

Contamination 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 contamination indicator.

MAHLE manufactures contamination indicators of the following designs:

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

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.

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.

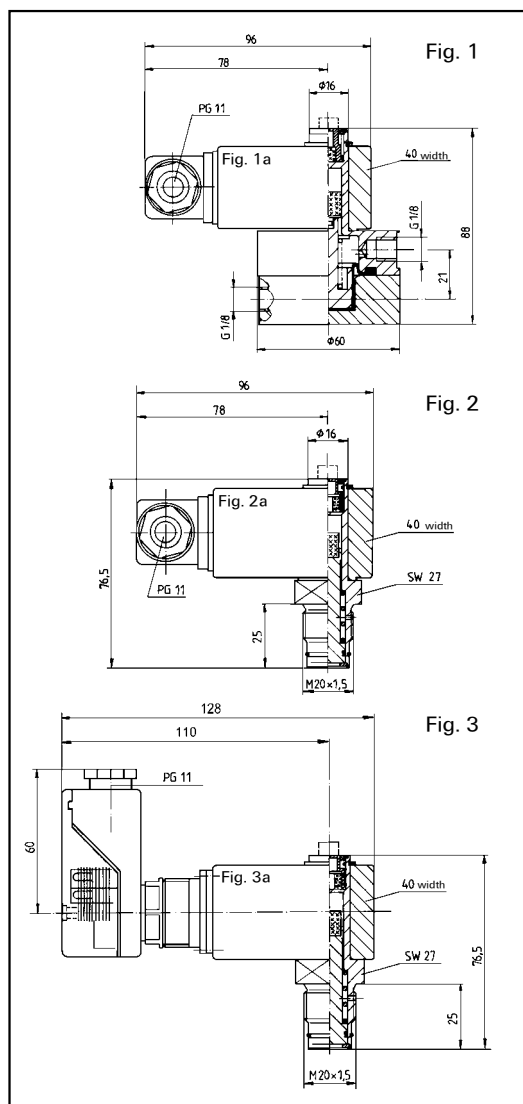
This red button remains visible until it is pushed in during the daily check which is to be performed while the plant is at operating temperature. If the button pops out immediately after being pushed in, the filter element must be replaced latest at the end of the shift.

This mechanical/visual function indication may also be used for generating contactless electrical signals. For this purpose an electrical upper part is pushed over the hydraulic/mechanical part. This upper part incorporates all electrical switching elements. Cable connection is via a DIN cube plug.

- Visual 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
- Pressure resistance
 - up to 10 bar (pressure/differential pressure)
 - up to 160 bar (differential pressure)
 - up to 450 bar (differential pressure)
- Rugged, non-bypass design
- Optimal element exploitation
- Worldwide distribution

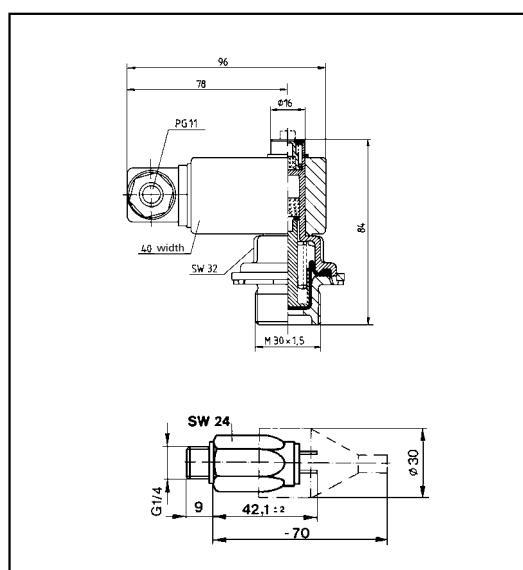


2. Differential pressure indicator



Operating pressure/ temperature resistance	Indicator setting	Indication	Contact type*	Fig.	Type	Part number	Material lower section	upper section
10 bar -10 to +120 °C	1,2 bar	visual		1	PIS 3087	773.899.0	Al	PA 6
		visual/ electr.	1	1+1a	PIS 3086	773.751.3		
			4	1+3a	PIS 3104	823.699.4		
160 bar -10 to +120 °C	2,2 bar	visual		2	PIS 3098	766.997.1	AL	PA 6
		visual/ electr.	1	2+2a	PIS 3097	766.994.8		
	3		PIS 3116		830.807.4			
	2		3+3a	PIS 3119	830.912.2			
	4			PIS 3012	830.845.4			
	5			PIS 3124	838.365.5			
	3,5 bar		visual		2	PIS 3098		
		vis./el.	1	2+2a	PIS 3097	823.664.8		
	5,0 bar	visual		2	PIS 3098	766.998.9		
		visual/ electr.	1	2+2a	PIS 3097	766.995.5		
	3		PIS 3116		830.808.2			
	3,7 / 5,0 bar		2	3+3a	PIS 3119	830.913.0		
			4		PIS 3012	830.844.7		
		5	PIS 3124	838.366.3				
400 bar -10 to +120 °C		2,2 bar	visual		2	PIS 3093	766.989.8	Ms
	visual/ electr.		1	2+2a	PIS 3092	766.985.6		
		3	PIS 3115		830.804.1			
		2	3+3a	PIS 3105	797.038.7			
		4		PIS 3102	794.213.9			
		5		PIS 3122	838.363.0			
		5,0 bar	visual		2	PIS 3093	766.991.4	
	visual/ electr.		1	2+2a	PIS 3092	766.986.4		
		3	PIS 3115		830.805.8			
		3,7 / 5,0 bar	2	3+3a	PIS 3105	797.039.5		
			4		PIS 3102	794.214.7		
	5		PIS 3122	838.364.8				
	8,0 bar		visual		2	PIS 3093	766.988.0	
		visual/ electr.	1	2+2a	PIS 3092	766.987.2		
3	PIS 3115		830.806.6					
450 bar -10 to +120 °C	2,2 bar	visual		2	PIS 3193	784.406.1	1.4301	PA 6
		vis./el.	1	2+2a	PIS 3192	830.848.8		
	5,0 bar	visual		2	PIS 3193	830.853.8		
		vis./el.	1	2+2a	PIS 3192	830.854.6		

3. Pressure indicator/pressure switch



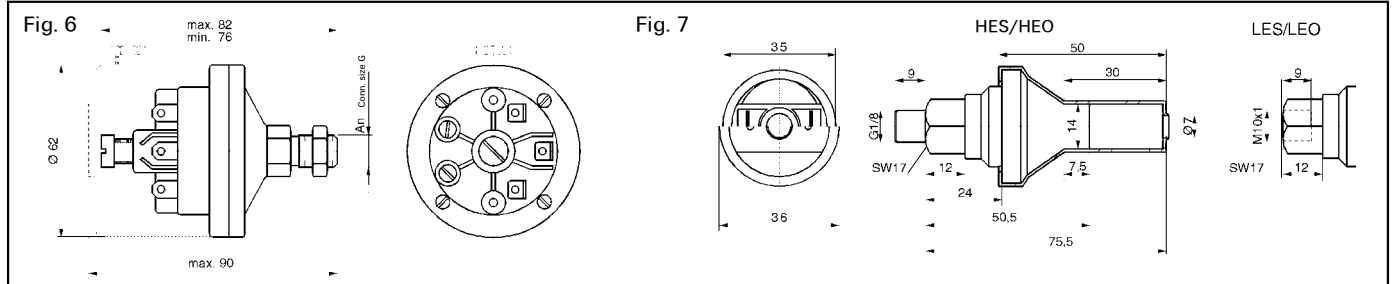
Operating pressure/temperature resistance	Indicator setting	Indication	Contact type*	Fig.				
10 bar -10 to +80 °C	1,2 bar	visual		4	PIS 3084	766.978.1	PA 66	PA 6
		visual/ electr.	1	4+4a	PIS 3085	766.980.7		
	3		PIS 3125		830.803.3			
	2		4+3a	PIS 3106	830.915.5			
	4			PIS 3103	794.217.0			
	5			PIS 3123	838.367.1			
	0,9 / 1,2 bar	visual/ electr.	visual	4	PIS 3084	773.780.2		
			1	4+4a	PIS 3085	773.803.2		
	3		PIS 3125		830.810.8			
	2		4+3a	PIS 3106	830.885.0			
	4			PIS 3103	797.042.9			
	5			PIS 3123	838.368.9			
1,7 / 2,2 bar								
10 bar -25 to +85 °C	1,2 bar	electr.	norm. open	5	DSS/1,2	786.381.4		
			norm. closed		DSO/1,2	787.058.7		
	2,2 bar	electr.	norm. open		DSS/2,2	784.584.5		
			norm. closed		DSO/2,2	787.059.5		
	5,0 bar	electr.	norm. open		DSS/5	786.382.2		
			norm. closed		DSO/5	787.060.3		

*Contact type:

- 1) Normally open/normally closed, wiring box DIN 43650, max. 230 V, max. 2,5 A
- 2) Normally closed, 2 setting points (75% / 100%); wiring box DIN 43650, max. 150 V, max. 1 A
- 3) Change over contact; wiring box DIN 43650, max. 150 V, max. 1 A
- 4) Change over contact; 2 setting points (75% / 100%); 3 LED; wiring box DIN 43651, 10-30 V, max. 1 A
- 5) Normally closed; 2 setting points (75% / 100%), signal suppression; wiring box DIN 43651, 10-30 V, max. 1 A

4. Vacuum switch

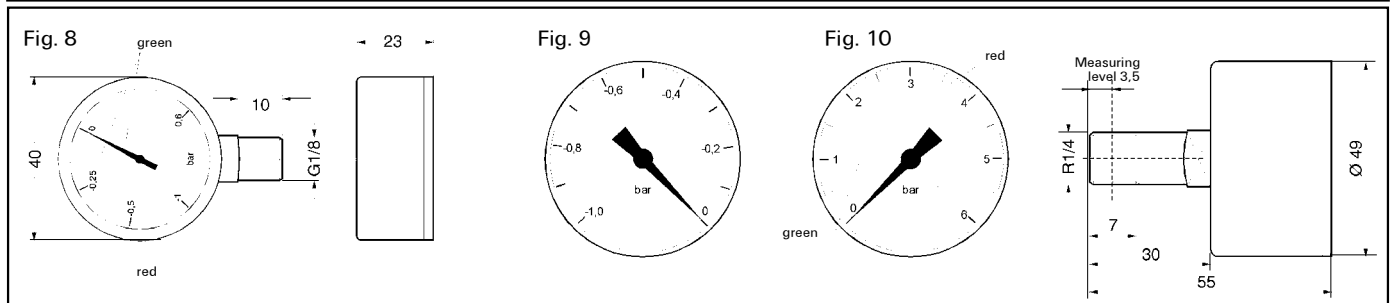
Permissible over-pressure max.	Temperature resistance	Indicator setting	Contact type	Fig.	Connection size	Type	Part number	Material	
								lower section	upper section
0,5 bar	-10 to +70 °C	-15 to -80 mbar	single pole double-throw cut-out switch	6	G ¼	PIS 3070	766.969.0	GD-AI	PA 6
1 bar		-50 to -600 mbar			G ½		766.972.4		
0,1 bar	-20 to +80 °C, +120 °C	-200 mbar ± 10	Normally open	7	G ½ (außen)	HES 2200 BP	830.889.2	GD-ZnAl	Poly-carbonat
		-200 mbar ± 10	Normally closed			HEO 2200 BP	830.890.0		
		-50 mbar ± 4	Normally open		M 10 x 1 (innen)	LES 250 I	830.891.8		
		-50 mbar ± 4	Normally closed			LEO 250 I	830.892.6		



Type HEC/HEO for hydraulic application, types LEO/LES for air application

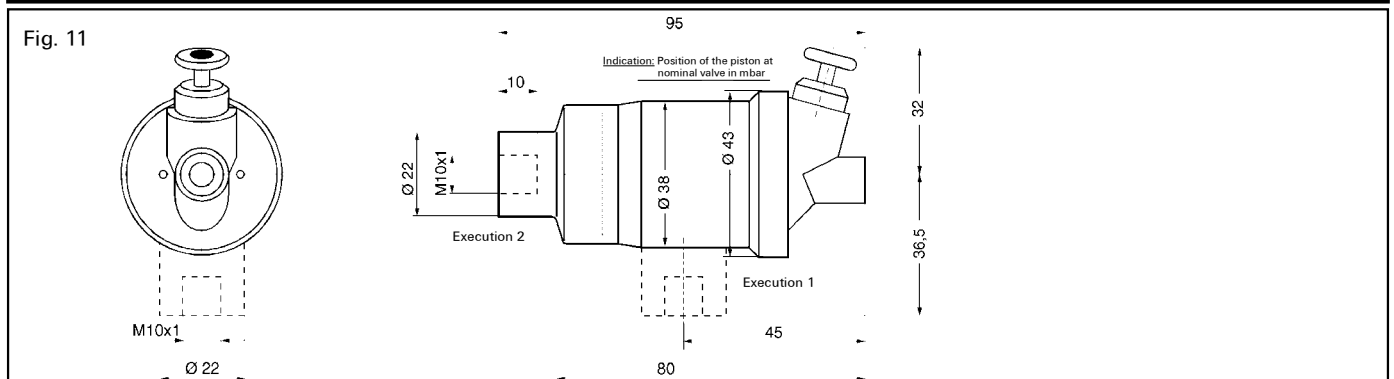
5. Vacuum meter / manometer

Nominal size (NG) mm	Specification	Indicating range	Fig.	Connection size	Part number	Class	Dial face
40	Vacuum meter	-1 to +1,5 bar	8	R ½ (conical)	754.802.7	min. 2,5	white
		-1 to +0,6 bar		G ½	754.590.8		Red/green area, sep. line 0,25 bar
50	Manometer	0 to -1 bar	9	R ¾ (conical)	761.755.8		white
		0 to 6 bar	10		838.199.8		Red/green area, sep. line 2,2 bar



6. Vacuum indicator / air filter

Indicator setting ±10%	Temperature resistance	Fig.	Execution	Type	Part number	Indication
-50 mbar	-40 to +110 °C	11	1	TB 745	830.905.6	visual indication - self locking -
-65 mbar			2	TB 745/1	830.906.4	
				TB 746/1	830.904.9	



Standard sealing material: NBR
Sealing material types LEO / LES: Silicone rubber

9. Technical Data

9.1 Contact type normally open/normally closed

Types PIS 3085, 3086, 3092, 3097, 3192

Maximum voltage: 230 V ~/=

Maximum current on contact: 2,5 A

Maximum contact load: 60 VA / 40 W

Inrush current: 70 VA

Type of protection: IP 65 when inserted and secured

Contact: normally open / normally closed

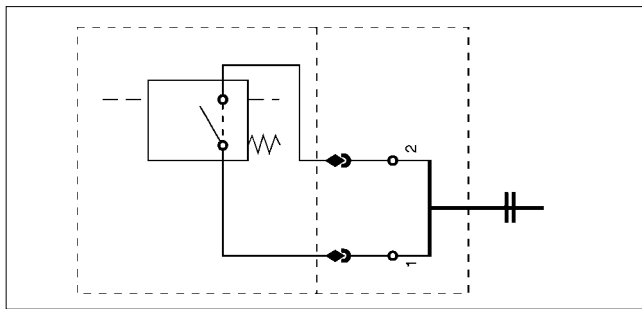
Cable connection: PG 11 Ø 6–10

The electrical indicator function can be changed from the Normally Open position to the Normally Closed position or visa versa by inverting the electrical section.

With the inrush current of 70 VA the indicator can trigger small contactors or contactor relays.

Inductivity in the direct current may require the use of a signal eraser.

The electric sections are shockproof (plastic housing)



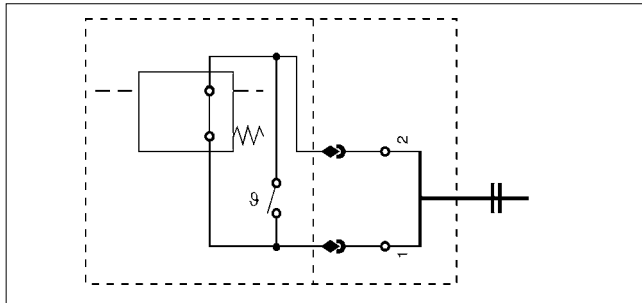
9.2 Contact type normally closed/signal lock-out

Type PIS 3003

Signal lock-out by thermorelay

Signal is released at 30 °C, reset at 20 °C

for further technical details see 9.1



9.3 Contact type normally closed 2 step

Types PIS 3105, 3106, 3119

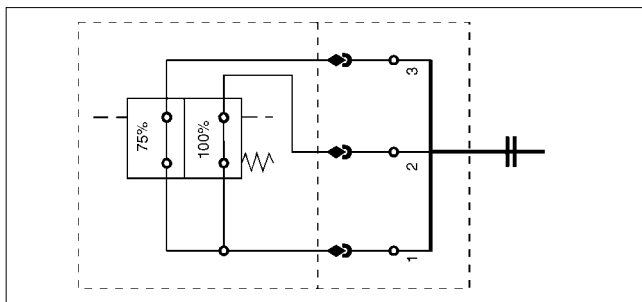
1. indicating at 75%
2. indicating at 100% of the indicating pressure

Maximum voltage: 150 V ~/=

Maximum current on contact: 1 A

Maximum contact load: 20 VA / 20 W

for further technical details see 9.1



9.4 Contact type normally closed 2 step/signal lock-out

Types PIS 3122, 3123, 3124

Maximum voltage: 10–30 V =

Maximum current on contact: 1 A

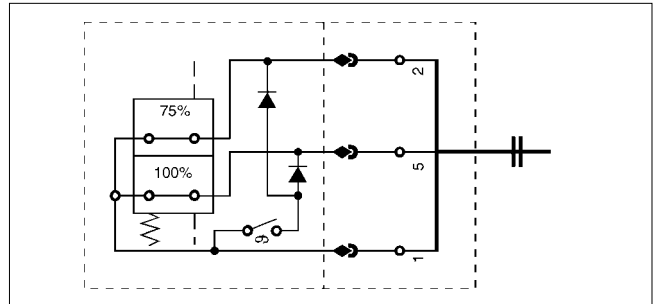
Maximum contact load: 20 W

Signal lock-out by thermorelay

Signal is released at 30 °C

reset at 20 °C

1. indicating at 75%
 2. indicating at 100% of the indicating pressure
- for further technical details see 9.1



9.5 Contact type change-over contact

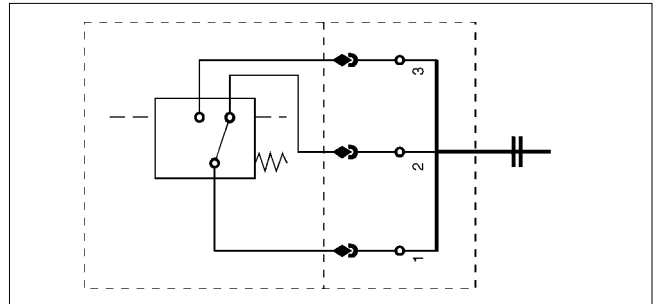
Types PIS 3115, 3116, 3125

Maximum voltage: 150 V ~/=

Maximum current on contact: 1 A

Maximum contact load: 20 VA / 20 W

for further technical details see 9.1



9.6 Contact type change-over contact/2 step LED

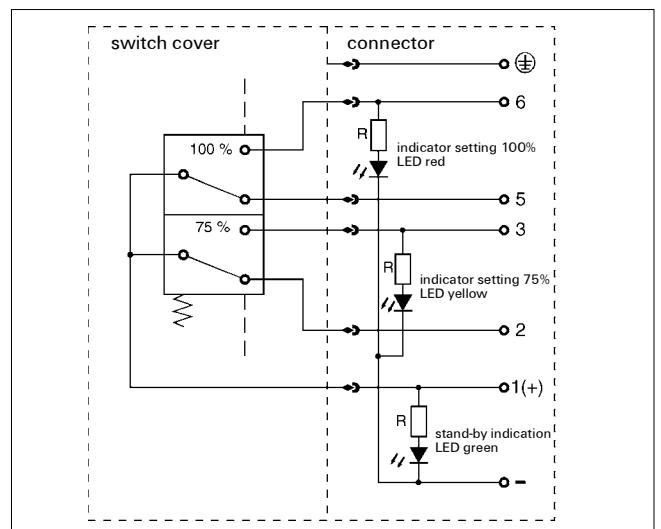
Types PIS 3012, 3102, 3103

Maximum voltage: 10–30 V =

Maximum current on contact: 1 A

Maximum contact load: 20 VA / 20 W

1. indicating at 75%
 2. indicating at 100% of the indicating pressure
- for further technical details see 9.1

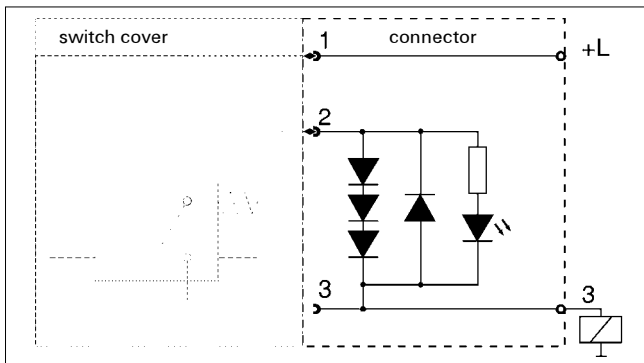


9.7 Wiring box with lamp insert

will be supplied instead of standard connection

Voltage: 12-230 V ~/=

not to combine with indicators with 2 setting points.

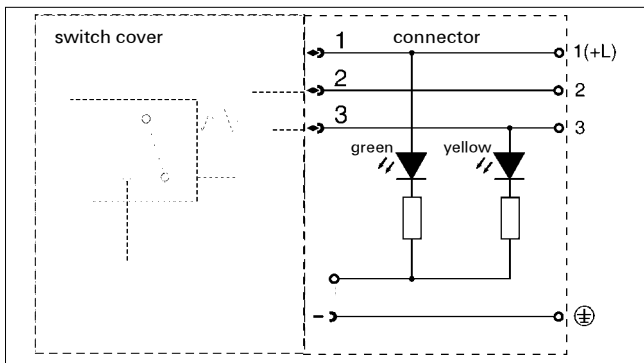


9.8 Wiring box with lamp insert

will be supplied instead of standard connection plug

Voltage: 10-30 V =

to combine with PIS 3115, 3116, 3125



9.9 Vacuum switch HES / LES

Contact: Normally open

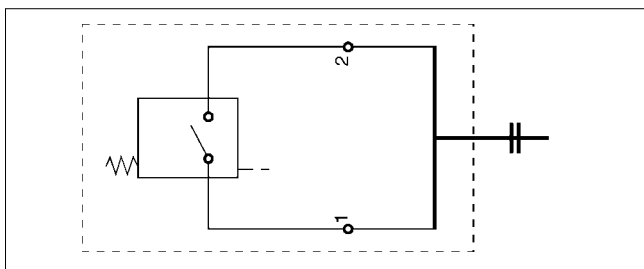
Contact load: HES: 42 V / 6 W

LES: 24 V / 6 W

Type of protection: IP 54 - with protecting cap

Electrical connections: AMP 6,3 DIN 46248

DIN 46247



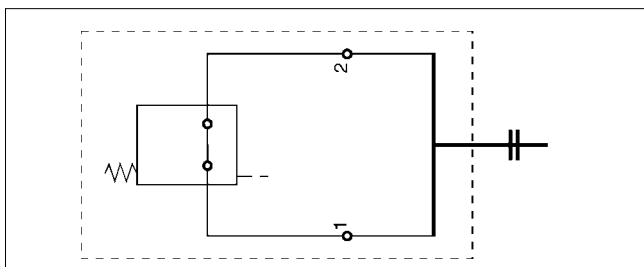
9.10 Vacuum switch HEO / LEO

Contact: Normally closed

Contact load: HEO: 42 V / 6 W at resistive load

LEO: 24 V / 6 W at resistive load

for further technical details see 9.9



9.11 Vacuum switch PIS 3070

Maximum voltage:

230 V ~/=

Maximum current on contact:

6 A

Contact:

Single pole changeover switch

Electrical connections:

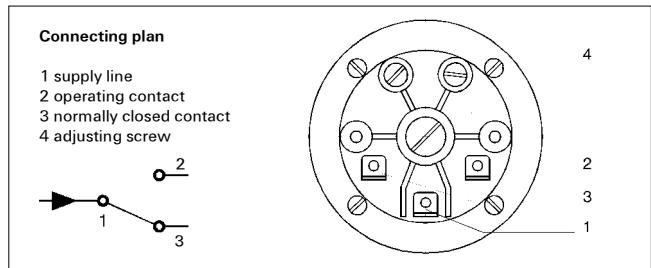
AMP 6,3 DIN 46248

DIN 46247

Type of protection:

IP 00 - without cover

IP 54 - with cover



9.12 Pressure switch DSS

Contact:

Normally open

Maximum voltage:

42 V

Maximum current on contact:

2 A

Contact load:

100 VA

Duty classification:

200/min

Type of protection:

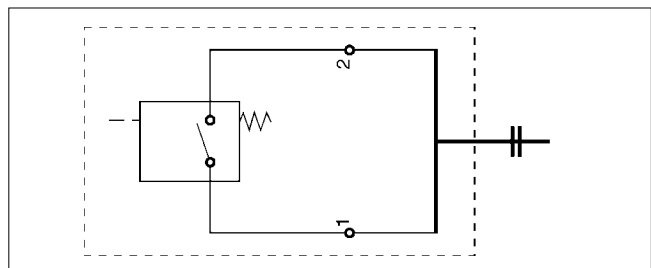
IP 00 - without protecting cap

IP 65 with protecting cap

Electrical connections:

AMP 6,3 DIN 46248

DIN 46247

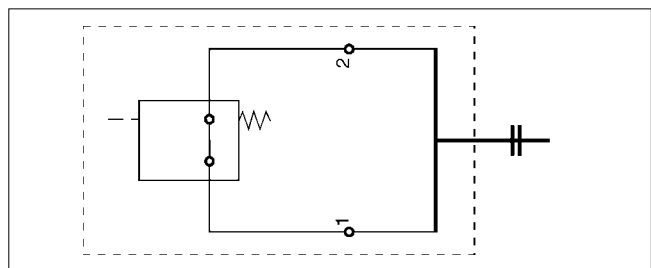


9.13 Pressure switch DSO

Contact:

Normally closed

for further technical details see 9.12



Subject to technical alteration without prior notice.



MAHLE Filtersysteme GmbH

Bereich Industriefilter · Schleifbachweg 45 · D-74613 Öhringen

Postfach 13 09 · D-74603 Öhringen

Telefon (0 79 41) 67-0 · Telefax (0 79 41) 67-429

Internet: <http://www.mahle.com> · E-mail: ub2_industrie@mahle.com