PINTER
MESS- UND REGELTECHNIK

TAMO

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Product Catalogue

MINICOMB®
Switches
for Pressure and Vacuum

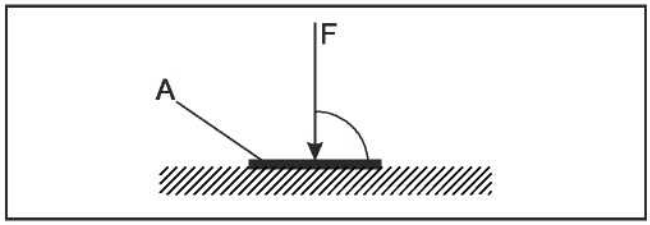
PL | ATEX

DEFINITION OF PRESSURE

A force applied uniformly over a certain area is called **pressure**:

$$p = F / A$$

(pressure = force / area)



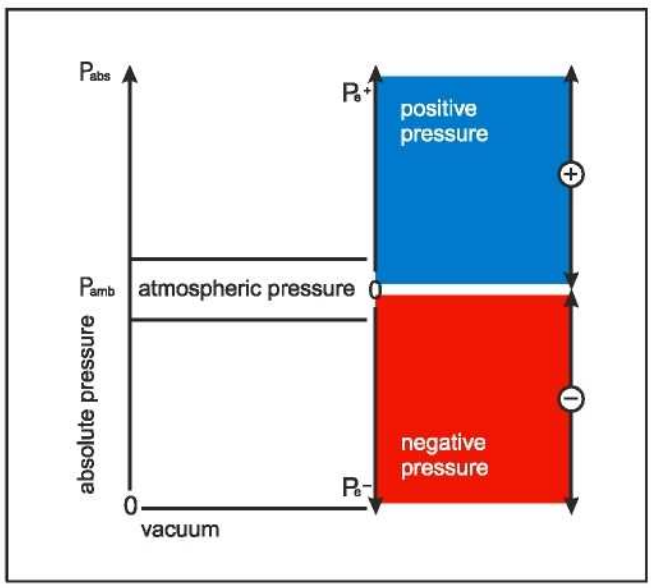
Pressure (P) besides temperature is one of the most frequently measured physical units.
The unit „Pascal" (Pa) is the SI unit of pressure within the metric unit system.
In Europe „bar" is the most commonly used (SI) unit. It roughly equals with the magnitude of the atmospheric pressure.

1 bar = 0,1 MPa = 0,1 N/m² = 10^5 Pa

Particularly in the anglo-american influenced region „psi" (pounds per square inch) is the most common unit.
The general term „pressure" is not always very clear:

In technical usage several types of pressure are differentiated, mainly differences between two pressure points, which in general linguistic usage all are called pressure.

To avoid confusion, the various types of pressure are distinguished according to their point of reference:



Absolute Pressure (Pabs)
Absolute pressure always refers to the absolute vacuum, i.e. the zero-point is the absolute vacuum.
A pressure gauge with measuring range 0 - 10 bar absolute shows the current ambient pressure (Pamb) when in nonoperating state/not installed.

Ambient Pressure (Pamb)
The atmospheric pressure is the ambient pressure.

Atmospheric Pressure Difference (Pe)
The atmospheric pressure difference, also called positive pressure (Pe+) respectively negative pressure (Pe-) is the most commonly measured type of pressure in the technical field.
It refers to atmospheric pressure (Pamb) and is the difference between the atmospheric pressure (Pamb) and absolute pressure (Pabs).

Pe = Pabs - Pamb

Pe becomes positive when the absolute pressure is higher than the athmospheric pressure; Pe becomes negative when the absolute pressure is lower than the atmospheric pressure.
A pressure gauge with measuring range 0 - 10 bar relative shows 0 bar when in nonoperating state/ not installed.

Differential Pressure (DP)
Differential pressure is the pressure difference (ΔP) between to measured pressures (P1, P2).

ΔP = P1 - P2

Differential pressure instruments are universal, as they can be used to as a relative pressure instrument or for **hydrostatic level measurement**.

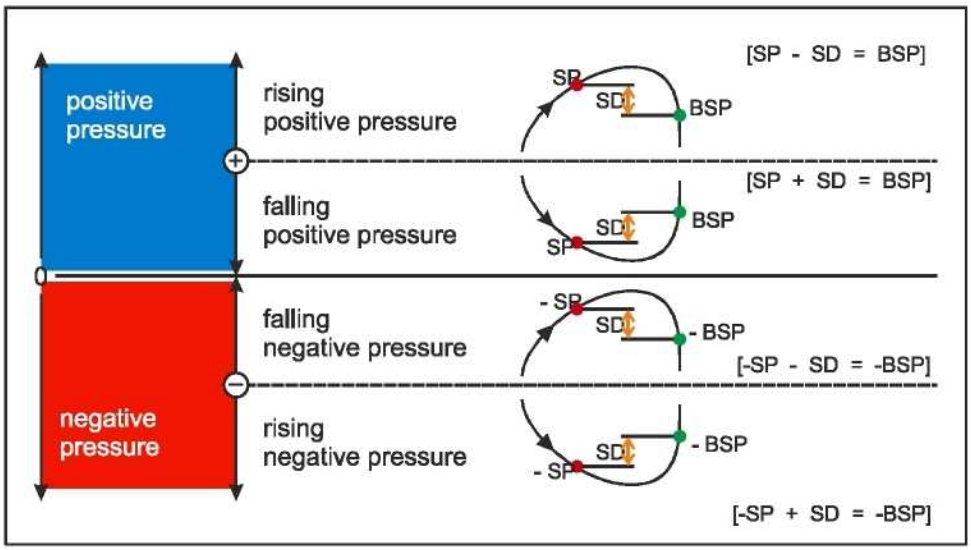
WHAT IS A PRESSURE SWITCH ?

Pressure switches are signal elements, that can be used for measuring pressure in pressure lines for gases, vapours or liquids.

In general pressure switches have one or more fixed or adjustable switching contacts.

Each switching contact has a **setpoint** (• SP). This setpoint corresponds to a pressure value setted on the pressure switch.

When rising above or falling below this value the switching contact within the pressure switch is triggered.



Due to inaccuracy the **re-set point** (• BSP) does not exactly match the setpoint.
The difference between setpoint and re-setpoint is called hysteresis or **switching differential** (↕ SD)

Once the switching contact is triggered, setted pressure values are transformed into electrical or pneumatic signals which are necessary for the control and regulation of processes, e.g. safety and alarm devices.

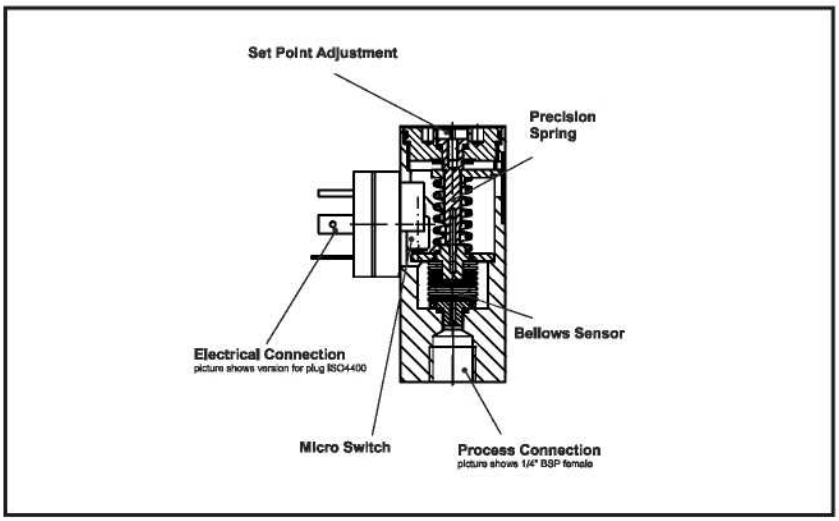
WHAT IS A MINICOMB® PRESSURE SWITCH?

The MINICOMB® pressure switch series is a very compact-sized pressure switch for measuring compressed air, low-viscous media and non-aggressive gases.
It is based on a force-balance measuring system with bellows sensors actuating one switching contact.

The force-balance measuring system with bellows sensors is friction-free and features high repeatability and very good longterm-stability.

The MINICOMB® is available with pressure range 0,2 - 16 bar, -0,9 - 0 bar or -0,9...+1 bar. Sub-base mounting or female threads are availbe for connecting to the process, while 4-pin plug according to ISO 4400 or plug M12x1 are available for electrical connection.

The MINICOMB® pressure switch series is approved for applications where PLc (Performance Level according to ISO 13849) is at least required (PLr) as well as for applications within hazardous area (zone 2 / 22 according to ATEX Directive 94/9/EC).



MINICOMB® Pressure Switch

MINICOMB with sub-base mounting

- friction-free force-balance measuring system
- high repeatability
- very good longterm stability
- pressure ranges -0,9... 0 (+1) bar or 0,2 - 16 bar
- **process connection 1/4“ ISO 228 female or sub-base mounting**
- **electrical connection plug ISO 4400 or plug M12x1**
- **approved for applications with PLr = PLc**
- **approved for ATEX zones 2 / 22**

MINICOMB with 1/4“ female ISO 228 thread

Description

The MINICOMB® Series is a very compact-sized pressure switch for measuring compressed air, low-viscous media and non-aggressive gases.

Operating Principle

The principle of operation is the balance of forces. The working force within each bellow is counter-balanced by adjustable steel springs.
This system actuates a microswitch when the working pressure overcomes the opposing force.
The measuring system operates without any pistons or diaphragms, thus completly friction-free, resulting in minimal wear and no maintenance.

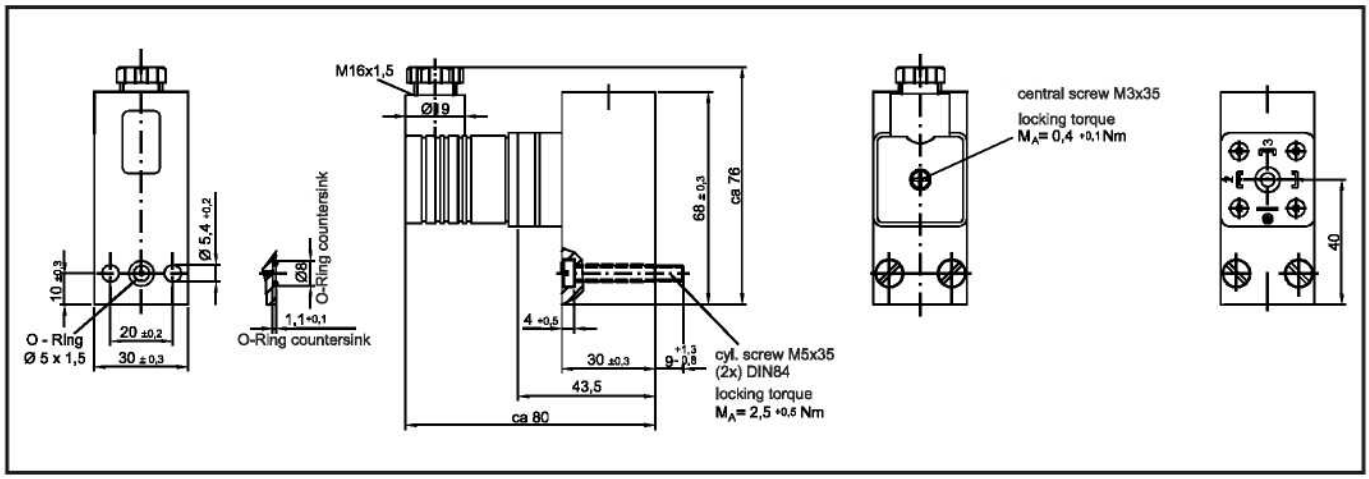
Approvals

PL	Performance Level (ISO 13849) PLc
ATEX	ATEX-Directive 94/9/EC Zone 2 / Zone 22

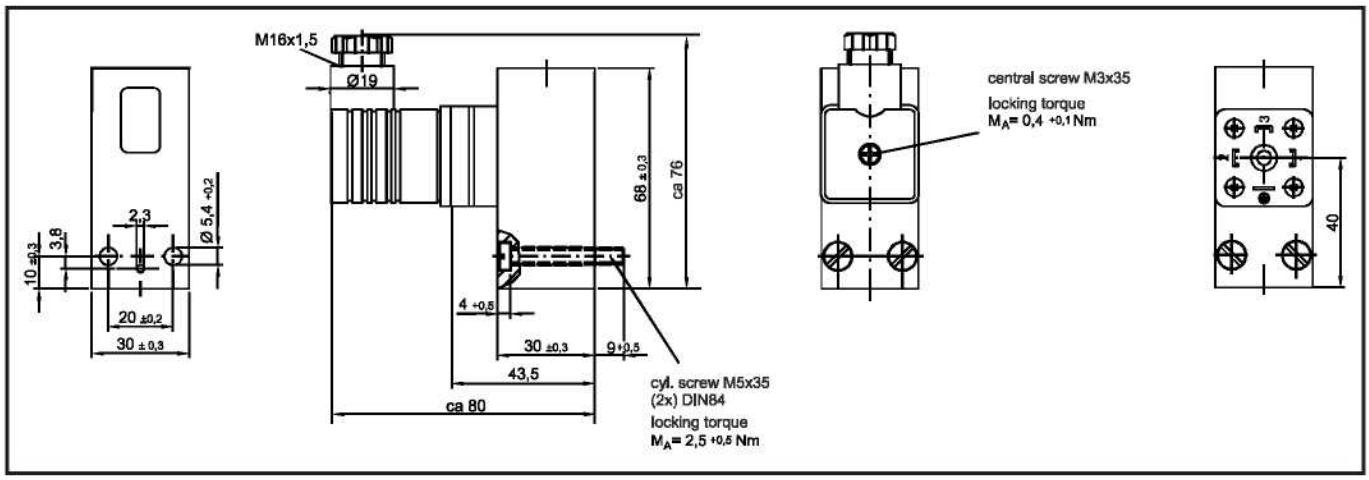
Technical Data	Standard	Options
Function	mechanical pressure switch; force-balance measuring system with bellows sensor	
Life Cycle	at least 10 mio switch cycles	
Pressure Range	0,2 - 16 bar	
Vacuum Range	-0,9 - 0 bar	
Pressure-/Vacuum Range)	-0,9...+1 bar	
Overpressure Safety	25 bar	
Vacuum Safety	-1 bar	
Enclosure Material	Aluminium	
Wetted Parts Material	Aluminium, Brass, NBR (Gasket)	FKM (Gasket)
Permissalbe Media Temperature	-10...+80°C	
Permissable Ambient Temperature	-20...+80°C	
Temperature Deviation	approx. 1% per 20°C	
Factory Adjustment Temperature	20°C	on request
Switching Contact	1 micro switch (SPDT)	
Adjustment Accuracy	≤ 1,0% FS	
Switching Accuracy	≤ 1,0% FS	
Repeatability	≤ 1,0% FS	
Switching Differential (Hysteresis)	≤ 4,0% FS	on request
Process Connection (alternatively)	sub-base mounting; sub-base mounting CNOMO; 1/4" female ISO 228 thread;	
Electrical Connection (alternatively)	Stecker EN175 301-803-A (ISO 4400); Stecker M12x1	
Weight	approx. 160 g	
Protection	IP65 (IP67 with plug M12x1)	
Schock Resistance (XYZ-Direction)	15 g (IEC 60068-2-64)	
Vibration Resistance (XYZ-Direction)	10 g (60 - 500 Hz) (IEC 60068-2-6)	

DIMENSIONS (VERSION WITH PLUG ISO 4400)

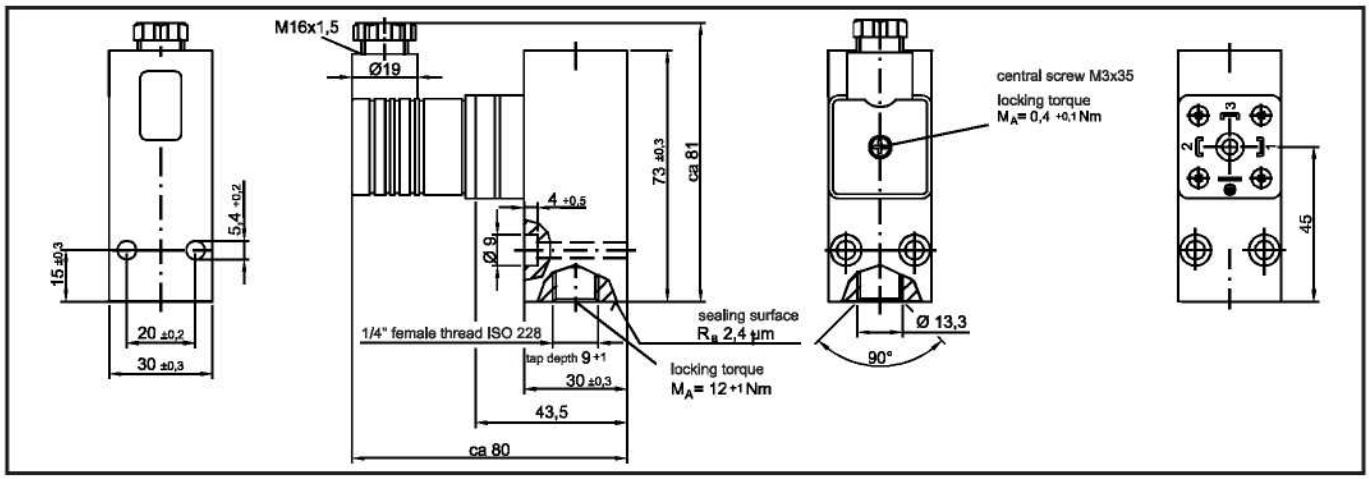
MINICOMB
sub-base mounting and plug ISO 4400



MINICOMB
sub-base mounting CNOMO and plug ISO 4400

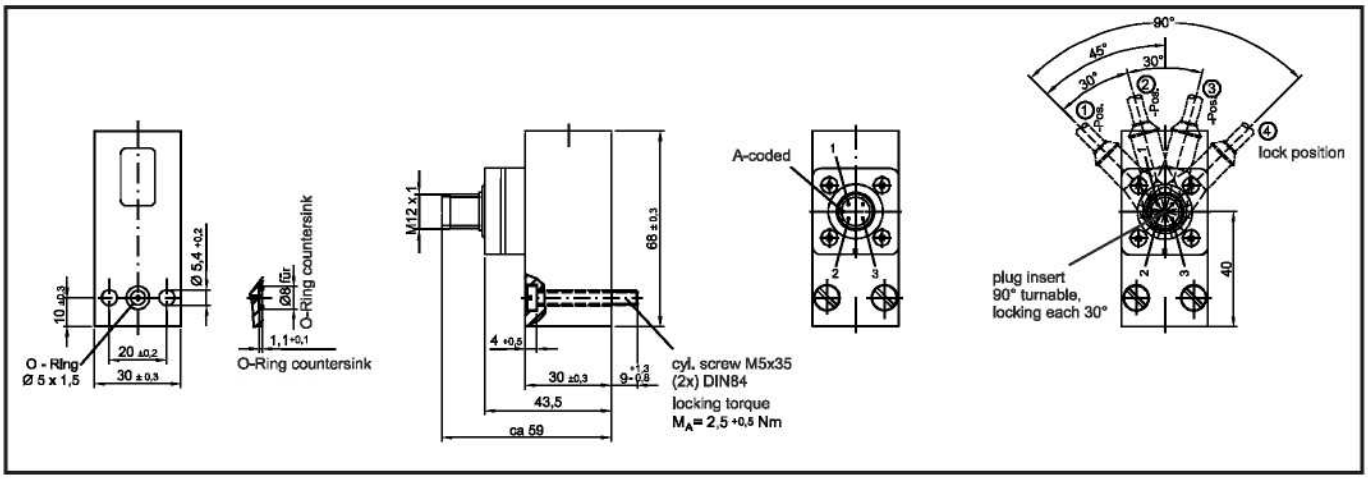


MINICOMB
1/4“ female ISO 228 thread mounting and plug ISO 4400

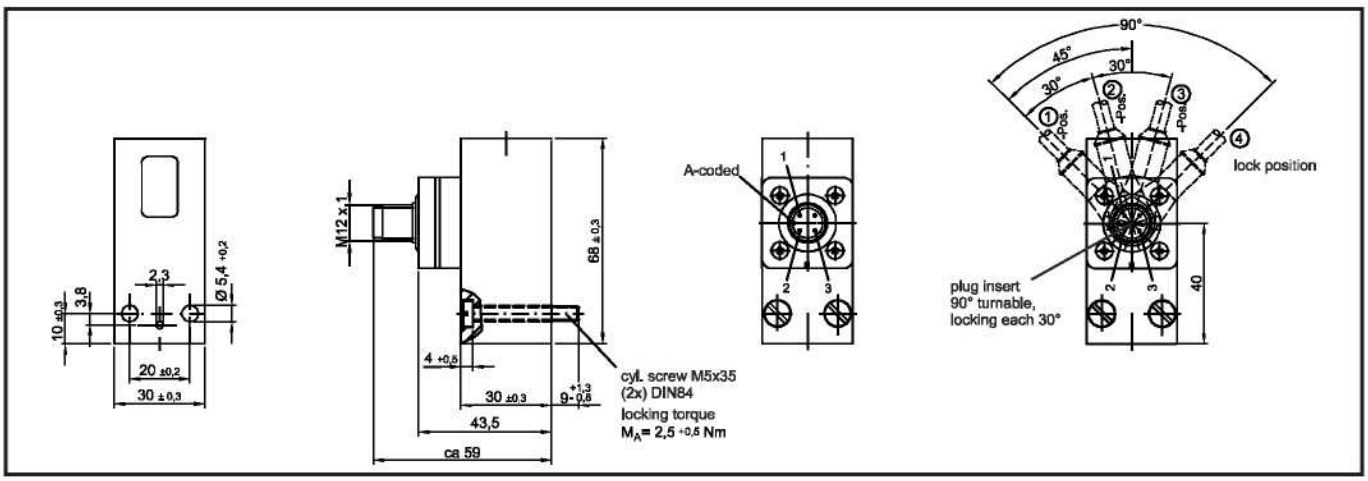


DIMENSIONS (VERSION WITH PLUG M12X1)

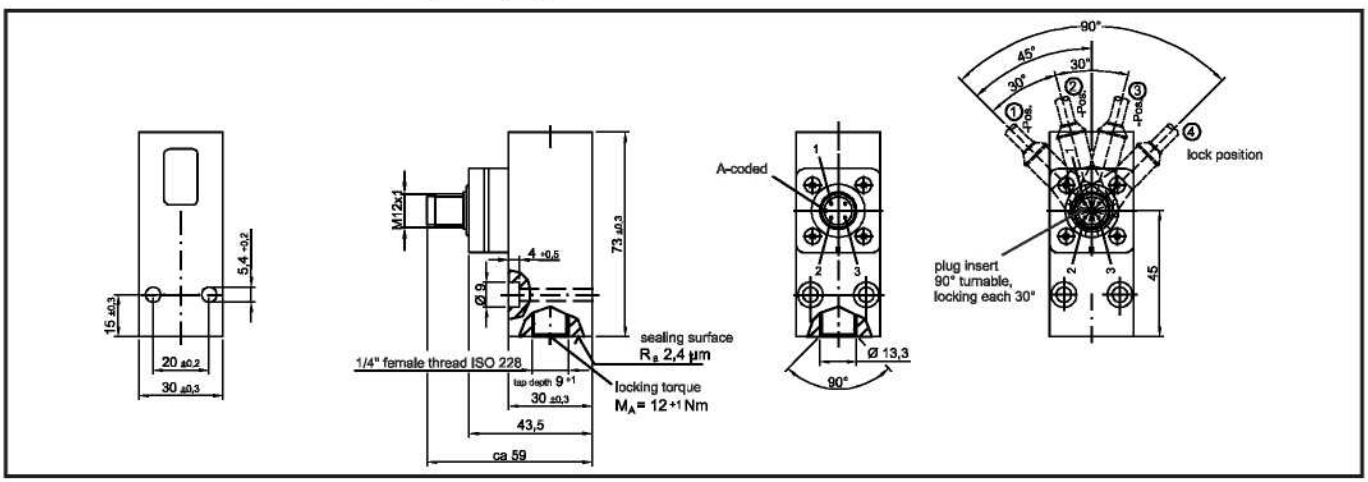
MINICOMB
sub-base mounting and plug M12x1



MINICOMB
sub-base mounting CNOMO and plug M12x1



MINICOMB
1/4“ female ISO 228 thread mounting and plug M12x1



ELECTRICAL DATA

Category AC-12 / DC-12

Switching Capacity

max. steady current I max [A] on **inductive** load

	U [V]	30V	48V	60V	125V	250V
version with plug ISO4400	I [A] AC	3	3	3	3	3
	I [A] DC	2	0,55	0,4	0,15	---
version with plug M12x1	I [A] AC	3	---	---	---	---
	I [A] DC	2	---	---	---	---
reference switch cycle: 30/min reference temperature: +30°C AC = cos phi ca. 0,7° DC = L/R ca 10ms						

Switching Capacity

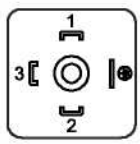
max. steady current I max [A] on **ohmic** load

	U [V]	30V	48V	60V	125V	250V
version with plug ISO4400	I [A] AC	5	3	5	5	5
	I [A] DC	3	1,2	0,8	0,4	---
version with plug M12x1	I [A] AC	4	---	---	---	---
	I [A] DC	3	---	---	---	---
reference switch cycle: 30/min reference temperature: +30°C						

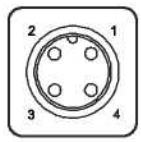
Electrical Connection

shown in zero pressure condition

plug ISO 4400



plug M12



		plug ISO4400	plug M12
micro switch	+UB	1	1
	normally closed	2	2
	normally open	3	4
	GND	4	---

ORDER-CODES

most common options

Pressure Range	Electrical Connection	Process Connection	Remarks	Order-Code
0,2 - 16 bar	ISO 4400	Sub-base mounting	1	C0011F-199-PAO
			ATEX, 1	C0111F-199-PAO
		Sub-base mounting CNOMO	1	C0011F-199-CAO
		1/4" female ISO 228 thread	2	C0051F-199-4AO
			ATEX, 2	C0151F-199-4AO
	M12	Sub-base mounting	1	C0011F-199-PDO
			ATEX, 1	C0111F-199-PDO
		Sub-base mounting CNOMO	1	C0011F-199-CDO
		1/4" female ISO 228 thread	2	C0051F-199-4DO
			ATEX, 2	C0151F-199-4DO
-0,9...0 bar	ISO 4400	Sub-base mounting	1	C0011F-300-PAO
			ATEX, 1	C0111F-300-PAO
		1/4" female ISO 228 thread	2	C0051F-300-4AO
			ATEX, 2	C0151F-300-4AO
	M12	Sub-base mounting	1	C0011F-300-PDO
			ATEX, 1	C0111F-300-PDO
		1/4" female ISO 228 thread	2	C0051F-300-4DO
			ATEX, 2	C0151F-300-4DO
-0,9...+1 bar	ISO 4400	Sub-base mounting	1	C0011F-301-PAO
			ATEX, 1	C0111F-301-PAO
		1/4" female ISO 228 thread	2	C0051F-301-4AO
			ATEX, 2	C0151F-301-4AO
	M12	Sub-base mounting	1	C0011F-301-PDO
			ATEX, 1	C0111F-301-PDO
		1/4" female ISO 228 thread	2	C0051F-301-4DO
			ATEX, 2	C0151F-301-4DO

1) Counter plug and installation screws within scope of delivery
2) Counter plug within scope of delivery

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CONVERSION TABLE FOR PRESSURE UNITS

		Standard International Units					Technical Units					
		mbar	bar	Pa	kPa	MPa	mm WC	m WC	kp/cm²	atm	Torr	psi
Standard International Units	mbar	•	0,001	100	0,1	0,0001	10,197	$10,197 \times 10^{-3}$	$1,0197 \times 10^{-3}$	$0,98692 \times 10^{-3}$	0,75006	$14,504 \times 10^{-3}$
	bar	1.000	•	100.000	100	0,1	$10,197 \times 10^{3}$	10,197	1,0197	0,9869	750,06	14,504
	Pa	0,01	0,00001	•	0,001	0,000001	0,10197	$0,10197 \times 10^{-3}$	$0,10197 \times 10^{-4}$	$9,8692 \times 10^{-6}$	$7,5006 \times 10^{-3}$	$0,14504 \times 10^{-3}$
	kPa	10	0,01	1.000	•	0,001	$0,10197 \times 10^{3}$	0,10197	$10,197 \times 10^{-3}$	$9,8692 \times 10^{-3}$	7,5006	0,14504
	MPa	10.000	10	1.000.000	1.000	•	$0,10197 \times 10^{6}$	$0,10197 \times 10^{3}$	10,197	9,8692	$7,5006 \times 10^{3}$	$0,14504 \times 10^{3}$
Technical Units	mm WS	$98,067 \times 10^{-3}$	$98,067 \times 10^{-6}$	9,8067	$9,8067 \times 10^{-3}$	$9,8067 \times 10^{-6}$	•	10^{-3}	10^{-4}	$96,784 \times 10^{-6}$	$73,556 \times 10^{-3}$	$1,4223 \times 10^{-3}$
	m WS	98,067	$98,067 \times 10^{-3}$	$9,8067 \times 10^{3}$	9,8067	$9,8067 \times 10^{-3}$	10^{3}	•	10^{-1}	$96,784 \times 10^{-3}$	73,556	1,4223
	kp/cm²	$0,98067 \times 10^{3}$	0,98067	$98,067 \times 10^{3}$	98,067	$98,067 \times 10^{-3}$	10^{4}	10	•	0,96784	735,56	14,223
	atm	$1,0133 \times 10^{3}$	1,0133	$0,10133 \times 10^{6}$	$0,10133 \times 10^{3}$	0,10133	$10,332 \times 10^{3}$	10,332	1,0332	•	760	14,693
	Torr	1,3332	$1,3332 \times 10^{-3}$	$0,10133 \times 10^{3}$	0,10133	$0,13332 \times 10^{-3}$	13,595	$13,595 \times 10^{-3}$	$1,3595 \times 10^{-3}$	$1,3158 \times 10^{-3}$	•	$19,34 \times 10^{-3}$
	psi	68,948	$68,948 \times 10^{-3}$	$6,8948 \times 10^{3}$	6,8948	$6,8948 \times 10^{-3}$	$0,70307 \times 10^{3}$	0,70307	$0,70307 \times 10^{-3}$	$0,70307 \times 10^{-4}$	51,715	•

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Company's name and address	*contact person*
	telephone, fax
inquiry no. / project no.	*E-Mail*
application	*measured media*
wetted parts material	*housing material*
media temperature T_{min} T_{max}	*environmental temperatur* T_{min} T_{max}
pressure load *static:* *dynamic: from* *to*	*vacuum* ☐ *Yes* ☐ *No*
special requirements	

Design pressure switch

model	*explosion proof version* ☐ *No* ☐ *EExi* ☐ *EExd* ☐ _____
number of switching contacts ☐ *1* ☐ *2* ☐ _____	*set point(s) - falling /rising?*
switching contact type ☐ *micro switch* ☐ *inductive* ☐ *pneumatic*	*switching performance (mech. and electr. for micro switch)*
actual value indicator (integrated pressure gauge) ☐ *Yes* ☐ *No*	*analogue signal (integrated pressure transducer 4 - 20mA)* ☐ *Yes* ☐ *No*
pressure range	*differential pressure range*
process connection ☐ *BSP* ☐ *NPT* ☐ *chemical seal* *see checkliste chemical seal* ☐ *others* ☐ *1/4* ☐ *1/2* ☐ *male* ☐ *female*	
electrical connection ☐ *M20/terminal blocks* ☐ *wired cable _____meter* ☐ *others* ☐ *plug ISO4400* ☐ *Harting plug*	
approvals / certificates	
other	
Quotation for pieces _____	☐ *annual demand* ☐ *single demand* ☐ *project demand* ☐ *spare parts*

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