

Maintenance Indicators

1. Features

Filter elements are economically used only if their dirt holding capacity is fully exploited. This is achieved by using filter housings with a maintenance indicator.

MAHLE manufactures maintenance indicators of the following designs:

- Differential pressure indicators
- Pressure indicators/switches/gauges
- Vacuum switches/gauges

With any filter element the collection of dirt particles continuously reduces the number of open pores or, in other words: The open cross section for allowing the liquid to flow is continuously reduced. Thus the pressure on the upstream side of the element (dirt side) increases continuously.

With pressure filters, the pressure is measured upstream and downstream of the filter element (differential pressure). With return line filters the pressure is measured only on the upstream side because, depending on the tank design, atmospheric pressure exits on the downstream side of the filter element is measured analog. With suction filters the vacuum is measured downstream.

A piston with attached magnet is moved against the force of a spring, with which the indicating point is determined by the piston surface. A homopolar poled magnet is fitted in the outer part in the indicating button.

The closer the pole-springs move towards each other, the stronger is the force with the magnets mutually repel, until finally the red button on the indicator pops out.

This red button remains visible until it is pushed in during the daily check which is to be performed while the plant is at operating temperature. If the button pops out immediately after being pushed in, the filter element must be replaced latest at the end of the shift.

This optical function may also be used for generating contactless electrical signals. For this purpose an electrical upper part is pushed over the hydraulic/optical part. This upper part incorporates all electrical switching elements.

- Optical and electrical indicator with standard check function
- Normally open/normally closed combination - standard feature
- Electrical function, easy to install at a later time
- Two-step indication, at 75 % and 100 % optional
- Signal lock out up to approx. 30 °C optional
- Rugged, non-bypass design
- Optimal element exploitation
- Worldwide distribution



2. Differential pressure indicators

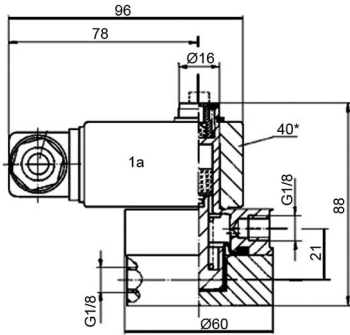


Fig. 1

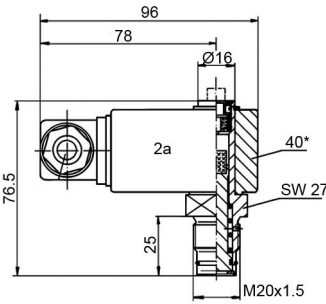


Fig. 2

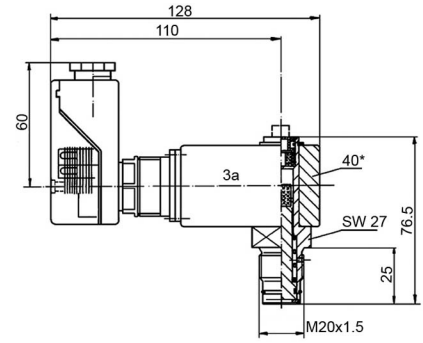


Fig. 3

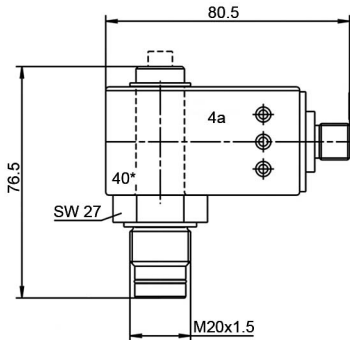


Fig. 4

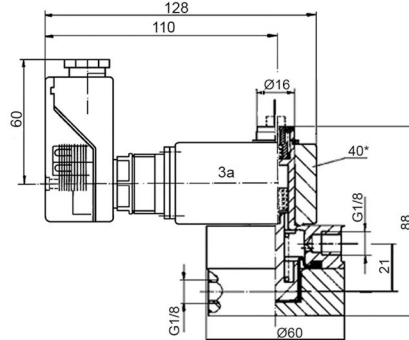


Fig. 15

40* = 40 mm wide

Differential pressure indicators

| Nominal pressure [bar] | Temperature [°C] | Type | Order number | Indicator setting [bar] | Indication | Contact type* | Fig. | Material lower section | Material upper section |
|------------------------|------------------|----------|--------------|-------------------------|----------------|---------------|-------------|------------------------|------------------------|
| 10 | -10 - +120 | PiS 3087 | 77738990 | 1.2 | visual | - | 1 | Al | PA 6 |
| | | PiS 3086 | 77737513 | | visual/electr. | 1 | 1 + 1a | | |
| | | PiS 3104 | 78236994 | | visual/electr. | 4 | 1 + 3a (15) | | |
| 160 | -10 - +120 | PiS 3098 | 77669971 | 2.2 | visual | - | 2 | Al | PA 6 |
| | | PiS 3097 | 77669948 | | visual/electr. | 1 | 2 + 2a | | |
| | | PiS 3116 | 78308074 | | visual/electr. | 3 | 2 + 2a | | |
| | | " " M12 | 79764028 | | visual/electr. | 10 | 4 + 4a | | |
| 160 | -10 - +120 | PiS 3119 | 78309122 | 1.7/2.2 | visual/electr. | 2 | 2 + 2a | Al | PA 6 |
| | | PiS 3012 | 78308454 | | visual/electr. | 4 | 3 + 3a | | |
| | | PiS 3131 | 79760869 | | visual/electr. | 5 | 3 + 3a | | |
| | | PiS 3141 | 79761859 | | visual/electr. | 6 | 3 + 3a | | |
| | | PiS 3151 | 79761909 | | visual/electr. | 8 | 4 + 4a | | |
| | | PiS 3154 | 76300339 | | visual/electr. | 9 | 4 + 4a | | |
| | | PiS 3157 | 76326706 | | visual/electr. | 11 | 4 + 4a | | |
| 160 | -10 - +120 | PiS 3098 | 77938582 | 3.5 | visual | - | 2 | Al | PA 6 |
| | | PiS 3097 | 78236648 | | visual/electr. | 1 | 2 + 2a | | |
| 160 | -10 - +120 | PiS 3098 | 77669989 | 5.0 | visual | - | 2 | Al | PA 6 |
| | | PiS 3097 | 77669955 | | visual/electr. | 1 | 2 + 2a | | |
| | | PiS 3116 | 78308082 | | visual/electr. | 3 | 2 + 2a | | |
| 160 | -10 - +120 | PiS 3119 | 78309130 | 3.7/5.0 | visual/electr. | 2 | 2 + 2a | Al | PA 6 |
| | | PiS 3012 | 78308447 | | visual/electr. | 4 | 3 + 3a | | |
| | | PiS 3157 | 76326714 | | visual/electr. | 11 | 4 + 4a | | |
| | | PiS 3131 | 79760877 | | visual/electr. | 5 | 3 + 3a | | |
| | | PiS 3141 | 79761867 | | visual/electr. | 6 | 3 + 3a | | |
| | | PiS 3151 | 79761917 | | visual/electr. | 8 | 4 + 4a | | |
| | | PiS 3154 | 76300321 | | visual/electr. | 9 | 4 + 4a | | |

| Differential pressure indicators | | | | | | | | | |
|----------------------------------|------------------|--------------|--------------|-------------------------|----------------|---------------|--------|------------------------|------------------------|
| Nominal pressure [bar] | Temperature [°C] | Type | Order number | Indicator setting [bar] | Indication | Contact-type* | Fig. | Material lower section | Material upper section |
| 400 | -10 - +120 | PiS 3093 | 77669898 | 2.2 | visual | - | 2 | CuZn | PA 6 |
| | | PiS 3092 | 77669856 | | visual/electr. | 1 | 2 + 2a | | |
| | | PiS 3115 | 78308041 | | visual/electr. | 3 | 2 + 2a | | |
| 400 | -10 - +120 | PiS 3105 | 77970387 | 1.7/2.2 | visual/electr. | 2 | 2 + 2a | CuZn | PA 6 |
| | | PiS 3102 | 77942139 | | visual/electr. | 4 | 3 + 3a | | |
| | | PiS 3132 | 79760919 | | visual/electr. | 5 | 3 + 3a | | |
| | | PiS 3142 | 79761875 | | visual/electr. | 6 | 3 + 3a | | |
| | | PiS 3152 | 79761925 | | visual/electr. | 8 | 4 + 4a | | |
| | | PiS 3155 | 76300354 | | visual/electr. | 9 | 4 + 4a | | |
| | | PiS 3158 | 76326722 | | visual/electr. | 11 | 4 + 4a | | |
| 400 | -10 - +120 | PiS 3093 | 77669914 | 5.0 | visual | - | 2 | CuZn | PA 6 |
| | | PiS 3092 | 77669864 | | visual/electr. | 1 | 2 + 2a | | |
| | | PiS 3115 | 78308058 | | visual/electr. | 3 | 2 + 2a | | |
| | | PiS 3115 M12 | 79764010 | | visual/electr. | 10 | 4 + 4a | | |
| 400 | -10 - +120 | PiS 3105 | 77970395 | 3.7/5.0 | visual/electr. | 2 | 2 + 2a | CuZn | PA 6 |
| | | PiS 3102 | 77942147 | | visual/electr. | 4 | 3 + 3a | | |
| | | PiS 3155 | 76300362 | | visual/electr. | 9 | 4 + 4a | | |
| | | PiS 3132 | 79760919 | | visual/electr. | 5 | 3 + 3a | | |
| | | PiS 3142 | 79761883 | | visual/electr. | 6 | 3 + 3a | | |
| | | PiS 3152 | 79761933 | | visual/electr. | 8 | 4 + 4a | | |
| | | PiS 3158 | 76326730 | | visual/electr. | 11 | 4 + 4a | | |
| 400 | -10 - +120 | PiS 3093 | 77669880 | 8 | visual | - | 2 | CuZn | PA 6 |
| | | PiS 3092 | 77669872 | | visual/electr. | 1 | 2 + 2a | | |
| | | PiS 3115 | 78308066 | | visual/electr. | 3 | 2 + 2a | | |
| 450 | -10 - +120 | PiS 3193 | 77844061 | 2.2 | visual | - | 2 | 1.4301 | PA 6 |
| | | PiS 3192 | 78308488 | | visual/electr. | 1 | 2 + 2a | | |
| | | PiS 3110 | 79353574 | | visual/electr. | 7 | 3 + 3a | | |
| 450 | -10 - +120 | PiS 3193 | 78308538 | 5.0 | visual | - | 2 | 1.4301 | PA 6 |
| | | PiS 3192 | 78308546 | | visual/electr. | 1 | 2 + 2a | | |
| | | PiS 3110 | 79353582 | | electrical | 7 | 3 + 3a | | |

*Contact type

- 1 Normally open/normally closed; 1 setting point; wiring box DIN EN 175301-803; max. 250 V AC/200 V DC; max. 1 A
- 2 Normally closed; 2 setting points; wiring box DIN EN 175301-803; max. 150 V; max. 1 A
- 3 Change-over contact; 1 setting point; wiring box DIN EN 175301-803; max. 150 V; max. 1 A
- 4 Change-over contact; 2 setting points; LED; Mercedes Benz Norm DBL 9666 EA; wiring box DIN EN 175201-804; max. 10-30 V; max. 1 A
- 5 Change-over contact; 2 setting points; LED; signal suppression; time delay; wiring box DIN EN 175201-804; 10-30 V; max. 1 A
- 6 Change-over contact; 2 setting points; LED; signal suppression; wiring box DIN EN 175201-804, 10-30 V; max. 1 A
- 7 Analog signal 4-20 mA; 2 setting points; LED; signal cold start; wiring box DIN EN 175201-804; 24 V; max. 1 A
- 8 Normally open/normally closed; 2 setting points; LED; signal suppression; plug connection M12x1; 10-30 V; max. 1 A
- 9 Normally open/normally closed; 2 setting points; LED; plug connection M12x1; 10-30 V; max. 1 A
- 10 Change-over contact; 1 setting point; plug connection M12x1; 150 V; max. 1 A
- 11 Normally closed/normally closed; 2 setting points; LED; plug connection M12x1; 150 V; max. 1 A

3. Pressure indicators/pressure switches

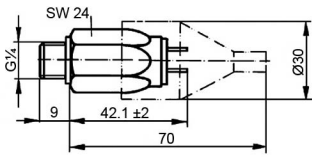


Fig. 5

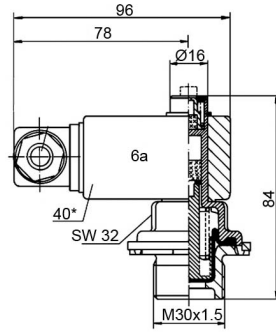


Fig. 6

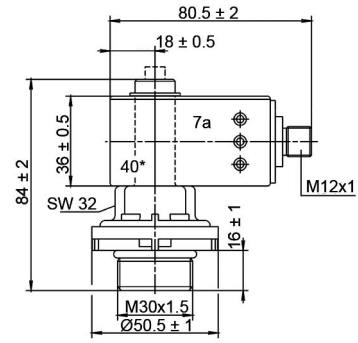


Fig. 7

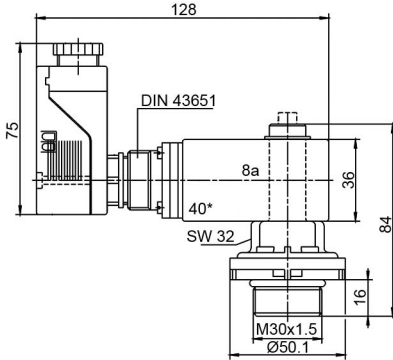


Fig. 8

40* = 40 mm wide

| Pressure indicators/pressure switches | | | | | | | | | |
|---------------------------------------|------------------|--------------|--------------|-------------------------|----------------|---------------|--------|------------------------|-------------------------------|
| Nominal pressure [bar] | Temperature [°C] | Type | Order number | Indicator setting [bar] | Indication | Contact type* | Fig. | Material lower section | Material upper section |
| 10 | -10 - +80 | PiS 3084 | 77669781 | 1.2 | visual | - | 6 | PA 66 | PA 6 |
| | | PiS 3085 | 77669807 | | visual/electr. | 1 | 6 + 6a | | |
| | | PiS 3125 | 78308033 | | visual/electr. | 3 | 6 + 6a | | |
| 10 | -10 - +80 | PiS 3106 | 78309155 | 0.9/1.2 | visual/electr. | 2 | 6 + 6a | PA 66 | PA 6 |
| | | PiS 3103 | 77942170 | | visual/electr. | 4 | 8 + 8a | | |
| 10 | -10 - +80 | PiS 3084 | 77737802 | 2.2 | visual | - | 6 | PA 66 | PA 6 |
| | | PiS 3085 | 77738032 | | visual/electr. | 1 | 6 + 6a | | |
| | | PiS 3125 | 78308108 | | visual/electr. | 3 | 6 + 6a | | |
| | | PiS 3125 M12 | 79764747 | | visual/electr. | 10 | 7 + 7a | | |
| 10 | -10 - +80 | PiS 3156 | 76300370 | 1.7/2.2 | opt./elektr. | 9 | 7 + 7a | PA 66 | PA 6 |
| | | PiS 3159 | 76326748 | | visual/electr. | 11 | 7 + 7a | | |
| | | PiS 3143 | 79761891 | | visual/electr. | 6 | 8 + 8a | | |
| | | PiS 3153 | 79761941 | | visual/electr. | 8 | 7 + 7a | | |
| | | PiS 3133 | 79760927 | | visual/electr. | 5 | 6 + 3a | | |
| | | PiS 3106 | 78308850 | | visual/electr. | 2 | 6 + 6a | | |
| | | PiS 3103 | 77970429 | | visual/electr. | 4 | 8 + 8a | | |
| 10 | -25 - +85 | DSS/1.2 | 77863814 | 1.2 | electrical | norm. open | 5 | galvanized steel | delivered with protection cap |
| | | DSO/1.2 | 77870587 | | electrical | n. closed | 5 | | |
| 10 | -25 - +85 | DSS/2.2 | 77845845 | 2.2 | electrical | norm. open | 5 | | |
| | | DSO/2.2 | 77870595 | | electrical | n. closed | 5 | | |
| 10 | -25 - +85 | DSS/5 | 77863822 | 5.0 | electrical | norm. open | 5 | | |
| | | DSO/5 | 77870603 | | electrical | n. closed | 5 | | |

*Contact type see remarks below 2. Differential pressure indicators

4. Vacuum/pressure gauges

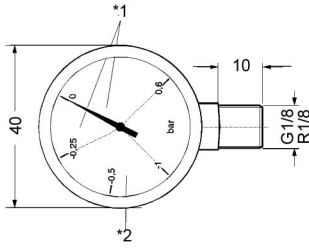


Fig. 9
*1 = Green area/*2 = Red area

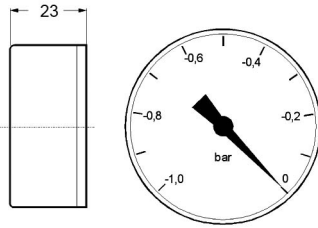


Fig. 10

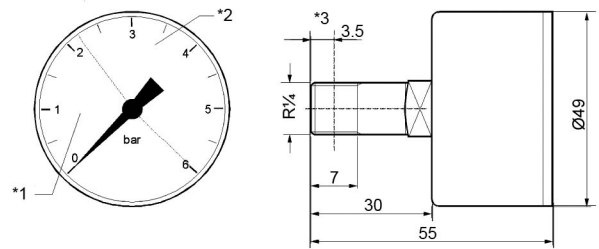


Fig. 11
*3 = Metering level

Vacuum/pressure gauges

| Nominal size [NG] | Type | Order number | Indicating range [bar] | Connection size | Fig. | Class | Dial face |
|-------------------|----------------|--------------|------------------------|-----------------|------|----------|------------------------------------|
| 40 | Vacuum gauge | 76345763 | -1 - +0.6 | R1/8 conical | 9 | min. 2.5 | Red/Green area sep. line -0.25 bar |
| | | 77545908 | | G1/8 | 9 | | white |
| 50 | | 77617558 | -1 - 0 | R1/4 conical | 10 | | |
| 50 | Pressure gauge | 78381998 | 0 - 6 | R1/4 conical | 11 | | Red/Green area sep. line 2.2 bar |

5. Vacuum switches

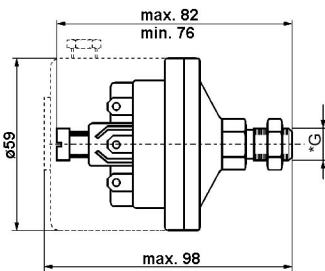


Fig. 12
*G = Connection

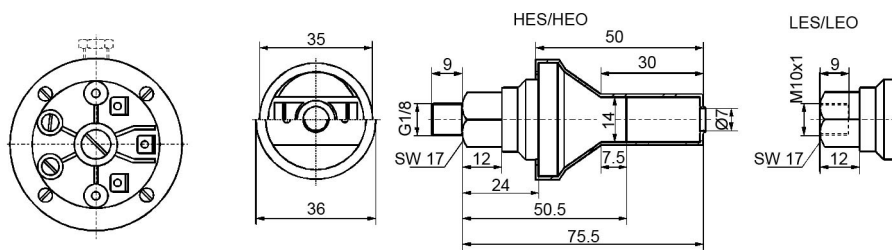


Fig. 13
HES/HEO only for fluids, LES/LEO only for air

Vacuum switches

| Permissible over-pressure [bar] | Temperature [°C] | Type | Order number | Switch setting [mbar] | Contact type | Fig. | Connection *G | Material lower section | Material upper section |
|---------------------------------|---------------------------|-------------|--------------|-----------------------|---|--------------|---------------|------------------------|------------------------|
| 0.5 | -10 - +70 | PiS 3070 | 77669690 | -15 - -80 | single pole change-over switch, snap-in joint | 12 | G1/4 | GD-Al | PA 6 |
| 1 | | | 77669724 | -50 - -600 | | | G1/8 | | |
| 0.1 | -20 - +80 short-term +120 | HES 2200 BP | 78308892 | -200 ±10 | normally open | 13 | G1/8 outside | GD-ZnAl | PC |
| | | HEO 2200 BP | 78308900 | | normally closed | | | | |
| | | LES 250 I | 78308918 | -50 ±4 | normally open | M10x1 inside | | | |
| | | LEO 250 I | 78308926 | | normally closed | | | | |

6. Vacuum indicators/air filters

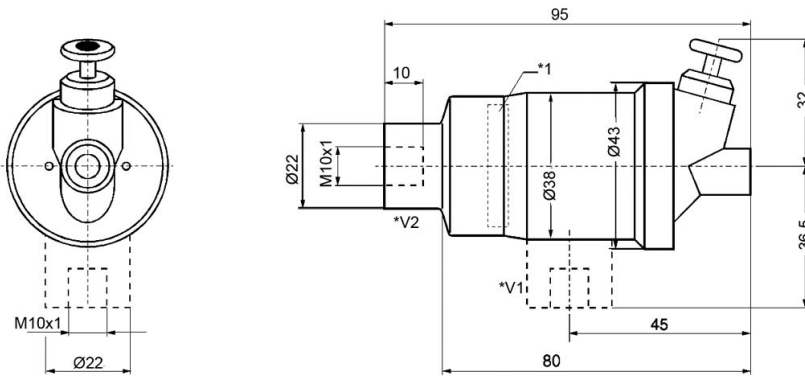


Fig. 14

*1 = Indication: position of display in mbar

*V1 = Version 1

*V2 = Version 2

Vacuum indicators/air filters

| Temperature [°C] | Type | Order number | Indicator setting ±10 % [mbar] | Indication type | Fig. | Version |
|------------------|----------|--------------|--------------------------------|----------------------|------|---------|
| -40 - +110 | TB 745 | 78309056 | -50 | optical self locking | 14 | 1 |
| | TB 745/1 | 78309064 | -50 | | | 2 |
| | TB 746/1 | 78309049 | -65 | | | 2 |

7. Accessories

7.1 Seal kits

| Type | NBR | FPM | EPDM |
|--|---------------------|----------|----------|
| | Order number | | |
| PiS 3092, 3093, 3102, 3105, 3115, 3132, 3142, 3152, 3155, 3192, 3193, 3158 | 77760275 | 77760283 | 77760291 |
| PiS 3012, 3097, 3098, 3116, 3119, 3131, 3141, 3151, 3154, 3157 | 77760309 | 77760317 | 77760325 |
| PiS 3084, 3085, 3103, 3106, 3125, 3133, 3143, 3153, 3156, 3159 | 78383382 | 78383390 | 78383408 |
| PiS 3086, 3087, 3104 | 77760242 | 77760259 | - |

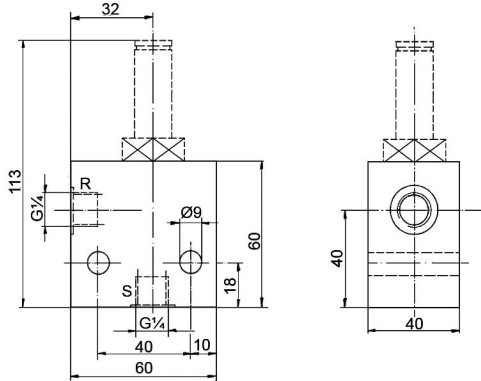
7.2 Electrical expansion kit/spare parts

| Designation | Order number |
|---|--------------|
| Electrical upper section normally open/closed for PiS 3084, 3087, 3093, 3098, 3193 (contact type 1) | 77536550 |
| Wiring box with lamp insert 12 - 230 V for electrical upper section normally open (acc. to DIN EN 175301-803) | 78307548 |
| Electrical upper section change-over contact for PiS 3084, 3087, 3093, 3098, 3193 (contact type 3) | 78308017 |
| Wiring box with 2 LEDs 10 - 30 V for electrical upper section change over contact (acc. to DIN EN 175301-803) | 78308025 |

| Designation | Order number |
|---|--------------|
| Electrical upper section change-over contact M12x1 für PiS 3084, 3087, 3093, 3098, 3193 (contact type 10) | 79764036 |
| Electrical upper section 2SP-LED-M12x1-SU (contact type 8) spare part for 2 setting points indicator! | 76116651 |
| Electrical upper section 2SP-LED-M12x1 (contact type 9) spare part for 2 setting points indicator! | 76300412 |
| Electrical upper section W-2SP-LED-SU-VERZ (contact type 5) spare part for 2 setting points indicator! | 79760943 |
| Electrical upper section W-2SP-LED-SU (contact type 6) spare part for 2 setting points indicator! | 76118590 |
| Electrical upper section W-2SP/Ö-LED-M12x1 (contact type 11) spare part for 2 setting points indicator! | 76326755 |
| Electrical upper section normally closed with signal suppression PiS 3003 | 77765357 |
| Electrical upper section normally open with signal suppression PiS 3002 | 77765365 |

7.3 Mounting block for differential pressure indicators (M20x1.5)

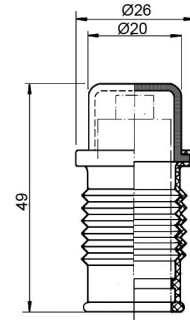
| Designation | Order number |
|----------------------------------|--------------|
| Mounting block (St) | 77809098 |
| Mounting block (1.4301), 450 bar | 77698517 |



R = clean side
S = dirt side

7.4 Protection cap

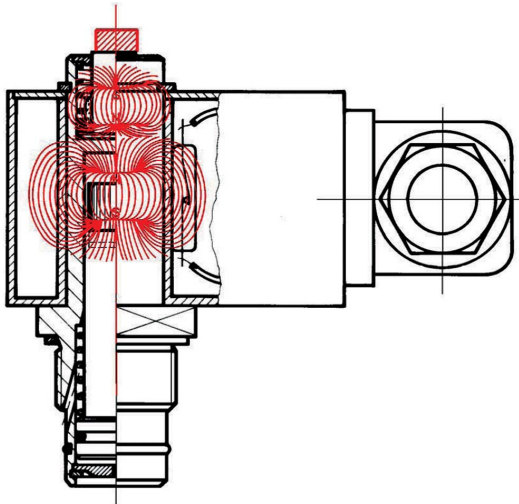
| Designation | Order number |
|---|--------------|
| Protection cap for all visual pressure and differential pressure indicators, -20 °C to +80 °C Resistant to: gasoil, purifying agent, insolation, dust, salt, water, concret | 78285330 |



8. Function

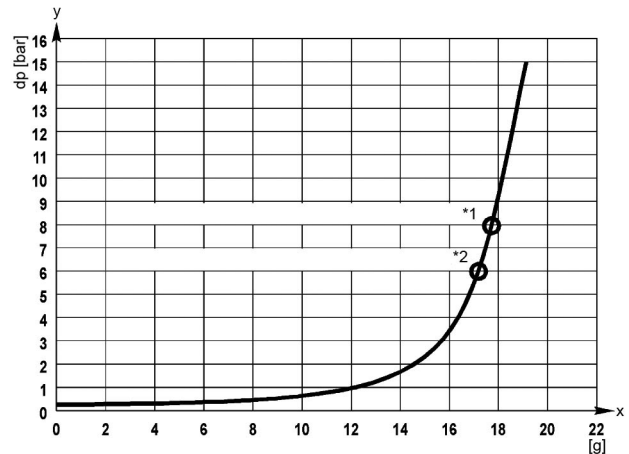
The magnetic field as previously described, contactless operates reed contacts in the electrical upper part. The desired contact type is selected by inverting upper part. Another option keeping the electrical signal electronically suppressed up to 30 °C operating temperature is also available. This eliminates false electrical signal during the cold start phase.

For efficient servicing it is desirable to have a pre-warning device (so that the filter element can be replaced, e.g. with the next tool change). For this purpose electrical upper parts with two indicating points, i.e. at 75 % and at 100 % of the indicator setting are available.



Pressure/vacuum gauges give an analog reading of the existing state of contamination of the filter elements. They require continuous control to ensure that the service time and reserve capacity are not unduly exceeded. If the contamination signal is disregarded, the filter element may collapse or, if a bypass valve is installed, part of the contamination fluid may reach the hydraulic components via the bypass valve and cause failure of the hydraulics.

Pressure/vacuum switches are provided with snap action switches, which ascertains that signal are issued only when the limit values have been fully reached.



Dirt holding capacity - Δp curve

x = dirt holding capacity [g]

y = differential pressure Δp [bar]

*1 = signal step maintenance indicator 100 %

*2 = signal step maintenance indicator 75 %

9. Technical specifications

9.1 Contact type normally open/normally closed

Contact type 1

Types PiS 3085, 3086, 3092, 3097, 3192

Max. voltage: 250 V AC/ 200 V DC

Max. current: 1 A

Contact load: 70 W

Type of protection: IP 65 in inserted and secured status

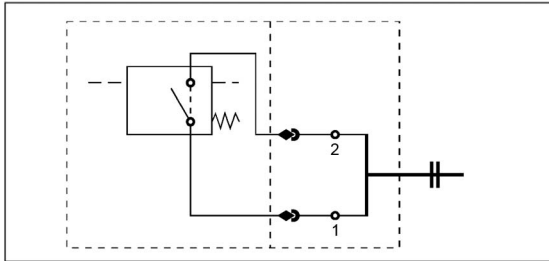
Contact type : normally open/normally closed

Cable sleeve: M20x1.5

Wiring box: DIN EN 175 301-803

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact.

By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Electrical parts are insulated (plastic material housing).



9.2 Contact type normally closed or open with signal suppression

Contact type normally closed

Type PiS 3003 (expansion kit)

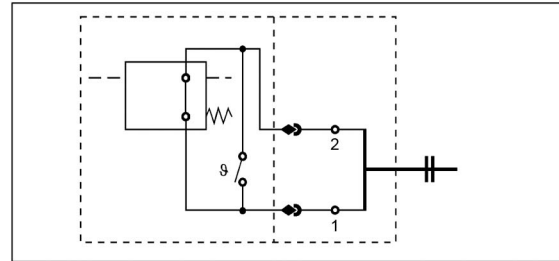
Contact type normally open

Type PiS 3002 (expansion kit)

Signal suppression by thermorelay

Signal is released at +30 °C

for further technical details see 9.1



9.3 Contact type normally closed 2 setting points

Contact type 2

Types PiS 3105, 3106, 3119

1. setting point at 75 % of the indicating pressure

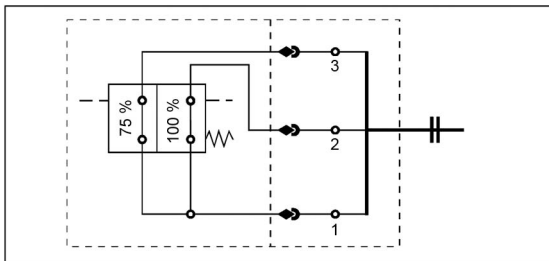
2. setting point at 100 % of the indicating pressure

Max. voltage: 150 V AC/DC

Max. current: 1 A

Contact load: 20 VA/20W

for further technical details see 9.1



9.4 Contact type Change-over contact

Contact type 3

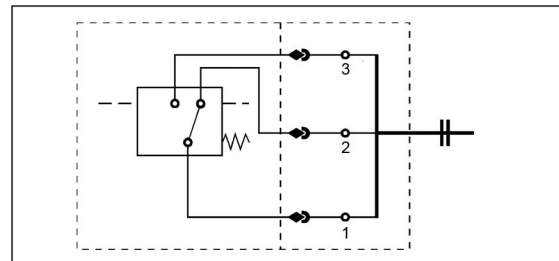
Types PiS 3115, 3116, 3125

Max. voltage: 150 V AC/DC

Max. current: 1 A

Contact load: 20 VA/20W

for further technical details see 9.1



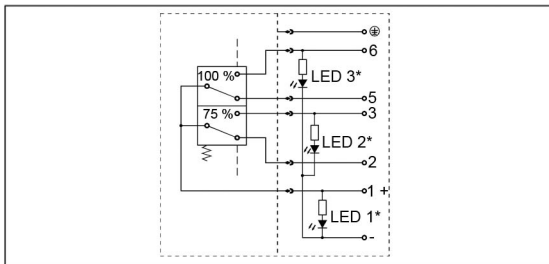
9.5 Contact type change-over contact, 2 setting points LED

Contact type 4

Types PiS 3012, 3102, 3103, 3104

1. setting point at 75 % of the indicating pressure
2. setting point at 100 % of the indicating pressure

Max. voltage: 10 - 30 V DC
 Max. current: 1 A
 Contact load: 20 VA/20 W
 Type of protection: IP 65 in inserted and secured status
 Plug connection: DIN EN 175201-804

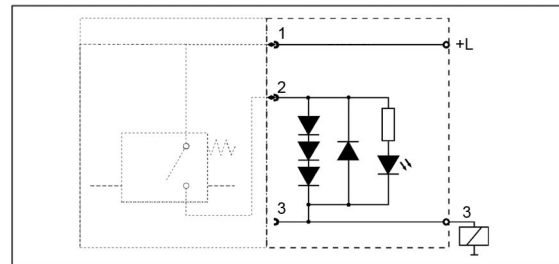


9.6 Wiring box with insert lamp

Will be supplied instead of standard connection.

Not to be combined with indicators with 2 setting points.

Max. voltage: 12-230 V AC/DC



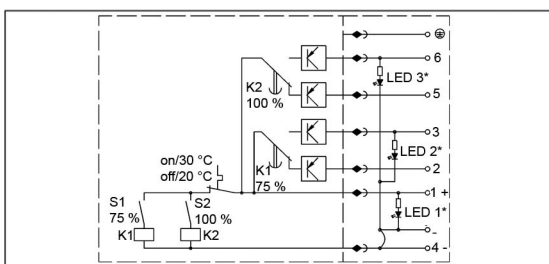
9.7 Contact type change-over contact, 2 setting points, LED, signal suppression, time delay

Contact type 5

Types PiS 3131, 3132, 3133

1. setting point at 75 % of the indicating pressure
2. setting point at 100 % of the indicating pressure

Max. voltage: 10 - 30 V DC
 Max. current: 1 A
 Contact load: 20 W
 Type of protection: IP 65 in inserted and secured status
 Plug connection: DIN EN 175201-804
 Signal suppression: by thermorelay
 Signal released: at + 30 °C
 Signal change down: at + 20 °C
 Impulse suppression K1 and K2 time delay 10 s



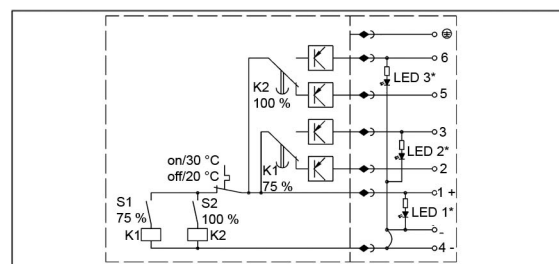
9.8 Contact type change-over contact, 2 setting points, LED, signal suppression

Contact type 6

Types PiS 3141, 3142, 3143

1. setting point at 75 % of the indicating pressure
2. setting point at 100 % of the indicating pressure

Max. voltage: 10 - 30 V DC
 Max. current: 1 A
 Contact load: 20 W
 Type of protection: IP 65 in inserted and secured status
 Plug connection: DIN EN 175201-804
 Signal suppression: by thermorelay
 Signal released: at + 30 °C
 Signal change down: at + 20 °C



LED 1* = Operating LED green

LED 2* = Setting point 75 % LED yellow

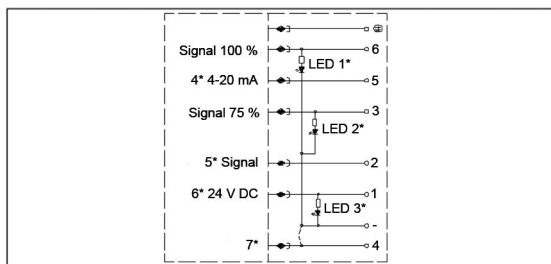
LED 3* = Setting point 100 % LED red

9.9 Contact type analog 4-20 mA, 2 setting points, LED, signal suppression

Contact type 7

Types PiS 3110, 3120

| | |
|-----------------------------|--|
| Max. voltage: | 24 V DC |
| Max. current: | 200 mA |
| Resistance: | 500 Ω |
| Type of protection: | IP 65 in inserted and secured status |
| Plug connection: | nach DIN EN 175201-804 |
| Output signal: | 4-20 mA |
| Outputs (PNP, max. 200 mA): | cold start signal 75 % setting point 100 % setting point |
| Signal damping: | 20 s |



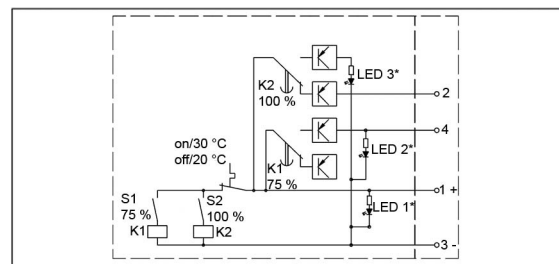
9.10 Contact type normally open/normally closed, 2 setting points, LED, signal suppression

Contact type 8

Types PiS 3151, 3152, 3153

1. setting point at 75 % of the indicating pressure (normally open)
2. setting point at 100 % of the indicating pressure (normally closed)

| | |
|---------------------|--------------------------------------|
| Max. voltage: | 10 - 30 V DC |
| Max. current: | 1 A |
| Contact load: | 20 W |
| Type of protection: | IP 65 in inserted and secured status |
| Plug connection: | M12x1, 4 pole |
| Signal suppression: | by thermorelay |
| Signal release: | at + 30 °C |
| Signal change down: | at + 20 °C |



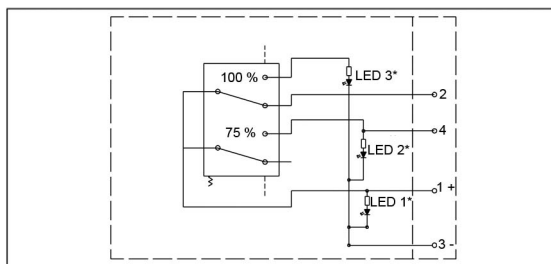
9.11 Contact type normally open/normally closed, 2 setting points

Contact type 9

PiS 3154, 3155, 3156

1. setting point at 75 % of the indicating pressure (normally open)
2. setting point at 100 % of the indicating pressure (normally closed)

| | |
|---------------------|--------------------------------------|
| Max. voltage: | 10-30 V DC |
| Max. current: | 1 A |
| Contact load: | 20 W |
| Type of protection: | IP 65 in inserted and secured status |
| Plug connection: | M12x1, 4 pole |

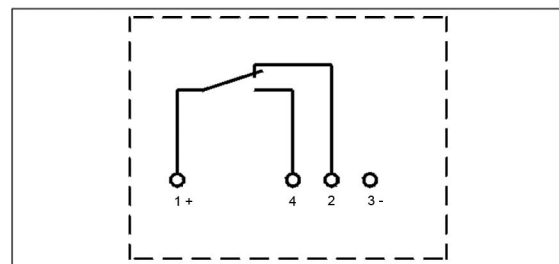


9.12 Contact type change-over contact

Contact type 10

PiS 3115-M12x1, 3116-M12x1, 3125-M12x1

| | |
|---------------------|--------------------------------------|
| Max. voltage: | 150 V |
| Max. current: | 1 A |
| Contact load: | 20 W |
| Type of protection: | IP 65 in inserted and secured status |
| Plug connection: | M12x1, 4 pole |



LED 1* = Operating LED green

LED 2* = Setting point 75 % LED yellow

LED 3* = Setting point 100 % LED red

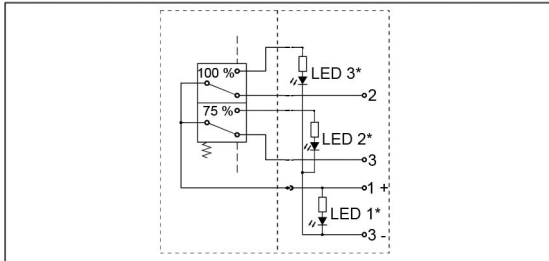
9.13 Contact type normally closed, 2 setting points

Contact type 11

Types PiS 3157, 3158, 3159

1. setting point at 75 % of the indicating pressure (normally closed)
2. setting point at 100 % of the indicating pressure (normally closed)

| | |
|---------------------|--------------------------------------|
| Max. voltage: | 10-30 V DC |
| Max. current: | 1 A |
| Contact load: | 20 W |
| Type of protection: | IP 65 in inserted and secured status |
| Plug connection: | M12x1, 4 pole |



- LED 1* = Operating LED green
- LED 2* = Setting point 75 % LED yellow
- LED 3* = Setting point 100 % LED red

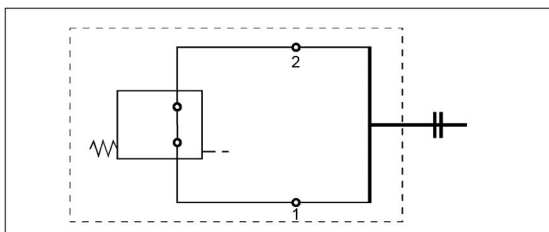
9.15 Vacuum switch HEO/LEO

Contact type normally closed

| | |
|--------------------|----------|
| Contact load HEO*: | 42 V/6 W |
| Contact load LEO*: | 24 V/6 W |

* at resistive load

for further technical details see 9.14

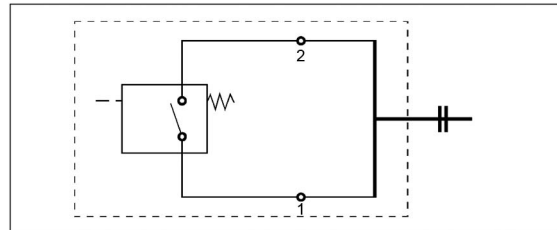


9.14 Vacuum switch HES/LES

Contact type normally open

| | |
|------------------------|-----------------------------|
| Electrical connection: | AMP 6,3 DIN 43248 |
| | bushings DIN 46247 |
| | switch type 2 pole |
| Contact load HES*: | 42 V/6 W |
| Contact load LES*: | 24 V/6 W |
| Type of protection: | IP 54 - with protecting cap |

* at resistive load

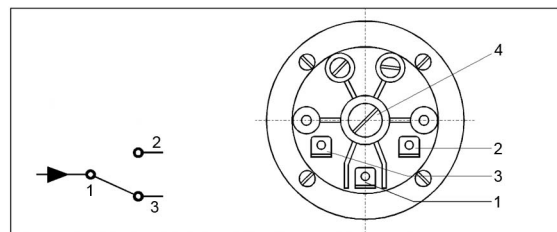


9.16 Vacuum switch PiS 3070

Contact type 1 pole change-over contact

| | |
|------------------------|---------------------|
| Electrical connection: | AMP 6,3 DIN 43248 |
| | bushings DIN 46247 |
| Max. voltage: | 230 V AC/DC |
| Max. current: | 6 A |
| Type of protection: | IP 00 without cover |
| | IP 54 with cover |

Position of installation: individual (position of installation is to be advised if setting point is adjusted)



- 1 = Supply line
- 2 = Operating contact

- 3 = Normally closed contact
- 4 = Adjusting screw

9.17 Pressure switch DSS

Contact type normally open

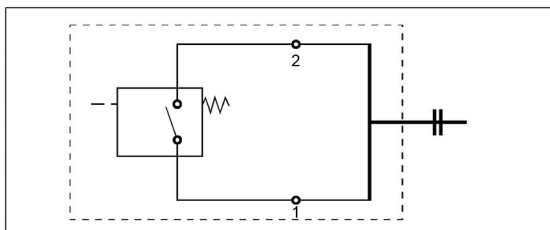
Electrical connection: AMP 6,3 DIN 46248
bushings DIN 46247
switch type 2 pole

Max. voltage: 42 V

Max. current: 2 A

Contact load: 100 VA

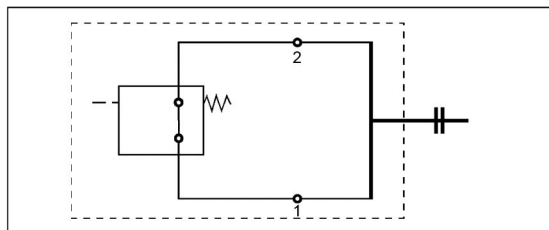
Duty classification: 200/min



9.18 Pressure switch DSO

Contact type normally closed

for further technical details see 9.17



Maintenance indicators PiS 3084, 3087, 3093, 3098, 3193 can be mounted in 45°.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application: Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

When using our filters in areas which are to be classified according to EU directive 94/9 EG (ATEX), we recommend prior discussion with us. The standard version can be used for liquids based on mineral oil /corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). Please consult with us if using other media.

Subject to technical alterations without prior notice.

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