
# Pressure

Pressure switches · Pressure transmitters

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FEMA

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# Alphabetical type index


Pressure switches


PST, PST...R

# Smart Press

## Electronic pressure switches / pressure transmitters PST, PST…-R

### Applications

Honeywell Fema PST and PST…-R series pressure switches are highly flexible and can be adjusted and configured in two modes, namely user mode and expert mode, 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.

Self-monitored versions are 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** | **Housing and cover** | Polybutylene terephthalate (PBT) |
| | **Ambient temperature** | -20 to + 60°C, from 36 V DC…50 °C |
| | **Storage temperature** | -35 to + 80°C |
| | **Medium temperature** | -20 to + 100°C |
| | **Relative humidity** | 0 to 95%, non-condensing |
| | **Total accuracy** | 0.5% of final value, 1…600 bar<br>1% of final value, 250…1000 mbar |
| | **Medium temperature drift** | 0.3% per 10 K |
| | **Weight** | 380 grams |
| | **Parts in contact with medium** | 1.4571 + 1.4542 (high pressure)<br>1.4571 + 1.4435 (low-pressure/flush) |
| | **Process connection** | |
| | Pressure gauge connection | G 1/2“ external thread |
| | Flush connection | G 3/4” external thread |
| **Electrical connection** | PST versions | 5-prong M12 plug, A-coded as per DIN IEC 60947-5-2 |
| | PST…-R version | Extra 3-prong M12 plug |
| | Protection class | II as per EN 60335-1 |
| | Degree of protection | IP65 according to EN 60529 |
| | Climate class | C as per DIN EN 60654 |
| | Power supply | 14…36 V DC, max. 100 mA |
| | EMC | compatible as per EN61326/A1 |
| **Electronic switch outputs (all versions)** | Outputs | 2, configurable as high/low side or push-pull switches, 14…36 V DC, max. 250 mA |
| | Reaction time | 30 ms |
| | Switching differential (SP/RP) | selectable via software |
| | Minimum Switching differential | ≙ resolution of the display |
| **Relay outputs (PST..-R series)** | Contact type | 1 switch-over contact (1 x UM) |
| | Min. electrical lifetime | 250,000 switching cycles |
| **Switching capacity** | AC1 (resistive load) | 1.5VA (24 VDC/60 mA, 230 VAC/6.5 mA) |
| **Gold contacts (AgSnO2+Au [5 µm])** | AC15 (inductive load) | unsuitable |
| | Max. switching capacity | 60 mA for < 5 ms |
| | Min. switching capacity | 50 mW (>5 V or >2 mA) |
| **Switching capacity Silver contacts (AgSnO2)** | AC1 (resistive load) | 690 VA (230 V AC / 3 A) |
| | AC15 (inductive load) | 230 VA (230 V AC / 1 A) |
| | Max. switching capacity | 30 A for < 5 ms |
| | Min. switching capacity | 500 mW (>12 V or >10 mA) |
| **Diagnostic output** | Output configuration | “WARN” output (plug 2) max. 20 mA, 14…36 V DC |
| **Transmitter output (analogue output)** | Voltage/current | 0…10 V and 4…20 mA, configurable in expert mode |
| | Range limitation | Measuring range can be limited by up to 50% FS |
| | Step response | approx. 300 ms |
| **Simulation mode** | System pressure simulation | via pressure range |
| | Reaction test on sensor signals | 4 x/sec…1 x/16 sec |

# Product Summary

**PST** = Pressure Switch + Transmitter
**PST…R** = Pressure Switch + Transmitter + Relay

01 = –1…+1 bar
002 = 0–1.6 bar
004 = 0–4 bar
010 = 0–10 bar
025 = 0–25 bar
060 = 0–60 bar
100 = 0–100 bar
250 = 0–250 bar
600 = 0–600 bar
250 = 0–250 mbar
400 = 0–400 mbar
600 = 0–600 mbar
001 = 0–1000 mbar

**G12S** = G 1/2“ Standard pressure gauge version
**G34F** = G 3/4” quasi-flush version

PST | V | 01 | R | G34F | -R

**V** = Vacuum version
**M** = Millibar version

**R** = Relative pressure sensor
**A** = Absolute pressure sensor

**R** = Relay output of electrically isolated changeover contact

**Ordering data**

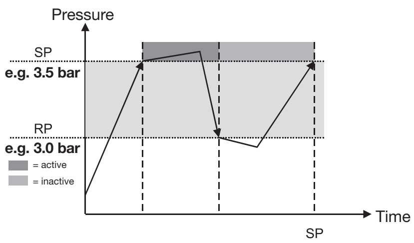
Smart Press with 2 electronic switching channels + transmitteroutput

Smart Press with 2 electronic switching channels + transmitteroutput and relay output

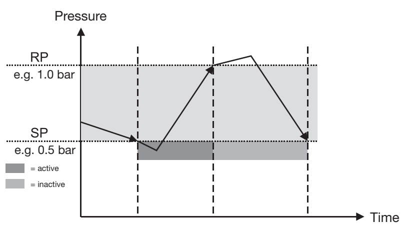
| Order no. | Pressure in bar | Order no. | Pressure in bar | Max. permissible pressure in bar | Bursting pressure in bar | Dimensioned drawing Page | Fig. |
|---|---|---|---|---|---|---|---|
| PSTM250RG12S | 0…250 mbar | PSTM250RG12S-R | 0…250 mbar | 1 | > = 1.6 | | |
| PSTM400RG12S | 0…400 mbar | PSTM400RG12S-R | 0…400 mbar | 2 | > = 3.2 | | |
| PSTM600RG12S | 0…600 mbar | PSTM600RG12S-R | 0…600 mbar | 2 | > = 3.2 | | |
| PSTV01RG12S | –1…+1 | PSTV01RG12S-R | –1…+1 | 6 | > = 10 | | |
| PST001RG12S | 0…1 | PST001RG12S-R | 0…1 | 6 | > = 10 | | |
| PST002RG12S | 0…1.6 | PST002RG12S-R | 0…1.6 | 6 | > = 10 | 16 | 30+31 |
| PST004RG12S | 0…4 | PST004RG12S-R | 0…4 | 12 | > = 20 | | |
| PST010RG12S | 0…10 | PST010RG12S-R | 0…10 | 30 | > = 50 | | |
| PST025RG12S | 0…25 | PST025RG12S-R | 0…25 | 75 | > = 125 | | |
| PST060RG12S | 0…60 | PST060RG12S-R | 0…60 | 180 | > = 300 | | |
| PST100RG12S | 0…100 | PST100RG12S-R | 0…100 | 300 | > = 500 | | |
| PST250RG12S | 0…250 | PST250RG12S-R | 0…250 | 500 | > = 1600 | 16 | 32+33 |
| PST600RG12S | 0…600 | PST600RG12S-R | 0…600 | 1000 | > = 1800 | | |
| PSTM250RG34F | 0…250 mbar | PSTM250RG34F-R | 0…250 mbar | 1 | > = 1.6 | | |
| PSTM400RG34F | 0…400 mbar | PSTM400RG34F-R | 0…400 mbar | 2 | > = 3.2 | | |
| PSTM600RG34F | 0…600 mbar | PSTM600RG34F-R | 0…600 mbar | 2 | > = 3.2 | | |
| PSTV01RG34F | –1…+1 | PSTV01RG34F-R | –1…+1 | 6 | > = 10 | | |
| PST001RG34F | 0…1 | PST001RG34F-R | 0…1 | 6 | > = 10 | 17 | 34+35 |
| PST002RG34F | 0…1.6 | PST002RG34F-R | 0…1.6 | 6 | > = 10 | | |
| PST004RG34F | 0…4 | PST004RG34F-R | 0…4 | 12 | > = 20 | | |
| PST010RG34F | 0…10 | PST010RG34F-R | 0…10 | 30 | > = 50 | | |
| PST025RG34F | 0…25 | PST025RG34F-R | 0…25 | 75 | > = 125 | | |
| PST002AG12S | 0…2 | PST002AG12S-R | 0…2 | 6 | > = 10 | 16 | 30+31 |
| PST010AG12S | 0…10 | PST010AG12S-R | 0…10 | 30 | > = 50 | | |
| PST002AG34F | 0…2 | PST002AG34F-R | 0…2 | 6 | > = 10 | 17 | 32+33 |
| PST010AG34F | 0…10 | PST010AG34F-R | 0…10 | 30 | > = 50 | | |

# Definitions

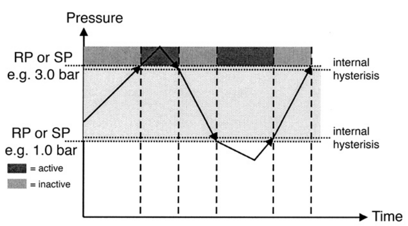
**Maximum pressure monitoring**




**Minimum pressure monitoring**




**Window monitoring**




## Maximum pressure monitoring

If an output is configured as a maximum detector, the electronic pressure switch monitors a programmed **upper pressure limit**. A switching process is triggered as soon as the pressure exceeds this limit.

## Minimum pressure monitoring

If an output is configured as a minimum detector, the electronic pressure switch monitors a programmed **lower pressure limit**. A switching process is triggered as soon as the pressure falls below this limit.

## Window monitoring

If an output is configured for pressure window monitoring, the electronic pressure switch monitors a programmed **pressure window**, i.e. the **range between a defined lower limit and a defined upper limit**. A switching process is triggered as soon as the pressure falls below the lower pressure limit or exceeds the upper pressure limit.

## Electronic pressure switch

**PST** and **PST…-R series** electronic pressure switches consist of an electronic, piezoresistive pressure sensor and a downstream analyser with 2 independently programmable switching channels, an analogue output and an optionally configurable relay output.

## Switching differential

In contrast to mechanical pressure switches, where the switching differential is essentially determined by the design, with electronic pressure switches any switching differential may be chosen. The difference between the switching point and the reset point (the switching differential) is defined at user level by entering and saving the switching and reset points via the software. The smallest definable switching differential corresponds to the display resolution.

## Switching point and reset point

Any switching point (SP) and reset point (RP) across the entire nominal pressure range of the electronic pressure switch can be selected at user level via the software.

## Switching point deviation

Illegal settings are automatically detected by the software. The value most recently set has priority over the value first set. If the electronic pressure switch is configured as a **maximum detector**, for example, the switching point (SP) must lie above the reset point (RP). If the reset point is above the switching point, or the switching point is below the reset point, no error will be displayed, but the switching points will be shifted accordingly until they are finally saved.

## Time Out function

“Time Out” refers to the time window in which values can be entered without the display automatically reverting to pressure display mode. For all settings at **user level** the setting window is **1 minute**. This means that if the user does not enter anything for one minute during the setting process, the unit automatically reverts to display mode and shows the current pressure in the display, disregarding any values that have been entered but not saved. However, when the unit is in setting mode at expert level, this “Time Out” function is turned off. In other words, the display (and thus the unit) remain in setting mode until the settings are saved in expert mode.

**Escape function**
After entering a valid 4-digit code, the user is able to parameterise and configure the unit at user or expert level. However, the unit automatically reverts to the locked state if no adjustment activity takes place within 60 seconds. Any manipulation of the rotary/push button extends the setting time by a further 60 seconds. On returning to the locked state, the word “CODE” (instead of “EXP”) appears in the corresponding screen. Once the correct code has been entered, the settings can be changed both in user mode and in expert mode.
In expert mode it is also possible to change the code. While the unit is in expert mode, if values or settings are changed but not saved (with “SAVE”), the unit will remain in expert mode until a defined state is chosen with “SAVE” or “REST” (restore data). If the code is set to “0000” in expert mode and this state is saved (with “SAVE”), the unit remains in the unlocked condition. In this case the “Escape” function is disabled.

**Simulation**
To check the connection configuration or the reaction of the system to output signals, the “SIM” setting can be used to simulate the pressure for which the unit is designed. The pressure can be varied from 0-100% of the total value with a rotary switch.
To show the reaction limits of the system it is also possible to set an alternating output signal with a variable pulse frequency (0 - 100% = 4x/sec …1x/16 sec). If simulation mode is not used for 30 minutes, the unit automatically reverts to display mode.

**Electronic slave pointer**
Smart Press allows you to trace a failure event back in time. The hours are counted, starting from the failure event until the readout date. This enables the system operator to determine when the failure occurred and so draw conclusions about any plant errors.

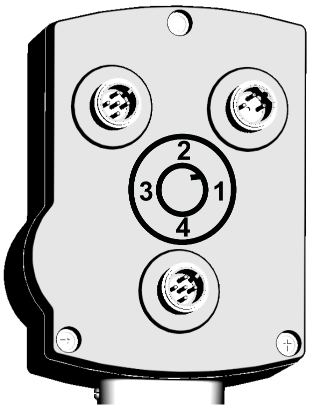
**Zero adjustment**
Zero adjustment is used to compensate any drift error of the sensor, which is liable to occur on all sensors during the lifecycle of the product. With zero adjustment, SmartPress allows you to set the display precisely to zero at zero pressure. The position of the adjustment curve is simply moved in parallel. The basic adjustment of the sensor is not changed. Zero adjustment is only possible within a range of +/– 2% of the overall pressure range. Therefore a position error, which is particularly liable to occur on sensors in the range of 0-1 bar, can easily be compensated. As the setting range is very small, it is virtually impossible for the sensor to be accidentally zeroed on pressurization.

**Push/pull output**
In expert mode the switch outputs can be configured as traditional open collector or **push/pull outputs**. The outputs always assume defined states (e.g.: unswitched: minus potential, switched: plus potential). If the outputs are applied to the input of a PLC, any **pull-down resistors**
that would otherwise be necessary can be dispensed with.

**Adjustment dynamics**
The bit generator of the SmartPress has been redesigned. The time-consuming job of “scanning” with the adjusting knob has given way to a convenient, dynamic setting strategy.
This allows the user to find the desired setting with just a few turns of the handwheel.

# 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**

| | |
|---|---|
| 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**
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**
All versions of series PST…R are also equipped with a B-coded M 12 plug.

Suitable cable sockets should be ordered at the same time for the electrical connection.

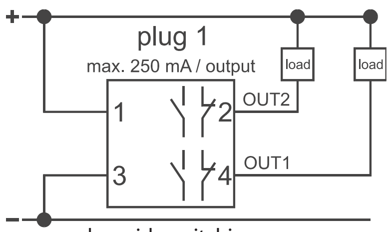
**Optional accessories**
**Cable socket**

| | | |
|---|---|---|
| 5-pole | ST12-5-G | straight version |
| 5-pole | ST12-5-A | right-angle version |
| 4-pole | ST12-4-G | straight version with 2 m cable |
| 4-pole | ST12-4-A | right-angle version with 2 m cable |

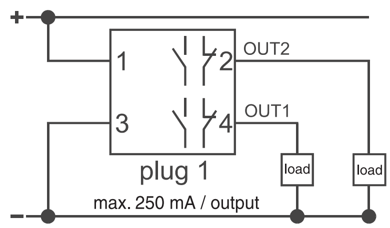
**Plug protection cap**
IP67 STA12

**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.

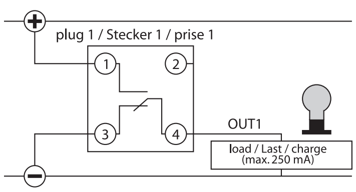
# Switch outputs

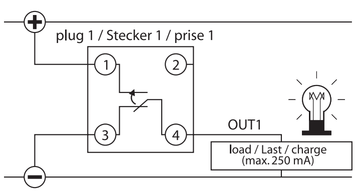



low-side switching




high-side switching




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.

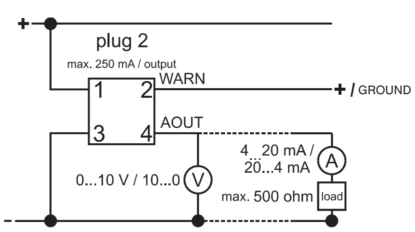
**If the power supplies of the pressure switch and connected load are independent of one another, the following must be taken into account: The potential difference between OC output and ground and OC output and supply voltage must not exceed 36 VDC. If the unit is configured for low-side switching, 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.**

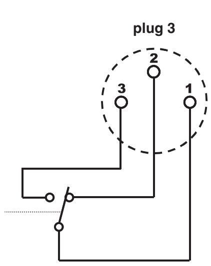
The switching channels are short-circuit-proof and they are monitored for current and temperature. Where current limiting is used and on overheating, both LEDs light up red (WARN function).
The freely configurable outputs can connect both the supply voltage (+ potential) itself and the ground (– potential)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



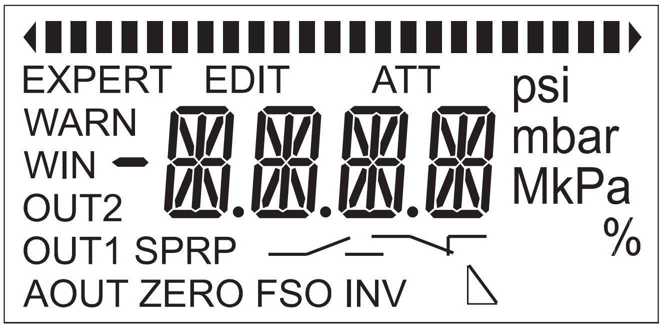

**Analogue output AOUT:**
The analogue output (AOUT) is available in versions PST and PST…-R. In expert mode it is configurable both as a 0-10 V/10-0 V, and as a 4–20 mA/20–4 mA output. The unit is supplied with the output configured for 0-10 V. The input impedance of the connected consumer **must not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

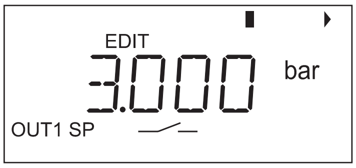
**Status LEDs**
The current status of the switch outputs is displayed by 2 LEDs located beneath the display (LED 1 and LED 2). The two 3-colour LEDs indicate the switching status of the corresponding output and the warning function.
· Orange: the output is **ACTIVE**
· Green: the output is **INACTIVE** (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** |

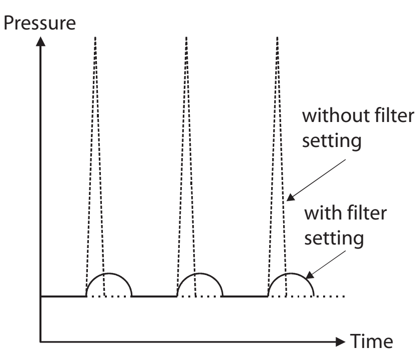
| | Display indication |
|---|---|
| - overload output 1 | -1*** |
| - overload output 2 | -2*** |
| - overload output 1 and 2 | -3*** |

# Settings at user level




**Switch output OUT 1 and OUT 2**
At user level, the switching point (SP) and reset point (RP) can be set across the entire nominal pressure range.
When the DIG (digital incremental sensor) is turned by one notch in the clockwise direction, the symbol "OUT 1" and "SP" appears. When the DIG is pressed, the EDIT "symbol" appears.
After that, any switching point can be selected by turning the DIG clockwise or anticlockwise. When you press the DIG again, "SAVE" is displayed. Press the DIG again to confirm. The chosen switching point is now permanently saved.
Turn it clockwise again to display the reset point (RP) symbol. The reset point (RP) is set in the same way as the switching point (SP).

**Analogue output (AOUT)**
Turning the DIG clockwise again opens the analogue output (AOUT) window. The screen displays the lower pressure value set (AOUT ZERO). Press the DIG to enter "EDIT" mode and then "SAVE" to save the lower reference value permanently.
Turn the DIG again to set "AOUT" "FSO". Here you can alter the upper reference value. The pressure value can be changed in the way described above.




**Filter setting (attenuation)**
To make the pressure switch insensitive to pressure peaks and to avoid distorting the measured value due to pressure peaks, a filter value of 0…95% can be set. After setting the switching points of OUT 2, turn the DIG again to open the "ATT" window. After pressing the DIG the user can change the value in edit mode (EDIT) or turn the filter off completely (OFF). Save the selected filter value with "SAVE". It is now permanently stored in the memory. The currently measured pressure is compared with the pressure measured previously. The currently measured pressure is then attenuated depending on the selected degree of filtering. This attenuation affects all outputs, i. e. all open collector outputs and relay outputs as well as the analogue output, as the attenuation has a direct influence on the incoming sensor signal. The previously measured pressure and the currently measured pressure (internally offset against each other) always produce a weight of 100%. The filter attenuation (effect) can be mathematically expressed as follows:

**R[x] = M[x] * (100% - F) + R[x - 1] * F**

where:
**"F"** is the selected attenuation in %,
**"M[x]"** is the measured value as a function of a defined time "x",
**"R[x - 1]"** is the previously displayed and output (calculated) measured value "x - 1", and
**"R[x]"** is the displayed and output (calculated) measured value in the time "x".

**Electronic slave pointer**
Before you exit user mode, the Smart Press shows the **extreme states in the past** by means of **right/left bar graph arrows** and maximum values in the vacuum/overpressure range. Press DIG once to enter **"EDIT" mode** and turn the knob to see how much time has passed since the event occurred.

# Settings at expert level

**Configuration of OUT 1 and OUT 2**

The last menu item in user mode (EXP) allows you to enter expert mode (after entering a code if necessary). The screen shows the configuration of OUT 1 (e.g. as WIN monitor for pressure window monitoring). Press the DIG to enter edit mode (EDIT). Output 1 can be configured as a minimum detector (left arrow), maximum detector (right arrow) or for pressure window monitoring (WIN) and as a push/pull output. Press to confirm your selection and open the function screen (FCT 1) of output 1. Press to enter edit mode (EDIT) and configure output 1 as normally open (NO), normally closed (NC), high-side or low-side switching or as a push/pull output.
OUT 2 is configured in the same sequence, but note than output 2 can also be configured as a WARN output.

**Configuration of analogue output (AOUT)**

Turn the DIG clockwise again to open the configuration menu (AOUT). The screen shows either FCTA (current output) or FCTV (voltage output). In EDIT mode the analogue output can be configured as current or voltage output, or inverted.

**Allocation of relay contact (on PST…-R versions only)**

Turn the DIG clockwise again to enter the relay output configuration mode (REL). Press to switch to EDIT mode. Turn to apply the relay function to OUT 1, OUT 2 or WARN. The OC outputs are not affected by this. That is to say, the relay function should always be regarded as parallel to the corresponding output.

**Setting pressure units to bar, Pascal or PSI**

Turn the DIG clockwise again to enter the “UNIT” menu. Press and turn to select and confirm the desired pressure unit.

**Setting the display background lighting**

Select the menu option **LED+** at expert level and “EDIT”, then choose **LED+** (permanently lit) or **LED–** (switching off automatically).

**Simulation mode**

Smart Press allows you to simulate various system states for checking connections and functions. Select menu option **SIM1** to take the system pressure through 0-100% according to the sensor specification. Selected switching points and the analogue output can be checked during this process.
The menu option **SIM2** allows you to initiate an alternating square wave signal with a variable pulse frequency. In this way you can test the system’s ability to react to sensor signals. If the display shows **SIM--**, simulation mode is turned off.

**Setting a four-digit locking code**

Turn the DIG clockwise again to enter the “CODE” menu. Press to enter EDIT mode, where you can enter and confirm a four-digit code between 0001 and 9999. 0000 is not a code.

**Exiting expert level via the EXIT menu**

Turn the DIG clockwise again to enter the “EXIT” menu. Press to go directly to display mode or to the SAVE menu (if any value has been modified). Here you can either confirm the new state with SAVE, or go back to the previous state (which existed before the modification) with REST (Restore).

# Overview of adjustable parameters

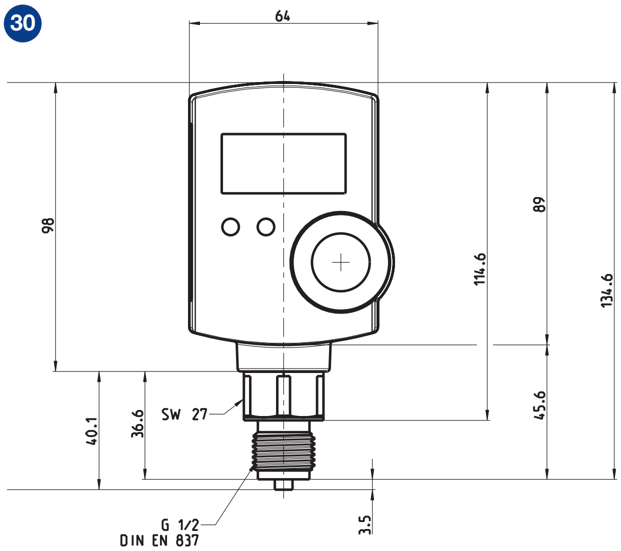
| Activity / Situation | Indications in LCD display | | Parameters modifiable in | |
|---|---|---|---|---|
| | Symbols | Digital values/text | User mode | Expert mode |
| **Current pressure is displayed*** | | | | |
| Current pressure | ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ relevant unit | relevant digital value | – | – |
| Output OUT 1 active | OUT 1 | – | – | – |
| Output OUT 2 active | OUT 2 | – | – | – |
| AOUT (pressure between ZERO and FSO) | AOUT | – | – | – |
| Rising pressure | ▶ | – | – | – |
| Falling pressure | ◀ | – | – | – |
| Alarm (sensor, power supply etc.) | WARN | ***1, **1* etc. | No | No |
| **Parameterisation of outputs OUT 1 (and OUT 2)*** | | | | |
| SP | ▮, OUT1 (OUT2), SP | digital value | Yes | No |
| RP | ▮, OUT1 (OUT2), RP | digital value | Yes | No |
| 1. Window (WIN) setting | ▮, OUT1 (OUT2), SP | digital value | Yes | No |
| 2. Window (WIN) setting | ▮, OUT1 (OUT2), RP | digital value | Yes | No |
| **Configuration of outputs OUT 1 (and OUT 2)** | | | | |
| Maximum pressure monitor (SP>RP) | EXPERT, SP, RP, ▮▮▮▶ | OUT1 (OUT2) | No | Yes |
| Minimum pressure monitor (SP<RP) | EXPERT, SP, RP, ◀▮▮▮ | OUT1 (OUT2) | No | Yes |
| Pressure window monitoring (WIN) | EXPERT, WIN | OUT1 (OUT2) | No | Yes |
| Output 2 as "WARN" output | EXPERT, WARN | OUT2 | No | Yes |
| Normally closed, low-side OUT 1 (2) | EXPERT, , ZERO | FCT1 (FCT2) | No | Yes |
| Normally open, low-side OUT 1 (2) | EXPERT, , ZERO | FCT1 (FCT2) | No | Yes |
| Normally closed, high-side OUT 1 (2) | EXPERT, , FSO | FCT1 (FCT2) | No | Yes |
| Normally open, high-side OUT 1 (2) | EXPERT, , FSO | FCT1 (FCT2) | No | Yes |
| Push-pull OUT 1 (2) | EXPERT, , ZERO, FSO | FCT1 (FCT2) | No | Yes |
| Inverted push-pull OUT 1 (2) | EXPERT, , ZERO, FSO | FCT1 (FCT2) | No | Yes |
| **Parameterisation of analogue output*** | | | | |
| Starting point (ZERO) | ▮, AOUT, ZERO | relevant digital value | Yes | No |
| Full-scale output (FSO) | ▮, AOUT, FSO | relevant digital value | Yes | No |
| **Configuration of the analogue output** | | | | |
| 0…10 V voltage output | EXPERT, AOUT | FCTV | No | Yes |
| 10…0 V voltage output | EXPERT, AOUT, INVΔ | FCTV | No | Yes |
| 4…20 mA current output | EXPERT, AOUT | FCTA | No | Yes |
| 20…4 mA current output | EXPERT, AOUT, INVΔ | FCTA | No | Yes |
| **Configuration of the relay output** | | | | |
| Relay coupled with OUT1 | EXPERT, OUT1 | REL | No | Yes |
| Relay coupled with OUT2 | EXPERT, OUT2 | REL | No | Yes |
| Relay with alarm output | EXPERT, WARN | REL | No | Yes |
| **Configuration units** | | | | |
| Unit | EXPERT, Pa/bar/psi | UNIT | No | Yes |
| **Display background lighting** | | | | |
| Lighting permanently on | EXPERT | LED+ | No | Yes |
| Lighting set to automatic | EXPERT | LED– | No | Yes |
| **Simulation** | | | | |
| Pressure simulation, nominal pressure range | EXPERT | SIM1 | No | Yes |
| Switching simulation, alternating | EXPERT | SIM2 | No | Yes |
| OFF simulation | EXPERT | SIM-- | No | Yes |
| **Electronic slave pointer** | | | | |
| Lowest occurring pressure | ◀▮▮▮ | digital pressure value | Yes | No |
| Highest occurring pressure | ▮▮▮▶ | digital pressure value | Yes | No |
| Read out time for lowest pressure | EDIT, ◀▮▮▮, h | digital pressure value in h | Yes | No |
| Time value (min) not available | EDIT, ◀▮▮▮, h | NAVL | Yes | No |
| Read out time for highest pressure | EDIT, ▮▮▮▶, h | digital pressure value in h | Yes | No |
| Time value (max) not available | EDIT, ▮▮▮▶, h | NAVL | Yes | No |
| Reset slave pointer | EDIT | Rset | Yes | No |
| **Zero adjustment** | | | | |
| X X X X X X | X X X X X X | | No | Yes |
| **Parameterisation of a filter** | | | | |
| Filter attenuation | ▮, ATT, % | digital value/OFF | Yes | No |
| **Locking/unlocking the unit with a code (user and expert level)** | | | | |
| Unlocked (code = 0000) | – | EXP | Yes | No |
| Locked (code ≠ 0000) | – | CODE, digital value | Yes | No |
| **Changing a code** | | | | |
| Unit is locked | EXPERT | LOCK | No | Yes |
| Unit is unlocked | EXPERT | CODE | No | Yes |

**Locking/unlocking the unit with a code (expert level only)** Described separately in the instruction manual.

* The same symbols that appear in expert mode are visible in user mode and show the current output configuration. Exceptions: if output is configured as max./min. detector, in user mode instead of ▮▮▮▶ or ◀▮▮, only ▶ or ◀ is displayed.

# Dimensioned drawings

30

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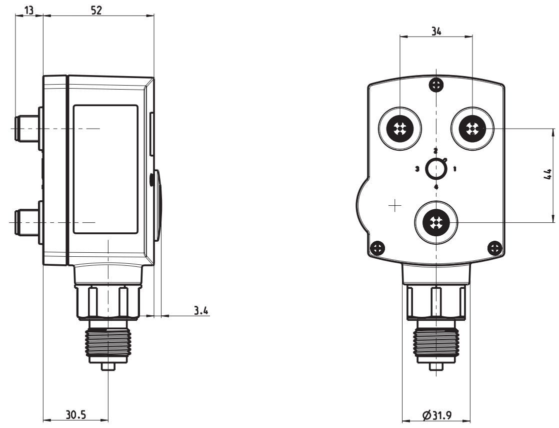


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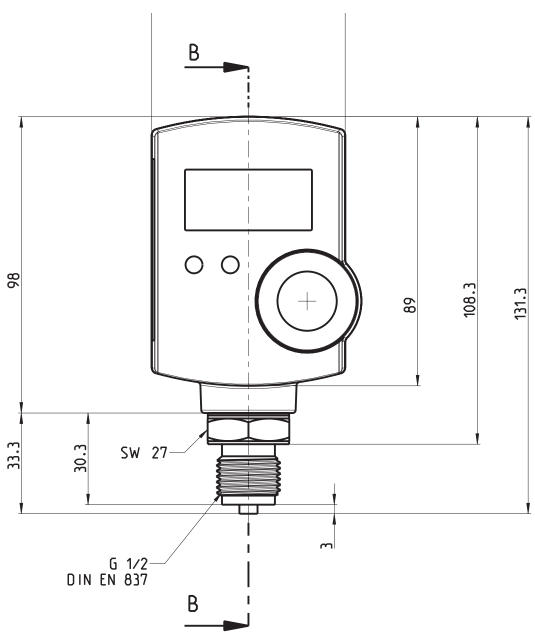


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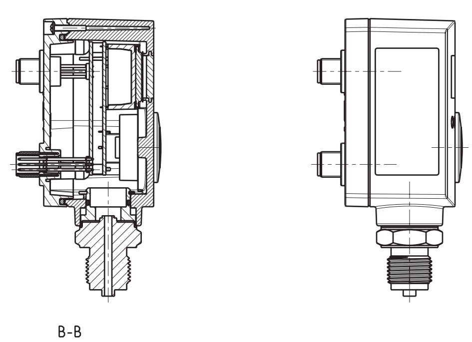

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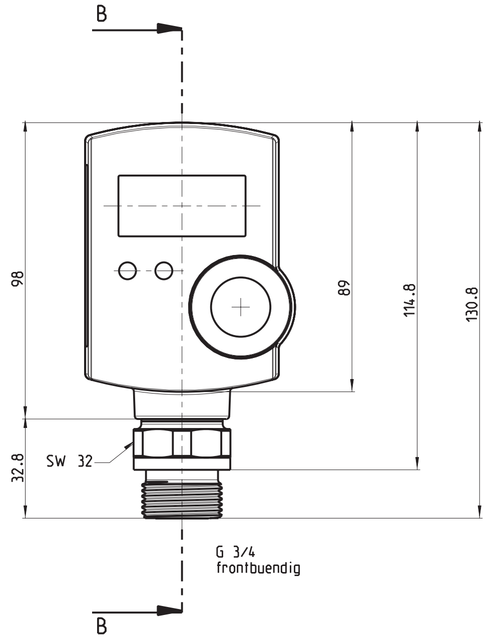
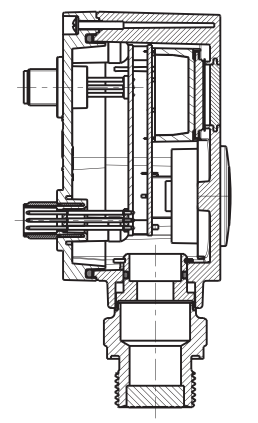


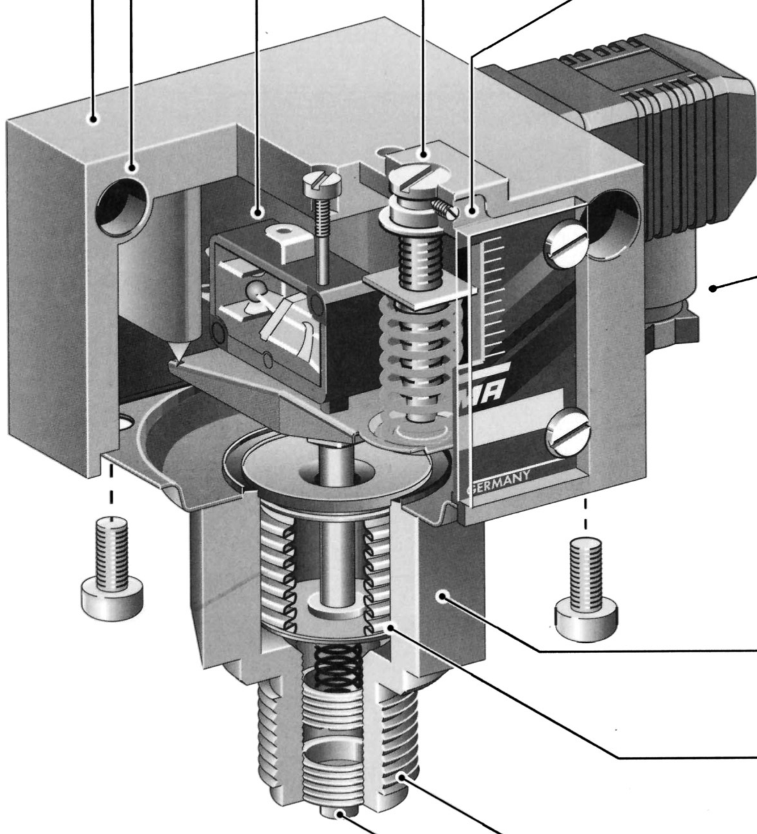

35



B-B

# 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**

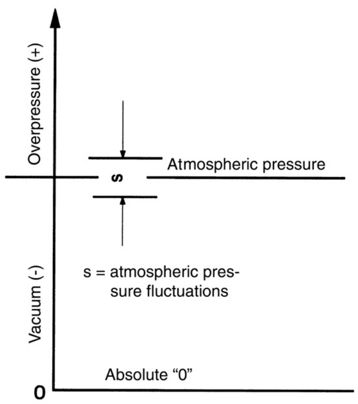
**Terminal connection**
**or plug connection to**
**DIN 43 650 Form A**

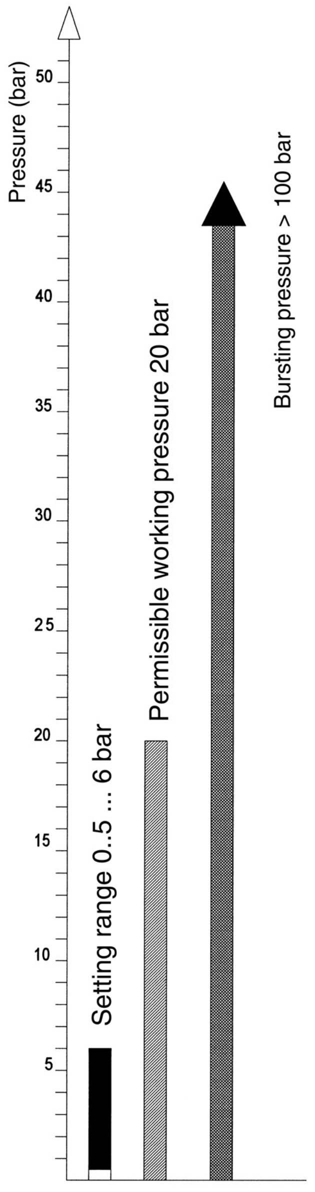
**Stainless steel sensor housing**

**Stainless steel bellows**
with internal stop

**Pressure connection**
G 1/2“ external
G 1/4” internal

**Centring pin**




**Pressure data for a pressure switch based on the example of DWR 625:**
Setting range: 0.5–6 bar
Perm. working pressure: 20 bar
Bursting pressure: >100 bar

# Definitions

## Pressure data

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

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

**Absolute pressure** Pressure 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 refer to relative pressure.

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

**Permissible bursting 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**

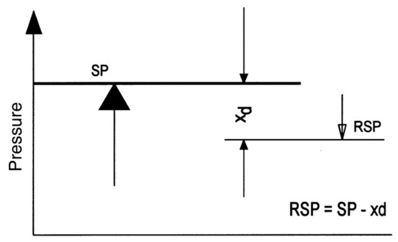
| Unit | bar | mbar | Pa | kPa | MPa | (psi) lb/m² |
|---|---|---|---|---|---|---|
| **1 bar** | 1 | 1000 | $10^{5}$ | 100 | 0.1 | 14,5 |
| **1 mbar** | 0.001 | 1 | 100 | 0.1 | $10^{-4}$ | 0.0145 |
| **1 Pa** | $10^{-5}$ | 0.01 | 1 | 0.001 | $10^{-6}$ | $1.45 \cdot 10^{-4}$ |
| **1 kPa** | 0.01 | 10 | 1000 | 1 | 0.001 | 0.145 |
| **1 MPa** | 10 | $10^{4}$ | $10^{6}$ | 1000 | 1 | 145 |
| **1 psi** | 0.069 | 68.94 | 6894 | 6.894 | 0.00689 | 1 |

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

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

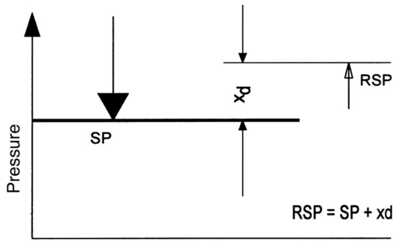
# Definitions

**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 are always 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.

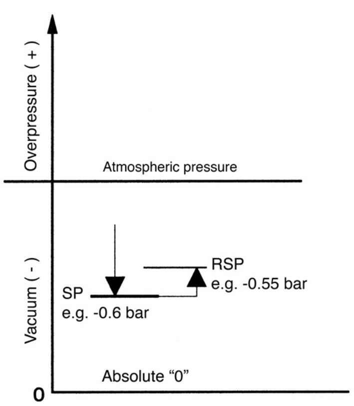
**Adjustable switching differential / Calibration**
In the case of pressure switches with adjustable switching differential, the hysteresis can be set within the specified limits. The switching point (SP) **and** reset point (RSP) are precisely definable. When setting the pressure switch, the switching 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 lying 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 (RP) is lower by the amount of the switching differential.

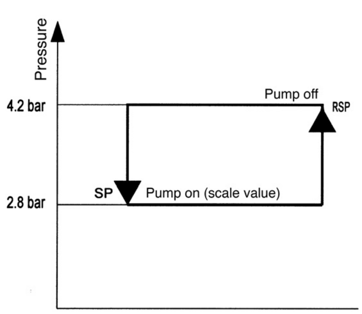
**Minimum pressure monitoring**
**With falling pressure,** switching takes place once the preset switching pressure is reached (SP). The reset point (RP) is higher by the amount of the switching differential.




**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 (from the point of view of absolute “0”).
“Falling” pressure means a rising vacuum.
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, in addition to the pressure it is also necessary to determine the direction of action. “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: DCM6-203 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.

# 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

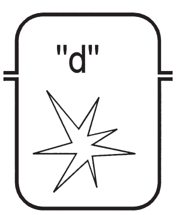
must not occur in the same place.

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.
With this in mind, the CENELEC technical committee has adopted the following European standards which are recognized in all EU member states.

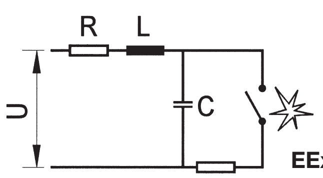
| | | | |
|---|---|---|---|
| **· General requirements** | **EN 50 014** | **· Pressure resistant encapsulation “d”** | **EN 50 018** |
| **· Oil encapsulation “o”** | **EN 50 015** | **· Increased safety “e”** | **EN 50 019** |
| **· Overpressure encapsulation “p”** | **EN 50 016** | **· Intrinsic safety “i”** | **EN 50 020** |
| **· Sand encapsulation “q”** | **EN 50 017** | **· Cast encapsulation “m”** | **EN 50 028** |

The guidelines relevant to FEMA products – besides the **“General Requirements EN 50 014”** – are **“Pressure resistant encapsulation d”** and **“Intrinsic safety i”**.

In addition, all explosion protection guidelines issued up to the present time have been combined into a single European Ex-Protection Directive 94/9EC. The aim of this new harmonized directive is to bring the explosion protection regulations of European member states into line with one another and eliminate barriers to trade between partner states. The new Directive 94/9EC (ATEX 100a), which came into force on 1 July 2003, replaces all previous directives.
All FEMA ex-pressure switches and ex-thermostats meet the requirements of the new European Ex-Protection Directive 94/9EC (ATEX 100a).




**EEx-d**




**EEx-i**

**Pressure resistant encapsulation “d”**
Switching elements and other electrical function units capable of igniting an explosive mixture are cast in a housing capable of withstanding the explosive pressure caused by an explosion indoors and preventing transmission to the surrounding atmosphere.

**Intrinsic safety “i”**
The equipment used in the area at risk of explosion contains only intrinsically safe electric circuits. An electric circuit is only intrinsically safe if the quantity of energy is so small that no spark or thermal effect can occur.

**The term “simple electrical equipment”**
In view of the use of simple microswitches without additional capacitance or inductance generating components, our pressure switches and thermostats designed for protection type Ex-i fall in the category of “simple electrical equipment”. These are not subject to testing or certification requirements within the meaning of Directive 94/9EC. The units may only be used in conjunction with ATEX-tested isolating amplifiers in areas at risk of explosion. We equip all units which are explicitly designed for such use with microswitches having gold contacts, a grounding screw and — for ease of identification — a blue cable entry.

# 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 [Berufsgenossenschaft Chemie] 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 [Gewerbeaufsichts-amt], where applicable with the assistance of the Insurance Association or the Technical Control Boards [Technische Überwachungsvereine]).
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 |
|---|---|---|
| T1 | > 450 | 450 |
| T2 | > 300 | 300 |
| T3 | > 200 | 200 |
| T4 | > 135 | 135 |
| T5 | > 100 | 100 |
| T6 | > 85 | 85 |

## Identification of explosion-protected electrical equipment

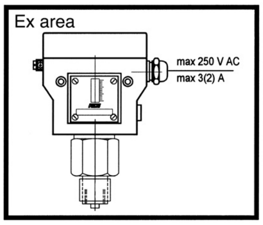
In addition to normal data (manufacturer, type, serial number, electrical data), data relating to the explosion protection must be included in the identification.
Under the new Directive 94/9EC (ATEX 95), based on IEC recommendations, the following identification is required:

**For example:** **Ex II G D EEx de IIC T6 IP65 T 80 °C**

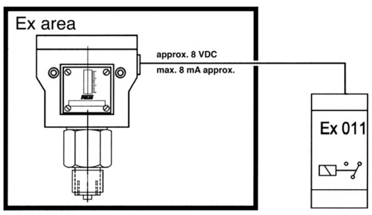
Ex-protection symbol
Device group II
Approved for gas
Approved for dust
Symbol for equipment built in accordance with European standards
Explosion protection identifier
Explosion group
Temperature class
IP protection class
Approved maximum temperature

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

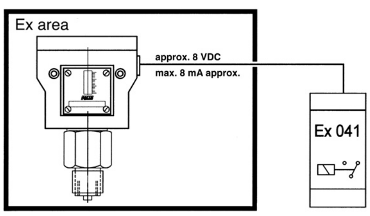
Specially equipped pressure switches can also be used in **explosion risk areas Zone 1, 2** and **21, 22**. The following alternatives are possible:



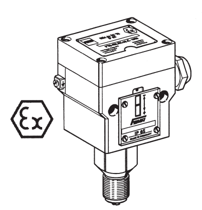
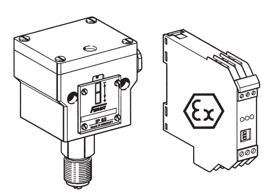
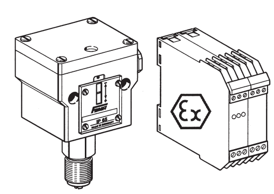

**1. Pressure-proof encapsulated switching device,**
**explosion protection EEx de IIC T6, PTB 02 ATEX 1121**
The pressure switch with pressure-proof encapsulation can be used directly in the explosion risk area (Zone 1 and 2 or 21 and 22). The maximum switching voltage, switching capacity and ambient temperature must be taken into account and the rules for installation in the explosion risk area must be observed. All pressure switches may be equipped with explosion-proof switching devices. However, special circuits and designs with an adjustable switching differential or internal interlock (reclosing lockout) are not permitted.




**2. EEx-i pressure switches**
All pressure switches of normal design can be used in explosion risk areas Zone 1 and 2 or 21 and 22, if they are integrated into an “intrinsically safe control current 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, e.g. type Ex 011 or Ex 041, must be tested by the Physikalisch-Technische Bundesanstalt (PTB) and approved for use in explosion risk areas. Isolating amplifiers must always be installed outside the explosion risk zone.
Pressure switches designed for EEx-ia installations may be provided with blue connection terminals and cable entries. In view of the low voltages and currents carried via the contacts of the microswitches, gold-plates contacts are recommended (additional function ZF 513).




**3. Pressure switches with microswitch and resistor combination for short-circuit and line break monitoring (see DBS series)**
A combination of a pressure switch with mechanical microswitch connected to a 1.5 kOhm series resistor and a safety-engineered isolating amplifier (type Ex 041) may also be used in explosion risk zones 1, 2 and 21, 22 (explosion protection EEx-ia).
The safety-engineered isolating amplifier produces a separate intrinsically safe control current circuit and at the same time monitors the supply conductors between the isolating amplifier and the pressure switch for short-circuit and line break. In this regard, see also the section on pressure limiters for safety-critical applications and data sheet Ex 041.

| **Pressure monitoring in explosion risk areas Zone 1 (21) and 2 (22)** | | |
|---|---|---|
|  |  |  |
| **Ex-D…** | **D…-513 + Ex 011** | **DWR…-576 + Ex 041** |
| **Pressure-proof encapsulated** | **Intrinsically safe** | **Intrinsically safe, line break and short-circuit monitoring** |
| Explosion protection: EEx de IIC T6 PTB approval for the complete switching device. Switching capacity at 250 V/3 A. The pressure switch can be installed within the Ex-Zone. | Explosion protection: EEx-ia PTB approval for isolating amplifiers Ex 041 Pressure switch with gold-plated contacts, blue terminals and blue cable entries. The isolating amplifier must be installed outside the Ex-Zone. | Explosion protection: EEx-ia PTB approval for isolating amplifiers Ex 041 Pressure switch with safety sensor, positive opening microswitch, gold-plated contacts, blue terminals and blue cable entries. The isolating amplifier must be installed outside the Ex-Zone. |

# 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, PTB, 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.**

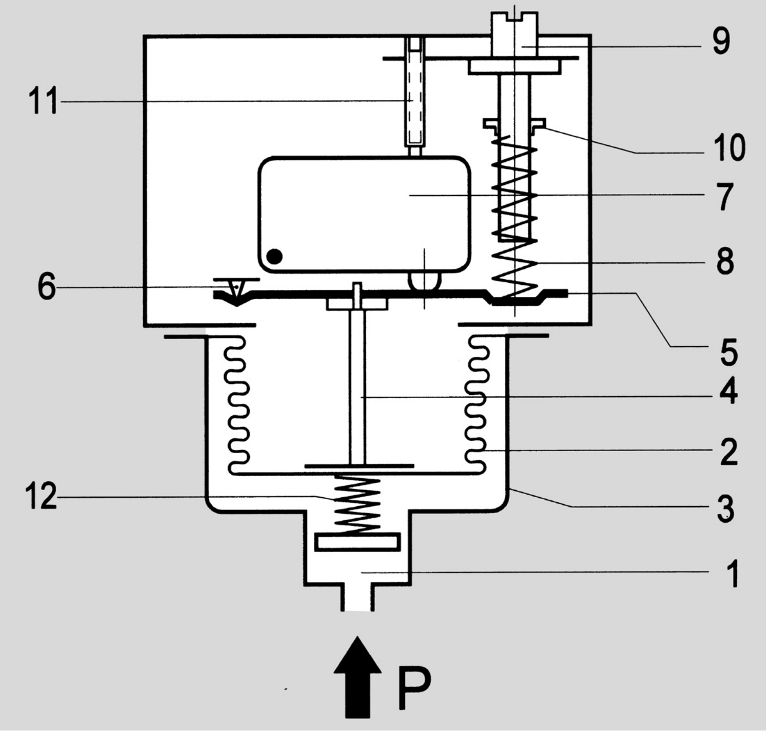
# Pressure switches

## General description

### Operating mode

The pressure occurring 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 pretension can be modified by the adjusting screw (**9**) (switching point adjustment). Turning the setting spindle (**9**) moves the running nut (**10**) and modifies the pretension 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 according to ISO 228 Part 1. Maximum screw-in depth on the G 1/4 internal thread = 9 mm.

### Centring pin

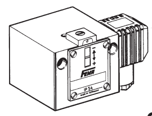
In the case of connection to the G 1/2 external thread with seal in the thread (i.e. without the usual sheet gasket on the pressure gauge connection), the accompanying centring pin is not needed. Differential pressure switches have 2 pressure connections (max. and min.) each of which are connected to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

# General technical data

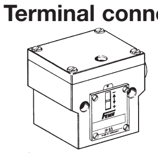
**with microswitches of the DCM, VCM, DNM, DNS and DDC series.**
The technical data of type-tested units may differ slightly.
(please refer to type sheet)

**Normal version** | **Ex version**

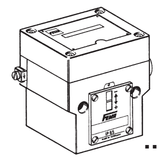
**Plug connection** | **Terminal connection**



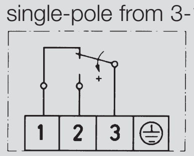
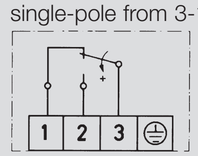
**...200**



**...300**



**...700**

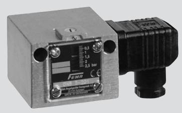
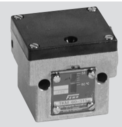
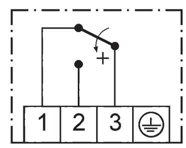
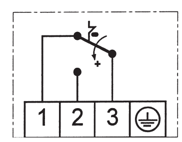
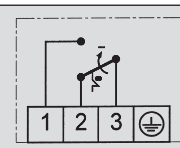
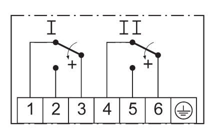
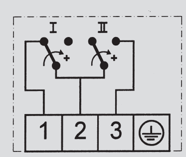
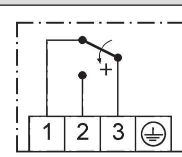
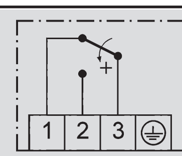
| | | |
|---|---|---|
| **Switch housing** | Diecast aluminium GD Al Si 12 | Diecast aluminium GD Al Si 12 |
| **Pressure connection** | G 1/2 external thread (pressure gauge connection) and G 1/4 internal thread<br>G 1/4 internal thread for DDCM differential pressure switches | |
| **Switching function and connection diagram** (applies only to version with microswitch) | Floating changeover contact.<br>With rising pressure switching<br>single-pole from 3-1 to 3-2.<br> | Floating changeover contact.<br>With rising pressure switching<br>single-pole from 3-1 to 3-2.<br> |
| **Switching capacity** (applies only to version with microswitch) | 8 A at 250 VAC<br>5 A at 250 VAC inductive<br>8 A at 24 VDC<br>0.3 A at 250 VDC<br>min. 10 mA, 12 VDC | 3 A at 250 VAC<br>2 A at 250 VAC inductive<br>3 A at 24 VDC<br>0.03 A at 250 VDC<br>min. 2 mA, 24 V DC |
| **Mounting position** | preferably vertical<br>(see technical data sheet) | vertical |
| **Degree of protection** (in vertical position) | IP 54; (for terminal connection ...300 IP 65) | IP 65 |
| **Ex degree of protection** | – | EEx de IIC T6 tested to EN 50014/50018/50019 (CENELEC) |
| **PTB approval Electrical connection** | – | PTB 02 ATEX 1121 |
| **Cable entry** | Plug connection to DIN 43 650 (200 series)<br>or terminal connection (300 series) | Terminal connection |
| **Ambient temperature** | PG 11 / for terminal connection M 16 x 1.5 | M 16 x 1.5 |
| **Switching point** | See data sheets | –15 to +60°C |
| | Adjustable via spindle. On switching device 300 the terminal box cover must be removed | Adjustable via spindle after the terminal box lid is removed |
| **Switching differential** | | |
| **Lead seal** | Adjustable or not adjustable<br>(see Product Summary) | Not adjustable |
| **Medium temperature** | Only possible on plug connection housing 200 | |
| **Vacuum** | Max. 70°C, briefly 85°C<br>Higher medium temperatures are possible provided the above limits for the switching device are ensured by suitable measures (e.g. siphon). | Max. 60°C |
| | All pressure switches can operate under vacuum. This will not damage the device. | |
| **Repetition accuracy of switching points** | < 1% of the working range (for pressure ranges > 1 bar) | |
| **Vibration strength** | | |
| **Mechanical life** | No significant deviations up to 4 g.<br>With sinusoidal pressure application and room temperature, 10 x 106 switching cycles.<br>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. | |
| **Isolation values** | | |
| **Oil and grease-free** | Overvoltage category III, contamination class 3, reference surge voltage 4000 V.<br>Conformity to DIN VDE 0110 (01.89) is confirmed. | |
| | The parts of all pressure switches with sensors made from steel or stainless steel are oil and grease-free. The sensors are hermetically encapsulated. They contain no seals. (See also additional function ZF 1979 Special Packing) | |

# ZF additional functions — Pressure switches and pressure monitors

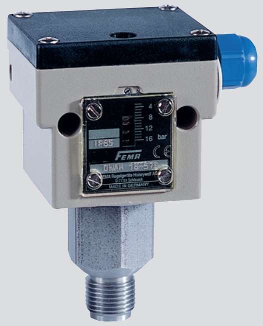
**Example for ordering:**
DWR 6 – 205
- 205: Code of additional function (e.g. maximum limiter)
- 6: Code for pressure range
- DWR: Sensor system

**How to order:**
Pressure switch
DWR 6–205
or DWR 6
with ZF 205

## Additional functions / Connection diagrams

| | Plug connection 200 series (IP 54) | Terminal connection 300 series (IP 65) | Connection diagram | Explanation |
|---|---|---|---|---|
| **Normal version (plug connection)**<br>Microswitch, single pole switching<br>Switching differential not adjustable |  |  |  | |
| **Terminal connection – housing (300)** | | **...301** | | |
| **Unit with adjustable switching differential** | **ZF 203** | | | |
| **Maximum limiter**<br>with reclosing lockout<br>**Interlocking with rising pressure** | **ZF 205** | |  | **see DWR series** |
| **Minimum limiter**<br>with reclosing lockout<br>**Interlocking with falling pressure** | **ZF 206** | |  | **see DWR series** |
| **Two microswitches**, switching in parallel or in succession. Fixed switching interval, only possible with terminal connection housing. **State the switching interval** (not possible with all pressure switches, see data sheet p. 2, pp. 40 - 43) | | **ZF 307 *** |  | |
| **Two microswitches, 1 plug** switching in succession. adjustable switching interval **Please indicate switching scheme*** (not possible with all pressure switches, see data sheet p. 2, pp. 40 – 43) | **ZF 217 *** | |  | |
| **Gold-plated contacts,**<br>single pole switching (not available with adjustable switching differential). | **ZF 213** | |  | **Permitted contact load:**<br>**Max: 24 VDC, 100 mA**<br>**Min: 5 VDC, 2 mA** |
| **Switch housing with surface protection**<br>(chemical version). | | **ZF 351** |  | |

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

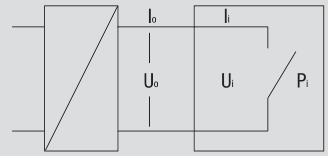


DWAM…-576

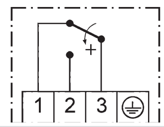
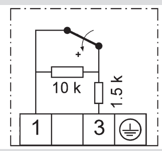
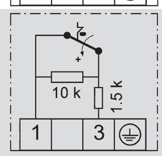
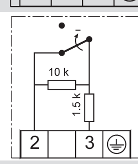
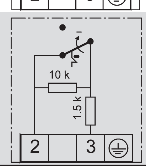
# Additional functions for EEx-i equipment ZF 5…

- Housing (300) 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 Ex 041).

**Important:**
All pressure switches with the ZF 5… additional functions listed here can only be operated in combination with a suitable isolating amplifier (see pages 60 – 61).




For ZF513, ZF576, ZF574:
$U_i$ = 15 V DC, $I_i$ = 60 mA,
$P_i$ = 0.9 W, $C_i$ < 1 nF, $L_i$ < 100 µH

| Additional functions for EEx-i equipment | | Connection diagram | Isolating amplifier |
|---|---|---|---|
| **Gold-plated contacts**, single-pole switching. Switching differential fixed (not adjustable). Switching capacity: max. 24 VDC, 100 mA, min. 5 VDC, 2 mA. | **ZF 513** |   | **Ex 011** |
| **Versions with resistor combination for line break and short-circuit monitoring in control current circuit, see DBS series, pages 54 – 56:** | | | |
| Normally closed contact with resistor combination for **maximum pressure monitoring**, gold-plated contacts, plastic-coated housing (chemical version). | **ZF 576** |   | **Ex 041** |
| Normally closed contact **with reclosing lockout** and resistor combination, for **maximum pressure monitoring** Plastic-coated housing (chemical version). | **ZF 577** |   | **Ex 041** |
| Normally closed contact with resistor combination for **minimum pressure monitoring**, gold-plated contacts, plastic-coated housing (chemical version). | **ZF 574** |   | **Ex 041** |
| Normally closed contact **with reclosing lockout** and resistor combination, for **minimum pressure monitoring** Plastic-coated housing (chemical version). | **ZF 575** |   | **Ex 041** |

| Other additional functions | Plug connection **200 series** | Terminal connection **300 series** |
|---|---|---|
| **Adjustment according to customer’s instruction: one** switching point | **ZF 1970*** | **ZF 1970*** |
| **two** switching points or defined switching differential | **ZF 1972*** | **ZF 1972*** |
| **Adjustment and lead sealing according to customer’s instruction:** | | |
| **one** switching point | **ZF 1971*** | **–** |
| **two** switching points or defined switching differential | **ZF 1973*** | **–** |
| **Labelling of units** according to customer’s instruction with sticker | **ZF 1978** | **ZF 1978** |
| **Special packing for oil and grease-free storage** | **ZF 1979** | **ZF 1979** |

**Documents:** Additional documents, e.g. data sheets, operating instructions, TÜV, DVGW or PTB certificates.

| Test certificates according to EN 10 204 | | |
|---|---|---|
| Factory certificate 2.2 based on non-specific specimen test | **WZ 2.2** | **WZ 2.2** |
| Acceptance test certificate 3.1 based on specific test | **AZ 3.1** | **AZ 3.1** |
| Acceptance test certificate for ZFV separating diaphragms | **AZ 3.1 –V** | **AZ 3.1 –V** |

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

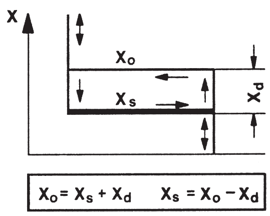
FEMA

# Setting instructions

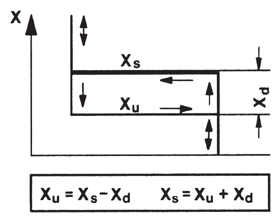
## Factory calibration of pressure switches

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 spread to both sides equally.
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.

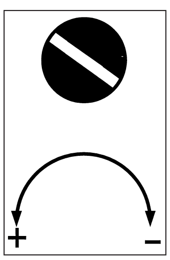
**1. Calibration at lower switching point**
Setpoint $x_S$ corresponds to the lower switching point, the upper switching point $x_O$ is higher by the amount of the switching differential $x_d$.




**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.



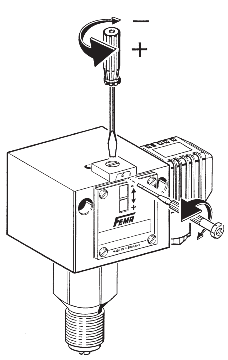

Clockwise: lower switching pressure

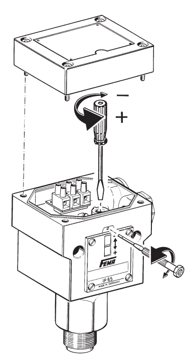
Anticlockwise: higher switching pressure

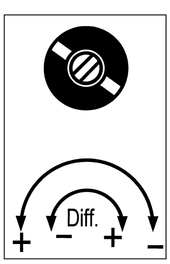
**Direction of action of setting spindle**

## 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

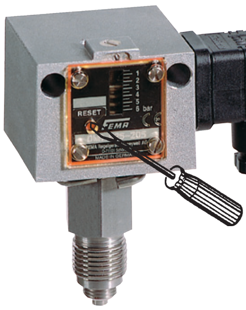
**With pressure switches of the DWAMV and DWR…-203 series, the direction of action of the differential screw is reversed.**

## Changing the switching differential (only for switching device with suffix "V", ZF 203)

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  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 seal 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.

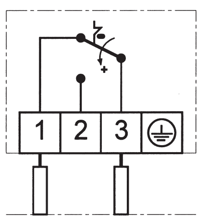


# Pressure switch with locking of switching state (reclosing lockout)

In the case of limiter functions, the switching state must be retained and locked, and only unlocked and the system restarted once 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 "bistable" 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 interlock 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. EEx-d versions cannot be equipped with internal locking.

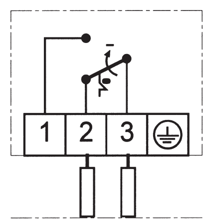
**Maximum pressurelimitation**




Switching and interlocking with rising pressure. Additional function ZF 205.

Connection of control current circuit to terminals 1 and 3.

**Minimum pressure limitation**

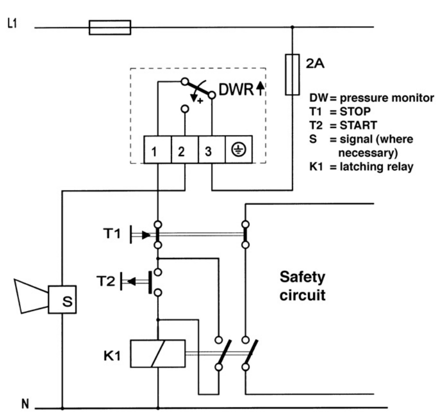



Switching and interlocking with falling pressure. Additional function ZF 206.

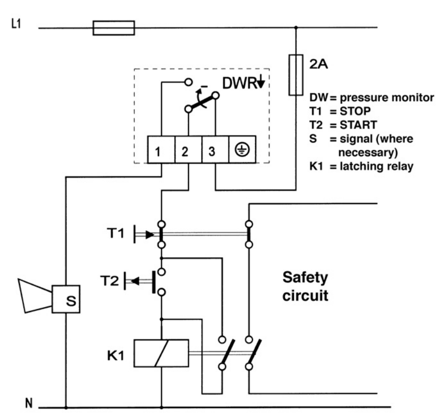
Connection of control current circuit to terminals 2 and 3.

**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 interlock 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

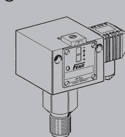
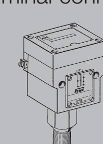
The type designations of FEMA pressure switches consist of a combination of letters followed by a number denoting the setting range. Additional functions and version variants are indicated by a code which is separated from the basic type by a hyphen. Ex versions (explosion protection EEx-d) are identified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

| Basic version (based on the example of DCM series) | with additional function | Ex-version |
|---|---|---|
| **DCM XXX** | **DCM XXX-YYY** | **Ex-DCM XXX** |

| | |
|---|---|
| DCM ⟶ | Series code (e.g. DCM) |
| XXX ⟶ | Codes for pressure range |
| YYY ⟶ | Code for additional functions |
| Ex ⟶ | Code for Ex version |

| Switch housing version | |
|---|---|
| DCM XXX | Basic version with plug connection housing |
| DCM XXX-2… | Basic version with plug connection housing |
| DCM XXX-3… | Terminal connection housing (300) |
| Ex-DCM XXX | EEx-d switching device (700) |
| DCM XXX-5… | EEx-i version |

**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 | 307 | 513 | 574 576 | 575 577 | EEx-d |
| DCM/VCM | •[1] | • | •[1] | • | •[1] | • | | | • |
| VNM/DNS/VNS | • | • | • | • | • | • | | | • |
| DWAM | | • | | • | | • | • | • | |
| DDCM | | • | •[2] | • | •[2] | • | | | • |
| DWR | • | • | | • | | • | • | • | • |
| DGM | | • | | • | | • | • | • | • |

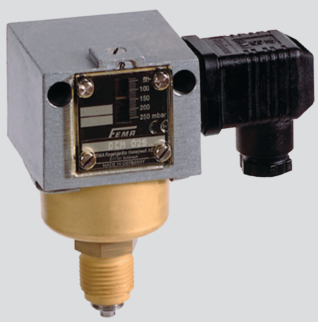
• available

[1] except DCM 4016, DCM 4025, VCM 4156 and DCM 1000
[2] except DDCM 252, 662, 1602, 6002

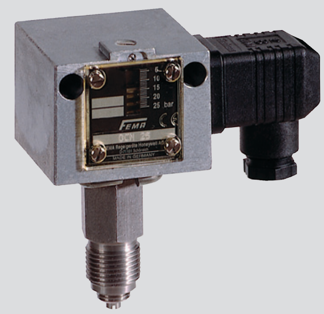
**Ex-versions (EEx-d) can only be supplied in basic form.**
**Additional functions are not possible.**

# DCM pressure switches and pressure monitors

for overpressure, for non-aggressive liquid and gaseous media



DCM 025



DCM 25

## 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**

| | |
|---|---|
| DCM 3…DCM 63 | Metal bellows: 1.4571<br>Sensor housing: 1.4104 |
| DCM 025 – DCM 1 | Metal bellows: Cu Sensor housing: Cu + Ms |
| DCM 4016/<br>DCM 4025 | Diaphragm: Perbunan<br>Sensor housing: 1.4301 |
| DCM 1000 | Diaphragm: Perbunan<br>Sensor housing: Brass |

**Mounting position**
Vertically upright and horizontal. DCM 4016 and 4025 vertically upright.

**Ambient temp. at switching device**
–25…+70 °C, except: DCM 4016, 4025, 1000: –15…+60 °C
For EEx-d versions: –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 (not EEx-d). 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.

**Switching pressure**
Adjustable from outside with screwdriver.

**Switching differential**
Not adjustable with DCM and Ex-DCM types. Adjustable from outside with DCM-203 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 |
| EEx-d | 3 A | 2 A | 0.03 A | 3 A |

| Type | Setting range | Switching differential (mean values) | Max. permissible pressure | Materials in-contact with medium | Dimensioned drawing |
|---|---|---|---|---|---|
| **Switching differential not adjustable** | | | | | |
| DCM 4016 | 1…16 mbar | 2 mbar | 1 bar | Perbunan | 1 + 11 |
| DCM 4025 | 4…25 mbar | 2 mbar | 1 bar | + 1.4301 | |
| DCM 1000 | 10…100 mbar | 12 mbar | 10 bar | Perbunan + MS | 1 + 10 |
| DCM 025 | 0.04…0.25 bar | 0.03 bar | 6 bar | | |
| DCM 06 | 0.1…0.6 bar | 0.04 bar | 6 bar | Cu + Ms | 1 + 14 |
| DCM 1 | 0.2…1.6 bar | 0.04 bar | 6 bar | | |
| DCM 506 | 15…60 mbar | 10 mbar | 12 bar | | 1 + 12 |
| DCM 3 | 0.2…2.5 bar | 0.1 bar | 16 bar | | 1 + 18 |
| DCM 6 | 0.5…6 bar | 0.15 bar | 16 bar | | |
| DCM 625 | 0.5…6 bar | 0.25 bar | 25 bar | | 1 + 17 |
| DCM 10 | 1…10 bar | 0.3 bar | 25 bar | 1.4104 | |
| DCM 16 | 3…16 bar | 0.5 bar | 25 bar | + | |
| DCM 25 | 4…25 bar | 1.0 bar | 60 bar | 1.4571 | 1 + 16 |
| DCM 40 | 8…40 bar | 1.3 bar | 60 bar | | |
| DCM 63 | 16…63 bar | 2.0 bar | 130 bar | | |
| **Switching differential adjustable** | | | | | |
| DCM 025-203 | 0.04…0.25 bar | 0.03…0.4 bar | 6 bar | | |
| DCM 06-203 | 0.1…0.6 bar | 0.04…0.5 bar | 6 bar | Cu + Ms | 1 + 14 |
| DCM 1-203 | 0.2…1.6 bar | 0.07…0.55 bar | 6 bar | | |
| DCM 3-203 | 0.2…2.5 bar | 0.15…1.5 bar | 16 bar | | 1 + 18 |
| DCM 6-203 | 0.5…6 bar | 0.25…2.0 bar | 16 bar | | |
| DCM 10-203 | 1…10 bar | 0.5…2.8 bar | 25 bar | | 1 + 17 |
| DCM 16-203 | 3…16 bar | 0.7…3.5 bar | 25 bar | 1.4104 | |
| DCM 25-203 | 4…25 bar | 1.3…6.0 bar | 60 bar | + | |
| DCM 40-203 | 8…40 bar | 2.6…6.6 bar | 60 bar | 1.4571 | 1 + 16 |
| DCM 63-203 | 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 to ZF data sheet.

**Ex version, (housing 700), explosion protection EEx-d**

| | | | | | |
|---|---|---|---|---|---|
| Ex-DCM 4016 | 1…16 mbar | 2 mbar | 1 bar | Perbunan | 3 + 11 |
| Ex-DCM 4025 | 4…25 mbar | 2 mbar | 1 bar | Perbunan | 3 + 11 |

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

### 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 30, 1. Calibration at lower switching point).

VCM 301

VNM 111

# VCM type series

## Negative pressure switches (vacuum switches)

FEMA negative pressure switches detect the pressure difference relative to atmospheric pressure. All data relating to the setting range 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. A minus sign before the pressure value signifies negative pressure below the relevant atmospheric pressure.

### 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.
IP 65, for EEx-d version.

**Pressure sensor materials**

| | |
|---|---|
| VNM 111 and VNM 301: | Metal bellows: 1.4571<br>Sensor housing: 1.4104 |
| VCM 095, 101 and 301: | Metal bellows of Cu Zn<br>Sensor housing of CuZn |
| VCM 4156: | Perbunan diaphragm sensor housing: 1.4301 |

**Mounting position**
Vertically upright and horizontal.
VCM 4156 vertically upright.

**Ambient temp. at switching device**
–25…+70 °C
For EEx-d versions: –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 (not EEx-d). 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.

**Switching pressure**
Adjustable from outside with screwdriver.

**Switching differential**
Not adjustable with VCM and Ex-VCM types.
Adjustable with VCM-203 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 |
| EEx-d | 3 A | 2 A | 0.03 A | 3 A |

### Product Summary

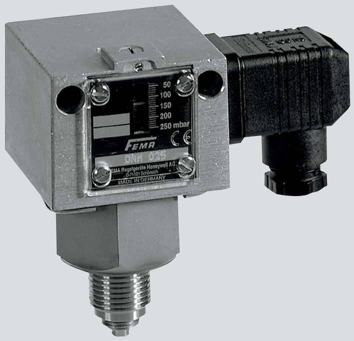
| Type | Setting range | Switching differential (mean values) | Max. permissible pressure | Dimensioned drawing |
|---|---|---|---|---|
| **Switching differential not adjustable** | | | | |
| VCM 4156 | -15…+6 mbar | 2 mbar | 1 bar | 1 + 11 |
| VCM 301 | -250…+100 mbar | 25 mbar | 1.5 bar | 1 + 13 |
| VNM 301 | –250…+100 mbar | 45 mbar | 3 bar | 1 + 15 |
| VCM 101 | –1*…+0.1 bar | 45 mbar | 3 bar | 1 + 14 |
| VCM 095 | –0.9…+0.5 bar | 50 mbar | 3 bar | 1 + 14 |
| VNM 111 | –1*…+0.1 bar | 50 mbar | 6 bar | 1 + 15 |
| **Switching differential adjustable** | | | | |
| VCM 301-203 | –250…+100 mbar | 30–200 mbar | 1.5 bar | 1 + 13 |
| VNM 301-203 | –250…+100 mbar | 70 –500 mbar | 3 bar | 1 + 15 |
| VCM 101-203 | –1*…+0.1 bar | 80 –350 mbar | 3 bar | 1 + 14 |
| VCM 095-203 | –0.9….+0.5 bar | 90 –400 mbar | 3 bar | 1 + 14 |
| VNM 111-203 | –1*…+0.1 bar | 90 –650 mbar | 6 bar | 1 + 15 |
| **Ex version, (housing 700), explosion protection EEx-d** | | | | |
| Ex-VCM 4156 | –15…+6 mbar | 2 mbar | 1 bar | 3 + 11 |
| Ex-VCM 301 | –250…+100 mbar | 25 mbar | 1.5 bar | 3 + 13 |
| Ex-VNM 301 | –250…+100 mbar | 45 mbar | 3 bar | 3 + 15 |
| Ex-VCM 101 | –1*…+0.1 bar | 45 mbar | 3 bar | 3 + 14 |
| Ex-VCM 095 | –0.9…+0.5 bar | 50 mbar | 3 bar | 3 + 14 |
| Ex-VNM 111 | –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.

For additional functions refer to ZF data sheet.
For smaller pressure ranges see also HCD and DPS data sheets.

### 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 30, 1. Calibration at lower switching point).



DNM 025

# DNM type series

## Pressure switches free of non-ferrous metal

All parts of the DNM series of FEMA pressure switches which come into contact with the medium are made of stainless steel. The pressure sensor is welded according to the latest methods without filler metals.

The diecast aluminium switch housing is also highly resistant to aggressive influences in the surrounding atmosphere.

### 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.
IP 65, for EEx-d version.

**Pressure sensor materials**
Sensor housing 1.4104
Pressure bellows: 1.4571

**Mounting position**
Vertically upright and horizontal.

**Ambient temperature at switching device**
–25…+70 °C.
For EEx-d versions: –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 (not EEx-d).
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.

**Switching pressure**
Adjustable from outside with screwdriver.

**Switching differential**
Not adjustable with DNM and Ex-DNM types.

**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 |
| EEx-d | 3 A | 2 A | 0.03 A | 3 A |

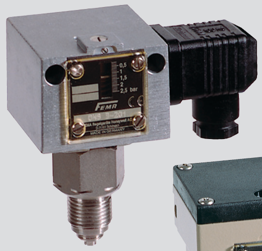
### Product Summary

| Type | Setting range | Switching differential (mean values) | Max. permissible pressure | Dimensioned drawing |
|---|---|---|---|---|
| **Switching differential not adjustable** | | | | |
| DNM 025 | 0.04…0.25 bar | 0.03 bar | 6 bar | 1 + 15 |
| **Ex version, (housing 700), explosion protection EEx-d** | | | | |
| Ex-DNM 10 | 1…10 bar | 0.3 bar | 16 bar | 3 + 17 |
| Ex-DNM 63 | 16…63 bar | 1.0 bar | 130 bar | 3 + 16 |

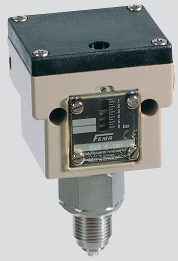
### Calibration

The **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 30, 1. Calibration at lower switching point).

Degree of protection:
IP 54/65



DNS 3-201



DNS 6-351

# DNS type series

## Pressure switch with stainless steel sensor system, with optional plastic-coated housing

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 hermetically encapsulated and contains no sealing materials.

### 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.
IP 65, for EEx-d version.

**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.
For EExd versions: –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 (not EEx-d).
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.

**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) | 250 VAC (ind) | 250 VDC (ohm) | 24 VDC (ohm) |
|---|---|---|---|---|
| Normal | 8 A | 5 A | 0.3 A | 8 A |
| EEx-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** | | | | | |
| VNS 301-201 | -250…+100 | mbar | 45 mbar | 3 bar | |
| VNS 111-201 | -1*…+0.1 | bar | 50 mbar | 6 bar | |
| DNS 025-201 | 0.04…0.25 | bar | 30 mbar | 6 bar | 1 + 15 |
| DNS 06-201 | 0.1…0.6 | bar | 40 mbar | 6 bar | |
| DNS 1-201 | 0.2…1.6 | bar | 60 mbar | 6 bar | |
| DNS 3-201 | 0.2…2.5 | bar | 0.1 bar | 16 bar | 1 + 18 |
| DNS 6-201 | 0.5…6 | bar | 0.15 bar | 16 bar | |
| DNS 10-201 | 1…10 | bar | 0.3 bar | 16 bar | 1 + 16 |
| DNS 16-201 | 3…16 | bar | 0.5 bar | 25 bar | |
| **…-203 types Adjustable switching differential** | | | | | |
| **Plastic-coated housing** | | | | | |
| VNS 301–351 | –250…+100 | mbar | 45 mbar | 3 bar | |
| VNS 111–351 | –1*…+0.1 | bar | 50 mbar | 6 bar | |
| DNS 025–351 | 0.04…0.25 | bar | 30 mbar | 6 bar | 2 + 15 |
| DNS 06–351 | 0.1…0.6 | bar | 40 mbar | 6 bar | |
| DNS 1–351 | 0.2…1.6 | bar | 60 mbar | 6 bar | |
| DNS 3–351 | 0.2…2.5 | bar | 0.1 bar | 16 bar | 2 + 18 |
| DNS 6–351 | 0.5…6 | bar | 0.15 bar | 16 bar | |
| DNS 10–351 | 1…10 | bar | 0.3 bar | 16 bar | 2 + 16 |
| DNS 16–351 | 3…16 | bar | 0.5 bar | 25 bar | |
| **Ex version, (housing 700), explosion protection EEx-d** | | | | | |
| Ex-VNS 301 | –250…+100 | mbar | 45 mbar | 3 bar | |
| Ex-VNS 111 | –1*…+0.1 | bar | 50 mbar | 6 bar | |
| Ex-DNS 025 | 0.04…0.25 | bar | 30 mbar | 6 bar | 3 + 15 |
| Ex-DNS 06 | 0.1…0.6 | bar | 40 mbar | 6 bar | |
| Ex-DNS 1 | 0.2…1.6 | bar | 60 mbar | 6 bar | |
| Ex-DNS 3 | 0.2…2.5 | bar | 0.1 bar | 16 bar | 3 + 18 |
| Ex-DNS 6 | 0.5…6 | bar | 0.15 bar | 16 bar | |
| Ex-DNS 10 | 1…10 | bar | 0.3 bar | 16 bar | 3 + 16 |
| Ex-DNS 16 | 3…16 | bar | 0.5 bar | 25 bar | |

**Explosion protection EEx-i with ZF 513**
Example for ordering: DNS…-513
* 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 30, 1. Calibration at lower switching point).

Degree of protection:
IP 54/65

Ex-DDCM DDCM 252

# DDCM type series

## Differential pressure switch

FEMA differential pressure switches 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 accurately detects the difference between the two applied pressures. The desired switching pressure is continuously adjustable within the ranges mentioned in the type summary.

The settings relate to the lower switching point (with falling differential pressure). The upper switching point (with rising differential pressure) is higher by the amount of the switching differential. All differential pressure monitors can also be used in the vacuum range. Every pressure switch has 2 pressure connections with appropriate markings.

### 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.
IP 65, for EEx-d version.

**Pressure sensor materials**
DDCM 014–16:
Pressure bellows of 1.4571
Sensor housing of 1.4305.
DDCM 252–6002:
Perbunan diaphragm.
Aluminium sensor housing.

**Mounting position**
vertically upright.

**Ambient temperature at switching device**
–25…+70 °C
For EEx-d versions: –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 (not EEx-d). 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) | 250 VAC (ind) | 250 VDC (ohm) | 24 VDC (ohm) |
|---|---|---|---|---|
| Normal | 8 A | 5 A | 0.3 A | 8 A |
| EEx-d | 3 A | 2 A | 0.03 A | 3 A |

### Product Summary

| Type | Setting range (differential pressure) | Switching differential (mean values) | Max.** permissible pressure | Materials in-contact with medium | Dimensioned drawing |
|---|---|---|---|---|---|
| **Switching differential not adjustable** | | | | | |
| DDCM 252* | 4…25 mbar | 2 mbar | 0.5 bar | Aluminium + Perbunan | 1 + 20 |
| DDCM 662* | 10…60 mbar | 15 mbar | 1.5 bar | | |
| DDCM 1602* | 20…160 mbar | 20 mbar | 3 bar | | |
| DDCM 6002* | 100…600 mbar | 35 mbar | 3 bar | | |
| DDCM 014* | –0.1…0.4 bar | 0.15 bar | 15 bar | Stainless steel 1.4305 + 1.4571 | 1 + 21 |
| DDCM 1 | 0.2…1.6 bar | 0.13 bar | 15 bar | | |
| DDCM 4* | 1…4 bar | 0.20 bar | 25 bar | | |
| DDCM 6 | 0.5…6 bar | 0.2 bar | 15 bar | | |
| DDCM 16 | 3…16 bar | 0.6 bar | 25 bar | | |

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

For smaller pressure ranges see also HCD and DPS datasheets.

| Type | Setting range (differential pressure) | Switching differential (mean values) | Max.** permissible pressure | Materials in-contact with medium | Dimensioned drawing |
|---|---|---|---|---|---|
| **Ex version · Explosion protection EEx de IIC T6** | | | | | |
| Ex-DDCM 252* | 4…25 mbar | 2 mbar | 0.5 bar | Aluminium + Perbunan | 3 + 20 |
| Ex-DDCM 662* | 10…60 mbar | 15 mbar | 1.5 bar | | |
| Ex-DDCM 1602* | 20…160 mbar | 20 mbar | 3 bar | | |
| Ex-DDCM 6002* | 100…600 mbar | 35 mbar | 3 bar | | |
| Ex-DDCM 014* | -0.1…0.4 bar | 0.15 bar | 15 bar | Stainless steel 1.4305 + 1.4571 | 3 + 21 |
| Ex-DDCM 1 | 0.2…1.6 bar | 0.13 bar | 15 bar | | |
| Ex-DDCM 4* | 1…4 bar | 0.2 bar | 25 bar | | |
| Ex-DDCM 6 | 0.5…6 bar | 0.2 bar | 15 bar | | |
| Ex-DDCM 16 | 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 MAU 8/Ms and MAU 8/Nst, page 63
· Valve combinations VKD 3 and VKD 5, page 63

### Calibration

The **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 30, 1. Calibration at lower switching point).

Degree of protection:
IP 54/65

DPS

# DPS series

## Differential pressure switches for ventilation and air-conditioning systems

### Applications

Differential pressure switches for filter, fan or air flow monitoring in air-conditioning and ventilation systems.

### 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**
50 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

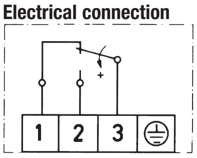
**Mounting**
Via fastening pieces integrated into the housing with 2 screws, mounted directly onto a vertical surface, e.g. of the airconditioning unit or air duct. For mounting in the ceiling area, use an L-shaped bracket if necessary.

**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:** Pg 11

FEMA

### Product Summary

| Type | Setting range for upper switching | Switching differentials (guideline values) |
|---|---|---|
| DPS 200 F | 0.2…2 mbar | 0.1 mbar |
| DPS 400 F | 0.4…4 mbar | 0.2 mbar |
| DPS 500 F | 0.5…5 mbar | 0.2 mbar |
| DPS 1000 F | 2…10 mbar | 1 mbar |
| DPS 2500 F | 5…25 mbar | 1.5 mbar |

### DVGW test certificate

EC type testing according to EC Gas Appliance Directive (90/396 EEC) and DIN EN 1854, product identification number **CE-0085AR0013**

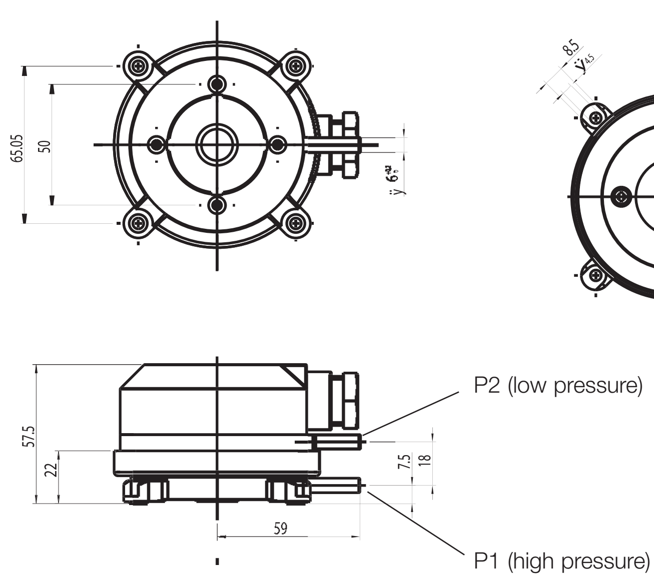
### Supplied accessories:

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

### Optional accessories:

DPSLF L-shaped bracket for installation turned through 90°, e.g. in ceiling area
DPSJF Channel connection fitting

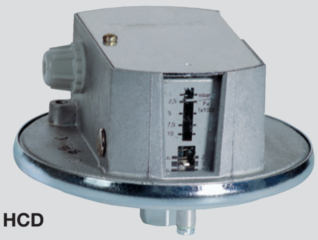
### Dimensioned drawing




CE DVGW tested

Degree of protection:
IP 54

CE
(according to Gas Appliance Directive 90/396/EEC)



HCD

# HCD series

## Pressure and differential pressure switches for neutral gases (DVGW-tested)

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 chamber). For differential pressure detection the high pressure is applied to the lower connection piece (G 1/4”) and the low pressure side to the upper connection piece (G 1/8”). A pressure measurement connector (9 mm ø) is available for accurate setpoint adjustment.

### 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.

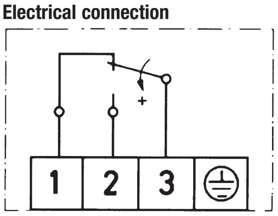
**Type of protection** IP 40 according to DIN 40050.

**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)

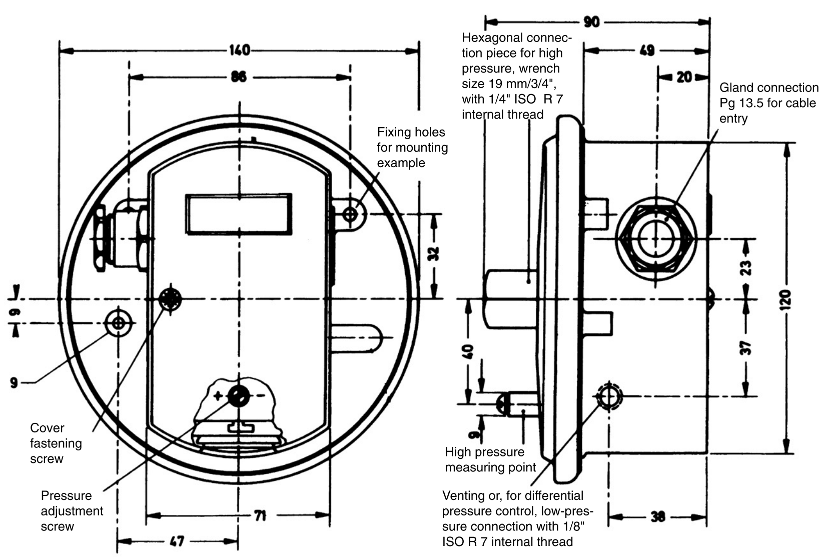
**Cable entry** Pg 13.5

Tested according to Gas Appliance Directive 90/396/EEC, DVGW reg. no. E 3085/2.

| Type | Setting range | Switching differential in lower range | Switching differential in upper range | Max. working pressure |
|---|---|---|---|---|
| HCD 6003 | 0.2…3 mbar | 0.3… mbar | 0.5 mbar | 100 mbar |
| HCD 6010 | 1…10 mbar | 0.3… mbar | 1 mbar | 100 mbar |
| HCD 6050 | 5…50 mbar | 1.5… mbar | 3 mbar | 200 mbar |
| HCD 6150 | 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



# S2 type series

## Pressure switches with 2 microswitches – technical data

FEMA pressure switches of the **DCM** (except DCM 1000, DCM 4016 and DCM 4025), **VCM** (except VCM 4156), **VNM, DNS, VNS** series and the differential pressure monitor **DDCM** (except DDCM 252, 662, 1602, 6002) can be equipped with 2 microswitches (see also the table on page 41).
**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.

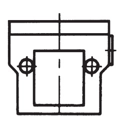
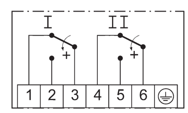
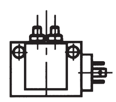
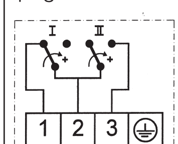
**Switching interval**
The switching interval of the two microswitches is the difference (in bar or mbar) between the switching points of the two microswitches.

**For example:**
When the pressure rises, a two-stage pressure switch turns on a warning light (e.g. 2.8 bar), 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. For all versions the rule is:
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 design 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, temperature, maximum pressure, mounting position, type of protection, electrical data etc. The principal dimensions are the same as for single-stage pressure switches, with similar pressure ranges and design features.

| Additional function | Switching interval between the two microswitches | Electrical connection | Connection diagram | Ordering information required |
|---|---|---|---|---|
| **ZF 307**<br> | **Factory setting** according to customer-specifications | **Terminal connection** (All terminals of both microswitches are accessible (6 terminals) | 2 x single pole switching.<br> | 1. Basic type with ZF 307<br>2. Switching points I and II, with direction of action in each case (rising or falling pressure).<br>Example: DCM 16-307<br>Switching point I:<br>10 bar falling<br>Switching point II:<br>12 bar falling or switching interval only. |
| **ZF 217**<br> | **Adjustable** via adjustment knobs I and II according to “Switching intervals” table | **Plug connection** according to DIN 43 650 (3-pole + ground conductor) Function-appropriate internal wiring according to “Switching functions” table | Example selection according to “Switching schemes” table, page 42.<br> | 1. Basic type with ZF 217<br>2. **Switching scheme**<br>Example:<br>DCM 16-217/B 4<br>Since all values are adjustable within the specified limits, no further data is required. |

# S2 type series (selection)

## ZF 217 pressure switches with two microswitches and switching intervals

### Switching intervals of two-stage pressure switches (ZF 217, ZF 307)

| **Type series** **S2** ZF 217 ZF 307 | | higher pressure  lower pressure | | |
|---|---|---|---|---|
| | **min. switching interval** | **max. switching interval (average values)** | | |
| **Type** | **Factory default** | **Switching scheme A1/A3/B2/B4 C1/C3/D2/D4 + ZF 307** | **Switching scheme A2/A4/C2/C4** | **Switching scheme B1/B3/D1/D3** |
| DCM 06 | 40 mbar | 165 mbar | 190 mbar | 140 mbar |
| DCM 025 | 20 mbar | 140 mbar | 160 mbar | 120 mbar |
| DCM 1 | 40 mbar | 240 mbar | 280 mbar | 200 mbar |
| DCM 3 | 0.1 bar | 0.65 bar | 0.75 bar | 0.55 bar |
| DCM 6 | 0.15 bar | 0.95 bar | 1.2 bar | 0.8 bar |
| DCM 10 | 0.25 bar | 1.6 bar | 1.85 bar | 1.35 bar |
| DCM 16 | 0.3 bar | 2.0 bar | 2.3 bar | 1.7 bar |
| DCM 25 | 0.6 bar | 4.0 bar | 4.6 bar | 3.4 bar |
| DCM 40 | 0.9 bar | 6.0 bar | 6.9 bar | 5.1 bar |
| DCM 63 | 1.3 bar | 8.5 bar | 9.8 bar | 7.2 bar |
| DDCM 1 | 0.09 bar | 0.55 bar | 0.64 bar | 0.46 bar |
| DDCM 6 | 0.14 bar | 0.94 bar | 1.08 bar | 0.8 bar |
| DNM 025 | 35 mbar | 215 mbar | 240 mbar | 180 mbar |
| VCM 095 | 40 mbar | 300 mbar | 340 mbar | 260 mbar |
| VCM 101 | 40 mbar | 260 mbar | 300 mbar | 220 mbar |
| VCM 301 | 20 mbar | 100 mbar | 120 mbar | 80 mbar |
| VNM 111 | 50 mbar | 310 mbar | 360 mbar | 260 mbar |

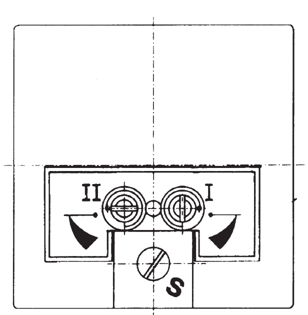


### Switching devices with adjustable switching interval

**Additional function ZF 217**

On switching devices with additional function ZF 217, the switching interval is continuously adjustable via two adjustment knobs I and II accessible from outside. The maximum 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 gives 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.



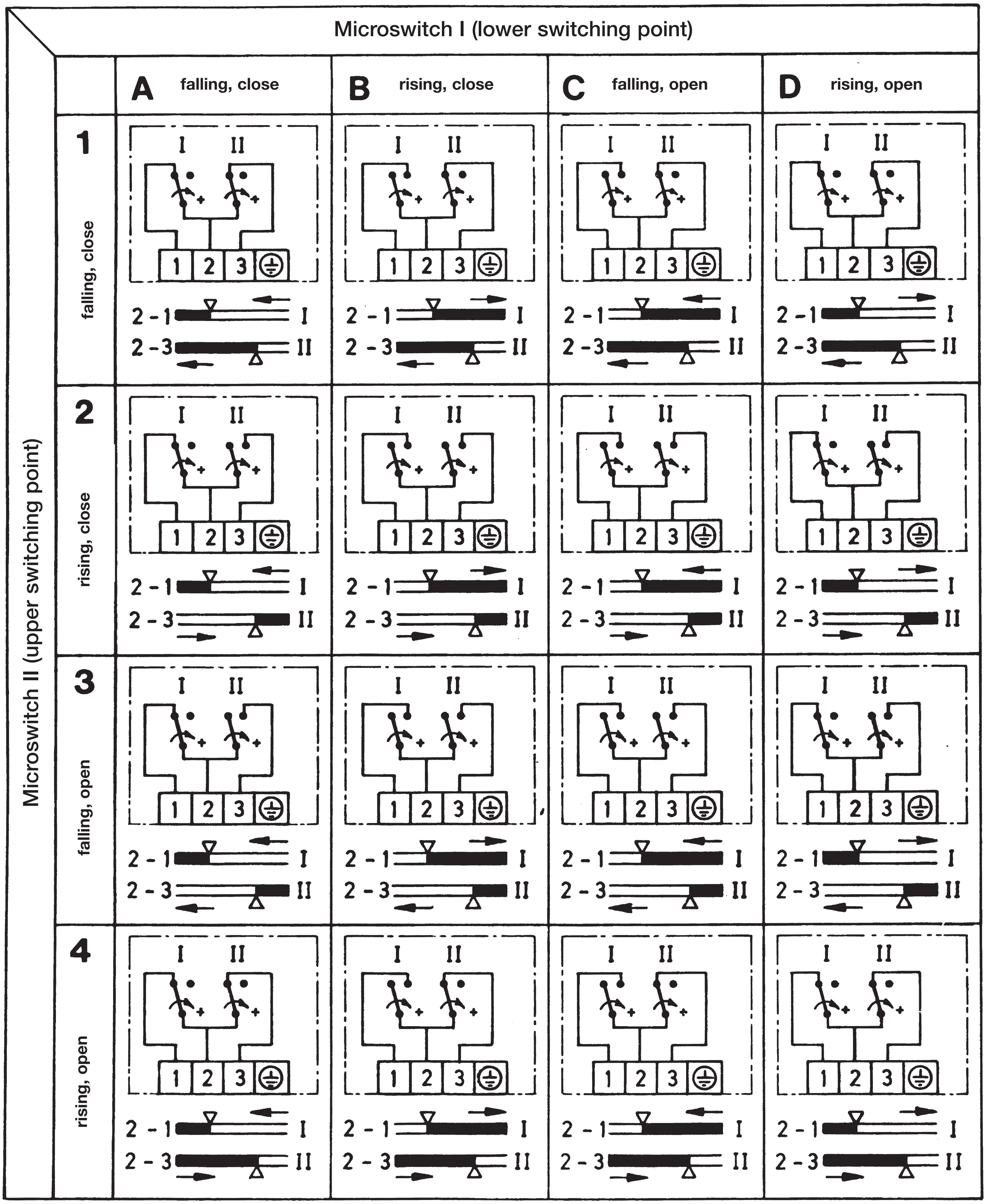

**Recommended adjustment method for switching devices with ZF 217**

1. Set adjustment knobs I and II to their basic positions.
   Turn adjustment knob I as far as possible anticlockwise.
   Turn adjustment knob II as far as possible clockwise.
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 ZF 217

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. DCM 10) and the switching scheme (e.g. A 2), for factory setting it is also necessary to indicate the switching points and direction of action:

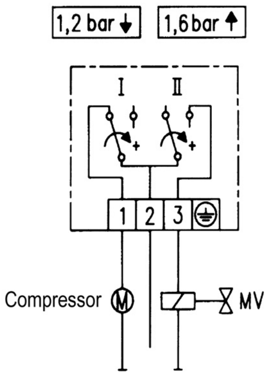
Example: DCM 10–217 / A 2 Switch I: 6.5 bar falling, Switch II: 7.5 bar rising.

# 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:

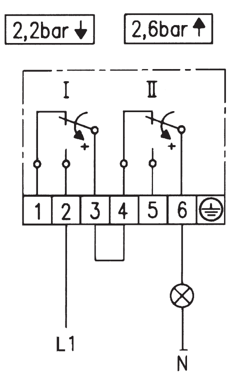
**Requirement**
Pressure holding devices and automatic expansion valves usually have a gas cushion whose pressure must be kept constant within a certain range. If the pressure is too low, a compressor is switched on. If the pressure is too high, a solenoid valve must be opened to vent the gas. Between 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, DNM, DNS, each with additional function ZF 217 and switching scheme A 2, are suitable. All pressureranges listed in the technical documents are possible. Example for ordering: DCM 6-217/A 2

**Switching function / connection scheme**

| | |
|---|---|
| Switch I: | With falling pressure, contact 1–2 closes (compressor on)<br>With rising pressure, contact 1 –2 opens (compressor off) |
| Switch II: | With rising pressure, contact 2–3 closes (valve open)<br>With falling pressure, contact 2 –3 opens (valve closed).<br>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**

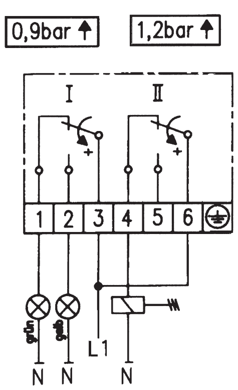



### Example 2:

**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 DCM 3–307 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 and <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 DDCM 6–307 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.

TÜV

DVGW

# 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 100/1”, issue 04.83,** 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 100/1”:

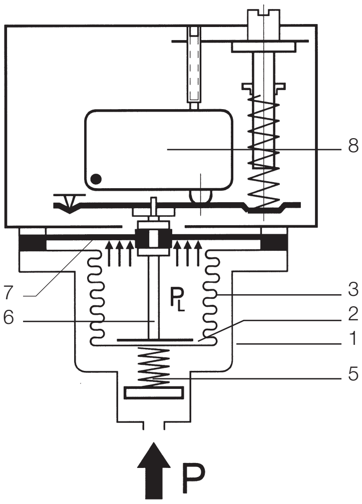
**Pressure monitors (DW)**
Pressure monitors are devices which switch off the heating system on exceeding and / or falling below a predefined pressure limit and release the heating system again only after a change in pressure.

**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 3.3 (of “Pressure 100/1”).

## 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**.



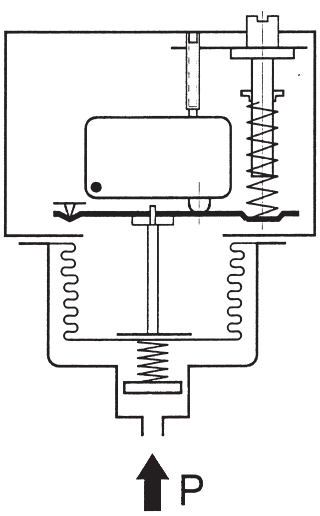

Self-monitoring maximum pressure limiter with safety diaphragm DWAM…, DWAMV…, SDBAM…

## Additional requirements for pressure limiters “of special construction”

**Section 3.3 of VdTÜV Memorandum “Pressure 100/1”:**
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 excerpt from VdTÜV Memorandum “Pressure 100/1”).

**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 diaphragmis therefore “of special construction” within the meaning of Memorandum “Pressure 100/1”, 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:**

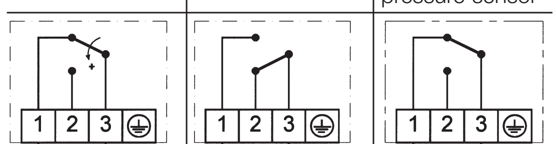
Pressure limiters “of special construction” with safety diaphragms (self-monitoring pressure sensors) offer the highest degree of safety in maximum pressure monitoring. Such devices must not however be used for minimum pressure monitoring. Pressure limiters “of special construction” with certification 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:

| 1 | 2 | 3 |
|---|---|---|
| Normal operation | Limit exceeded | Leakage in pressure sensor |

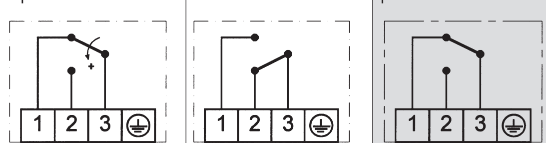



| | | |
|---|---|---|
| Control circuit closed | Control circuit interrupted | Control circuit interrupted |

**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.

| Normal operation | Limit exceeded | Leakage in pressure sensor |
|---|---|---|




| | | |
|---|---|---|
| Control circuit closed | Control circuit interrupted | Control circuit<br>Dangerous condition! |

# Further observations and summary

## Minimum pressure

All **minimum pressure monitors and minimum pressure limiters are self-monitoring** within the meaning of “Pressure 100/1” (with or without safety diaphragm).

**Pressure limiters must interlock the cut-off state**
Memorandum “Pressure 100/1” 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 29 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 4751 Part 2. 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 3398 Parts 1 and 3, and liquid fuels, covered by DIN 3398 Part 4.

**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 contacts, can be fitted with **positive opening contacts (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 (EX 041). In the case of faults in the power supply, the system cuts off to the safe side. EEx-d and EEx-i 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 pressuremonitoring on pipelines and pressure vessels.

# Standards – Directives – Component tests

**VdTÜV Pressure 100/1**

**DVGW DIN 3398 T.1 and 3**

**TÜV DIN 3398 T.4**

**TÜV, Pressure 100/1 (DIN 3398 T.3 and 4)**

**PED 97/23EC**

**ATEX 94/9 EC**

**Steam and hot water**
Pressure monitors and pressure limiters for steam and hot water in systems to DIN 4751 T2 and TRD 604. Series DA and DWR.

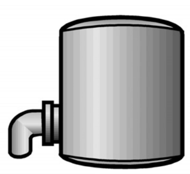
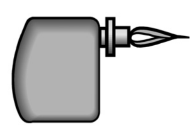
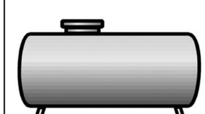
**Fuel gases** CE
Pressure monitors and limiters for fuel gases in accordance with DVGW Worksheet G 260.
Series DGM and DWR.

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

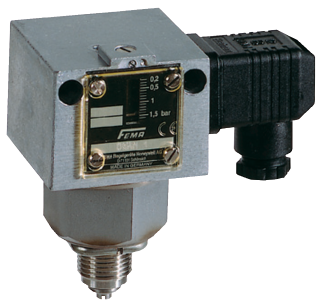
**Safety-engineered pressure limiters**
For safety-critical pressure monitoring in liquid gas systems, chemical and process engineering systems.

**Pressure Equipment Directive 97/23EC**
Pressure monitors and limiters to DIN 3398 Parts 3 + 4 fall into Category IV of the PED

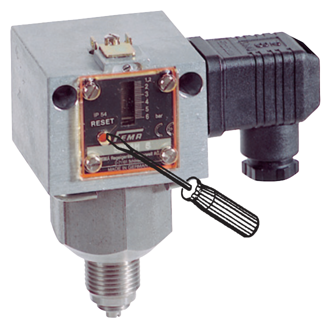
**Ex-versions**
For Ex areas Zones 1 and 2, all pressure switches can be supplied in pressure-proof encapsulated design (Ex degree of protection EEx de IIC T 6).
PTB approval: PTB 02 ATEX 1121
For intrinsically safe control circuits (Ex degree of protection EEx-ia), pressure switches with gold contacts,proximity switches and the blue terminals and cable entries customary in EExi 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 (EEx-ia) to a non-intrinsically safe active circuit is required

| | | | | |
|---|---|---|---|---|
| **Medium** | **Steam Hot water**  | **Fuel gases** DVGW Worksheet G260/1  | **Liquid fuels** (fuel oil)  | **Pressure vessels** (e.g. for liquefied gas)  |
| **Plant directives** | **DIN 4751 Part 2 TRD 604** | | | |
| **Directives for component testing** | **VdTÜV Pressure 100/1 Issue 4.83** | **DIN 3398 Part 3 Issue 11.82** | **DIN 3398 Part 4 Issue 10.86** | **TÜV Pressure 100/1 DIN 3398 T.4** |
| **Type series** | **DA DWR…** | **DWR… DGM…** | **DWR…** | **FD… DWAM…** |

# Selection according to function and application



Pressure monitor



Pressure limiter with internal interlock

| Application / Function | **Steam and hot water** systems to TRD 604 and DIN 4751 T.2 | **Fuel gases** to DVGW-Worksheet G 260 | **Heating oil** and other **liquid fuels** | **Other media** (check compatibility with the materials used) |
|---|---|---|---|---|
| **Pressure monitoring**<br>**Pressure regulation**<br>(e.g. burner or pump control) | DWAM…<br>DWAMV…<br>DWR…<br>DWR…-203 | DGM…<br>DWR…<br>DWR…-203 | DWR…<br>DWR…-203 | DWAM…<br>DWAMV…<br>DWR…<br>DWR…-203 |
| **Maximum pressure limitation**<br>with internal interlock | SDBAM…<br>DWR…-205 | DGM…-205<br>DWR…-205 | DWR…-205 | SDBAM…<br>DWR…-205 |
| with external interlock | DWAM…<br>DWR… | DGM…<br>DWR… | DWR… | DWAM…<br>DWR… |
| **Minimum pressure limitation**<br>with internal interlock | DWR…-206 | DGM…-206<br>DWR…-206 | DWR…-206 | DWR…-206 |
| with external interlock | DWR…<br>DWR… | DGM…<br>DWR… | DWR… | |

…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 43650.

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

**DA 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.

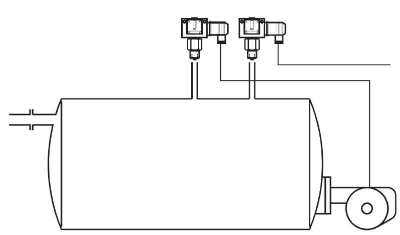
# Equipment of a boiler with pressure monitor and pressure limiter

**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 pressurelimiter) or **DWAM… or DWR…** (with external interlock in the control cabinet) Suggested connection for the external interlock, see page 31.

Pressure monitor DWAM… or DWR…

Pressure limiter SDBAM… or DWR…-205



# DA series

## Maximum pressure monitors and limiters

DWAM 1

### 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 limitingdevices, 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) | 250 VAC (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.

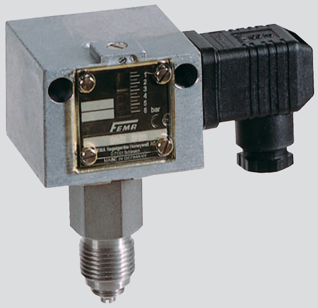
| | |
|---|---|
| **Component tested for** | **Steam** Systems according to TRD 604<br>**Hot water** Systems according to DIN 4751, T. 2 |
| **Testing basis** | VdTÜV Memorandum “Pressure 100/1” |
| **TÜV type test approval mark** | TÜV · DW 04 – 132 for series DWAM…<br>TÜV · DW 04 – 133 for series DWAMV…<br>TÜV · SDB 04 – 134 for series SDBAM… |
| **Function** | Pressure monitor / Pressure limiter |
| **Direction of action** | **For maximum pressure monitoring only** |
| **Sensor** | **“Of special construction”** (self-monitoring sensor with safety diaphragm) |

TÜV
TESTED

**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** | | | | |
| DWAM 06 | 0.1…0.6 bar | 0.04 bar | 5 bar | 1 + 15 |
| DWAM 1 | 0.2…1.6 bar | 0.05 bar | 5 bar | |
| DWAM 6 | 1.2…6 bar | 0.2 bar | 10 bar | |
| DWAM 625 | 1.2…6 bar | 0.25 bar | 20 bar | 1 + 19 |
| DWAM 16 | 3…16 bar | 0.4 bar | 20 bar | |
| DWAM 32 | 6…32 bar | 1.2 bar | 45 bar | |
| **Pressure monitors with differential adjustment for max. pressure monitoring** | | | | |
| DWAMV 1 | 0.2…1.6 bar | 0.12…0.6 bar | 5 bar | 1 + 15 |
| DWAMV 6 | 1.2…6 bar | 0.4…1.5 bar | 10 bar | |
| DWAMV 16 | 3…16 bar | 0.8…2.5 bar | 20 bar | 1 + 19 |
| DWAMV 32 | 6…32 bar | 2.5…6.0 bar | 45 bar | |
| **Pressure limiters for maximum pressure monitoring (with internal interlock)** | | | | |
| | | **Pressure change for unlocking** | | |
| SDBAM 1 | 0.2…1.6 bar | 0.12 bar | 5 bar | 1 + 15 |
| SDBAM 2,5 | 0.4…2.5 bar | 0.15 bar | 5 bar | |
| SDBAM 6 | 1.2…6 bar | 0.4 bar | 10 bar | |
| SDBAM 625 | 1.2…6 bar | 0.6 bar | 20 bar | 1 + 19 |
| SDBAM 16 | 3…16 bar | 0.8 bar | 20 bar | |
| SDBAM 32 | 6…32 bar | 3.0 bar | 45 bar | |

The maximum permissible working pressure is defined as the upper limit at which the operation, switching reliability and water tightness of the pressure switch are in no way impaired. Pressure monitors DWAM… can also be used for maximum pressure limitation if an external interlock is used (see page 31).



DWR 625

# DWR series

## Pressure monitors for steam and hot water, fuel gases and liquid fuels

### 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. In Ex version only vertical.

**Ambient temperature at switching device**
–25 to +70°C,
for EEx-d version –15 to +60°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 (not EEx-d). 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 30, 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) | 250 VAC (ind) | 250 VDC (ohm) | 24 VDC (ohm) |
|---|---|---|---|---|
| Normal | 8 A | 5 A | 0.3 A | 8 A |
| EEx-d | 3 A | 2 A | 0.03 A | 3 A |

**Degree of protection** IP 54 according to DIN 40 050
IP 65 (alternative version)

**Ex protection**
EEx de IIC T6, approval PTB 02 ATEX 112, EEx-i with ZF 513

**Degree of protection of EEx-d version**
IP 65, installation position only vertical.

FEMA

**Component tested for**

| | |
|---|---|
| **Steam** | Systems according to TRD 604 |
| **Hot water** | Systems according to DIN 4751, T. 2 |
| **Fuel gases** | DVGW Worksheet G 260 |
| **Liquid fuels** | e.g. fuel oils |

| Testing basis | Registration no. |
|---|---|
| Pressure 100/1, Issue 4.83 | ID: 000 000 7042 |
| DIN 3398, T. 3, Issue 11.92 | NG-4347AQ1411 |
| DIN 3398, T. 4, Issue 10.86 | 3 C028/05 |

TÜV
DVGW
DIN Geprüft

**Function**
Pressure monitor or pressure limiter (with external interlock)

**Direction of action**
**For maximum and minimum pressure monitoring (DWFS, SDBFS)**

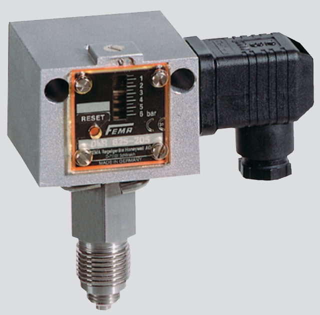
**Sensor**
**“of special construction”** by testing with 2 million cycles.

**Product Summary**

| Type | Setting range | Switching differential (mean values) | Maximum working pressure 1* | Maximum working pressure 2* | Dimensioned drawing |
|---|---|---|---|---|---|
| **Pressure monitors without differential adjustment** | | | | | |
| DWR 06 | 0.1…0.6 bar | 0.04 bar | 6 bar | 6 bar | 1 + 15 |
| DWR 1 | 0.2…1.6 bar | 0.06 bar | | | |
| DWR 3 | 0.2…2.5 bar | 0.1 bar | 10 bar | 16 bar | 1 + 18 |
| DWR 6 | 0.5…6 bar | 0.2 bar | | | |
| DWR 625 | 0.5…6 bar | 0.25 bar | 20 bar | 25 bar | 1 + 17 |
| DWR 16 | 3…16 bar | 0.5 bar | | | |
| DWR 25 | 4…25 bar | 1.0 bar | 50 bar | 63 bar | 1 + 16 |
| DWR 40 | 8…40 bar | 1.3 bar | | | |
| EEx-ia versions with ZF 513 (page 29) | | | | | |
| **Switching differential adjustable** | | | | | |
| DWR 06–203 | 0.1…0.6 bar | 0.08…0.5 bar | 6 bar | 6 bar | 1 + 15 |
| DWR 1–203 | 0.2…1.6 bar | 0.15…0.6 bar | | | |
| DWR 3 –203 | 0.2…2.5 bar | 0.17…1.2 bar | 10 bar | 16 bar | 1 + 18 |
| DWR 6 –203 | 0.5…6 bar | 0.3…1.4 bar | | | |
| DWR 625 –203 | 0.5…6 bar | 0.4…2.5 bar | 20 bar | 25 bar | 1 + 17 |
| DWR 16 –203 | 3…16 bar | 0.75…3.15 bar | | | |
| DWR 25 –203 | 4…25 bar | 1.3…6.0 bar | 50 bar | 63 bar | 1 + 16 |
| DWR 40–203 | 8…40 bar | 2.3…6.6 bar | | | |
| **Ex -versions (EEx de IIC T6) e.g. for fuel gases (housing 700)** | | | | | |
| Ex-DWR 06 | 0.1…0.6 bar | 0.04 bar | 6 bar | 6 bar | 3 + 15 |
| Ex-DWR 1 | 0.2…1.6 bar | 0.06 bar | | | |
| Ex-DWR 3 | 0.2…2.5 bar | 0.1 bar | 10 bar | 16 bar | 3 + 18 |
| Ex-DWR 6 | 0.5…6 bar | 0.2 bar | | | |
| Ex-DWR 625 | 0.5…6 bar | 0.25 bar | 20 bar | 25 bar | 3 + 17 |
| Ex-DWR 16 | 3…16 bar | 0.5 bar | | | |
| Ex-DWR 25 | 4…25 bar | 1.0 bar | 50 bar | 63 bar | 3 + 16 |
| Ex-DWR 40 | 8…40 bar | 1.3 bar | | | |

* max. working pressure
Column 1: For devices according to DIN 3398, Part 3 (gas pressure monitors)
Column 2: For devices according to “Pressure 100/1” and DIN 3398, Part 4 (for steam, hot water and liquid fuels)

CE TÜV tested DIN Geprüft DVGW TÜV Ex Degree of protection: IP 54/65



DWR 625-205

# DWR-B series

## Pressure limiters for steam and hot water, fuel gases and liquid fuels

The pressure limiters are equipped with a reclosing lockout for the mechanical interlocking of the switch-off state. If the switching point set on the pressure limiter is reached, the limiter switches off. The switch-off state is retained even if the pressure changes again. It can only be reset by manually operating the reset button. For unlocking to be possible, the pressure at the sensor must have fallen (in the case of maximum pressure limiters) or risen (in the case of minimum pressure limiters). The pressure change values are listed in the Product Summary.

### 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 30, 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 30, 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) | 250 VAC (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
IP 65 (alternative version)

**Sealing P2**
On request (can be fitted later).

| | | |
|---|---|---|
| **Component tested for** | **Steam** | Systems according to TRD 604 |
| | **Hot water** | Systems according to DIN 4751, T. 2 |
| | **Fuel gases** | DVGW Worksheet G 260 |
| | **Liquid fuels** | e.g. fuel oils |

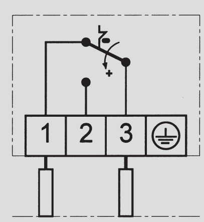
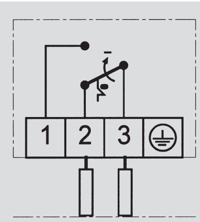
| Testing basis | Registration no. |
|---|---|
| Pressure 100/1, Issue 4.83 | |
| For maximum pressure limiter | TÜV.SDB.02 – 310 |
| For minimum pressure limiter | TÜV.SDB.02 – 309 |
| DIN 3398, Part 3, Issue 11.92 | NG-4347AQ1411 |
| DIN 3398, Part 4, Issue 10.86 | 3 C028/05 |

TÜV
DVGW
DIN Geprüft

| | |
|---|---|
| **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.**

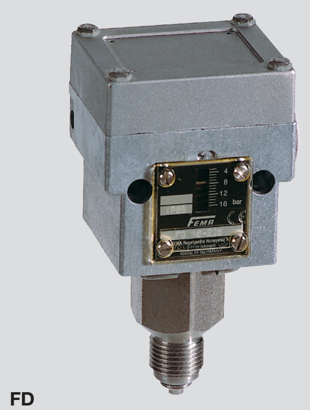
### Product Summary

| Type | Setting range | Switching differential (mean values) | Maximum working pressure 1* | 2* | Connection diagram |
|---|---|---|---|---|---|
| **Maximum pressure limiters** | | | | | |
| DWR 06–205 | 0.1…0.6 bar | 0.06 bar | 6 bar | 6 bar |  |
| DWR 1–205 | 0.2…1.6 bar | 0.09 bar | | | |
| DWR 3 –205 | 0.2…2.5 bar | 0.20 bar | 10 bar | 16 bar | |
| DWR 6–205 | 0.5…6 bar | 0.30 bar | | | |
| DWR 625 –205 | 0.5…6 bar | 0.50 bar | 20 bar | 25 bar | |
| DWR 16 –205 | 3…16 bar | 0.70 bar | | | |
| DWR 25 –205 | 4…25 bar | 1.4 bar | 50 bar | 63 bar | |
| DWR 40–205 | 8…40 bar | 2.3 bar | | | |
| **Minimum pressure limiters** | | | | | |
| DWR 06–206 | 0.1…0.6 bar | 0.06 bar | 6 bar | 6 bar |  |
| DWR 1 –206 | 0.2…1.6 bar | 0.09 bar | | | |
| DWR 3 –206 | 0.2…2.5 bar | 0.20 bar | 10 bar | 16 bar | |
| DWR 6–206 | 0.5…6 bar | 0.30 bar | | | |
| DWR 625 –206 | 0.5…6 bar | 0.50 bar | 20 bar | 25 bar | |
| DWR 16 –206 | 3…16 bar | 0.70 bar | | | |
| DWR 25 –206 | 4…25 bar | 1.4 bar | 50 bar | 63 bar | |
| DWR 40–206 | 8…40 bar | 2.3 bar | | | |

* Maximum working pressure and dimensions as for type series DWR. Pressure monitors DWR… (page 51) 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 50. Types DWAM… can also be used with external interlock as maximum pressure limiters.

CE TÜV tested DIN Geprüft DVGW TÜV

Degree of protection:
IP 54/65



FD

# FD series

## Safety-engineered maximum pressure limiter for liquid gas systems, setting range 5–16 bar

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 parts of the sensor subjected to pressure are welded without filler metals. Over and above the requirements of the TRB, the pressure sensor is "self-monitoring", i. e. in the event of rupture of the measuring bellows, the pressure limiter switches off to the safe side. The pressure sensor thus complies with the "special construction" requirements as defined in the VdTÜV Memorandum "Pressure 100/1".

### 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** EEx-ia (only when used in conjunction with Ex 041 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 30, 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 FD 16–327.
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 FD 16–326.
Interlock defeat: After pressure reduction of approx. 0.5 bar. Press unlocking button in control cabinet.

**Line break and short-circuit monitoring**
On types FD 16–326 and FD 16–327 used in conjunction with Ex 041 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.

The pressure limiters are used in intrinsically safe control circuits (Ex protection EEx-ia). Through use of the Ex 041 isolating amplifier and a suitable resistor combination in the switching device of the pressure limiter, the control circuit is monitored for line break and short-circuit.

### Product Summary

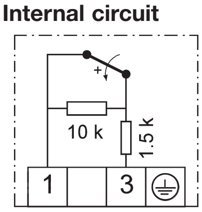
| Type | Setting range | Switching differential | Interlock* | Periphery | TÜV-testing station identifying | Dimensional drawing |
|---|---|---|---|---|---|---|
| FD 16 –326 | 5-16 bar | 0.5 | External | **Isolating amplifier Ex 041,** (self-monitoring with line break and short-circuit monitoring) | 01-12-0109 | 1 + 19 |
| FD 16 –327 | 5-16 bar | 2.5 | Internal | | 01-12-0110 | 1 + 19 |

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

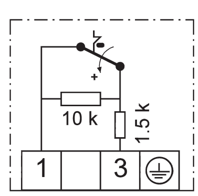
**Defeat:**
E = External, i.e. in control cabinet via relay with latching
I = Internal, i.e. locally at pressure limiter

**For technical data of isolating amplifier, see Datasheet Ex 041, page 61.**
**Please note when ordering:** List pressure limiter and isolating amplifier separately.

### Internal circuit

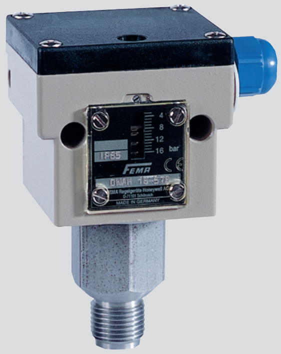



**FD 16 –326**
Single-pole changeover switch with resistor combination for line break and short-circuit monitoring.
(External interlock in control cabinet necessary).




**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 Ex 041.**



DWAM…-576

# DBS series

## Pressure monitors and limiters for especially safety-critical applications

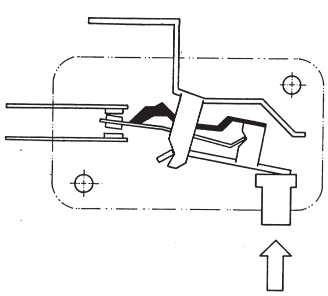
### Technical data

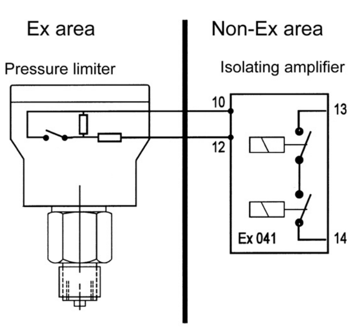
**Greater safety**
- **in process engineering and chemical installations,**
- **in gas and liquid gas installations**

**Basic features:**
– “Of special construction” according to VdTÜV Memorandum “Pressure 100/1”
– Line break and short-circuit monitoring- between pressure switch and isolating amplifier EX 041
– Suitable for Ex areas (zone 1 & 2 or 21 & 22) (explosion protection EEx-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-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. The pressure switches can also be used in Ex zones (zone 1, 2 and 21, 22) and in all cases require an **Ex 041 isolating amplifier**. The isolating switching 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 Ex 041 isolating amplifier and the pressure switch are monitored for short-circuit and line break.

### 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 isinterrupted, 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
See also Datasheet Ex 041. 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 (EEx-ia). This arrangement is suitable for zones 1 and 2, 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**
EEx-ia (only when used in conjunction with Ex 041 isolating amplifier).

**Component testing** See table on page 56.

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

**Ambient temperature** –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.

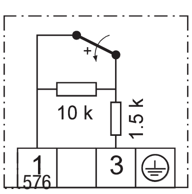
**Max. working pressure**
See Product Summary

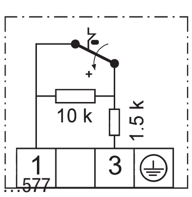
**Switching pressure setting**
Adjustable with the setting spindle after removing the terminal box.

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

**Switching capacity**
24 VDC, max. 100 mA. (at higher switching power the gold plating on the contact may be damaged).

**Connection diagrams**




## Maximum pressure monitors

Sensor “of special construction”, self-monitoring via safety diaphragm, type-tested according to VdTÜV Memorandum “Pressure 100/1”.

| Type | Setting range | Switching differential (mean values) | Max. permissible pressure |
|---|---|---|---|
| DWAM 06-576 | 0.1…0.6 bar | 0.04 bar | 5 bar |
| DWAM 1-576 | 0.2…1.6 bar | 0.05 bar | 5 bar |
| DWAM 2.5-576 | 0.4…2.5 bar | 0.07 bar | 5 bar |
| DWAM 6-576 | 1.2…6 bar | 0.15 bar | 10 bar |
| DWAM 625-576 | 1.2…6 bar | 0.25 bar | 20 bar |
| DWAM 16-576 | 3…16 bar | 0.4 bar | 20 bar |
| DWAM 32-576 | 6…32 bar | 1.2 bar | 45 bar |

**Versions:**
**ZF 577: Maximum pressure limiter (with internal interlock)** Microswitch not positive opening, contacts: silver alloy. Other equipment as for DWAM…576
**Ex 041 isolating amplifier, see page 61.**

## Maximum pressure monitors

Sensor “of special construction” through component test with **2 million operating cycles** (not self-monitoring).

**Component tests:**
VdTÜV Memorandum “Pressure 100/1”
DIN 3398 T.3 (for fuel gases)
DIN 3398 T.4 (for liquid fuels)

| Type | Setting range | Switching differential (mean values) | Max. permissible pressure in gas | other media |
|---|---|---|---|---|
| DWR 06-576 | 0.1…0.6 bar | 0.04 bar | 6 bar | 6 bar |
| DWR 1-576 | 0.2…1.6 bar | 0.06 bar | 6 bar | 6 bar |
| DWR 3-576 | 0.2…2.5 bar | 0.1 bar | 10 bar | 16 bar |
| DWR 6-576 | 0.5…6 bar | 0.2 bar | 10 bar | 16 bar |
| DWR 625-576 | 0.5…6 bar | 0.25 bar | 20 bar | 25 bar |
| DWR 16-576 | 3…16 bar | 0.5 bar | 20 bar | 25 bar |
| DWR 25-576 | 4…25 bar | 1.0 bar | 50 bar | 63 bar |
| DWR 40-576 | 10…40 bar | 1.3 bar | 50 bar | 63 bar |

**Versions:**
**ZF 577: Maximum pressure limiter (with internal interlock)**
Microswitch not positive opening, contacts: silver alloy. Other equipment as for DWR…576
**Ex 041 isolating amplifier, see page 61.**

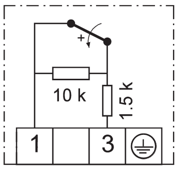
**Calibration**
Devices of the **DWR-576** and **DWAM-576** series are calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 30, 2. Calibration at upper switching point).

## Safety-engineered minimum pressure monitors for maximum and minimum pressure monitoring

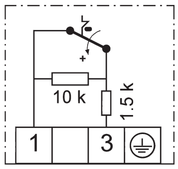
### Technical data

**Switching element**
See table opposite.

**Connection diagrams**




…574




…575

The other technical data correspond to the devices for maximum pressuremonitoring (page 55).

| Type | Setting range | Switching differential (mean values) | Max. permissible pressure in gas | Max. permissible pressure other media |
|---|---|---|---|---|
| DWR 06-574 | 0.1…0.6 bar | 0.04 bar | 6 bar | 6 bar |
| DWR 1-574 | 0.2…1.6 bar | 0.06 bar | 6 bar | 6 bar |
| DWR 3-574 | 0.4…2.5 bar | 0.1 bar | 10 bar | 16 bar |
| DWR 6-574 | 0.5…6 bar | 0.2 bar | 10 bar | 16 bar |
| DWR 625-574 | 0.5…6 bar | 0.25 bar | 20 bar | 25 bar |
| DWR 16-574 | 3…16 bar | 0.5 bar | 20 bar | 25 bar |
| DWR 25-574 | 4…25 bar | 1.0 bar | 50 bar | 63 bar |
| DWR 40-574 | 10…40 bar | 1.3 bar | 50 bar | 63 bar |

**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 30, 1. Calibration at lower switching point).

**Versions:**
**ZF 575: Minimum pressure limiter (with internal interlock)**
Microswitch not positive opening,
Switching contacts: silver alloy
Other equipment as for DWR…574

**Ex 041 isolating amplifier, see page 61.**

## Features of safety-engineered pressure monitors and pressure limiters

| Devices | Component testing | Features | | | | | Options | |
|---|---|---|---|---|---|---|---|---|
| | 1 = VdTÜV Memorandum “Pressure 100/1”<br>2 = DIN 3398 Part 3<br>3 = DIN 3398 Part 4 | Resistor combination for line break and short-circuit monitoring | EExi version for intrinsically safe control circuits | Self-monitoring pressure sensor | Positive opening microswitches | Gold-plated contacts | Limiter with internal interlock (reclosing lockout) | Plastic-coated housing Chemical version |
| **Maximum pressure monitoring** | | | | | | | | |
| FD 16-326 | 1 + 3 | • | • | • | • | • | | |
| FD 16-327 | 1 + 3 | • | • | • | | | • | |
| DWAM…576 | 1 | • | • | • | • | • | | • |
| DWAM…577 | 1 | • | • | • | | | • | • |
| DWR…576 | 1 + 2 + 3 | • | • | | • | • | | • |
| DWR…577 | 1 + 2 + 3 | • | • | | | | • | • |
| **Minimum pressure monitoring** | | | | | | | | |
| DWR…574 | 1 + 2 + 3 | • | • | • | • | • | | • |
| DWR…575 | 1 + 2 + 3 | • | • | • | | | • | • |

DGM 310 A

# DGM series

## Pressure monitors for fuel gases

### 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.
IP 65 (for EEx-d version)

**Pressure sensor materials**
See Product Summary

**Ambient temperature** –25 to +60°C.
–15 to +60°C (for EEx-d versions). 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.
EEx-d version only vertical.

**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 |
| EEx-d | 3 A | 2 A | 0.03 A | 3 A |

Switching devices in EEx-i version with gold-contacts.
Max. switching capacity: 24 VDC 100 mA.

**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 3398, Part 3, Issue 11/82, DIN EN 1854 |
| **Function** | Pressure monitor, pressure limiter<br>Pressure monitor (with internal or external interlock) |
| **Direction of action** | **For maximum and minimum pressure monitoring** |
| **DVGW Reg. No.**<br>**CE Ident. No.** | NG-4346 AP 1011 CE-0085 AQ 1088 |

**DVGW**

CE
(according to Gas Appliance Directive 90/396/EEC)

### Product Summary

| Type | Setting range | | Switching differential (mean values) | | Max. working pressure | | Materials in contact with medium | Dimensioned drawing |
|---|---|---|---|---|---|---|---|---|
| DGM 306 A | 15…60 | mbar | 6 | mbar | 0.8 | bar | CU + Ms | |
| DGM 310 A | 20…100 | mbar | 7 | mbar | 0.8 | bar | CU + Ms | 1 + 13 |
| DGM 325 A | 40…250 | mbar | 10 | mbar | 0.8 | bar | CU + Ms | |
| DGM 06 A | 100…600 | mbar | 25 | mbar | 2 | bar | CU + Ms | 1 + 14 |
| DGM 1 A | 0.2…1.6 | bar | 40 | mbar | 3 | bar | CU + Ms | |
| DGM 506 | 15…60 | mbar | 8 | mbar | 5 | bar | 1.4104 | |
| DGM 516 | 40…160 | mbar | 12 | mbar | 5 | bar | 1.4104 | 1 +12 |
| DGM 525 | 100…250 | mbar | 20 | mbar | 5 | bar | 1.4104 | |

For other pressure ranges see type series DWR

**Ex -versions** — **Degree of protection EEx de IIC T6, housing 700**

| Type | Setting range | | Switching differential (mean values) | | Max. working pressure | | Materials in contact with medium | Dimensioned drawing |
|---|---|---|---|---|---|---|---|---|
| Ex-DGM 506 | 15…60 | mbar | 10 | mbar | 5 | bar | 1.4104 | |
| Ex-DGM 516 | 40…160 | mbar | 12 | mbar | 5 | bar | 1.4104 | 3 + 12 |
| Ex-DGM 525 | 100…250 | mbar | 20 | mbar | 5 | bar | 1.4104 | |

For other pressure ranges see type series DWR

**EEx-i version (intrinsically safe)** — **Housing 500**

| Type | Setting range | | Switching differential (mean values) | | Max. working pressure | | Materials in contact with medium | Dimensioned drawing |
|---|---|---|---|---|---|---|---|---|
| DGM 306-513 | 15…60 | mbar | 6 | mbar | 0.8 | bar | CU + Ms | |
| DGM 310-513 | 20…100 | mbar | 7 | mbar | 0.8 | bar | CU + Ms | 2 + 13 |
| DGM 325-513 | 40…250 | mbar | 10 | mbar | 0.8 | bar | CU + Ms | |
| DGM 06-513 | 100…600 | mbar | 25 | mbar | 2 | bar | CU + Ms | 2 + 14 |
| DGM 1-513 | 0.2…1.6 | bar | 40 | mbar | 3 | bar | CU + Ms | |
| DGM 506-513 | 15…60 | mbar | 10 | mbar | 5 | bar | 1.4104 | |
| DGM 516-513 | 40…160 | mbar | 12 | mbar | 5 | bar | 1.4104 | 2 + 12 |
| DGM 525-513 | 100…250 | mbar | 20 | mbar | 5 | bar | 1.4104 | |

### Calibration

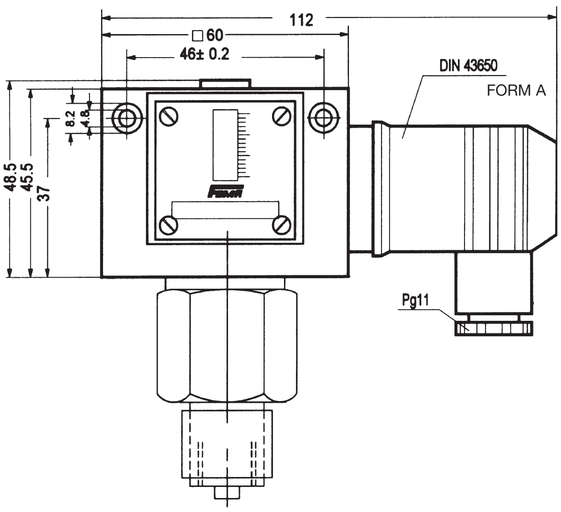
The **DGM** series is calibrated for rising pressure. This means that the adjustable switching pressure on the scale corresponds to the switching point at rising pressure. The reset point is lower by the amount of the switching differential. (See also page 30, 2. Calibration at upper switching point).

For other pressure ranges see type series DWR

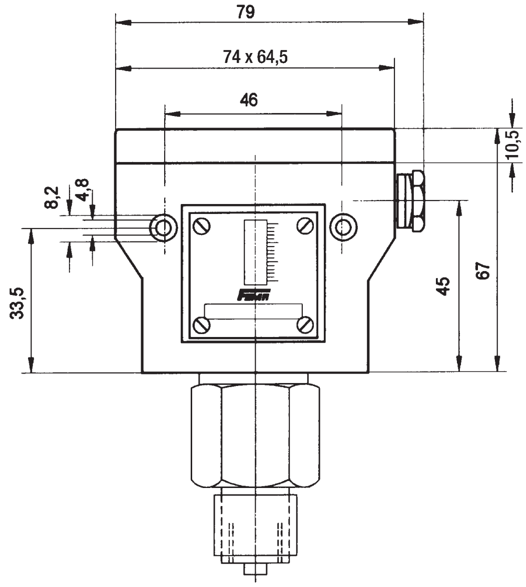
CE  TÜV tested  DIN tested  DVGW tested  Ex  Degree of protection: IP 54/65

# Dimensioned drawings of switch housings

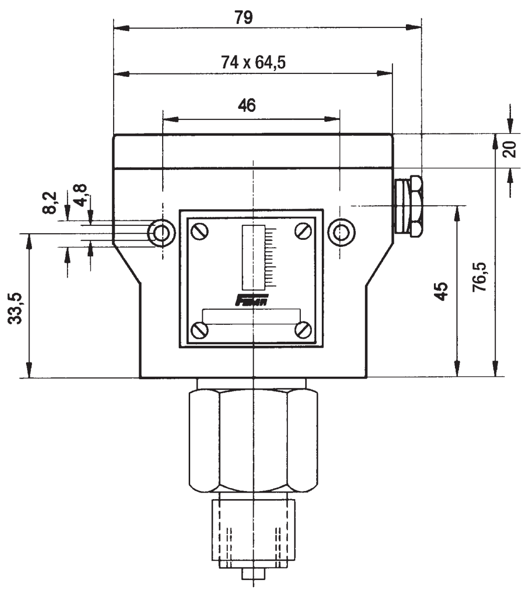
**1** **Housing 200 (plug connection)**




**2** **Housing 300 and 500 (terminal connection)**

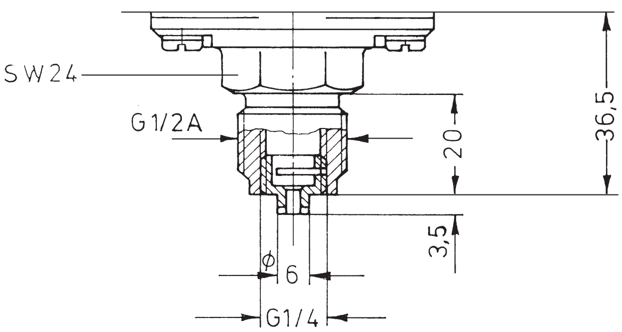



**3** **Housing 700 (Ex)**

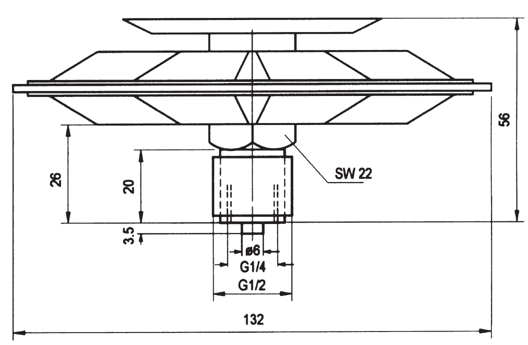



# Dimensioned drawings of pressure sensors

**10**

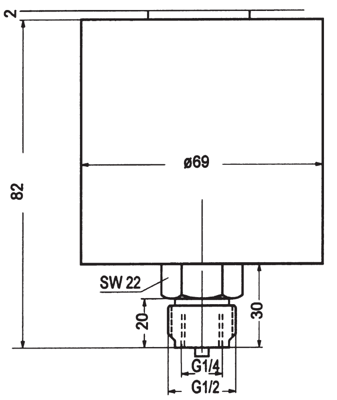



**11**

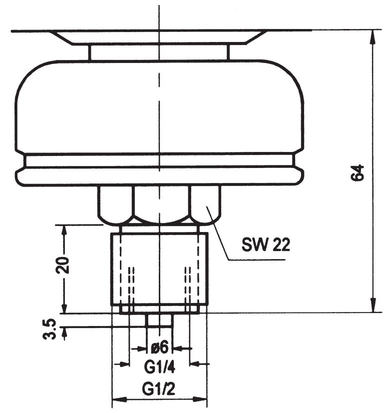


# Dimensioned drawings of pressure sensors

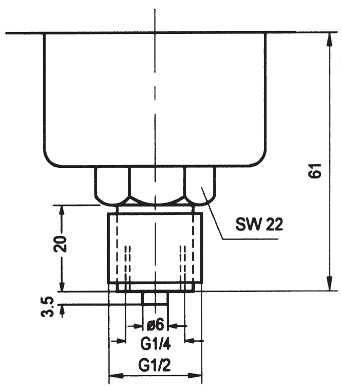
12



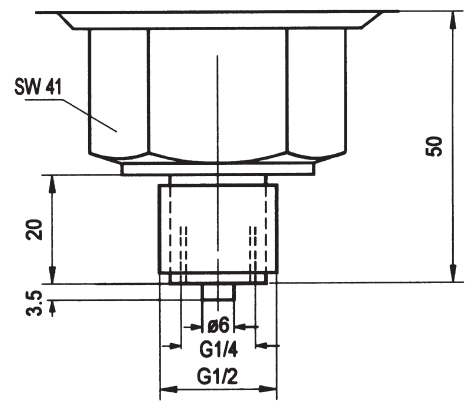

13



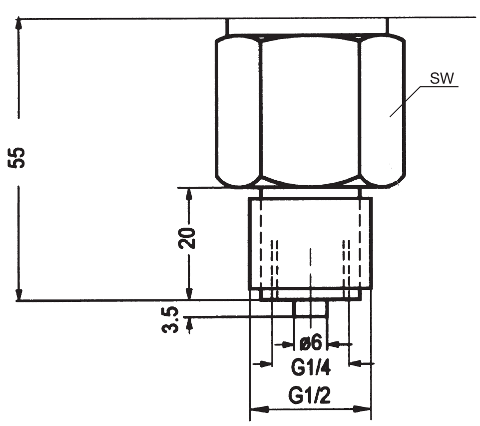

14




15

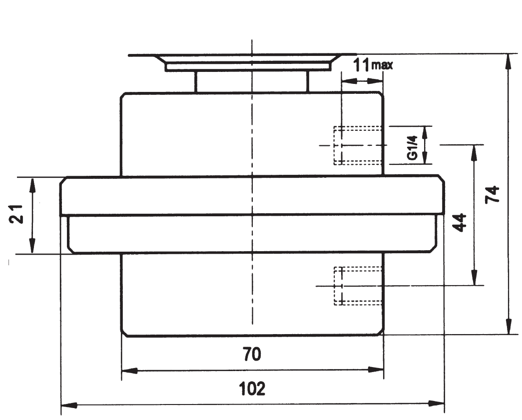



16–19

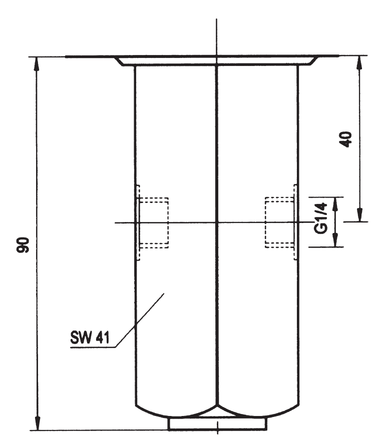



| Dimensioned drawing | SW |
|---|---|
| 16 | 22 |
| 17 | 24 |
| 18 | 30 |
| 19 | 32 |

20




21



EX 011

# Accessories for EX 011 series

## Isolating amplifier for intrinsically safe control circuits

- 1-channel
- Control circuit EEx-ia IIC
- Reversible direction of action
- 1 signal output with 1 change-over
- EMC according to NAMUR NE 21

**Application**
Suitable for all pressure and temperature switches with microswitches (basic versions) and for devices with additional function ZF 513:

### Technical data

**Nominal voltage** 230V, 45 Hz…65 Hz

**Power consumption** ≤ 1 W

**Input (intrinsically safe)** Terminals 1+, 3–

**Nominal data** according to DIN 19234

**No-load voltage/short-circuit current**
approx. 8 VDC/approx. 8 mA

**Switching point** 1.2 mA…2.1 mA

**PTB approval** PTB 00 ATEX 2081

**Explosion protection** EEx-ia

**Outputs (not intrinsically safe)**
**Contact load**
AC: 250V/2 A/cos. > 0.7
DC: 240V/1 A resistive load

**Switching frequency** ≤ 10 Hz

**Electrical isolation**
**Input/output**
according to DIN EN 50 020, safely electrically isolated.

**Input/mains**
according to DIN EN 50 020, safely electrically isolated.

**Output/mains** according to DIN EN 50 178

**Ambient temperature** –20°C…+60°C

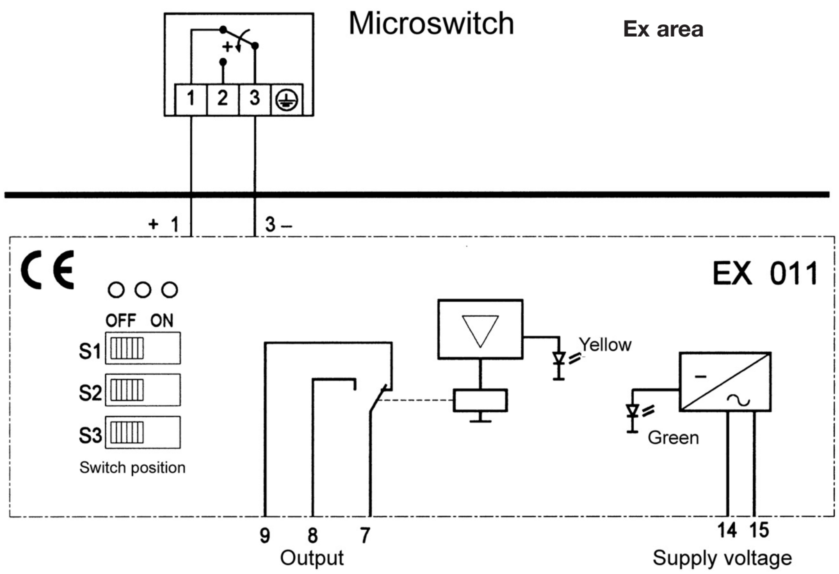
**Direction of action**
The direction of action of the output can be adjusted with the slide switch S1 on the front of the housing.

**LED**
green = mains
yellow = relay output
red = line break

**Slide switches**
S1 Direction of action
S2 No function

**Mounting**
Standard rail 35 mm.

**Dimensions**
20 x 115 x 93 (W x H x D).



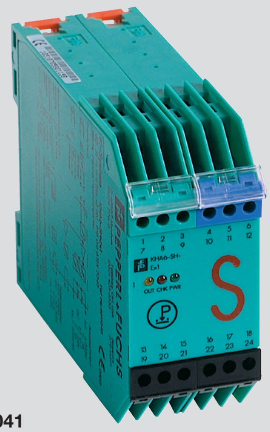

With the **type EX 011 isolating amplifier** intrinsically safe control circuit commands can be transmitted to non-intrinsically safe active circuits. The inputs are safely isolated from the outputs and from the mains in accordance with DIN EN 50 178.

**Direction of action**
The direction of action of the outputs can be adjusted with the slide switch S1 on the front of the housing.

| Control circuit | Output relay | LED yellow | LED red |
|---|---|---|---|
| Switching contact closed | picked up | on | off |
| Switching contact open | dropped out | off | off |

The table applies to switch position S1 = OFF

| Type designation Type | Supply voltage | Power consumption |
|---|---|---|
| EX 011 | 230V, 45…65 Hz | ≤ 1 W |



EX 041

# Accessories for EX 041 series

## for intrinsically safe control circuits with short-circuit and line break monitoring

- **1-channel**
- **1 failsafe relay output according to DIN VDE 0660 Part 209 (BIA certificate no. 940 64)**
- **Control circuit EEx-ia IIC**
- **1 progressive output with 1 normally open contact**
- **1 passive electronic output, error message**

**Application**
Suitable for all safety-engineered pressure moni-tors/pressure limiters, with microswitches and resistor combination
ZF 576   ZF 574   ZF 577   ZF 575,
FD series

### Technical data

**Nominal voltage** 230V, 48 Hz…62 Hz

**Power consumption** ≤ 3 W

**Input (intrinsically safe)** Terminals 10+, 12–

**No-load voltage/short-circuit current**
approx. 8.4 VDC/approx. 11.7 mA

**Switching point**
**Relay dropped out** J < 2.1 mA and J > 5.9 mA
**Relay picked up** 3.2 mA < J < 5mA

**Line resistance**
< 50 ohm. Cable capacitances and inductance must be taken into account in the Ex area.

**PTB approval** PTB 00 ATEX 2043

**Explosion protection, category** EEx-ia

**Outputs (not intrinsically safe)**
**Output I: (failsafe)**
Relay terminals 13, 14
**Output II: (not failsafe)**
Relay terminals 15, 21

**Contact load**
AC: 250V/1 A/cos. > 0.7
DC: 24V/1 A resistive load

**Output III**
**Error message (not failsafe)**
Electronic output, passive, terminals 16+, 17–

**Nominal voltage** DC 10 V…30 V

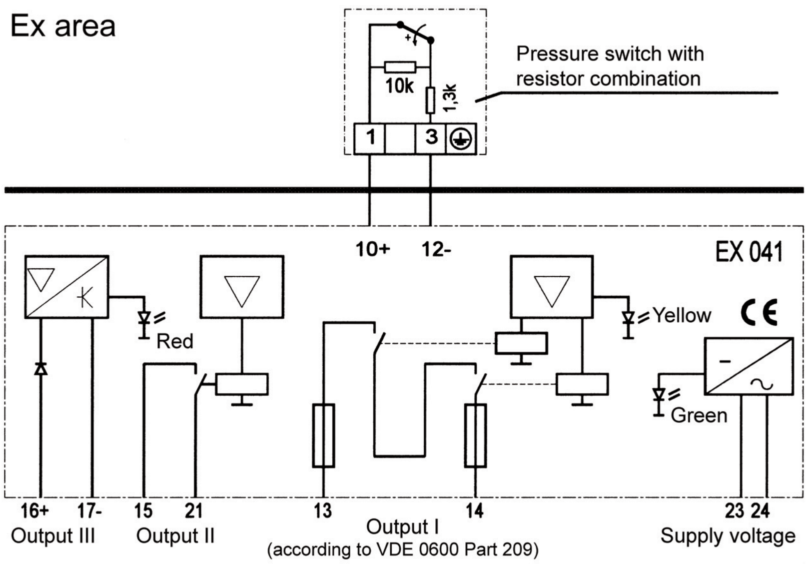
**Nominal current** < 7 mA, short-circuit-proof

**Switching frequency** ≤ 5 Hz

**Ambient temperature** –20°C…+60°C

**Installation** Standard rail 35 mm.

**Dimensions**
40 x 115 x 93 (W x H x D).




The **type EX 041 isolating amplifier** is used for the transmission of intrinsically safe control commands (e.g. from pressure switches) to non-intrinsically safe active circuits. **In the event of short-circuit or line break in the control circuit, the isolating amplifier switches to the safe side** (see "Direction of action" table). It also reacts to the safe side (output relay drops out) if internal component failures and resultant errors occur.

**Output I** Relay output failsafe according to VDE 0660, Part 209, terminals separately led to the outside for series connected protective interlock circuit, for example.
**Output II** Progressive output with relay stage (not failsafe).
**Output III** Alarm output potential-free (not failsafe).

### Important note

The type EX 041 isolating amplifier can only be used together with pressure switches with resistor combination (additional function ZF 576, ZF 577…, see also "Application" above).

### Direction of action

| Control circuit | Output relay I and II | Status indicator yellow | Status indicator red | Electronic output III |
|---|---|---|---|---|
| Switching contact closed | picked up | on | off | blocked |
| Switching contact open | dropped out | off | off | blocked |
| Line break or short-circuit in the input circuit | dropped out | off | on | switched through |
| Contact welding Output I | dropped out | off | on | switched through |

### Type designation

| Type | Supply voltage | Power consumption |
|---|---|---|
| EX 041 | 230 V, 48…62 Hz | ≤ 3 W |

# Accessories for ZFV series

## Pressure mediators attached to pressure switches

A separating diaphragm or a pressure mediator 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 11 851 are customary for pressure monitoring in the foodstuffs industry. Pressure mediators and evaluating devices (pressure switches, pressure transmitters, pressure gauges) from 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.

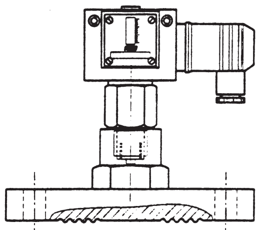
### Technical data

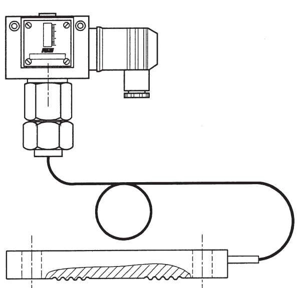
**Material** 1.4571.

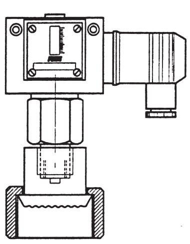
**Realization**
Fully assembled, evacuated, filled and adjusted.

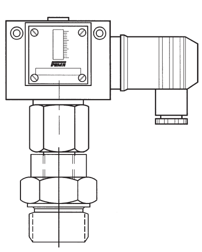
**Filling medium** M 20, food-safe.

**Max. permissible pressure**
40 bar (applies to separating diaphragm only. The max. permissible pressure of the pressure switch or pressure transmitter must be observed).









### Product Summary

| DN | Switching point from | Temperature range* | Type |
|---|---|---|---|
| **Flanged pressure mediators** made of stainless steel 1.4571, membrane flush to the front, flange to DIN 2527 | | | |
| 50 | 0.3 bar | –40…120°C | ZFV 184-50 |
| 80 | 0.15 bar | | ZFV 184-80 |
| with Teflon coating | | | |
| 50 | 0.3 bar | –40…120°C | ZFV 184-50PTFE |
| 80 | 0.15 bar | –40…120°C | ZFV 184-80PTFE |
| **Flanged pressure mediators** with 1 m pipeline, flange to DIN 2527 | | | |
| 50 | 0.3 bar | –30…300°C | ZFV 185-50 |
| 80 | 0.15 bar | | ZFV 185-80 |
| with Teflon coating | | | |
| 50 | 0.3 bar | –30…300°C | ZFV 185-50PTFE |
| 80 | 0.15 bar | –30…300°C | ZFV 185-80PTFE |

Pipeline up to a maximum of 10 m on request

### Technical information

Combinations with pressure mediators are filled and calibrated at 20°C. Very different operating temperatures can adversely affect the measurement result, particularly with long capillary pipes and large flange diameters. Furthermore, all capillary pressure mediators must be filled and adjusted at the same height as the evaluation unit. If the measuring points and the evaluation units are at different heights within the system, any pressure difference must be taken into account when setting the switching points. This effect is particularly noticeable when monitoring small system pressures.

| DN | Switching point from | Temperature range* | Type |
|---|---|---|---|
| **Pressure mediators** for the foodstuffs industry with milk pipe connection according to DIN 11851 | | | |
| 50 | 0.4 bar | –30…120°C | ZFV 162-50 |
| with Teflon coating | | | |
| 50 | 0.4 bar | –30…120°C | ZFV 162-50PTFE |
| **Screw-in pressure mediators** flush to the front | | | |
| G 1 | 0.6 bar | –30…120°C | ZFV 749 |

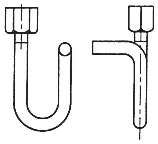
* Please note that the temperature at the pressure switch must not exceed 60°C for long periods.

**Note:**
In future, all pressure switches purchased together with ZFV must be ordered in the following way:
e.g. DCM 6-S + ZF 1970
+ ZFV 184-50

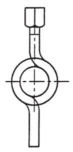
FEMA

# Accessories

## Siphons, NPT adapters, pressure surge reducers



U-shape (Form B)

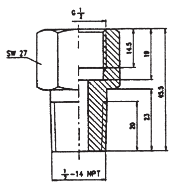


Circular (Form D)

**according to DIN 16282 made of seamless steel tube 20 mm ø**

| FORM B | Material | Type |
|---|---|---|
| Inlet: Weld-on end with weld chamfer | St 35.8-I | U 430 B |
| Outlet: Connection shank DIN 16 282 Form 6 | 1.4571 | U 480 B |
| G 1/2” with clamping sleeve DIN 16 283 G 1/2“ | | |

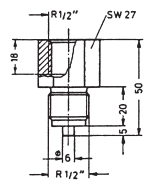
| FORM D | Material | Type |
|---|---|---|
| Inlet: Weld-on end with weld chamfer | St 35.8-I | K 430 D |
| Outlet: Connection shank DIN 16 282 Form 6 | 1.4571 | K 480 D |
| G 1/2” with clamping sleeve DIN 16 283 G 1/2“ | | |




NPT1

**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.

| Description | Type |
|---|---|
| NPT adapter, material 1.4104 and sealing ring<br>DIN 16 258, Form C material ITC to DIN 3754 Part 1 | NPT 1 |




DMW-K

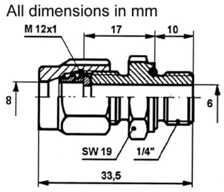
**Pressure surge reducer**

| Medium | Material | Type |
|---|---|---|
| Water and gaseous media | Brass | DMW |
| Water and gaseous media | Brass | DMW-K |

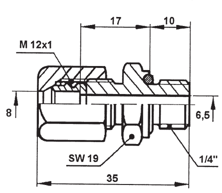
# Accessories

## Threaded joints and valve combinations for differential pressure

All dimensions in mm




**MAU 8 / Ms**



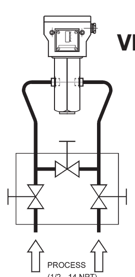

**MAU 8 / Nst**

**Threaded joint with male adapter union G 1/4”/8 mm**
G 1/4” external thread with O-ring seal for connection of pipes with 8 mm external diameter for connection of:
Differential pressure switches DDCM… and other devices with G 1/4” internal thread

**Product Summary**

| Body | O-ring | Type |
|---|---|---|
| Brass | NBR | MAU 8 / Ms |
| Stainless steel (1.4571) | FPM | MAU 8 / Nst |

Max. permissible temperature: 100°C Max. permissible pressure: 100 bar




**VKD 3**

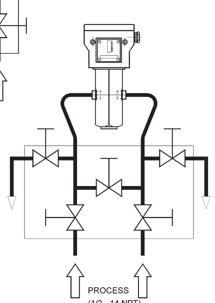
**Valve combinations for differential pressure switches**
The valve blocks are suitable for differential pressure switches DDCM 014 to DDCM 16 and for differential pressure transmitters FHBN...

**Technical data**

| | |
|---|---|
| Pressure stage: | PN 420 |
| Materials: | Housing 1.4404<br>Internal parts 1.4571 |
| Seals: | PTFE |
| Process connections: | 1/4–14 NPT |
| Included items: | Supplied complete with screw fittings and shaped pipe sections in stainless steel. |

**Product Summary**

| | Type |
|---|---|
| 3-fold combination | VKD 3 |
| 5-fold combination | VKD 5 |




**VKD 5**

The 5-fold combination contains two additional venting valves.

# Specifications

## Pressure switches/isolating amplifiers

**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 43650. 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 43650. 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 adjustment 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 43650. 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…

**DDCM 252… DDCM 6002** Differential pressure switch with plug connection to DIN 43650. 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...

**DDCM 1… DDCM 16** Differential pressure switch with plug connection to DIN 43650 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 100/1”. Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN 43650, 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 100/1”. Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN 43650, 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 100/1” and DIN 3398 Part 3 and Part 4. Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN 43650, 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 100/1” and DIN 3398 Part 3 and Part 4. Switch housing made of diecast aluminium GD Al Si 12, plug connection to DIN 43650, 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 43650. DVGW-tested according to DIN 3398, Parts 1 and 3. Sensor casing of Cu/Zn/high grade steel 1.4104. Switch housing of diecast aluminium GD Al Si 12, plug connection to DIN 43650, 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 100/1”. 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

**FD 16 –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 100/1” and DIN 3398, Part 4. Explosion protection: EEx-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: FD 16 –326

**FD 16 –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 100/1” and DIN 3398, Part 4. Explosion protection: EEx-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: FD 16-327

**Type series** **Isolating amplifier**

**Ex 011** Isolating amplifier for intrinsically safe control circuits. Explosion protection: EEx-ia IIC. Signal output: 1 change-over, nominal voltage 230 V, 45 –60 Hz
Type: Ex 011

**Ex 041** Safety-engineered isolating amplifier for intrinsically safe control circuits. Explosion protection: EEx-ia IIC. Signal output: 1 failsafe relay output, nominal voltage 230 V, 45 –60 Hz, type of protection IP 65
Type: Ex 041

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

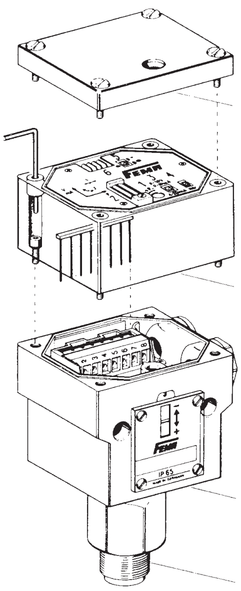
# Pressure and differential pressure transmitters/ Electrical pressure switches/transmitters

| Type series | Pressure ranges | Medium | Output signal | Operating mode | Remarks/ Applications | Page |
|---|---|---|---|---|---|---|
| **F**  | Vacuum up to 40 bar<br>Differential pressure up to 10 bar<br>Operating ranges continuously adjustable | liquid and gaseous | 0–10 V<br>0–20 mA<br>4–20 mA<br>(3-conductor system) | Mechanical-inductive | For general applications in liquid and gaseous media. | 67 – 73 |
| **PST**  | -1…600 bar | liquid and gaseous stainless steel sensors | 0–10 V<br>10–0 V<br>4–20 mA<br>20–4 mA<br>2-channel switch | Piezoresistive | Electronic pressure switches with configurable transmitter output | 6 – 17 |
| **SN**  | Up to 60 bar<br>Operating ranges continuously adjustable | liquid and gaseous (stainless steel sensors) | 0–10 V /<br>4–20 mA<br>(3-conductor-system)<br>4–20 mA<br>(2-conductor-system) | Piezoresistive | Highly accurate<br>Hermetically en-capsulated sensor system made of stainless steel. | 74 – 78 |
| **DPT**  | Differential pressure<br>-50 Pa/+50 Pa<br>up to 0–2500 Pa | gaseous | 0–10 V /<br>4–20 mA<br>(3-conductor-system)<br>4–20 mA<br>(2-conductor-system) | Piezoresistive | Ventilation and air-conditioning systems | 79 |
| **Accessories** | | | | | | 80 – 82 |
| **Specifications** | | | | | | 83 |

# Type series F

## Pressure transmitters, mechanical-inductive

**Operating method**
Pressure transmitters are used to convert overpressure, vacuum or differential pressure into a proportional electrical signal of 0–10 V, 0–20 mA (4–20 mA). A metal bellows or diaphragm is exposed to the occurring pressure. The pressure-dependent movements of the metal bellows are transmitted free of play to an inductive displacement sensor. The electronic system converts the position of the displacement sensor into a proportional electrical signal (voltage and injected current).

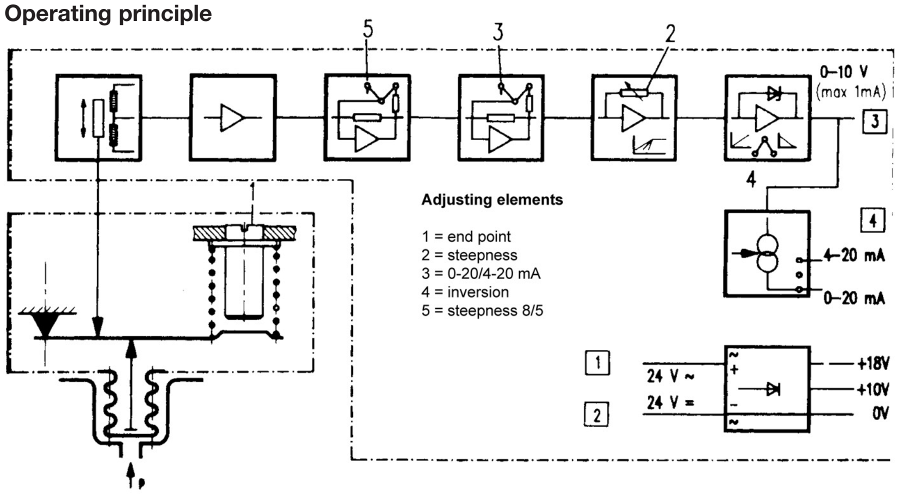


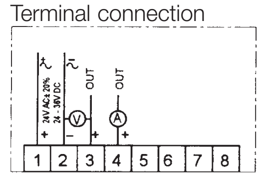
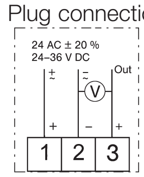
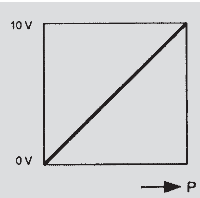
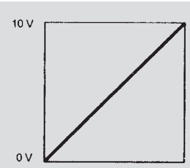
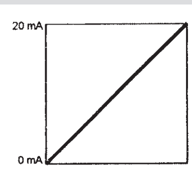

**A complete transmitter consists of a sensor module with pressure and electrical connections, an evaluation module and a cover.**

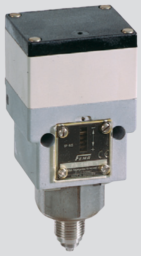
Additional evaluation modules can be plugged in.

## General technical information

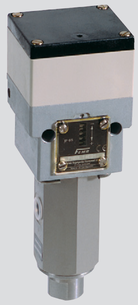
**Operating principle**




| Type series | F…+ ED 1 | F…+ ED 3 |
|---|---|---|
| Electrical connection | Terminal connection  Output signal 0–10 V and 0–20 mA | Plug connection  Output signal 0–10 V |
| Voltage output characteristic |  |  |
| Current output characteristic |  | |



Pressure FN... + ED 1



Differential pressure FHBN...+ ED 1

# Type series F...+ ED 1

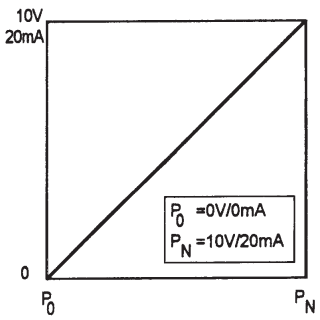
## with terminal connection

**Pressure transmitter with 3 conductors**

- with 2 output signals 0–10 V and 0–20 mA
- Switchable to 2–10 V and 4–20 mA and invertible
- Plug-in display module AZ 331

Pressure transmitters of the F series produce 0–10 V / 0–20 mA. Both signals are applied to the terminal strip and can be used in parallel. A complete transmitter consists of a sensor parts and the plug-in evaluation module ED 1. Removing the cover gives access to an operator interface for adjusting the operating range. A plug-in digital display AZ 331 is available to display the output signal in any units (voltage / current / pressure / differential pressure). For further details see Datasheet AZ.

**Characteristic of a transmitter (nominal range)**




**Product Summary**

| Operating range (nominal range) $P_0$–$P_N$ | Smallest adjustable operating range | Max. permissible pressure (approx. values) | Sensor material | Type |
|---|---|---|---|---|
| **Overpressure** | | | | |
| 0 – 50 mbar | 20 mbar | 2.5 bar | | FN 505 + ED 1 |
| 0 – 100 mbar | 25 mbar | 5 bar | | FN 510 + ED 1 |
| 0 – 250 mbar | 65 mbar | 6 bar | 1.4104 | FN 025 + ED 1 |
| 0 – 500 mbar | 125 mbar | 6 bar | + | FN 05 + ED 1 |
| 0 – 1 bar | 250 mbar | 6 bar | 1.4571 | FN 1 + ED 1 |
| 0 – 2.5 bar | 0.7 bar | 16 bar | | FN 3 + ED 1 |
| **Vacuum** | | | | |
| –1 to 0 bar | 250 mbar | 6 bar | 1.4104 | FVN 111 + ED 1 |
| –1 to 1 bar | 500 mbar | 6 bar | + | FVN 112 + ED 1 |
| –1 to 5 bar | 1.5 mbar | 25 bar | 1.4571 | FVN 105 + ED 1 |
| –250 to+250 mbar | 125 mbar | 3 bar | | FVN 125 + ED 1 |
| **Differential pressure** | | | | |
| 0 – 500 mbar | 125 mbar | 10 bar | | FHBN 05 + ED 1 |
| 0 – 1 bar | 250 mbar | 15 bar | 1.4305 | FHBN 1 + ED 1 |
| 0 – 2.5 bar | 0.7 bar | 15 bar | + | FHBN 3 + ED 1 |
| 0 – 5 bar | 1.25 mbar | 15 bar | 1.4571 | FHBN 5 + ED 1 |
| 0 – 10 bar | 2.5 mbar | 25 bar | | FHBN 10 + ED 1 |

### Accessories

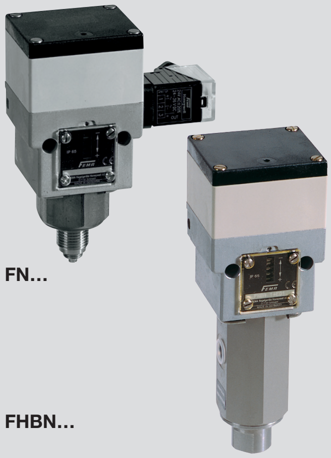
- Plug-in display module AZ 331
- Programmable display APV 630

**For differential pressure**

- Valve combination VKD 3, VKD 5
- Threaded joint with male adapter union MAU 8

### Note

- If measured values diverge due to higher static (system) pressure, observe the adjustment instructions on page 71.



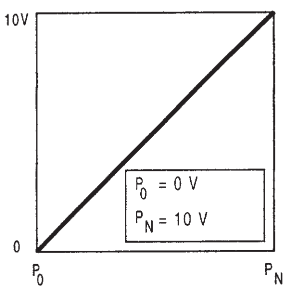

# Type series F…+ ED 3

## with plug connection

- Openable plug connection is easy to fit and service, with a transparent front
- 0–10 V output (invertible)
- Plug-in display module AZ 331

Pressure and differential pressure transmitters of the F…+ ED 3 series (with voltage output) are almost identical to versions …ED 1. A voltage signal is available at the connection plug. Possible settings are described on pages 71 – 72.

**Characteristic ED 3**




**Product Summary**

| Operating range (nominal range) $P_0$–$P_N$ | Smallest adjustable operating range | Max. permissible pressure (approx. values) | Sensor material | Type |
|---|---|---|---|---|
| **Overpressure** | | | | |
| 0 – 50 mbar | 20 mbar | 2.5 bar | | FN 505 + ED 3 |
| 0 – 100 mbar | 25 mbar | 5 bar | 1.4104 | FN 510 + ED 3 |
| 0 – 250 mbar | 65 mbar | 6 bar | + | FN 025 + ED 3 |
| 0 – 500 mbar | 125 mbar | 6 bar | 1.4571 | FN 05 + ED 3 |
| 0 – 1 bar | 250 mbar | 6 bar | | FN 1 + ED 3 |
| 0 – 2.5 bar | 700 mbar | 16 bar | | FN 3 + ED 3 |
| **Vacuum** | | | | |
| –1 to 0 bar | 250 mbar | 6 bar | 1.4104 | FVN 111 + ED 3 |
| –1 to +1 bar | 500 mbar | 6 bar | + | FVN 112 + ED 3 |
| –1 to 5 bar | 1500 mbar | 25 bar | 1.4571 | FVN 105 + ED 3 |
| –250 to +250 mbar | 125 mbar | 3 bar | | FVN 125 + ED 3 |
| **Differential pressure** | | | | |
| 0 – 500 mbar | 125 mbar | 10 bar | | FHBN 05 + ED 3 |
| 0 – 1 bar | 250 mbar | 15 bar | 1.4305 | FHBN 1 + ED 3 |
| 0 – 2.5 bar | 0.7 bar | 15 bar | + | FHBN 3 + ED 3 |
| 0 – 5 bar | 1.25 bar | 15 bar | 1.4571 | FHBN 5 + ED 3 |
| 0 – 10 bar | 2.5 bar | 25 bar | | FHBN 10 + ED 3 |

### Accessories

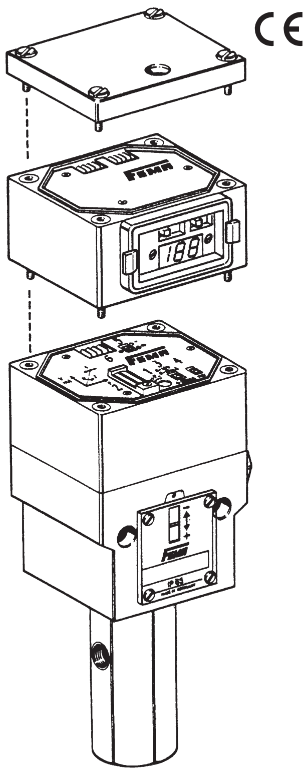
- Plug-in display module — AZ 331

**For differential pressure**
- Valve combination — VKD 3, VKD 5
- Threaded joint with male adapter union — MAU 8

### Note

- If measured values diverge due to higher static (system) pressure, observe the adjustment instructions on page 71.

Degree of protection:
IP 65



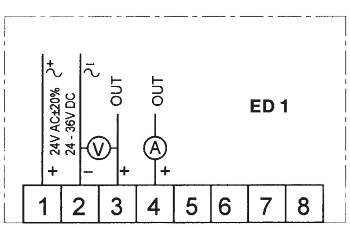
# Type series F

## Technical data

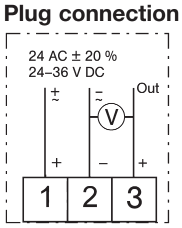
| | |
|---|---|
| **Supply voltage** | 24 V AC ± 20% or 24–36 V DC<br>Signal and supply voltage is connected to the sensor module. |
| **Power consumption** | max. 1 W |
| **Outputs (short-circuit proof)** | 0–10 V, 2–10 V (± 1 mA),<br>0–20 mA, 4–20 mA (3-conductor system)<br>All outputs are invertible. |
| **Load impedance** | max. 750 Ohm. |
| **Direction of action** | Rising pressure produces a rising output signal (default setting).<br>Invert with slide switch 4. |
| **Output signal<br>0–10 V and 0–20 mA** | Voltage and current output can also be picked up and used simultaneously. Terminals 5–8 are reserved for later expansions and must not be connected as this would destroy the device. |
| **Operating mode** | mechanical, inductive |
| **Sensor element** | Pressure bellows or diaphragm |
| **Pressure connection** | G 1/2 external and G 1/4 internal.<br>On FH types: G 1/4 internal. |
| **Cable entry** | 2 x M 16 x 1.5 |
| **Degree of protection** | IP 65 |
| **Installation** | Directly on the pressure line or mounted on wall with two 4 mm ø screws. |
| **Materials** | see Product Summary. |
| **Linearity** | The maximum linearity error is approx. 1% of full scale. |
| **Hysteresis** | approx. 0.5% nominal range, related to full output<br>0–10 V or 0–20 mA. |
| **Long-term drift** | 0.2% FS / year |
| **Repetition accuracy** | approx. 0.2% |
| **Accuracy class** | 1.0 |
| **Temperature drift** | Range from 20–45°C approx. 0.02%/K<br>Range from 0–20°C approx. 0.05%/K |
| **Influence of static pressure** | < = 3%/bar (see adjusting instructions, page 72) |
| **Mounting position** | Vertical. With other mounting positions, the degree of protection and accuracy are different. |
| **Ambient temperature** | 0 to 45°C |
| **Max. medium temperature** | 70°C. Temperatures may reach 85°C for short periods. Higher medium temperatures are possible if the above limit values for the switching device  are ensured by suitable measures (e.g.siphon). |
| **Storage temperature** | –20 to +70°C |

All plugged-in modules are powered via the terminal strip of the sensor module (on ED 1) or via the plug connection. The output signal is sent from each module for further evaluation via the same route. The power consumption increases by approx. 1 W for each additional module plugged in.

**Connection schemes**
**Terminal connection**

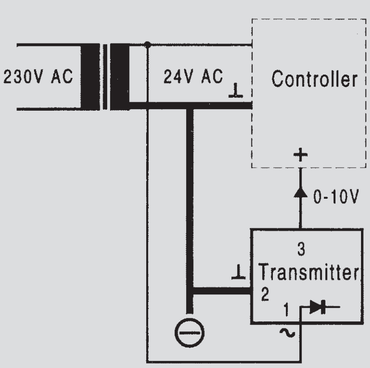



**Plug connection**



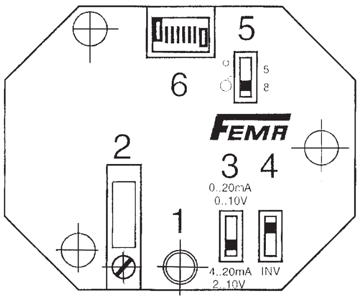

**ED 3 output signal 0–10 V**

**Important:**
When connecting to control systems with a common AC supply, the ground conductor must be looped through. That is to say,  on all devices in the system, the same reference potential must be present at the corresponding ground terminal (terminal 2). In the case of a DC supply, ensure correct polarity.

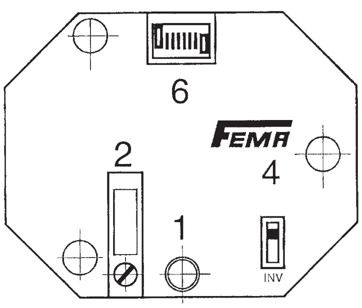


# Type series F

## Adjustment and operation




**Operator interface ED 1**
1 = Setting spindle for setting the final value $P_E$
2 = Setting potentiometer for setting the initial value $P_A$
3 = Slide switch for selecting the output signal 0–20 mA (0–10 V) or 4–20 mA (2–10 V)
4 = Slide switch for inverting the output signal
5 = Slide switch for changing the steepness of the characteristic in a ratio of 8:5.
Normal position: 8
For smaller operating ranges (< approx. 70% of the nominal range), select position 5
6 = Plug connector for further evaluation modules



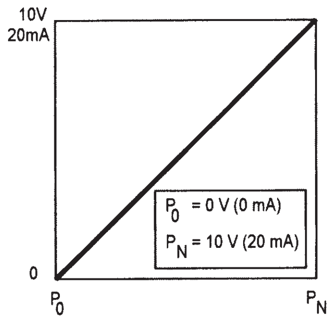

**Operator interface ED 3**
1 = Setting spindle for setting the final value $P_E$
2 = Setting potentiometer for setting the initial value $P_A$
4 = Slide switch for inverting the output signal
6 = Plug connector for further evaluation modules

### Operating ranges and output signals are adjustable over a wide range.

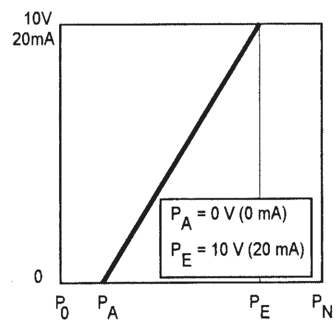
An outstanding characteristic of the pressure transmitters is the variability of the characteristic curve, which means that the pressure range and output signal can be adapted to any subsequent control system.

$P_0$ = starting pressure of nominal range
$P_N$ = nominal pressure (end point of nominal range)
$P_A$ = starting pressure of set range
$P_E$ = end pressure of set range

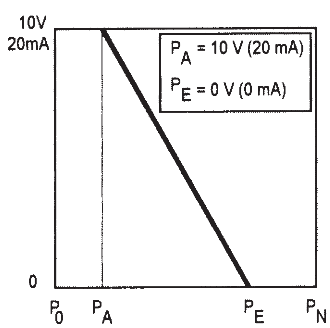
### Output signals for module ED 1




**Basic setting**
The factory default setting covers the nominal range $P_0$ (usually 0 bar) to $P_N$.

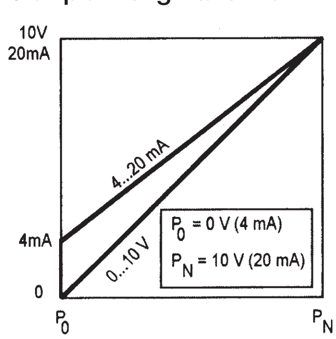



**Altering the range**
The range can easily be altered by shifting the end point and adjusting the steepness of the characteristic curve.




**Inversion**
The output signal can be inverted by means of a slideswitch.

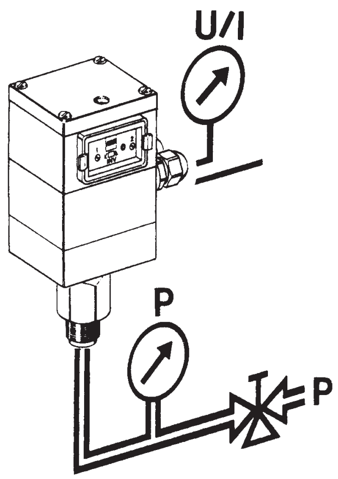
### Output signals for module ED 3




Range alteration and inversion as above.
The current signal can be reduced below 4 mA (down to approx. 2.5 mA). If the installation has a fault alarm system, the response threshold should be set below 2.5 mA.

# Type series F

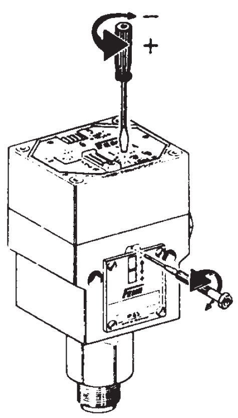
## Setting and testing




### Altering the operating range

To check functioning or change the settings from outside the system, a test set-up is required which meets the following requirements:

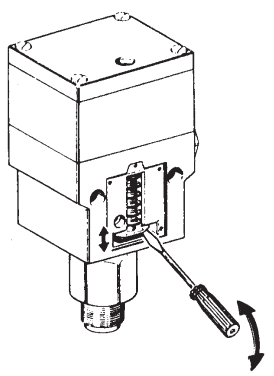
1. It must be possible to apply pressure to the pressure transmitter up to the desired final value. The pressure must be displayed by a sufficiently accurate pressure gauge.
2. To display the output signal a voltmeter with a measuring range of 0–10 V (preferably 0–15 V) or an ammeter with a measuring range of 0–20 mA (preferably 0–25 or 0–30 mA) are required.
3. To supply power to the transmitter, a 24 V AC or 24 V DC voltage source is needed.




**Setting operations must be carried out in the correct sequence**

1. Remove the plastic cover
2. Set the slide switches (3) and (4) to the correct position (switch 3 is only present on ED 1)
   Switch (3): Output signal 0–10 V / 0–20 mA or 4–20 mA / 2–10 V (only on ED 1)
   Switch (4): Direction of action
   Switch up — rising pressure = rising output signal
   Switch down (INV): — rising pressure = falling output signal
3. Loosen the locking screw above the cover glass (approx. 2 turns anticlockwise)
4. Apply final pressure $P_E$
5. Using a screwdriver, turn the setting spindle (1) to the desired output signal (depending on position of slide switches (3) and (4): 10 V, 20 mA, 0 V, 0 mA, 4 mA)
6. Apply starting pressure $P_A$
   With the potentiometer (2), adjust the output signal to the desired value (depending on position of slide switches: 0 V, 0 mA, 10 V, 20 mA, 4 mA)
7. Check the setting again and then retighten the locking screw for the setting spindle.

**Important: Always set the upper final value $P_E$ with the setting spindle (1) first, and then the lower initial value $P_A$ with the potentiometer (2).**



### Generating an output signal without pressure

It can often be very useful to generate an output signal before commissioning the system, in order to check electrical operation, the direction of action and the functioning of downstream control elements. The procedure is as follows:

1. Loosen the four screws on the scale window and remove the cover glass, scale plate and rubber seal.
2. In the lower, wide part of the cut-out in the housing, insert the tip of a small screwdriver underneath the bridge.
3. Carefully move the bridge up and down. When the supply voltage is applied, the output signal should change depending on the movements of the bridge.
4. Check the direction of action. Upward movement of bridge corresponds to rising pressure.
5. Once you have finished testing, carefully screw the parts back on again in the following order: rubber seal, scale plate, cover glass.

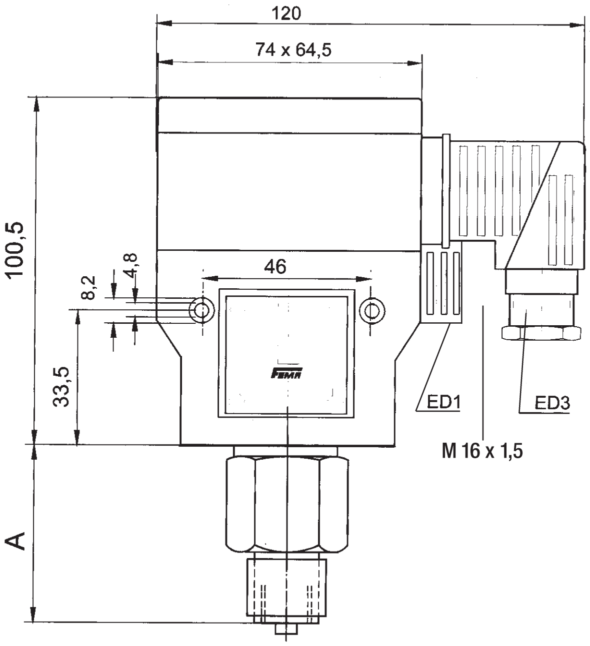
**Caution:** In the event of incorrect assembly, IP 65 protection is no longer assured.

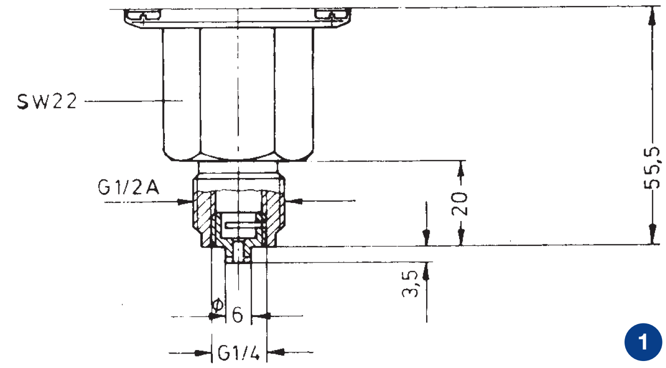
### Adjustment instructions: Correction of effect with static pressure

- The system in which the FHBN is installed must be filled and exposed to the usual static pressure.
- A differential pressure must not be active, i.e. no pump operation and no flow.
- Remove the plastic cover and check slide switches 3 + 4.
- The FHBN is supplied with the correct voltage and the output voltage is displayed.
- Loosen the spindle locking screw above the inspection window.
- Adjust setting spindle “1” with a screwdriver until the output signal is “0”.
- Retighten the spindle with the spindle locking screw.

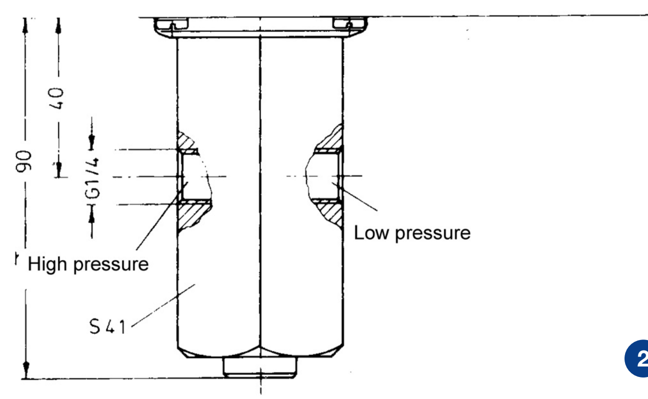
# Type series F

## Dimensioned drawings

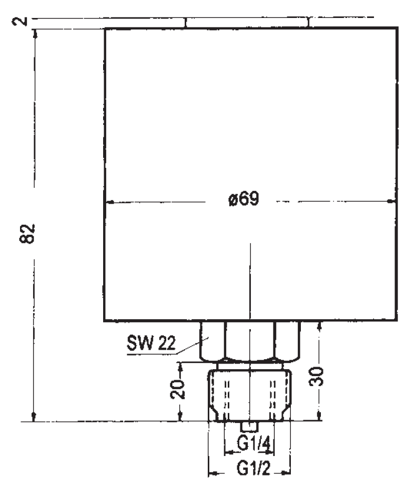



1




2




3

| Dimensioned drawing no. | Types | A |
|---|---|---|
| 1 | FN 025-FN 3<br>FVN… | 55.5 |
| 2 | FHBN… | 90 |
| 3 | FN 505, FN 510 | 82 |

Height of evaluation module = 1 Module height = 34 mm.
The dimensions are for the basic device, consisting of sensor and evaluation module.
Each further plug-in module increases the overall height by one module unit = 34 mm.

**Type series SN…311**
2 output signals
0–10 V and 4–20 mA

# Type series SN 3

## Pressure transmitters, piezoresistive, 3-conductor system

The nominal ranges of types SN…311 mentioned in the Product Summary below can be limited by 50% of the nominal range via setting potentiometers of the evaluation electronics. The smallest settable operating range is indicated in column 2 of the Product Summary. The zero point can likewise be shifted by 50% of the nominal range.

Inversion of output signal possible on SN…-311 and …-395.

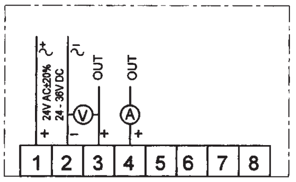
### Technical data

| | |
|---|---|
| **Pressure connection** | G 1/2 external, wrench size 27 |
| **Cable entry** | 2 x Pg 9 |
| **Degree of protection** | IP 65 |
| **Mounting** | Directly on pressure line |
| **Materials** | Sensor housing: 1.4571<br>Pressure diaphragm: 1.4435<br>Terminal housing: Makrolon |
| **Service life** | 100m cycles (typical) |
| **Dimensions** | See page 73. |
| **Operating voltage** | 24 V AC ± 20% or 24 V…36 V DC |
| **Power consumption** | max. 1 W |
| **Synchronization error of voltage and current output on SN 311** | max. ± 0.3% FS |
| **Load impedance** | 0–10 V impedance > 10 kOhm<br>4–20 mA impedance ≤ 650 Ohm |
| **Linearity error** | max. ± 0.5% FS |
| **Hysteresis** | max. ± 0.1% FS |
| **Temperature hysteresis** | max. ± 0.5% FS |
| **Reproducibility** | max. ± 0.1% FS |
| **Overall accuracy** | ≤ 1% |
| **Medium temperature** | –30 to 100°C |
| **Compensated range** | 0–100°C |
| **Temperature drift** | max. ± 0.04% FS/K |
| **Ambient temperature** | 0–50°C |
| **Inversion of output signal** | On SN…311 and SN 395 |
| **LED digital display (optional)** | Powered via transmitter. |
| **AZ 331** | No separate supply needed. |

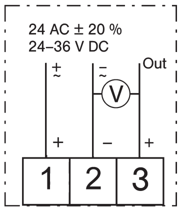
### Product Summary

| Operating range (nominal range) (bar) | Smallest settable operating range (bar) | Max. permissible pressure (bar) | Type |
|---|---|---|---|
| **2 output signals 0–10 V and 4–20 mA terminal connection, range adjustable** | | | |
| 0 – 0.25 | 0.125 | 0.75 | SN 025-311 |
| 0 – 0.6 | 0.3 | 1.8 | SN 06-311 |
| 0 – 1 | 0.5 | 3 | SN 1-311 |
| 0 – 2.5 | 1.25 | 7.5 | SN 3-311 |
| 0 – 6 | 3 | 18 | SN 6-311 |
| 0 – 10 | 5 | 30 | SN 10-311 |
| 0 – 25 | 12.5 | 70 | SN 25-311 |
| 0 – 40 | 20 | 80 | SN 40-311 |
| **Output signal 0–10 V plug connection, range adjustable via jumpers (50%, 20%)** | | | |
| 0 – 0.25 | 0.05 | 0.75 | SN 025-395 |
| 0 – 0.6 | 0.12 | 1.8 | SN 06-395 |
| 0 – 1 | 0.2 | 3 | SN 1-395 |
| 0 – 2.5 | 0.5 | 7.5 | SN 3-395 |
| 0 – 6 | 1.2 | 18 | SN 6-395 |
| 0 – 10 | 2 | 30 | SN 10-395 |
| 0 – 25 | 5 | 70 | SN 25-395 |
| 0 – 40 | 8 | 80 | SN 40-395 |

### Connection scheme SN…311




### Connection scheme SN 395

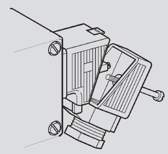



**Type series SN…395**
Output signal 0–10 V
Not adjustable, inversion **not** possible. Plug connection
(digital display AZ 331)

SN 280

# Type series SN…-280

**The low-voltage plugs on SN transmitters can be opened up. This simplifies fitting and also means that the supply voltage and output signal can be measured directly from the opened plug.**



**As-delivered condition**:
The transmitters are fully assembled in the factory (sensor + evaluation module + cover) and set to the nominal range. Additional modules and external modules are supplied separately.

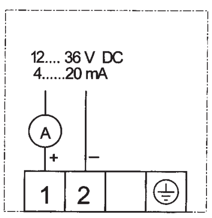
## Technical data

| | |
|---|---|
| **Electrical connection** | Plug connection DIN 43650 PG 11 |
| **Supply voltage** | 12 V…30 V DC |
| **Ambient temperature** | 0…+60°C |
| **Material** | Housing: Makrolon<br>Sensor: 1.4571<br>Diaphragm: 1.4435 |
| **Degree of protection** | IP 65 |
| **Included accessories** | Plug DIN 43650 |
| **Pressure connection** | G 1/2 external |
| **Wrench size** | 27 |
| **Installation** | Directly on pressure line |
| **Linearity** | ≤ 1% FS |
| **Compensated range** | 0–100°C |
| **Response time** | ≤ 10 ms |
| **Max. medium temperature** | –30…+110°C |
| **Measuring principle** | Piezoresistive |
| **Mounting** | Directly on pressure line |
| **Output signal** | 4…20 mA, impedance<br>≤ (UB–10 V) / 0.02 A |
| **Overall accuracy** | ≤ 1% FS<br>(fixed-point line) |
| **Ambient temperature** | 0…60°C |
| **Direction of action** | Rising pressure produces rising output signal |
| **Accessories** | Plug-in display AZG 241 |

## Product Summary

| Operating range (bar) | Operating range (kPa) | Max. pressure (bar) | Type |
|---|---|---|---|
| 0 – 0.25 | 0 – 25 | 0.75 | SN 025-280 |
| 0 – 0.6 | 0 – 60 | 1.8 | SN 06-280 |
| 0 – 1 | 0 – 100 | 3 | SN 1-280 |
| 0 – 1.6 | 0 – 160 | 6.4 | SN 2-280 |
| 0 – 2.5 | 0 – 250 | 7.5 | SN 3-280 |
| 0 – 4 | 0 – 400 | 16 | SN 4-280 |
| 0 – 6 | 0 – 600 | 18 | SN 6-280 |
| 0 – 10 | 0 – 1000 | 30 | SN 10-280 |
| 0 – 16 | 0 – 1600 | 48 | SN 16-280 |
| 0 – 25 | 0 – 2500 | 70 | SN 25-280 |
| 0 – 40 | 0 – 4000 | 80 | SN 40-280 |

**Connection scheme** SN…-280

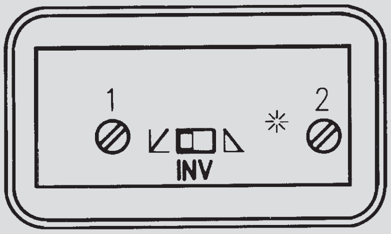



The power supply is connected to terminals 1+ / 2–

Degree of protection:
IP 65

# Type series SN 3

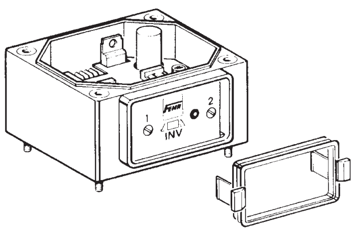
## Operator interface / operating ranges




**3-conductor systems (SN…–3)**
Adjusting elements:
1 = zero point
2 = end point
INV = direction of action (INVERSION)

**Optical indication of output signal via LED**
The LED becomes brighter as the output signal increases. A zero signal can be displayed by briefly operating the INV switch. With output signal "0" and the slide switch in the "INV" position, the LED is brightly lit.
**Do not forget to turn the switch back!**

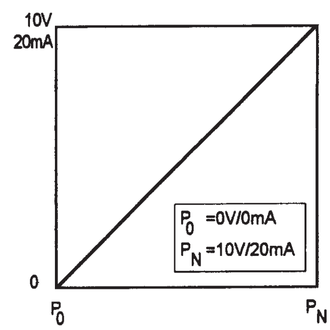
**Operator interface**
The adjusting elements are accessible after removing the cover glass on the evaluation module.

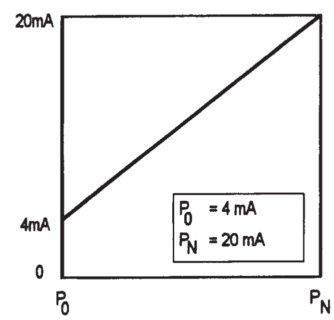



## Operating ranges are adjustable over a wide range

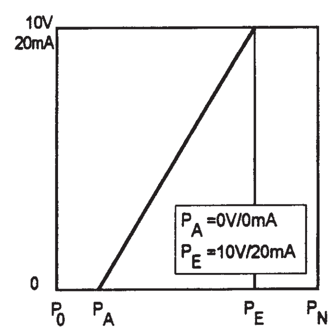
**Basic setting**
The factory default setting covers the nominal range $P_0$ (usually 0 bar) to $P_N$.

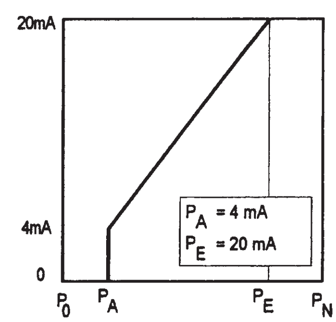
$P_0$ = Starting pressure of nominal range
$P_N$ = Nominal pressure (end point of nominal range)
$P_A$ = Starting pressure of set range
$P_E$ = End pressure of set range



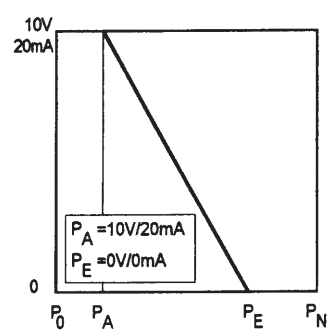




**Altering the range**
The range can easily be altered by shifting the zero point and adjusting the steepness of the characteristic curve.
Observe the correct sequence of adjustment (see next page).



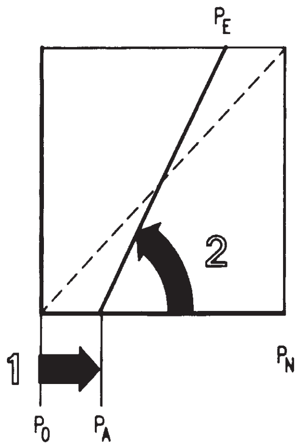

**Inversion**
(only on 3-conductor system)
The output signal can be inverted with the "INV" slide switch.




**Inversion not possible on 2-conductor system.**

# Type series SN 3

## Setting the operating range, testing




Preliminary remark: The transmitters are carefully set in the factory to the nominal range. If the operating range is changed to different values, the guaranteed accuracy no longer applies.
The attainable accuracy depends, among other things, on the care taken during adjustment.

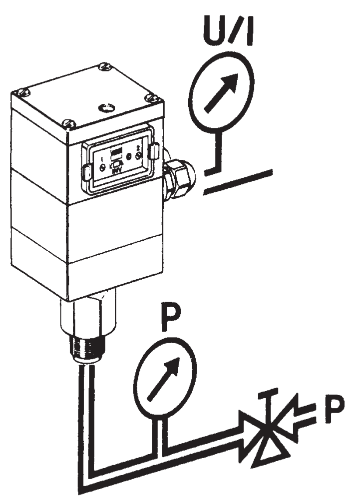
**Warm up the device before making adjustments.**
Accurate settings are only possible with the device at operating temperature; therefore connect the power supply approximately 10 minutes before starting to make adjustments.

## Setting operations must be carried out in the correct sequence

1. Apply minimum pressure $P_A$ to the sensor and set the output signal to 0 V or 4 mA with potentiometer 1.
2. Apply maximum pressure $P_E$ to the sensor. Set output signals to 10 V / 20 mA with potentiometer 2.
3. Check the settings.

**Important:** Always set the zero point with potentiometer 1 first, then set the amplification (end of range) with potentiometer 2.
For inversion of the output signal, operate slide switch INV and repeat the setting procedure in the same way. Inversion is only possible on 3-conductor systems.

**The plug-in digital display AZ facilitates accurate setting**
Digital display AZ 331 (additional module) can be very useful for setting operating ranges which differ from the nominal range. The digital display (factory setting 0–10 V) plugs into the connector 6 and shows the output signal continuously during the setting process.

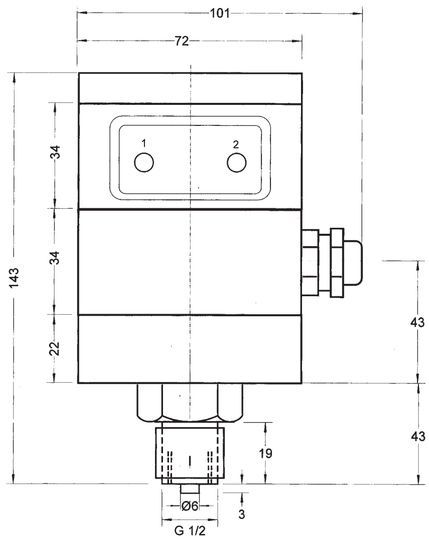



## Device arrangement for calibration and testing from outside the system

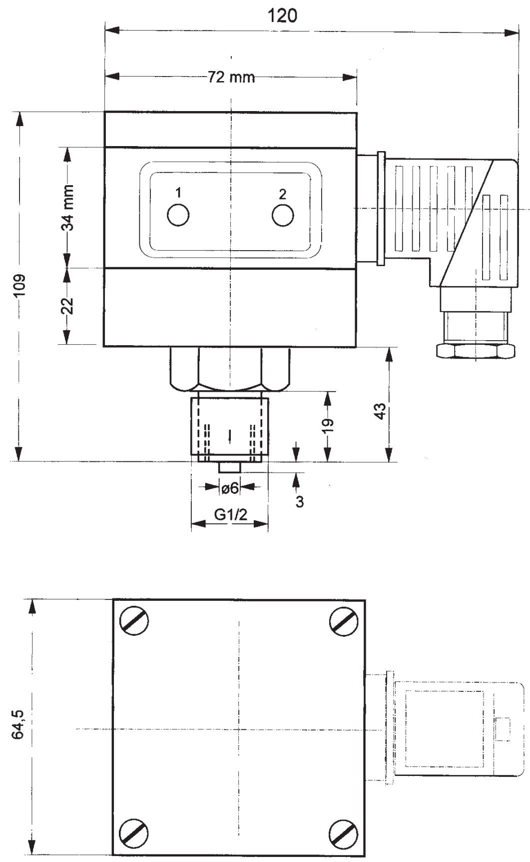
To check functioning or change the settings from outside the system, a test set-up is required which meets the following requirements:
1. It must be possible to apply pressure to the pressure transmitter up to the desired final value. The pressure must be displayed by a sufficiently accurate pressure gauge.
2. To display the output signal a voltmeter with a measuring range of 0–10 (preferably 0–15 V) or an ammeter with a display range of 0–20 mA (preferably 0–25 or 0–30 mA) are required.
3. To supply power to the transmitter, a 24 VAC or 24 VDC voltage source is needed.

# Type series SN

Dimensioned drawings



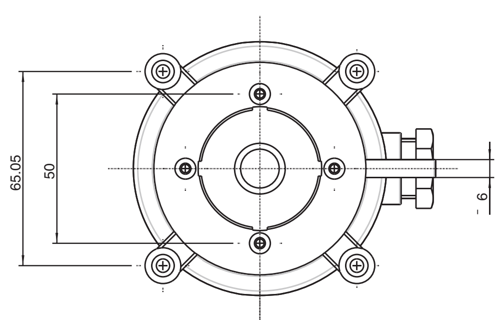

SN...311

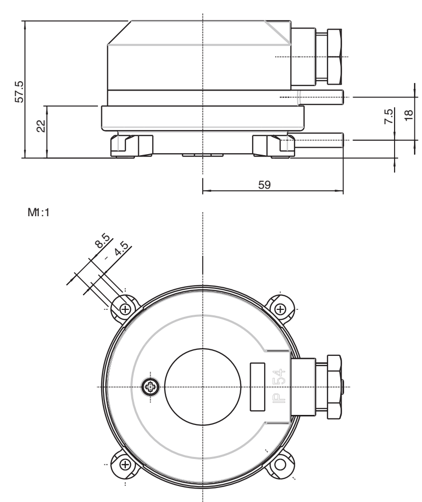



SN...-395/-280

# Type series DPT (D)

Dimensioned drawings



DPT 1000 D

# Type series DPT (D)

## Differential pressure transmitters

### Applications

- Air-conditioning and ventilation systems
- Building automation
- Environmental protection
- Fan and ventilator control
- Valve and shutter control
- Filter and fan monitoring
- Liquid and level monitoring
- Controlling of air flows

### 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 20 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 |
| **Optional accessories:** | DPSL L-shaped bracket for installation turned through 90°, e.g. in ceiling area |

### Product Summary

| Type | Default operating range in Pa | Operating range extended by jumpers in Pa | Over-pressure in kPa | Bursting pressure in kPa | Temperature error |
|---|---|---|---|---|---|
| **Versions with output voltage 0 - 10 V** | | | | | |
| DPT 50 | -50 … + 50 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 110 | -100 … +100 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 550 | -500 … +500 | not possible | 20 | 40 | ≤ ± 1% FS |
| DPT 1100 | -1000 …+1000 | not possible | 40 | 70 | ≤ ± 1% FS |
| DPT 100 | 0 - 100 | 0 - 250 | 20 | 40 | ≤ ± 5% FS |
| DPT 250 | 0 - 250 | 0 - 500 | 20 | 40 | ≤ ± 5% FS |
| DPT 500 | 0 - 500 | 0 - 1000 | 20 | 40 | ≤ ± 2.5% FS |
| DPT 1000 | 0 - 1000 | 0 - 2500 | 40 | 70 | ≤ ± 1% FS |
| **Versions with output voltage 0 - 10 V and digital display** | | | | | |
| DPT 50 D | -50 … +50 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 110 D | -100 … +100 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 550 D | -500 … +500 | not possible | 20 | 40 | ≤ ± 1% FS |
| DPT 1100 D | -1000 …+1000 | not possible | 40 | 70 | ≤ ± 1% FS |
| DPT 100 D | 0 - 100 | 0 - 250 | 20 | 40 | ≤ ± 5% FS |
| DPT 250 D | 0 - 250 | 0 - 500 | 20 | 40 | ≤ ± 5% FS |
| DPT 500 D | 0 - 500 | 0 - 1000 | 20 | 40 | ≤ ± 2.5% FS |
| DPT 1000 D | 0 - 1000 | 0 - 2500* | 40 | 70 | ≤ ± 1% FS |
| **Versions with current output 4 - 20 mA (3-conductor)** | | | | | |
| DPT 53 | -50 … + 50 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 113 | -100 … +100 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 553 | -500 … +500 | not possible | 20 | 40 | ≤ ± 1% FS |
| DPT 1103 | -1000 … +1000 | not possible | 40 | 70 | ≤ ± 1% FS |
| DPT 103 | 0 - 100 | 0 - 250 | 20 | 40 | ≤ ± 5% FS |
| DPT 253 | 0 - 250 | 0 - 500 | 20 | 40 | ≤ ± 5% FS |
| DPT 503 | 0 - 500 | 0 - 1000 | 20 | 40 | ≤ ± 2.5% FS |
| DPT 1003 | 0 - 1000 | 0 - 2500 | 40 | 70 | ≤ ± 1% FS |
| **Versions with current output 4 - 20 mA (3-conductor) and digital display** | | | | | |
| DPT 53 D | -50 … +50 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 113 D | -100 … +100 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT 553 D | -500 … +500 | not possible | 20 | 40 | ≤ ± 1% FS |
| DPT 1103 D | -1000 … +1000 | not possible | 40 | 70 | ≤ ± 1% FS |
| DPT 103 D | 0 - 100 | 0 - 250 | 20 | 40 | ≤ ± 5% FS |
| DPT 253 D | 0 - 250 | 0 - 500 | 20 | 40 | ≤ ± 5% FS |
| DPT 503 D | 0 - 500 | 0 - 1000 | 20 | 40 | ≤ ± 2.5% FS |
| DPT 1003 D | 0 - 1000 | 0 - 2500* | 40 | 70 | ≤ ± 1% FS |
| **Versions with current output 4 - 20 mA (2-conductor)** | | | | | |
| DPT52 | -50 … + 50 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT112 | -100 … +100 | not possible | 20 | 40 | ≤ ± 5% FS |
| DPT102 | 0 - 100 | 0 - 250 | 20 | 40 | ≤ ± 5% FS |
| DPT252 | 0 - 250 | 0 - 500 | 20 | 40 | ≤ ± 5% FS |
| DPT502 | 0 - 500 | 0 - 1000 | 20 | 40 | ≤ ± 2.5% FS |
| DPT1002 | 0 - 1000 | 0 - 2500 | 40 | 70 | ≤ ± 1% FS |

*pressure displayed in kPa

CE

Degree of protection:
IP 54/00

FEMA

# Type series AZ

## Digital display, plugs onto transmitter


AZ 331

AZ display modules show the output of a transmitter from the MODUFLEX system on an LED display.
On 3-conductor systems the supply and signal voltage is led from the evaluation module via ribbon cable. No additional wiring is needed.
The starting and end values of the display can be set anywhere between -50 and +1199, so that any display range can be assigned to any pressure range. The decimal point can be moved with a slide switch.
The y-signals of the transmitter can thus be displayed in any unit, e.g. V, mA, bar, mbar, %,°C, °F, psi, m, cm (filling level), $m^3$, $cm^3$ (volume) etc.

### Technical data

| | |
|---|---|
| **Display** | 3 1/2 digit LED display, 7 mm high, adjustable display range: –50 to +1999 |
| **Supply voltage** | 24 VAC or 24 VDC. Via ribbon cable from the basic module |
| **Signal voltage** | (input) 0–10 V. Signal input via ribbon cable from the evaluation module or from other modules. Signal input switchable with slide switch 9. Normal setting: D (output signal from evaluation module is displayed) |
| **Decimal point** | Set with slide switch |
| **Factory setting** | Input signal 0–10 V 0–10.00 ± 1 digit |
| **Power consumption** | Max. 1 W |
| **Degree of protection** | IP 65, in the installed state |
| **Dimensions** | Height: 1 module unit = 34 mm |

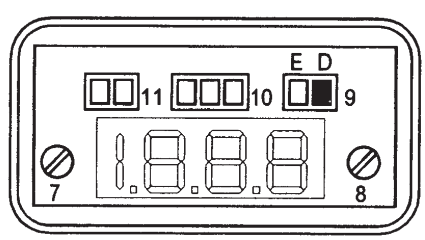
By setting the input selector switch 9 to position E, the unit can be made to display signals generated by other modules. Furthermore, in its condition on delivery (factory setting 0–10.0), the display module can be used for accurately setting the operating range of a transmitter. All controls are accessible from the front, after removing the window. After setting, reinsert the window and press it in evenly.

### Product Summary

| Type | Suitable for | Display | Display range |
|---|---|---|---|
| AZ 331 | 3-conductor systems | 3 1/2 digit | –50…+1999 |

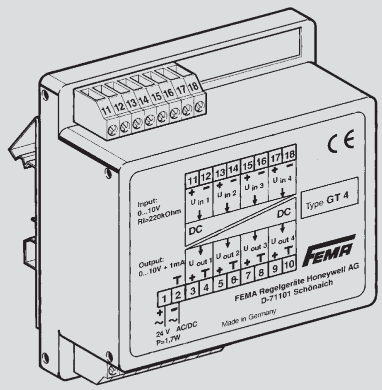
### Controls

| | |
|---|---|
| **Potentiometer 7** | For setting lower display value (e.g. for y-signal 0%) |
| **Potentiometer 8** | For setting upper display value (e.g. for y-signal 100%) |
| **Input selector switch 9** | Position D: Output signal of the evaluation module is displayed (normal setting)<br>Position E: Signal of another module is displayed |
| **Decimal point switch 10** | For setting the decimal point |
| **Decimal point switch 11** | Decimal point on/off |




**Operator interface**
AZ 331 (3 1/2 digit)

See above for description of controls.



GT 4

# Type series GT

## Electrical isolation of analogue transmitter signals

The analogue output signals of a transmitter can be electrically isolated from the evaluation device using a signal separator. In this way, interference affecting the transmitter signal can be suppressed and influences caused by ground loops prevented.

A signal separator is absolutely essential for transmitters whose output signals have to be transmitted over long distances and for signal lines which are exposed to strong electromagnetic radiation.

### Technical data

| | |
|---|---|
| **Supply voltage** | 24 V AC ± 20% or 24–36 V DC. |
| **Power consumption** | 1.7 W |
| **Inputs** | Voltage signals, e.g. 0–10 V, 2–10 V, 0–1 V and all voltage ranges between 0 and 10 V |
| **Input resistor** | Ri > 220 kOhm |
| **Outputs** | Voltage signals 1:1 from input signal, max. output signal current ± 1 mA |
| **Transformation ratio** | 1:1 |
| **Channels** | 4 channels, usable in parallel |
| **Linearity** | 0.1% FS |
| **Transmission error** | max. 0.1% FS |
| **Interference suppression** | Interference suppression N according to EN 50 081-1 and EN 50 082-1, class B |
| **Degree of protection** | IP 30 |
| **Protection class** | II |
| **Ambient temperature** | 0–50°C |
| **Mounting** | On mounting rail NS 35/7.5 to DIN 46 277 |

The 4-channel configuration and the limitation to voltage signals results in very good value for money. Signal separator GT 4 is designed for 4 input signals between 0 and 10 V (e.g. 0–10 V, 2–10 V, 0–5 V, 0–1 V). The input signal is conveyed to the output terminals in a ratio of 1:1. The input and output are electrically isolated.

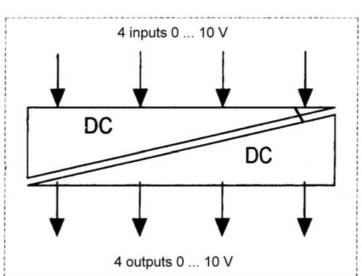
### Product Summary

| Type | Channels | Transformation | Operating range |
|---|---|---|---|
| GT 4 | 4 | 1 : 1 | between 0 and 10 V |

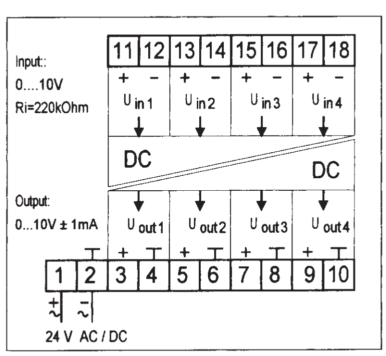
All 4 channels can be used in parallel and independently of one another; however, the input and output channels are not electrically isolated from one another.

Current signals of 0–20 mA or 4–20 mA in the input circuit can likewise be processed if a 500 ohm resistor with the requisite tolerance is attached to the input terminals. A proportional voltage signal is present at the output. The accuracy achieved in the separation of current signals and conversion into voltage signals essentially depends on the accuracy of the 500 ohm resistor that is used. With a resistor value of 500 ± 0.1%, a transmission accuracy of 0.3% is achieved.

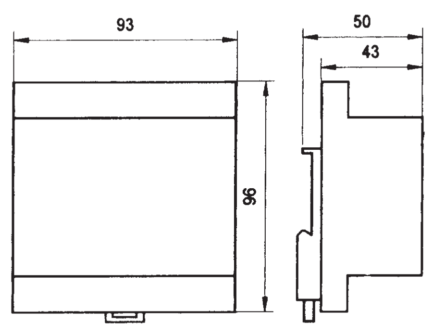
### Schematic diagram




### Connection scheme




### Dimensions



AP ...

# Type series AP

## with 1 or 2 limit value switches for PT100, PT1000 and voltage and current signals

Various routines for setting the following parameters are integrated into the microprocessor-controlled digital display:
· Measuring range (start and end point)
· Display range (start and end point)
· Setting of decimal point
· 2 limit values (relays) and their hysteresis
· Relay dropout or pickup delay
· Scanning of minimum and maximum measured value
· Rounding up or down of last digit
· Averaging

### Technical data

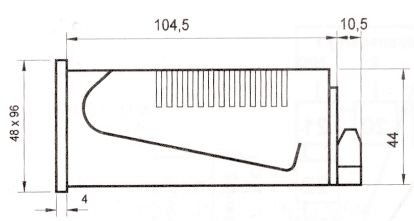
| | |
|---|---|
| **Input signals** | Freely selectable by setting jumpers. See Product Summary |
| **Housing front** | 48 x 96 mm (DIN) |
| **Dimension display** | On APT: °C<br>On APV: none |
| **Display** | 3 1/2 digit, LED 12.5 mm, red, automatic "–" sign |
| **Display range** | See Product Summary Other ranges adjustable |
| **Decimal point** | Programmable |
| **Measuring rate** | 2.5 measurements/second |
| **Keyboard lockable** | with jumper (prevents input of commands) |
| **Switching outputs programmable** | 2 x NO/NC contacts |
| **Switching capacity of output relay** | 2 x 230 V, 5 A AC |
| **Supply voltage** | 230 V, 50–60 Hz, 3 VA |
| **Degree of protection (front)** | IP 60, DIN 40 050 |
| **Working temperature** | –10 to +50°C |
| **Connection method** | Lift terminals |
| **Front panel cut-out** | H x W: 44.5 x 90.5 mm |
| **Max. installation depth** | 115 mm |

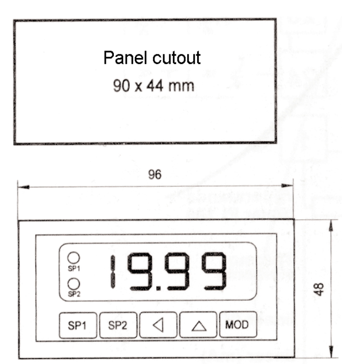
All routines and parameters can be set with keys on the front. The switching status of the relays is displayed by LEDs. Setting is buffered. If the supply voltage is interrupted, the set parameters are retained. For powering transmitters, an electrically isolated 24 VDC power supply (max. 30 mA) is available.

### Product Summary

| Type | Input signals (programmable) | Display range (programmable) | Suitable for | Stages |
|---|---|---|---|---|
| APV 600<br>APV 630 | 0–1 V DC<br>0–10 V DC<br>0–20 mA DC | –1999<br>to<br>+1999 | Pressure and temperature transmitters | 1 switching point<br>2 switching points |
| APT 600<br>APT 650 | Pt 100 / Pt 1000 | –150°C to +199.9°C<br>–200°C to +800°C | Temperature sensors Pt 100 / Pt 1000 | 1 switching point<br>2 switching points |

### Dimensions



# Specifications

## Pressure switches/isolating amplifiers/ flow monitoring

**F + ED 1**
**Pressure transmitter** of modular design with terminal connection; operating range adjustable, supply voltage: 24 V AC/DC, nominal range …–… mbar/bar. Smallest range … mbar/bar
Output signal (invertible): 0–10 V **and** 0–20 mA
Output signal short-circuit and surge-proof up to 24 V, with plug connector for further plug-in modules (e.g. digital display); type F…+ ED 1

**F + ED 3**
**Pressure transmitter** of modular design with openable plug connection to DIN 43 650
Operating range adjustable, supply voltage: 24 V AC/DC, nominal range …–… mbar/bar. Smallest range … mbar/bar Output signal (invertible): 0–10 V, output signal short-circuit and surge-proof up to 24 V, with plug connector for further plug-in modules (e.g. digital display);
type F…+ ED 3

**SN…311**
**Pressure transmitter** of modular design with terminal connection; operating range adjustable via 2 potentiometers, supply voltage: 24 V AC/DC, nominal range …–… mbar/bar. Smallest range … mbar/bar Output signal (invertible): 0–10 V **and** 0–20 mA, output signal short-circuit and surge-proof up to 24 V, with plug connector for further plug-in modules (e.g. digital display); type SN…-311

**SN…395**
**Pressure transmitter** of modular design with openable plug connection to DIN 43 650, operating range adjustable via jumpers to 100%, 50%, 20% of nominal range, supply voltage: 24 V AC/DC, range …–… mbar/bar Output signal: 0–10 V, output signal short-circuit and surge-proof up to 24 V, with plug connector for further plug-in modules (e.g. digital display);
type SN…-395

**SN…280**
**Pressure transmitter** of modular design with openable plug connection to DIN 43 650 Supply voltage: 11–36 V DC, range …–… mbar/bar, output signal: 4–20 mA (two-conductor) Output signal short-circuit and surge-proof up to 24 V; type SN…-280

**PST…**
**Electronic pressure switch/transmitter** with 5-pole 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

**DPT…**
**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…

**AZ…**
**Plug-in digital display** (LED, 7 mm high),
3 1/2 digit, supply voltage and signal voltage via basic module, display range adjustable;
type AZ 331

**GT 4**
**Signal separator**, 4-channel, for standard rail-mounting, for electrical isolation of analogue transmitter signals between 0 V and 10 V, transformation ratio: 1:1, supply voltage:
24 V AC/DC; type GT 4

**APV 630**
**Programmable digital display with 2 limit value switches** for panel surface mounting (standard dimensions 48 x 96 mm), 3 1/2 digit LED display, 12.5 mm, red, input signals:
0–1 VDC, 0–10 VDC, 0–20 mA DC,
programmable operating range and switching point, supply voltage: 230 V AC; type APV 630

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