (TÜV, DVGW, ATEX, etc.) required for the intended application?
3	**Function**	Monitors, limiters. Safety-engineered pressure limiters.
4	**Direction of action**	Is the maximum pressure or minimum pressure to be monitored? Does the pressure switch have a controller function (e.g. turns pump on and off)?
5	**Setting range**	The desired setting range can be found in the Product Summaries.
6	**Switching differential** for controllers/monitors only	The adjustable switching differential is only important in the case of pressure switches with a controller function. For limiter functions the switching differential (hysteresis) has no significance
7	**Maximum working pressure**	The maximum working pressure listed in the tables must be equal to or greater than the maximum system pressure
8	**Environmental conditions**	Medium temperature / ambient temperature / type of protection / humidity / Ex-zone / Outdoor installation – protective measures
9	**Type of construction/ size Pressure connection**	Size, installation position, installation method, pressure connection with seal
10	**Electrical data Switching capacity**	Switching element / changeover contact / normally closed contact / normally open contact / switching capacity / interlocking / gold contacts / contactless signal transmission

This list of criteria does not claim to be complete.
However, all items must be checked.
The stated sequence is expedient but not mandatory.

DCM25

DCM/DNM

Pressure switches and pressure monitors for overpressure

This universal pressure switch can be used in general mechanical engineering and the printing machine industry, as well as in pneumatics and hydraulics.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) according to DIN 16 288 and internal thread G 1/4 according to ISO 228 Part 1.

Switching device
Robust housing (200) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 54, in vertical position.

Pressure sensor materials

DNM025…DCM63	Metal bellows: 1.4571 Sensor housing: 1.4104
DCM025 – DCM 1	Metal bellows: Cu Sensor housing: Cu + Ms
DCM4016/ DCM4025	Diaphragm: Perbunan Sensor housing: 1.4301
DCM1000	Diaphragm: Perbunan Sensor housing: Brass

Mounting position
Vertically upright and horizontal. DCM4016 and 4025 vertically upright.

Ambient temp. at switching device
–25…+70 °C, except: DCM4016, 4025, 1000: –15…+60 °C

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85°C for short periods). Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gaugeconnection) or on a flat surface with two 4 mm Ø screws.

Switching pressure
Adjustable from outside with screwdriver.

Switching differential
Not adjustable with DCM and types. Adjustable from outside with DCMV types. For values see Product Summary.

Contact arrangement
Single-pole changeover switch.

Switching capacity	250 VAC (ohm)	250 VAC (ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Materials in-contact with medium	Dimen-sioned drawing
Switching differential not adjustable					**page 21 + 22**
DCM4016	1…16 mbar	2 mbar	1 bar	Perbunan	1 + 11
DCM4025	4…25 mbar	2 mbar	1 bar	+ 1.4301	
DCM1000	10…100 mbar	12 mbar	10 bar	Perbunan + MS	1 + 10
DCM025	0.04…0.25 bar	0.03 bar	6 bar	Cu + Ms	
DCM06	0.1…0,6 bar	0.04 bar	6 bar	Cu + Ms	1 + 14
DCM1	0.2…1,6 bar	0.04 bar	6 bar	Cu + Ms	
DNM025	0.04…0.25 bar	0.03 bar	6 bar		1 + 15
DCM506	15…60 mbar	10 mbar	12 bar		1 + 12
DCM3	0.2…2.5 bar	0.1 bar	16 bar	Sensor	1 + 18
DCM6	0.5…6 bar	0.15 bar	16 bar	housing	
DCM625	0.5…6 bar	0.25 bar	25 bar	1.4104	1 + 17
DCM10	1…10 bar	0,3 bar	25 bar	+	
DCM16	3…16 bar	0.5 bar	25 bar	Pressure	
DCM25	4…25 bar	1.0 bar	60 bar	bellow	1 + 16
DCM40	8…40 bar	1.3 bar	60 bar	1.4571	
DCM63	16…63 bar	2.0 bar	130 bar		
Switching differential adjustable					
DCMV025	0.04…0.25 bar	0.03…0.4 bar	6 bar		
DCMV06	0.1…0.6 bar	0.04…0.5 bar	6 bar	Cu + Ms	1 + 14
DCMV1	0.2…1.6 bar	0.07…0.55 bar	6 bar		
DCMV3	0.2…2.5 bar	0.15…1.5 bar	16 bar	Sensor	1 + 18
DCMV6	0.5…6 bar	0.25…2.0 bar	16 bar	housing	
DCMV625	0.5…6 bar	0.25…2.0 bar	25 bar	1.4104	1 + 17
DCMV10	1…10 bar	0.5…2.8 bar	25 bar	+	
DCMV16	3…16 bar	0.7…3.5 bar	25 bar	Pressure	
DCMV25	4…25 bar	1.3…6.0 bar	60 bar	bellow	
DCMV40	8…40 bar	2.6…6.6 bar	60 bar	1.4571	1 + 16
DCMV63	16…63 bar	3.0…10 bar	130 bar		

For smaller pressure ranges see also VCM, DGM, HCD and DPS sheets.
For additional functions refer page 26-29.

Calibration

The **DCM** series is calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

Ex-DCM
see page 61

DNS3-201

DNS/VNS

Pressure switches and vacuum switches with stainless steel sensors (1.4571)

Pressure switches of the DNS series are suitable for monitoring and controlling pressures in chemical plants, process engineering and any situation where the pressure of aggressive liquids and gases must be monitored.

All components of the sensor system are made of high-quality stainless steel (1.4571) and welded using the latest methods without filler metals. The pressure sensor is gasket-free plasma-welded.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) according to DIN 16 288 and internal thread G 1/4 according to ISO 228 Part 1.

Switching device
Robust housing (200) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 54, in vertical position.

Pressure sensor materials
Pressure bellows and all parts in contact with medium. X 6 Cr Ni Mo Ti 17122 Material no. 1.4571

Mounting position
Vertically upright and horizontal.

Max. ambient temperature at switching device
–25…+70 °C.

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85°C for short periods.
Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gaugeconnection) or on a flat surface with two 4 mm Ø screws.

Switching pressure
Adjustable from outside with screwdriver.

Switching differential
For values see Product Summary.

Contact arrangement
Single-pole changeover switch.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Plastic coating
The diecast aluminium housing in GD Al Si is chromated and stove-enamelled with resistant plastic. Corrosion tests with 3% saline solution and 30 temperature changes from +10 to +80°C showed no surface changes after 20 days.

Product Summary

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimen-sioned drawing
Switching differential not adjustable				page 21 + 22
VNS301-201	-250…+100 mbar	45 mbar	3 bar	
VNS111-201	-1*…+0.1 bar	50 mbar	6 bar	
DNS025-201	0.04…0.25 bar	30 mbar	6 bar	1 + 15
DNS06-201	0.1…0.6 bar	40 mbar	6 bar	
DNS1-201	0.2…1.6 bar	60 mbar	6 bar	
DNS3-201	0.2…2.5 bar	0.1 bar	16 bar	
DNS6-201	0.5…6 bar	0.15 bar	16 bar	1 + 18
DNS10-201	1…10 bar	0.3 bar	16 bar	
DNS16-201	3…16 bar	0.5 bar	25 bar	1 + 16
Switching differential adjustable				
VNS301–203	–250…+100 mbar	70 –300 mbar	3 bar	
VNS111–203	–1*…+0.1 bar	90 –550 mbar	6 bar	
DNS025–203	0.04…0.25 bar	60 –300 mbar	6 bar	1 + 15
DNS06–203	0.1…0.6 bar	80 –400 mbar	6 bar	
DNS1–203	0.2…1.6 bar	100 –600 mbar	6 bar	
DNS3–203	0.2…2.5 bar	0.15– 1.5 bar	16 bar	1 + 18
DNS6–203	0.5…6 bar	0.25– 2.0 bar	16 bar	
DNS10–203	1…10 bar	0.45– 2.5 bar	16 bar	1 + 16
DNS16–203	3…16 bar	0.8– 3.5 bar	25 bar	

* At very high vacuums, close to the theoretical maximum of –1 bar, the switch may not be usable in view of the special conditions of vacuum engineering. However, the pressure switch itself will not be damaged at maximum vacuum.

Calibration

The **DNS** and **VNS** series are calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

-DNS/VNS
see page 62

CE

Protection Class:
IP 54

DNS6-351

DNS/VNS

Pressure and vacuum switches with stainless steel sensors (1.4571)

Chemical version (switching housing with surface protection)
Pressure switches of the DNS series are suitable for monitoring and controlling pressures in chemical plants, process engineering and any situation where the pressure of aggressive liquids and gases must be monitored. All components of the sensor system are made from high-quality stainless steel (1.4571) and welded using the latest methods without filler metals. The pressure sensor is gasket free plasma welded.

SIL 2 according IEC 61508-2

Technical data

Pressure connection External thread G 1/2" (pressure gauge connection) according to DIN 16 288 and internal thread G 1/4" according to ISO 228 Part 1

Switching device Robust housing (200) made of seawater-resistant diecast aluminium GD Al Si 12

Protection class IP 65, in vertical position

Pressure sensor materials Pressure bellows and all parts in contact with medium X 6 Cr Ni Mo Ti 17122 Material no. 1.4571

Mounting position Vertically upright and horizontal

Max. ambient temperature at switching device –25 to +70 °C

Max. medium temperature The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85 °C for short periods. Higher medium temperatures are possible provided the upper limit at the switching device is ensured by suitable measures (e.g. siphon).

Contact arrangement Single-pole changeover switch

Plastic coating The diecast aluminium housing in GD Al Si is chromated and stove-enamelled with resistant plastic. Corrosion tests with 3% saline solution and 30 temperature changes from +10 to +80°C showed no surface changes after 20 days

Switching capacity	250 VAC (ohm)	250 VAC (ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Type	Setting range	Hysteresis (mean value)	Max. permissible pressure	Dimensioned drawing
Hysteresis not adjustable				page 21+22
VNS301-351	-250…+100 mbar	45 mbar	3 bar	2 + 15
VNS111-351	-1*…+0,1 bar	50 mbar	6 bar	
DNS025-351	0,04…0,25 bar	30 mbar	6 bar	
DNS06-351	0,1…0,6 bar	40 mbar	6 bar	
DNS1-351	0,2…1,6 bar	60 mbar	6 bar	
DNS3-351	0,2…2,5 bar	0,1 bar	16 bar	2 + 18
DNS6-351	0,5…6 bar	0,15 bar	16 bar	
DNS10-351	1…10 bar	0,3 bar	16 bar	2 + 16
DNS16-351	3…16 bar	0,5 bar	25 bar	

* At very high vacuums, close to the theoretical maximum of –1 bar, the switch may not be usable in view of the special conditions of vacuum engineering. However, the pressure switch itself will not be damaged at maximum vacuum.

Calibration

The **DNS** and **VNS** series are calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

DNS/VNS
see page 62

DDCM252

DDCM

Differential pressure switches

FEMA differential pressure monitors are suitable for monitoring and controlling differential pressures, flow monitoring and automatic control of filter systems. A double chamber system with stainless steel bellows or Perbunan diaphragm detects the difference between the two applied pressures.

The desired switching pressure is continuously adjustable within the ranges mentioned in the product summary.
All differential pressure monitors can also be used in the vacuum range.
The switching differential is not adjustable.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
Internal thread G 1/4

Switching device
Robust housing (200) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 54, in vertical position.

Pressure sensor materials
DDCM014–16:
Pressure bellows of 1.4571
Sensor housing of 1.4305.
DDCM252–6002:
Perbunan diaphragm.
Aluminium sensor housing.

Mounting position
vertically upright.

Ambient temperature at switching device
–25…+70 °C

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85°C for short periods). Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line or on a flat surface with two 4 mm Ø screws.
Note the connection of pressurized lines:
P (+) = high pressure
S (–) = low pressure

Switching pressure
Adjustable from outside with screwdriver.

Switching differential
Not adjustable. For values see Product Summary.

Scale
Types 252–6002 without graduation. Set according to pressure gauge.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

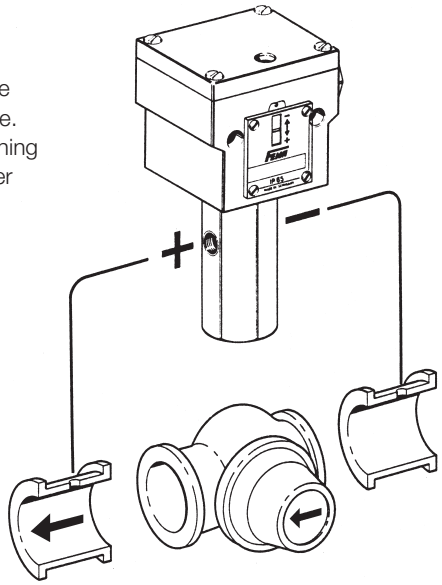
Type	Setting range (differenttial pressure	Switching differential (mean values)	Max.** permissible pressure	Materials in contact with medium	Dimen-sioned drawing
Switching differential not adjustable					**page 21 + 22**
DDCM252*	4…25 mbar	2 mbar	0,5 bar		
DDCM662*	10…60 mbar	15 mbar	1,5 bar	Aluminium	1 + 20
DDCM1602*	20…160 mbar	20 mbar	3 bar	+ Perbunan	
DDCM6002*	100…600 mbar	35 mbar	3 bar		
DDCM014	–0.1…0.4 bar	0.15 bar	15 bar		
DDCM1	0.2…1.6 bar	0.13 bar	15 bar	Stainless steel	
DDCM4*	1…4 bar	0.20 bar	25 bar	1.4305 +	
DDCM6	0.5…6 bar	0.20 bar	15 bar	1.4571	1 + 21
DDCM16	3…16 bar	0.60 bar	25 bar		

* without graduation (only ± scale)
** also loadable on one side
For more differential pressure monitors, see the HCD and DPS series, page 67 and 68.

For accessories, see VKD… and MAU8…, on pages 145 and 145.

Calibration

The **DDCM** series are calibrated for falling pressure. This means that the adjustable pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Callibration at lower switching point).



Pump monitoring application example

The differential pressure switch (e.g. DDCM1) monitors differential pressure through the pump. The system shuts down if values fall below an adjustable switching threshold. Pump monitoring does not depend on the static pressure in the system.

Ex DDCM
see page 63

CE

Protection Class:
IP 54/65

VCM301

VCM/VNM

Negative pressure switches (vacuum switches)

FEMA negative pressure switches detect the pressure difference relative to atmospheric pressure. All data relating to the switching pressure ranges and thus also the scale divisions on the switching devices are to be understood as the difference in pressure between the relevant atmospheric pressure and the set switching pressure. The "zero" reference point on the scale of the unit corresponds to the relevant atmospheric pressure.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) according to DIN 16 288 and internal thread G 1/4 according to ISO 228 Part 1.

Switching device
Robust housing (200) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 54, in vertical position.

Pressure sensor materials

VNM111 and VNM301:	Metal bellows: 1.4571 Sensor housing: 1.4104
VCM095, 101 and 301:	Metal bellows of CuZn Sensor housing of CuZn
VCM4156:	Perbunan diaphragm sensor housing: 1.4301

Mounting position
Vertically upright and horizontal.
VCM4156 vertically upright.

Ambient temp. at switching device
–25…+70 °C

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85°C for short periods. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gaugeconnection) or on a flat surface with two 4 mm Ø screws.

Switching pressure
Adjustable from outside with screwdriver.

Switching differential
Not adjustable with VCM types. Adjustable with VCM V type. For values see Product Summary.

Contact arrangement
Single-pole changeover switch.

Switching capacity	250 VAC (ohm)	250 VAC (ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Product summary

Type	Setting range (differential pressure)	Switching differential (mean values)	Max. permissible pressure	Dimensioned drawing
Switching differential not adjustable				page 21 + 22
VCM4156	–15…+6 mbar	2 mbar	1 bar	1 + 11
VCM301	–250…+100 mbar	25 mbar	1.5 bar	1 + 13
VNM301	–250…+100 mbar	45 mbar	3 bar	1 + 15
VCM101	–1*…+0.1 bar	45 mbar	3 bar	1 + 14
VCM095	–0.9…+0.5 bar	50 mbar	3 bar	1 + 14
VNM111	–1*…+0.1 bar	50 mbar	6 bar	1 + 15
Switching differential adjustable				
VCMV301	–250…+100 mbar	30 – 200 mbar	1,5 bar	1 + 13
VCMV101	–1*…+0.1 bar	80 – 350 mbar	3 bar	1 + 14
VCMV095	–0.9…+0.5 bar	90 – 400 mbar	3 bar	1 + 14
VNMV301	–250...+100 bar	70 – 450 mbar	3 bar	1 + 15
VNMV111	–1*…+0.1 bar	90 – 650 mbar	6 bar	1 + 15

* At very high vacuums, close to the theoretical maximum of –1 bar, the switch may not be usable in view of the special conditions of vacuum engineering. However, the pressure switch itself will not be damaged at maximum vacuum.

For additional functions refer to page 26–29.
For smaller pressure ranges see also HCD and DPS data sheets, page 67 and 68.

Calibration

The **VCM** and **VNM** series are calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

VCM/VNM
see page 64

Tested to PE Directive 97/23 EC

Rated according to SIL

DWAM1

DWAM, DWAMV, SDBAM

Pressure monitors / pressure limiters

These series are particularly suitable for maximum pressure monitoring in steam and hot water systems. These pressure switch are "of special construction", with self-monitoring pressure sensor, built in accordance with Pressure Equipment Directive PED 97/23/EC. They can be used as pressure monitors or a pressure limiters for maximum pressure monitoring (systems in accordance with TRD 604 and DIN EN 12828) and are available with or without hysteresis adjustment.

➔ p.49

Tested to PE Directive 97/23 EC

Rated according to SIL

DWAM6-576

DBS

Pressure monitors / pressure limiters

In many ways, safety-engineered pressure limiters offer a higher degree of safety compared with standard pressure switches and are therefore especially suitable for chemical process engineering and thermal installations in which safety is an especially critical factor in pressure monitoring. Pressure switches can also be used in Ex zones (zones 0, 1, 2 and 20, 21, 22) and, in all cases, require an isolating amplifier. The isolating amplifier is also responsible for monitoring lines for short-circuit and line break and therefore offers an additional safety advantage – even in non-Ex zones. For Ex applications, the isolating amplifier must be installed outside the Ex zone. The lines between the isolating amplifier and the pressure switch are monitored for short-circuit and line break.

➔ p.50–52

Tested to PE Directive 97/23 EC

Rated according to SIL

FD16-326

FD

Maximum pressure limiters for liquid gas installations

Pressure limiters of the FD series are constructed in accordance with the special directives for liquid gas engineering. The requirements of TRB 801 Appendix II §12 are met. All parts coming into contact with the medium are made from stainless steel 1.4104 and 1.4571. The pressure sensor was designed to be "self-monitoring" to exceed the requirements of TRB , i. e. should the measuring bellows rupture, the pressure sensor switches off towards the safe side. The pressure sensor thus complies with "of special construction" in the sense of VdTÜV Memorandum "Pressure 100". Pressure limiters are used in intrinsically safe control circuits (Ex protection Ex-ia). By using an isolating amplifier, the control circuit is also monitored for line break and short-circuit.

➔ p.53

Tested to ATEX 94/9 EC

Rated according to SIL

DGM

Pressure monitors for fuel gases

DVGW tested to DIN EN1854:2006. Gas pressure monitors are suitable for all gases in accordance with DVGW Worksheet G 260 and for air.

DGM310A

→ p.54
→ p.66

Tested to PED 97/23 EC
Tested to ATEX 94/9 EC

Rated according to SIL

DWR

Pressure monitors/limiters

Especially suitable as a pressure monitor or pressure limiter for fuel gases (DVGW Worksheet G 260 to DIN EN1854) and liquid fuels (e.g. fuel oil), as well as for steam systems according to TRD 604 and hot water systems to DIN EN 12828. The DWR is used to monitor maximum and minimum pressures. These pressure switches are "of special construction" and have been tested with 2 million operating cycles.

DWR625

→ p.55–56
→ p.65

Pressure switches "of special construction"

Definitions and information

Pressure monitoring and pressure limiting in

- **Steam boilers**
- **District heating systems**
- **Oil pipelines**
- **Liquid gas installations etc.**
- **Hot water heating systems**
- **Gas installations**
- **Firing systems**

is extremely important with regard to safety.

Component testing

Pressure monitoring devices for safety-critical applications must work reliably and be tested according to the relevant directives in each case. **The reliability of pressure monitors and pressure limiters must be certified by a component test** which is performed by the testing agencies responsible in each case (e.g. TÜV and DVGW). The following section deals with the FEMA product range for safety-critical pressure monitoring in thermal and process engineering systems.

Special construction

The term "of special construction" originates from the **VdTÜV Memorandum "Pressure 100", issue 07.2006,** which defines the requirements for **pressure monitors and pressure limiters for steam boilers and hot water systems**. Originally used only for pressure monitoring in the area of steam and hot water, the "special construction" characteristic is increasingly used as a quality and safety argument for other applications as well. The following section describes the requirements for pressure limiters "of special construction". Recommendations for the correct selection of pressure limiters are given by reference to safety analyses.

Definitions of the VdTÜV Memorandum "Pressure 100":

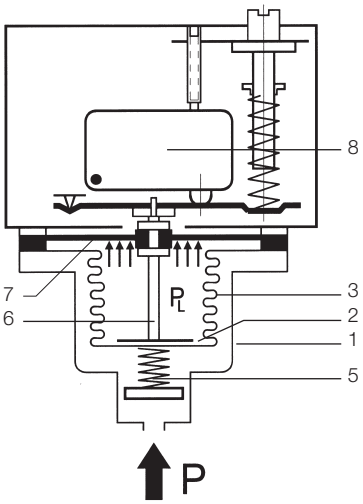
Pressure monitors (DW)
Pressure monitors are devices which switch off the heating system on exceeding and / or falling below a predefined pressure limit and release the heating system again only after a change in pressure.

Pressure limiters (DB)
Pressure limiters are devices which switch off the heating system on exceeding and / or falling below a predefined pressure limit and lock it to prevent automatic restarting.

Pressure limiters "of special construction" (SDB)
Pressure limiters "of special construction" perform the same tasks as pressure limiters. In addition they must satisfy the extended safety requirements of section 3.4 (of "Pressure 100").

Safe condition

According to DIN VDE 0660, Part 209, the safe condition of the system is reached if a cut-off command is present at the output contact which means that in the safe condition, the microswitch in the pressure limiter is actuated (opened) and the control circuit is interrupted. Series connected switching devices must react in the same way. The operating mode of the safety pressure limitation thus corresponds to the **closed circuit principle**.



Self-monitoring maximum pressure limiter with safety diaphragm DWAM…, DWAMV…, SDBAM…

Additional requirements for pressure limiters "of special construction"

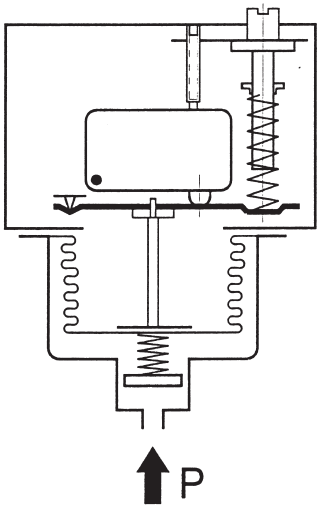
Section 3.4 of VdTÜV Memorandum "Pressure 100":
Pressure limiters "of special construction" **must, in the event of a breakage in the mechanical part of the measuring element, lead to cut-off and interlock of the heating**. This requirement is also fulfilled if the mechanical part of the measuring element is calculated for vibrating stress **or has withstood a test with 2 million operating cycles and the pressurized parts of the measuring element are made of corrosion-resistant materials**.
(Abbreviated except from VdTÜV Memorandum "Pressure 100").

Therefore there are two possible ways of meeting the requirements for pressure limiters "of special construction":

a) By a self-monitoring pressure sensor which is designed so that a breakage in the mechanical part of the measuring element leads to cut-off to the safe side (see Fig. 1)
b) By certification of endurance testing with 2 million operating cycles during the component test (see Fig. 2)

a) Self-monitoring pressure sensor with safety diaphragm (for maximum pressure monitoring only)

Fig. 1 is a cross-sectional diagram of a pressure sensor which fulfils the "special construction" requirements. The measuring chamber is bordered by the housing (1), base (2) and measuring bellows (3). All parts are made of stainless steel and are welded together without filler metals. When the pressure rises the measuring bellows (3) moves upwards, supported by the back pressure spring (5). The setpoint spring installed in the switching device acts as a counterforce. A transfer bolt (6) which transfers the pressure-dependent movements of the measuring bellows (3) to the switching device located above is placed on the inside of the base. A plastic diaphragm (7), which is not in contact with the medium and in normal operation follows the movements of the measuring bellows but itself has no influence on the position of the bellows, is clamped in the upper part of the transfer bolt. On breakage of the measuring bellows (3), the medium can escape into the interior of the bellows. The medium pressure is now on the underside of the diaphragm (PL). An additional force is generated because of the far larger effective area of the diaphragm compared with the bellows, and this pushes the transfer bolt (6) upwards. This results in cut-off to the safe side. The cut-off condition thus achieved is normally interlocked electrically or mechanically, so that the system also remains cut off when the pressure drops again. The plastic diaphragm (7) is not a pressure-bearing part; it has no function in normal operation and is effective only if a leakage occurs to the measuring bellows. Safety diaphragms of the described design are permissible up to 32 bar. This should be sufficient for most applications.



Pressure limiter without safety-diaphragm (not self-monitoring for maximum pressure) DWR…

b) Pressure sensors with certification of 2 million operating cycles (DWR series)

In this design it is assumed that the pressure sensors which have withstood dynamic loading of 2 million operating cycles during component testing can be considered as reliable elements. They do not have an additional safety device in the sensor. Although the units are produced and tested with very great care, maximum pressure limiters without additional safety device can lead to dangerous conditions if errors which cannot be detected in the tests occur due to secondary effects. These may be caused by hole corrosion due to deposited metal particles on the (usually very thin-walled) bellows of the pressure sensor, material defects in the pressure bellows or a broken weld seam. Despite careful production and testing, a residual risk remains in the case of maximum pressure monitoring. It is ultimately up to the user and operator of the systems themselves to decide on the degree of safety to which pressure vessels should be monitored.

Pressure sensors without safety diaphragm are self monitoring when used in minimum pressure monitoring applications.

Safety analysis for maximum pressure monitoring

Observing the direction of action

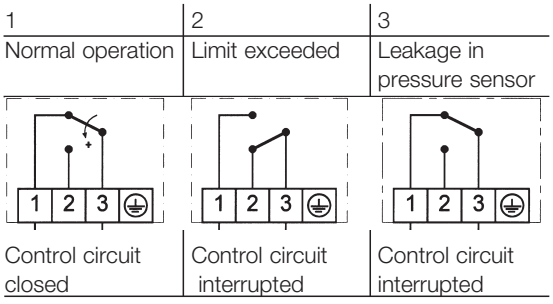
The preceding description and safety considerations relate to the monitoring of maximum pressure. The safe side here means: The energy supply is cut off (e.g. burner is turned off) to avoid a further pressure rise. Minimum pressure monitoring requires an entirely different approach. The safe side here means: Preventing the pressure from falling further (for example: hotwater systems with external pressure retention or monitoring of water level in heating systems). Based on a safety analysis, a pressure limiter without safety diaphragm is clearly the best option. In the event of leakage in the sensor, "low pressure" is signalled and the system switches over to the safe side. A pressure sensor without safety diaphragm is therefore "of special construction" within the meaning of Memorandum "Pressure 100",
if it is used as a minimum pressure limiter. On the other hand, it is clear from the above that pressure sensors with safety diaphragms, which offer considerable advantages in maximum pressure monitoring, should never be used for minimum pressure monitoring. Incorrect use can create a dangerous condition. It is therefore essential for users and planners to observe the direction of action when selecting pressure limiters.

In summary it may be said:
Pressure limiters "of special construction" with safety diaphragms (self-monitoring pressure sensors) offer the highest degree of safety in maximum pressure monitoring. Such devices must not however be used for minimum pressure monitoring. Pressure limiters "of special construction" with certification of 2 million operating cycles are self-monitoring in the case of minimum pressure monitoring, even without a safety diaphragm. In the case of maximum pressure monitoring, however, a residual risk remains.

Safety analysis for maximum pressure monitoring

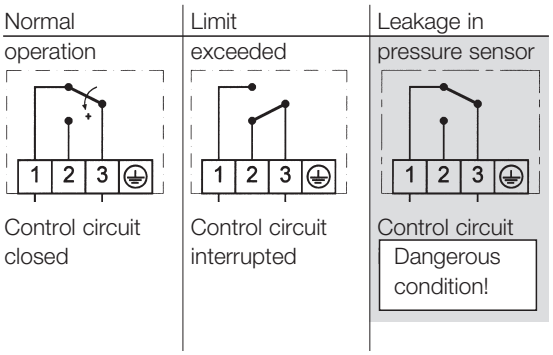
If one considers the switch positions in the possible operating conditions, the difference compared with pressure sensors "of special construction" becomes clear. The left column shows normal operation in which the switch connects terminals 3 and 1. The cut-off condition when pressure is too high is shown in column 2. The control circuit is interrupted via terminals 3 and 1.
The difference in safety terms is clear from column 3, which shows the switch position in the event of a leak in the pressure sensor. With a safety-engineered sensor the control circuit is interrupted, whereas in the case of a sensor without a safety diaphragm the control circuit remains closed, and thus a "dangerous condition" can arise.

Devices with safety diaphragm (DWAM, DWAMV, SDBAM)
In pressure limiters "of special construction" which are equipped with **safety sensors**, different operating conditions occur in the following switch positions:



Device without safety diaphragm
"Special construction" must also be proven by an **endurance test with 2 million operating cycles**. In the case of breakage/leakage (e.g. material defect, fault in weld seams, hole corrosion), the system **does not cut off to the safe side (no self-monitoring).**

In the different operating conditions the following switch positions occur **in the case of maximum pressure monitoring**: In the event of leakage in the pressure sensor, the pressure monitors/limiters according to b) are not safe. A "dangerous condition" can arise.



Further observations and summary

Minimum pressure

All **minimum pressure monitors and minimum pressure limiters are self-monitoring** within the meaning of "Pressure 100" (with or without safety diaphragm).

Pressure limiters must interlock the cut-off state
Memorandum "Pressure 100" specifies that pressure limiters must cut off and interlock against automatic restarting. For this purpose, pressure limiters are offered with integrated mechanical interlock (reclosing lockout). The direction of action is also important in the selection of the interlock. Depending on the direction of action it is necessary to determine whether the interlock should operate on rising (maximum pressure monitoring) or falling (minimum pressure monitoring) pressure.

External interlock is also possible
A pressure monitor can become a pressure limiter if an electrical interlock is connected in series. The figures on page 22 show suggested interlock circuits for maximum pressure and minimum pressure monitoring. The direction of action must be observed when deciding the circuit. For the combination of pressure monitor with external interlock to be considered as a limiter "of special construction", the pressure monitor itself must satisfy the "special construction" requirements.

Other considerations

"Special construction" — not just for steam and hot water systems
According to current standards, pressure limiters "of special construction" are mandatory for steam boilers according to TRD 604 and for heating systems according to DIN EN12828. They are considered to be failsafe elements within the meaning of TRD 604 and can therefore be used on installations in 24-hour operation and 72-hour operation (for further information see TRD 604). It is clearly advantageous to transfer the positive experience from pressure monitoring of steam boilers to other applications. In the interest of greater safety it is desirable to incorporate the requirements for pressure limiters "of special construction" used in safety-critical monitoring applications into other standards as well. This applies particularly to applications in the field of gas, which are covered by DIN EN1854, and liquid fuels, covered by DIN EN764-7.

For even greater safety:
Positive opening contacts
In maximum pressure monitoring, safety can be further increased through additional measures. The microswitches, normally equipped with a spring contact, can be fitted with **positive opening contact (to protect against contact sticking)**.

Line break and short-circuit monitoring
The power supply to the pressure limiter is monitored for short-circuit and interruption by an external isolating amplifier. In the case of faults in the power supply, the system cuts off to the safe side.
Ex-d and Ex-ia versions, where applicable combined with sensors "of special construction", open up a wide range of possibilities in the field of Ex-applications for **process engineering systems and gas engineering**. See DBS-series.

Summary

It is apparent that safety can be improved significantly and numerous causes for the occurrence of dangerous conditions can be eliminated through the appropriate use of technical measures. However, it is also apparent that a residual risk remains. Careful planning and conscientious maintenance and testing of existing systems are absolutely essential for reliable pressure monitoring on pipelines and pressure vessels.

Standards – Directives – Component tests

VdTÜV Pressure 100

Steam and hot water
Pressure monitors and pressure limiters for steam and hot water in systems to DIN EN12828 and TRD 604. Series DA and DWR.

DVGW DIN EN1854

Fuel gases CE
Pressure monitors and limiters for fuel gases in accordance with DVGW Worksheet G 260. Series DGM and DWR.

TÜV DIN EN764-7

Liquid fuels
Pressure monitors and pressure limiters for liquid fuels (heating oil) Series DWR.

TÜV, Pressure 100

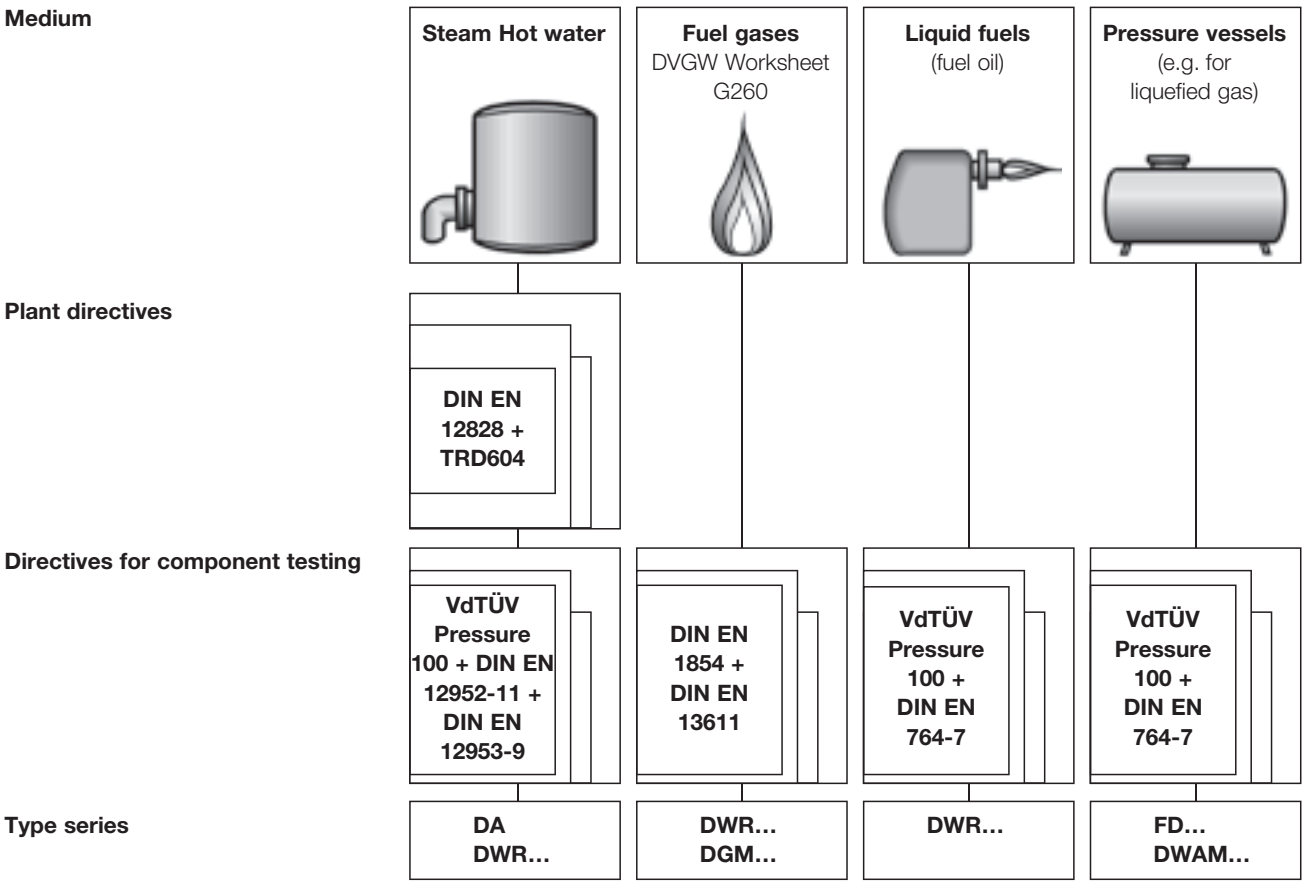
Safety-engineered pressure limiters
For safety-critical pressure monitoring in liquid gas systems, chemical and process engineering systems.

PED 97/23/EC

Pressure Equipment Directive 97/23/EC
Pressure monitors and limiters to DIN EN12952-11 and DIN EN12953-9

ATEX 94/9/EC

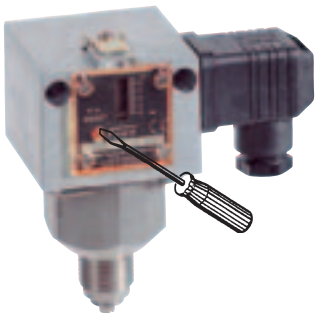
Ex-versions
For Ex-areas Zones 1 and 2, as well as 21 and 22 all pressure switches can be supplied in pressure-proof encapsulated design.
All intrinsically safe devices are for the Ex-Zones 0, 1, 2, 20, 21 and 22.
For intrinsically safe control circuits (Ex degree of protection Ex-ia), pressure switches with gold plated silver contact, and the blue terminals and cable entries customary in Ex-ia areas can be supplied. In addition to the pressure switch, an isolating amplifier which transfers the control commands of the pressure switch from an intrinsically safe control circuit (Ex-ia) to a non-intrinsically safe active circuit is required



Selection according to function and application

Pressure monitor

Function \ Application	**Steam and hot water** systems to TRD 604 and DIN EN12828	**Fuel gases** to DVGW-Worksheet G 260	**Heating oil** and other **liquid fuels**	**Other media** (check compatibility with the materials used)
Pressure monitoring Pressure regulation (e.g. burner or pump control)	DWAM… DWAMV… DWR… DWR…-203	DGM… DWR… DWR…-203	DWR… DWR…-203	DWAM… DWAMV… DWR… DWR…-203
Maximum pressure limitation with internal interlock	SDBAM… DWR…-205	DGM…-205 DWR…-205	DWR…-205	SDBAM… DWR…-205
with external interlock	DWAM… DWR…	DGM… DWR…	DWR…	DWAM… DWR…
Minimum pressure limitation with internal interlock	DWR…-206	DGM…-206 DWR…-206	DWR…-206	DWR…-206
with external interlock	DWR… DWR…	DGM… DWR…	DWR…	



Pressure limiter with internal interlock

…The code number for the pressure range must be inserted here (see datasheets). A final number of 2… (e.g. DWR…-205) means a plug connector according to DIN EN175301.

DWR series
The DWR series **covers all the applications mentioned above**.

DWAM-, DWAMV-, SDBAM-series (self-monitoring sensor)
DWAM, DWAMV and SDBAM are **only suitable for maximum pressure monitoring**. They offer **additional safety** due to the **safety diaphragm (selfmonitoring sensor)**. They are TÜV-tested for steam and hot water, but thanks to the self-monitoring sensor can also be recommended for other, **particularly safety-critical applications** (e.g. in process engineering).

Sensors of the DWR series are self-monitoring when used in minimum pressure monitoring applications.

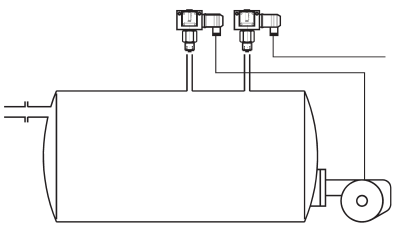
Equipment of a boiler with pressure monitor and pressure limiter

Pressure monitor for burner control: **DWAM… or DWR…** (without adjustable switching differential) or (better, because switching differential adjustable) **DWAMV… or DWR…–203**

Pressure limiter for safety monitoring: **SDBAM… or DWR…–205** (with internal interlock, unlocking button on the pressure limiter) or **DWAM… or DWR…** (with external interlock in the control cabinet) Suggested connection for the external interlock, see page 18.

Pressure monitor DWAM… or DWR…

Pressure limiter SDBAM… or DWR…-205



DWAM1

DWAM, DWAMV, SDBAM

Pressure monitors / pressure limiters

These series are particularly suitable for maximum pressure monitoring in steam and hot-water systems. The pressure switch is "of special construction", with a self-monitoring pressure sensor, built in accordance with Pressure Equipment Directive PED 97/23/EC.

It can be used as a pressure monitor or a pressure limiter for maximum pressure monitoring (systems in accordance with TRD 604 DIN EN12828) systems in accordance with DIN EN12952-11 and DIN EN12953-9 and is available with or without adjustment.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) to DIN 16 288 and internal thread G 1/4 to ISO 228 Part 1.

Switching device
Rugged housing (200) made of seawater-resistant diecast aluminium.

Materials
Pressure bellows: Material no. 1.4571
Sensor housing: Material no. 1.4104
Switch housing: GD Al Si 12 according to DIN 1725

Mounting position
Vertically upright and horizontal.

Ambient temperature at switching device
–20 to +70°C.

Medium temperature –20 to +70°C.
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85°C for short periods. Higher medium temperatures are possible provided the upper limit at the switching device is ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gauge connection) or on a flat surface with two 4 mm Ø screws.

Calibration for maximum pressure switch
The pressure monitors and safety pressure limiting devices are calibrated so that, **under rising pressure**, switching takes place at the defined switching pressure. The reset point under falling pressure is lower by the amount of the switching differential, or, in the case of pressure limiting devices, by the fall in pressure specified in the table. The scale value corresponds to the upper switching point.

Switching differential
See Product Summary.

Contact arrangement
Single-pole changeover switch.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Sealing P2
Generally available for SDBAM limiters.

Bursting pressure
For all types ≥ 100 bar.
Verified by TÜV test.

Component tested for	**Steam** Systems according to TRD 604 **Hot water** Systems according to DIN EN12828
Testing basis	VdTÜV Memorandum "Pressure 100"
Function	Pressure monitor / Pressure limiter
Directing of action	**For maximum pressure monitoring only**
Sensor	**"Of special construction"** (self-monitoring sensor with safety diaphragm)

Product Summary Maximum pressure monitoring (↑) (for other pressure ranges see DWR series)

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimensioned drawing
Pressure monitors without differential adjustment for max. pressure monitoring				**page 21 + 22**
DWAM06	0.1…0.6 bar	0.04 bar	5 bar	
DWAM1	0.2…1.6 bar	0.05 bar	5 bar	1 + 15
DWAM6	1.2…6 bar	0.2 bar	10 bar	
DWAM625	1.2…6 bar	0.25 bar	20 bar	
DWAM16	3…16 bar	0.4 bar	20 bar	1 + 19
DWAM32	6…32 bar	1.2 bar	45 bar	
Pressure monitors with differential adjustment for max. pressure monitoring				
DWAMV1	0.2…1.6 bar	0.12…0.6 bar	5 bar	1 + 15
DWAMV6	1.2…6 bar	0.4…1.5 bar	10 bar	
DWAMV16	3…16 bar	0,8…2,5 bar	20 bar	1 + 19
DWAMV32	6…32 bar	2.5…6.0 bar	45 bar	
Pressure limiters for maximum pressure monitoring (with internal interlock)				
		Pressure change for unlocking		
SDBAM1	0.2…1.6 bar	0.12 bar	5 bar	
SDBAM2,5	0.4…2.5 bar	0.15 bar	5 bar	1 + 15
SDBAM6	1.2…6 bar	0.4 bar	10 bar	
SDBAM625	1.2…6 bar	0.6 bar	20 bar	
SDBAM16	3…16 bar	0.8 bar	20 bar	1 + 19
SDBAM32	6…32 bar	3.0 bar	45 bar	

* If a downstream external interlock is added, DWAM... pressure monitors can also be used as pressure limiters (see page 51).

· Sealing device P2 is included for SDBAM limiters and can also be retrofitted to pressure monitors on request. See sealing P2.
· DWAM... also available in Ex-i equipment. See DBS series.

Minimum pressure controls
– Minimum pressure monitor: DWR… page 50
– Minimum pressure limiter: DWR…-206 page 56

FEMA by Honeywell

CE TÜV tested DIN geprüft Protection Class: IP 54

DWAM6-576

DBS

Pressure monitors / pressure limiters

In many aspects, safety-engineered pressure limiters offer a higher degree of safety compared with normal pressure switches and are therefore especially suitable for chemical process engineering and thermal installations in which safety is an especially critical factor in pressure monitoring. Pressure switches can also be used in Ex- zones (zone 0, 1, 2 and 20, 21, 22) and, in all cases, require an isolating amplifier.
The isolating amplifier is also responsible for monitoring lines for short-circuit and line break and therefore offers an additional safety advantage – even in non-Ex-zones. For Ex-applications, the isolating amplifier must be installed outside the Ex-zone. The lines between the isolating amplifier and the pressure switch are monitored for short-circuit and line break.

SIL 2 according IEC 61508-2

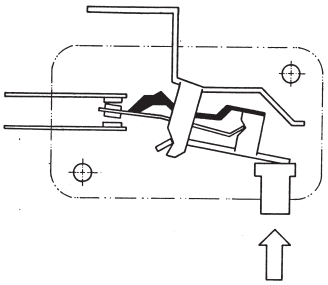
Technical data

Greater safety
· in process engineering and chemical installations,
· in gas and liquid gas installations

Basic features:
– "Of special construction" according to VdTÜV Memorandum "Pressure 100"
– Line break and short-circuit monitoring-between pressure switch and isolating amplifier
– Suitable for Ex areas (zone 0, 1 & 2 or 20, 21 & 22) (explosion protection Ex-ia)
– Degree of protection IP 65
– Plastic-coated housing (chemical version)

Options:
– Limiter with internal interlock

Type-specific features:
– Self-monitoring sensors
– Positive opening microswitches
– Gold-plated contacts
– TÜV, DVGW component tests



Safety requirements for pressure limiters

Pressure limiters "of special construction" (DBS) must fulfil additional safety requirements, i.e. breakage or leakage in the mechanical part of the sensor must lead to shutdown to the safe side. The pressure limitermust respond as if the system pressure had already exceeded the maximum limit. The control circuit for the pressure limiter must also be considered from the point of view of safety, as short-circuits in the supply lines or other faults in the control current circuit can lead to dangerous conditions.

Switching element with positive opening operation and gold-plated contacts

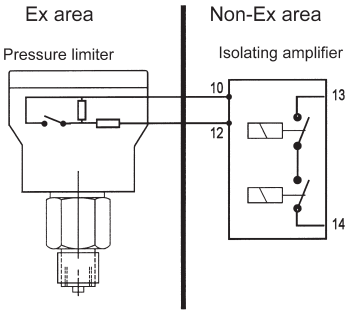
The microswitch is equipped with positive opening operation. Rather than transmitting the plunger force via a spring, which is the usual method with most microswitches, this newly developed microswitch has an additional lever which transmits the movements of the pressure bellows positively to the contact lever. If the spring breaks, the contact lever is moved directly.

Line break and short-circuit monitoring in the control circuit

The resistor connected in series with the switching contact limits the current to a defined value with the switch closed. In the event of short-circuit in the area between the isolating amplifier and the series resistor, the current rises above the predetermined limit value, the relay of the isolating amplifier drops out, the output current circuit is interrupted and thus the safe condition is achieved. In the event of a line break, the current flow is interrupted, the relay drops to the safe side and interrupts the output current circuit (safety sequence). Furthermore, the isolating amplifier is designed so that, if faults occur in the electronics (conductor interruption, component defect etc.) and in the resulting situations, the safe shutdown condition is assured. These characteristics of the safety-engineered isolating amplifier, including line break and short-circuit monitoring, satisfy the requirements of DIN/VDE 0660, Part 209.

Connection diagram

For pressure monitoring in Ex areas, the isolating amplifier must be installed outside the Ex-zone. The pressure limiter has an intrinsically safe control current circuit (Ex-ia). This arrangement is suitable for zones 0, 1 and 2, 20, 21 and 22.



Safety-engineered maximum pressure monitors

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) according to DIN 16 288.

Switch housing 500
Diecast aluminium GD Al Si 12.
Aluminium housing coated with resistant plastic.

Degree of protection IP 65.

Ex protective category
Ex-ia (only when used in conjunction with suitable isolating amplifier).

Component testing See table on page 46.

Pressure sensor materials
Housing: 1.4104
Pressure bellows: 1.4571
All parts fully welded.

Ambient temperature DWAM: –20°C to +60°C, DWR: –25°C to +60°C.
At ambient temperatures at or below 0°C, ensure that condensation cannot occur in the sensor or in the switching device.

Max. temperature of medium at sensor
+ 60°C.

Outdoor installations
Protect the device against direct atmospheric influences. Provide a protective cover.

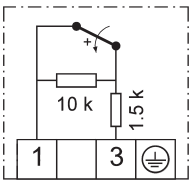
Max. working pressure
See Product Summary

Switching pressure setting
Adjustable with the setting spindle after removing the terminal box.

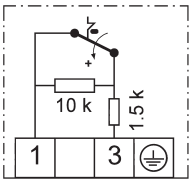
Mounting
With suitable weld-on connections and union nuts or with pressure gaugescrew union G 1/2.

Power supply circuit
U_i 14 V DC
R_i 1500 Ohm
C_i 1 nF
L_i 100 µH

Connection diagrams



…576



…577

Maximum pressure monitors

Sensor "of special construction", self-monitoring via safety diaphragm, type-tested according to VdTÜV Memorandum "Pressure 100". **SIL2 according IEC 61508-2**

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimensioned drawing
				page 21 + 22
DWAM06-576	0.1…0.6 bar	0.04 bar	5 bar	
DWAM1-576	0.2…1.6 bar	0.05 bar	5 bar	
DWAM2,5-576	0.4…2.5 bar	0.07 bar	5 bar	2 +
DWAM6-576	1.2…6 bar	0.2 bar	10 bar	15
DWAM625-576	1.2…6 bar	0.25 bar	20 bar	
DWAM16-576	3…16 bar	0.4 bar	20 bar	2 +
DWAM32-576	6…32 bar	1.2 bar	45 bar	19

Versions:
ZF 577: Maximum pressure limiter (with internal interlock)
Microswitch not positive opening, contacts: silver alloy other equimpent like DWAM…576

Maximum pressure monitors

Sensor "of special construction" made from stainless steel. (Component testing with 2 million operating cycles). Component tests: VdTÜV Memorandum "Pressure 100", DIN EN1854 (fuel gases), DIN EN764-7, systems in accordance to DIN EN12952-11 and DIN EN12953-9.
SIL 2 according ICE 61508-2

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimensioned drawing
				page 21 + 22
DWR06-576	0,1…0,6 bar	0,04 bar	6 bar	2 +
DWR1-576	0,2…1,6 bar	0,06 bar	6 bar	15
DWR3-576	0,2…2,5 bar	0,1 bar	16 bar	2 +
DWR6-576	0,5…6 bar	0,2 bar	16 bar	18
DWR625-576	0,5…6 bar	0,25 bar	25 bar	2 +
DWR16-576	3…16 bar	0,5 bar	25 bar	17
DWR25-576	4…25 bar	1,0 bar	63 bar	2 +
DWR40-576	10…40 bar	1,3 bar	63 bar	16

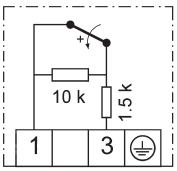
Versions:
ZF 577: Maximum pressure limiter (with internal interlock)
Microswitch not positive opening, contacts: silver alloy other equimpent like DWR… 576

Calibration
Devices of the **DWR-576** and **DWAM-576** series are calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 23, 2. Celebration at upper switching point).

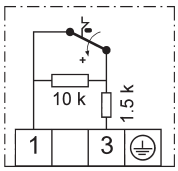
Technical data

Switching element
See table opposite.

Connecting diagrams



…574



…575

The other technical data correspond to the devices for maximum pressure monitoring (page 51).

For the power supply circuit:
U_i 14 V DC
R_i 1500 Ohm
C_i 1 nF
L_i 100 µH

Safety-engineered minimum pressure monitors
Sensor "of special construction made from stainless steel. (self-monitoring and component testing with 2 million operating cycles). Component tests: VdTÜV Memorandum "Pressure 100", DIN EN3398 (fuel gases) DIN EN764-7, systems in accordance to DIN EN12952-11 and DIN EN12953-9
SIL2 according IEC 61508-2

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimensioned drawing page 21 + 22
DWR06-574	0.1…0.6 bar	0.04 bar	6 bar	2 +
DWR1-574	0.2…1.6 bar	0.06 bar	6 bar	15
DWR3-574	0.2…2.5 bar	0.1 bar	16 bar	2 +
DWR6-574	0.5…6 bar	0.2 bar	16 bar	18
DWR625-574	0.5…6 bar	0.25 bar	25 bar	2 +
DWR16-574	3…16 bar	0.5 bar	25 bar	17
DWR25-574	4…25 bar	1.0 bar	63 bar	2 +
DWR40-574	8…40 bar	1.3 bar	63 bar	16

Calibration
The **DWR-574** series is calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

Versions:
ZF 575: Minimum pressure limiters (with internal interlock)
Switching contacts: silver alloy
other equipment like DWR… 574

Features of safety-engineered pressure monitors and pressure limiters

Devices	Component testing	Features						Options	
	1 = VdTÜV Memorandum "Pressure 100" 2 = DIN EN1854 3 = DIN EN764-7 4 = DIN EN12952-11/DIN EN12953-9	Resistor combination for line break and short-circuit monitoring	Ex-ia-version for intrinsically safe control circuits	Self-monitoring pressure sensor	Plastic-coated housing Chemical version	Positive opening microswitches	Gold-plated contacts	Limiter with internal interlock Chemical version	
Maximum pressure monitoring									
FD16-326	1 + 3	■	■	■		■	■		
FD16-327	1 + 3	■	■	■				■	
DWAM…576	1 + 4	■	■	■	■	■	■		
DWAM…577	1 + 4	■	■	■	■			■	
DWR…576	1 + 2 + 3 + 4	■	■		■	■	■		
DWR…577	1 + 2 + 3 + 4	■	■		■			■	
Minimum pressure monitoring									
DWR…574	1 + 2 + 3 + 4	■	■		■		■		
DWR…575	1 + 2 + 3 + 4	■	■		■			■	

FD16-326

FD

Maximum pressure limiters for liquid gas installations

Pressure limiters of the FD series are constructed in accordance with the special directives for liquid gas engineering. The requirements of TRB 801 Appendix II §12 are met. All parts coming into contact with the medium are made of stainless steel 1.4104 and 1.4571. The pressure sensor was designed to be "self-monitoring" to exceed the requirements of TRB , i. e. should the measuring bellows rupture, the pressure sensor switches off towards the safe side. The pressure sensor thus complies with "of special construction" in the sense of VdTÜV Memorandum "Pressure 100". Pressure limiters are used in intrinsically safe control circuits (Ex-protection Ex-ia).
By using an isolating amplifier, the control circuit is also monitored for line break and short-circuit.

SIL 2 according IEC 61508-2

Technical data

Pressure connection External thread G 1/2 (pressure gauge connection) according to DIN 16 288.

Switch housing 300
Diecast aluminium GD Al Si 12.

Degree of protection: IP 65

Explosion protection Ex-ia (only when used in conjunction with isolating amplifier).

TÜV testing station identifying mark see Product Summary.

Pressure sensor materials
Housing: 1.4104, Pressure bellows: 1.4571
All parts fully welded. Perbunan safety diaphragm (not in contact with medium).

Ambient temperature –25°C to +60°C.
At ambient temperatures below 0°C, ensure that condensation cannot occur in the sensor or in the switching device.

Max. medium temperature: +60°C.

Outdoor installations
Protect the device against direct atmospheric influences. Provide a suitable protective cover.

Max. permissible working pressure: 40 bar.

Switching pressure: 5–16 bar. Adjustable with the setting spindle after removing the terminal box.

Calibration
The **FD16-316** and **FD16-327** series are calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 23, 2. Calibration at upper switching point).

Mounting
Can be fitted directly onto pressure line with suitable weld-on connections and union nuts.

Interlock after cutout
Internal interlock on FD16–327.
Interlock defeat: after pressure reduction of approx. 2.5 bar by pressing the red button (with tool) on the scale side of the pressure switch.

External interlock on FD16–326.
Interlock defeat: After pressure reduction of approx. 0.5 bar. Press unlocking button in control cabinet.

Line break and short-circuit monitoring
On types FD16–326 and FD16–327 used in conjunction with isolating amplifier, the control circuit is monitored for short-circuit and line break. The resistor combination incorporated into the pressure switch ensures that a defined current flows at all times during normal operation. In the event of short-circuit or line break, the current level changes and the relay drops out to the safe side.

Product Summary

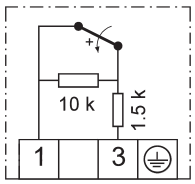
Type	Setting range	Switching differential*	Interlock	Dimensioned drawing
				page 21 + 22
FD16–326	3-16 bar	0.5	Extern	2 + 19
FD16–327	3-16 bar	2.5	Intern	2 + 19

* Interlock on reaching upper cutoff point (maximum pressure set).

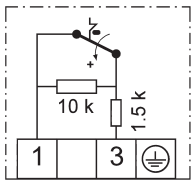
Defeat:
E = External, i.e. in control cabinet via relay with latching
I = Internal, i.e. locally at pressure limiter

For the power supply circuit
U_i 14 V DC
R_i 1500 Ohm
C_i 1 nF
L_i 100 µH

Internal circuit



FD 16-326
Single-pole changeover switch with resistor combination for line break and short-circuit monitoring.
(External interlock in control cabinet necessary).



FD 16-327
Single-pole changeover switch with mechanical switching state interlock on reaching maximum pressure and with resistor combination for line break and short-circuit monitoring.

Please note: FD pressure limiters must never be connected directly to mains voltage. They must only be used in conjunction with isolating amplifier.

CE TÜV tested Protection Class: IP 65

DGM310A

DGM

Pressure monitors for fuel gases

DVGW tested to DIN EN1854
Gas pressure monitors are suitable for all gases in accordance with DVGW Worksheet G260 and for air.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 to DIN 16 288 and internal thread G 1/4 to ISO 228 Part 1 (permissible up to 4 bar).

Switching device
Seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 54 for vertical installation position.

Pressure sensor materials
See Product Summary

Ambient temperature –25 to +60°C.
At ambient temperatures below 0°C, ensure that condensation cannot occur in the sensor or in the switching device.

Maximum working pressure
See Product Summary

Mounting
Either directly on the pipe or with two 4 mm ø screws on the wall surface.

Mounting position
Vertically upright and horizontal.

Setting
Continuously adjustable via the setting spindle with a screwdriver. The set switching pressure is visible in the scale window.

Sealing P2
On request (can be fitted later).

Switching differentials
Largely independent of the set switching pressure. Not adjustable. For values see Product Summary.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Pressure measuring connection
Care must be taken to ensure that a pressure measuring connection is available in a suitable place on the gas appliance.

Component tested for	Fuel gases according to DVGW Worksheet G 260
Testing basis	DIN EN1854
Function	Pressure monitor
Direction of action	**For maximum and minimum pressure monitoring**

Product Summary

Type	Setting range	Switching differential (mean values)	Max. working pressure	Materials in contact with medium	Dimensioned drawing
					p. 21 + 22
DGM306A	15…60 mbar	6 mbar	0.8 bar	CU + Ms	
DGM310A	20…100 mbar	7 mbar	0.8 bar	CU + Ms	1 + 13
DGM325A	40…250 mbar	10 mbar	0.8 bar	CU + Ms	
DGM06A	100…600 mbar	25 mbar	2 bar	CU + Ms	1 + 14
DGM1A	0.2…1.6 bar	40 mbar	3 bar	CU + Ms	
DGM506	15…60 mbar	8 mbar	5 bar	1.4104	
DGM516	40…160 mbar	12 mbar	5 bar	1.4104	1 +12
DGM525	100…250 mbar	20 mbar	5 bar	1.4104	

Calibration

The **DGM** series is calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 23, 2. Calibration at upper switching point).

For other pressure ranges see type series DWR, page 49.

Ex-ia version (intrinsically safe)
As above, but with additional function ZF513 (Ex-ia).
Example for ordering: **DGM516-513**

Ex-DGM see page 66

DWR625

DWR

Pressure monitors

Especially suitable as a pressure monitor or pressure limiter for fuel gases (DVGW Worksheet G 260) and liquid fuels (e.g. fuel oil), as well as for steam systems according to TRD 604 and hot-water systems to DIN EN12828, systems in accordance to DIN EN12952-11 and DIN EN12953-9. The DWR is used to monitor maximum and minimum pressures.

This pressure switch is "of special construction" and has been tested with 2 million operating cycles. TÜV and DVGW tests exists.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) to DIN 16 288 and internal thread G 1/4 to ISO 228 Part 1 (for gas applications internal thread permissible only up to 4 bar).

Switching device
Rugged housing (200) made of seawater-resistant diecast aluminium.

Materials
Pressure bellows: Material no. 1.4571
Sensor housing: Material no. 1.4104 Switch housing: GD Al Si 12 (DIN 1725)

Mounting position
Vertically upright and horizontal.

Ambient temperature at switching device
–25 to +70°C,
Medium temperature –25 to +70°C. The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85°C for short periods. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gauge connection) or on a flat surface with two 4 mm Ø screws.

Calibration
The DWR series is calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 17, 2. Calibration at upper switching point). In version ...-203 the switching differential is adjustable. The basic calibration is maintained.

Bursting pressure
For all types ≥ 100 bar, verified by TÜV test.

Switching differential For values see Product Summary.

Contact arrangement Single pole changeover switch.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Degree of protection IP 54 according to DIN 40 050

Component tested for	
Steam	Systems according to TRD 604
Hot water	Systems according to DIN EN12828
Fuel gases	DVGW Worksheet G 260
Pressure tank	DIN EN764-7
Function	Pressure monitor or pressure limiter (with external interlock)
Direction of action	**For maximum and minimum pressure monitoring (DWFS, SDBFS)**
Sensor	**"of special construction"** by testing with 2 million cycles.

Product Summary

Type	Setting range	Switching differential (mean values)	Maximum working pressure	Dimensioned drawing
Pressure monitors without differential adjustment				**p. 21 + 22**
DWR06	0.1…0.6 bar	0.04 bar	6 bar	1 + 15
DWR1	0.2…1.6 bar	0.06 bar		
DWR3	0.2…2.5 bar	0.1 bar	16 bar	1 + 18
DWR6	0.5…6 bar	0.2 bar		
DWR625	0.5…6 bar	0.25 bar	25 bar	1 + 17
DWR16	3…16 bar	0.5 bar		
DWR25	4…25 bar	1.0 bar	63 bar	1 + 16
DWR40	8…40 bar	1.3 bar		
Switching differential adjustable				
DWR06–203	0.1…0.6 bar	0.08…0.5 bar	6 bar	1 + 15
DWR1–203	0.2…1.6 bar	0.15…0.6 bar		
DWR3–203	0.2…2.5 bar	0.17…1.2 bar	16 bar	1 + 18
DWR6–203	0.5…6 bar	0.3…1.4 bar		
DWR625–203	0.5…6 bar	0.4…2.5 bar	25 bar	1 + 17
DWR16–203	3…16 bar	0.75…3.15 bar		
DWR25–203	4…25 bar	1.3…6.0 bar	63 bar	1 + 16
DWR40–203	8…40 bar	2.3…6.6 bar		

Ex-DWR
see page 65

DWR625-205

DWR

Pressure limiters

Especially suitable as a pressure limiter for fuel gases (DVGW Worksheet G 260) and liquid fuels (e.g. fuel oil), as well as for steam systems according to TRD 604 and hot-water systems to DIN EN12828, systems in accordance to DIN EN12952-11 and DIN EN12953-9.

The DWR-205/-206 is used to limit maximum and minimum pressures and has an internal interlock.

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) to DIN 16 288 and internal thread G 1/4 to ISO 228 Part 1 (for gas applications internal thread permissible only up to 4 bar).

Switching device
Rugged housing (200) made of seawater-resistant diecast aluminium.

Materials
Pressure bellows: Material no. 1.4571
Sensor housing: Material no. 1.4104
Switch housing: GD Al Si 12 (DIN 1725)

Mounting position Vertically upright and horizontal.

Ambient temperature at switching device
–25…+70°C

Medium temperature –25…+70°C.
The medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Temperatures may reach 85°C for short periods. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gauge connection) or on a flat surface with two 4 mm Ø screws.

Calibration
The **DWR-205** series is calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 17, 2. Calibration at upper switching point). The **DWR-206** series is calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 17, 1. Calibration at lower switching point).

Bursting pressure For all types ≥ 100 bar, verified by TÜV test.

Switching differential For values see Product Summary.

Contact arrangement Single pole changeover switch.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Normal	8 A	5 A	0.3 A	8 A

Degree of protection IP 54 according to DIN 40 050

Sealing P2
On request (can be fitted later).

Component tested for	**Steam**	System according to TRD 604
	Hot water	System according to DIN EN12828
	Fuel gases	DVGW Worksheet G 260
	Pressure tank	DIN EN764-7
Function	Pressure limiter (with internal interlock)	
Direction of action	**For maximum and minimum pressure monitoring (SDBFS)**	
Sensor	**"Of special construction"** by testing with 2 million cycles.	

Important: When selecting the limiter, it is necessary to decide whether the device is to be used for maximum or minimum pressure monitoring. The direction of action cannot be reversed at the pressure limiter.

Product Summary

Type	Setting range	Switching differential (mean values)	Maximum working pressure	Dimensioned drawing
Maximum pressure limiters				**page 21 + 22**
DWR06–205	0.1…0.6 bar	0.06 bar	6 bar	1 + 15
DWR1–205	0.2…1.6 bar	0.09 bar		
DWR3–205	0.2…2.5 bar	0.20 bar	16 bar	1 + 18
DWR6–205	0.5…6 bar	0.30 bar		
DWR625–205	0.5…6 bar	0.50 bar	25 bar	1 + 17
DWR16–205	3…16 bar	0.70 bar		
DWR25–205	4…25 bar	1.4 bar	63 bar	1 + 16
DWR40–205	8…40 bar	2.3 bar		
Minimum pressure limiters				
DWR06–206	0.1…0.6 bar	0.06 bar	6 bar	1 + 15
DWR1–206	0.2…1.6 bar	0.09 bar		
DWR3–206	0.2…2.5 bar	0.20 bar	16 bar	1 + 18
DWR6–206	0.5…6 bar	0.30 bar		
DWR625–206	0.5…6 bar	0.50 bar	25 bar	1 + 17
DWR16–206	3…16 bar	0.70 bar		
DWR25–206	4…25 bar	1.4 bar	63 bar	1 + 16
DWR40–206	8…40 bar	2.3 bar		

* Maximum working pressure and dimensions as for type series DWR. Pressure monitors DWR… (page 55) can also be used as maximum pressure and minimum pressure limiters with external interlock. You will find other maximum pressure limiters with safety sensor, type series SDBAM…, on page 49. Types DWAM… can also be used with external interlock as maximum pressure limiters.

FEMA by Honeywell

CE TÜV tested DIN Geprüft DVGW TÜV Protection Class: IP 54

General information about explosion protection

Basic principle

The basic principle of explosion protection is that:

a) combustible materials (gas, vapour, mist or dust) in dangerous quantities
b) air (or oxygen)
c) ignition sources

must not occur in the same place.

The permanent or temporary occurrence of explosive mixtures as per a) and b) is often unavoidable, therefore when operating electrical installations care must be taken to ensure that no ignition sources can occur.

In order to accomplish this, standards have been legislated in Europe serving as a basis for various different types of ignition protection. These standards have been recognized in all European countries. Equipment for the reliable prevention of the ignition of ambient explosive gas mixtures must be constructed according to these standards.

These standards are based on European Directive 94/9/EC (ATEX). The goal of this regulation is the harmonization of statutory regulations in the area of explosion protection as well as the elimination of trade barriers between Member States. This Directive provides for the harmonization of all standards relevant to the construction of equipment with ignition protection.

The most important types of ignition protection for FEMA products are as follows:

"Ex-d" pressure-proof encapsulation	**EN 60079-1**
"Ex-e" enhanced safety	**EN 60079-7**
"Ex-t" protection via housing	**EN 60079-31**
"Ex-ia" intrinsically safety	**EN 60079-11**

Pressure switches
Specially designed FEMA Ex-protected pressure switches are available for use in ex-protection areas. They conform to these standards and are type-tested (Ex-d, Ex-e, Ex-t) and/or have been technically prepared for these areas (Ex-ia).

"Ex-d" Pressure-Proof Encapsulation
Switch components and other electrical functional units capable of igniting explosive gas mixtures are encapsulated in a housing which will survive the explosive pressure of an internal explosion and the special design of which prevents the transference of this explosion to the ambient atmosphere.

"Ex-e" Enhanced Safety
This type of ignition protection pertains to the special design of the terminal connection housing. The connection area is grouted and thus specially separated from the microswitch. A type-tested terminal block, a type-tested cable gland, and the IP65 Protection Degree all ensure an enhanced safety of "Ex-e" in the connection housing.

"Ex-t" Protection via Housing
This type of ignition protection pertains to dust-explosion protection and is based upon the reliable protection of ignition sources against atmospheric dust. For FEMA pressure switches and thermostats for use in dust explosion-protected areas, a Protection Degree of IP65 is required. Together with devices according to "Ex-d" and "Ex-e," devices with "Ex-t" protection are approved for use in gaseous and dust-laden atmospheres.

"Ex-i" Intrinsically Safety
The equipment employed in explosion-relevant areas are components of inherently-safe electrical circuits. An electrical circuit is inherently safe if the amount of energy it contains is so small that no spark or other thermal effect can arise. This reliably prevents the ignition of explosive gas mixtures in the proximity of this equipment. In the context of this Directive, pressure switches and thermostats containing no switching components with energy-storage effects are referred to as "simple electrical equipment."

The Term "Simple Electrical Equipment"
Through the use of simple microswitches without additional capacitive or inductive components means that our "Ex-ia" pressure switches and thermostats are classified as "simple electrical equipment." The testing and certification of such equipment is not required by Directive 94/9/EC. However, in explosion-relevant areas requiring "Ex-ia" explosion protection, they may be employed only together with E.C. type-tested isolating amplifiers. All of the devices which we manufacture explicitly for use in such areas are equipped with microswitches with gold contacts, an earthing terminal and are marked for easier identification with a blue cable gland.

General information about explosion protection

Zone classification

Explosion risk areas are grouped into zones according to the likelihood of a dangerous explosive atmosphere **according to EN 1127-1** occurring.
When assessing the explosion hazard, i.e. when identifying explosion risk areas, the "Guidelines for the Avoidance of Danger due to Explosive Atmospheres with Examples (ExRL)" of the German Insurance Association for the Chemical Industry must be taken into account.
If the situation concerns a special case or if doubts exist as to the definition of explosion risk areas, the matter shall be decided by the supervisory authorities (Trade Supervisory Office, where applicable with the assistance of the Insurance Association or the Technical Control Boards.
In Zones 0 (20) and 1 (21), only electrical equipment for which a type test certificate has been issued by a recognized testing agency may be used. In Zone 0 (20), however, only equipment expressly authorized for that zone may be used. Equipment approved for use in Zones 0 (20) and 1 (21) may also be used in Zone 2 (22). Under the new European Directive 94/9 EC (ATEX 100a), a distinction is made between **gas atmospheres** and **dust atmospheres**. This results in the following zone classifications:

Gas	**Zone 0**	**continuously or for long periods**	**Zone 0** (gas) is a place in which a dangerous explosive atmosphere is present continuously or for long periods. This normally includes only the interior of containers or the interior of apparatus (evaporators, reaction vessels etc.), if the conditions of Zone 0 are fulfilled. Continuous danger > 1000 hours/year.
	Zone 1	**occasionally**	**Zone 1** (gas) is a place in which a dangerous explosive atmosphere can be expected to occur occasionally in normal operation. This may include the immediate vicinity of Zone 0. Occasional danger = 10 to 1000 hours/year.
	Zone 2	**seldom and for short periods**	**Zone 2** (gas) is a place in which a dangerous explosive atmosphere can be expected to occur only rarely and then only for short periods. This may include areas surrounding Zones 0 and/or 1. Danger only under abnormal operating conditions < 10 hours/year.
Dust	**Zone 20**	**continuously or for long periods**	**Zone 20** (dust) is a place in which a dangerous explosive atmosphere in the form of a cloud of dust in air is present continuously or for long periods, and in which dust deposits of unknown or excessive thickness may be formed. Dust deposits on their own do not form a Zone 20. Continuous danger > 1000 hours/year.
	Zone 21	**occasionally**	**Zone 21** (dust) is a place in which a dangerous explosive atmosphere in the form of a cloud of dust in air may occasionally occur in normal operation, and in which deposits or layers of inflammable dust may generally be present. This may also include the immediate vicinity of Zone 20. Occasional danger = 10 to 1000 hours/year.
	Zone 22	**seldom and for short periods**	**Zone 22** (dust) is a place in which a dangerous explosive atmosphere may be expected to occur only rarely and then only for short periods. This may include areas in the vicinity of Zones 20 and 21. Danger only under abnormal operating conditions < 10 hours/year.

General information about explosion protection

Explosion group

The requirements for explosion-protected equipment depend on the gases and/or vapours present on the equipment and on the dusts lying on, adhering to and/or surrounding the equipment. This affects the gap dimensions required for pressure-proof encapsulation and, in the case of intrinsically safe circuits, the maximum permitted current and voltage values. Gases, vapours and dusts are therefore subdivided into various explosion groups.
The danger of the gases rises from explosion group IIA to IIC. The requirements for electrical equipment in these explosion groups increase accordingly. Electrical equipment approved for IIC may also be used for all other explosion groups.

Temperature class

The maximum surface temperature of an item of equipment must always be lower than the ignition temperature of the gas, vapour or dust mixture. The temperature class is therefore a measure of the maximum surface temperature of an item of equipment.

Temperature class °C	Ignition temperature °C	Maximum surface temperature °C
T1	> 450	450
T2	> 300	300
T3	> 200	200
T4	> 135	135
T5	> 100	100
T6	> 85	85

Equipment Protection Level (EPL)

In addition to the afore mentioned types of ignition protection, the new norms IEC and EN60079ff have introduced the corresponding Equipment Protection Levels (EPL).

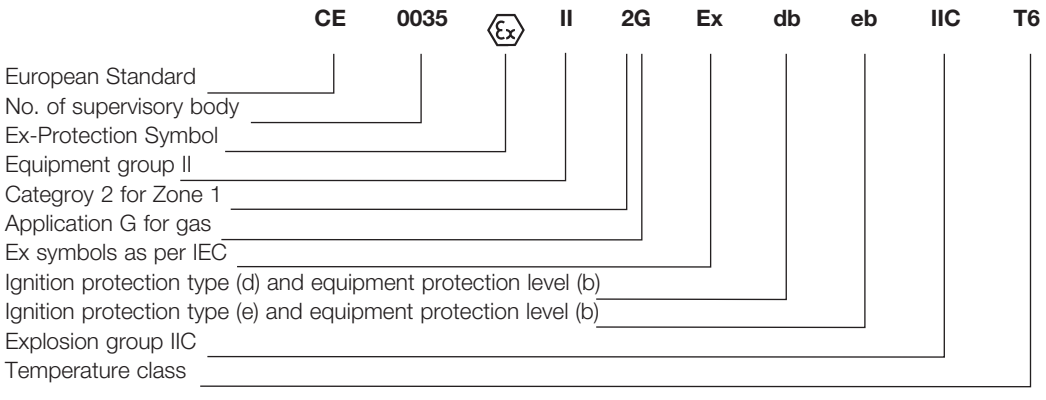
EPL Gb (G = Gas-Ex-Protection, b = High Protection Level)
Equipment with a high protection level for use in gas-explosion areas in which – during normal operation or in the event of foreseeable malfunctions or defects – there is no danger of ignition.

EPL Db (D = Dust, b = High Protection Level)
Equipment with a high protection level for use in flammable dust-laden atmospheres in which – during normal operation or in the event of foreseeable malfunctions or defects – there is no danger of ignition.

Marking of Explosion-Protected Electrical Equipment

In addition to the usual data (manufacturer, model, serial number, electrical data), the explosion-protection information is likewise to be included in the marking.
According to Directive 94/9/EC (ATEX), in compliance with the IEC recommendation and the currently valid standards, the following forms of identification are to be followed.

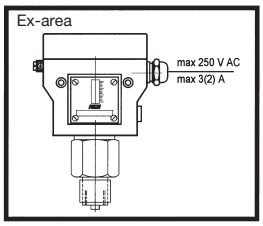
Example for FEMA Pressure Switch and Thermostats with "Ex-de" Ignition Protection

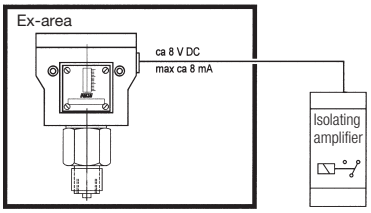


Ex devices

Pressure monitoring in explosion risk areas, Zones 1, 2 and 21, 22

Specially equipped pressure switches can also be used in explosion risk areas Zone 1, 2 and 21, 22. The following alternatives are possible:



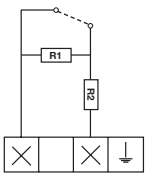


1. Flame – proof enclosure
CE 0035 Ex II 2G Ex db eb IIC T6
CE 0035 Ex II 2D Ex tb IIIC IP65 T85ºC
The pressure switch with can be used directly in the explosion risk area (Zones 1 and 2 or 21 and 22). The maximum switching voltage, switching capacity and ambient temperature must be taken into account and the rules for installation in the explosion risk area must be observed.
Special circuits and designs with an adjustable hysteresis or internal interlock (reclosing lockout) are not possible.

Please note: Ex devices that have been ordered and already produced will not be taken back.

2. Ex-ia pressure switches
All pressure switches of normal design can be used in explosion risk areas Zones 1 and 2 or 21 and 22, if they are integrated into an "intrinsically safe circuit". Intrinsic safety is based on the principle that the control circuit in the explosion risk area carries only a small quantity of energy which is not capable of generating an ignitable spark.
Isolating amplifiers must be ATEX tested and approved for use in installations in explosion risk areas. Isolating amplifiers must in any event be installed outside the Ex Zone. Pressure switches intended for Ex-ia installations are equipped with blue terminals and cable entries. In view of the low voltages and currents carried via the contacts of the microswitches, gold-plated contacts are used in the additional function Ex-ia (ZF513).

Pressure monitoring in Zones 1 (21) and 2 (22)

Flame proof enclosure Ex-d	**Intrinsically safe D ...-513 + isolating amplifier D ...574,576 + isolating amplifier**
Ignition protection type: CE 0035 Ex II 2G Ex db eb IIC T6 CE 0035 Ex II 2D Ex tb IIIC IP65 T85ºC	Ignition protection type: Ex-ia
ATEX approval for the complete switching device	ATEX approval for isolating amplifiers
Pressure switches with a silver contact	Pressure switches with gold-plated contacts, blue terminals and blue cable entry.
Switching capacity: max. 3 A, 250 VAC min. 2mA, 24 VDC	Switching capacity: max. 100 mA, 24 VDC min. 2 mA, 5 VDC
	Information for devices with additional functions according to EN60079-11:2007: ZF513: U_i = 24 V DC, I_i = 50 mA ZF574, ZF576: U_i = 20 V DC, P_i = 0,6 W, R_1 = 10 kOhm, 0,6 W, R_2 = 1,5 kOhm, 0,6 W L_i = insignificant C_i = insignificant 
The pressure switch can be installed within the Ex-Zone.	The isolating amplifier must be installed outside the Ex-Zone.

Ex-DNM10

Ex-DCM / Ex-DNM

Ⓔx II 2G Ex d e IIC T6 Gb

Ⓔx II 1/2D Ex ta/tb IIIC T80 ºC Da/Db

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) according to DIN 16 288 and internal thread G 1/4 according to ISO 228 Part 1.

Switching device
Robust housing (700) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 65, in vertical position.

Pressure sensor materials

Ex-DNM	Metal bellows: 1.4571 Sensor housing: 1.4104
Ex-DCM4016/ Ex-DCM4025	Diaphragm: Perbunan Sensor housing: 1.4301

Mounting position
Vertically upright and horizontal. Ex-DCM 4016 and 4025 vertically upright.

Ambient temp. at switching device
–20…+60 °C

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gaugeconnection) or on a flat surface with two 4 mm Ø screws.

Switching pressure
Adjustable from outside with screwdriver.

Contact arrangement
Single-pole changeover switch.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Ex-d	3 A	2 A	0.03 A	3 A

Product Summary

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Materials in contact with medium	Dimen-sioned drawing
Switching differential not adjustable					**page 21 + 22**
Ex-DCM4016	1…16 mbar	2 mbar	1 bar	Perbunan	3 + 11
Ex-DCM4025	4…25 mbar	2 mbar	1 bar	+ 1.4301	3 + 11

For other Ex-devices, see type series VCM, DNS, DDCM, DWR, DGM.

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimen-sioned drawing
Ex-DNM10	1…10 bar	0.3 bar	25 bar	3 + 17
Ex-DNM63	16…63 bar	1.0 bar	130 bar	3 + 16

Calibration

The **Ex-DCM/Ex-DNM** series is calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

CE Ⓔx

Protection Class: IP 65

Ex-DNS3

Ex-DNS/Ex-VNS

Ⓔx II 2G Ex d e IIC T6 Gb

Ⓔx II 1/2D Ex ta/tb IIIC T80 °C Da/Db

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) according to DIN 16 288 and internal thread G 1/4 according to ISO 228 Part 1.

Switching device
Robust housing (700) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 65

Pressure sensor materials
Pressure bellows and all parts in contact with medium. X 6 Cr Ni Mo Ti 17122 Material no. 1.4571

Mounting position
Vertically upright and horizontal.

Max. ambient temperature at switching device
–20…+60 °C.

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gaugeconnection) or on a flat surface with two 4 mm Ø screws.

Switching pressure
Adjustable from outside with screwdriver.

Contact arrangement
Single-pole changeover switch.

Switching capacity	250 VAC (ohm)	250 VAC (ind)	250 VDC (ohm)	24 VDC (ohm)
Ex-d	3 A	2 A	0.03 A	3 A

Plastic coating
The diecast aluminium housing in GD Al Si is chromated and stove-enamelled with resistant plastic. Corrosion tests with 3% saline solution and 30 temperature changes from +10 to +80°C showed no surface changes after 20 days.

Product Summary

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimensioned drawing
Switching differential not adjustable				page 21 + 22
Ex-VNS301	–250…+100 mbar	45 mbar	3 bar	
Ex-VNS111	–1*…+0.1 bar	50 mbar	6 bar	
Ex-DNS025	0.04…0.25 bar	30 mbar	6 bar	3 + 15
Ex-DNS06	0.1…0.6 bar	40 mbar	6 bar	
Ex-DNS1	0.2…1.6 bar	60 mbar	6 bar	
Ex-DNS3	0.2…2.5 bar	0.1 bar	16 bar	4 + 18
Ex-DNS6	0.5…6 bar	0.15 bar	16 bar	
Ex-DNS10	1…10 bar	0.3 bar	16 bar	4 + 16
Ex-DNS16	3…16 bar	0.5 bar	25 bar	

* At very high vacuums, close to the theoretical maximum of –1 bar, the switch may not be usable in view of the special conditions of vacuum engineering. However, the pressure switch itself will not be damaged at maximum vacuum.

Calibration

The **Ex-DNS** and **Ex-VNS** series are calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

Ex-DDCM1 (stainless steel sensor)

Ex-DDCM

Ⓔx II 2G Ex d e IIC T6 Gb
Ⓔx II 1/2D Ex ta/tb IIIC T80 °C Da/Db

SIL 2 according IEC 61508-2

Technical data

Pressure connection
Internal thread G 1/4

Switching device
Robust housing (700) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 65

Pressure sensor materials
Ex-DDCM014–16:
Ex-Pressure bellows of 1.4571
Sensor housing of 1.4305.
DDCM252–6002:
Perbunan diaphragm.
Aluminium sensor housing.

Mounting position
vertically upright.

Ambient temperature at switching device
–20…+60 °C

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line or on a flat surface with two 4 mm Ø screws.
Note the connection of pressurized lines:
P (+) = high pressure
S (–) = low pressure

Switching pressure
Adjustable from outside with screwdriver.

Scale
Type DDCM252–6002 without graduation. Set according to pressure gauge.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Ex-d	3 A	2 A	0.03 A	3 A

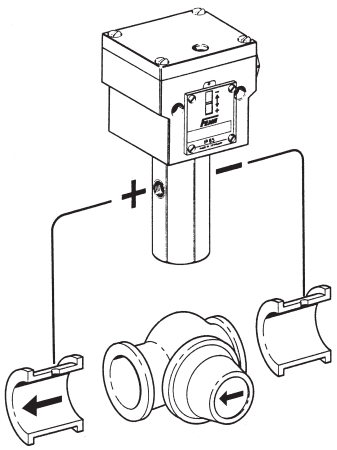
Type	Setting range (differential pressure)	Switching differential (mean values)	Max.** permissible pressure	Materials in contact with medium	Dimen-sioned drawing
Switching differential not adjustable					page 21 + 22
Ex-DDCM252*	4…25 mbar	2 mbar	0.5 bar		
Ex-DDCM662*	10…60 mbar	15 mbar	1.5 bar	Aluminium	3 + 20
Ex-DDCM1602*	20…160 mbar	20 mbar	3 bar	+ Perbunan	
Ex-DDCM6002*	100…600 mbar	35 mbar	3 bar		
Ex-DDCM014*	-0.1…0.4 bar	0.15 bar	15 bar		
Ex-DDCM1	0.2…1.6 bar	0.13 bar	15 bar	stainless steel	
Ex-DDCM4*	1…4 bar	0.2 bar	25 bar	1.4305 +	3 + 21
Ex-DDCM6	0.5…6 bar	0.2 bar	15 bar	1.4571	
Ex-DDCM16	3…16 bar	0.6 bar	25 bar		

* without graduation (only ± scale)
** also loadable on one side

Accessories: · Threaded joint with male adapter union G 1/4"/8 mm MAU8/Ms and MAU8/Nst page 145
· Valve combinations VKD3 and VKD5, page 144

Calibration

The **Ex-DDCM** series is calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 17, 1. Calibration at lower switching point).



Pump monitoring application example

The differential pressure switch (e.g. Ex-DDCM1) monitors differential pressure through the pump. The system shuts down if values fall below an adjustable switching threshold. Pump monitoring does not depend on the static pressure in the system.

Ex-VNM111

Ex-VCM/Ex-VNM

II 2G Ex d e IIC T6 Gb
II 1/2D Ex ta/tb IIIC T80 ºC Da/Db

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) according to DIN 16 288 and internal thread G 1/4 according to ISO 228 Part 1.

Switching device
Robust housing (700) made of seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 65

Pressure sensor materials

Ex-VNM111 and Ex-VNM301:	Metal bellows: 1.4571 Sensor housing: 1.4104
Ex-VCM095, 101 and 301:	Metal bellows of Cu Zn Sensor housing of CuZn
Ex-VCM4156:	Perbunan diaphragm sensor housing: 1.4301

Mounting position
Vertically upright and horizontal.
Ex-VCM4156 vertically upright.

Ambient temp. at switching device
–20…+60 °C

Max. medium temperature
The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gaugeconnection) or on a flat surface with two 4 mm Ø screws.

Switching pressure
Adjustable from outside with screwdriver.

Contact arrangement
Single-pole changeover switch.

Switching capacity	250 VAC (ohm)	250 VAC (ind)	250 VDC (ohm)	24 VDC (ohm)
Ex-d	3 A	2 A	0.03 A	3 A

Product Summary

Type	Setting range	Switching differential (mean values)	Max. permissible pressure	Dimen-sioned drawing
Switching differential not adjustable				page 21 + 22
Ex-VCM4156	–15…+6 mbar	2 mbar	1 bar	3 + 11
Ex-VCM301	–250…+100 mbar	25 mbar	1.5 bar	3 + 13
Ex-VNM301	–250…+100 mbar	45 mbar	3 bar	3 + 15
Ex-VCM101	–1*…+0.1 bar	45 mbar	3 bar	3 + 14
Ex-VCM095	–0.9…+0.5 bar	50 mbar	3 bar	3 + 14
Ex-VNM111	–1*…+0.1 bar	50 mbar	6 bar	3 + 15

* At very high vacuums, close to the theoretical maximum of –1 bar, the switch may not be usable in view of the special conditions of vacuum engineering. However, the pressure switch itself will not be damaged at maximum vacuum.

Calibration

The **Ex-VCM** and **Ex-VNM** series are calibrated for falling pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at falling pressure. The reset point is higher by the amount of the switching differential. (See also page 23, 1. Calibration at lower switching point).

Ex-DWR25

Ex-DWR

II 2G Ex d e IIC T6 Gb
II 1/2D Ex ta/tb IIIC T80 °C Da/Db

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 (pressure gauge connection) to DIN 16 288 and internal thread G 1/4 to ISO 228 Part 1 (for gas applications internal thread permissible only up to 4 bar).

Switching device
Rugged housing (700) made of seawater-resistant diecast aluminium.

Materials
Pressure bellows: Material no. 1.4571
Sensor housing: Material no. 1.4104 Switch housing: GD Al Si 12 (DIN 1725)

Mounting position
Vertically upright

Ambient temperature at switching device
–20 to +60°C.
Medium temperature –25 to +60°C. The maximum medium temperature at the pressure sensor must not exceed the permitted ambient temperature at the switching device. Higher medium temperatures are possible provided the above limit values for the switching device are ensured by suitable measures (e.g. siphon).

Mounting
Directly on the pressure line (pressure gauge connection) or on a flat surface with two 4 mm Ø screws.

Calibration
The DWR series is calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 23, 2. Calibration at upper switching point).

Bursting pressure
For all types ≥ 100 bar, verified by TÜV test.

Contact arrangement Single pole changeover switch.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Ex-d	3 A	2 A	0.03 A	3 A

Degree of protection IP 65, only vertically upright

Ex protection
EEx de IIC T6

Component tested for	**Steam**	Systems according to TRD 604
	Hot water	Systems according to DIN EN12828
	Fuel gases	DVGW Worksheet G 260
	Pressure tank	DIN EN764-7
Function	Pressure monitor or pressure limiter (with external interlock)	
Direction of action	**For maximum and minimum pressure monitoring (DWFS, SDBFS)**	
Sensor	**"of special construction"** by testing with 2 million cycles.	

Product Summary

Type	Setting range	Switching differential (mean values)	Maximum working pressure	Dimen-sioned drawing
Switching differential not adjustable				**page 21 + 22**
Ex-DWR06	0.1…0.6 bar	0.04 bar	6 bar	4 + 15
Ex-DWR1	0.2…1.6 bar	0.06 bar		
Ex-DWR3	0.2…2.5 bar	0.1 bar	16 bar	4 + 18
Ex-DWR6	0.5…6 bar	0.2 bar		
Ex-DWR625	0.5…6 bar	0.25 bar	25 bar	4 + 17
Ex-DWR16	3…16 bar	0.5 bar		
Ex-DWR25	4…25 bar	1.0 bar	63 bar	4 + 16
Ex-DWR40	8…40 bar	1.3 bar		

Ex-DGM525

Ex-DGM

⟨Ex⟩ II 2G Ex d e IIC T6 Gb

⟨Ex⟩ II 1/2D Ex ta/tb IIIC T80 °C Da/Db

SIL 2 according IEC 61508-2

Technical data

Pressure connection
External thread G 1/2 to DIN 16 288 and internal thread G 1/4 to ISO 228 Part 1 (permissible up to 4 bar).

Switching device
Seawater-resistant diecast aluminium GD Al Si 12.

Degree of protection
IP 65

Pressure sensor materials
See Product Summary

Ambient temperature –20 to +60°C.
At ambient temperatures below 0°C, ensure that condensation cannot occur in the sensor or in the switching device.

Maximum working pressure
See Product Summary

Mounting
Either directly on the pipe or with two 4 mm ø screws on the wall surface.

Mounting position
Vertically upright

Setting
Continuously adjustable via the setting spindle with a screwdriver. The set switching pressure is visible in the scale window.

Switching differentials
Largely independent of the set switching pressure. Not adjustable. For values see Product Summary.

Switching capacity	250 VAC (ohm)	(ind)	250 VDC (ohm)	24 VDC (ohm)
Ex-d	3 A	2 A	0.03 A	3 A

Pressure measuring connection
Care must be taken to ensure that a pressure measuring connection is available in a suitable place on the gas appliance.

Component tested for	Fuel gases according to DVGW Worksheet G 260
Testing basis	DIN EN1854
Function	Pressure monitor
Direction of action	**For maximum and minimum pressure monitoring**

Product Summary

Type	Setting range	Switching differential (mean values)	Max. working pressure	Materials in contact with medium	Dimensioned drawing
					page 21 + 22
Ex-DGM506	15…60 mbar	10 mbar	5 bar	1.4104	
Ex-DGM516	40…160 mbar	12 mbar	5 bar	1.4104	3 + 12
Ex-DGM525	100…250 mbar	20 mbar	5 bar	1.4104	

Calibration
The **Ex-DGM** series is calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 23, 2. Calibration at upper switching point).

For other pressure ranges see type series DWR, page 65

HCD

Pressure and differential pressure monitors for air and fuel gases

HCD6010

Pressure switches of the HCD series are suitable for neutral and non-aggressive gases. They can be used for monitoring overpressure and differential pressure. For overpressure detection the pressure side is connected to the lower connection piece G 1/4"; for vacuum detection the pressure side is connected to the upper connection piece G 1/8" (remove sealing clamp). For differential pressure detection, high pressure is applied to the lower connection piece (G 1/4") and low pressure to the upper connection piece (G 1/8"). A pressure measurement connection (9 mm ø) is available for accurate setpoint adjustment. The pressure switch is tested according to DIN EN1854 and approved by DVGW for air and fuel gases according to DVGW worksheet G 260.

Technical data

Pressure connection
Pressure connection for overpressure:
G 1/4" internal thread.
For vacuum and differential pressure:
G 1/8" internal thread.

Switch housing
Diecast aluminium.

Medium temperature
–15 to +60 °C.

Maximum working pressure
See Product Summary

Mounting position
Horizontal with connection pieces pointing downwards.

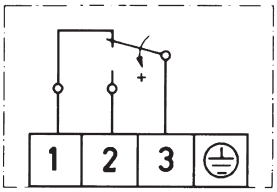
Type of protection IP 40 according to DIN 40050.

Mounting
Either directly on pipe or with mounting bracket (supplied) on a vertical surface.

Setting the switching point
Remove the cover and turn the setting spindle marked +/– in the corresponding direction. The scale shows only guideline values. For accurate setpoint adjustment it is necessary to use a pressure gauge which can be attached to the measuring point (9 mm ø pressure measurement connector).

Switching function Single pole switching.

Electrical connection



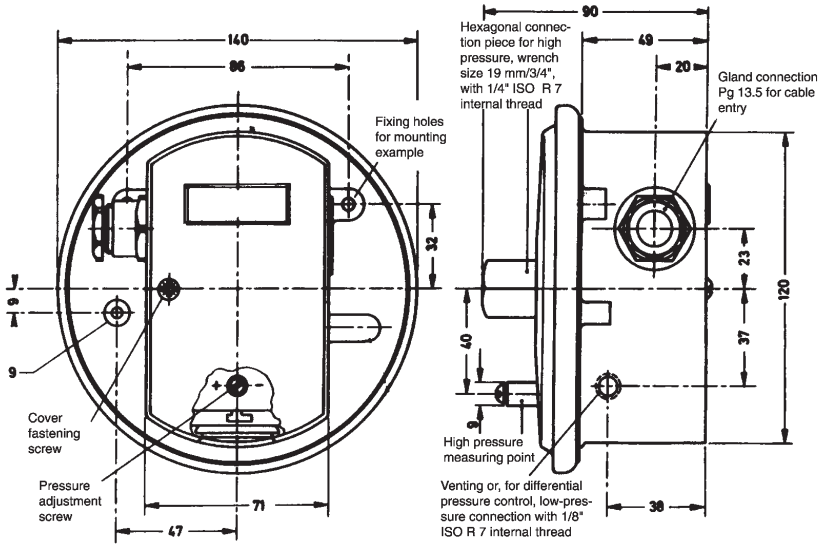
Switching capacity
2 A/220–240 VAC (inductive load)
10 A/220–240 V AC (resistive load)

Cable entry Pg 13.5

Type	Setting range	Switching differential in lower range	Switching differential im upper range	Max. working pressure
HCD6003	0.2…3 mbar	0.3… mbar	0.5 mbar	100 mbar
HCD6010	1…10 mbar	0.3… mbar	1 mbar	100 mbar
HCD6050	5…50 mbar	1.5… mbar	3 mbar	200 mbar
HCD6150	15…150 mbar	4… mbar	10 mbar	300 mbar

The switching differential is not adjustable. The low switching differentials are for the lower setting range; the higher values relate to the upper ranges.

Dimensioned drawing



CE **DVGW** tested

Protection Class: IP 40

DPS400F

DPS

Differential pressure switches for ventilation and air-conditioning (not for fuel gases)

Differential pressure switches for filter, fan or air flow monitoring in air-conditioning and ventilation systems, tested according to the EC Gas Appliance Directive 2009/142/EC and DIN EN 1854

Technical data

Pressure connection
Plastic connection piece with 6 mm external diameter for measuring hose with 5 mm internal diameter. Connector P 1 for higher pressure, P 2 for lower pressure.

Pressure medium
Air, and non-combustible and non-aggressive gases.

Diaphragm
made of sintered silicone is resistant to outgassing. Switching kinematics on the "P2" side.

Switch housing and parts in contact with medium
Switch housing and pressure connection P 2 made of PA 6.6. Lower part and pressure connection P 1 made of POM.

Medium and ambient temperature
–20°C to +85°C
(storage temperature –40°C to +85°C)

Maximum working pressure
100 mbar for all types.

Mounting position
vertical, pressure connections pointing downwards. (With horizontal mounting and cover facing upwards, the scale values are 20 Pa below the actual values; with horizontal mounting and cover facing downwards, the scale values are 20 Pa higher. At setting values below 50 Pa, the device must be mounted vertically!).

Degree of protection: IP 54

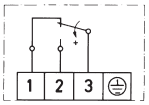
Mounting
Via fastening pieces integrated into the housing with 2 screws, mounted directly onto a vertical surface, e.g. of the airconditioning unit or air duct. For mounting in the ceiling area, use an L-shaped bracket if necessary.

Setting the switching point
Remove the cover and set the scale to the desired value. The setting values relating to the upper switching point (for maximum pressure monitoring). For minimum pressure monitoring, the switching point lies below the setting value, according to the switching differential.

Weight: 160 g

Switching function: single pole switching.

Electrical connection



Flat plug 6.3 x 0.8 DIN 46 244 or use the screw terminals supplied.

Min. switching capacity: 5 mA / 5 VDC
Max. switching capacity: 1.5 (0.4) A / 250 VAC

Cable entry: M 16x1,5

FEMA by Honeywell

Product Summary

Type	Setting range for upper switching	Switching differentials (guideline values)
DPS200F	0.2…2 mbar	0.1 mbar
DPS400F	0.4…4 mbar	0.2 mbar
DPS500F	0.5…5 mbar	0.2 mbar
DPS1000F	2…10 mbar	1 mbar
DPS2500F	5…25 mbar	1.5 mbar

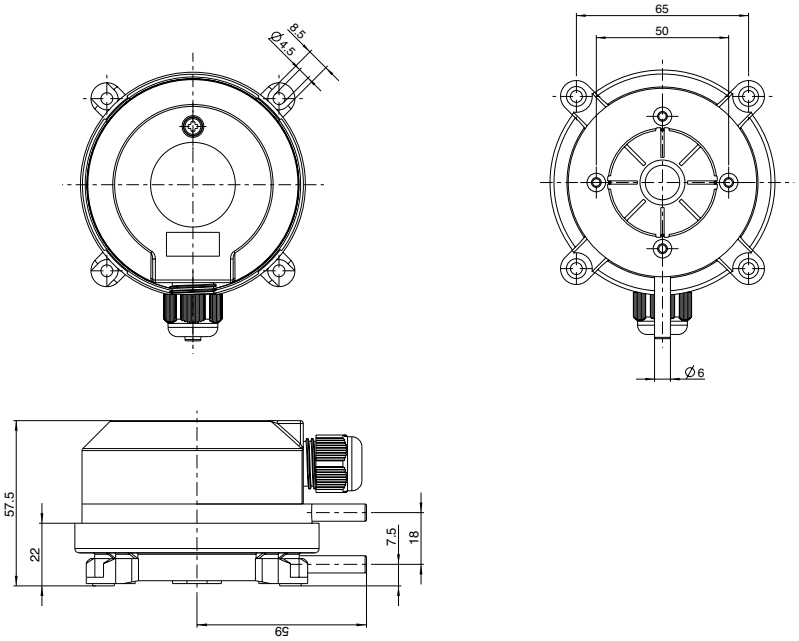
DVGW test certificate

EC type testing according to EC Gas Appliance Directive (EU/2009/142/EG) and DIN EN 1854

Supplied accessories:

2 m silicone hose, 2 connection pieces with mounting screws,
2 self-tapping screws for mounting the housing,
3 screw terminals for the electrical connection

Dimensioned drawing



CE

DVGW tested

Protection Class: IP 54

Electronic pressure switches

FEMA
by Honeywell

Without display

With display and control panel

Smart DCM

Electronic pressure switches

The robust, microprocessor-supported electronic pressure switches in the Smart DCM series from Honeywell FEMA measure relative pressures in ranges from -1 ...+1 bar and 0-40 bar They are particularly suitable for controlling system pressures in the fields of mechanical engineering, supply engineering, environmental technology and HVAC. The equipment can be installed directly in the pressure line using the G1/2" external thread. Entering switching points is easy with the generously proportioned keyboard and graphic display. For OEM applications, devices can be supplied with fixed parameter and switching point adjustment.

Technical data

Measuring ranges	
relative	1… + 40 bar
Ambient temperature	
Versions without HMI	–20…+80 °C
Versions with HMI	–20…+70 °C
Storage temperature	
Versions without HMI	–40…+80 °C
Versions with HMI	–30…+80 °C
Medium temperature	–20…+70 °C
Relative humidity	0…95 % non-condensing
Overall accuracy	0.5% of full scale
Weight	
Versions without HMI	300 grams
Versions with HMI	350 grams
Parts in contact with medium	Stainless steel (1.4571)
Process connection	
Pressure gauge connection	G1/2" external thread
Electrical connection	
Plug connection	5-pin M12x1
Protection class	II as per EN 61010
Versions without HMI	IP67
Versions with HMI	IP65
Power supply	18...35 Vdc
EMC	as per EN 61326
Switching output	Open collector
Open collector switching output	
Contact load	250 mA (protected against excess current)
Upper value (min.)	Supply -2 V
Lower value (max.)	GND + 0,5 V
Hysteresis	SP and RP in the menu free choice
Warning output	Pin 2
Housing and cover	PA66 GF25

Functions

· Configuration of open collector switching output as:
- ❑ minimum pressure monitor,
- ❑ maximum pressure monitor,
- ❑ pressure window monitoring

· configuration of switching contact as:
- ❑ normally closed
- ❑ normally open

· Setting the switching and reset point over the entire pressure range
· Switch on/off delay
· Simulation mode
· Devices without display are factory-configured
· Devices with display and keyboard can be easily configured by the customer
· The optional Hard- and Softwaretool CFT1 allowes simple configuration and parametrization of all Smart SNDCM models by PC

Smart DCM display functions (device series with display only)

· Rotation of graphics display in 90° steps, possible by means of software.
· Current pressure display
· Switching state display
· Two-colour background lighting for warning signals

Other features:

· Restore function
· Warning function for implausible switching points, sensor fault, overload and overheating
· Manual zero adjustment
· 4-digit code enables locking

Electrical connection:

· 5-pin M12x1 plug connector, Form A
· M12x1 connector included

Product Summary

RV101 = -1... +1 bar relative
RB001 = 0... 1 bar relative
RB004 = 0... 4 bar relative
RB010 = 0... 10 bar relative
RB016 = 0... 16 bar relative
RB025 = 0... 25 bar relative
RB040 = 0... 40 bar relative

PS	S	RV101	1	- S
PS = Pressure switch	H = HMI* S = Standard, not configurable		1 = G1/2" Standard Pressure gauge connection	S = Special designation, setting according to customer specification

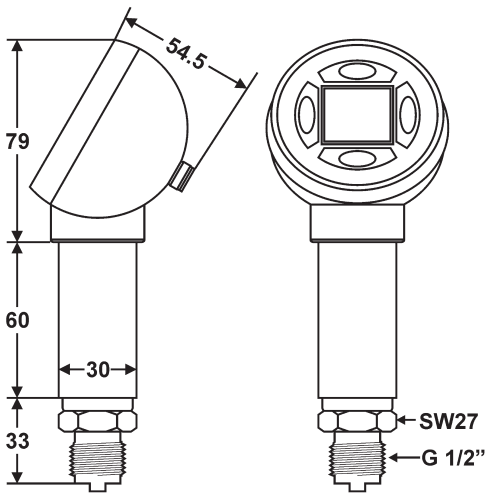
* HMI = **H**uman **M**achine **I**nterface = Digital display + Data input via buttons

Type**	Pressure in bar	Max. permissible pressure (bar)	Type
PSSRV1011-S	-1...+1	6	**PSHRV1011**
PSSRB0011-S	0...1	3	**PSHRB0011**
PSSRB0041-S	0...4	12	**PSHRB0041**
PSSRB0101-S	0...10	30	**PSHRB0101**
PSSRB0161-S	0...16	48	**PSHRB0161**
PSSRB0251-S	0...25	50	**PSHRB0251**
PSSRB0401-S	0...40	80	**PSHRB0401**

** Minimum order quantity: 25 pieces

CFT1: Software for Windows XP and data interface for easy adjustment of switching points, switch on/off delay, for example; as well as checking for excess pressure/temperature, see also page 147

Dimensioned drawings



PSHR... PSSR...

With display and control panel

Smart DCM DIFF

Electronic differential pressure switches

The microprocessor-supported electronic differential pressure switches in the Smart DCM DIFF series from Honeywell FEMA measure differential pressures and relative pressures in 6 pressure stages from 0-100 mbar to 0-20 bar.

Electronic differential pressure switches are highly suitable for a wide variety of applications, including the accurate measurement, monitoring and control of differential pressures. The principal applications are in pump and filter monitoring.

Technical data

Measuring ranges	relative 0-100 mbar to 0-20 bar
Ambient temperature	
Versions with HMI	–20…+70 °C
Storage temperature	
Versions with HMI	–30…+80 °C
Medium temperature	–20…+80 °C
Relative humidity	0…95 % non-condensing
Accuracy	1 % except PSH DM 1002
Weight	
Versions without HMI	400 grams
Versions with HMI	450 grams
Parts in contact with medium	Stainless steel 1.4404 (AISI 316 L)
Process connection	2x G1/4" internal thread
Electrical connection	5-pin M12x1 plug, "A"
Protection class	III as per EN 61140 (PELV)
Versions with HMI	IP65
Climate class	
Indoor	4K4H as per EN 60721-3-4
Outdoor	3K8H as per EN 60721-3-3
Mechanical stability	
Vibration	20g as per IEC 68-2-6 (up to 2000 Hz)
Mechanical shock	100g as per IEC 68-2-27
Power supply	18...35 Vdc, max. 30 mA
Open collector switching output	
Contact load	250 mA (protected against excess current)
Upper value (min.)	Supply - 2 V
Lower value (max.)	GND + 0.5 V
Response time	max. 300 ms
Hysteresis	SP and RP in the menu free choice
Housing and cover	PA66 GF25, Chemical resistance 4C4 as per EN 60721-3-4
Display screen cover	PMMA (Plexiglas)
Membrane keyboard	Polyester

Functions

· Configuration of open collector switching output as:
- ❑ minimum pressure monitor,
- ❑ maximum pressure monitor,
- ❑ pressure window monitoring

· Configuration of switching contact as:
- ❑ normally closed
- ❑ normally open

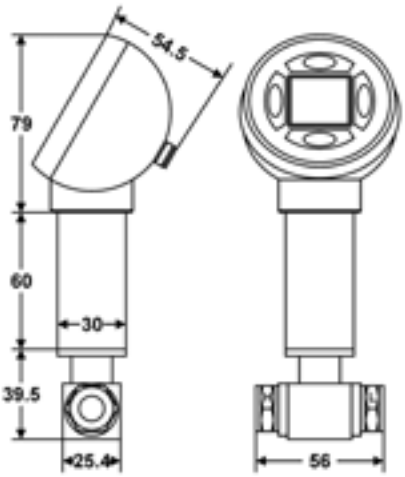
· Setting the switching and reset point over the entire pressure range
· Switch on/off delay
· Simulation mode
· Devices with a display and keyboard can be easily configured by the customer

Smart DCM DIFF display functions (device series with display only)
· Displays current pressure in bar, Pa, psi und %
· Switching state display
· Two-colour background lighting for warning signals

Other:
· Restore function
· Warning function for implausible switching points, sensor fault, overload and overheating
· Manual zero adjustment
· 4-digit code enables locking

Electrical connection:
· 5-pin M12x1 plug connector, Form A
· M12x1 connector included

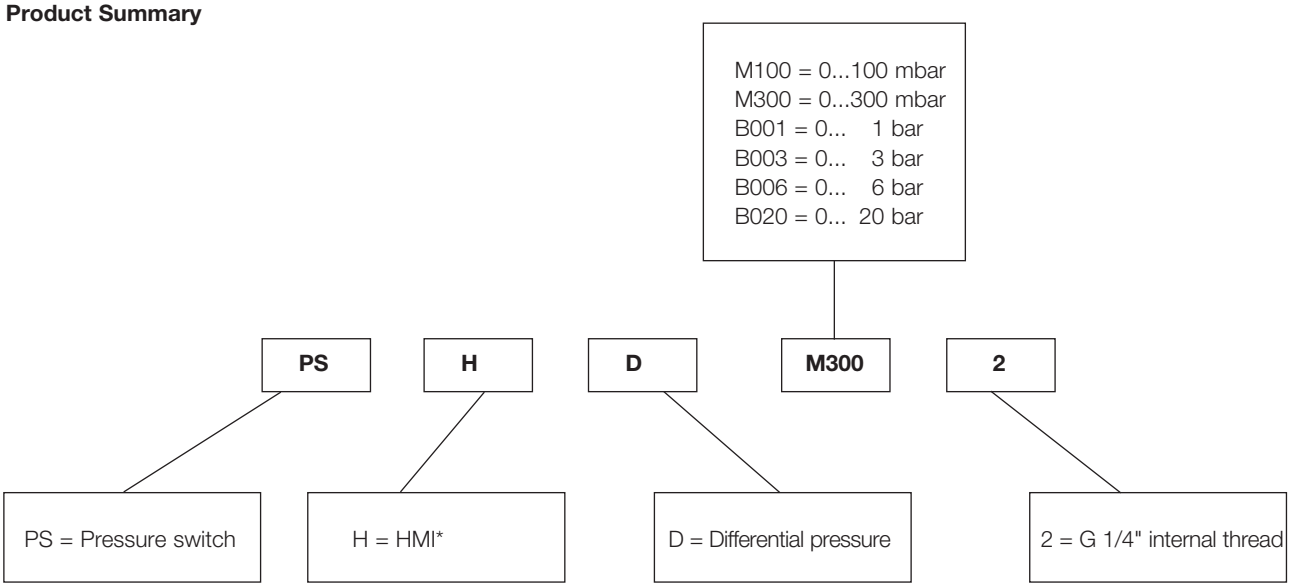
Dimensioned drawings



CE

Protection Class:
IP 65/ IP 67

Product Summary



* HMI = **H**uman **M**achine **I**nterface = Digital display + Data input via buttons

Type	Measuring range (bar)	Max. permissible differential pressure (bar)	Bursting pressure (bar)	Overrange pressure (bar)	Max. permissible system pressure (bar)
PSHDM1002	0-0,1	0,9	1,2	0,9	70
PSHDM3002	0-0,3	0,9	1,2	0,9	70
PSHDB0012	0-1	3	4	3,0	70
PSHDB0032	0-3	9	12	7,0	70
PSHDB0062	0-6	21	28	7,0	70
PSHDB0202	0-20	60	70	7,0	70

Measuring range:
Calibrated measuring range of device. The switching and resetting points can be set within this pressure range. This pressure range is given in the product ordering code PSHD**M3002**, for example. Here **M300** means pressure range 0-300 mbar.

Maximum premissible differential pressure:
Maximum pressure difference thatmay be connected between the two connections "H" and "L" without knocking the sensor element out of adjustment or causing it long-term damage.

Bursting pressure:
Above the stated bursting pressures, the sensors are subject to mechanical failure. This removes the security of separation between the "H" and "L" connections and the sensor housing may even rupture.

Maximum permissible system pressure:
System pressure that may be allowed to bear on both pressure connections without knocking the sensor element out of adjustment or causing it long term damage. Within these limits, the pressure may be allowed to reach the maximum permissible differential pressure on the overpressure side "H" without putting the sensors out of adjustment or causing them long-term damage.

Attention:
According to intended use, the lower pressure needs to be connected to the "L" marked port and the higher pressure to "H" marked port. Interchange of both ports (high pressure at "L" port) may lead to damage of the differential pressure measurement cell.

Smart Press PST

Smart Press PST/PST-R

Electronic pressure switches/pressure transmitters

Honeywell Fema PST and PST…R series pressure switches are highly versatile, can be adjusted and configured in two modes and are used for fine adjustment and monitoring of system pressures in plant engineering, fluidics, process engineering and pneumatics, and for monitoring and control of pumps and compressors. They are all fitted with a WARNING system and have a standardized 20 mA warning output. The equipment is therefore also used in manufacturing lines in the automotive industry and in many areas of mechanical and special-purpose engineering. With an overall accuracy of 0.5% of full scale, these pressure switches/transmitters are also suitable for measurement monitoring in many laboratory applications.

Technical data

Measuring ranges	–1… + 600 bar
Ambient temperature	–20…+60 °C
Storage temperature	–35…+80 °C
Medium temperature	–20…+100 °C
Relative humidity	0…95 % non-condensing
Overall accuracy	≤ 0.5 % of full scale
Weight	depends on model
Parts in contact with medium	1.4571 and 1.4542 (250 - 600 bar), 1.4571 and 1.4435 (< 250 bar and flush to the front)
Process connections	
Pressure gauge connection	G 1/2" external thread
Quasi-flush	G 3/4" external thread
Electrical connections	
PST	2 x 5-pin M 12 plug, as per DIN IEC 60947-5-2 (available as accessory)
PST…- R versions	Additional 4-pin M 12 plug (available as accessory)
Protection class	II as per EN 60335-1 IP 65 as per EN 60529
Climate class	C as per DIN EN 60654
Power supply	14…36 VDC
EMC	as per EN 61326/A1
Outputs	
2 open collector Switching outputs	250 mA at 14...36 VDC, Configurable as high-side/low-side switching and as push/pull outputs
Hysteresis	(SP and RP) selectable via software
Reaction time	30 ms
Relay outputs (TST…-R)	
Permissible resistive load	250 VAC, 5 A,
Permissible inductive load	250 VAC, 0.8 A (200 VA)
Contact type	1 changeover contact (1 x UM)
Service life	at least 250,000 switching cycles
Warning output	
Output configuration	Warning output on plug 2 max. 20 mA, 14...36 VDC
Transmitter output	
Voltage/current	0–10 V or 4–20 mA, configurable (also invertible) in expert mode
Housing and cover	Polybutylene terephthalate PBT-GF30, resistant to chemicals and stress cracking
Display screen cover	Polycarbonate PC
Weight	approx. 380 g

Functions

The 2 switching outputs can be configured as:
· Minimum pressure monitors, maximum pressure monitors, pressure window monitoring
· Configurable as normally closed or normally open, high-side or low-side switching and as a push/pull output
· Relay output assigned to channel 1 or 2 or to the warning output (in the case of PST…-R)

Configuration of the analog output:

· 0-10 V, 4-20 mA or 10-0 V and 20-4 mA
· Analog measuring range can be limited to a minimum of 50 % of the total measuring range
· Select pressure unit: bar, Pa or psi

Smart Press display functions:

· 4-digit digital display with bar graph for pressure trend, settings and set parameters
· 2 three-colour LEDs to show the switching state of the outputs, implausible settings and as a warning status indicator

Electrical pin connection:

· Two 5-pin M12 plug connections for power supply, switching outputs and analog output
· One 4-pin M12 plug connection for the relay output (PST…-R versions)

Plus:

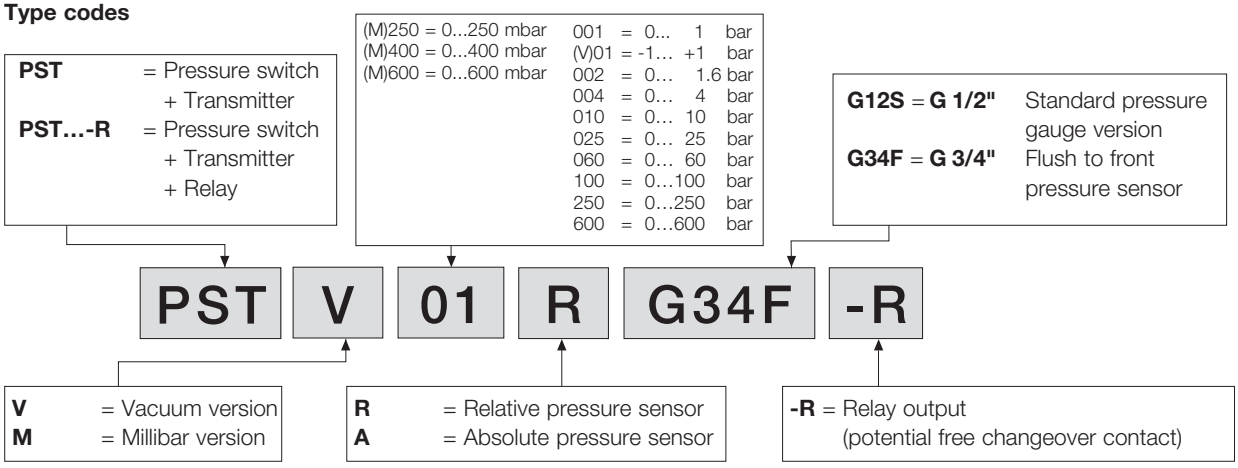
· Pressure peak filter
· Pressure simulation and switching simulation modes
· Restore function
· Warning function for implausible switching points, sensor fault, overload and overheating
· Manual zero adjustment

FEMA by Honeywell

CE

Protection Class: IP 65

Type codes



Type	Pressure in bar	Max. permissible pressure (bar)	Type	Dimensioned drawing pg. 79
PSTV01RG12S	-1… +1	6	**PSTV01RG12S-R**	
PSTM250RG12S	0 – 250 mbar	1	**PSTM250RG12S-R**	
PSTM400RG12S	0 – 400 mbar	2	**PSTM400RG12S-R**	
PSTM600RG12S	0 – 600 mbar	2	**PSTM600RG12S-R**	
PST001RG12S	0 – 1 bar	6	**PST001RG12S-R**	
PST002RG12S	0 – 1,6	6	**PST002RG12S-R**	
PST004RG12S	0 – 4	12	**PST004RG12S-R**	
PST010RG12S	0 – 10	30	**PST010RG12S-R**	
PST025RG12S	0 – 25	75	**PST025RG12S-R**	30 +
PST060RG12S	0 – 60	180	**PST060RG12S-R**	31
PST100RG12S	0 – 100	300	**PST100RG12S-R**	
PST250RG12S	0 – 250	500	**PST250RG12S-R**	32
PST600RG12S	0 – 600	1000	**PST600RG12S-R**	
PSTV01RG34F	-1… +1	6	**PSTV01RG34F-R**	
PSTM250RG34F	0 – 250 mbar	1	**PSTM250RG34F-R**	
PSTM400RG34F	0 – 400 mbar	2	**PSTM400RG34F-R**	
PSTM600RG34F	0 – 600 mbar	2	**PSTM600RG34F-R**	
PST001RG34F	0 – 1 bar	6	**PST001RG34F-R**	
PST002RG34F	0 – 1,6	6	**PST002RG34F-R**	
PST004RG34F	0 – 4	12	**PST004RG34F-R**	33
PST010RG34F	0 – 10	30	**PST010RG34F-R**	
PST025RG34F	0 – 25	75	**PST025RG34F-R**	
PST002AG12S	0 – 2	6	**PST002AG12S-R**	30 +
PST010AG12S	0 – 10	30	**PST010AG12S-R**	31
PST002AG34F	0 – 2	6	**PST002AG34F-R**	33
PST010AG34F	0 – 10	30	**PST010AG34F-R**	

PST plug requirement

PST...	
- as transmitter	One ST12-5
- as switch	One ST12-5
- as transmitter + switch	Two ST12-5
PST... R	
- as transmitter + relay	One ST12-5 + One ST12-4
- as switch + relay	One ST12-5 + One ST12-4
- as transmitter + switch + relay	Two ST12-5 + One ST12-4

CE

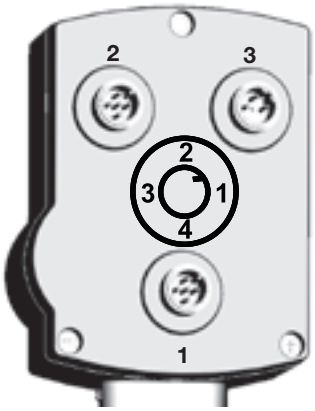
Protection Class: IP 65

Accessories (to be order separately)

Cable socket Type			
For output 1+2			
ST12-5-A	5-pin	A-coded	Right-angle version
ST12-5-G	5-pin	A-coded	Straight version
For output 3 (relay output)			
ST12-4-A	4-pin	B-coded	Right-angle version
ST12-4-G	4-pin	B-coded	Straight version
ST12-4-AK	4-pin	B-coded	Right-angle version with 2 m cable
ST12-4-GK	4-pin	B-coded	Straight version with 2 m cable
Plug protection cap			
STA12			IP 65

Electrical connection

Electrical connection and contact assignment
Electrical connection is via M12 plugs on the back of the unit. Depending on the version, either 2 (PST) or 3 (PST…-R) M12 connector plugs are available (not supplied with the unit).



Contact assignment on plug 1 (A-coded)
Pin 1: Supply voltage 14…36 VDC
Pin 2: OUT 2 (output 2) open collector output
Pin 3: 0 volt (ground)
Pin 4: OUT 1 (output 1) open collector output
Pin 5: Serial interface (locked for calibration)

Special characteristic of open collector outputs:
Depending on the design, the output voltage at open collector outputs can be up to 2.5 V lower than the applied supply voltage.
Example: Supply voltage 14 V… output voltage OUT 1 approx. 11.5 V.

Contact assignment on plug 2 (A-coded)
All versions of series PST and PST…-R are also equipped with an A-coded M 12 plug.
Pin 1: Supply voltage 14…36 VDC
Pin 2: WARN (warning output max. 20 mA)
Pin 3: 0 V (ground)
Pin 4: Analogue output AOUT
Pin 5: Serial interface (for factory calibration only)
Units of the PST series can be powered both via plug 1 and via plug 2. If the PST is used purely as a transmitter, only one connection via plug 2 is needed, because the supply voltage can be connected here too (see "Contact assignment on plug 1").

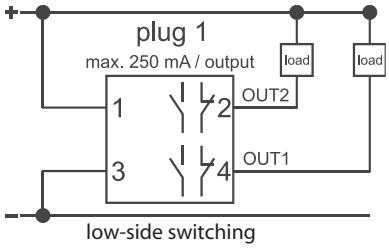
Contact assignment on plug 3 (B-coded)
All versions of series PST…R are also equipped with a B-coded M 12 plug.
Pin 1: Common contact
Pin 2: normally closed contact
Pin 3: normally open contact

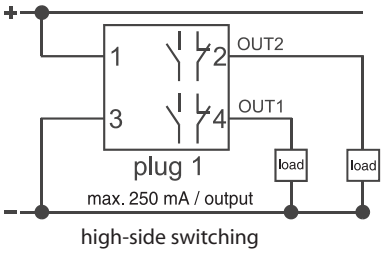
Contacting
ST12-4-AK and ST12-4-GK

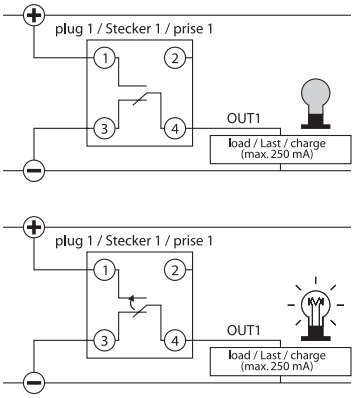
Relais contact	colour	Contact
1	brown	common
2	white	NC
3	blue	NO
4	green/yellow	n. a.

NB – For IP65 special plug protection cap STA12 is required
Observance of IP65 water and dust proofing requires the secure sealing of electrical connections not closed with plugs.
The soft rubber dust caps fitted for shipping do not fulfil this requirement. A reliable seal can only be achieved by the **STA12** protection cap.

Switch outputs







High-side switching push/pull outputs

Switch output OUT1 and OUT2:
The switch outputs can be configured via the software (at expert level) both as normally closed / normally open, and as high-side and low-side switching.

- In **normally closed configuration**, the selected voltage potential (ground or supply voltage) occurs at the output in the **unswitched** state.
- In **normally open configuration**, the selected voltage potential (ground or supply voltage) occurs at the output in the **switched** state.
- In the **low-side switching configuration**, the outputs switch the voltage potential 0V (ground) with respect to a consumer connected to OUT1 or OUT2.
- In the **high-side switching configuration**, the outputs switch the supply voltage potential (minus approx. 2V) with respect to a consumer connected to OUT1 or OUT2.

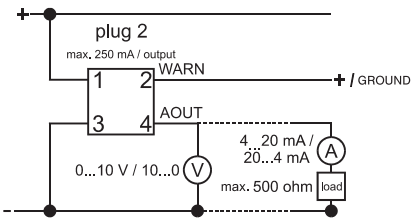
If the power supplies of the pressure switch and connected load are independent of one another, the following must be taken into account: The potential difference between OC output and ground and OC output and supply voltage must not exceed 36 VDC. If the unit is configured for low-side switching, the external supply voltage must have the same ground reference as the unit itself. If the unit is defined as high-side switching, the external supply voltage must be linked to the supply voltage of the unit. It is important to note that the voltage drop in the through-connected state can be as much as 2 V. The maximum permitted current at the OC is 250 mA per switch output (OUT1, OUT2). A maximum switching current of 250 mA may flow through each channel.

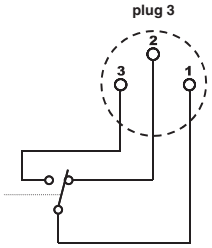
The switching channels are short-circuit-proof and they are monitored for current and temperature. Where current limiting is used and on overheating, both LEDs light up red (WARN function).
The freely configurable outputs can connect both the supply voltage (+ potential) itself and the ground (– potential) of the supply voltage to the output. If plus potential exists at the output, ground minus potential occurs after switching over.

If ground minus potential exists at the output, plus potential occurs after switching over.

Advantage: The output behaves like a mechanical changeover contact which emits either plus or minus potential. In other words, the open output is never electrically undefined, as is the case with an open collector output. Pull-up resistors are therefore unnecessary.

Analogue output and relay output





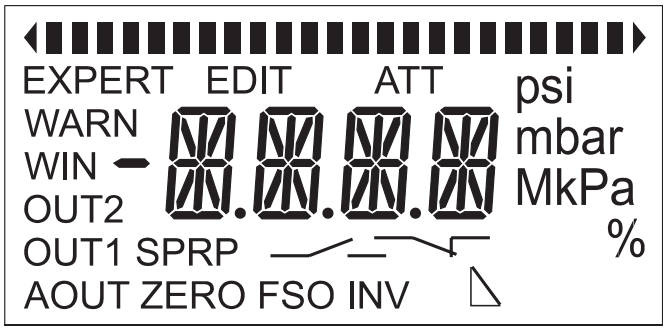
Analogue output AOUT:
The analogue output (AOUT) is available in versions PST and PST…-R. In expert mode it is configurable both as a 0-10 V/10-0 V, and as a 4–20 mA/20–4 mA output. The unit is supplied with the output configured for 0-10 V. The input impedance of the connected consumer **must not exceed 500 ohms**.

Relay output REL:
The relay output is available in version PST…-R. In expert mode the analogue output can be coupled via the software with output 1 (OUT1) and output 2 (OUT2), and with the WARN function. This means that the user can choose a potential-free output for these 3 important functions. The changeover contact of the relay is designed for a maximum resistive load of 4 A and an inductive load of 200 VA. At the lower end the 5 µ gold-plated silver contacts are designed for a minimum load of 50 mW. (5 V at 10 mA).
It should always be remembered that after a one-off maximum load, use at minimum load is no longer possible.

Indicators and display

The indicators in the display have the following meanings:

ATT	Attenuation (for setting a filter)
EXPERT	Expert mode (allows the user to configure the unit, e.g. as maximum detector or minimum detector or for window monitoring)
WARN	Warning function / alarm
WIN	Window monitoring (for monitoring a pressure window to detect exceeding or falling below a selected pressure window)
OUT1	Switch output OC 1
OUT2	Switch output OC 2
SP	Switching point
RP	Reset point Switch contact configured as normally open Switch contact configured as normally closed
AOUT	Analogue output (if the current pressure is outside the currently set range, the "AOUT" symbol is not visible).
ZERO	Zero point display for the analogue output or display symbol if output 1 or output 2 defined as low-side switching (unit switches power supply plus to the output). Combined with "FSO" in the switch configuration menu as indicator for the push/pull function.
FSO	Upper limit of the selected analogue display range or display symbol if output 1 or 2 defined as high-side switching. (unit switches power supply minus to the output). Combined with "ZERO" in the switch configuration menu as indicator for the push/pull function.
INV	Inversion of the analogue signal (i.e. "INV" appears if, instead of a standard analogue signal 0…10 V or 4…20 mA, the analogue signal output is set to 10…0 V or 20…4 mA).



Display

The unit has a 4-digit digital display with 3 decimal points and a minus sign. There are also other symbols for the different settings and configurations.
The display also includes a **bar graph**. This is at the top of the display and consists of a row of separately addressable individual segments with arrow symbols at either end.
As soon as the unit is powered up, all symbols appear on the display for 1 second as a test and the two LEDs light up briefly. The unit then goes into display mode, showing the current system pressure and the selected unit (bar, PSI or Pa). In addition the pressure trend (falling or rising) is indicated by an arrow at the left (falling) or right (rising) end. The "AOUT" indicator tells the user that the pressure is currently in the predefined pressure range for the analogue signal.

Meaning of LED colours

LED status		Meaning	
LED 1 lit	**LED 2 lit**	**Output 1 Status**	**Output 2 Status**
green	green	inactive	inactive
green	orange	inactive	active
orange	green	active	inactive
orange	orange	active	active
red	red	SP/RP implausible	
red	red	error	

Status LEDs

The current status of the switch outputs is displayed by 2 LEDs located beneath the display (LED 1 and LED 2). The two 3-colour LEDs indicate the switching status of the corresponding output and the warning function.

- Orange: the output is **ACTIVE**
- Green: the output is **INACTIVE** (if defined as WARN output, likewise INACTIVE)
- During input of the switching points, only the LED of the switching channel currently being modified is active. When switching points are entered, if an implausible entry is made for the maximum detector, e. g. SP < RP, the relevant channel LED lights up red.
- Both status LEDs light up red as soon as a WARN state occurs (e. g. electronics faulty and unit overheating).

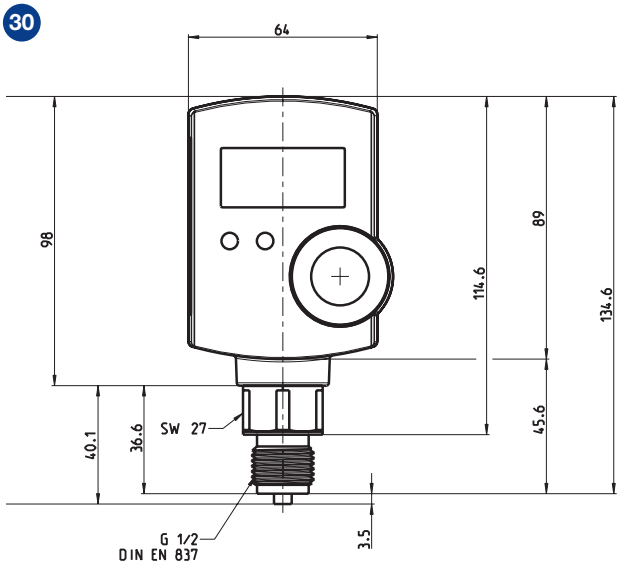
Warning with both LEDs RED and WARN output active

	Display indication
- on sensor failure	-***1
- under-voltage	-**1*
- under-temperature	-*1**
- over-temperature	-*2**

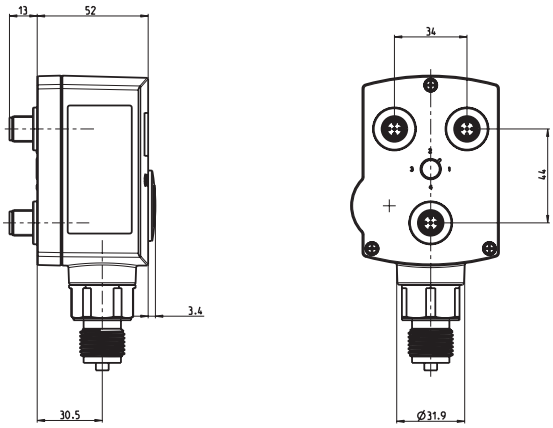
	Display indication
- overload output 1	-1***
- overload output 2	-2***
- overload output 1 and 2	-3***

Dimensioned drawings

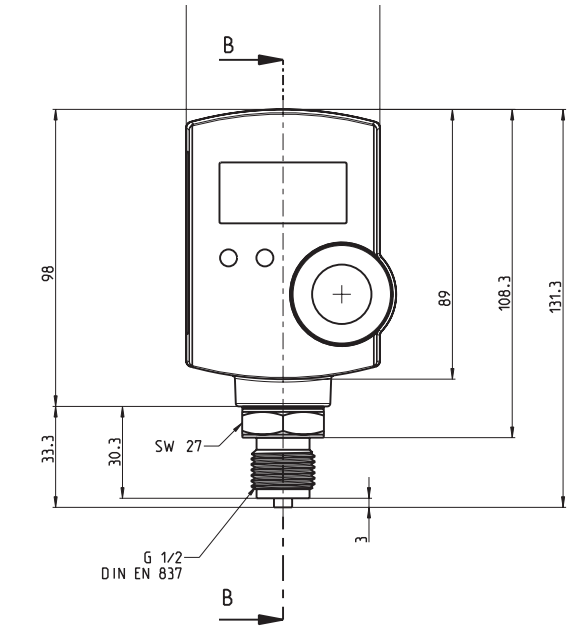
30



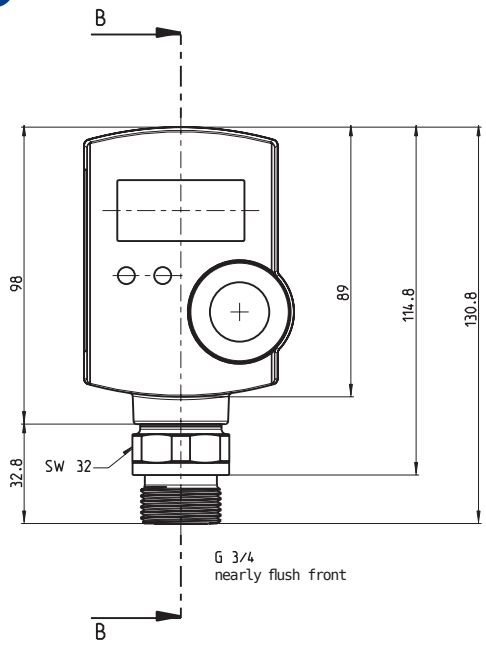
31



32



33



Specifications

Pressure switches

Type series	Pressure switches
PST…	Electronic pressure switches for liquid and gaseous media with 2 open collector switching outputs and analogue output, power supply 14…36V DC, type of protection IP 65, switching points freely adjustable from … to … bar. Freely programmable analogue output 4–20 mA or 0–10 V (may also be inverted), process connection G 3/4'' or G 1/2'', absolute or relative pressure versions Type: PST…
PST…R	Electronic pressure switches for liquid and gaseous media with 2 open collector switching outputs, analogue output and potential-free relay output, power supply 14…36V DC, type of protection IP 65, switching points freely adjustable from … to … bar. Freely programmable analogue output 4–20 mA or 0–10 V (may also be inverted), process connection G 3/4'' or G 1/2'', absolute or relative pressure versions Type: PST…R
DCM…	Pressure switch with plug connection to DIN EN175301. Switch housing made of diecast aluminium GD Al Si 12, type of protection IP 54. Range of adjustment from ... to ... bar/mbar. Switching differential adjustable / not adjustable. Pressure connection G 1/2, external and G 1/4, internal Type: DCM…
DNM…/ VNM…	Pressure switch with plug connection to DIN EN175301. Sensor housing made of stainless steel 1.4104. Switch housing made of diecast aluminium GD Al Si 12, type of protection IP 54. Range of djustment from ... to ... bar/bar. Switching differential adjustable / not adjustable. Pressure connection G 1/2, external and G 1/4, internal Type: DNM...
DNS…/ VNS…	Pressure switch with plug connection to DIN EN175301. Sensor made entirely of stainless steel 1.4571. Switch housing made of diecast aluminium GD Al Si 12, type of protection IP 54. Range of adjustment from ... to ... bar/bar. Switching differential adjustable /not adjustable. Pressure connection G 1/2, external and G 1/4, internal Type: DNS...,VNS...
DNS...351/ VNS...351	Pressure switch with terminal connection. Sensor made entirely of stainless steel 1.4571. Switch housing made of diecast aluminium GD Al Si 12, plastic-coated housing, type of protection IP 65. Range of adjustment from ... to ... bar/bar. Switching differential adjustable / not adjustable. Pressure connection G 1/2, external and G 1/4, internal Type: DNS…, VNS…
DDCM252…	Differential pressure switch with plug connection to DIN EN175301.
DDCM6002	Sensor made of aluminium, measuring diaphragm of Perbunan. Pressure connection G 1/4, internal, switch housing made of diecast aluminium GD Al Si 12, type of protection IP 54. Range of adjustment from …to…bar/bar Type DDCM...
DDCM1… DDCM16	Differential pressure switch with plug connection to DIN EN175301 Sensor made of stainless steel 1.4104 and 1.4571. Pressure connections G 1/4, internal. Switch housing made of diecast aluminium GD Al Si 12, type of protection IP 54. Range of adjustment from …to …bar/bar Type: DDCM…Type series
DWAM…/ DWAMV…	Pressure monitor "of special construction" for maximum pressure monitoring with self-monitoring sensor (safety sensor). Tested according to VdTÜV Memorandum "Pressure 100". Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN EN175301, type of protection IP 54. Range of adjustment from ... to ... bar/bar. Switching differential adjustable / not adjustable. Pressure connection G 1/2, external and G 1/4, internal Type: DWAM…
SDBAM…	Pressure limiter "of special construction" for maximum pressure monitoring. With internal interlock (reclosing lockout) with self-monitoring sensor (safety sensor), tested according to VdTÜV Memorandum "Pressure 100". Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN EN175301, type of protection IP 54. Range of adjustment from ... to ... bar/mbar. Pressure connection G 1/2, external and G 1/4, internal Type: SDBAM…
DWR…/ DWR…203	Pressure monitor "of special construction" for maximum and minimum pressure monitoring. Tested according to VdTÜV Memorandum "Pressure 100" and EN. Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN EN175301, type of protection IP 54. Range of adjustment from ... to ... bar/bar. Switching differential adjustable / not adjustable. Pressure connection G 1/2, external and G 1/4, internal Type: DWR…

Type series	Pressure switches
DWR…205/ DWR…206	Pressure limiter "of special construction" for maximum pressure (205) or minimum pressure monitoring (206). With locking of switching state (reclosing lockout). Tested according to VdTÜV Memorandum "Pressure 100"and DIN EN175301. Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN EN175301, type of protection IP 54. Range of adjustment from ... to ... bar/bar. Pressure connection G 1/2, external and G 1/4, internal Type: DWR…
DGM…	Pressure monitor for gas with plug connection to DIN EN175301. DVGW-tested according to DIN EN1854. Sensor casing of Cu/Zn/ high grade steel 1.4104. Switch housing of diecast aluminium GD Al Si 12, plug connection to DIN EN175301, type of protection IP 54. Range of adjustment from ... to ... bar/bar. Switching differential not adjustable. Pressure connection G 1/2, external and G 1/4, internal Type: DGM…
DWAM…576	Pressure monitor "of special construction" for maximum pressure monitoring. With self-monitoring sensor (safety sensor), positive opening contacts (gold-plated). Resistor combination for wire break and short-circuit monitoring. Tested according to VdTÜV Memorandum "Pressure 100". Switch housing made of diecast aluminium GD Al Si 12, type of protection IP 65. Range of adjustment from ... to ... bar/bar. Pressure connection G 1/2, external and G 1/4, internal Type: DWAM…576
FD16 –326	Pressure monitor "of special construction" for maximum pressure monitoring in liquid gas systems with self-monitoring sensor (safety-sensor). Resistor combination for wire break and short-circuit monitoring. TÜV-tested according to VdTÜV Memorandum "Pressure 100" and DIN EN764-7. Explosion protection: Ex-i. Switch housing made of GD Al Si 12, type of protection IP 65. Adjustable from 3 to 16 bar. Pressure connection G 1/2, external and G 1/4, internal Type: FD16 –326
FD16 –327	Pressure limiter "of special construction" for maximum pressure monitoring in liquid gas systems with self-monitoring sensor (safety-sensor). Switching state interlock (reclosing lockout). Resistor combination for wire break and short-circuit monitoring. TÜV-tested according to VdTÜV Memorandum "Pressure 100" and DIN EN764-7, Part 4. Explosion protection: Ex-i. Switch housing made of GD Al Si 12, type of protection IP 65. Adjustable from 3 to 16 bar. Pressure connection G 1/2, external and G 1/4, internal Type: FD16-327

The specifications refer to the listed normal versions of the pressure switches. In the case of Ex versions or devices with additional functions, the texts must be supplemented or amended accordingly.

Pressure transmitters

FEMA
by Honeywell

Liquids and gases

Smart SN

Smart SN

pressure transmitters

The robust, microprocessor-supported electronic pressure sensors in the Smart SN series from Honeywell FEMA measure relative pressures in ranges from -1 ... +1 bar and 0-40 bar. The Smart SN series transmitters are especially well suited to the measurement and monitoring of system pressures. The graphic display can be rotated in 90° steps and provides reliable readings for the current local pressure and output signal. A generously proportioned keypad ensures the Smart SN transmitter version is simple to configure. The equipment can be installed directly in the pressure line using the G1/2" external thread.

Smart SN ➔ p. 84–85

Liquids and gases

Smart DIFF

Smart SN DIFF

differential pressure transmitters

The microprocessor-supported electronic differential pressure sensors in the Smart DCM DIFF and Smart SN DIFF series from Honeywell FEMA measure differential pressures and relative pressures in 7 pressure ranges from 0-250 mbar to 0-25 bar. Electronic differential pressure switches and differential pressure transmitters are highly suitable for a wide variety of applications, including the more accurate measurement, monitoring and control of differential pressures. The principal applications are in pump and filter monitoring.

Smart SN DIFF ➔ p. 86–87

Liquids and gases

Smart Press PST

Smart Press PST/PST-R

Electronic pressure switches/transmitters

Honeywell Fema PST and PST…R series pressure switches/transmitters are highly versatile, can be adjusted and configured in two modes and are used for the fine adjustment and monitoring of system pressures in plant engineering, fluidics, process engineering and pneumatics, and for the monitoring and control of pumps and compressors. They are all fitted with a WARNING system and have a standardized 20 mA warning output. The equipment is therefore also used in manufacturing lines in the automotive industry and in many areas of mechanical and special-purpose engineering. With an overall accuracy of 0.5% of full scale, these pressure switches/transmitters are also suitable for measurement monitoring in many laboratory applications.

➔ p.74–79

Ventilation and air-conditioning systems

DPTM

DPTM

Differential pressure transmitters, piezoresistive

DPTM series differential pressure transmitters are used to monitor gaseous, non-aggressive media. Possible applications include:

· Air-conditioning and ventilation systems
· Building automation
· Environmental protection
· Fan and ventilation control
· Valve and shutter control
· Filter and fan monitoring

➔ p. 88–89

Without display

With display and control panel

Smart SN

Microprocessor-supported pressure transducers

The robust, microprocessor-supported electronic pressure transducers in the Smart SN series from Honeywell FEMA measure relative pressures in ranges from -1 …+1 bar and 0-40 bar. They are particularly suitable for use as pressure sensors in the fields of mechanical engineering, supply engineering, environmental technology and HVAC. The equipment can be installed directly in the pressure line using the G1/2" external thread. Entering switching points is easy with the generously proportioned keyboard and graphic display. 2- and 3-wire versions are available, as are versions for use with alternating current.

*** All 2-wire versions according IEC 61508 (SIL 2)**

Technical data

Measurement ranges	
relative	1… + 40 bar
Ambient temperature	
Versions without HMI	–20…+80 °C
Versions with HMI	–20…+70 °C
Storage temperature	
Versions without HMI	–40…+80 °C
Versions with HMI	–30…+80 °C
Medium temperature	–20…+70 °C
Relative atmospheric humidity	0…95 % non-condensing
Overall accuracy	0.5% of end value
Weight	
Versions without HMI	300 grams
Versions with HMI	350 grams
Parts in contact with medium	Stainless steel (1.4571)
Process connection	
Pressure gauge connection	G1/2" external thread
Electrical connection	
Plug connection	5-pin M12x1
Protection class	II as per EN 61010
Versions without HMI	IP67
Versions with HMI	IP65
Power supply	
2-wire	18...35 Vdc
3-wire	24 Vac/dc +10/-20
EMC	according to EN 61326
Mechanical stability	
Vibration	20g as per IEC 68-2-6 (up to 2000 Hz)
Mechanical shock	100g as per IEC 68-2-27
Outputs	
Current output	0/4...20 mA max. 500 Ohm (load impedance)
Voltage output	0/4...10 mA min.15 KOhm
Transmitter output (analog)	
Current/Voltage	4…20 mA, 0/2...10 V, 0/4...20 mA configurable (also invertible)
Housing and cover	PA66 GF25

Functions

· Microprocessor-supported 2- and 3-wire pressure sensors
· Scalable up to 50% of the nominal pressure range

Configuration of the analog output:

· 0-10 V, 2-10 V, 0-20 mA and 4-20 mA
· Select pressure unit: bar, Pa or psi

Smart SN display functions

· Current pressure display
· Current analog output display (voltage or power)
· WARNING - Display with visible error codes

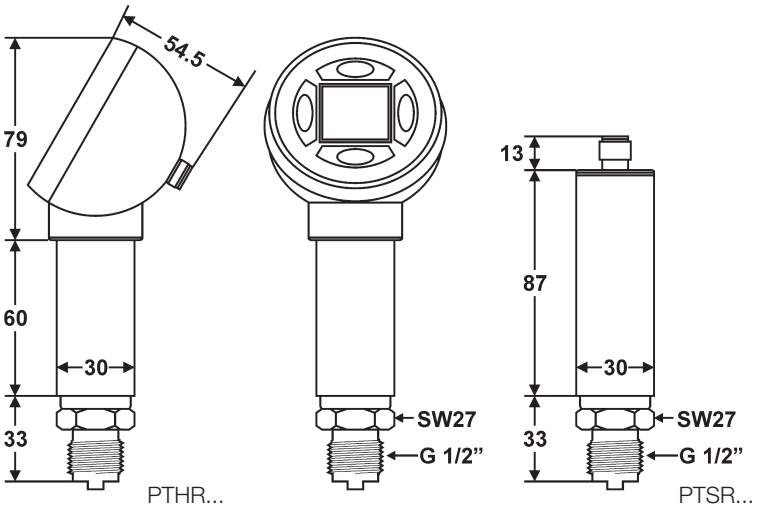
Other features:

· Restore function
· Warning function for sensor fault, overload and overheating
· Manual zero adjustment
· 4-digit code enables locking

Electrical connection:

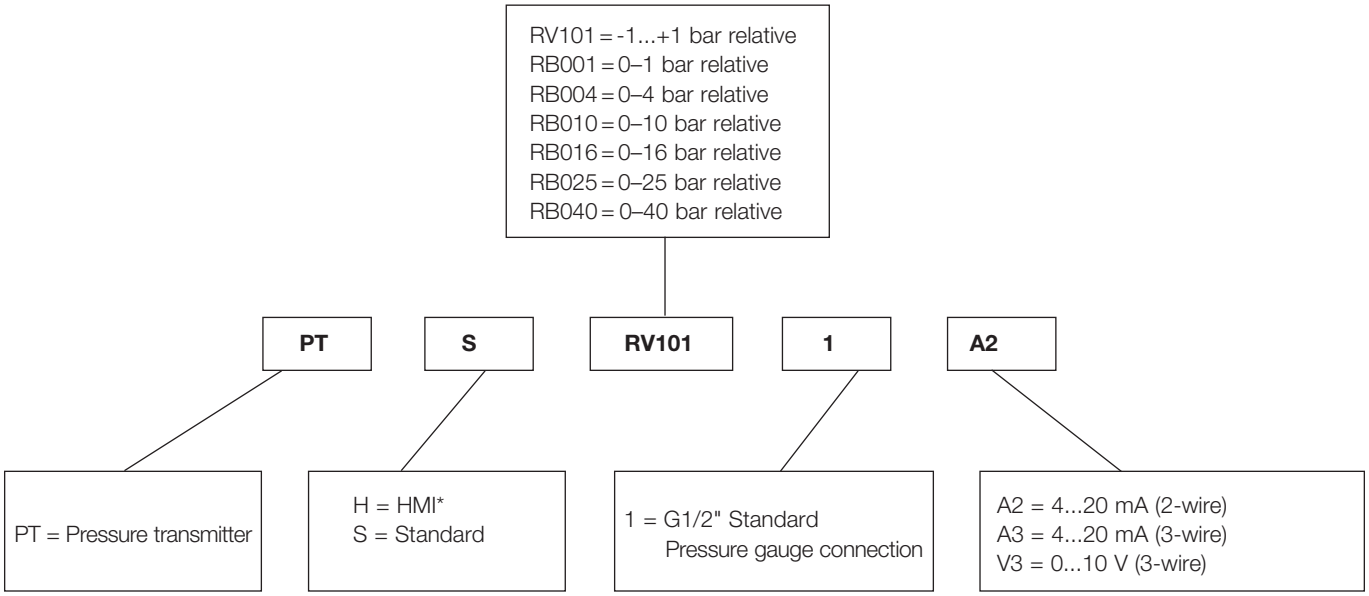
· 5-pin M12x1 plug connector, Form A
· M12x1 connector included

Dimensioned drawings



PTHR... PTSR...

Product Summary



* HMI = **H**uman **M**achine **I**nterface = Digital display + Data input via buttons

2-Leiter

Type	Pressure in bar	Max. permissible pressure (bar)	Type
PTSRV1011A2	-1...+1	6	**PTHRV1011A2**
PTSRB0011A2	0...1	3	**PTHRB0011A2**
PTSRB0041A2	0...4	12	**PTHRB0041A2**
PTSRB0101A2	0...10	30	**PTHRB0101A2**
PTSRB0161A2	0...16	48	**PTHRB0161A2**
PTSRB0251A2	0...25	50	**PTHRB0251A2**
PTSRB0401A2	0...40	80	**PTHRB0401A2**

3-Leiter

Type	Pressure in bar	Max. permissible pressure (bar)	Type
PTSRV1011V3	-1...+1	6	**PTHRV1011V3**
PTSRB0011V3	0...1	3	**PTHRB0011V3**
PTSRB0041V3	0...4	12	**PTHRB0041V3**
PTSRB0101V3	0...10	30	**PTHRB0101V3**
PTSRB0161V3	0...16	48	**PTHRB0161V3**
PTSRB0251V3	0...25	50	**PTHRB0251V3**
PTSRB0401V3	0...40	80	**PTHRB0401V3**
PTSRV1011A3	-1...+1	6	
PTSRB0011A3	0...1	3	
PTSRB0041A3	0...4	12	
PTSRB0101A3	0...10	30	
PTSRB0161A3	0...16	48	
PTSRB0251A3	0...25	50	
PTSRB0401A3	0...40	80	

Configurations Tool

Type	Function
CFT1	Software and data interface for easy adjustment of switching points, switch on/off delay, for example; as well as checking for excess pressure/temperature, see also page 147

CE

Protection Class:
IP 67 / IP 65

With display and control panel

Smart SN DIFF

Microprocessor-supported differential pressure transducers

The microprocessor-supported differential pressure transmitters in the Smart SN DIFF series from Honeywell FEMA measure differential pressures and relative pressures in 6 pressure ranges from 0-100 mbar to 0-20 bar.

Differential pressure transmitters are highly suitable for a wide variety of applications, including the accurate measurement, monitoring and control of differential pressures. The principal applications are in pump and filter monitoring.

Technical data

Measuring ranges	0-250 mbar
relative	to 0-25 bar
Ambient temperature	
Versions without HMI	–20…+80°C
Versions with HMI	–20…+70°C
Storage temperature	
Versions without HMI	–40…+100°C
Versions with HMI	–30…+80°C
Medium temperature	–20…+70°C
Relative atmospheric humidity	0…95% non-condensing
Accuracy	1%, except PTHDM 1002 ...
Weight	
Versions without HMI	350 grams
Versions with HMI	450 grams
Parts in contact with medium	Stainless steel 1.4404 (AISI 316L)
Process connection	2x G1/4" internal thread
Electrical connection	5-pin M12x1 plug, "A"
Protection class	III to EN 61140 (SELV)
Versions without HMI	IP67 to EN 60529-2
Versions with HMI	IP65 to EN 60529-2
EMC	according to EN 61326
Climate class	
Indoor	4K4H to EN 60721-3-4
Outdoor	3K8H to EN 60721-3-3
Power supply	
2-wire	18...35 Vdc
3-wire	24 Vdc ± 20 %, max. 50 mA
EMC	according to EN 61326
Mechanical stability	
Vibration	20g as per IEC 68-2-6 (up to 2000 Hz)
Mechanical shock	100g as per IEC 68-2-27

Functions

· Microprocessor-supported 2- and 3-wire pressure sensors
· Scalable up to 50% of the nominal pressure range

Configuration of the analog output:

· 0-10 V, 2-10 V, 0-20 mA, 4-20 mA
· Select pressure unit: bar, Pascal or PSI

Smart SN display functions

· Displays current differential pressure in bar, Pa, psi and %
· Current analog output display (voltage or power)
· WARNING - Display with visible error codes

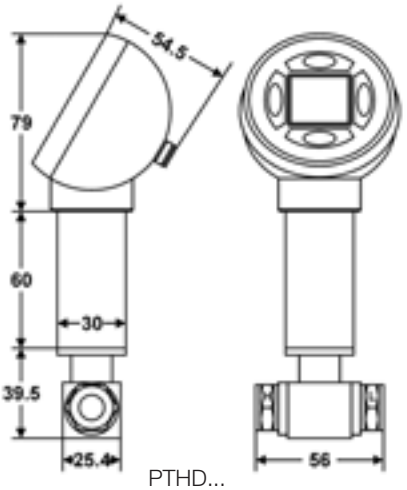
Electrical connection:

· 5-pin M12x1 plug connector, Form A
· M12x1 connector included

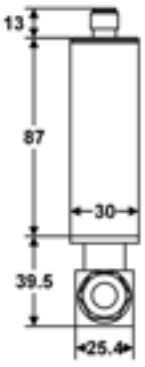
Other:

· Restore function
· Warning function for sensor fault, overload and overheating
· Manual zero adjustment
· 4-digit code enables locking

Dimensioned drawings



PTHD...

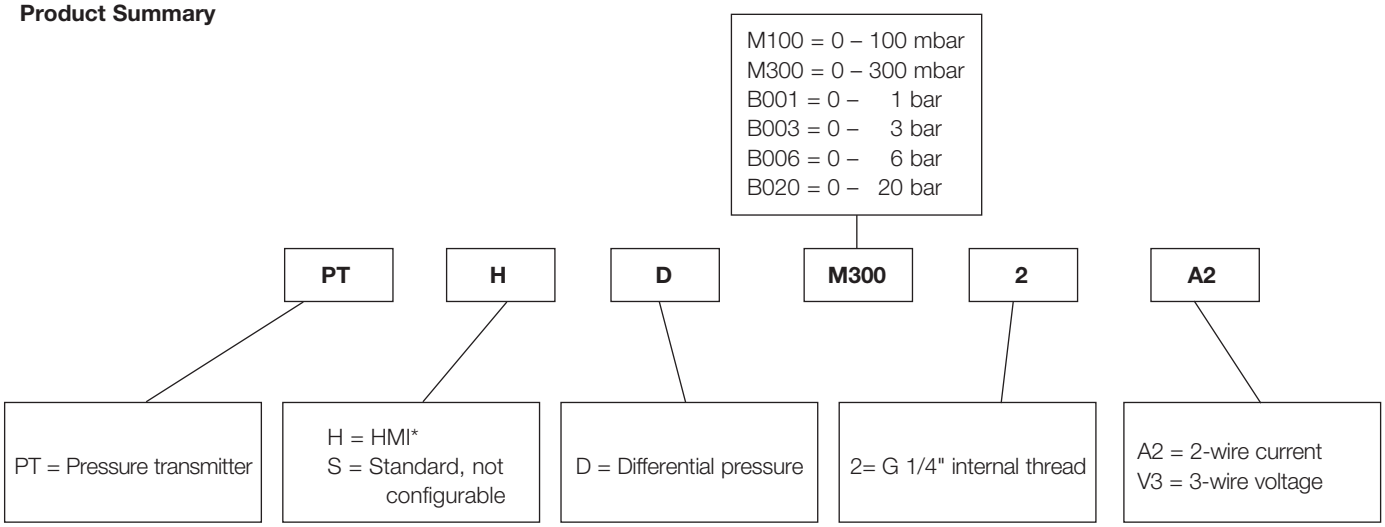


PTSD...

CE

Protection Class:
IP 67 / IP 65

Product Summary



* HMI = **H**uman **M**achine **I**nterface = Digital display + Data input via buttons

2-wire

Type	measurement range (bar)	Max. permissible Differential pressure (bar)	Bursting pressure (bar)	Max. permissible system pressure (bar)	Overrange pressure rev. pressure)
PTHDM1002A2	0-0,100	0,9	1,2	70	0,9
PTHDM3002A2	0-0,300	0,9	1,2	70	0,9
PTHDB0012A2	0-1	3	4	70	3,0
PTHDB0032A2	0-3	9	12	70	7,0
PTHDB0062A2	0-6	21	28	70	7,0
PTHDB0202A2	0-20	60	70	70	7,0

3-wire

Type	measurement range (bar)	Max. perm. Differential pressure (bar)	Bursting pressure (bar)	Max. perm. system pressure	Overrange pressure rev. pressure)	Type
PTSDM1002V3**	0–0,100	0,9	1,2	70	0,9	**PTHDM1002V3**
PTSDM3002V3**	0–0,300	0,9	1,2	70	0,9	**PTHDM3002V3**
PTSDB0012V3**	0–1	3	4	70	3,0	**PTHDB0012V3**
PTSDB0032V3**	0–3	9	12	70	7,0	**PTHDB0032V3**
PTSDB0062V3**	0–6	21	28	70	7,0	**PTHDB0062V3**
PTSDB0202V3**	0–20	60	70	70	7,0	**PTHDB0202V3**

** Transmitter without HMI (PTSD…) only are available with voltage output

Measuring range:
Calibrated measuring range of device. The switching and resetting points can be set within this pressure range. This pressure range is specified in the product ordering code. PTHD**B001**2. Here **B001** means pressure range 0-1 bar.

Maximum permissible differential pressure:
Maximum pressure difference that may be connected between the two connections "H" and "L" without knocking the sensor element out of adjustment or causing it long-term damage.

Bursting pressure
Above the stated bursting pressures the sensors are subject to mechanical failure. This removes the security of separation between the "H" and "L" connections and the sensor housing may even rupture.

Maximum permissible system pressure:
System pressure that may be allowed to bear on both pressure connections without knocking the sensor element out of adjustment or causing it long-term damage. In addition the pressure may be allowed to reach the maximum permissible differential pressure on the pressure side "H" without putting the sensor out of adjustment or causing long-term damage to it.

Attention:
According to intended use, the lower pressure needs to be connected to the "L" marked port and the higher pressure to "H" marked port. Interchange of both ports (high pressure at "L" port) may lead to damage of the differential pressure measurement cell.

DPTM

DPTM

Differential pressure transmitters, piezoresistive, for gaseous, non-aggressive media

DPTM series differential pressure transmitters are used to monitor gaseous, non-aggressive media.

Possible applications include:

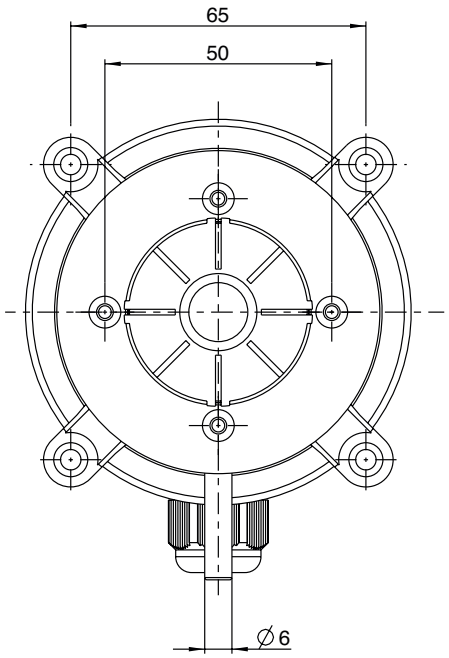
- Air-conditioning and ventilation systems
- Building automation
- Environmental protection
- Fan and ventilation control
- Valve and shutter control
- Filter and fan monitoring

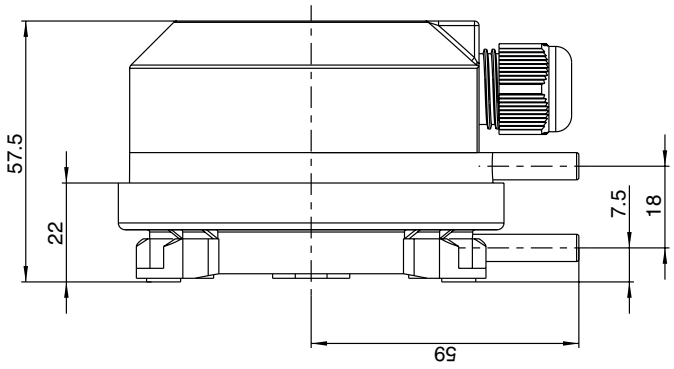
Technical data

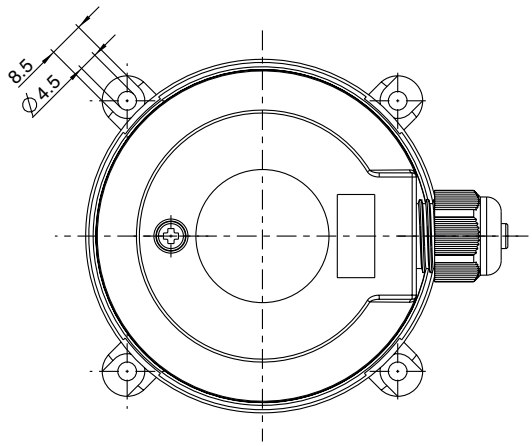
Pressure media	Air, and non-combustible and non-aggressive gases.
Pressure connection	Plastic connection piece with 6 mm external diameter for measuring hose with 5 mm internal diameter. Connector P 1 for higher pressure, P 2 for lower pressure.
Cable entry / electrical connection	M 16 x 1.5, screw terminals for wires and leads with conductor cross-section up to 1.5 mm².
Degree of protection according to DIN 40050	IP 54 with cover, IP 00 without cover
Mounting	Any mounting position possible, with screws supplied
Materials	Transmitter housing and pressure connection P2 made of ABS, light grey. Fastening element with pressure connection P1 made of POM, white.
Long-term stability in % FS/year	-50 Pa - 1000 Pa ≤ 2.5; 1000/2500 Pa ≤ 1.5
Repetition accuracy	< ± 0.2% of final value
Linearity and hysteresis factor	< ± 1% of end value
Response time	switchable 100 ms/1sec
Medium and ambient temperature	–10°C to +70°C
Permitted air humidity	0–95% non-condensing (2-conductor DC only!)
Operating voltage	18…30 V AC, 16–32 V DC (2-conductor DC only)
Max. current consumption	30 mA for AC, 20 mA for DC
Power consumption	Max. 1 W
Output signal	0–10 V, short-circuit-proof to ground 4–20 mA, short-circuit-proof ≤ 30 mA
Housing dimensions and weight	Diameter 85 mm x 58 mm, 130 g
Standards and conformity	EN 60770, EN 61326
Supplied accessories:	2 m silicone hose, 2 connection pieces with fastening screws, 2 self-tapping screws for fastening the housing

Type	Default operating range in Pa	Operating range extended by jumpers in Pa
Differential pressure transmitter, 3-conductor		
without digital display, output signal 0-10 V und 4-20 mA		
DPTM50	–50 / +50	not possible
DPTM110	–100 / +100	not possible
DPTM550	–500 / +500	not possible
DPTM1100	–1000 / +1000	not possible
DPTM100	0 – 100	0 – 250
DPTM250	0 – 250	0 – 500
DPTM500	0 – 500	0 – 1000
DPTM1000	0 – 1000	0 – 2500
DPTM5000	0 – 5000	0 – 10000
with digital display, output signal 0-10 V und 4-20 mA		
DPTM50D	-50 ... +50	not possible
DPTM110D	-100 ... +100	not possible
DPTM550D	-500 ... +500	not possible
DPTM1100D	-1000 ... +1000	not possible
DPTM100D	0 – 100	0 – 250
DPTM250D	0 – 250	0 – 500
DPTM500D	0 – 500	0 – 1000
DPTM1000D	0 – 1000	0 – 2500
DPTM5000D	0 – 5000	0 – 10000
Differential pressure transmitter, 2-conductor		
without digital display, output signal 4-20 mA		
DPTM52	–50 / +50	not possible
DPTM112	–100 / +100	not possible
DPTM552	–500 / +500	not possible
DPTM1102	–1000 / +1000	not possible
DPTM102	0 – 100	0 – 250
DPTM252	0 – 250	0 – 500
DPTM502	0 – 500	0 – 1000
DPTM1002	0 – 1000	0 – 2500
DPTM5002	0 – 5000	0 – 10000

Type series DPTM (D)







Specifications

PST...
Electronic pressure switch/transmitter
with 5-pin plug connection to DIN
IEC 60947-5-2, supply voltage: 14…36 VDC
Nominal pressure range …–… mbar/bar,
output signal: 4–20 mA and 0–10 V, selectable and invertible

DPTM...
Differential pressure transmitters for gaseous, non-aggressive media
Output signal: 0–10 V, short-circuit-proof to ground, 4–20 mA, short-circuit-proof ≤ 30 mA, operating range…–…Pa; type DPT…

CTF1...
Configuration tool for the parameterisation of the electronic pressure switches and transmitters, series PTH, PTS, PSH and PSS.

PTH, PTS...
Electronic relative pressure transmitter
for the working ranges -1…+1 bar and 0-40 bar.

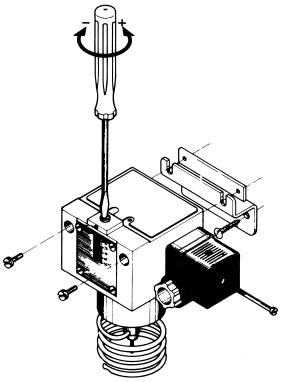
PTHD, PTSD...
Electronic differential pressure transmitter
Smart SN DIFF for measuring the differential- and relative-pressure pitches from 0-100 mbar till 0-20 bar.

Mechanical thermostats

FEMA
by Honeywell

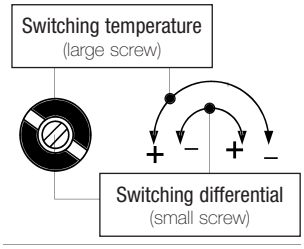
General technical information

for series TX, TRM and TAM

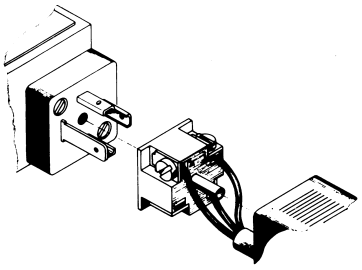


Adjustment of thermostats at lower switching point
Setpoint x_S corresponds to the lower switching point (with falling temperature), the upper switching point x_O (with rising temperature) is higher by the amount of the switching differential x_d.

Setting the switching temperature (setpoint adjustment)
Prior to adjustment, the setscrew above the scale must be loosened by approx. 2 turns and retightened after setting.
The switching temperature is set via the spindle. The set switching temperature is shown by the scale. In view of tolerances and variations in the characteristics of sensors and springs, and due to friction in the switching kinematics, slight discrepancies between the setting value and the switching point are unavoidable. The thermostats are usually calibrated in such a way that the setpoint adjustment and the actual switching temperature correspond as closely as possible in the middle of the range.
Possible deviations spread to both sides equally.
Clockwise: low switching temperature
Anticlockwise: high switching temperature



Changing the switching differential (only for switching device TRMV...)
The switching differential is changed by turning the setscrew within the spindle. The lower switching point is not changed by the differential adjustment; only the upper switching point is shifted by the differential. One turn of the differential screw changes the switching differential by about 92 of the total differential range.
When adjusting please note:
Switching temperature: Clockwise for lower switching point.
Anticlockwise for higher switching point.
Switching differential: Clockwise for larger differential. Anticlockwise for smaller differential.



Electrical connection
Plug connection to DIN EN175301. Cable entry Pg 11, max. cable diameter 10 mm.
Cable outlet possible in 4 directions spaced 90° apart.

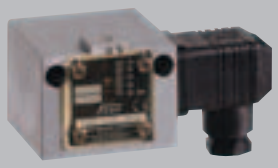
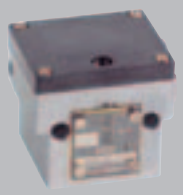
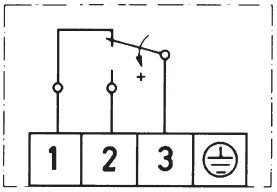
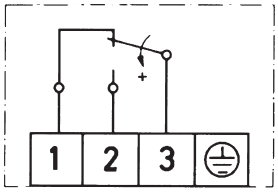
Temperature limiter with reclosing lockout
Additional function ZFT205 and ZFT206: All thermostats can be equipped with a mechanical interlock. On reaching the value set on the scale, the microswitch trips over and remains in this position. The lock can be released by pressing the unlocking button (identified by a red dot on the scale side of the switching device). The interlock can take effect with rising or falling temperature, depending on the version.

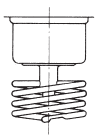
Mounting position
A vertical mounting position is preferable if at all possible. IP 54 protection is guaranteed with a vertical mounting position. A different mounting position may alter the degree of protection, but the operation of the thermostat is not affected.

Outdoor installation of thermostats
FEMA thermostats can be installed out of doors provided they are mounted vertically and suitably protected against the direct effects of weather. At ambient temperatures below 0°C, ensure that condensation cannot occur in the sensor or in the switching device.

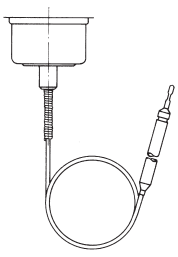
Mechanical thermostats

Principal technical data

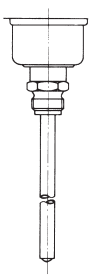
	Standard version	Terminal connection
		
	...200	...300
Switch housing	Diecast aluminium GDAlSi 12	Diecast aluminium GDAlSi 12
Switching function and connection scheme (applies only to version with microswitch)	Floating changeover contact With rising pressure single pole switching from 3–1 to 3–2 	Floating changeover contact. With rising pressure single pole switching from 3–1 to 3–2 
Switching capacity (applies only to version with microswitch)	8 A at 250 VAC 5 A at 250 VAC inductive 8 A at 24 VDC 0.3 A at 250 VDC min. 10 mA, 12 VDC	3 A at 250 VAC 2 A at 250 VAC inductive 3 A at 24 VDC 0.03 A at 250 VDC min. 2 mA, 24 VDC
Mounting position	Vertical or horizontal, preferably vertical	Vertical
Protection class (in vertical position)	IP 54	IP 65
Electrical connection	Plug connection to DIN EN175301	Terminal connection
Cable entry	Pg 11	M 16 x 1.5
Ambient temperature	–15 to +70 °C	–15 to +70 °C
Switching point	Adjustable with spindle	Adjustable with spindle after the terminal box cover is removed
Hysteresis	Adjustable or not adjustable (see Product Summary)	Not adjustable
Medium temperature	Max. 70 °C, briefly 85 °C	Max. 60 °C, briefly 85 °C
Vibration strength	No significant deviations up to 4 g. At higher accelerations, the switching differential is reduced slightly. Use over 25 g is not permitted.	
Isolation values	Overvoltage category III, contamination class 3, reference surge voltage 4000 V. Conformity to DIN VDE 0110 is confirmed.	
Sensor systems		



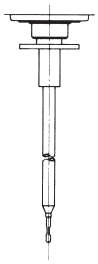
Room sensor TRM



Capillary tube sensor TAM



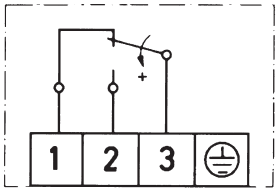
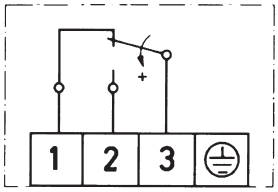
Rod sensor TX+R10

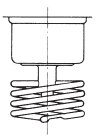


Air duct sensor TX+R6

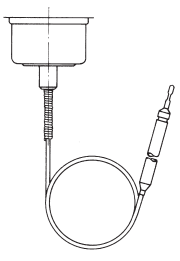
Mechanical thermostats

Principal technical data

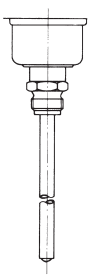
	Terminal connection	Ex version
		
	...500 (Ex-ia)	**...700 (Ex-d)**
Switch housing	Diecast aluminium GDAISi 12	Diecast aluminium GDAISi 12
Switching function and connection scheme (applies only to version with microswitch)	Floating changeover contact With rising pressure single pole switching from 3–1 to 3–2 	Floating changeover contact. With rising pressure single pole switching from 3–1 to 3–2 
Switching capacity (applies only to version with microswitch)	8 A at 250 VAC 5 A at 250 VAC inductive 8 A at 24 VDC 0.3 A at 250 VDC min. 10 mA, 12 VDC	3 A at 250 VAC 2 A at 250 VAC inductive 3 A at 24 VDC 0.03 A at 250 VDC min. 2 mA, 24 VDC
Mounting position	Vertical or horizontal, preferably vertical	Vertical
Protection class (in vertical position)	IP 65	IP 65
Explosion protection	–	CE 0035 Ex II 2G Ex db eb IIC T6 CE 0035 Ex II 2D Ex tb IIIC IP65 T85°C
Electrical connection	Terminal connection	Terminal connection
Cable entry	M 16 x 1.5	M 16 x 1.5
Ambient temperature	–15 to +60 °C	–20 to +60 °C
Switching point	Adjustable with spindle after the terminal box cover is removed	Adjustable with spindle after the terminal box cover is removed
Hysteresis	Adjustable or not adjustable (see Product Summary)	Not adjustable
Medium temperature	Max. 60 °C	Max. 60 °C
Vibration strength	No significant deviations up to 4 g. At higher accelerations, the switching differential is reduced slightly. Use over 25 g is not permitted.	
Isolation values	Overvoltage category III, contamination class 3, reference surge voltage 4000 V. Conformity to DIN VDE 0110 is confirmed.	
Sensor systems		



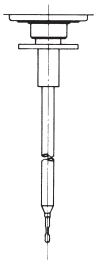
Room sensor TRM



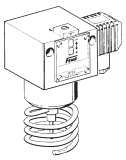
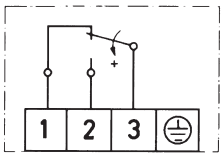
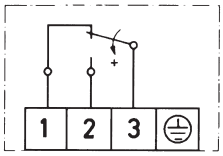
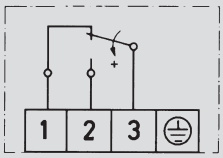
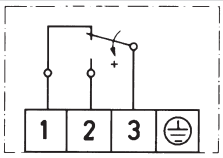
Capillary tube sensor TAM



Rod sensor TX+R10



Air duct sensor TX+R6

Plug connection 200 series	Description	Connection scheme
	**Standard version** Microswitch, single pole switching	
ZFT213	**Gold-plated contacts** with low contact resistance (e. g. for low voltage) Not available with adjustable hysteresis	
ZFT301	**Terminal connection housing (IP 65)**	
ZFT351	**Protection class IP 65 and switch housing with surface protection** (terminal connection housing)	
ZFT513	**Ex-ia -version** 500 housing, blue cable entry and terminal connection Gold-plated contacts, protection class IP 65	
	Power supply circuit: U_i 24 V DC I_i 100 mA C_i 1 nF L_i 100 µH	

* Additional prices are to be added to the standard equipment prices in each case.
For devices which differ from the standard equipment, the code of the switching device is part of the type designation.
** Switching point adjustment: Please specify switching point and direction of action (rising or falling temperature).

Example for ordering:

TX150-513

Code of additional function
Code for temperature range
Type

Service functions

Devices with service functions will be produced individually according to the customer's specifications. The system requires that these product combinations be identified in such a way as to prevent any possibility of confusion. These combinations are characterised by a product code with the suffix "-S" on the packaging label as well as separate labels with barcodes for each service function.

Service functions	
ZFT5970	**Setting of switching point according to customer's instructions**
ZFT5971	**Setting of switching points according to customer's instructions with lead sealing**
ZFT1978	**Labelling of units** according to customer's instructions with sticker **Test certificates according to EN 10 204**
WZ2.2	Factory certificate 2.2 based on non-specific specimen test
AZ3.1	Acceptance test certificate 3.1 based on specific test

**** Switching point adjustment:** Please specify **switching point and direction of action** (rising or falling pressure).
Service functions are available for the following type series (including Ex-versions):
Thermostats: TAM, TX, TRM,
Ordering devices with service functions: See page 27.

Ventilation and air-conditioning systems

TRM

Room thermostats for industrial uses

FEMA room thermostats are suitable for industrial plants, for greenhouses, livestock buildings and warehouses, and also for monitoring the maximum temperature in switchgear cabinets and relay stations. Room thermostats are supplied complete with wall bracket H 1.

TRM150

→ p.98
→ p.112

Ventilation and air-conditioning systems

T6120 A/B

Thermostats for industrial uses

Thermostats are suitable for monitoring temperatures in business premises, such as warehouses, machine rooms and garages, as well as greenhouses and indoor areas of agricultural use. Versions with a copper sensor element can also be used in damp locations, chillers and freezers.

T6120A1005

→ p.99–100

Ventilation and air-conditioning systems

H

Room and duct hygrostats

The H6045A1002 single-stage duct hygrostat and the H6120A1000 single-stage room hygrostat are designed for monitoring relative humidity in air conditioning systems and climatic chambers and for controlling air humidifiers and dehumidifiers in indoor swimming pool buildings. Both devices have a dust protected microswitch with a high switching capacity. Thanks to their simple and robust construction, they offer a low-cost solution for heating, ventilation and air-conditioning systems.

H6045A1000

→ p.101

FT6960-60F

FT69

Single-stage protection thermostats for air heating and climate control systems

They register the temperature along the entire length of the capillary. When mounting outdoors, please note that the fluid reservoir located in the thermostat is also temperature-sensitive and thus an integral part of the active measuring system. If the temperature of any 30-cm-long segment of the capillary drops to below the set-point, the thermostat will switch off automatically.
The complete length of the capillary must be looped uniformly along the air conduit's entire cross-section. If the capillary is damaged, the thermostats will switch off automatically.

➔ p.102

STW70130F

STW/STB

Safety strap-on thermostats

Self- monitoring sensor systems for temperature monitoring and limiting tasks, e.g., for floor-heating applications.
If the sensor is damaged, i.e., if the expansion fluid in the capillary tube leaks, the strap-on thermostat responds as though the temperature has exceeded the set-point and will thus switch to the safety setting (e.g., will switch off the circulation pump). To ensure reliable functioning, the surface of the pipe must be thoroughly cleaned of contamination, rust, paint, etc. Each thermostat is delivered together with a strap allowing attachment to pipes having a diameter of up to 100 mm. Additionally, the thermostat can be mounted to walls using the capillary. An optional immersion well allows use as an immersion sensor. This demonstrates the great versatility of this innovative device, which is also reflected in the small quantity of stock kept on hand by customers. Among the innovative features of this device are its automatic temperature compensation and the Push-In® contacts for quick wiring. The devices are CE-approved and UL-certified and also certified according to Pressure Equipment Directive DIN EN14597.

➔ p.107

TRM150

Room thermostats type series TRM

for industrial premises

FEMA room thermostats are suitable for industrial plants, greenhouses, livestock buildings and warehouses, and also for monitoring the maximum temperature in switchgear cabinets and relay stations. Room thermostats are supplied complete with wall bracket H1.

SIL 2 according IEC 61508-2

Technical data

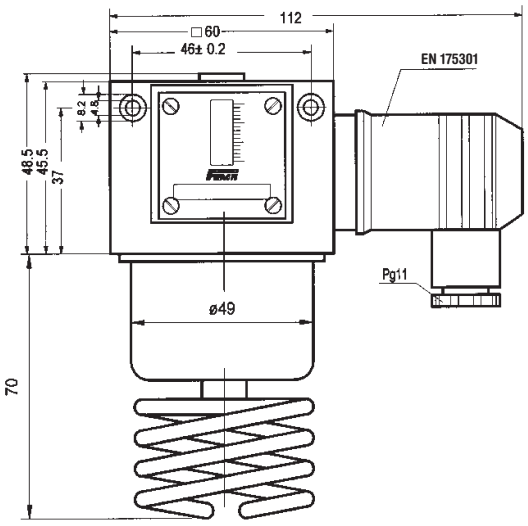
Body	Diecast aluminium GD Al Si 12 according to DIN 1725. Resistant to ammoniacal vapours and seawater
Mounting position	Any, preferably vertical
Max. ambient temperature	70°C
Max. temperature at sensor	70°C
Contact arrangement	Single-pole changeover switch
Switching capacity	8 (5) A 250 VAC
Degree of protection	IP 54 according to DIN 40050 (with vertical installation)
Mounting	With wall bracket H 1 or directly on the wall with 2 screws (Ø 4)
Calibration	Scale value corresponds to the lower switching point (with falling temperature), the upper switching point is higher by the amount of the switching differential
Plug connection	Via angled plug to DIN EN175301 (3-pin + earth contact), cable entry Pg 11, max. cable diameter 10 mm, cable outlet possible in 4 directions spaced 90° apart.
Switching temperature	Adjustable from outside with screwdriver
Switching differential	Not adjustable on TRM series, adjustable on TRMV series For values see Product Summary

Product Summary

Type	Setting range	Switching differential (mean values)
Switching differential not adjustable		
TRM 022	-20 to +20°C	1.0 K
TRM 40	0 to +40°C	1.0 K
TRM 150	+10 to +50°C	1.0 K
Switching differential adjustable		
TRMV 40	0 to +40°C	3–10 K
TRMV 150	+10 to +50°C	3–10 K

Ex-TRM, page 112

Dimensions



T6120B1003

Room thermostats
Type series T6120A, B

Single and dual stage

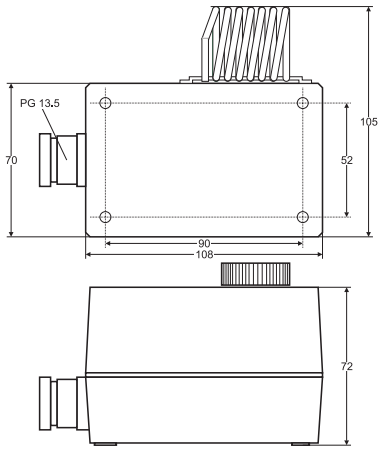
- Liquid-filled copper and stainless steel sensors
- Robust design:
  Degree of protection IP 54 or IP 65
- Easy installation and wiring
- Dustproof encapsulated microswitch with changeover contact for heating and cooling

Applications

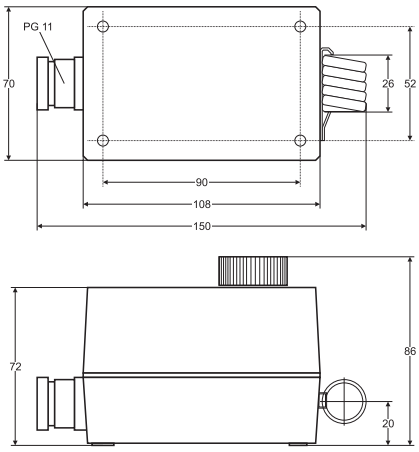
T6120A and B single and dual stage room thermostats are suitable for measuring, monitoring and controlling temperatures in heating and cooling systems.
These devices are used for the following applications:

- Commercial buildings
- Storage premises
- Garages
- Machine rooms
- Factories
- Greenhouses
- Livestock buildings

Dimensions



T6120A1005 (in mm)



T6120B1003 (in mm)

	T6120A1005	T6120B1003
Number of stages	1	2
Contact type	1 changeover contact	2 changeover contacts
Switching interval	1 K (fixed)	1 K (fixed)
per stage		2…10 K
between stages		(adjustable)
Setting range	0…60 °C	-30…+35 °C
Working temperature	-10…+65 °C	-15…+60 °C
Storage temperature	-20…+70 °C	
Permissible switching current	10 (1.5) A	15 (8) A
Permissible switching voltage	250 V AC	24…250 V AC
Housing material	ABS, glas fibre reinforced	
Sensor material	1.4301	copper
Weight	360 g	530 g
Degree of protection	IP 54	IP 65
Dimensions (W x H x L in mm)	108 x 70 x 72	

CE

Protection Class:
IP 54/65

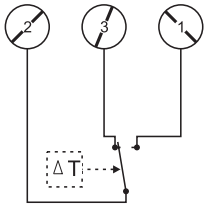


Figure 1: T6120A1005

Function and wiring T6120A1005

To control a heating unit, connect terminals 2 and 3 of the thermostat to the heating unit. When the temperature rises, the contact will open (see Figure 1). To control a cooling unit, connect terminals 1 and 2 of the thermostat to the cooling unit. When the temperature drops, the contact will open (see Figure 1).

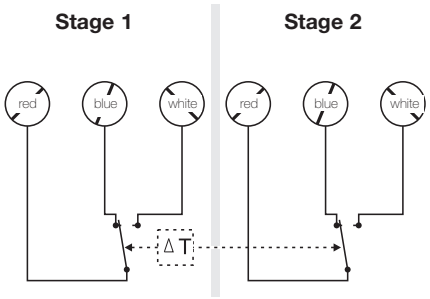
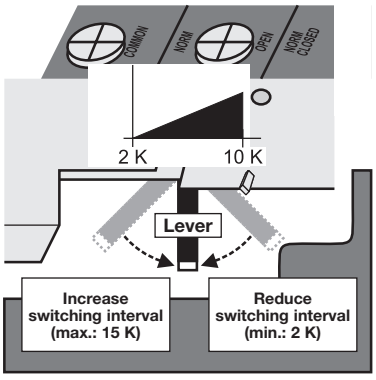


Figure 2: T6120B1003

Function and wiring T6120B1003

To control a heating unit, connect the red terminal and the blue terminal of both stages of the thermostat to the corresponding terminals of the heating unit. When the temperature rises, first the contact of stage 1 opens. If the temperature continues to rise by an amount corresponding to the set switching interval, the contact of stage 2 opens. To control a cooling unit, connect the red terminal and white terminal of both stages of the thermostat to the corresponding terminals of the cooling unit. When the temperature falls, first the contact of stage 1 opens. If the temperature continues to fall by an amount corresponding to the set switching interval, the contact of stage 2 opens (see Figure 3). See also the explanation given below: "Adjusting the switching interval between 2 stages on the T6120B1003".



Adjusting the switching interval between 2 stages on the T6120B1003

The switching interval between the two stages can be adjusted between 2 K (factory setting) and 10 K. To do this, pull off the adjustment knob, undo the two fastening screws, and remove the housing cover. An adjustment lever with scale is now visible on the side. Move this lever to the right to increase the switching interval. Move it to the left to reduce the switching interval.

Room and duct hygrostats Type series H6045/H6120

Single-stage

H6120A1000

The H6045A1002 single-stage duct hygrostat and the H6120A1000 single-stage room hygrostat are designed for monitoring relative humidity in air conditioning systems and climatic chambers and for controlling air humidifiers and dehumidifiers in indoor swimming pool buildings.

Further applications include air humidity regulation in food storage premises, the textile and paper industries, printing works, the optical and chemical industries, greenhouses, hospitals and wherever relative air humidity levels need to be measured, controlled and monitored.

Technical data

H6045A1002 duct hygrostat

Range Relative humidity	35…100 % r.h.
Switching capacity	15 (8) A, 24…250 VAC
Switch	Single-pole changeover
Working temperature	-10 to +65°C
Max. air-flow speed	8 m/s
Degree of protection	IP 65
Protection class	I
Tolerance	max. 4 % r.h.
Switching hysteresis	5 % r.h.
Housing material	ABS glass fibre reinforced
Weight	480 g

H6120A1000 Room hygrostat

Range Relative humidity	35…100% r.h.
Switching capacity	5 (0.2) A, 230 VAC
Switch	Single-pole changeover
Working temperature	0 to +60°C
Max. air-flow speed	15 m/s
Degree of protection	IP 30
Protection class	I
Tolerance	max. 3 % r.h.
Switching hysteresis	4 % r.h.
Housing material	ABS (white)
Weight	125 g

Switching point adjustment

The switching point can be adjusted using the knob located on the top of the device. The clearly marked scale and the pointer on the housing make it very easy to adjust the humidity level.

Both devices have a dustproof encapsulated microswitch with high switching capacity. Thanks to their simple and robust construction, they offer a low-cost solution for heating, ventilation and air-conditioning systems.

i Mounting

H6045A1002

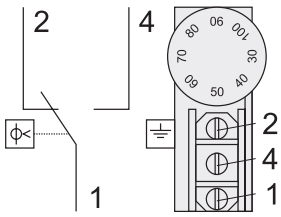
The duct hygrostat H6045A1002 can be installed directly in air ducts using the included mounting bracket.

H6120A1000

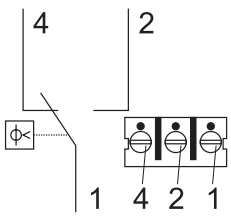
The room hygrostat H6120A1000 must be installed far enough away from heat sources and out of direct sunlight. Care must be taken to ensure that air can flow freely past the sensor. The ideal installation position on the wall is at a height of approx. 1.5 m from the floor.

Electrical connection

H6045A1002

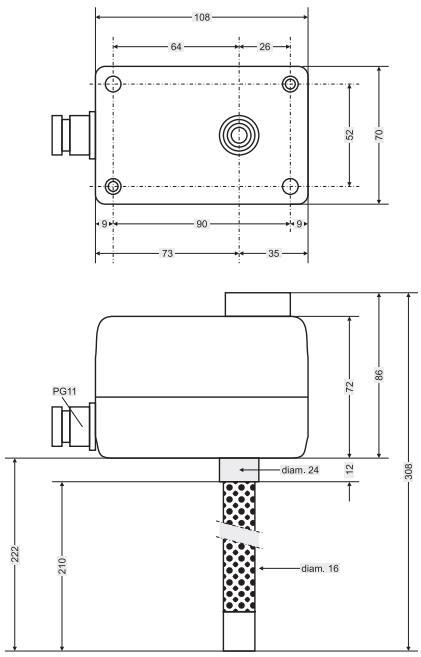


H6120A1000

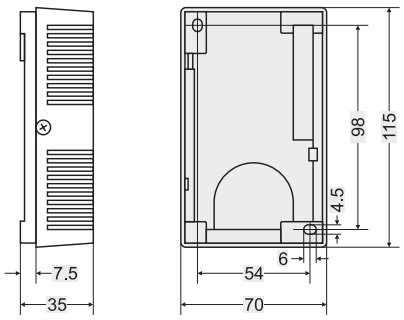


Dimensions

H6045A1002



H6120A1000



Protection Class: IP 65/30

FT69

FT69

Single-stage protection thermostats for air heating and climate control systems

They register the temperature along the entire length of the capillary. When mounting outdoors, please note that the fluid reservoir located in the thermostat is also temperature-sensitive and thus an integral part of the active measuring system. If the temperature of any 30-cm-long segment of the capillary drops to below the set-point, the thermostat will switch off automatically. The complete length of the capillary must be looped uniformly along the air conduit's entire cross-section. If the capillary is damaged, the thermostats will switch off automatically.

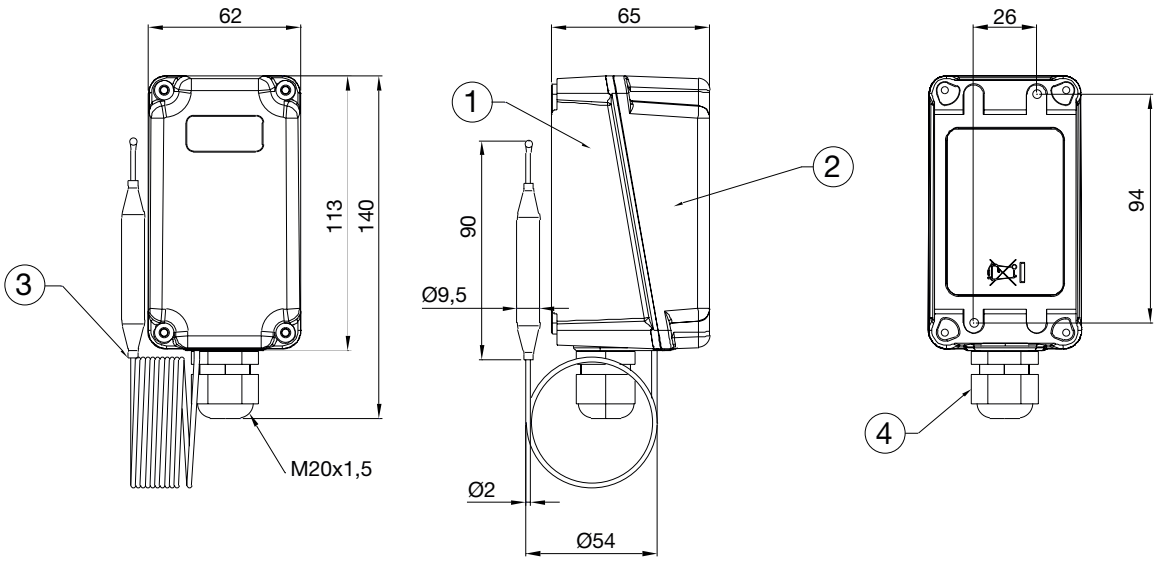
Technical data

Switching capacity (gold cont.)
Max. overload temp. 200 °C (max. 1hr)
Switching capacity 24 to 250 Vac; 15(8) A
Humidity 0 to 95% rh, non-condensing
Adjustable temp. range -10...+12 °C (+14...+54 °F)
Storage temperature -30...+60 °C
Operating temperature -20...+55 °C
Cooling of capillary coil 30 cm (min.)
Hysteresis 2 K
Reproducibility ± 1 K
Protection class IP65 as per EN60529
Wiring terminals Screw terminals for wires of up to 1.5 mm² cross-section
Cable entry M20x1.5 for ø 6...13 mm
Housing materials Polycarbonate and ABS
Weight 280 g
Dimensions 125 x 75 x 62 mm

Type	Protection class	Capillary length	Reset
FT6960-18F	IP 65	1,8 m	manual
FT6960-30F	IP 65	3,0 m	manual
FT6960-60F	IP 65	6,0 m	manual
FT6961-18F	IP 65	1,8 m	auto
FT6961-30F	IP 65	3,0 m	auto
FT6961-60F	IP 65	6,0 m	auto

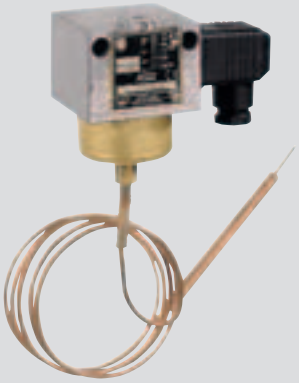
Accessories included in Delivery:
· The 3-meter and 6-meter versions are each delivered with 6 mounting retainers.
· The 1.8-meter version is delivered with 3 mounting retainers..

Dimensioned drawings



FT6961-18F

Liquids and gases



TAM813

TAM

Capillary tube thermostats with 1.5 m capillary tube

The sensor cartridge at the end of the capillary tube is the actual active (temperature-sensitive) part of the sensor. Changes in temperature on the capillary tube have no effect on the switching point. Pressure-tight installation of the sensor in pressure vessels of all kinds is possible with the aid of an immersion well.

→ p.105
→ p.111

Liquids and gases

TX490

TX

Rod thermostats (without immersion well)

Rod thermostats are suitable for direct installation in tanks, pipelines and air ducts. The immersion wells can be fitted in advance. Select immersion wells R…from the table on page 147.

→ p.106
→ p.110

Liquids and gases

STW70130F

STW/STB

Safety strap-on thermostats

Self- monitoring sensor systems for temperature monitoring and limiting tasks, e.g., for floor-heating applications.

If the sensor is damaged, i.e., if the expansion fluid in the capillary tube leaks, the strap-on thermostat responds as though the temperature has exceeded the set-point and will thus switch to the safety setting (e.g., will switch off the circulation pump). To ensure reliable functioning, the surface of the pipe must be thoroughly cleaned of contamination, rust, paint, etc. Each thermostat is delivered together with a strap allowing attachment to pipes having a diameter of up to 100 mm. Additionally, the thermostat can be mounted to walls using the capillary. An optional immersion well allows use as an immersion sensor. This demonstrates the great versatility of this innovative device, which is also reflected in the small quantity of stock kept on hand by customers. Among the innovative features of this device are its automatic temperature compensation and the Push-In® contacts for quick wiring. The devices are CE-approved and UL-certified and also certified according to Pressure Equipment Directive DIN EN14597.

➔ p.107

Tested to PE Directive 97/23 EC

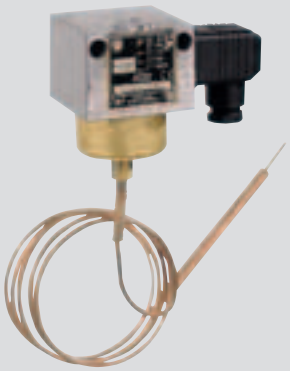
STB+TW

STB

Temperature monitors, temperature limiters, type-tested

Temperature monitors and temperature limiters are tested according to Pressure Equipment Directive 97/23 EC, meet the requirements of DIN EN 14597 and can thus be used for heating systems according to DIN EN 12828, for steam and hot water systems and for district heating systems. The devices with safety function (STW, STB) are self-monitoring, i.e. in the event of breakage or leaks in the measuring system the circuit is opened and the system is switched off towards the safe side.

➔ p.108



TAM813

TAM

Capillary tube thermostats with 1.5 m capillary tube

The sensor cartridge at the end of the capillary tube is the actual active (temperature-sensitive) part of the sensor. Changes in temperature on the capillary tube have no effect on the switching point. Pressure-tight installation of the sensor in pressure vessels of all kinds is possible with the aid of an immersion well.

SIL 2 according IEC 61508-2

Technical data

Body	Diecast aluminium GD Al Si 12 according to DIN 1725.
Mounting position	Any, preferably vertical
Max. ambient temperature at switching device	+70°C
Capillary tube	Cu capillary tube, 1.5 m long Other capillary tube lengths are not possible
Sensor cartridge	8 mm Ø, 100 mm long, material: Cu
Contact arrangement	Single pole changeover switch
Switching capacity	8 (5) A 250 VAC
Degree of protection	IP 54 according to DIN EN60529 (with vertical installation)
Mounting	Temperature sensor with or without immersion tube in containers, air ducts etc. Switching device with 2 screws (Ø 4) directly on a flat wall surface
Calibration	Scale value corresponds to the lower switching point (with falling temperature), the upper switching point is higher by the amount of the switching differential
Plug connection	Via angled plug to DIN EN175301 (3-pin + earth contact), cable entry Pg 11, max. cable diameter 10 mm, cable outlet possible in 4 directions spaced 90° apart. Supplied with plug.
Switching temperature	Adjustable via the setting spindle with a screw-driver
Switching differential	Not adjustable
Immersion tubes	see page 149.

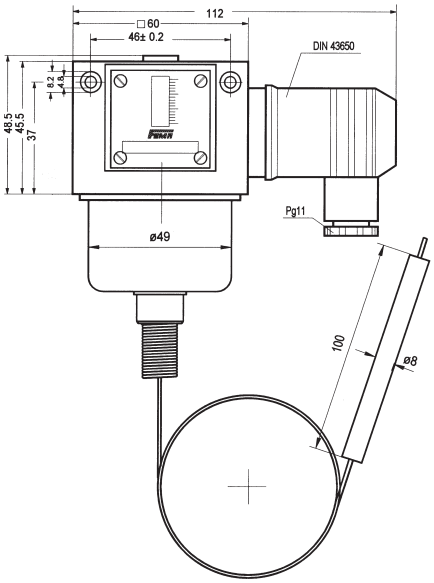
Product Summary

Type	Setting range	Switching differential (mean values)	Max. permissible temperature at sensor
TAM022	–20 to + 20 °C	1.5 K	110 °C
TAM150	+10 to + 50 °C	1.5 K	110 °C
TAM490	+40 to + 90 °C	2.0 K	125 °C
TAM813	+80 to +130 °C	2.0 K	150 °C

Accessories

Immersion tube type … R 1, R 2, R 3, RN 1, RN 2, see page 149.

Dimensioned drawing:



-TAM see page 111

CE

Protection Class: IP 54

TX 490

TX

Rod thermostats (without immersion tube)

Rod thermostats are suitable for direct installation in tanks, piplines and air ducts. The immersion well can be fitted in advance.

SIL 2 according IEC 61508-2

Technical data

Housing	Diecast aluminium GD Al Si 12 according to DIN 1725.
Mounting position	Any, preferably vertical
permitted. ambient temperature at switching device	+70°C
Max. perm. temperature at sensor	See Product Summary
Contact arrangement	Single pole changeover switch
Switching capacity	8 (5) A 250 VAC
Degree of protection	IP 54 according to DIN EN60529 (with vertical installation)
Calibration	Scale value corresponds to the lower switching point (with falling temperature), the upper switching point is higher by the amount of the switching differential
Plug connection	Via angled plug to DIN EN175301 (3-pin + earth contact), cable entry Pg 11, max. cable diameter 10 mm, cable outlet possible in 4 directions spaced 90° apart. Supplied with plug.
Switching temperature	Adjustable from outside with screwdriver
Switching differential	Not adjustable, for values see Product Summary
Immersion tubes	See page 159.

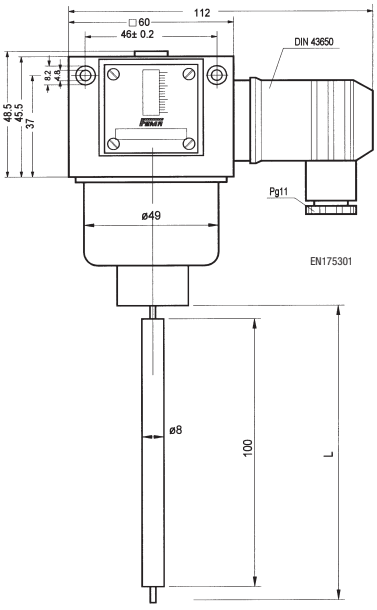
Product Summary

Type	Setting range	Switching differential (mean values)	Max. permissible temperature at sensor
Tauchtiefe 135 mm			
TX023	–20 to + 30 °C	1.5 K	110 °C
TX150	+10 to + 50 °C	1.5 K	110 °C
TX490	+40 to + 90 °C	2.5 K	125 °C
TX813	+80 to +130 °C	4.0 K	150 °C
Tauchtiefe 220 mm			
TXB023	–20 to + 30 °C	1.5 K	110 °C
TXB150	+10 to + 50 °C	1.5 K	110 °C
TXB490	+40 to + 90 °C	2.5 K	125 °C
TXB813	+80 to +130 °C	4.0 K	150 °C

Accessories

Immersion tube type R10/MS, R20/MS, R10/NST, R20/NST, see page 149.
Immersion tubes for NPT thread on request.

Dimensioned drawing:



-TX see page 110

STW70130F

STW / STB

Safety strap-on thermostats

Self- monitoring sensor systems for temperature monitoring and limiting tasks, e.g., for floor-heating applications.

If the sensor is damaged, i.e., if the expansion fluid in the capillary tube leaks, the strap-on thermostat responds as though the temperature has exceeded the set-point and will thus switch to the safety setting (e.g., will switch off the circulation pump). To ensure reliable functioning, the surface of the pipe must be thoroughly cleaned of contamination, rust, paint, etc. Each thermostat is delivered together with a strap allowing attachment to pipes having a diameter of up to 100 mm. Additionally, the thermostat can be mounted to walls using the capillary. An optional immersion well allows use as an immersion sensor. This demonstrates the great versatility of this innovative device, which is also reflected in the small quantity of stock kept on hand by customers. Among the innovative features of this device are its automatic temperature compensation and the Push-In® contacts for quick wiring. The devices are CE-approved and UL-certified and also certified according to Pressure Equipment Directive DIN EN 14597.

Technical data

Max. switching capacitiy	230 VAC, 12 (2.5) A
Min. switching capacity	24 V AC/DC, 100 mA
Humidity	0...95% rh, non-condensing
Storage/transport temp.	-30...+80 °C
Operating temperature	0...+80 °C
Max. overload temperature	120 °C (strap-on mounting)
Max. length of capillary	2 m
Min. bend radius of capillary	5 mm
Max. pipe diameter	100 mm
Mounting position	NL 0 / 90 as per DIN 16257
Switch-point accuracy STW 2080, STB 2080	
At 20... 50 °C	+0 / -12 K
At 50... 80 °C	+0 / -5 K
Switch-point accuracy STW 70130, STW 70130	
At 70... 100 °C	+0 / -12 K
At 100... 130 °C	+0 / -5 K
Switch deviation	max. ±5 K during lifetime
Hysteresis	approx. 10 K
Protection class	IP54 as per EN60529
Wiring terminals	Push-IN® up to 2.5 mm² cross-section
Cable entry	M20x1.5 for Ø 6... 12 mm
Housing materials	PA, ABS, PMMA
Weight	280 g
Dimensions	150 x 53 x 63 mm
Approvals	DIN, PED, CE, UL

Type	Setting range	Application	Hysteresis	Reset
STW2080F	20–80 °C	monitoring	10 K	auto
STB2080F	20–80 °C	limiter	10 K	manual
STW70130F	70–130 °C	monitoring	10 K	auto
STB70130F	70–130 °C	limiter	10 K	manual

STW2080F and STW70130F safety temperature monitor

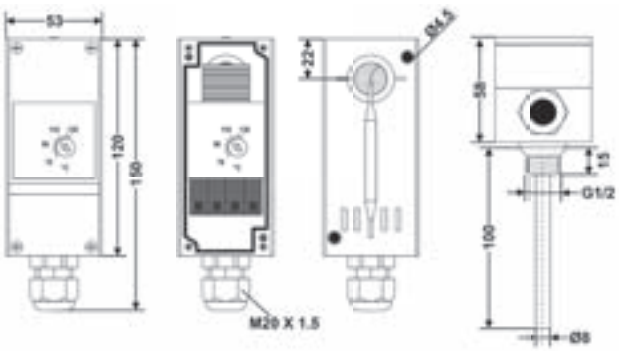
If the sensor temperature exceeds the set value, a snap-action switch opens, interrupting the electrical circuit. As soon the sensor temperature drops by more than 10 K, the snap-action switch again closes automatically. If the measurement system is damaged, i.e., if the expansion fluid in the capillary tube leaks, the switch will open and remain open (resetting no longer possible). Also, if the sensor temperature drops below approx. -20 °C, the snap-action switch opens, but closes again automatically after the temperature rises again.

STB2080F and STB70130F safety temperature limiter

If the sensor temperature exceeds the set value, a snap-action switch opens, interrupting the electrical circuit, and remains open until reset manually. To manually reset the device, the sensor temperature must drop by more than 10 K. If the measurement system is damaged, i.e., if the expansion fluid in the capillary tube leaks, the switch will open and remain open (resetting no longer possible). Also, if the sensor temperature drops to below approx. -20 °C, the snap-action switch opens, but closes again automatically after the temperature rises again.

Type	Immersion well, brass, nickel-plated permitted pressure: 40 bar
STG12-100F	G 1/2", 100 mm, ø 8 mm

Dimensioned drawings:



CE

Protection Class: IP 54

STB+TWF

STB

Temperature monitors, temperature limiters, type-tested

Temperature monitors and temperature limiters are tested according to Pressure Equipment Directive 97/23 EC, meet the requirements of DIN EN14597 and can thus be used for heating systems according to DIN EN12828, for steam and hot water systems and for district heating systems. The devices with safety function (STW, STB) are self-monitoring, i.e. in the event of breakage or leaks in the measuring system the circuit is opened and the system is switched off towards the safe side.

Technical data

Body Diecast aluminium with plastic cover.

Immersion tube Brass G 1/2", included with product Stainless steel G 1/2", order separately. Type T4NSTF or T5NSTF, see Product Summary

Permitted ambient temperature +80°C at the switching head

Switching point accuracy (in upper third of scale) for TW, STW, STB: ± 5 % for TR: ± 1.5 % (in % of scale range)

Switching differential (in % of scale range) for TR, TW: 3–4 % for STW, STB: 4–6%

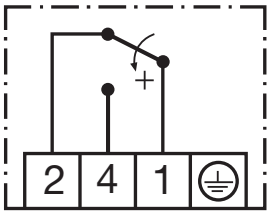
Lead seal The cover of the switching device can be lead sealed so that the internal settings of the limiter switching points are no longer accessible after sealing.

Switching capacity 10 (2) A, 250 VAC

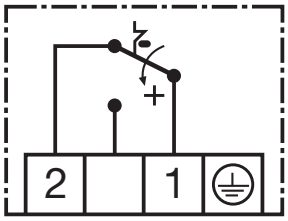
Degree of protection IP 54

Connection schemes:

In devices with a dual function there are 2 switching elements. Pay attention to the function of the relevant switch when connecting.



TW, STW, TR



STB

Type	STW1F	STB1F	STW+TRF	STB+TWF	STB+TRF
Function	Safety temperature monitor	Safety temperature limiter	Safety temperature monitor and controller	Safety temperature limiter and monitor	Safety temperature limiter and controller
Setting range	20 to 150 °C	60 to 130 °C	20 to 150 °C	30 to 110 °C	30 to 110 °C
Setting	internal	internal	STW internal TR external	STW internal TW internal	STB internal TR external
Controls accesible from outside	no	Reclosing button	Setting wheel for TR	Reclosing button	Reclosing button and setting wheel for TR
Contact	changeover	opener contact	2 x changeover	NC (STB) and changeover (TW)	NC (STB) and changeover (TR)
Reclosing lockout (internal)	no	yes	no	yes	yes
Max. temperature at sensor	175 °C	150 °C	175 °C	130 °C	130 °C
Immersion depth	150 mm	150 mm	150 mm	150 mm	150 mm
Permitted pressure, brass immersion tube	40 bar	40 bar	25 bar	25 bar	25 bar
Permitted pressure, stainless steel immersion tube	80 bar T4NSTF	80 bar T4NSTF	40 bar T5NSTF	40 bar T5NSTF	40 bar T5NSTF

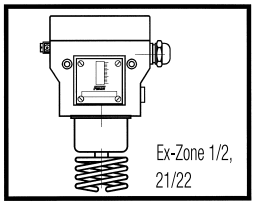
Immersion wells, stainless steel, 1.4571, G1/2"

Temp. monitor, temp. limiter	Immersion depth	Type
STW1F STB1F	150mm	**T4NSTF**
STB+TWF STB+TRF STW+TRF	150 mm	**T5NSTF**

Temperature monitoring
in explosion-endangered areas

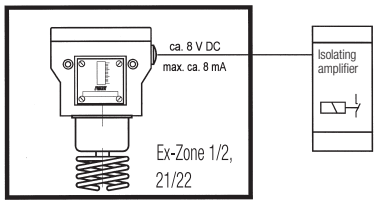
Temperature switches with special equipment can also be used in explosion risk area ≥ Zone 1, 2 and 21, 22.

The following alternatives are possible:



1. Thermostats with pressure-proof encapsulated switching device, degree of protection Ex II 2 G/D EEx de IIC T6 IP65 T 80°C

The thermostat in pressure-proof encapsulation can be used directly in explosion risk areas Zone 1, 2 and 21. The maximum switching voltage, switching capacity and ambient temperature must be taken into account and the rules for installation in the explosion risk area must be observed.
All thermostats may be equipped with explosion-proof switching devices. However, special circuits and designs with an adjustable switching differential are not permitted.

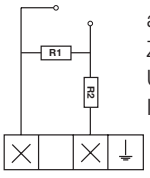


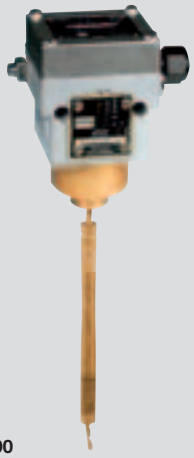
2. Thermostats in Ex-ia version

All thermostats in the standard version can be used in explosion risk areas Zone 1, 2 and 21, 22 if they are incorporated into an "intrinsically safe circuit". Intrinsic safety is based on the principle that the control current circuit in the explosion risk area carries only a small quantity of energy which is not capable of generating an ignitable spark.
Isolating amplifiers, must be tested by the Physikalisch-Technische Bundesanstalt (PTB) pursuant to ATEX 100 and approved for use in explosion risk areas. Isolating amplifiers must in any event be installed outside the explosion risk area.
Thermostats which are intended for Ex-ia installations are equipped with blue terminals and cable entries. In view of the low voltages and currents carried via the contacts of the microswitches, gold-plated contacts are used in the Ex-ia version (additional function ZFT513).

Temperature monitoring in Zone 1 (21) and 2 (22)

Pressure-proof encapsulated Ex-de ...	**Intrinsically safe D ...-513**
Explosion protection: Ex II 2 G/D EEx de IIC T6 IP 65 T80° C	Explosion protection: Ex-ia
ATEX approval for the complete switching device	ATEX approval for isolating amplifier
Thermostats with silver contact	Thermostats with gold-plated contacts, blue terminal and blue cable entry.
Switching capacity: max. 3 A, 250 VAC min. 2 mA, 24 VDC	Switching capacity: max. 100 mA, 24 VDC min. 2 mA, 5 VDC
	Information for devices with additional functions according to EN60079-11:2007: ZF513: U_i = 24 V DC, I_i = 50 mA ZF574, ZF576: U_i = 20 V DC, P_i = 0,6 W, R_1 = 10 kOhm, 0,6 W, R_2 = 1,5 kOhm, 0,6 W L_i = insignificant C_i = insignificant
The thermostat can be installed within the Ex-Zone.	The isolating amplifier must be installed outside the Ex-Zone.





Ex-TX490

Ex-TX

II 2G Ex d e IIC T6 Gb

II 1/2D Ex ta/tb IIIC T80 °C Da/Db

Rod thermostats are suitable for direct installation in tanks, pipelines and air ducts. The immersion wells can be fitted in advance.

SIL 2 according IEC 61508-2

Technical data

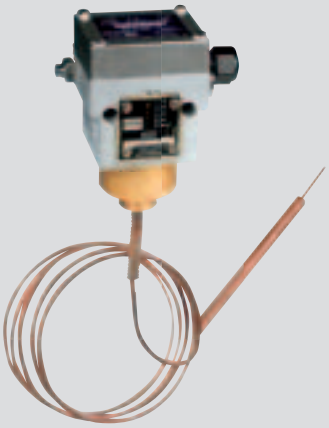
Housing	Diecast aluminium GD Al Si 12 according to DIN 1725.
Mounting position	Any, preferably vertical
Permitted ambient temperature at switching device	+60°C
Permitted temperature at sensor	See Product Summary
Contact arrangement	Single pole changeover switch
Switching capacity	8 (5) A 250 VAC
Degree of protection	IP 65 according to DIN EN60529 (with vertical installation)
Calibration	Scale value corresponds to the lower switching point (with falling temperature), the upper switching point is higher by the amount of the switching differential
Switching temperature	Adjustable from outside with screwdriver
Switching differential	Not adjustable, for values see Product Summary
Immersion tubes	See page 149.

Product Summary

Type	Setting range	Switching differential (mean	Max. permissible temperatur values) at sensor
Immersion depth 135 mm			
Ex-TX023	–20 to + 30 °C	1.5 K	110 °C
Ex-TX150	+10 to + 50 °C	1.5 K	110 °C
Ex-TX490	+40 to + 90 °C	2.5 K	125 °C
Immersion depth 220 mm			
Ex-TXB023	–20 to + 30 °C	1.5 K	110 °C
Ex-TXB150	+10 to + 50 °C	1.5 K	110 °C
Ex-TXB490	+40 to + 90 °C	2.5 K	125 °C

Accessories

Immersion tube type R10/MS, R20/MS, R10/NST, R20/NST, page 149.
Immersion tubes for NPT thread on request.



Ex-TAM813

Ex-TAM

Ⓔx II 2G Ex d e IIC T6 Gb

Ⓔx II 1/2D Ex ta/tb IIIC T80 °C Da/Db

The sensor cartridge at the end of the capillary tube is the actual active (temperature-sensitive) part of the sensor. Changes in temperature on the capillary tube have no effect on the switching point. Pressure-tight installation of the sensor in pressure vessels of all kinds is possible with the aid of an immersion well.

SIL 2 according IEC 61508-2

Technical data

Body	Diecast aluminium GD Al Si 12 according to DIN 1725.
Mounting position	Any, preferably vertical
Permitted ambient temperature at switching device	–20 to +60 °C
Capillary tube	Cu capillary tube, 1.5 m long Other capillary tube lengths are not possible
Sensor cartridge	8 mm Ø, 100 mm long, material: Cu
Contact arrangement	Single pole changeover switch
Switching capacity	8 (5) A 250 VAC
Degree of protection	IP 65 according to DIN EN60529 (with vertical installation)
Mounting	Temperature sensor with or without immersion tube in containers, air ducts etc. Switching device with 2 screws (Ø 4) directly on a flat wall surface
Calibration	Scale value corresponds to the lower switching point (with falling temperature), the upper switching point is higher by the amount of the switching differential
Switching temperature	Adjustable via the setting spindle with a screwdriver
Switching differential	Not adjustable
Immersion tubes	see page 149.

Product Summary

Type	Setting range	Switching differential (mean values)	Max. permissible temperature at sensor
Ex-TAM022	–20 to + 20 °C	1.5 K	110 °C
Ex-TAM150	+10 to + 50 °C	1.5 K	110 °C
Ex-TAM490	+40 to + 90 °C	2.0 K	125 °C
Ex-TAM813	+80 to +130 °C	2.0 K	150 °C

Accessories

Immersion tube type … R1, R2, R3, RN1, RN2, page 149.

CE Ⓔx Protection Class: IP 65

Ex-TRM150

TRM

II 2G Ex d e IIC T6 Gb

II 2D Ex tb IIIC T80 °C Db

FEMA room thermostats are suitable for industrial plants, for greenhouses, livestock buildings and warehouses, and also for monitoring the maximum temperature in switchgear cabinets and relay stations. Room thermostats are supplied complete with wall bracket H1.

SIL 2 according IEC 61508-2

Technical data

Body	Diecast aluminium GD Al Si 12 according to DIN 1725. Resistant to ammoniacal vapours and seawater
Mounting position	Any, preferably vertical
Permitted ambient temperature	–20 to +60 °C
Permitted temperature at sensor	60°C
Contact arrangement	Single-pole changeover switch
Switching capacity	8 (5) A 250 VAC
Degree of protection	IP 65 according to DIN EN60529 (with vertical installation)
Mounting	With wall bracket H 1 or directly on the wall with 2 screws (Ø 4)
Calibration	Scale value corresponds to the lower switching point (with falling temperature), the upper switching point is higher by the amount of the switching differential
Switching temperature	Adjustable from outside with screwdriver
Switching differential	Not adjustable

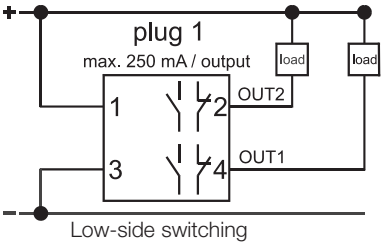
Product Summary

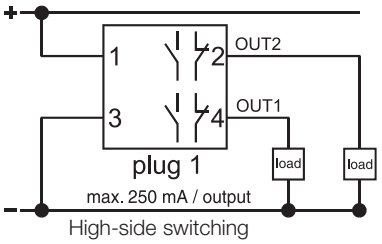
Type	Setting range	Switching differential (mean values)
Ex-TRM022	–20 to +20 °C	1.0 K
Ex-TRM40	0 to +40 °C	1.0 K
Ex-TRM150	+10 to +50 °C	1.0 K

Electronic thermostats / transmitters

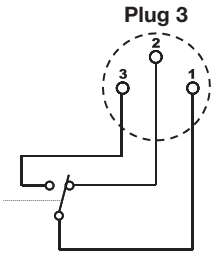
FEMA
by Honeywell

Switch outputs



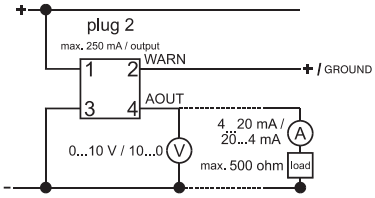


Switch output OUT1 and OUT2
The switch outputs can be configured via the software (at expert level) both as normally closed / normally open, and as high-side and low-side switching.
In **normally closed configuration**, the selected voltage potential (earth or supply voltage) occurs at the output in the **unswitched** state.
In **normally open configuration**, the selected voltage potential (earth or supply voltage) occurs at the output in the **switched** state.
In the **low-side switching configuration**, the outputs switch the voltage potential 0V (earth) with respect to a consumer connected to OUT1 or OUT2.
In the **high-side switching configuration**, the outputs switch the supply voltage potential (minus approx. 2V) with respect to a consumer connected to OUT1 or OUT2.
If the power supplies of the pressure switch and connected load are independent of one another, the following must be taken into account: The potential difference between OC output and earth and OC output and supply voltage must not exceed 36 VDC. If the configuration is "low-side switching", the external power supply must have the same earth reference as the device itself. If the device is defined as "high-side switching", the external power supply must be connected to the positive power supply of the device. It is important to note that the voltage drop in the through-connected state can be as much as 2 V.
The maximum permitted current at the OC is 250 mA per switch output (OUT1, OUT2).
A maximum switching current of 250 mA may flow through each channel.
The switching channels are short-circuit-proof and they are monitored for current and temperature. Where current limiting is used and on overheating, both LEDs light up red (WARN function).



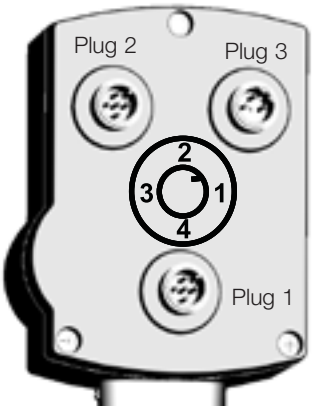
Relay output REL
The relay output is realised in version **TST…-R**. In expert mode the analogue output can be coupled via the software with output 1 (OUT1) and output 2 (OUT2), and with the WARN function. This means that the user can choose a potential-free output for these 3 important functions. The changeover contact of the relay is designed for a maximum resistive load of 4A and an inductive load of 200VA. At the lower end the 5µ gold-plated silver contacts are designed for a minimum load of 50 mW (5 V at 10 mA).
It should always be remembered that, after a one-off maximum load on the switching current side, the gold plating of the contacts is stripped so they can no longer be used for low-current and low-voltage applications.

Analogue output



Analogue output
The analogue output (AOUT) is available in versions TST and TST…-R. In expert mode it is configurable both as a 0-10 V/10-0 V, and as a 4-20 mA/20-4 mA output. The unit is supplied with the output configured for 0-10 V.
The input impedance of the connected consumer **must not exceed 500 ohms**.

Electrical connection



Electrical connection and contact assignment
Electrical connection is via M12 plugs on the back of the unit.
Depending on the version, either 2 (TST) or 3 (TST…-R) M12 connector plugs are available (not supplied with the unit).

Contact assignment on plug 1 (A-coded)
Pin 1: Supply voltage 14…36 VDC
Pin 2: OUT 2 (output 2) open collector output
Pin 3: 0 volt (earth)
Pin 4: OUT 1 (output 1) open collector output
Pin 5: Serial interface (locked for calibration)

Special characteristic of open collector outputs
Depending on the design, the output voltage at open collector outputs can be up to 2.5 V lower than the applied supply voltage.
Example: Supply voltage 14 V… Output voltage OUT 1 approx. 11.5 V.

Contact assignment on plug 2 (A-coded)
All versions of series TST and TST…-R are also equipped with an A-coded M 12 plug.
Pin 1: Supply voltage 14…36 VDC
Pin 2: WARN (warning output max. 20 mA)
Pin 3: 0 V (earth)
Pin 4: Analogue output AOUT
Pin 5: Serial interface (locked for calibration)

Units of the TST series can be powered both via plug 1 and via plug 2. If the TST is used purely as a transmitter, only one connection via plug 2 is needed, because the supply voltage can be connected here too (see "Contact assignment on plug 1").

Contact assignment on plug 3 B-coded)
All versions of series TST…R are also equipped with a B-coded M 12 plug.
Pin 1: Common contact
Pin 2: Normally closed contact
Pin 3: Normally open contact

Smart Temp TST

Smart Temp TST

Electronic thermostat + temperature transmitter

Smart Temp electronic thermostats are used wherever it is necessary to carry out special monitoring tasks combined with switching functions. The device is ideal for two-stage temperature control. Smart Temp is therefore highly suitable for temperature control in mechanical and plant engineering, fluidics, process engineering and pneumatics, and for monitoring and control of heating systems, climatic cabinets, ovens, and cooking systems.

Its open-ended sensor technology means that the range of possible applications is growing all the time. In the TST…-R version, floating switching signals are output via a relay contact. A convenient and configurable analog output transmits critical process temperatures to measurement and control systems.

Technical data

Measuring ranges	-50°C…+400°C
Ambient temperature	-20°C…+60°C
Storage temperature	-35°C…+80°C
Relative humidity	0…95% non-condensing
Overall accuracy	0.5% of full scale
Weight	depends on model
Parts in contact with medium	Built-on sensors: 1.4571, external sensors: depends on model
Process connections	Standard built-on sensor: G 1/2" external thread External sensor connection: M8 plug according to DIN IEC 60947-5-2
Electrical connections	TS and TST versions: 5-pin M 12 plug as per DIN IEC 60947-5-2 (as accessory) TST…-R versions: Additional 4-pin M12 plug, as per DIN EN 50044 (as accessory)
Sensor element	PT 1000 Class A`
Protection class	II as per EN 60335-1 IP65 as per EN 60529
Climate class	C as per DIN EN 60654
Power supply	14…36 VDC
Outputs	2 open-collector outputs 250 mA at 16…36 VDC Configurable as high-side/low-side switching and as push/pull outputs Switching differential (SP and RP) selectable via software
Relay outputs (TST...-R)	Permissible resistive load: 250 VAC, 5 A Permissible inductive load: 250 VAC, 0.8 A (200 VA) Contact type: 1 changeover contact (1 xU M) Maximum service life: 100,000 switching cycles
Warning output	Output configuration: Warning output on plug 2 max. 20 mA, 14...36 VDC
Transmitter output	Voltage/current 0 -10 V and 4…20 mA, configurable in expert mode
Housing and cover	Polybutylene terephthalate PBT-GF30, resistant to chemicals and stress cracking
Display screen cover	Polycarbonate PC

With an **overall accuracy of 0.5%** of full scale, these electronic thermostats are also suitable for monitoring measurements in laboratory applications. Models with built-on sensors for a temperature range of **-50°C....+200°C** and models with external sensors for a temperature range of **-50°C....+400°C** are available.
Please let us know if you have special sensor requirements.
We have the facilities to make your special sensor for you.

Functions

The 2 switching outputs can be configured as:
- Minimum thermostat, maximum thermostat, temperature window monitoring
- Configurable as normally closed or normally open, high-side or low-side switching and as a push/pull output
- Relay output assigned to channel 1 or 2 or to the warning output (in the case of TST.-R)

Configuration of the analog output:
- 0-10 V, 4-20 mA or 10-0 V and 20-4 mA
- Analog measuring range can be limited to a minimum of 50 % of the total measuring range
- Choice of temperature unit (°C and °F)

Smart Temp display functions:
- 4-digit digital display with bar graph for temperature, settings and set parameters
- 2 three-colour LEDs to show the switching state of the outputs, implausible settings and as a warning status indicator

Electrical connection:
- Two 5-pin M12 plug connections for power supply, switching outputs and analog output
- One 4-pin M12 plug connection for the relay output
- One 4-pin M8 plug connection for PT1000 Class A sensors (for all TST... EPT series)

Plus:
- Switch on/off delay of 0-60 sec.
- Temperature simulation mode, two-stage locking code, restore function
- Warning function for implausible switching points, sensor fault, overload and overheating

Electronic thermostats

Type	Temperature range	Sensor immersion depth (mm)	Sensor design	Type
TST050G12100	-50 °C...+50 °C	100	Built-on	**TST050G12100-R**
TST050G12250	-50 °C...+50 °C	250	Built-on	**TST050G12250-R**
TST200G12100	-50 °C...+200 °C	100	Built-on neck-tube	**TST200G12100-R**
TST200G12250	-50 °C...+200 °C	250	Built-on neck-tube	**TST200G12250-R**
TST200EPT1K*	-50 °C...+200 °C	n.a.	External with cable	**TST200EPT1K-R***
TST400EPT1K*	-50 °C...+400°C	n.a.	External with cable	**TST400EPT1K-R***

* Wall-mounting kit for evaluation unit AST1 included.

External sensors

Type	Temperature range	Sensor immersion depth (mm)	Cable length	Comment
P2-TVS12-400100	-50 °C...+400 °C	100	2,5 m	ST8-3 plug enclosed
P2-TVS12-400250	-50 °C...+400 °C	250	2,5 m	ST8-3 plug enclosed

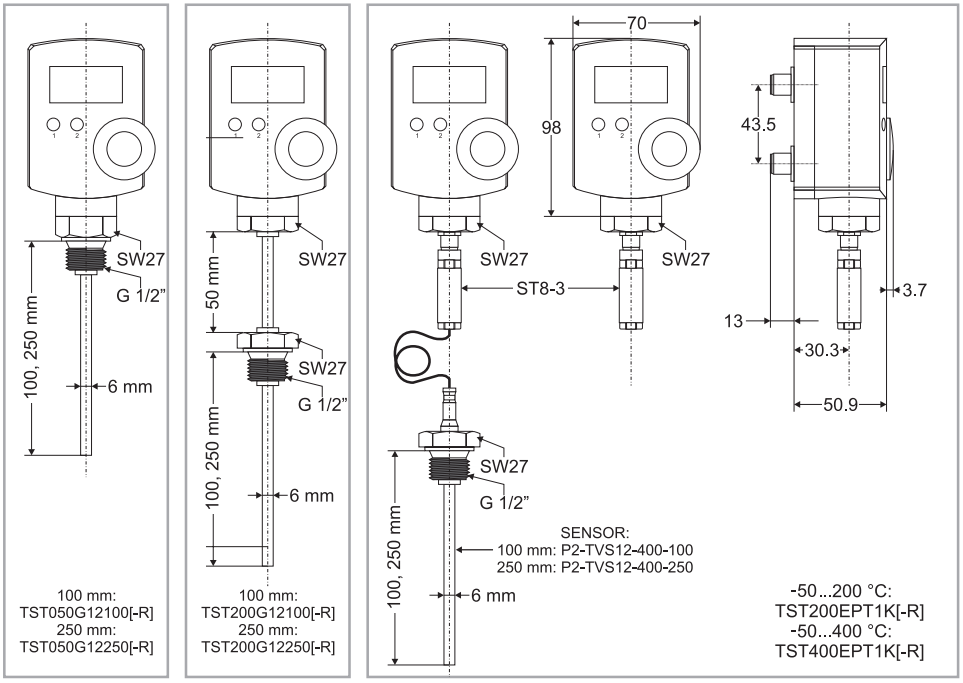
For more stainless steel sensors, see page 121.

Accessories (order separately)

Cable socket Type			
For output 1+2			
ST12-5-A	5-pin	A-coded	Right-angle version
ST12-5-G	5-pin	A-coded	Straight version
For output 3 (relay output)			
ST12-4-A	4-pin	B-coded	Right-angle version
ST12-4-G	4-pin	B-coded	Straight-angle version
ST12-4-AK	4-pin	B-coded	Right-angle version with 2 m cable
ST12-4-GK	4-pin	B-coded	Straight version with 2 m cable
Cover Cap			
STA12			IP 65

Contacting
ST12-4-AK and ST12-4-GK

Relais contact	colour	Contact
1	brown	common
2	white	NC
3	blue	NO
4	green/yellow	n.a.



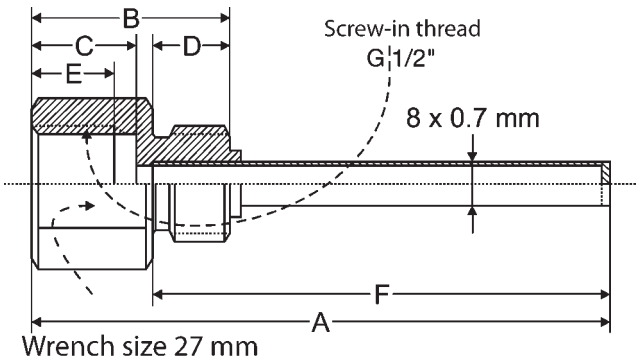
Immersion wells for Smart Temp

Types	Immersed length (mm)	Material	Type	Comment	Max. perm. pressure (bar)
G12-100	100	1.4571/316L	**G1/2 A**	Cyl. ext. thread	100
G12-250	250	1.4571/316L	**G1/2 A**	Cyl. ext. thread	100
R12-100	100	1.4571/316L	**R1/2“**	Con. ext. thread	100
R12-250	250	1.4571/316L	**R1/2“**	Con. ext. thread	100
N12-100	100	1.4571/316L	**N1/2“**	Con. ext. NPT thread	100
N12-250	250	1.4571/316L	**N1/2“**	Con. ext. NPT thread	100

Mounting dimensions for Smart Temp

· Wrench size: AF 27
· Internal thread for insertion sensor: G1/2"
· Immersion tube diameter: 8 x 0.7 mm

Type	A	B	C	D	E	F	Process thread
G12-100	105	36	19	14	15	83	G1/2" (cylindrical)
G12-250	255	36	19	14	15	233	G1/2" (cylindrical)
R12-100	105	36	19	14	15	83	G1/2" (conical)
R12-250	255	36	19	14	15	233	G1/2" (conical)
N12-100	105	36	19	14	15	83	N1/2" (conical NPT)
N12-250	255	36	19	14	15	233	N1/2" (conical NPT)



Temperature sensors

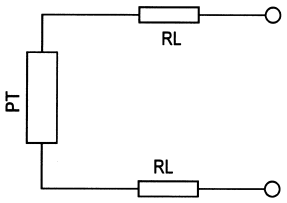
FEMA
by Honeywell

General notes on temperature measurement

with resistance sensors Pt 100 and Pt 1000

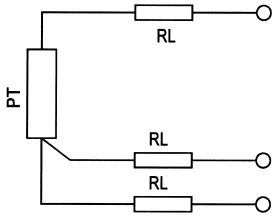
Connection possibilities for Pt... sensors

Two-wire connection



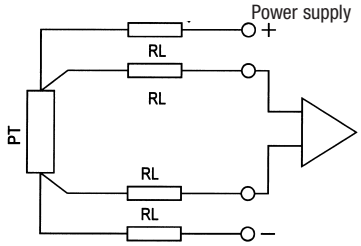
Advantage: Only 2 wires
Disadvantage: The line resistance RL distorts the measurement result

Three wire connection



Advantage: The line resistances are taken into account by the electronic analyser. The measurement result is not distorted.
Disadvantage: 3 wires are needed. All 3 wires must have the same resistance.

Four-wire connection



Advantage: The line resistances do not play any role due to the electronic analyser (current feed and high-ohmic voltage sensing). The measurement result is not distorted. The lines can have different resistances.
Disadvantage: 4 wires are needed.

Connection wires with the same colours are electrically connected to one another.

Platinum temperature sensors Pt 100 or Pt 1000 make use of the constant change in resistance of materials at changing temperatures. A platinum-rhodium alloy specially suited to this purpose is normally used because of its good stability and high reproducibility.
The resistance of the sensor increases as the temperature rises.

The resistance values are stipulated in DIN IEC 751 as follows:
Pt 100 = 100 ohms at 0°C
Pt 1000 = 1000 ohms at 0°C

The resistance values for all temperatures are quoted in the above-mentioned standard.
The resistance sensors are divided into accuracy classes according to their limiting error.

For FEMA Pt 100/1000 sensors, Class A applies: 0.15 K + 0.002 x t*
*t is the numerical value of the temperature in °C (disregarding the sign)

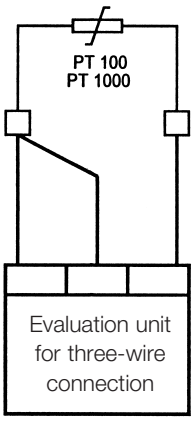
Resistance values of Pt 100 sensors (except from DIN 43 760, IEC 751)

Temperature °C	Basic values of Pt 100											Temperature °C
	0	1	2	3	4	5	6	7	8	9	10	
– 50	80,31	79,91	79,51	79,11	78,72	78,32	77,92	77,52	77,13	76,73	76,33	– 50
– 40	84,27	83,88	83,48	83,08	82,69	82,29	81,89	81,50	81,10	80,70	80,31	– 40
– 30	88,22	87,83	87,43	87,04	86,64	86,25	85,85	85,46	85,06	84,67	84,27	– 30
– 20	92,16	91,77	91,37	90,98	90,59	90,19	89,80	89,40	89,01	88,62	88,22	– 20
– 10	96,09	95,69	95,30	94,91	94,52	94,12	93,73	93,34	92,95	92,55	92,16	– 10
0	100,00	99,61	99,22	98,83	98,44	98,04	97,65	97,26	96,87	96,48	96,09	0
0	100,00	100,39	100,78	101,17	101,56	101,95	102,34	102,73	103,12	103,51	103,90	0
10	103,90	104,29	104,68	105,07	105,46	105,85	106,24	106,63	107,02	107,40	107,79	10
20	107,79	108,18	108,57	108,96	109,35	109,73	110,12	110,51	110,90	111,28	111,67	20
30	111,67	112,06	112,45	112,83	113,22	113,61	113,99	114,38	114,77	115,15	115,54	30
40	115,54	115,93	116,31	116,70	117,08	117,47	117,85	118,24	118,62	119,01	119,40	40
50	119,40	119,78	120,16	120,55	120,93	121,32	121,70	122,09	122,47	122,86	123,24	50
60	123,24	123,62	124,01	124,39	124,77	125,16	125,54	125,92	126,31	126,69	127,07	60
70	127,07	127,45	127,84	128,22	128,60	128,98	129,37	129,75	130,13	130,51	130,89	70
80	130,89	131,27	131,66	132,04	132,42	132,80	133,18	133,56	133,94	134,32	134,70	80
90	134,70	135,08	135,46	135,84	136,22	136,60	136,98	137,36	137,74	138,12	138,50	90
100	138,50	138,88	139,26	139,64	140,02	140,39	140,77	141,15	141,53	141,91	142,29	100
110	142,29	142,66	143,04	143,42	143,80	144,17	144,55	144,93	145,31	145,68	146,06	110
120	146,06	146,44	146,81	147,19	147,57	147,94	148,32	148,70	149,07	149,45	149,82	120
130	149,82	150,20	150,57	150,95	151,33	151,70	152,08	152,45	152,83	153,20	153,58	130
140	153,58	153,95	154,32	154,70	155,07	155,45	155,82	156,19	156,57	156,94	157,31	140
150	157,31	157,69	158,06	158,43	158,81	159,18	159,55	159,93	160,30	160,67	161,04	150
160	161,04	161,42	161,79	162,16	162,53	162,90	163,27	163,65	164,02	164,39	164,76	160
170	164,76	165,13	165,50	165,87	166,24	166,61	166,98	167,35	167,72	168,09	168,46	170
180	168,46	168,83	169,20	169,57	169,94	170,31	170,68	171,05	171,42	171,79	172,16	180
190	172,16	172,53	172,90	173,26	173,63	174,00	174,37	174,74	175,10	175,47	175,84	190
200	175,84	176,21	176,57	176,94	177,31	177,68	178,04	178,41	178,78	179,14	179,51	200

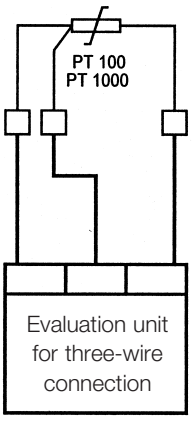
The resistance values of Pt 1000 are higher by a factor of ten.

When Pt sensors are connected, the line resistances between the measuring point and evaluation unit (e.g. transmitter) must be taken into account (see left column).
All FEMA evaluation units (transmitters and temperature switches) have an input circuit for 3-wire connection. The sensors must be connected as shown in the following diagrams. All three wires must be of equal length and have the same conductor cross-section to compensate for the line resistances.

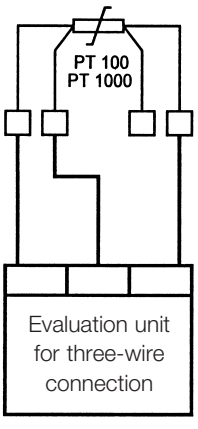
Two-wire sensor



Three-wire sensor



Four-wire sensor



P100

P

Pt 100 temperature sensors in stainless steel

The temperature sensors are made entirely from stainless steel 1.4571. Sensor element: Pt 100, Class A to DIN IEC 751, 3-wire connection. Cable entry M16x1.5, Protection class IP 67. Temperature range –50…+400 °C.

Technical Data

Housing and cover	Stainless steel 1.4571/ 316Ti
Parts in contact with medium	Stainless steel 1.4571/ 316Ti
Temperature of medium	-50...+400 °C
Process connection	G1/2" Außengewinde
Electrical connection	
P100...	screw clamp on ceramic base
P100A...	50 mm cable ends
Sensor element	Pt 100 temperature sensor conforming to EN 60 751, Class A, three-wire circuit
Cable entry	M16x1,5 screw clamp
Cable diameter	ø 6–9 mm
Protection rating	IP 67 (when connected properly)
Max. permissible pressure	100 bar
Response time	$\tau_{0.9}$ = 12 sec (in water at 0,4 m/s)

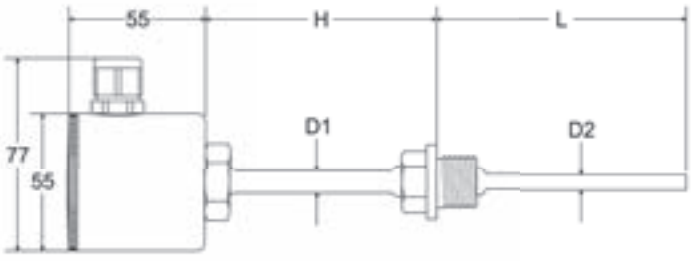
Immersion sensors with screw-in thread G1/2", 6 mm ø

Type	Max. permissible pressure (bar)	Immersion depth L (mm)
P100-100	100	100
P100-150	100	150
P100-200	100	200
P100-250	100	250

Immersion wells (screw-in threat G1/2")

Type	Immersion depth	Thread	Max. permissible pressure (bar)
G12-100	100	G1/2"	100
G12-150	150	G1/2"	100
G12-200	200	G1/2"	100
G12-250	250	G1/2"	100
R12-100	100	R1/2"	100
R12-150	150	R1/2"	100
R12-200	200	R1/2"	100
R12-250	250	R1/2"	100
N12-100	100	½" NPT	100
N12-150	150	½" NPT	100
N12-200	200	½" NPT	100
N12-250	250	½" NPT	100

Dimensions:



L (Fitting length)	D1 (Protection tube ø)	D2 (Protection tube ø)	H (Protection tube ø)
100 mm	9 mm	6 mm	70 mm
150 mm	9 mm	6 mm	70 mm
200 mm	9 mm	6 mm	70 mm
250 mm	9 mm	6 mm	70 mm

CE

Protection Class: IP 67

Strap-on sensor ALF21/31

High-quality sensors for HVAC and industrial applications ALF..., TF..., KF..., RF21/31

Accurate Pt 100 / Pt 1000 Class A sensors with IP 65 plastic terminal box

The highly accurate and reliable sensors of the ALF, TF, KF and RF series are designed for demanding HVAC applications. They are also suitable for industrial applications, where 3-wire technology is standard and IP 65 protection is considered necessary for the terminal box. A very low-cost yet highly accurate solution thanks to the use of Pt 100/1000 Class A sensors.

Technical data

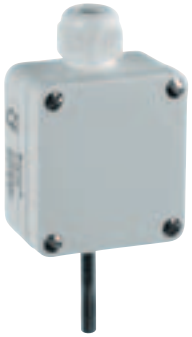
Sensor accuracy
Sensor technology — IEC751 Class A
0.15 K + 0.2 % • [t]
(t in °C)

Sensitivity
Pt 100 — ≈ 0.385 Ω / K
Pt 1000 — ≈ 3.85 Ω / K

Electrical connection
Cable connection — PG11 and screw terminals 3 x1.5 mm²

Electrical data
Measuring current — 1 mA
Insulation resistance — > = 100 MOhm at 20 °C (500VDC)
Sensor connection — 3-wire
Degree of protection — IP 65

Air duct sensor KF21/31



Room temperature sensor RF21/31

The ALF series strap-on sensors have a spring-loaded sensor ensuring good heat transfer at all times. In view of the 3-wire design, these sensors (Pt 1000A version) are recommended as an economical alternative for use together with TST…EPT1K.

Types, applications and materials

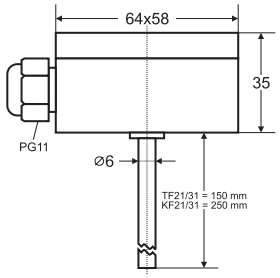
Type	Description	Max. perm. pressure immersion tube	Temperature range	Sensor	Protective tube material
ALF21	Strap-on sensor	n.a.	–30 bis +110 °C	Pt 100	n.a.
ALF31	Strap-on sensor	n.a.	–30 bis +110 °C	Pt 1000	n.a.
TF21*	Immersion sensor	40 bar	–30 bis +150 °C	Pt 100	1.4301
TF31*	Immersion sensor	40 bar	–30 bis +150 °C	Pt 1000	1.4301
KF21**	Air duct sensor	n.a.	–30 bis +150 °C	Pt 100	1.4301
KF31**	Air duct sensor	n.a.	–30 bis +150 °C	Pt 1000	1.4301
RF21	Room sensor	n.a.	–50 bis +90 °C	Pt 100	1.4571
RF31	Room sensor	n.a.	–50 bis +90 °C	Pt 1000	1.4571
ST8-3	Sensor plug for attachment to TST...EPT1K				

* A thermowell made from 1.4571 stainless steel is included.
** A PVC mounting flange is included.

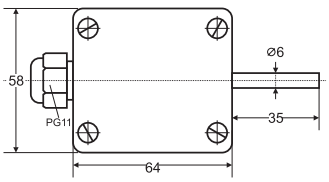
Terminal box made from PA6 (polyamide)

Dimensioned drawings:

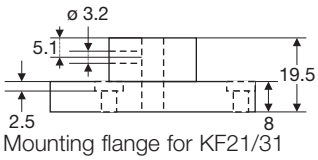
TF/KF21/31



RF21/31

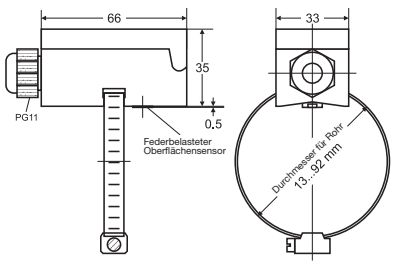


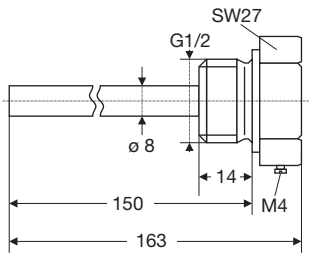
Attached accessory TF/KF21/31



Mounting flange for KF21/31

ALF21/31





Thermowell for TF21/31

Strap for pipe dia. 13 to 92 mm included.

Specifications

TRM/TRMV
Room thermostats for industrial premises, type TRM,
setting range from … to …°C.
Switching differential not adjustable / adjustable.
Diecast aluminium with plug connection to DIN EN175301.

T6120
Room thermostats for industrial rooms type T6120 …
setting range from … till … °C.
Switching difference adjustable / fixed.
Switching housing made of ABS, fibre glass armoured.

H6045A1002
Duct hygrostat, setting range 35 … 100% r.h.
Switching housing made of ABS, fibre glass armoured.

H6120A200
Duct hygrostat, setting range 35 … 100% r.h.
Switching housing made of ABS, fibre glass armoured.

STW
Safety temperature switch
Setting range from … till … °C, switching difference fixed.
Approved according to PED 97/23/EC.
Approved acc. to DIN EN14597 and therefore permitted for
use in heating installations acc. to DIN EN12828.

STB
Safety temperature limiter
Setting range from … till … °C, switching difference fixed.
Approved according to PED 97/23/EC.
Approved acc. to DIN EN14597 and therefore permitted for
use in heating installations acc. to DIN EN12828.

FT69
Frost protection thermostat for air heating- and conditioning.
Setting range -10°C … +12 °C, set point at +5°C falling,
Capillary length: … m, reset manually / automatically,
Switching housing: ABS and polycarbonate.

TAM
Capillary tube thermostat type TAM… range of adjustment
from … to …°C. Capillary tube length 1.5 m,
diecast aluminium with plug connection to DIN 175301.

TX
Rod thermometer type TX …, range of adjustment from …
to …°C. Immersion depth 135 mm / 220 mm,
diecast aluminium housing with plug connector to DIN 175301.

STB+TWF/STB+TWF
Safety temperature limiter and control / monitoring.
Setting range from … till … °C, switching difference fixed.
Approved according to PED 97/23/EC.
Approved acc. to DIN EN14597 and therefore permitted for
use in heating installations acc. to DIN EN12828.

Specifications

TST
Electronic thermostat and temperature transmitter
with 2 open collector switching contacts and analogue output signal,
power supply 14-36V DC, protection class IP65 switching points are free adjustable,
setting range: … till … °C, immersion depth … mm.
Free programmable analogue output signal 4 … 20mA or 0 … 10V.

TST…R
Electronic thermostat and temperature transmitter
with 2 open collector switching contacts and
analogue output signal and potential free relay output.
Power supply 14-36V DC, protection class IP65 switching
points are free adjustable, setting range: … till … °C, immersion depth … mm.
Free programmable analogue output signal 4 … 20mA or 0 … 10V.

P
Temperature sensor Pt100, stainless steel made (1.4571).
Protection class IP67, PT100, class A acc. to DIN IEC751.
3-wire connection, cable entry M16x1.5.
Setting range -50 … +400 °C, immersion depth … mm.

ALF
Strap-on temperature sensor Pt100 / 1000,
class A acc. to DIN IEC751,
3-wire connection, cable entry PG11,
setting range -30 … +110 °C.

TF
Immersion temperature sensor Pt100 / 1000,
class A acc. to DIN IEC751,
3-wire connection, cable entry PG11,
setting range -30 … +150 °C, sensor length 150 mm.

KF
Air duct temperature sensor Pt100 / 1000,
class A acc. to DIN IEC751,
3-wire connection, cable entry PG11,
setting range -30 … +150 °C, sensor length 250 mm.

RF
Room temperature sensor Pt100 / 1000,
class A acc. to DIN IEC751,
3-wire connection, cable entry PG11,
setting range -50 … +90 °C.

Flow monitors

FEMA
by Honeywell

Ventilation and air-conditioning systems

S6040

Flow monitoring in ventilation systems

Air flow monitor S6040A1003 is suitable for flow monitoring of air and non-aggressive gases in ducts of air-conditioning and air-purification systems.

S6040

➔ p.128

Ventilation and air-conditioning systems

KSL

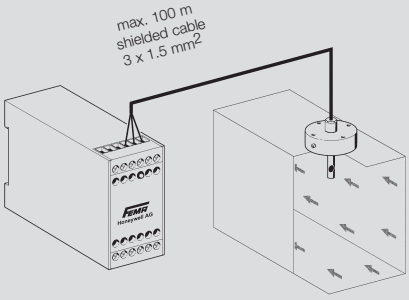
Air flow monitoring, compact design

Air flow sensors are suitable for air and all non-combustible and non-aggressive gases. They are used in ventilation and air conditioning systems. While the fan starts up the switch-on bypass is active. The bypass duration (2 – 60 s) is adjustable.

KSL230

➔ p.129

Ventilation and air-conditioning systems



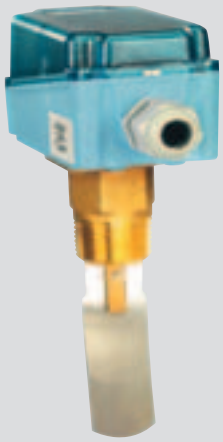
SWL

Air flow monitoring

The SLF15 sensor can be used in combination with an ASL… evaluation device to monitor the flow in the air (e.g. in air-conditioning systems). The switching point is adjustable. While the fan starts up the switch-on bypass is active. The bypass duration (2 – 60 s) is adjustable.

➔ p.130

TÜV-tested according to notice "Strömung 100"



S6065

S6065

Flow monitoring for liquid media (TÜV-tested)

TÜV-tested (according to notice "Flow 100") flow monitors of series S6065A are particularly suitable for flow monitoring of coolants in air-conditioning and refrigeration systems. Version V4A is also suitable for monitoring aggressive liquids.

➔ p.131

Liquids and gases

KSW230

KSW

Flow monitoring, compact design

These compact flow sensors are suitable for the monitoring of cooling circuits (up to 35% glycol) and heating circuits and for the aggressive media to which their construction materials are resistant (1.4305).

➔ p.133

Liquids and gases

SWW

Flow monitoring

The SWF62 sensor can be used in combination with an ASW… evaluation device to monitor the flow in liquid and gaseous media. The switching point can be adjusted using coarse and fine potentiometers. This is the ideal system for monitoring water circuits and cooling circuits containing up to 35% glycol.

➔ p.134

S6040

Series S6040

Flow monitoring in ventilation systems

Air flow monitor S6040A1003 is suitable for flow monitoring of air and non-aggressive gases in ducts of air-conditioning and air-purification systems.

Technical data

Switching capacity 15 (8) A, 24…250 VAC

Service life
50000 cycles at nominal load

Working temperature -40°C…+85°C

Electrical connection
Screw terminals for 1.5 mm²

Cable diameter 6…9 mm

Protection class I according to EN60730

Degree of protection
IP65 according to EN60529

Housing material
ABS and corrosion-protected steel

Replacement paddle: PA1

Unit specifications

Specification	Type
	S6040A1003
Flow medium	air
Mounting	Vertically through a 20 mm hole. Paddle mounted inside.
Max. temperature of medium	85 °C
Pressure	0,25 bar
Paddle material	1.4301
Paddle lever material	Brass
Housing dimensions	108 x 70 x 72 mm
Weight	700 g
Replacement paddle	**PA 1**

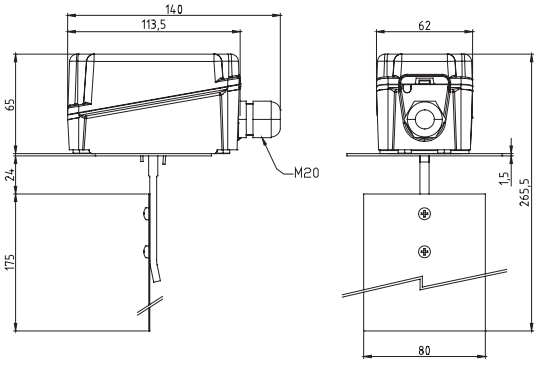
Mounting

The air flow monitor S6040A1003 (with paddle included) is mounted in the air duct with the switch housing at the top. The paddle is mounted from the inside of the air duct. Settling distance required: at least 5 x duct diameter before and after the switch.
To ensure a proper seal, the unit with the accompanying sealing plate must be fastened on the air duct through a 20 mm hole using the screws supplied. Once the unit is mounted on the duct, the paddle is fastened on the shaft from the inside.

Switching point adjustment

Lowest switching point: approx. 2.5 m/s; reset point: 1 m/s.
Highest switching point: approx. 9.2 m/s; reset point: 8.0 m/s.

Dimensioned drawings:



CE

Protection Class:
IP 65

KSL 230

KSL series

These compact flow monitors reliably measure air flow in air ducts and detect any falling below a predefined switching point. The sensitivity and hence the switching point can be set very precisely with a potentiometer. The switching state is shown by a yellow LED.

The sensor tip must be completely immersed in the medium. Signal evaluation and the switching process take place within the unit itself so that no additional space is required inside the switch cabinet.

Technical data

Medium temperature -10…+80°C

Max. ambient temperature -20…+60°C

Temperature compensation
fast, adjustment no more than 0.3 s after change in air temperature.

Sensor tube material MS 58, nickel-plated

Max. permitted pressure 10 bar

Connection PG 7, mounting flange

Power supply 230 VAC or 24 VAC/DC

Power consumption 4 VA

Contact load
Relay, single pole
250 VAC, 10 (2) A

Temperature gradient 15 K/min.

Flow rate 0.1…30 m/s

Response time 1…10 s

Measuring element
Insensitive to moisture. Clean only under running water, without tools.

Immersion depth max. 130 mm

Sensor protection
In case of mechanical failure of the sensor element, power failure or short circuit, the relay drops out.

Reproducibility of switching point +/-1%

Weight 400 g

Mounting conditions
The sensor tip should be placed in the midst of the pipe and must be bathed completely from the medium.
Please porvide a straight pipe:
5x the pipe diameter before and after the sensor device.

Applications and conditions of use

The sensor is easy to install and has no mechanical moving parts liable to wear. Ideal for **ventilation and air-conditioning systems**, where the sensor can be used to monitor **fans, air intakes and butterfly valves**. Other applications include **clean rooms**, where the sensor can be used to monitor **air locks**. Ideal for the **medium, air and all non-combustible and non-aggressive gases**.

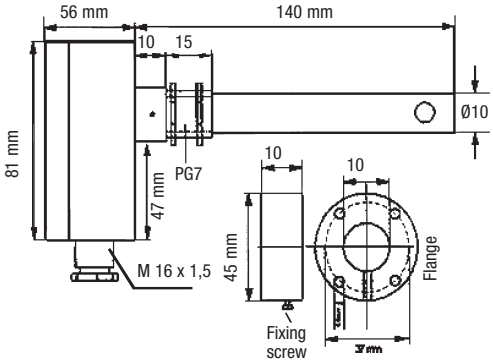
Operating method

The electronic flow monitors work according to the calorimetric principle. A thermistor is heated up. As heat is withdrawn by the flowing medium, the thermistor resistance alters. The change in resistance is evaluated. As the resistance also depends on the temperature of the medium, the difference is determined by a second thermistor and the temperature deviation is compensated. In this way the switching point remains stable. Suspended materials adhering to the sensor can have an insulating effect and so affect the measurement result and hence the defined switching point. Therefore it is advisable to remove any dirt during routine maintenance operations.

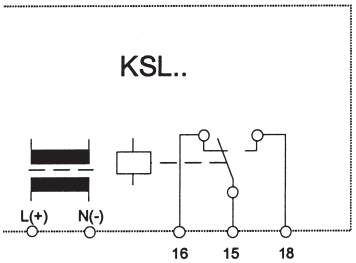
Product Summary

Type	Supply voltage
KSL230	230 V AC
KSL24	24 V AC/DC

Dimensioned drawing



Wiring diagram



Setting potentiometer
+ = high sensitivity
– = low sensitivity

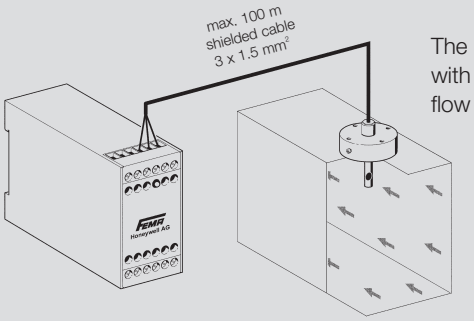
Signal lamps
· Mains power present: Green LED ON
· Closing delay ON:
Yellow "time" LED ON
· Flow present:
Yellow "air flow" LED ON

CE

Protection Class:
IP 65

SWL

Air flow monitoring



The SLF15 sensor can be used in combination with an ASL... evaluation device to monitor the flow in the air (e.g. in air-conditioning systems).

The switching point is adjustable. While the fan starts up the switch-on bypass is active. The bypass duration (2 – 60 s) is adjustable.

Technical data of sensor

General
Fast-reacting air flow sensor with movable flange for installation in air ducts. With temperature compensation, suitable for media with rapid temperature changes.

Medium temperature -20…+100°C

Compensation behavior
(Reaction speed on change in medium temperature) fast, approx. 0.3 s

Installation depth 150 mm

Sensor tube diameter 10 mm

Sensor tube material nickel-plated brass

Measuring element
Insensitive to moisture (can be cleaned in water). Sensitive to mechanical deformation (care must be taken when cleaning with hard objects).

Degree of protection IP 32

Electrical connection
Terminal strip accessible after removal of cover. 3-wire connection to evaluation unit

Mounting conditions
The sensor tip should be placed in the midst of the pipe and must be bathed completely from the medium. Please provide a straight pipe: 5x the pipe diameter before and after the sensor device.

Technical data of evaluation unit

Power supply
230 VAC or 24 VAC/DC
(see Product Summary)

Power consumption approx. 3 VA

Contact load
Relay, single pole 8 A, max. 250 VAC

Ambient temperature 0 – 60°C

Flow rate
Adjustable from 0.1 to 20 m/s for gaseous media

Response time approx. 1 s

Repetition accuracy
<2%, relative to the flow rate directly on the sensor.

Switching hysteresis approx. 2% of overall range

Max. cable length between sensor and evaluation unit
100 m, for shielded cable 1.5 mm².

Sensor protection
In case of breakage or interruption of the sensor wires, the unit switches off or an interruption of flow is signaled.

Type of construction Standard housing N 45

Weight approx. 0.35 kg

FEMA
by Honeywell

Function

The air flow monitors work according to the calorimetric principle. A thermistor is heated up. As heat is withdrawn by the flowing air, the thermistor resistance alters. The change in resistance is evaluated. As the resistance also depends on the temperature of the medium, the difference must be determined by a second thermistor. The difference is compensated and in this way the switching point is kept stable. Suspended materials adhering to the sensor can have an insulating effect and so affect the measurement result and hence the defined switching point. Therefore it is advisable to remove any dirt during routine maintenance operations.

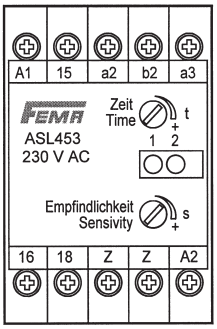
Switch-on bypass

While the plant is being started up (still no airflow present), the output contact is activated and the flow condition signaled. The time for the switch-on bypass is adjustable from 2-60 s. The start-up or switch-on bypass starts when the unit is switched on. If an external start button (normally closed contact) is connected (to the Z-Z terminals), the start-up bypass begins when the (locking) button is pressed.

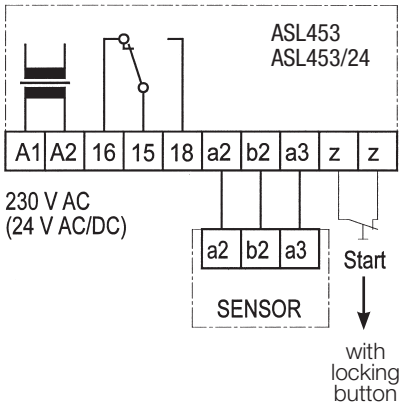
Product Summary

Type		Supply voltage
SLF15	Sensor	–
ASL453	Evaluation unit	230 V AC
ASL453/24	Evaluation unit	24 V AC/DC

Operator interface



Wiring diagram



In case of malfunction, a sensor error can be ruled out by checking the resistances between the connecting wires. Sensor SLF15 must be disconnected and checked with a suitable ohmmeter between the individual connecting wires:

Black-brown approx. 8.2 kOhm
Black-blue approx. 8.2 kOhm
Brown-blue approx. 18 kOhm

The terminal voltage of evaluation units ASW454 or ASW454/24 can also be checked with a voltmeter between the "a2" and "a3" terminals after disconnecting the sensor.
31.4 VDC is the correct value.

Adjusting elements

s = sensitivity
t = time for switch-on bypass
(high sensitivity at low flow)

Signal lamps

1 = Flow present or switch-on bypass active
2 = supply voltage present

CE

Protection Class:
IP 32 (sensor)
IP 65 (evaluation unit)

S6065

Series S6065

Flow monitoring for liquid media (TÜV-tested)

TÜV-tested (according to notice "Flow 100") flow monitors of series S6065A are particularly suitable for flow monitoring of coolants in air-conditioning and refrigeration systems. Version V4A is also suitable for monitoring aggressive liquids.

Technical data

Switching capacity 15 (8) A, 24…250 VAC

Service life
50000 cycles at nominal load

Working temperature -40°C…+85°C

Electrical connection
Screw terminals for 1.5 mm²

Cable diameter 6…9 mm

Protection class I according to EN60730

Degree of protection IP65 according to EN60529

Housing material
ABS and corrosion-protected steel

Product characteristics

· Low-cost solution for flow monitoring in heating, ventilation and air-conditioning installations
· Fully encapsulated microswitch (single-pole changeover contact) with high current capacity
· TÜV-tested according to notice "Flow 100"

Switching point adjustment

The unit is preset to the lowest switching range. The desired switching range can be set by turning the adjusting screw in a clockwise direction (in the area of the connectionterminals). Table of switching values 1 shows reset points (RP), switching points (SP) and paddle sizes for different pipe diameters.

Mounting

Flow monitors for liquid media S6065A1003 and S6065A2001 can be mounted in any position, but must be positioned far enough away from pipe angles, filters and valves. The arrow on the housing must point in the flow direction. When installing in vertical pipes, take care to ensure that the flow direction is from bottom to top. Readjustment of the switching point is also necessary, as the weight of the paddle in this position affects the cut-off range. To protect the internal bellows against dirt deposits, the unit must never be installed in the pipe with the housing pointing downwards.

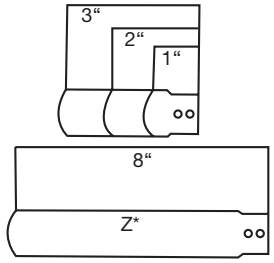
Replacement paddle: PA2

Unit specifications

Models	S6065A1003	S6065A2001
Flow medium	non-aggressive liquids	aggressive liquids
Mounting	Rp 1" (ISO 7/1)	Rp 1" (ISO 7/1)
Max. temperature of medium	120°C	120°C
Pressure	11 bar	30 bar
Sensor housing material	Brass	1.4404
Paddle material	1.4401	1.4401
Paddle lever material	Brass	1.4401
Housing dimensions	113 x 70 x 65 mm	108 x 70 x 72 mm
Weight	850 g	850 g
Approvals	TÜV Flow 100	TÜV Flow 100
Replacement paddle, stainless steel	**PA2**	

Table of switching values 1

Pipe DN	Length of paddle	Reset and switching points (m³/h) min. flow rate RP	min. flow rate SP	max. flow rate. RP	max. flow rate. SP
1"	1"	0.6	1.0	2.0	2.1
1 1/4"	1"	0.8	1.3	2.8	3.0
1 1/2"	1"	1.1	1.7	3.7	4.0
2"	1" + 2"	2.2	3.1	5.7	6.1
2 1/2"	1" + 2"	2.7	4.0	6.5	7.0
3"	1" + 2" + 3"	4.3	6.2	10.7	11.4
4"	1" + 2" + 3"	11.4	14.7	27.7	29.0
4"	1" + 2" + 3" +Z*	6.1	8.0	17.3	18.4
5"	1" + 2" + 3"	22.9	28.4	53.3	55.6
5"	1" + 2" + 3" +Z*	9.3	12.9	25.2	26.8
6"	1" + 2" + 3"	35.9	43.1	81.7	85.1
6"	1" + 2" + 3" +Z*	12.3	16.8	30.6	32.7
8"	1" + 2" + 3"	72.6	85.1	165.7	172.5
8"	1" + 2" + 3" +Z*	38.6	46.5	90.8	94.2



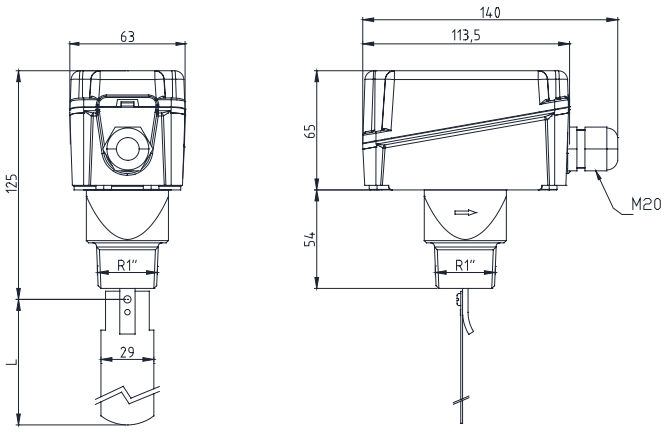
*Z: 8" paddle must be shortened according to the pipe diameter. The installed paddle must not touch the pipe walls.

CE TÜV tested

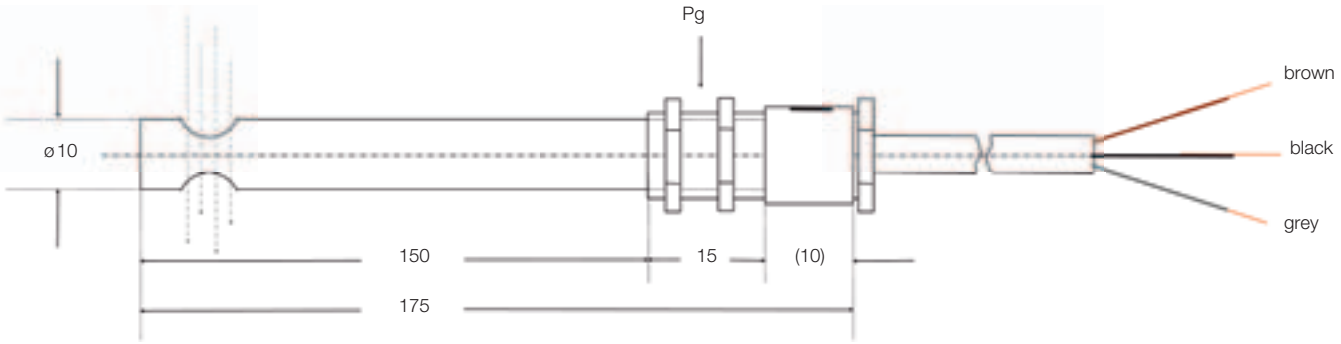
Protection Class: IP 65

Series S6040/S6065

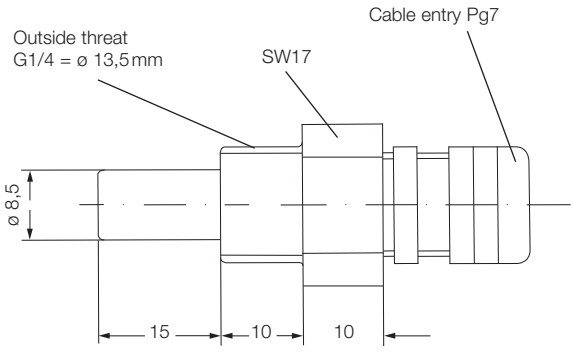
S6065A1003 / S6065A2001



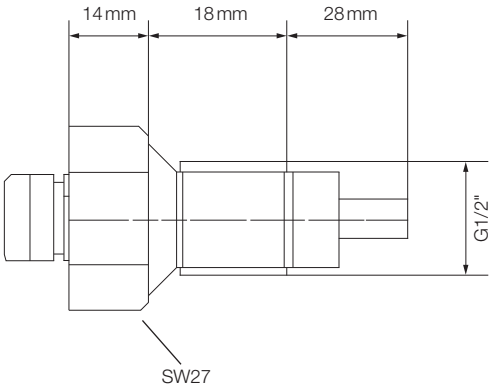
SLF15



SWF62



SWF62L



KSW230

KSW series

For monitoring flow of liquid and piped, gaseous media

These compact flow monitors reliably measure the flow of liquids and gases in pipes and detect any falling below a predefined switching point. The sensitivity and hence the switching point can be set very precisely with a rough and fine potentiometer. The switching state is shown by a yellow LED. The sensor element must be located in the flow.

Technical data

Medium temperature -10…+80°C

Max. ambient temperature -20…+60°C

Temperature compensation
0–80°C, higher temperatures (up to 120°C) may cause a deviation of the switching point but cannot damage the sensor.

Sensor material
In contact with medium: stainless steel 1.4305
Sealing compound: Wepuran (vu 4459/41 sv)

Max. pressure 30 bar

Process connection G 1/2"

Power supply 230 VAC or 24 VAC/DC

Power consumption 4 VA

Contact load
Relay, single pole
250 VAC, 10 (2) A

Max. temperature gradient 15 K/min.

Flow rate 0.05…3 m/s

Response time 1…10 s

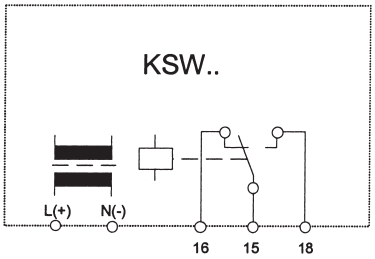
Sensor protection
In case of mechanical failure of the sensor element or power failure or short circuit, the relay drops out.

Reproducibility of switching point
+/-1%

Weight 430 g

Mounting conditions:
The sensor tip should be placed in the midst of the pipe and must be bathed completely from the medium.
Please provide a straight pipe:
5x the pipe diameter before and after the sensor device. Malfunctions can occur when the sensor device is mounted directly after f.e.g. valves, butterfly valves or junctions.

Wiring diagram



Applications and conditions of use

The sensor is easy to install and has no mechanical moving parts liable to wear. It is especially suitable for monitoring **cooling and heating circuits containing up to 35% glycol**. **Prevents pumps from running dry.** These devices are used in the **chemical industry** for **monitoring flow of aqueous alkaline solutions and bases**. Such use is subject to compatibility with the material 1.4305.
Thanks to its robust design, the sensor is suitable for lightly contaminated media, and also aggressive media provided the material is compatible. Suspended material adhering to the sensor can have an insulating effect and so affect the measurement result and hence the defined switching point. Therefore it is advisable to remove any dirt during routine maintenance operations.

Operating method

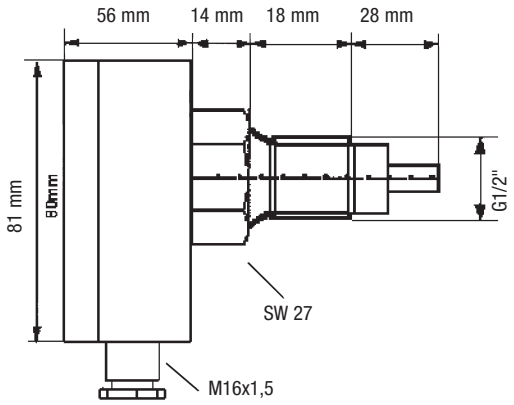
The electronic flow monitors work according to the calorimetric principle. A thermistor is heated up. As heat is withdrawn by the flowing medium, the thermistor resistance alters. The change in resistance is evaluated. As the resistance also depends on the temperature of the medium, the difference is determined by a second thermistor and the temperature deviation is compensated. In this way the switching point remains stable.

Type	Supply voltage
KSW230	230 V AC
KSW24	24 V AC/DC

Operator interface and dimensioned drawing of setting potentiometer
Rough and fine sensitivity
(high sensitivity for small flow).

Signal lamps
Mains power present: LED green "mains" ON
LED yellow "flow" ON

Dimensioned drawing

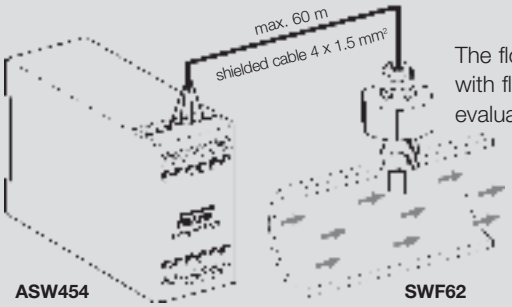


CE

Protection Class:
IP 65

SWW series

For monitoring flow of liquid and piped, gaseous media



The flow in fluids can be monitored reliably with flow sensors SWF62 and SWF62L and evaluation unit ASW454.

The sensitivity can be adjusted accurately with a rough and fine potentiometer. The switching state is indicated by LED. The sensor element must be located in the flow.

Technical data of sensor

General
The flow sensor in stainless steel 1.4571 is suitable for lightly contaminated media, and also aggressive media provided the material is compatible. Flows in gaseous media can also be monitored with this sensor.

Medium temperature 0…80°C.
Higher medium temperatures (up to 120°C) may cause a deviation of the switching point but cannot damage the sensor.

Temperature compensation up to 80°C

Sensor material
In contact with medium: stainless steel 1.4571
Casting compound: Wepuran (vu 4459/41 sv)
Cable gland: Nickel-plated brass

Max. permitted pressure 20 bar

Process connection G 1/4'' or G 1/2''

Connection cable four-wire, 2.5 m long

Degree of protection IP 65

Mounting conditions:
The sensor tip should be placed in the midst of the pipe and must be bathed completely from the medium.
Please provide a straight pipe:
5x the pipe diameter before and after the sensor device. Malfunctions can occur when the sensor device is mounted directly after f.e.g. valves, butterfly valves or junctions.

Technical data of evaluation unit

Power supply
230 VAC or 24 VAC/DC
(see Product Summary)

Power consumption approx. 3 VA

Contact load
Relay, single pole
8 A, max. 250 VAC

Ambient temperature 0 - 60°C

Max. temperature gradient 10 K/min.

Flow rate
0.1…3 m/s (liquid media) 1…15 m/s (gaseous media)

Response time approx. 20 – 60 s

Repetition accuracy
< 2%, relative to the flow rate at the sensor.

Switching hysteresis
Approx. 2% of overall range.

Max. cable length between sensor and evaluation unit
60 m, for shielded cable 1.5 mm².

Sensor protection
In case of breakage or interruption of the sensor wires, the unit switches off or an interruption of flow is signaled.

Type of construction Standard housing N 45

Weight approx. 0.35 kg

Function

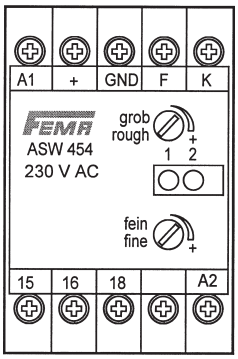
The flow monitors work according to the calorimetric principle. A thermistor is heated up. As heat is withdrawn by the flowing medium, the thermistor resistance alters. The change in resistance is evaluated. As the resistance also depends on the temperature of the medium, the difference must be determined by a second thermistor. The difference is compensated and in this way the switching point is kept stable. When monitoring high flow rates, rapid temperature fluctuations can trigger switching operations. Suspended materials adhering to the sensor can have an insulating effect and so affect the measurement result and hence the defined switching point. Therefore it is advisable to remove any dirt during routine maintenance operations.

Product Summary

Sensors	Type	Screw-in thread	Sensor length (from thread)	Thread length
	SWF62	G 1/4	**25** mm	**10** mm
	SWF62L	G 1/2	**45** mm	**18** mm

Evaluation units	Type	Supply voltage
	ASW454	230 V AC
	ASW454/24	24 V AC/DC

Operator interface



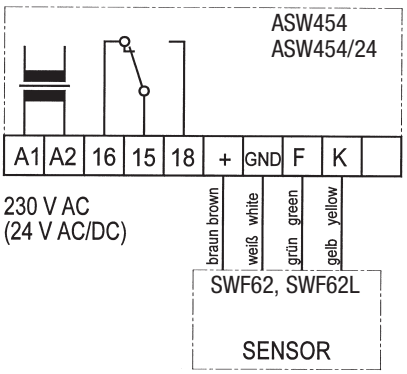
Adjusting elements

Sensitivity (rough and fine)
(high sensitivity at low flow)

Signal lamps

1 = Flow present
2 = Supply voltage present

Wiring diagram



In case of malfunction, a sensor error can be ruled out by checking the resistances between the connecting wires of the sensor. Sensor SWF62 or SWF62L must be disconnected and checked with a suitable ohmmeter between the individual connecting wires:

White-brownapprox. 0.2 kOhm
White-green approx. 1.0 kOhm
White-yellowapprox. 1.0 kOhm

The terminal voltage of the evaluation units ASW454 or ASW 454/24 can also be checked with a voltmeter between the "+" and "Gnd" terminals after disconnecting the sensor.
14.8 VDC is the correct value.

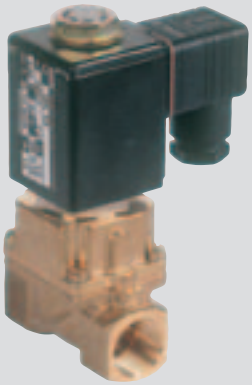
CE

Protection Class:
IP 65 (sensor)
IP 32 (evaluation unit)

Solenoid valves

FEMA
by Honeywell

Liquids



GK

Solenoid valves for neutral media up to 180 °C

The GK series piston-type solenoid valves are ideal for use as shutoff valves in heating and process engineering systems for neutral media such as hot water and steam.
The valves require no minimum differential pressure and can open and close even without pressure or with low differential pressures.

GK13

➔ p.137

Liquids

AB

Solenoid valves for liquids – normally closed

Solenoid valves of the AB series are suitable for non-aggressive liquids in a pressure range of up to 10 bar.
These are the valves of choice for water and hydraulic fluid, oils and additive-free greases.

➔ p.138

AB

Liquids and gases

GB

Solenoid valves for gaseous and liquid media

Normally closed, also stainless steel 1.4410
Function is not dependent on a specific minimum differential pressure; the valves operate correctly with no pressure, at slight differential pressure, right through to maximum pressure. They are therefore the valves of choice for installation in plants where differential pressures fluctuate greatly and are not possible to determine precisely in advance. The valves are also suitable for use in heating and cooling circuits.

GB12

➔ p.139

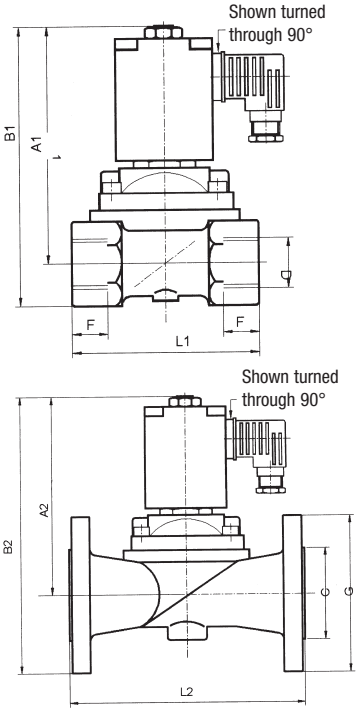
GK13

GK

Solenoid valves for neutral media up to 180 °C

The GK series piston-type solenoid valves are ideal for use as shutoff valves in heating and process engineering systems for neutral media such as hot water and steam. The valves require no minimum differential pressure and can open and close even without pressure or with low differential pressures. Power socket included.

Dimensioned drawings



Technical data

Type	2/2-way
Operating mode	normally closed
Type of construction	Piston-type solenoid valve, coupled, no minimum differential pressure required.
Materials	Screwed version: brass; flange version: cast iron GG 25.
Sealing material	PTFE and graphite
Media	Neutral media, e. g. hot water and steam.
Temperature of medium	0°C to 180°C
Ambient temperature	max. 55°C
Viscosity	max. 21 mm²/s
Line connection	G 1/2 to G 2, flange for DN 25—DN 50
Operating voltages (±10%)	230 V, 50 Hz
Duty cycle	100%
Electrical connection	Angled plug to DIN EN175301
Power consumption	Start: 100 VA; operation: 35 VA, DN 50: 30 W
Degree of protection	IP 65
Mounting position	Any, solenoid actuator preferably upwards
Switching times (standard values)	**opening:** DN 15—DN 25: 100—400 ms DN 32—DN 50: 200—1200 ms **closing:** DN 15—DN 25: 300—500 ms DN 32—DN 50: 1000—3000 ms

Product Summary

Type	DN (mm)	k_{VS}-value (m^3/h)	Working pressure (bar)	Connection	Material	Weight (kg)
GK13	13	3,7	0–10	G 1/2“	Ms	1,0
GK20	20	5,0	0–10	G 3/4“	Ms	1,4
GK25	25	10,0	0–10	G 1“	Ms	1,9
GK32	32	16,0	0–10	G 1 1/4“	Ms	3,2
GK40	40	16,0	0–10	G 1 1/2“	Ms	3,7
GK50	50	36,0	0–10	G 2“	Ms	7,8
GK25F	25	10,0	0–10	Flange	GG 25	4,6
GK32F	32	16,0	0–10	Flange	GG 25	7,0
GK40F	40	16,0	0–10	Flange	GG 25	7,5
GK50F	50	36,0	0–10	Flange	GG 25	12,8

Device plug with LED

Type	
ST221	für 200 V – 240 V AC/DC

	Screwed versions					Flange versions				
DN	**D**	**L 1**	**A 1**	**B 1**	**F**	**C**	**G**	**L 2**	**A 2**	**B 2**
13	G 1/2“	65	113	127	14					
20	G 3/4“	100	131	147	16					
25	G 1/2“	115	136,5	157	18	68	120	160	140,5	210,5
32	G 1 1/4“	126	161	186	20	78	140	180	161	231
40	G 1 1/2“	126	165	195	22	88	150	200	165	240
50	G 2“	164	225	260	24	102	165	230	225	307,5

CE

Protection Class: IP 65

AB

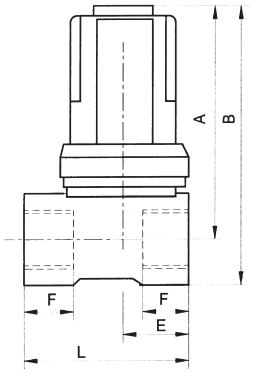
AB

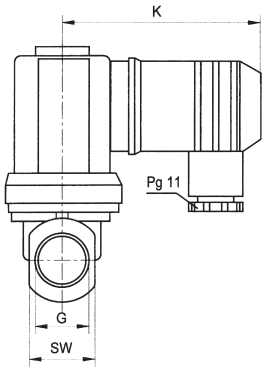
Solenoid valves for liquids – normally closed

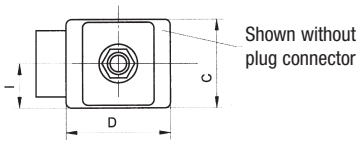
Solenoid valves of the AB series are suitable for non-aggressive liquids in a pressure range up to 10 bar.

These are the valves of choice for water and hydraulic fluid, oils and additive-free greases. Power socket included.

Dimensioned drawings







Technical data

Type	2/2-way
Operating mode	normally closed
Type of construction	Diaphragm solenoid valve, coupled. No initial pressure needed.
Pressure range	0 – 10 bar

No back-pressure may occur as the valve will open in an uncontrolled manner.

Materials	Casing: brass, internal parts: stainless steel
Sealing material	Perbunan
Mounting position	Any, solenoid system preferably upright
Temperature of medium	-10°C to +90°C
Max. ambient temperature	55°C
Duty cycle	100% ED
Electrical connection	Device socket to DIN EN175301
Voltage / current type	Standard version 230 V, 50 Hz
Degree of protection	IP 65 according to DIN EN60529 with device socket

Power consumption in VA or W

Switching state	Nominal diameter/DN 10	13	20	25	40	mm
AC: Start	34	36	38	160	202	VA
AC: Oper.	14	14	14	38	38	VA

Product Summary

Type	DN (mm)	Pressure range (bar)	k_{vs}-value (m^3/h)	Connection thread	Weight (kg)
AB10	10	0–10	1,8	G 3/8“	0,4
AB13	13	0–10	3,5	G 1/2“	0,55
AB20	20	0–10	8,6	G 3/4“	1,0
AB25	25	0–10	11,0	G 1“	1,7
AB32	25	0–10	11,0	G 1 1/4“	1,7
AB40	40	0–10	30,0	G 1 1/2“	3,5
AB50	40	0–10	30,0	G 2“	3,5

Device plug with LED display

	Type
for 200 V – 240 V AC/DC	**ST221**

DN	A	B	C	D	E	F	G	K	L	M	SW
10	72	86	38	38	20	12	G 3/8"	65	50	3.5	27
13	83	99	45	51	24	14	G 1/2"	65	58	3.5	32
20	99	119	66	66	35	16	G 3/4"	65	80	3.5	41
25	145	166	105	105	69	18	G 1"	69	95	7	41
25	145	166	105	105	69	18	G 1 1/4"	69	95	7	50
40	157	187	105	105	69	22	G 1 1/2"	69	132	7	60
40	157	187	105	105	69	22	G 2"	69	132	7	70

CE

Protection Class: IP 65

GB12

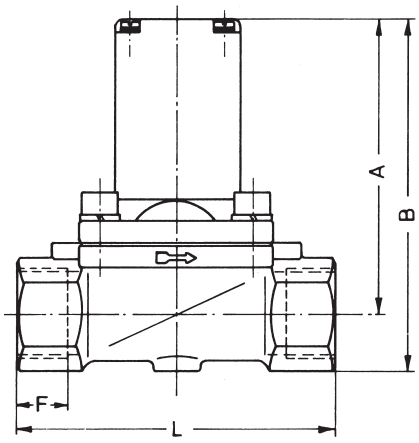
GB

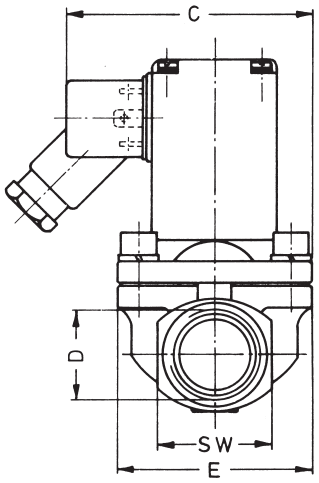
Solenoid valves for gaseous and liquid media

Normally closed, also stainless steel 1.4410
Function is not dependent on a specific minimum differential pressure; the valves operate correctly with no pressure, at slight differential pressure, right through to maximum pressure.

They are therefore the valves of choice for installation in plants where differential pressures fluctuate greatly and are not possible to determine precisely in advance. The valves are also suitable for use in heating and cooling circuits.
Power socket included.

Dimensioned drawings





Technical data

Type	2/2-way
Operating mode	normally closed
Type of construction	Diaphragm solenoid valve, coupled. No initial pressure needed.
Materials	Casing: brass, internal parts: stainless steel Alternatively: Casing: stainless steel 1.4410, internal parts: stainless steel
Sealing material	Perbunan
Mounting position	Any, solenoid system preferably upright
Temperature of medium	-10°C to 90°C
Max. ambient temperature	55°C
Max. viscosity	Approx. 21 mm²/s
Power consumption	100 to 120 VA (start) 25 VA / 12 W (operation)
Operating frequency	Up to 50 cycles per minute
Duty cycle	100% ED
Electrical connection	Angled plug to DIN EN175301
Voltage / current type	Standard version 230 V, 45–60 Hz
Degree of protection	IP 65 according to DIN EN60529 with plug

Product Summary

Type	DN (mm)	Pressure range (bar)	k_{VS}-value (m^3/h)	Connection thread	Weight (kg)
Brass valve body					
GB 12	12	0–16	2,8	G 1/2“	1,0
GB 20	20	0–16	5,0	G 3/4“	1,4
GB 25	25	0–16	10,0	G 1“	1,8
Stainless steel 1.4410 valve body, seal: Viton					
GB 12 VA	12	0–16	2,8	G 1/2“	1,0
GB 20 VA	20	0–16	5,0	G 3/4“	1,4
GB 25 VA	25	0–16	10,0	G 1“	1,8

Device plug with LED display

	Type
for 200 V – 240 V AC/DC	**ST221**

DN	D	A	B	C	E	L	SW	F
15	G 1/2"	80	95.5	73	40	74.5	27	14
20	G 3/4"	106	122	86.5	60	100	32	16
25	G 1"	110.5	131	91.5	70	115	41	18

CE

Protection Class: IP 65

Tested to DIN EN 264

AV

AV

Solenoid valves for liquids – normally closed

Solenoid valves of the AV series are particularly suitable for use as anti-siphon valves in supply installations for light fuel oil EL.

➔ p.141

With KTW Recommendation

AT

AT

Solenoid valves for liquids – normally closed

Solenoid valves of the AT series are particularly suitable for use as shutoff valves for drinking water, hot water, alkaline detergents and bleaches. They are especially suitable for plants differential pressures. Solenoid valves of the AT series are **VDE-approved according to EN 60730 as electrically operated water valves up to 50°C.** Furthermore, the **EPDM sealing material satisfies the "KTW" (plastics in drinking water) recommendations** of the German Department of Health. (1986 6th Memo. ff.). Because of the EPDM sealing material **they must never be used in installations with media containing oil or grease.**

➔ p.142

Important Notice regarding the Operation of Magnetic Valves:

Series AB, AV and AT magnetic valves feature a force-coupled diaphragm system. The space above the diaphragm is pressure-balanced (i.e. equalized with the line), and closing spring thus represents the sole closing force. Consequently, in order to open the valve, the magnetic coil must overcome only the force of the closing spring. This minimizes the magnetic coil´s power consumption.

In the case of small magnetic valves, this is the usual procedure, but it requires that the space above the diaphragm be kept clean. Contaminations (e.g., metal parts, rust, or other suspended solids) can lodge themselves behind the diaphragm and thus limit or even block the necessary smooth motion of the magnetic core. This will result in a malfunctioning of the magnetic valve, overheating of the magnetic coil, or even coil failure.

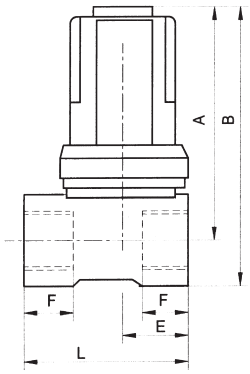
This problem is not rectified by replacing the coil; in most cases the valve will continue malfunctioning. It is therefore urgently necessary that the entire valve be replaced; at the same time, measures must be taken to avoid the build-up of contamination. For this reason, the customer must install a dirt filter.

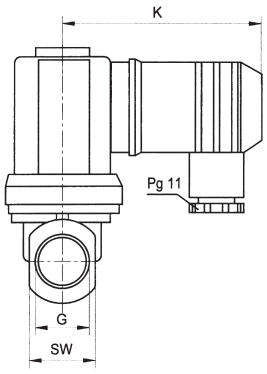
AV series

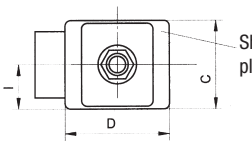
DN 10–40

This range of high-quality solenoid valves is not dependent on a specific minimum differential pressure; the valves operate extremely reliably with no pressure, at slight differential pressure, right through to maximum pressure. They are therefore the valves of choice for installation in plants where differential pressures fluctuate greatly and are not possible to determine precisely in advance. Solenoid valves of the AV series are approved as **safety shut-off devices according to DIN EN ISO23553-1.**

Dimensioned drawings







Shown without plug connector

Technical data

Type	2/2-way
Operating mode	normally closed
Type of construction	Diaphragm solenoid valve, coupled. No initial pressure needed.
Pressure range	-0.6 to 4 bar (DN 10, 13), -0.6 to 10 bar (DN 20-40) No back-pressure may occur as the valve will open in an uncontrolled manner.
Materials	Casing: brass, internal parts: stainless steel
Sealing material	FPM (Viton)
Mounting position	Any, solenoid system preferably upright
Temperature of medium	0°C to +90°C
Max. ambient temperature	55°C
Duty cycle	100% ED
Electrical connection	Device socket to DIN EN175301
Voltage / current type	Standard version 230 V, 50 Hz
Degree of protection	IP 65 according to DIN EN60529 with device socket
Power consumption in VA or W	

Switching state	Nominal diameter/DN 10	13	20	25	40	mm
AC: Start	34	36	38	160	202	VA
AC: Oper.	14	14	14	38	38	VA

Product Summary

Type	DN (mm)	Pressure-range (bar)	k_{VS}-value (m^3/h)	Connection thread	Weight (kg)
AV102MS2	10	-0,6 – 4	1,8	G 3/8“	0,4
AV103MS2	10	-0,6 – 4	1,8	G 1/2“	0,4
AV131MS2	13	-0,6 – 4	3,5	G 1/2“	0,55
AV201MS2	20	-0,6 – 10	8,6	G 3/4“	1,0
AV251MS2	25	-0,6 – 10	11,0	G 1“	1,7
AV252MS2	25	-0,6 – 10	11,0	G 1 1/4“	1,7
AV401MS2	40	-0,6 – 10	30,0	G 1 1/2“	3,5
AV402MS2	40	-0,6 – 10	30,0	G 2“	3,5

Device plug with LED display

Type	
ST221	for 200 V – 240 V AC/DC

Dimensions (mm):

DN	A	B	C	D	E	F	G	K	L	M	SW
10	72	86	38	38	20	12	G 3/8“	65	50	3,5	27
13	83	99	45	51	24	14	G 1/2“	65	58	3,5	32
20	99	119	66	66	35	16	G 3/4“	65	80	3,5	41
25	145	166	105	105	69	18	G 1“	69	95	7	41
25	145	166	105	105	69	18	G 1 1/4“	69	95	7	50
40	157	187	105	105	69	22	G 1 1/2“	69	132	7	60
40	157	187	105	105	69	22	G 2“	69	132	7	70

CE

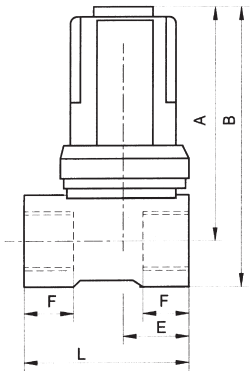
Protection Class: IP 65

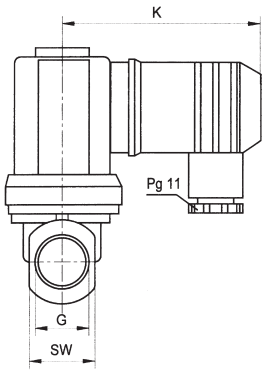
AT series

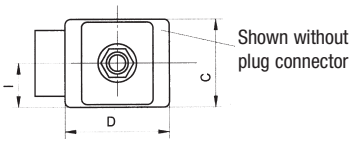
DN 10–40

This range of high-quality solenoid valves is not dependent on a specific minimum differential pressure; the valves operate extremely reliably with no pressure, at slight differential pressure, right through to maximum pressure. They are therefore the valves of choice for installation in plants where differential pressures fluctuate greatly and are not possible to determine precisely in advance. The AT valve series **may only be used for media free from oil and grease**, such as drinking water, hot water or alkaline detergents and bleaches**.** Solenoid valves of the AT series are VDE-approved according to EN 60730 as **electrically operated water valves up to 50°C**. Furthermore, the **EPDM** sealing material satisfies the **"KTW" (plastics in drinking water) recommendations of the German Department of Health**.

Dimensioned drawings







Technical data

Type	2/2-way
Operating mode	normally closed
Type of construction	Diaphragm solenoid valve, coupled. No initial pressure needed.
Pressure range	0 – 10 bar No back-pressure may occur as the valve will open in an uncontrolled manner.
Materials	Casing: brass, internal parts: stainless steel
Sealing material	EPDM
Mounting position	Any, solenoid system preferably upright
Temperature of medium	0°C to +90°C
Max. ambient temperature	55°C
Duty cycle	100% ED
Electrical connection	Device socket to DIN EN175301
Voltage/current type	Standard version 230 V, 50 Hz
Degree of protection	IP 65 according to DIN EN60529 with device socket

Power consumption in VA or W						
Switching state	Nominal diameter/DN 10	13	20	25	40	mm
AC: Start	34	36	38	160	202	VA
AC: Oper.	14	14	14	38	38	VA

Product Summary

Type	DN (mm)	pressure range (bar)	k_{VS}-value (m^3/h)	Connecting thread	Weight (kg)
AT 10	10	0–10	1,8	G 3/8“	0,4
AT 13	13	0–10	3,5	G 1/2“	0,55
AT 20	20	0–10	8,6	G 3/4“	1,0
AT 25	25	0–10	11,0	G 1“	1,7
AT 32	25	0–10	11,0	G 1 1/4“	1,7
AT 40	40	0–10	30,0	G 1 1/2“	3,5
AT 50	40	0–10	30,0	G 2“	3,5

Device plug with LED display

Type	
ST221	for 200 V – 240 V AC/DC

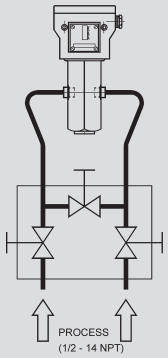
Dimensions (mm):

DN	A	B	C	D	E	F	G	K	L	M	SW
10	72	86	38	38	20	12	G 3/8“	65	50	3,5	27
13	83	99	45	51	24	14	G 1/2“	65	58	3,5	32
20	99	119	66	66	35	16	G 3/4“	65	80	3,5	41
25	145	166	105	105	69	18	G 1“	69	95	7	41
25	145	166	105	105	69	18	G 1 1/4“	69	95	7	50
40	157	187	105	105	69	22	G 1 1/2“	69	132	7	60
40	157	187	105	105	69	22	G 2“	69	132	7	70

CE

Protection Class: IP 65

Accessories

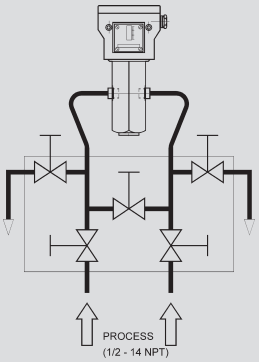


VKD3

VKD

Accessories for differential pressure switches

The valve blocks are suitable for:
Differential pressure switches DDCM014 to DDCM16,
Differential pressure switches Smart DCM DIFF
Differential pressure transmitters Smart SN DIFF



VKD5

Technical data

Pressure stage	PN 420
Materials	Housing 1.4404 Internal parts 1.4571
Seals	PTFE
Process connections	1/2"–14 NPT

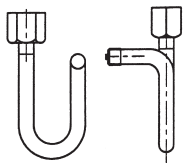
Supplied complete with screw fittings and shaped pipe sections in stainless steel

Type overview

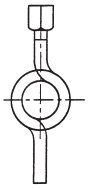
Type	
VKD3	3-fold combination
VKD5	5-fold combination

The valve blocks are for the cut-off of impulse pipes for liquid and gaseous media.
The 3-fold combination can be used for the cut-off of the impulse pipe and beside of the bypass pipe.
The 5-fold combination has two air bleed valves additionally. For use with the Smart DCM DIFF or the Smart SN DIFF the angle pipes have to be adjusted (shortened) on both sides of the sensor inputs.

Siphons



U-shape (FORM B)

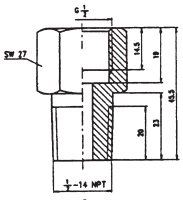


Circular (FORM D)

Siphons according to DIN 16282 made of 20 mm Ø seamless steel tube

Type	FORM B	Material
U430B	**Inlet:** Weld-on end with weld chamfer	St 35.8-I
U480B	**Outlet:** Connection shank DIN 16282 Form 6 G 1/2" with clamping sleeve DIN 16283 G 1/2"	1.4571

Type	FORM D	Material
K430D	**Inlet:** Weld-on end with weld chamfer	St 35.8-I
K480D	**Outlet:** Connection shank DIN 16282 Form 6 G 1/2" with clamping sleeve DIN 16283 G 1/2"	1.4571

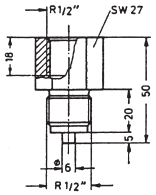


NPT adapter

NPT adapter

The purpose of the NPT adapter is to connect pressure switches, pressure transmitters, pressure gauges, etc. to NPT threaded connections. A suitable sealing washer is also supplied.

Type	Description
NPT1	NPT adapter, material 1.4104 and sealing ring DIN 16258, Form C material ITC to DIN 3754 Pt.1



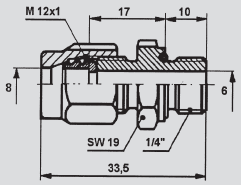
DMW-K

Pressure surge reducer

Type	Material
DMW	Brass

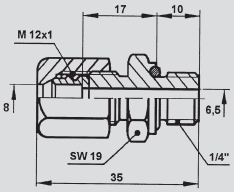
MAU

Threaded joint with male adapter union



MAU8/Ms
all dimensions in mm

for differential pressure switches and transmitters
Threaded joint with male adapter union G 1/4" / 8 mm for connecting:
· DDCM differential pressure switches
· Smart DCM DIFF differential pressure switches
· Smart SN DIFF differential pressure transmitters
· Pressure switches with 1/4" internal thread



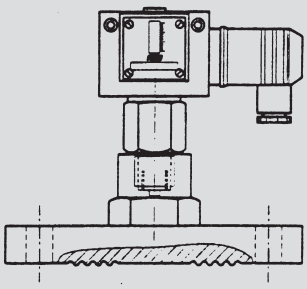
MAU 8 / Nst
all dimensions in mm

Technical data

Maximum permissible temperature: 100 °C
Maximum permissible pressure: 100 bar

Product Summary

Type		Body	O-ring
MAU8/MS	G 1/4″ brass screw-in thread with O-ring seal for connection	Brass Stainless	NBR
MAU8/Nst	of pipes with 8 mm external diameter	steel (1.4571)	FPM



Flanged pressure mediator

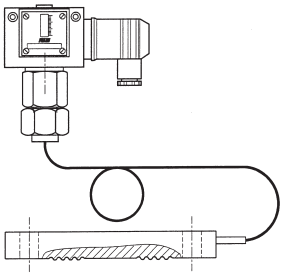
ZFV

Pressure mediators / diaphragm seals

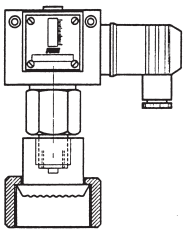
attached to pressure switches and pressure transmitters
A separating diaphragm or a pressure is necessary if aggressive, viscous or crystallizing media must be kept away from the actual pressure sensor. A pressure mediator is also indispensable to avoid cavities if easy cleaning of the supply lines is important. Special "milk pipe unions" according to DIN 11851 are customary for pressure monitoring in the foodstuffs industry. Pressure and evaluating devices (pressure switches, pressure gauges) form a self-contained unit. The transmission fluid (filling medium) transmits the medium pressure from the separating membrane to the measuring element. The filling medium M 20 is food-safe and, being able to withstand temperatures from –40 to +300 °C, is also suitable for industrial applications.

Technical data

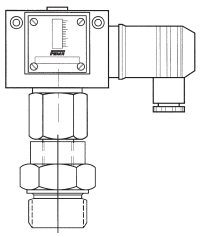
Flange dimensions	to DIN 2527, PN 40
Material	1.4571
Specification	Fully assembled, evacuated, filled and adjusted
Filling medium	M 20 food-safe
Max. permissible pressure	40 bar (applies to separating diaphragm only, the max. permissible pressure of the pressure switch or pressure transmitter must be observed)



Flanged pressure mediator with 1 m pipeline



Pressure mediator



Screw-in pressure mediator

Delivery up to approx. 4–6 weeks, depending on the associated pressure switch.

Product Summary

Flanged pressure mediators made of stainless steel 1.4571, diaphragm flush to the front, flange to DIN 2527, PN 40

Type	DN	Pressure ranges** Pressure switch from	Temperature range* (filling medium)
ZFV184-50	50	0,3 bar	-40…120 °C
ZFV184-80	80	0,15 bar	-40…120 °C
with Teflon coating			
ZFV184-50PTFE	50	0,3 bar	-40…120 °C
ZFV184-80PTFE	80	0,15 bar	-40…120 °C

Flanged pressure mediators with 1 m pipeline, flange to DIN 2527, PN 40

ZFV185-50	50	0,3 bar	-30…300 °C
ZFV185-80	80	0,15 bar	-30…300 °C
with Teflon coating			
ZFV185-50PTFE	50	0,3 bar	-30…300 °C
ZFV185-80PTFE	80	0,15 bar	-30…300 °C

Pipeline up to a maximum of 10 m on request.

Pressure mediators for the foodstuffs industry with milk pipe connection according to DIN 11851

Type	DN	Pressure ranges** Pressure switch from	Temperature range* (filling medium)
ZFV162-50	50	0,4 bar	-30…120 °C
with Teflon coating			
ZFV162-50PTFE	50	0,4 bar	-30…120 °C

Varivent or Triclamp versions of the pressure mediator are available on request.

Screw-in pressure mediators
Flush connection. Use for pressure switches only, not for transmitters.

Type	DN	Pressure range** Pressure switch from	Temperature range* (filling medium)
ZFV749	G 1	0,5 bar	-30…120 °C
ZFV749-V191	G 1 with cooling piece	0,5 bar	-30…120 °C

*** Please note that the temperature at the pressure switch must not exceed 60 °C for long periods.**
**** Can only be used for pressure ranges ≥ the values stated in the table.**

Configuration Tool CFT1:

Possible settings for the PSS- and PSH- series:
· setting of switch point and reset point
· setting of the monitor function: max.-, min.- or window -monitoring
· setting function: opener or closer
· setting of the delay: switch on or off
· choose the display unit: bar, Pa or Psi

Possible settings for the PTS- and PTH-series:
· choose the output signals: 0-10V, 2-10V, 0-20mA, 4-20mA
· invert the output signal
· start- and end-point of the measuring pressure range
· auto-zero
· manually zero setting
· setting of the pressure peak filter

Possible settings for the display versions:
· rotation of the display in 90° steps
· contrast of the display
· lock code

Diagnostic function shows:
· over-pressure situation
· over-temperature situation
· elapsed hour counter
· CPU errors
· failure descriptions of the last 5 errors

Further possibilities with the CFT1:
· multiply configurations
· save and print out configurations
· design configurations with the PC
· test functions and output signals
· simulation of the configurations

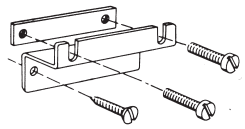
With our configuration software CFT1 and the corresponding hardware you can configure and parameterize our electronic pressure switches and transmitters series PTH, PSH, PTS and PSS.

After inserting the CD in your drive the CFT1 software will be installed on your PC automatically.
A port identification assistance makes the hardware installation much more easier.
With one "click" the connected device will be recognized including it´s serial number and the technical data.
An easy and clear user surface enables an effective operation with the CFT1.

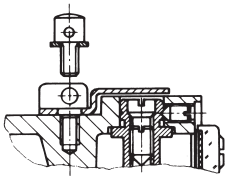
Scope of delivery:
· 1 cable, M12
· 1 cable, USB
· 1 CD with software and manual (EN2B-0344GE51)
· 1 CONFIG TOOL in plastic foil
· 1 mounting instruction (MU1B-0412GE51)

Configuration Tool	
Type	**function**
CFT1	Software and interface for ease pressure range and filter adaption, incl. f.e.g. checking for pressure and temperature overloading.

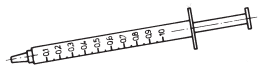
for thermostats and pressure monitors



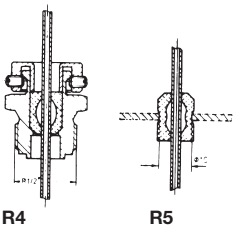
H1



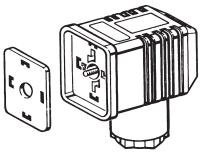
P2



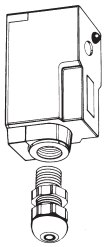
WLP1



R4 R5



ST5

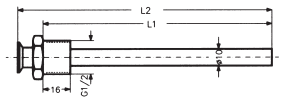


ST218

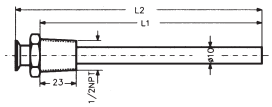
Type	
H1	**Wall bracket** including fixing screws and plugs (6 mm Ø); included as standard with TRM type thermostats. Suitable for all switching devices of the 200 and 300 series.
P2	**Sealing device** consisting of cover plate and capstan screw for covering and sealing the adjusting screws. Only suitable for switching device 200 (plug connection)
WLP1	**Heat conducting compound** to improve the transfer of heat, e.g. for strap-on thermostats. Approx. 1.5 cm^3 in handy dispenser.
R4	**Capillary tube bushing** for 3 mm capillary tube (not pressure-tight). Screw-in thread G 1/2". Suitable for all TAM.
R5	**Capillary tube bushing** Rubber plug for 3 mm capillary tube. Bore diameter 10 mm. Not pressure-tight (5 off packed in bag). Suitable for all TAM.
ST5	**Replacement plug to DIN ISO 4400** for 200 series switching devices, with seal and fastening screw, 3-pin + earth contact
ST218	**Plug connector with position indication via LEDs** Operating voltage: 12–240 V AC/DC Operating current: max. 2 A LED current consumption: max. 10 mA LED indication: green, if voltage present at contact pin 1; red, if voltage present at contact pin 3 Plug rotates through 270 °, engaging at 45 ° intervals Connection cables: 1.5 mm^2 (finely stranded) Protection class: IP 65 Ambient temperature: 0–60 °C Suitable for 200 series pressure and temperature switches (plug connection) which are equipped with a microswitch (standard version).

ZT

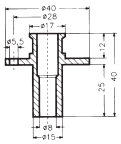
Immersion wells



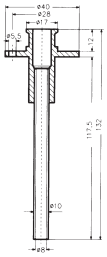
Immersion wells G 1/2"



Immersion wells 1/2" NPT



R6



R7

for thermostats and temperature transmitters

Type	Immersion depth L_1 (mm)	Overall length L_2 (mm)	Suitable for
Nickel-plated brass, G 1/2", permitted pressure 25 bar			
R1/Ms	135	151	**TAM…**
R2/Ms	220	236	
R3/Ms	500	516	
R10/Ms	135	151	**TX…/TP**
R20/Ms	220	236	
Stainless steel (1.4571 + 1.4401) G 1/2", permitted pressure 63 bar			
R1/Nst	135	151	**TAM…**
R2/Nst	220	236	
R10/Nst	135	151	**TX…/TP**
R20/Nst	220	236	
Nickel-plated brass, 1/2" NPT, permitted pressure 25 bar			
RN1/Ms	135	151	**TAM…**
RN2/Ms	220	236	
RN10/Ms	135	151	**TX…/TP**
RN20/Ms	220	236	
Stainless steel (1.4571 + 1.4401) 1/2" NPT, permitted pressure 63 bar			
RN1/Nst	135	151	**TAM…**
RN2/Nst	220	236	
RN10/Nst	135	151	**TX…**
RN20/Nst	220	236	

Immersion wells with fixing flange for air ducts

Type	Immersion depth of sensor	Suitable for
Material: chromated steel		
R6	135 mm	**TX…**
R7	220 mm	

Immersion wells (screw-in thread G1/2")

Type	Immersion depth (mm)	Connection	Max. perm. press. (bar)
G12-100	100	G1/2"	100
G12-150	150	G1/2"	100
G12-200	200	G1/2"	100
G12-250	250	G1/2"	100
R12-100	100	R1/2"	100
R12-150	150	R1/2"	100
R12-200	200	R1/2"	100
R12-250	250	R1/2"	100
N12-100	100	**1/2"** NPT	100
N12-150	150	**1/2"** NPT	100
N12-200	200	**1/2"** NPT	100
N12-250	250	**1/2"** NPT	100

TERMS AND CONDITIONS
Except as agreed to on the face hereof, the following terms and conditions apply without exception to all sales described on the face hereof by the member of the Honeywell International Inc. group of companies identified on the face of this document ("Honeywell") to Buyer.

1. SOLE TERMS.

Honeywell's sale is expressly limited to the terms herein and any additional or different terms or conditions on Buyer's purchase order or any other instrument, agreement, or understanding are deemed to be material alterations and are rejected and not binding upon Honeywell. Honeywell's acceptance of Buyer's purchase order is expressly conditional upon Buyer's assent to the terms and conditions contained herein in their entirety. Buyer's acceptance of delivery from Honeywell constitutes Buyer's acceptance of these terms and conditions in their entirety.

2. QUOTE/ PRICES.

Honeywell's quotation, if constituting the reverse side of this document, is firm only if Buyer enters an order within the time specified on the quote or, if none be mentioned, 30 days. Buyer must request shipment of the entire quantity of goods ordered within 12 months from date of order, otherwise, Honeywell standard prices at time of shipment may, at Honeywell's option, apply to those quantities actually delivered, even if already invoiced. All tooling, designs, drawings, and other intellectual property produced or delivered hereunder are owned by Honeywell. If, after conclusion of contract Honeywell's costs of materials have increased by 5% or more and this increase could not have been foreseen by Honeywell, then Honeywell may increase the price on all affected goods accordingly.

3. PAYMENT.

Unless otherwise stated on the face hereof, all payments are to be in EUR and are due in Honeywell's account within 30 days from date of invoice. Invoices remaining unpaid after their due date will be subject to an interest charge of 5% per year. Invoices remaining unpaid 30 days after their due date and receipt of invoice will be subject to an interest charge of 8%-points above the respective base rate published by the German Federal Bank per year, unless buyer is not responsible for the default Buyer will pay all costs necessary for collection of unpaid amounts, including attorneys' fees, unless Buyer is not responsible for the default.

4. DELIVERY; EXAMINATION; RETENTION OF TITLE.

(a) All delivery dates are estimates unless agreed otherwise by Honeywell in writing.
(b) Delivery terms for goods are EXWORKS (Incoterms 2000) Honeywell's facility with all risk of loss or damage to goods passing to Buyer upon delivery to carrier.
(c) Buyer must to inspect all goods upon delivery without undue delay and has to report open defects, transport damages, failures in identity and shortages without undue delay, in no event later than 5 days after delivery, hidden defects without undue delay, in no event later than 5 days after detection in writing to Honeywell, otherwise all goods will be deemed delivered and accepted., unless Honeywell has maliciously concealed the defect.
In the event Buyer is in default of acceptance Buyer shall be liable for increased costs incurred by Honeywell.
(d) Honeywell shall retain title in all goods delivered by Honeywell until payment has been made in full. In the event of a current account, retention of title shall serve as security for any balance due to Honeywell.
(e) The Buyer shall treat the goods with care; in particular it shall insure it sufficiently against fire, water and theft at reinstatement value at its own cost.
(f) In the event of seizure or any other measure taken by third parties in relation to the goods, the Buyer shall notify Honeywell in writing without undue delay so that Honeywell can initiate legal proceedings pursuant to § 771 of the German Code of Civil Procedure in order to prevent execution of any court order. If the third party is unable to reimburse the costs incurred in court and out of court of a claim pursuant to § 771 of the German Code of Civil Procedure, the Buyer is liable for the damages incurred hereby.
(g) Any processing of or alteration to the goods carried out by the Buyer shall always be carried out for Honeywell. If the goods are processed using other items, which do not belong to Honeywell, Honeywell shall acquire co-ownership of the new item in the ratio of the value of the object delivered to the other processed items at the time of processing.
(h) If the goods are irreversibly mixed using other items, which do not belong to Honeywell, Honeywell shall acquire co-ownership of the new item in the ratio of the value of the object delivered to the other mixed items at the time of mixing. If the mixing process takes place in such a way that the Buyer's item must be regarded as the principal item the parties shall be deemed to have agreed that the Buyer shall transfer shared title to Honeywell pro rata.
(i) Should the Buyer sell the goods delivered – whether processed or not – in due course of business, it hereby assigns any claims from selling the goods with all ancillary rights vis-à-vis its customer to Honeywell.
(j) On good cause the Buyer is obliged, if requested by Honeywell, to inform Honeywell of any assignment to a third-party purchaser and to give Honeywell all information required for the assertion of its rights and to hand over any documents.
(k) Should the realisable value of Honeywell's security exceed the debt claim to be secured by more than 10 % Honeywell shall release means of security – at its discretion – at the request of the Buyer.

5. TAXES.

The amount of any and all applicable taxes will be added to the price and paid by Buyer, unless Buyer has provided Honeywell with exemption certificates acceptable to the taxing authorities.

6. FORCE MAJEURE. DELIVERY DELAY.

Honeywell is not liable for any delay in production or delivery of goods if due to a force majeure event, which includes, among other things, shortages or inability to obtain materials or components, or refusals to grant an export license or the suspension or revocation thereof, or any other acts of any government that would limit Honeywell's ability to perform, fire, earthquake, flood, severe weather conditions, or any other acts of God, quarantines, epidemics, pandemics, or other regional medical crisis labour strikes or lockouts, riots, strife, insurrection, civil disobedience, armed conflict, terrorism or war (or imminent threat of same), or any other cause whatsoever beyond Honeywell's reasonable control.
If the force majeure event continues for longer than 90 days, either party may terminate Buyer's purchase order. If Buyer terminates the order Buyer will pay Honeywell for work performed prior to termination and all reasonable expenses incurred by Honeywell prior to termination. In the event of delays in delivery or performance caused by force majeure or Buyer, the date of delivery or performance shall be extended by the period of time Honeywell is actually delayed or as mutually agreed.
If, for reasons other than the foregoing, Honeywell should default or delay or not deliver goods, Buyer may cancel Buyer's purchase order, through prior written notice to Honeywell. In as far as Buyer incurred damages due to the delivery delay culpably caused by Honeywell Honeywell's liability is limited to 0.5% of the order value of the delayed delivery per week in any event to 5% of the order value of the delayed delivery. Buyer is only entitled to claim damages in lieu of performance in accordance with section 11.

7. TERMINATION.

No Buyer purchase order may be terminated without Honeywell's prior written consent. Goods scheduled for shipment within 30 days cannot be rescheduled. Goods scheduled for shipment between 30 and 60 days may be rescheduled with Honeywell's prior written consent and if, rescheduled beyond 60 days that quantity may not be further rescheduled. Buyer is, nonetheless liable for termination charges, which may include (a) a price adjustment based on the quantity of goods delivered, (b) all costs, direct and indirect, incurred and committed for Buyer's terminated purchase order, (c) the full cost of all unique materials required for custom goods, and (d) a reasonable allowance for prorated expenses and anticipated profits consistent with industry standards. Honeywell may terminate a Buyer's purchase order in whole or in part upon Buyer's breach of these terms and conditions or Buyer's bankruptcy, insolvency, dissolution, or receivership proceedings.

8. INFRINGEMENT INDEMNIFICATION.

(a) Honeywell agrees to (i) defend or settle any claim, suit, or proceeding brought against Buyer based solely upon a claim that any goods manufactured and provided solely by Honeywell hereunder directly infringe any third party German patent, copyright, or maskwork, and (ii) to pay costs and damages finally awarded to the third party, provided that: (A) Honeywell is notified promptly in writing of such claim, (B) Honeywell is provided sole control of such defence or settlement using counsel of Honeywell's choice, and (C) Buyer provides Honeywell with all available information and assistance. Because Honeywell has exclusive control over resolving infringement claims hereunder, in no event will Honeywell be liable for Buyer's attorneys' fees, if any.
(b) Honeywell shall not be responsible for any settlement or compromise of any such third party claim made without Honeywell's written consent. Honeywell has no obligation and this Section 8 will not apply to any claim of infringement of any intellectual property right of a third party (i) by goods not in Honeywell's catalogue or goods developed pursuant to Buyer's direction, design, process, or specification, (ii) by the combination of any goods with other elements if such infringement could have been avoided but for such combination, (iii) by goods that have been modified if such infringement would have been avoided by the unmodified goods, (iv) by goods not used for their ordinary purpose, or (v) by software if such software is other than the latest version of the software released by Honeywell and provided to Buyer. Buyer agrees to defend, indemnify, and hold harmless Honeywell from and against any claims, suits, or proceedings whatsoever arising from such exclusions identified in this Section 8(b), unless this is not caused by Buyer's failure.
(c) At any time after a claim has been made or Honeywell believes is likely to be made, or a court of competent jurisdiction enters an injunction from which no appeal can be taken, Honeywell has at its option the discretion to (i) procure for Buyer the right to continue using such goods, (ii) replace or modify such goods in a way that it does not further infringe any third party intellectual property rights and without affecting the functionality of said goods. In the event Honeywell fails to do so within a reasonable time limit to be set by Buyer, Honeywell shall accept the return of such goods and refund the purchase price less 20% annual depreciation from shipment date. The foregoing states Buyer's exclusive remedy for any actual or alleged infringement of intellectual property rights. Buyer is only entitled to claim damages subject to section 11.

9. SOFTWARE.

Software, if listed on the face hereof or installed on a good listed on the face hereof, is governed by the following terms unless a software license agreement is included with such software. Subject to Buyer's compliance with these terms and conditions, Honeywell grants a personal, limited, nonexclusive license to use the object code of the software solely for Buyer's internal purposes. The license is limited to such kind of goods as are specified on Buyer's purchase order for which this instrument serves as either a quotation or acknowledgment. No other use is permitted. Honeywell retains for itself (or, if applicable, its suppliers) all title and ownership to any software delivered hereunder, all of which contains confidential and proprietary information and which ownership includes, without limitation, all rights in patents, copyrights, trademarks, and trade secrets. Buyer shall not attempt any transfer without prior written consent of Honeywell, sublicense, or redistribution of the software except as expressly permitted herein. Buyer is only entitled to copy the software in as far as necessary for the contractual purpose. Buyer is entitled to make back-up copies in as far as necessary. Furthermore Buyer shall not disclose, distribute, or display any such software, or otherwise make it available to others (except as Honeywell authorizes in writing) or allow any unauthorized use of the software. Buyer is only entitled to reverse compile the software within the scope of § 69e UrhG. Buyer is only entitled modify, upgrade or alter the software in any other way within the scope of § 69c UrhG. Honeywell may terminate this license if Buyer breaches fundamental provisions under these terms and conditions.

10. WARRANTY.

(a) The following is in lieu of all other warranties and conditions, express or implied including those of satisfactory quality and fitness for particular purpose.
(b) Except as otherwise expressly provided herein, Honeywell warrants goods of its manufacture in all material respects to be free of defective materials and faulty workmanship and as conforming to applicable specifications and/or drawings. Honeywell may, without notice to Buyer, incorporate changes to goods that do not alter form, fit, or function and are reasonably acceptably to Buyer. Commencing with delivery Honeywell's warranty shall run for the period specified on the face hereof or, if none be mentioned, 12 months.
(c) Non-complying goods returned to Honeywell will be repaired or replaced, at Honeywell's option, and return-shipped lowest cost, transportation prepaid. The costs of transportation to Honeywell have to be borne by Buyer. In the event Honeywell fails to repair or replace the non-complying good within a reasonable time limit set by Buyer, Honeywell shall accept the return of such goods and refund the purchase price less 20% annual depreciation from shipment date. The foregoing states Buyer's exclusive remedy in case of defects. Buyer is only entitled to claim damages subject to section 11.
(d) No goods will be accepted for return without an authorization number obtained in advance of shipment to Honeywell.

(e) Goods subject to wear and tear or burnout through usage shall not be deemed defective because of such wear and tear or burnout. No warranty shall apply if the defect or damage was caused by or related to installation, combination with other parts and/or products, modification to or repair of any goods other than by Honeywell, or resulted from Buyer's acts, omissions, misuse, or negligence.
(f) Repaired or replaced goods shall be warranted for the remainder of the unused warranty term or for 90 days from shipment, whichever is longer.
(g) Experimental goods (which may be designated by the letter "X" or "E" beginning their part number identification) or unreleased or beta software are prototype, pre- production items that have yet to complete all phases of release testing; these goods are sold "AS IS" WITH NO WARRANTY.
(h) It is Buyer's responsibility to ensure that the Goods are fit for the application in which they are used.
(i) Software, if listed on the face hereof and/or used within goods listed on the face hereof and warranted by Honeywell, will be furnished on a medium that's free of defect in materials or workmanship under normal use for so long as the hardware and/or system is under warranty. During this period, Buyer has the rights listed in section 10 C with regard to any defects of the software.
(j) Where hardware and/or a system is installed by Honeywell, such installation is warranted against faulty workmanship for the same period (if any) as applies to the installed items. During this concurrently running period, Honeywell will correct without charge any workmanship it finds to be faulty.
(k) These warranties are for the benefit of the Buyer only and are not assignable or transferable.

11. LIMITATION OF LIABILITY.

(a) Honeywell is liable for intent and gross negligence on its part, on the part of its legal representatives and vicarious agents. If Honeywell has not acted intentionally Honeywell's liability is restricted to typical, foreseeable damage.
(b) Honeywell shall also be liable in the event of negligent injury to life, body and health caused by Honeywell, its legal representatives or vicarious agents and in the event of wilful failure to disclose a defect. Where a guarantee is provided by Honeywell, then the extent of Honeywell's liability is to be determined pursuant to the guarantee declaration.
(c) Honeywell shall also be liable for the negligent infringement of such duties, the fulfilment of which warranted the execution of the agreement in the first place and the observance of which the Buyer is and can be sure of on Honeywell's part, the part of its legal representatives or vicarious agents. If Honeywell has not acted intentionally Honeywell's liability is restricted to typical, foreseeable damage.
(d) Additionally Honeywell shall be liable in cases of mandatory statutory liability, for example pursuant to the Product Liability Act.
(e) Other than stated herein any liability of Honeywell is excluded, regardless of the theory of liability, whether based in contract, tort, indemnity or otherwise.
(f) The Buyer shall notify and consult with Honeywell without undue delay and comprehensively if it intends to take legal recourse in accordance with the afore-mentioned provision. The Buyer has to allow Honeywell to investigate and examine the damages.

12. RECOMMENDATIONS.

Any recommendations or assistance provided by Honeywell concerning the use, design, application, or operation of the goods shall not be construed as representations or warranties of any kind, express or implied, and such information is accepted by Buyer at Buyer's own risk and without any obligation or liability to Honeywell. It is the Buyer's sole responsibility to determine the suitability of the goods for use in the Buyer's application(s). The failure by Honeywell to make recommendations or provide assistance shall not give rise to any liability to Honeywell.

13. LAWS.

a)Buyer will comply with all applicable laws, regulations, and ordinances of any governmental authority in any country having proper jurisdiction, including, without limitation, those laws of the United States or other countries that regulate the import or export of the goods provided by Honeywell and shall obtain all necessary import/export licenses in connection with any subsequent import, export, re-export, transfer, and use of all goods, technology, and software purchased, licensed, and received from Honeywell. Unless otherwise mutually agreed in writing, Buyer agrees that it will not use the goods in connection with any activity involving nuclear fission or fusion, any use or handling of any nuclear material, or any nuclear, chemical, or biological weapons.
b) Goods and services delivered by Honeywell hereunder will be produced and supplied in compliance with all applicable laws and regulations in the Federal Republic of Germany. Buyer confirms that it will ensure that all goods are properly installed and used in accordance with the applicable safety at work laws and regulations, and Buyer will indemnify Honeywell in respect of any costs, claims, actions or liability arising out of that Act, or otherwise arising out of the supply by Buyer or use by others of the goods, unless this is not caused by Buyer's failure.

14. PRECLUSION AGAINST SETOFF.

Buyer is only entitled to set off any amount against any amount due or to become due from Honeywell to Buyer or its affiliates that are undisputed or final absolute.

15. WEEE

a) Prices do not include the costs of recycling goods covered by the European WEEE Directive 2002/96/EC and such costs may be added to the prices quoted.
b) Unless a charge has been made therefore under section 15 a above, if the provisions of the WEEE Directive 2002/96/EC as implemented in any local jurisdiction apply to goods, the financing and organisation of the disposal of the waste electrical and electronic equipment are the responsibility of the Buyer who herewith accepts this responsibility, and Buyer will indemnify Honeywell in respect of all such liabilities. The Buyer will handle the collection, processing and recycling of the goods in accordance with all applicable laws and regulations, and shall pass on this obligation to the final user of the goods. Failure by the Buyer to comply with these obligations may lead to the application of criminal sanctions in accordance with local laws and regulations

16. APPLICABLE LAW.

These Terms and Conditions are subject to the Laws of the Federal Republic of Germany. These terms and conditions are excluded from the United Nations Convention on Contracts for the International Sale of Goods, 1980, and any successor thereto. The competent court at the seat of Honeywell will have exclusive jurisdiction to adjudicate any dispute related to these terms and conditions.

17. INDEMNIFICATION.

Buyer shall indemnify Honeywell for all costs and damages, including attorneys' fees, suffered by Honeywell as a result of Buyer's culpable actual or threatened breach of these terms and conditions.

18. MISCELLANEOUS.

The parties may exchange confidential information during the performance or fulfilment of any purchase order. All confidential information shall remain the property of the disclosing party and shall be kept confidential by the receiving party for a period of 10 years following the date of disclosure. These obligations shall not apply to information which is: (a) publicly known at the time of disclosure or becomes publicly known through no fault of recipient, (b) known to recipient at the time of disclosure through no wrongful act of recipient, (c) received by recipient from a third party without restrictions similar to those in this section, or (d) independently developed by recipient. Each party shall retain ownership of its confidential information, including without limitation all rights in patents, copyrights, trademarks and trade secrets. A recipient of confidential information may not disclose such confidential information without the prior written consent of the disclosing party, provided that Honeywell may disclose confidential information to its affiliated companies, employees, officers, consultants, agents, and contractors These terms and conditions (including those stated on the face hereof) constitute the entire agreement of Honeywell and Buyer, superseding all prior agreements or understandings, written or oral, and cannot be amended except by a mutually executed writing. Buyer may not assign any rights or duties hereunder without Honeywell's written prior consent. Honeywell may subcontract its obligations hereunder without Buyer's consent. No representation, warranty, course of dealing, or trade usage not contained or expressly set forth herein will be binding on Honeywell. Headings and captions are for convenience of reference only and do not alter the meaning or interpretation of these terms and conditions. No failure by Honeywell to enforce at any time for any period the provisions hereof shall be construed as a waiver of such provision or of the right of Honeywell to enforce thereafter each and every provision. In the event any provision herein is determined to be illegal, invalid, or unenforceable, the validity and enforceability of the remaining provisions shall not be affected and, in lieu of such provision, a provision as similar in terms as may be legal, valid, and enforceable shall be added hereto. Provisions herein which by their very nature are intended to survive termination, cancellation, or completion of Buyer's order after acceptance by Honeywell shall survive such termination, cancellation, or completion. All stenographic and clerical errors are subject to correction. These terms and conditions shall confer no benefit on any third party.

19. LANGUAGE

The English language version of these terms and conditions will prevail in case of conflict with any translations provided for convenience purposes.

www.fema.biz

All products datas online

- technical datas
- mounting instructions
- tender text
- product pictures
- product selector
- certificates

Honeywell GmbH
FEMA-Controls
POB 12 54
71099 Schönaich
Germany
Telephone +49 (0) 7031/6 37-02
Telefax +49 (0) 7031/6 37-8 50
info@fema.biz

Pressure · Temperature · Flow Control

www.honeywell.com
www.fema.biz

EN0B-0684GE51 R0113
Subject to change.

FEMA
by Honeywell