Pressure Switches
Application Guideline
Honeywell

Product Overview

The Fema Pressure Switch product portfolio provides devices suitable for many applications. The portfolio contains Special functions and equipment as well as approved devices for several kinds of applications, where component-tested devices are mandatory.

All Sensors are tightness-tested with helium.

Following overview shows features and functions of Fema Pressure Switches.

Pressure Switches for standard applications

For Pressure monitoring and pressure controlling (ON/OFF controller). Pressure range from vacuum up to 63 bar overpressure, Series DCM…/DNM…/VCM…

Variants and types:
- Screw terminals instead of plug
- enhanced IP Protection
- Ex-versions available
- plastic-coated housing for aggressive environment
- 2-step switch
- different switching elements

Overpressure & Vacuum Switches in Stainless Steel

All medium contacted parts made of Stainless Steel 1.4571. Variants & types according to above sections are possible. Pressure range from vacuum up to 16 bar.

Pressure Monitor and Pressure Limited

for Steam, Hot Water, Fuel gases, Liquid gases and Fuel Oil

with all necessary component tests according to TÜV, DVGW, DIN.

Pressure range up to 40 bar.

Type series DA; DWR…/DGM…

Pressure Limiter featuring Safety Technology

Wherever there is a demand for high safety level monitoring supply line breaks and short circuits.

- together with Ex 041 Switching amplifier for EEx-i-applications suitable
- With plastic-coated housing suitable for chemical applications
- Pressure range up to 40 bar, type series DBS…

Variants and types
- self-monitoring sensor
- gold contacts for EEx-i versions
- constrained-opened microswitch

Differential Pressure Monitors

Differential Pressure Monitors to control the difference between 2 measuring points. Mostly used for monitoring filter and pump function. Available types for measuring differential pressure in liquid flow systems, as well as air flow applications.

Differential Pressure Switch types available up to 16 bar.
10 criteria to observe in the selection of a pressure monitor / pressure limiter

<table>
<thead>
<tr>
<th>CHECKLIST</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medium</strong></td>
<td>Steam, hot water, fuel gases, air, flue gases, liquefied gas, liquid fuels, other media</td>
</tr>
<tr>
<td><strong>Sensor material</strong></td>
<td>Stainless steel, non-ferrous metals, plastics (e.g. Perbunan). Are all sensor materials resistant to the medium? Oil- and grease-free for oxygen?</td>
</tr>
<tr>
<td><strong>Type approval</strong></td>
<td>Is a type approval (TÜV, DVGW, PTB, etc.) required for the intended application?</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>Monitor, limiter (with internal or external interlock). Pressure limiter in safety engineering?</td>
</tr>
<tr>
<td><strong>Direction of action</strong></td>
<td>Should the maximum pressure or the minimum pressure be monitored? Does the pressure switch have a controller function (e.g. pump on and off)?</td>
</tr>
<tr>
<td><strong>Setting range</strong></td>
<td>Select the desired setting range from the type overviews.</td>
</tr>
<tr>
<td><strong>Switching difference</strong></td>
<td>The adjustable switching difference is important only for pressure switches with controller function. The switching differential (hysteresis) has no significance for limiter functions.</td>
</tr>
<tr>
<td><strong>Max. permissible operating pressure</strong></td>
<td>The maximum permissible operating pressure listed in the tables must be equal or greater than the maximum system pressure.</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td>Medium temperature / ambient temperature / type of protection / humidity / Ex zone / Outdoor installation – protective measures</td>
</tr>
<tr>
<td><strong>Design / Size</strong></td>
<td>Size, installation position, installation possibility, pressure connection with gasket.</td>
</tr>
<tr>
<td><strong>Pressure connection</strong></td>
<td>Switching element / change-over contact / normally closed contact / normally open contact / switching capacity / interlocking / gold contacts / contactless signal transmission.</td>
</tr>
</tbody>
</table>

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 monitoring in explosion-endangered areas

Pressure switches with special equipment can also be used in the Ex area Zone 1 and 2. The following alternatives are possible:

1. **Pressure switch with pressure-proof encapsulated switching device, degree of protection EEx de IIC T6**
   - The pressure switch in pressure-proof encapsulation can be used directly in the Ex area (Zone 1 and 2).
   - Maximum switching voltage, switching capacity, and ambient temperature must be taken into account and the rules for the installation in the Ex area must be observed. All pressure switches can be equipped with Ex switching mechanisms. Special circuits as well as versions with adjustable switching differences are not possible.

2. **Pressure switches in EEx-i-version**
   - All pressure switches in normal version can be used in the Ex area Zone 1 and 2, if they are incorporated in an “intrinsically safe circuit”. In principle, the intrinsic safety is based on the fact that the control circuit run in the Ex area carries only a small amount of energy, which is not able to generate ignitable sparks.
   - Isolating switching amplifiers, e.g. Type Ex 011 or Ex 041 must be tested by the PTB and approved for Ex-installations. Isolating switching amplifiers must in any event be installed outside the Ex zone.
   - Pressure switches which are intended for EEx-ia installations can be equipped with blue terminals and cable entries. Because of the low voltages and currents which are carried by the contacts of the microswitch, gold plated contacts are recommended (optional function ZF 513).

3. **Pressure switches with microswitch and series resistor for wire breakage and short circuit monitoring**
   - A combination of pressure switch with mechanical microswitch connected with a 1.5 kΩ series resistor and a 10 kΩ parallel resistor and an isolating switching amplifier in safety technology (Type Ex 041) can also be used for Ex zone 1 and 2 (degree of protection EEx-ia). The isolating switching amplifier in safety technology generates an intrinsically safe control circuit and simultaneously monitors the supply line between the isolating switching amplifier and pressure switch for short circuit and line break.
   - Please refer to the chapter on pressure switches in safety technology and data sheet Ex 041.

**Pressure monitoring in Ex areas Zone 1 and 2**

- **Ex-D…**
  - Flameproof enclosed
  - Ignition protection type: EEx de IIC T6
  - PTB approval for the complete switchgear
  - Switching capacity at 230 V / 3 A.
  - The pressure switch can be installed inside the Ex zone.
  - ATEX-approval for gas and dust in preparation.

- **D…-513 + Ex 011**
  - Intrinsically safe
  - Ignition protection type: EEx-ia
  - PTB approval for isolation switching amplifiers Ex 011.
  - Pressure switches with gold-plated contacts, blue terminals and blue cable entries.
  - The isolation switching amplifier must be installed outside the Ex zone.

- **DWAM…-576 + Ex 041**
  - Intrinsically safe, line break and short circuit monitoring
  - Ignition protection type: EEx-ia
  - PTB approval for isolation switching amplifiers Ex 041.
  - Pressure switches with safety sensor, forced opening micro-switch, gold-plated contacts blue terminals and blue cable entries.
  - The isolation switching amplifier must be installed outside the Ex zone.
Switch housings for pressure switches

The switching housings consists of high quality and seawater-resistant aluminium diecastings. Three versions are available:

**Housing 200 (normal version)**
Plug connection to DIN 43650
Degree of protection IP 54
Setpoint setting accessible from the outside.

**Housing 300**
With terminal connection box
Degree of protection IP 65
Setpoint setting and terminal connections accessible only after removal of the terminal box lid.

**Housing 700 (EEx-d-version)**
All pressure and differential pressure switches can be equiped with these switching housings and are thus approved for Ex zones 1 + 2.
Degree of protection IP 65.
Ex degree of protection EEx de IIC T6.

Component tests

Special type series have been developed for special applications in the safety area:

- **Steam and hot water** (Series DWR and DA)
  Pressure monitors and pressure limiters for steam and hot water in systems to DIN 4751 P2 and TRD 604.

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

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

- **Pressure limiters in safety engineering**
  For safety-relevant pressure monitoring in liquid gas systems, chemical and processing engineering systems.

**Ex-versions**
For Ex-areas Zone 1 + 2, all pressure switches can be delivered in pressure-proof encapsulated design (Ex-degree of protection EEx de IIC T6). PTB approval: Ex-90.C.1059.
ATEX-approval for gas and dust in preparation.

- **EEx-ia** (intrinsically safe)
  For intrinsically safe control circuits (Ex-degree of protection EEx-ia), the pressure switches can be delivered with gold contacts, EEx-ia as well as with the blue terminals and cable entries customary in the EEx-ia area.
  An isolating switching amplifier, which transfers the control commands of the pressure switch from an intrinsically safety control circuit (EEx-ia) into a non-intrinsically safe active circuit, is required in addition to the pressure switch.
  ATEX-approval for gas and dust in preparation.

### Switch housings

<table>
<thead>
<tr>
<th>Housing 200 (normal version)</th>
<th>IP 54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug connection to DIN 43650</td>
<td></td>
</tr>
<tr>
<td>Degree of protection IP 54</td>
<td></td>
</tr>
<tr>
<td>Setpoint setting accessible from the outside.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Housing 300</th>
<th>IP 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>With terminal connection box</td>
<td></td>
</tr>
<tr>
<td>Degree of protection IP 65</td>
<td></td>
</tr>
<tr>
<td>Setpoint setting and terminal connections accessible only after removal of the terminal box lid.</td>
<td></td>
</tr>
</tbody>
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</tr>
<tr>
<td>Degree of protection IP 65</td>
<td></td>
</tr>
<tr>
<td>Ex degree of protection EEx de IIC T6.</td>
<td></td>
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### Component tests

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  ATEX-approval for gas and dust in preparation.
Technical overview pressure switches

Valid for all pressure switch with microswitches of the DCM, VCM, DNM, DNS, DDC series. The technical data of the component tested units deviate in part slightly. (Please refer to type sheet)

All pressure switches can operate under vacuum, the device is not damaged by this.

< 1 % of the working range (for pressure ranges > 1 bar)

Up to 4 g no noteworthy deviations.

With sinusoidal pressure application and room temperature, 10 x 10^6 switching cycles. The expected life time depends strongly upon the type of pressure application, therefore this figure can serve only as rough estimate. With pulsating pressure or pressure impacts in hydraulic systems, pressure surge reduction is recommended.

Overvoltage category III, contamination class 3, reference surge voltage 4000 V.

The conformity to DIN VDE 0110 (01.89) will be confirmed.

The parts of all pressure switches in contact with the medium are oil and grease-free (with the exception of series HCD… und DPS…).

The sensors are hermetically encapsulated, they contain no seals (see also additional function ZF 1979, special packing).

Vacuum

All pressure switches can operate under vacuum, the device is not damaged by this.

Repetition accuracy of the switching points

< 1 % of the working range (for pressure ranges > 1 bar)

Vibration strength

Up to 4 g no noteworthy deviations.

Mechanical life

With sinusoidal pressure application and room temperature, 10 x 10^6 switching cycles. The expected life time depends strongly upon the type of pressure application, therefore this figure can serve only as rough estimate. With pulsating pressure or pressure impacts in hydraulic systems, pressure surge reduction is recommended.

Isolation values

Overvoltage category III, contamination class 3, reference surge voltage 4000 V. The conformity to DIN VDE 0110 (01.89) will be confirmed.

Oil and grease-free

The parts of all pressure switches in contact with the medium are oil and grease-free (with the exception of series HCD… und DPS…).

The sensors are hermetically encapsulated, they contain no seals (see also additional function ZF 1979, special packing).
Optional function ZF

Pressure Switches and Pressure Monitors

Optional function / connection diagrams

<table>
<thead>
<tr>
<th>Description</th>
<th>Plug connection</th>
<th>Terminal connection</th>
<th>Connection diagrams</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal version (plug connection) microswitch, single pole switching over, switching differential not adjustable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal connection housing (Series 300)</td>
<td>...301</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment of switching difference</td>
<td>...V or ...203</td>
<td></td>
<td>see following pages</td>
<td></td>
</tr>
<tr>
<td>Maximum limiter with reclosing lock-out. Interlocking with increasing pressure. see DWR-series</td>
<td>...205</td>
<td></td>
<td>see DWR-series 29</td>
<td></td>
</tr>
<tr>
<td>Minimum limiter with reclosing lock-out. Interlocking with falling pressure. see DWR-series</td>
<td>...206</td>
<td></td>
<td>see DWR-series 29</td>
<td></td>
</tr>
<tr>
<td>Two microswitches, switching in parallel or in succession. Fixed switching interval. Terminal connection case. Please state circuit diagram. (not possible on every pressure switch)</td>
<td>...307</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two microswitches, 1 plug switching in succession, adjustable switching interval. Please state circuit diagram. (not possible on every pressure switch)</td>
<td>...217</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold-plated contacts Single pole switching over. Cannot be supplied with adjustable switching difference.</td>
<td>...213</td>
<td></td>
<td>Switching capacity: max. 24 VDC, 100 mA min. 5 VDC, 2 mA</td>
<td></td>
</tr>
</tbody>
</table>

Switching units / optional functions / Adjustment / Documents

<table>
<thead>
<tr>
<th>Description</th>
<th>Plug connection</th>
<th>Terminal connection</th>
<th>Connection diagrams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug connector with position indication 12 V–240 VAC/DC</td>
<td>ST 218</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection type IP 65 and switching housing with surface protection (Chemical version)</td>
<td></td>
<td>...351</td>
<td></td>
</tr>
</tbody>
</table>

Example:
DCM 6 – 205
Code of switching unit (e.g. maximum limiter)
Code of pressure range
Sensor system

Ordering text:
Pressure switch
DCM 6 – 205
or DCM 6 with ZF 205
**Optional function ZF**

**Pressure Switches and Pressure Monitors**

**Optional function for EEx-i equipment ZF 5…**

- Housing (300) with terminal connection (IP 65), blue cable entry and blue terminals.
- Partially with resistance combination for line breakage and short circuit monitoring (with isolating switching amplifier Ex 041).

**Important:**
All pressure switches with the optional functions listed here can be operated only together with a suitable isolating switch amplifier.

<table>
<thead>
<tr>
<th>Optional function in EEx-i equipment</th>
<th>Type</th>
<th>Connection diagram</th>
<th>Isolating switching amplifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold-plated contacts, single-pole switch-over. Switching differential permanent (not adjustable). Switching capacity: max. 24 VDC, 100 mA, min. 5 VDC, 2 mA</td>
<td>…513</td>
<td><img src="Insert%20Diagram%20Here" alt="Connection Diagram" /></td>
<td>EX 011</td>
</tr>
<tr>
<td>Normally closed contact with resistance combination, for maximum pressure monitoring. Gold-plated contacts. Housing with surface protection. (Chemical version)</td>
<td>…576</td>
<td><img src="Insert%20Diagram%20Here" alt="Connection Diagram" /></td>
<td>EX 041</td>
</tr>
<tr>
<td>Normally closed contact with reclosing lock-out and resistance combination, for maximum pressure monitoring. Housing with surface protection. (Chemical version)</td>
<td>…577</td>
<td><img src="Insert%20Diagram%20Here" alt="Connection Diagram" /></td>
<td>EX 041</td>
</tr>
<tr>
<td>Normally closed contact with resistant combination for minimum pressure monitoring. Gold-plated contacts. Housing with surface protection. (Chemical version)</td>
<td>…574</td>
<td><img src="Insert%20Diagram%20Here" alt="Connection Diagram" /></td>
<td>EX 041</td>
</tr>
<tr>
<td>Normally closed contact with reclosing lock-out and resistance combination, for minimum pressure monitoring. Housing with surface protection. (Chemical version)</td>
<td>…575</td>
<td><img src="Insert%20Diagram%20Here" alt="Connection Diagram" /></td>
<td>EX 041</td>
</tr>
</tbody>
</table>

**Adjustment optional functions**

Adjustment according to customer’s instruction:
- one switching point: …1970* …1970* …1970*
- two switching points or defined switching differential: …1972* …1972* …1972*

Adjustment and sealing according to customer’s instruction:
- one switching point: …1971* – –
- two switching points or defined switching differential: …1973* – –

Certification for Helium tightening test:

Label of units according to customer’s instruction:

Special packing for oil and grease-free storage:
- …1979 …1979 …1979

Documents:
- additional documents, e.g. data sheets, mounting instructions, TÜV-, DVGW- or PTB-certificate: DOKU DOKU DOKU

Certificates according to EN 10 204
- Test report 2.2, type series certificate: WZ 2.2 WZ 2.2 WZ 2.2
- AZ 3.1 B Inspection certificate, specific product test: AZ 3.1 B AZ 3.1 B AZ 3.1 B
- Inspection certificate for separating membranes FV: AZ 3.1 B–V AZ 3.1 B–V AZ 3.1 B–V

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