

PRODUCT CATALOGUE

MANOCOMB[®] **Precision Pressure Switch**



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ISO9001 & RS00009



VALVES, SWITCHES, INSTRUMENTATION
AND SYSTEMS FOR
PRESSURE, FLOW AND
TEMPERATURE APPLICATIONS

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To our valued customers !

We would like to thank you for your interest in our products and introduce to you in following our mechanical pressure switches - series **MANOCOMB®**.

As a specialist for pressure measurement we are able to offer you a suitable pressure switch for almost all applications.

From standard industrial pressure switches over precision pressure switches up to a special solution for your application; whether mounting a chemical seals system, cooling installation and over pressure protection systems or a tailor-made solution especially developed for you, with over 30 years know-how in manufacturing, own toolings und prototype production and most modern machinery we are looking forward to every new challenge.

Your team of PINTER Mess- und Regeltechnik GmbH


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What is pressure ?

Definition of pressure

A force, which acts evenly on a defined area, is called pressure.

Pressure (P) is one of the mostly measured physical units besides temperature.

Measured media can be gases, vapours, liquids or suspensions.

The unit "bar" is the most common unit for pressure within Europe.

It corresponds approx. to the dimensions of atmospheric pressure.

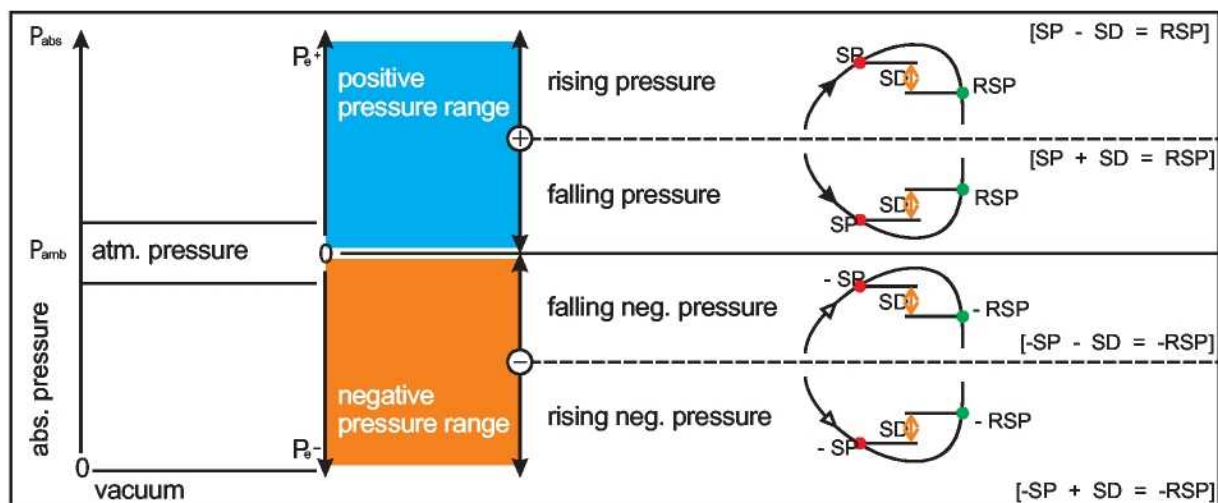
The general term "pressure" is not always clear, as we differentiate between several kinds of pressure by their reference point:

- 1.) absolute pressure (P_{abs})
- 2.) atmospheric air pressure (P_{amb})
- 3.) differential pressure (ΔP)
- 4.) atmospheric pressure difference or over pressure (P_e)

Atmospheric pressure difference (over pressure), which is the difference between absolute pressure and atmospheric air pressure is the most common measured kind of pressure in technical engineering.

Atmospheric pressure .

Definition of pressure ranges, set points, re-set points, switching differential



P_{abs} = absolute pressure referring to vacuum

P_{amb} = absolute value of ambient atmospheric pressure

P_e = pos. or neg. over pressure referring to P_{amb}

Every switching contact has

- a set point (SP)
- a re-set point (RSP)
- ↕ a switching differential (SD) - (hysteresis)

What is a pressure switch ?

Working method of pressure switches in general

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

In general pressure switches have one or more fixed or adjustable setpoints which can be setted on a specific pressure value.

The setted values are being transformed into an electric or pneumatic output signal which is necessary for the control and regulation of processes, e.g. safety and alarm devices.

Pressure can be captured in different ways, e.g. with diaphragms, bourdon tube measuring systems or with the force-balance measuring system the MANOCOMB® precision pressure switch features.

Working method of MANOCOMB® Precision pressure switches

The MANOCOMB® pressure switch is a modular precision pressure instrument based on a force-balance measuring system, that triggers either one or two switching contacts. These switching contacts can be comfortably adjusted on a calibrated set value input scale (class 1.0). For protecting once made contact adjustments a sealable version is available.

Optionally the MANOCOMB® precision pressure switch can be equipped with an integrated pressure gauge (actual value indicator, class 1.0) and/or integrated pressure transducer (analogue signal 4 - 20 mA or 0 - 10 V, 0,5% FS) inside the same housing.

Based on the modular system an enormous number of housing types, switching contact types, pressure and differential pressure ranges, process connections and electric / pneumatic connections is available.

This great variety qualifies the MANOCOMB® precision pressure switch for all measuring points and operating conditions.

Additional optional equipment such as chemical seals systems, cooling installations or over pressure protection systems not even taken in consideration.

Several independant institutes confirm the comfortable as well as precise and safe operation of the MANOCOMB® precision pressure and have it certified according to:



Advantages of MANOCOMB® precision pressure switches

Differences between MANOCOMB® precision pressure switches and conventional pressure switches

1. High precision and extremely tough force-balance measuring system with bellows and calibrated stress or tension spring. Without moving axles , turning motions, hinges or pestles the measuring systems works completely **friction free !**
2. The measuring systeme is assembled to the housing completely unstressed and torsion free !
3. Every switching contact has its own measuring system independent from each other !
4. Very comfortable set point adjustment with calibrated set value input scale, class 1.0 without tools or reference measuring necessary !
5. Great variety of switching contacts,
e.g. microswitches, inductive contacts, air gap contacts, pneumatic contacts !
6. Integrated pressure gauge (actual value indicator, class 1.0) and/or integrated pressure transducer (analogue signal 4 - 20 mA or 0 - 10 V, 0,5% FS) !

Technical advantages of MANOCOMB® precision pressure switches ?

1. The measuring system has no parts subject to wear and tear and is exceptionally precise:
switching differential: depending on switching contact approx. 0,5 - 3,5%
reproducibility: depending on switching contact approx. 0,03%
virtually unlimited life span !
insensitive to pressure pulses, shocks and vibration !
2. Adjusted set points will not be affected by housing tensions or irradiation.
3. High switching accuracy. Every switching contact is adjustable over the whole measuring range (0 - 100%) independently and without influencing the other switching contact !
4. When adjusting the set point, no tools or reference measuring is necessary !
The adjustment can be made comfortably on site, without affecting safety !
Set values are clearly visable and can be compared easily with the actual pressure !
5. Great variety of switching contacts for optimizing the control and regulation system
e.g. high switching load, own-proof switching circuit, pneumatic output signal !
6. Simplified measuring point arrangement with integrated further measuring instruments !

Economical advantages of MANOCOMB® precision pressure switches ?

1. Lowest losses in uptime due to highly precise set point adjustment !
2. Compact dimensions and simplified measuring point arrangement with integrated further measuring instruments !
3. Modern design without mechanical wear and tear !
No spare parts needed !
4. Precise reproducibility and long-term stability; saves a lot of maintenance time and correction of once adjusted set points !

The MANOCOMB® Precision pressure switch in detail

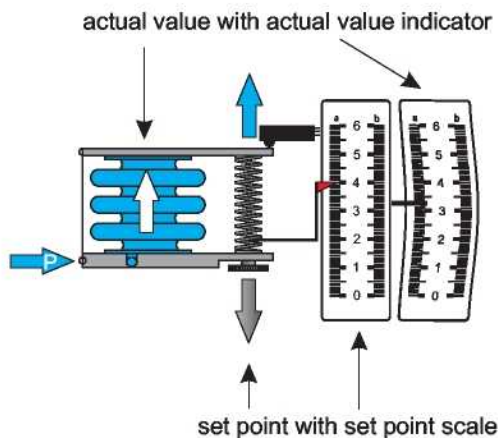
The force-balance operating principle

Pressure switches for pressure and vacuum

An adjustable tension or stress spring provides the set point.

The process pressure (actual value) acts on the bellows.

Once the actual value opposes the set point adjustment, force-balance-principle, a friction-free mounted lever triggers an electric or pneumatic switching contact.

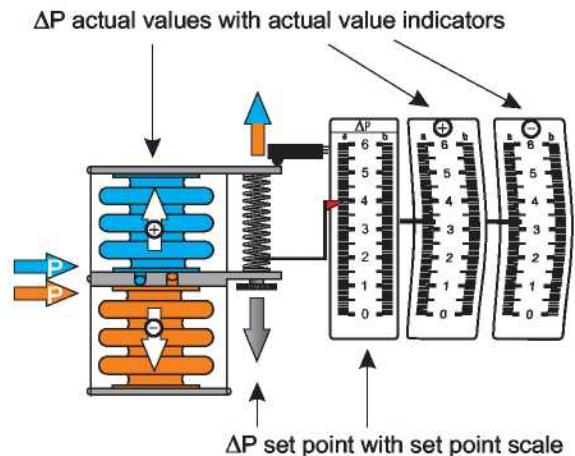


Pressure switches for differential pressure

An adjustable tension or stress spring provides the set point.

Two bellows working against each other build the differential pressure ΔP (actual differential value) from two process pressures (actual value).

Once the actual differential value opposes the set point adjustment, force-balance-principle, a friction-free double-lever triggers an electric or pneumatic switching contact.



Set point adjustment, actual value indicator (gauge), pressure transducer

Actual value indicator

integrated pressure gauge, accuracy class 1.0 to visualize the actual process pressure (actual value).

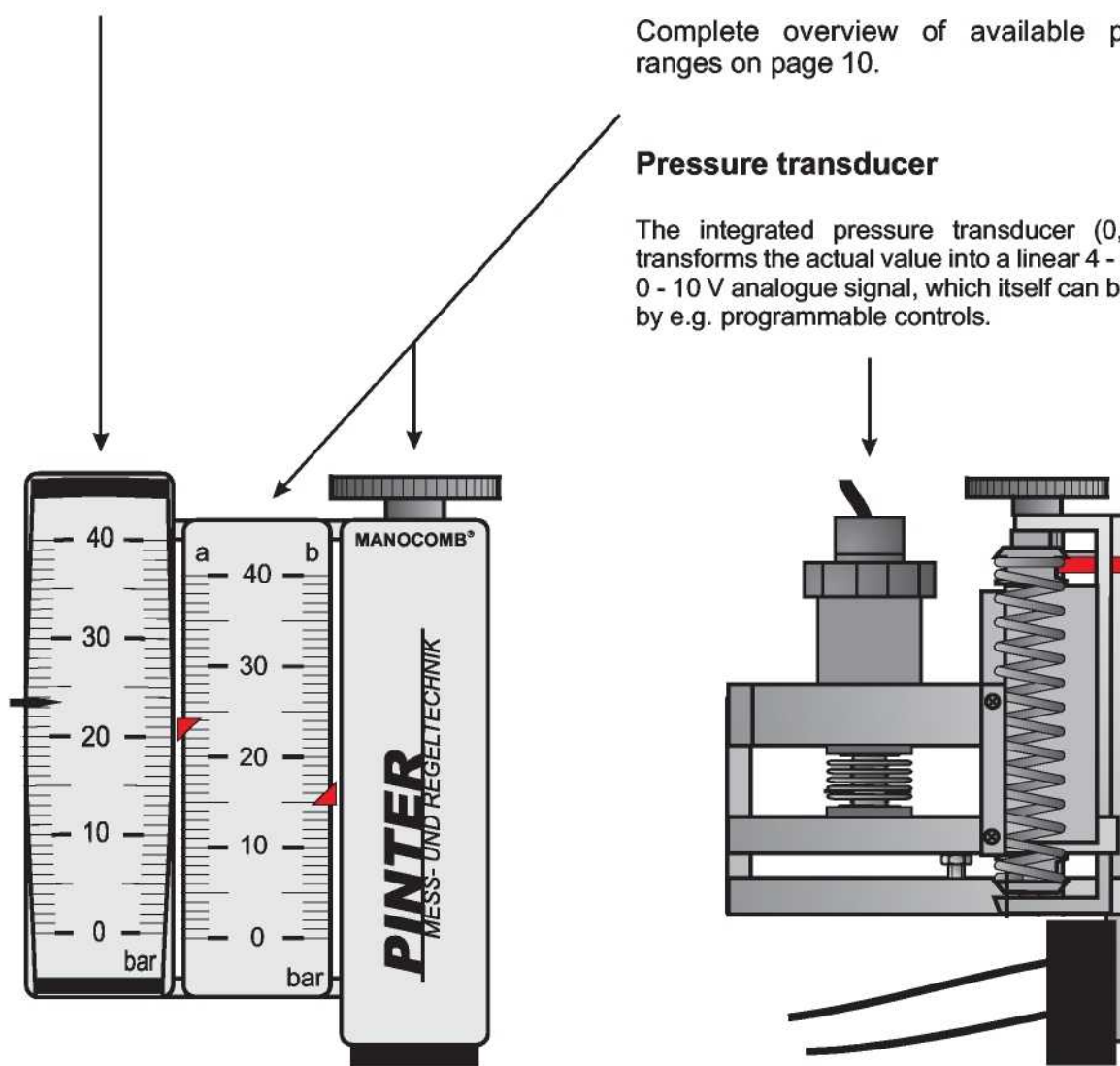
Set point and set point adjustment

Adjusting the set point(s) is done with a small cogwheel. The values are clearly visible on the calibrated set point scale (class 1.0) Due to this very precise possibility to adjust the set point, no tools or reference measuring is necessary.

Complete overview of available pressure ranges on page 10.

Pressure transducer

The integrated pressure transducer (0,5% FS) transforms the actual value into a linear 4 - 20 mA or 0 - 10 V analogue signal, which itself can be utilized by e.g. programmable controls.



Switching contact

Please see complete overview of available switching contacts starting on page 12.

Signal flow charts

Pressure switches for pressure and vacuum

switching contacts	1	2
process connections	1	1
type designation	1K, 1KA	2K, 2KA

Pressure switches with one or two switching contacts and one process connection

A pressure switch with one switching contact reads one pressure value, i.e. one set point (SP).

With two switching contacts two pressure values i.e. two set points can be read in row or in parallel.

A pressure switch with one process connection reads pressure changes in one pressure line.

switching contacts	2
process connections	2
type designation	2KP, 2K2AP

Pressure switches with two switching contacts and two process connections.

A pressure switch with two process connections reads pressure values before and after a pressure line resistance or from two separate pressure lines.

Type 2KP (2K2AP) is equipped with two independent measuring systems. It corresponds to two pressure switches 1K (1KA) in one housing.

Pressure switches for differential switches

switching contacts	1	2
type designation	1KPDi, 1K2APDi	2KPDi, 2K2APDi

The differential pressure ($\Delta P = P_1 - P_2$) is being determined by the differential pressure switch.

The differential pressure triggers one or two switching contacts.

MANOCOMB® Precision pressure switch

Supply range / Overview

model	page	protection type	switching function					indicators		wetted parts		switching contact types				process connections					elect. connections				pn.	
			1K	2K	2KP	1KPDi	2KPDi	set point scale	actual value ind.	brass	stainless steel	micro switch	inductive contact	air gap contact	pn. 3/2-way valve	analogue output	G - Thread	NPT - Thread	cutting ring	hose connector	chemical seals	M - Thread	cable	plug		terminal blocks
IP65	16	IP65	■	■	■	■	▣	■	□	■	□	■	□	▣	□	■	□	□	□	□	■	□	□	□	□	□
AL	18	IP65	■	■	■	■	▣	■	□	■	□	■	□	□	■	□	□	□	□	■	□	□	□	□	□	
TM	20	IP65	■					■	□	■	□	■	□		■	□	□	□	□				■			
IP54	22	IP65	■	■	■	■	▣	■	□	■	□	■	□	□	■	□	□	□	□	■	□					
96x96	24	IP22	■	■	■	■		■	□	■	□	■	□		■	□	□	□						■		
EX	26	IP55	■	■	■	■		■	□	■	□	■	□		■	□	□	□	□		■					

- standard version
- possible option
- ▣ available on request



For model specific details please review corresponding page in catalogue as stated in above table.

Pressure ranges

pressure	brass	stainless steel
0 - 60 mbar	⊗	⊗
0 - 100 mbar	⊗	⊗
0 - 160 mbar	⊗	⊗
0 - 250 mbar	⊗	⊗
0 - 400 mbar	⊗	⊗
0 - 600 mbar	●	⊗
0 - 0,6 bar	●	⊗
0 - 1 bar	●	●
0,2 - 1 bar	●	●
0 - 1,6 bar	●	●
0 - 2,5 bar	●	●
0 - 4 bar	●	●
0 - 6 bar	●	●
0 - 10 bar	●	●
0 - 16 bar	●	●
0 - 25 bar	●	●
0 - 40 bar	●	●
0 - 60 bar	●	●
0 - 100 bar	●	●
0 - 160 bar	○	●
0 - 250 bar	○	●
0 - 400 bar	○	⊗

- available with/without actual value ind.
- ⊗ available without actual value ind.
- not available

vacuum	brass	stainless steel
-1 - 0 bar	●	●
-0,6 - 0 bar	●	⊗
-600 - 0 mbar	●	⊗
-400 - 0 mbar	⊗	⊗
-250 - 0 mbar	⊗	⊗
-160 - 0 mbar	⊗	⊗
-100 - 0 mbar	⊗	⊗
-60 - 0 mbar	⊗	⊗

differential pressure	brass	stainless steel
with max ratio 10:1 (static pressure : differential pressure) - others on request. Pressure ranges and availability from actual value indicators as above.		



All above stated pressure ranges can be supplied in other measuring units (e.g. MPa, kPa, psi). You will find a conversion table for pressure units in the appendix.

Pressure ranges which are not graded according to DIN, can be adapted on request.

Overpressure / Vacuum Safety

vacuum safety in all pressure ranges up to -1 bar;
overpressure safety at least 1,5x FS; extended overpressure safety available on request.

MANOCOMB® Precision pressure switch

Materials

housing

Most of the MANOCOMB® precision pressure switches feature a re-inforced polycarbonat housing with a transparent makrolon cover.

Optionally the housing (Type IP65 und TM) is available in **UL94-V0** listed material.

For extremely rough environment a housing made of aluminium (Type AL) is available.

All housing types correspond to protection type **IP65** (except from model 96x96).

Please find detailed information on each model on the model specific catalogue page.

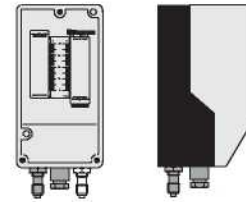
wetted parts

In standard version the MANOCOMB® precision pressure switch s wetted parts are made of: **brass / tin-bronze**

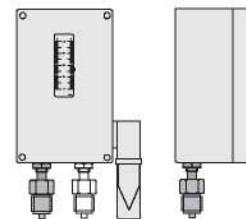
When applicable, the MANOCOMB® precision pressure switch s wetted parts can be made of: **stainless steel AISI 316Ti (1.4571)**

This extremely high-grade material is especially recommended when measuring aggressive media.

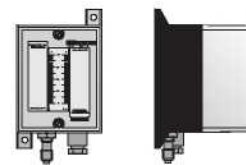
The sensor on model TM s pressure transducer is made of: Al_2O_3



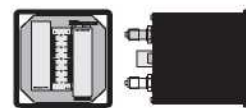
Model IP65 und TM



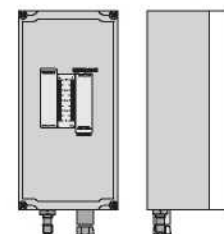
Model AL¹



Model IP54



Model 96x96



Model EX

¹ Illustration shows optional components

MANOCOMB® Precision pressure switch

Switching contacts

The MANOCOMB® Precision pressure switch is available with an enormous number of switching contacts.



Micro switches

are the most common switching contacts and are available in different versions:

Max. load or micro switches (cat. AC/DC 12). All values based on induction-free load.

Type	24V	48V	110V	240V	typical switching differential at 1 - 250 bar ¹
Standard	A (AC)	5	5	5	≤ 1,0 %
	A (DC)	1	0,5	-	
MG ² (Gold)	A (AC)	1	1	1	≤ 1,5 %
	A (DC)	1	0,5	0,2	
MW	A (AC)	5	5	5	≤ 0,8 %
	A (DC)	1	0,5	-	
MH	A (AC)	5	5	5	≤ 1,5 %
	A (DC)	5	2	0,8	
CS	A (AC)	5	5	5	≤ 2,0 %
	A (DC)	5	2	0,4	
CH ³	A (AC)	12	12	10	≤ 1,5 %
	A (DC)	10	2	0,4	
CZ ³ (forced circuit opening)	A (AC)	5	5	5	≤ 2,0 %
	A (DC)	5	2	0,4	

¹ deviation from full scale

² possible for own proof circuits (EExi)

³ available for pressure range 0 - 6 bar and higher



Inductive contacts

e.g. for use in own proof applications (EExi) or for differential pressure switches with a high ratio from static to differential pressure:

Type \ ATEX-Zone	1G	2G	3G	1D	3D	typical switching differential at 1 - 250 bar ¹
I-N	☑	☑		☑		≤ 1,0 %
I-SN	☑	☑	☑	☑	☑	≤ 1,0 %

¹ deviation from full scale

further information on request

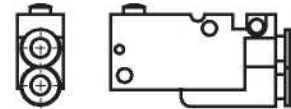
MANOCOMB® Precision pressure switch

Switching contacts

The MANOCOMB® Precision pressure switch is available with an enormous number of switching contacts.

3/2-way-pneumatic-valve

Instead of a micro switch, MANOCOMB® Precision pressure switches can be equipped with either one or two 3/2-way-valves. When using these mini-valves, the MANOCOMB® precision pressure switch is suitable for any explosion-proof environment. Further information on request.



Air gap contacts

as well as 3/2-way-valves can be used instead of a micro switch. Technically the predecessor of the version with 3/2-way-valve. Further information on request.

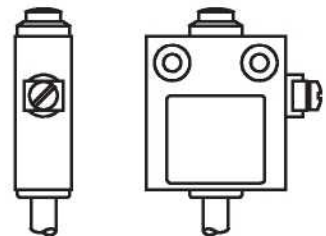


Encapsulated micro switches (EExd)

as well as all other switching contacts can be used instead of standard micro switches.

MANOCOMB® precision pressure switches with encapsulated micro switches can be used in explosion-proof environment. All corresponding micro switches are certified according to PTB/ATEX. As they are the only electrical part on the pressure switch, a certification of the whole pressure switch is not necessary.

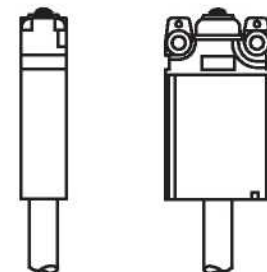
All encapsulated micro switches correspond to **EEx d IIC T6**.



Type		30V	250V	allowed environmental temperatures	typical switching differential at 1 - 250 bar ¹
HW	A (AC)	3	3	- 20 - +70°C	≤ 2,0 %
	A (DC)	3	3		
ST	A (AC)	7	5	- 20 - +40°C (+70°C on request)	≤ 3,0 %
	A (DC)	7	0,4		
STG (Gold)	A (AC)	on request			
	A (DC)	on request			

¹ deviation from full scale

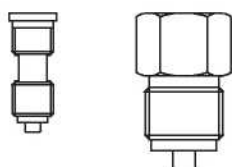
further information on request



MANOCOMB® Precision pressure switch

Process connections

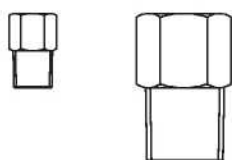
The MANOCOMB® Precision pressure switch is available with an enormous number of process connections.



BSP-Thread (ISO 228)

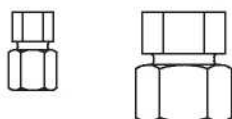
Every model is equipped with a 1/4 BSP male process connection.

Optionally available with other BSP threads with male or female threads.



NPT-Thread

Optionally available with male or female threads, e.g. 1/2 NPT male, 1/2 NPT female, 1/4 NPT female



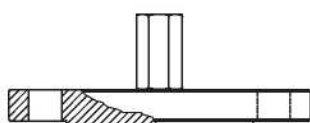
Cutting ring connection (Ermeto)

Optionally available in different versions, e.g. ER6, ER8, ER10, ER12



Pneumatic connection

Optional connection for hose Ø6



Flange connections

Optionally available in different versions (DIN or ANSI/ASME), e.g. DN25, DN40, DN50, DN80, DN 1 , DN 1.5 , DN 2 .

Not available for model 96x96



Chemical seals

Especially for aggressive, highly viscous, polluted, crystallizing or hot media, chemical seals are recommended.

Chemical seals are available in different versions, e.g. flange type, thread type, clamp type.

For further information please see separate **product catalogue "Chemical Seals"** .

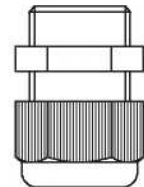
MANOCOMB® Precision pressure switch

Electrical / pneumatic connections

The MANOCOMB® Precision pressure switch is available with an enormous number of electrical / pneumatic connections.

Cable gland

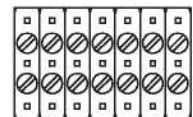
In standard most models are equipped with an M20 cable gland for cable installation. The cable itself is connected to terminal blocks in the protected room inside the housing. Other cable glands are available.



Terminal blocks

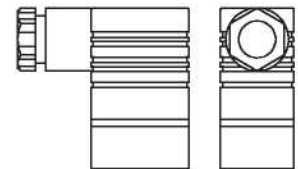
The terminal blocks inside the housing are suitable for wires up to 2,5 mm².

Not available for models TM, 96x96 and EX



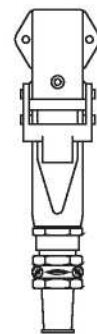
Plugs according to DIN 43650 / ISO 4400 (Hirschmann)

Optionally available according to DIN43650 Form A, B, C. Standard for model TM. Not available for models 96x96 and EX.



Harting plugs

Optionally Harting H7D or H8U are available. Not available for models 96x96 and EX.



Direct wired

Optionally available with wired cable. Standard for models IP54 and EX. Not available for models TM and 96x96.

pneumatic connection

Optional connection for hose Ø6. Standard when using pneumatic switching contact(s).



MANOCOMB® Precision pressure switch *Model IP65*



Switching function

Type-designation	number of		process connections
	contacts	actual value ind.	
1K	1	-	1
1KA	1	1	1
2K	2	-	1
2KA	2	1	1
2KP	2	-	2
2K2AP	2	2	2
1KPDi	1	-	2
1K2APDi	1	2	2

Pressure ranges

highest neg. pressure range	-1...0 bar
lowest neg. pressure range	-60...0 mbar
lowest pos. pressure range	0 - 60 mbar
highest pos. pressure range	0 - 400 bar

an overview of all pressure ranges can be found on page 10.

Differential pressure ranges

with max. ratio of 10:1 from static pressure to differential pressure. Others on request.

Standard version

materials	
housing	poly-carbonate reinforced; with transparent cover
wetted parts	brass
switching contact(s)	micro switch type standard
temperatures:	
Media (brass version)	-20°C up to +70°C
Media (stainless steel version)	-20°C up to +130°C
environment	-20°C up to +70°C
deviation	± 1,0% per 20°C
accuracy	
accuracy of set point adjustment	dep. on contact ¹
reproducibility	± 0,03
actual value ind. (integr. gauge)	class 1.0
process connection	1/4 BSP male
electrical connection	M20 and terminal blocks 2,5mm ²
electrical data	dep. on contact ¹
weight	approx. 1,0 - 1,5 kg depending on switching function
protection (EN 60529)	IP65

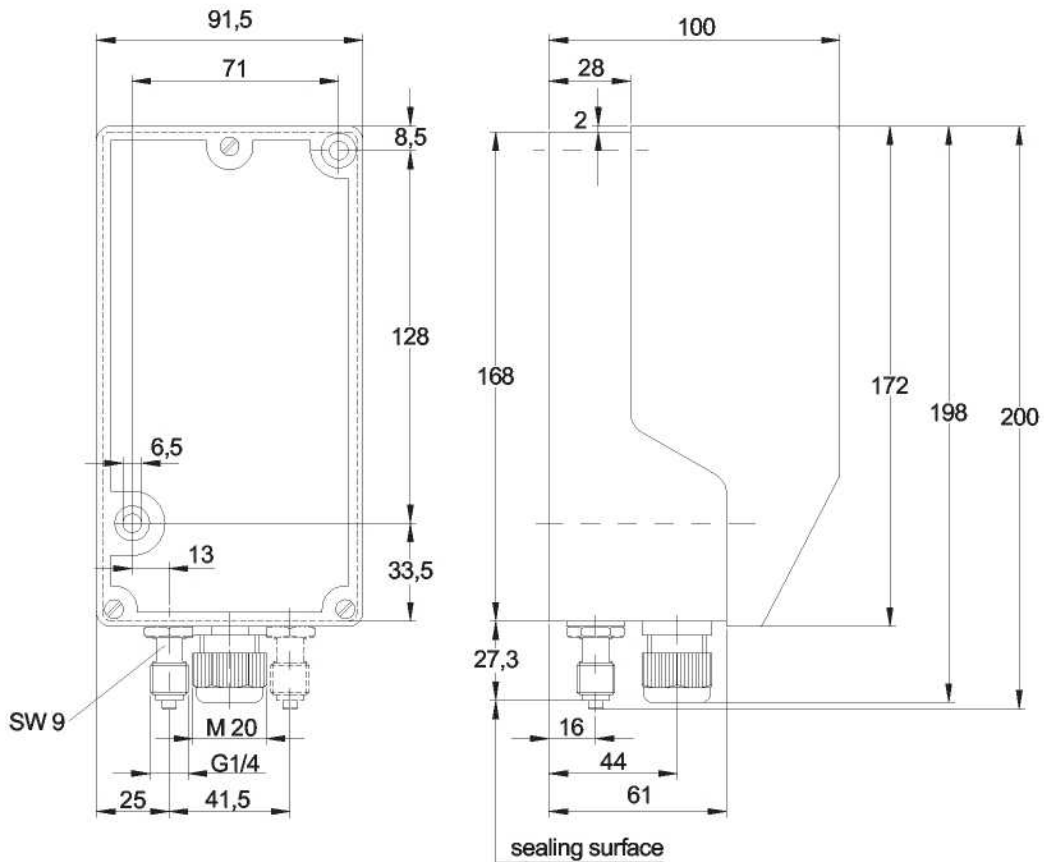
Options

materials	
housing	poly-carbonate reinforced; with transparent cover
wetted parts	(acc. to UL-94 V0) stainless steel AISI 316Ti (1.4571)
switching contact(s)	micro switch(es), inductive contact(s) pneumatic valve(s) air gap contact
process connection	see page 14
electrical connection	see page 15

¹ see switching contacts on page 12+13

MANOCOMB® Precision pressure switch Model IP65

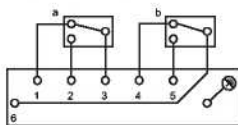
Dimensions



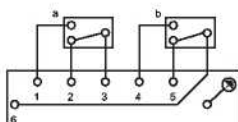
Wiring diagram

zero pressure condition for micro switch(es)

positive pressure



negative pressure



Certificates

please also see appendix



Pressure Equipment Directive 97/23/EG

Module B (BAF-MUC 03 12 707534 001)

Module D (DGR-0036-QS-359-04)

VdTÜV-Merkblatt Druck 100/1, TRD604

(TÜV.DWFS(SDBFS).02-312)

Gas Appliance Directive 90/396/EWG,

EN1854 (DIN 3398-1,2), DIN3398-3

(CE-0085BO6137 / 6138)

DIN 3398-4

(3CO3803)

MANOCOMB® Precision pressure switch *Model AL*



Switching function

Type-designation	number of actual		process connections
	contacts	value ind.	
1K	1	-	1
2K	2	-	1
2KP	2	-	2
1KPDi	2	-	2

Pressure ranges

highest neg. pressure range	-1...0 bar
lowest neg. pressure range	-60...0 mbar
lowest pos. pressure range	0 - 60 mbar
highest pos. pressure range	0 - 400 bar

an overview of all pressure ranges can be found on page 10.

Differential pressure ranges

with max. ratio of 10:1 from static pressure to differential pressure. Others on request.

Standard version

materials	
housing	coated aluminium without windows
wetted parts	brass
switching contact(s)	micro switch type standard
temperatures:	
Media (brass version)	-20°C up to +70°C
Media (stainless steel version)	-20°C up to +130°C
environment	-20°C up to +70°C
deviation	_ 1,0% per 20°C
accuracy	
accuracy of set point adjustment	depending on switching contact ¹
reproducibility	_ 0,03
process connection	1/4 BSP male
electrical connection	M20 and terminal blocks 2,5mm ²
electrical data	depending on switching contact ¹
weight	approx. 1,2 - 1,7 kg depending on switching function
protection (EN 60529)	IP65

Options

materials	
housing	coated aluminium with window
wetted parts	stainless steel AISI 316Ti (1.4571)
switching contact(s)	micro switch(es),
process connection	see page 14
electrical connection	see page 15

¹ see switching contacts on page 12+13

MANOCOMB® Precision pressure switch-transducer Model TM smart measuring



Switching function

Type-designation	number of		process connections
	contacts	actual value ind. analog signals	
1K	1	-	1
1KA	1	1	1
2K	2	-	1
2KA	2	1	1

Pressure ranges

highest neg. pressure range	-1...0 bar
lowest neg. pressure range	-1...0 bar
lowest pos. pressure range	0 - 1 bar
highest pos. pressure range	0 - 400 bar

an overview of all pressure ranges can be found on page 10.

Standard version

materials

housing	poly-carbonate reinforced; with transparent cover
wetted parts	brass

switching contact(s)	micro switch type standard
-----------------------------	----------------------------

temperatures:

Media (brass version)	-20°C up to +70°C
Media (stainless steel version)	-20°C up to +130°C
environment	-20°C up to +70°C
deviation	_ 1,0% per 20°C

accuracy

accuracy of set point adjustment	dep. on contact ¹
reproducibility	_ 0,03
actual value ind. (integr. gauge)	class 1,0
analogue signal (integr. transducer)	_ 0,5% FS

process connection	1/4 BSP male
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electrical connection	2x plug ISO4400
------------------------------	-----------------

electrical data

supply for transducer	dep. on contact ¹
output signal	14 - 28 VDC 4 - 20 mA

weight	approx. 1,5 kg
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protection (EN 60529)	IP65
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Options

materials

housing	poly-carbonate reinforced; with transparent cover
wetted parts	(acc. to UL-94 V0) stainless steel AISI 316Ti (1.4571)

switching contact(s)	micro switch(es)
-----------------------------	------------------

analogue signal	0 - 10 V
------------------------	----------

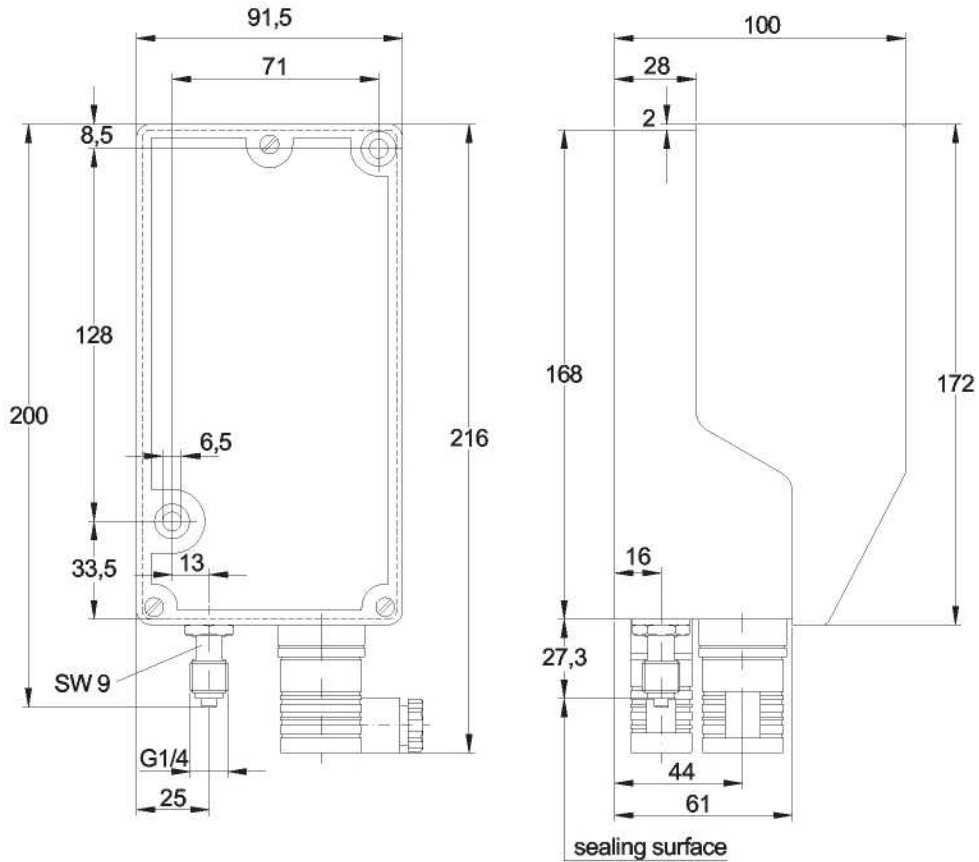
process connection	see page 14
---------------------------	-------------

electrical connection	see page 15
------------------------------	-------------

¹ see switching contacts on page 12+13

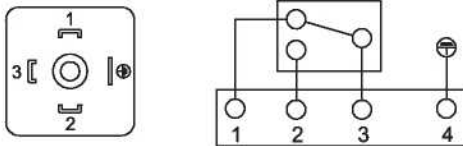
MANOCOMB® Precision pressure switch-transducer Model TM smart measuring

Dimensions



Wiring diagram
zero pressure condition

for microswitch



for analogue signal 4 - 20 mA



Certificates
please also see appendix



Pressure Equipment Directive 97/23/EG,
VdTÜV-Merkblatt Druck 100/1
Module B (BAF-MUC 04 03 707534 002)
Module D (DGR-0036-QS-359-04)

MANOCOMB® Precision pressure switch Model IP54



Switching function

Type-designation	number of		process connections
	contacts	actual value ind.	
1K	1	-	1
1KA	1	1	1
2K	2	-	1
2KA	2	1	1
2KP	2	-	2
2K2AP	2	2	2
1KPDi	1	-	2
1K2APDi	1	2	2

Pressure ranges

highest neg. pressure range	-1...0 bar
lowest neg. pressure range	-60...0 mbar
lowest pos. pressure range	0 - 60 mbar
highest pos. pressure range	0 - 400 bar

an overview of all pressure ranges can be found on page 10.

Differential pressure ranges

with max. ratio of 10:1 from static pressure to differential pressure. Others on request.

Standard version

materials

housing	poly-carbonate reinforced; with transparent cover
wetted parts	brass

switching contact(s)	micro switch type standard
-----------------------------	----------------------------

temperatures:

Media (brass version)	-20°C up to +70°C
Media (stainless steel version)	-20°C up to +130°C
environment	-20°C up to +70°C
deviation	± 1,0% per 20°C

accuracy

accuracy of set point adjustment	dep. on contact ¹
reproducibility	± 0,03
actual value ind. (integr. gauge)	class 1,0

process connection	1/4 BSP male
---------------------------	--------------

electrical connection	1,5m cable
------------------------------	------------

electrical data	dep. on contact ¹
------------------------	------------------------------

weight	approx. 1,0 - 1,5 kg depending on switching function
---------------	------------------------------------------------------

protection (EN 60529)	IP65
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Options

materials

wetted parts	stainless steel AISI 316Ti (1.4571)
--------------	-------------------------------------

switching contact(s)	micro switch(es), air gap contact(s)
-----------------------------	--------------------------------------

process connection	see page 14
---------------------------	-------------

electrical connection	see page 15
------------------------------	-------------

¹ see switching contacts on page 12+13

MANOCOMB® Precision pressure switch *Model 96x96*



Switching function

Type-designation	number of		process connections
	contacts	actual value ind.	
1K	1	-	1
1KA	1	1	1
2K	2	-	1
2KA	2	1	1
2KP	2	-	2
2K2AP	2	2	2
1KPDi	1	-	2
1K2APDi	1	2	2

Pressure ranges

highest neg. pressure range	-1...0 bar
lowest neg. pressure range	-60...0 mbar
lowest pos. pressure range	0 - 60 mbar
highest pos. pressure range	0 - 400 bar

an overview of all pressure ranges can be found on page 10.

Differential pressure ranges

with max. ratio of 10:1 from static pressure to differential pressure. Others on request.

Standard version

materials

housing	steel sheet housing front cover (poly-carbonate) black with transparent window
wetted parts	brass

switching contact(s)	micro switch type standard
-----------------------------	-------------------------------

temperatures:

Media (brass version)	-20°C up to +70°C
Media (stainless steel version)	-20°C up to +130°C
environment	-20°C up to +70°C
deviation	_ 1,0% per 20°C

accuracy

accuracy of set point adjustment	dep. on contact ¹
reproducibility	_ 0,03
actual value ind. (integr. gauge)	class 1,0

process connection	1/4 BSP male
---------------------------	--------------

electrical connection	terminal blocks 2,5mm ²
------------------------------	---------------------------------------

electrical data	dep. on contact ¹
------------------------	------------------------------

weight	approx. 1,0 - 1,5 kg depending on switching function
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protection (EN 60529)	IP65
------------------------------	------

Options

materials

wetted parts	stainless steel AISI 316Ti (1.4571)
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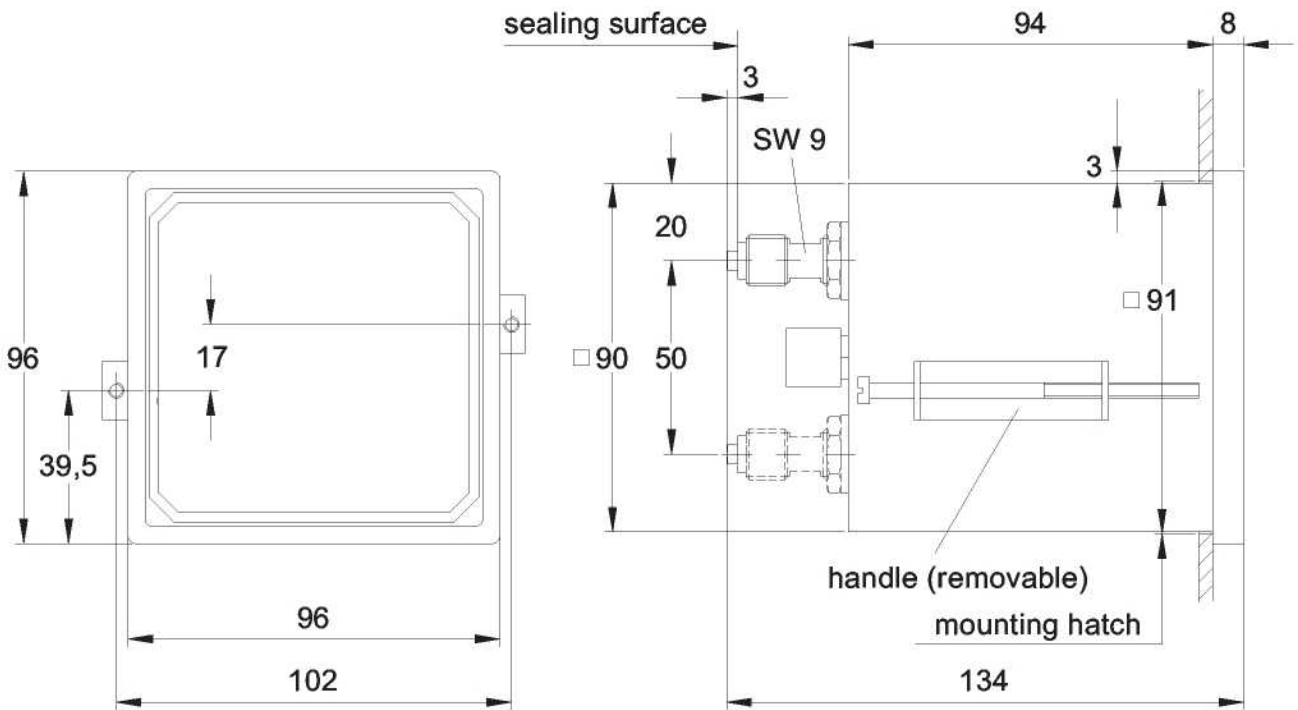
switching contact(s)	micro switch(es), inductive contact(s)
-----------------------------	-------------------------------------------

process connection	see page 14
---------------------------	-------------

¹ see switching contacts on page 12+13

MANOCOMB® Precision pressure switch Model 96x96

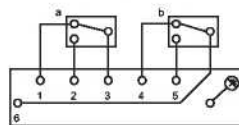
Dimensions



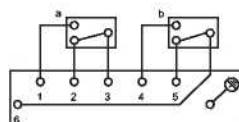
Wiring diagram

zero pressure condition for micro switch(es)

positive pressure



negative pressure



MANOCOMB® Precision pressure switch *Model EX*



Switching function

Type-designation	number of		process connections
	contacts	actual value ind.	
1K	1	-	1
1KA	1	1	1
2K	2	-	1
2KA	2	1	1
2KP	2	-	2
2K2AP	2	2	2
1KPDi	1	-	2
1K2APDi	1	2	2

Pressure ranges

highest neg. pressure range	-1...0 bar
lowest neg. pressure range	-60...0 mbar
lowest pos. pressure range	0 - 60 mbar
highest pos. pressure range	0 - 400 bar

an overview of all pressure ranges can be found on page 10.

Differential pressure ranges

with max. ratio of 10:1 from static pressure to differential pressure. Others on request.

Standard version

materials

housing	poly-carbonate reinforced; with transparent cover
wetted parts	brass
switching contact(s)	micro switch, encapsulated, type ST

temperatures:

Media (brass version)	-20°C up to +70°C
Media (stainless steel version)	-20°C up to +130°C
environment	depending on switching contact ¹
deviation	- 1,0% per 20°C

accuracy

accuracy of set point adjustment	dep. on contact ¹
reproducibility	- 0,03
actual value ind. (integr. gauge)	class 1,0

process connection

1/4 BSP male

electrical connection

3m cable

electrical data

dep. on contact¹

weight

approx. 1,0 - 1,5 kg depending on switching function

protection (EN 60529)

IP65

Options

materials

wetted parts	stainless steel AISI 316Ti (1.4571)
--------------	----------------------------------------

switching contact(s)

encapsulated
micro switch(es)

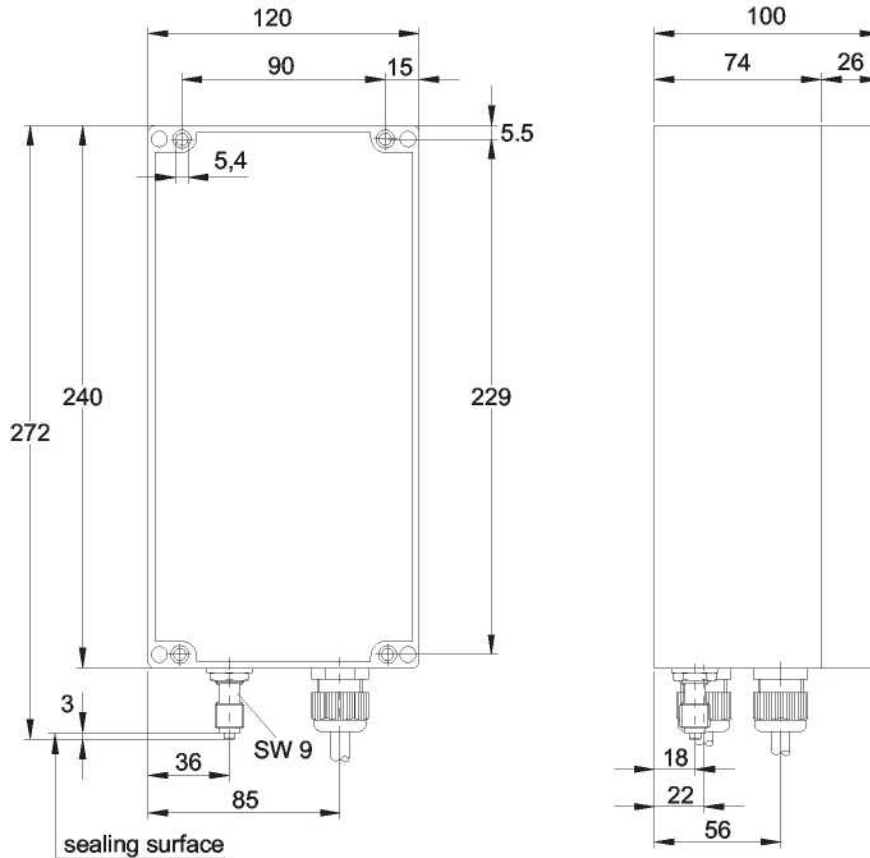
process connection

see page 14

¹ see switching contacts on page 12+13

MANOCOMB® Precision pressure switch Model EX

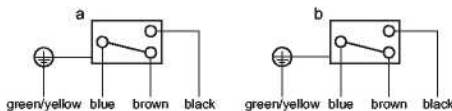
Dimensions



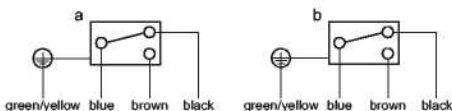
Wiring diagram

zero pressure condition

positive pressure



negative pressure



Certificates



All used encapsulated micro switches are certified according to PTB/ATEX. As they are the only electrical part on the pressure switch, a certification of the whole pressure switch is not necessary.



Picture shows precision pressure switch MANOCOMB® model IP65 version 1K2APDi in special version with 2 shut-off valves on mounting panel for SIEMENS, Erlangen.



Picture shows 3x precision pressure switches MANOCOMB® model IP65 version 1K used as **pressure monitor and pressure limiter respectively** for boiler operation.

PINTER • PRODUCTS • PRACTICE



Upper picture shows pneumatic controller PC50 developed and manufactured for Bopp & Reuther Sicherheits- und Regelarmaturen GmbH, Mannheim with pneumatic precision pressure switches MANOCOMB® in special version (lower picture).



Picture shows pressure switch INDUSWITCH type DU with mounted chemical seal type ET.



Lower picture shows 5x precision pressure switch MANOCOMB® model IP65 version 2KA/VAMG used in power plant "Grosskraftwerk Mannheim (upper picture).



Picture shows pressure transducer type PTM and pressure gauge type P1

PINTER • PRODUCTS • PRACTICE



Picture shows precision pressure switch MANOCOMB® Model TM version 1KA/MG in special version with overpressure safety valve and process connection with test point for SIEMENS Medical



Pictures show gauge with analogue signal Type P1TM and pressure transmitter Type PTM-P, each with mounted chemical seal Type MT for use on food tanks..

APPENDIX

Certificates

All shown certificates and declarations are also available for download as PDF files on our website www.pinter-gmbh.de in their newest issue .

Works inspection certificates according to EN 10204

Works inspection certificates are available on request at a small charge. Please already state in your inquiry and/or purchase order, if you need a works inspection certificate.

Conversion table for pressure units

The “**conversion table for pressure units**” on page 34 was made very carefully. Nevertheless we cannot exclude, that mistakes have occurred, so this conversion table is supplied without liability.

For use with Microsoft Windows operating systems a conversion tool is available on our website www.pinter-gmbh.de in the download section free of charge. Please read through the information provided on the download page before using the conversion tool.

Inquiry Checklist “Pressure Switches

For your convenience when inquiring a PINTER pressure switch we have made an **inquiry checklist “pressure switch**”, which you will find on page 35 or on our website www.pinter-gmbh.de as a PDF-form file in the download section.

Quality assurance

according to DIN EN ISO 9001:2000 and Pressure Equipment Directive 97/23/EG Module D

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT



ZERTIFIKAT

Die Zertifizierungsstelle der TÜV Management Service GmbH bescheinigt, dass das Unternehmen



PINTER
Mess- und Regeltechnik
Technische Keramik
Höhenweg 4
D-69436 Schönbrunn-Moosbrunn

für den Geltungsbereich

Entwicklung, Herstellung und Vertrieb von Druckmessgeräten und Präzisions-Druckschaltern

ein Qualitätsmanagementsystem eingeführt hat und anwendet.

Durch ein Audit, Bericht-Nr. 70065537 wurde der Nachweis erbracht, dass die Forderungen der

ISO 9001: 2000

erfüllt sind. Dieses Zertifikat ist gültig bis 2007-12-20
Zertifikat-Registrier-Nr. 12 100 24144 TMS




München, 2004-12-22



ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT



ZERTIFIKAT

Die Benannte Stelle nach Druckgeräterichtlinie - Zertifizierungsstelle für Qualitätssicherungssysteme - der TÜV Industrie Service GmbH - TÜV SÜD Gruppe bescheinigt, dass das Unternehmen

PINTER Mess- und Regeltechnik GmbH
Höhenweg 4
D - 69436 Moosbrunn

für den Geltungsbereich

Druckwächter / Druckbegrenzer besonderer Bauart als Ausrüstungsteile mit Sicherheitsfunktion (MANOCOMB IP 65/... und MANOCOMB TM/...)

ein Qualitätssicherungssystem nach Druckgeräterichtlinie 97/23/EG Anhang III, Modul D eingeführt hat und anwendet.

Durch ein Audit, Bericht-Nr.: IS-TAF-MUC-0-1471-00/04 wurde der Nachweis erbracht, dass die betreffenden Anforderungen erfüllt sind.

Der Hersteller ist berechtigt, die im Rahmen des Geltungsbereiches dieses Qualitätssicherungssystems hergestellten Druckgeräte bei der Kennzeichnung mit unserer Kenn-Nummer wie dargestellt zu versehen:

CE 0036

Zertifikat - Nr. DGR-0036-QS-359-04
ausg. am 21. Dezember 2004



Mannheim, 21. Dezember 2004

TÜV Industrie Service GmbH Tel.: 09245 621 39 12 23 Fax: 09245 621 39 33 34
TÜV SÜD Gruppe Gabelstraße 28 69126 Mannheim e-mail: gabel@tuev.com

Notified Body No. 0036 Member of COOPERATION ORGANIZATION CECC (CONFORMED TO EUROPEAN CONFORMANCE CONTROL)

TÜV Industrie Service GmbH - TÜV SÜD Gruppe - DGR-03 Zertifizierungsstelle - D-68167 Mannheim

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT

Type-Examination

according to Pressure Equipment Directive 97/23/EG Module B and VdTÜV Merkblatt Druck 100/1 (Modell IP65)

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT



ZERTIFIKAT
Certificate

EG-Baumusterprüfung (Modul B) nach Richtlinie 97/23/EG
EC Type-examination (Module B) according to Directive 97/23/EG

Zertifikat-Nr.: IS-TAF-MUC 03 12 707534 001
Certificate No.: Revision 01

Name und Anschrift des Herstellers: Pinter Mess- und Regeltechnik GmbH
Höhenweg 4
69436 Moosbrunn

Hermit wird bescheinigt, daß das unten genannte EG-Baumuster die Anforderungen der Richtlinie 97/23/EG erfüllt.
We hereby certify that the type mentioned below meets the requirements of the Directive 97/23/EG.

Produktart: Druckwächter / Druckbegrenzer besonderer Bauart als Ausrüstungsteile mit Sicherheitsfunktion
product category

Typ, Ausführung: MANOCOMB IP65/...
type, model

Prüfungsnlage: VdTÜV Merkblatt Druck 100/1:1983-04
basis of examination

Prüfbericht Nr.: C-D 1158-00/03 vom 2003-12-02
test report No.

Fertigungsstätte: TÜV SÜD Deutschland Bau und Betrieb
Pinter Mess- und Regeltechnik GmbH
Höhenweg 4
69436 Moosbrunn
manufacturing plant

(Ort, Datum): München, 2005-07-11


Ersetzt für Ausgabe 2003-12-03
Bitte beachten Sie die einzelnen Hinweise.
Please note the remarks on the second page.



Mitglied der COOPERATION ORGANIZATION CECC (CONFORMED TO EUROPEAN CONFORMANCE CONTROL)

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT



Siehe 2. zum Zertifikat Nr. 12 100 24144 TMS
Zertifikat-Nr.: IS-TAF-MUC 03 12 707534 001
Revision 01

Übersicht der Geräteausführungen:
MANOCOMB-IP65/...

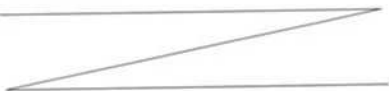
1K	- 1 Schaltkontakt
2K	- 2 Schaltkontakte
2KP	- 2 getrennte Prozessanschlüsse, je 1 Schaltkontakt
1nDPH	- Differenzdruckwächter
A	- mit Irtwertanzeige
VA	- medumtberührte Teile aus Edelstahl
S	- Häube plombierbar

Der Druckwächter / Druckbegrenzer besonderer Bauart wird wahlweise mit folgenden Anzeige- und Einstellbereichen hergestellt:

-1...0 bar	-600...0 mbar	-400...0 mbar
-250...0 mbar	-160...0 mbar	-100...0 mbar
-60...0 mbar	0...60 mbar	0...1,0 bar
0...25 bar	0...100 mbar	0...1,5 bar
0...40 bar	0...160 mbar	0...2,5 bar
0...60 bar	0...250 mbar	0...4,0 bar
0...100 bar	0...400 mbar	0...6,0 bar
0...160 bar	0...600 mbar	0...10 bar
0...250 bar	0...1000 mbar	0...16 bar

Die nachfolgend genannten Bedingungen sind zu berücksichtigen:

- Das Gefährdungsrisiko bei äußerem Brand sowie bei Belastungen durch Verkehr, Wind und Erdbeben ist abhängig von der Einbausituation und dem Aufstellungsort des Druckgerätes gegebenenfalls geändert zu beurteilen.
- In der Ausführung als DWFS ist der Ausgangskontakt mit maximal 0,6 A MT extern abzuschleifen. In der Ausführung als SDPFS ist der Ausgangskontakt mit maximal 0,36 A MT (= 0,36 A x 0,6) extern abzuschleifen.
- Bei Verwendung als SDPFS ist die Verriegelungs- und die Entriegelungsfunktion in der nachfolgenden elektrischen Schaltung gemäß den "Zusatzanforderungen für die Ausführung von Sicherheitseinrichtungen" der DIN VDE 0116, Ziffer 8.7 auszuführen.
- Das Gerät ist mittels einer Wasservorlage gegen die Einflüsse von zu hoher Medumtemperatur zu schützen.



ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICATO ♦ CERTIFICAT

Type-Examination

according to Gas Appliances Directive 90/396/EWG, EN1854 (former DIN 3398, part 1+2) (Modell IP65)

CE 0085		DVGW Zertifizierungsstelle
EG-Baumusterprüfbescheinigung <i>EC type examination certificate</i>		
CE-0085B06137 Produkt-Identifikationsnummer		
Anwendungsbereich field of application	EG-Gasgeräterichtlinie (90/396/EWG) EC Gas Appliances Directive (90/396/EEC)	
Zertifikathaber owner of certificate	PINTER Meß- und Regeltechnik GmbH Höhenweg 4, D-69436 Moosbrunn	
Vertreiber distributor	PINTER Meß- und Regeltechnik GmbH Höhenweg 4, D-69436 Moosbrunn	
Produktart product category	Gasarmaturen: Druckwächter für Gas, Luft und Abgas < 4 bar (4346)	
Produktbezeichnung product description	Präzisionsdruckschalter	
Modell model	MANOCOMB IP65/...	
Bestimmungsländer countries of destination	AT, BE, DE, DK, ES, FI, FR, GB, GR, IE, IS, IT, LU, NL, PT, SE	
Prüfberichte test reports	Baumusterprüfung: C-D 1156-00/03 vom 01.12.2003 (TSG)	
Prüfgrundlagen basis of type examination	EU/90/396/EWG (29.06.1990) DIN EN 1854 (01.11.1997)	
Aktenzeichen file number	03-0104-GEE	
 18.02.2004 10:41:30 Datum / Date of issue, Date of certificate issue		DVGW Deutsche Vereinigung für Gas- und Wasserfachleute e.V. Fachbereich wissenschaftlicher Verein Zertifizierungsstelle Josef-Wilmer-Strasse 1-3 D-43123 Barmen Telefon: +49 (0)208 91 88 807 Telefax: +49 (0)208 91 88 803

A-2/2		CE-0085B06137
Gasart gas category	Bemerkung remarks	
Brenngase nach G260	sowie für Luft, Rauchgas- und Abgas in Feuerungsanlagen	
Typ type	Technische Daten technical data	Bemerkungen remarks
MANOCOMB IP65/...	Erstlastbereich: 0,01...1,0 bar max. Betriebsdruck: 1,0 bar	
Ausführungsvariante type variation	Erläuterungen explanations	
-1K	1 Schaltkontakt	
-2K	2 Schaltkontakte	
-3KP	2 getrennte Prozessanschlüsse, je 1 Schaltkontakt	
-1KPD	Differenzdruckschalter	
-A	mit Isolieranlange	
-VA	mediumberührte Teile aus Edelstahl	
-B	Haube plumbierbar	
Verwendungshinweise / Bemerkungen hints of utilization / remarks		
Einbaulage: senkrecht Zul. Umgebungstemperatur: -20...+70 °C		

Type-Examination

according to Gas Appliances Directive 90/396/EWG, DIN3398, part 3 (Modell IP65)

CE 0085		DVGW Zertifizierungsstelle
EG-Baumusterprüfbescheinigung <i>EC type examination certificate</i>		
CE-0085B06138 Produkt-Identifikationsnummer		
Anwendungsbereich field of application	EG-Gasgeräterichtlinie (90/396/EWG) EC Gas Appliances Directive (90/396/EEC)	
Zertifikathaber owner of certificate	PINTER Meß- und Regeltechnik GmbH Höhenweg 4, D-69436 Moosbrunn	
Vertreiber distributor	PINTER Meß- und Regeltechnik GmbH Höhenweg 4, D-69436 Moosbrunn	
Produktart product category	Gasarmaturen: Druckwächter für Gas, Luft und Abgas (4347)	
Produktbezeichnung product description	Präzisionsdruckschalter	
Modell model	MANOCOMB IP65/...	
Bestimmungsländer countries of destination	AT, BE, DE, DK, ES, FI, FR, GB, GR, IE, IS, IT, LU, NL, PT, SE	
Prüfberichte test reports	Baumusterprüfung: C-D 1156-00/03 vom 01.12.2003 (TSG)	
Prüfgrundlagen basis of type examination	EU/90/396/EWG (29.06.1990) DIN 3398-3 (01.11.1982)	
Aktenzeichen file number	03-0104-GEE	
 18.02.2004 10:41:30 Datum / Date of issue, Date of certificate issue		DVGW Deutsche Vereinigung für Gas- und Wasserfachleute e.V. Fachbereich wissenschaftlicher Verein Zertifizierungsstelle Josef-Wilmer-Strasse 1-3 D-43123 Barmen Telefon: +49 (0)208 91 88 807 Telefax: +49 (0)208 91 88 803

A-2/2		CE-0085B06138
Gasart gas category	Bemerkung remarks	
Brenngase nach G260	sowie für Luft, Rauchgas- und Abgas in Feuerungsanlagen	
Typ type	Technische Daten technical data	Bemerkungen remarks
MANOCOMB IP65/...	Erstlastbereich: 0,02...250 bar max. Betriebsdruck: 250 bar	
Ausführungsvariante type variation	Erläuterungen explanations	
-1K	1 Schaltkontakt	
-2K	2 Schaltkontakte	
-3KP	2 getrennte Prozessanschlüsse, je 1 Schaltkontakt	
-1KPD	Differenzdruckschalter	
-A	mit Isolieranlange	
-VA	mediumberührte Teile aus Edelstahl	
-B	Haube plumbierbar	
Verwendungshinweise / Bemerkungen hints of utilization / remarks		
Einbaulage: senkrecht Zul. Umgebungstemperatur: -20...+70 °C		

Declaration of Conformity
regarding DIN 3398, part 4



Test-Type-Approval
acc. to Pressure Equipment Directive 97/23/EG
and VdTÜV Druck 100/1 (Modell IP65)



Conversion table for pressure units

		Standard International Units					Technical Units					
		mbar	bar	Pa	kPa	MPa	mm WC	m WC	kp/cm ²	atm	Torr	psi
Standard International Units	mbar	•	0,001	100	0,1	0,0001	10,197	10,197 x 10 ³	1,0197 x 10 ⁻³	0,98692 x 10 ⁻³	0,75006	14,504 x 10 ⁻³
	bar	1.000	•	100.000	100	0,1	10,197 x 10 ³	10,197	1,0197	0,9869	750,06	14,504
	Pa	0,01	0,0001	•	0,001	0,000001	0,10197	0,10197 x 10 ³	0,10197 x 10 ⁻⁶	9,8692 x 10 ⁻⁵	7,5006 x 10 ⁻³	0,14504 x 10 ⁻³
	kPa	10	0,01	1.000	•	0,001	0,10197 x 10 ³	0,10197	10,197 x 10 ⁻³	9,8692 x 10 ⁻³	7,5006	0,14504
	MPa	10.000	10	1.000.000	1.000	•	0,10197 x 10 ⁶	0,10197 x 10 ³	10,197	9,8692	7,5006 x 10 ³	0,14504 x 10 ³
Technical Units	mm WS	98,067 x 10 ⁻³	98,067 x 10 ⁻⁶	9,8067	9,8067 x 10 ⁻³	9,8067 x 10 ⁻⁶	•	10 ³	10 ⁻⁴	96,784 x 10 ⁻⁶	73,556 x 10 ⁻³	1,4223 x 10 ⁻³
	m WS	98,067	98,067 x 10 ⁻³	9,8067 x 10 ³	9,8067	9,8067 x 10 ⁻³	10 ³	•	10 ⁻¹	96,784 x 10 ⁻³	73,556	1,4223
	kp/cm ²	0,98067 x 10 ³	0,98067	98,067 x 10 ³	98,067	98,067 x 10 ⁻³	10 ⁴	10	•	0,96784	735,56	14,223
	atm	1,0133 x 10 ³	1,0133	0,10133 x 10 ⁶	0,10133 x 10 ³	0,10133	10,332 x 10 ³	10,332	1,0332	•	760	14,693
	Torr	1,3332	1,3332 x 10 ⁻³	0,10133 x 10 ³	0,10133	0,13332 x 10 ⁻³	13,595	13,595 x 10 ³	1,3595 x 10 ⁻³	1,3158 x 10 ⁻³	•	19,34 x 10 ⁻³
	psi	68,948	68,948 x 10 ⁻³	6,8948 x 10 ³	6,8948	6,8948 x 10 ⁻³	0,70307 x 10 ³	0,70307	0,70307 x 10 ⁻³	0,70307 x 10 ⁻⁵	51,715	•

Unit conversion for your computer

A conversion tool for Microsoft Windows can be downloaded free of charge on our website www.pinter-gmbh.de in the download section. Please read through the information provided on the download page before using the conversion tool.

Inquiry checklist (pressure switch)

(by fax to ⇒ +49 / 6272 / 9303-40)

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 <input type="checkbox"/> Yes <input type="checkbox"/> No
special requirements	

Design pressure switch

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



Pressure Switches

are signal elements which are used in pressure lines for gases, vapours and liquids. Set pressure values (set points) are transformed by pressure switches into electrical or pneumatic signals, which in their turn are necessary for the operation of open- or closed-loop process controls, safety and alarm devices.

PINTER s range of high quality pressure switches covers:

MANOCOMB® Precision Pressure Switches

for vacuum, pressure and differential pressure
brass and stainless steel versions
with integr. pressure gauge and integr. analogue signal (4 -20 mA or 0 -10V)
with microswitches, inductive contacts, pneumatic contacts
explosion proof Ex (d/i) versions, with aluminium housing, in rack mount housing
certified according to DIN, DIN DVGW, VdTÜV, Pressure Equipment Directive

INDUSWITCH Industrial Pressure Switches

for vacuum and pressure
compact measurements
brass and stainless steel versions

customer specific version available



Chemical Seals

are process connections with a diaphragm, which separate the measuring instrument from the media. Through this, pressure switches, gauges and transducers can be used with e.g. highly corrosive media.

PINTER s range of high quality chemical seals covers e.g.:

- chemical seals with flange connection
- threaded chemical seals
- chemical seals for hygienic processes.



Pressure Gauges

are pressure indicators that show the pressure measured with bourdon tube, diaphragm oder capsule spring.

PINTER s range of high quality pressure gauges covers e.g.:

- Gauges with integr. analogue signal
- NG63/100 Gauges in stainless steel
- Precision Pressure Gauges



Pressure Transducers

are measuring instruments, that transform pressure signals into a linear electrical and have piezo-resistive, capacitive or ceramics sensors.

PINTER s range of high quality pressure transducers covers e.g.

- Standard Pressure Transducers
- Pressure Transducers for industrial appl.
- Pressure Transducers w. flush membrane
- Pressure Transducers w. flange connection



Indicators

are pressure indicators, that show pressure values from electrical signals that have previously been transformed by pressure transducers.

PINTER s Digital-Indicator DI-Series features:

- user-friendly operation
- menu-guided software
- code-protection against unauthorized setting
- large supply voltage range from 24-253 VAC/VDC

Engineering and System solutions



From Engineering...



...over precise manufacturing...



...to a perfect solution for your application

As a specialist for pressure measuring we can offer the suitable pressure switch for almost any application. Of the standard over adapting chemical seals, cooling equipment and overpressure safety systems up to the special solution for your application. We develop and manufacture measuring -, control -, and monitoring systems for you competently and efficiently with most modern machines and tools.

The custom-made solution developed for you is manufactured with over 30 years Know How in manufacturing, own tooling and prototype construction and most modern machinery in individual manufacture or as small and mass production. With own controller design and welding engineering we meet your demands.

Customers rely on our know-how

E.g. in 2000 we developed the pneumatic controller PC50 for the Bopp & Reuther GmbH, Mannheim, Germany for controlling safety relief valves which are used e.g. in nuclear power stations. In the following years further controllers were developed, among them electro-pneumatic, non-ferrous, nonmagnetic and bearing insensitive controllers Today these controllers are completely manufactured in house at our headquarters in Schoenbrunn.

General terms and conditions of sale

§ 1 General - Validity

- (1) The following general terms of sale (general terms and conditions) shall apply exclusively to all of our services rendered and goods delivered. We do not accept conflicting or different terms and conditions of our customers, unless we have explicitly agreed in writing to the validity of such. Our general terms and conditions shall also apply in the case that we accept without reserve the customer's request to conclude the contract or the customer's services or goods, even if we are aware of conflicting or different terms and conditions of our customers.
- (2) Our general terms and conditions shall also apply to all future contracts with the customer.

§ 2 Prices - Costs - Delivery

- (1) Our supply prices are based on currently effective purchase prices as well as scales of wages and salaries. If the period between closing of the contract and delivery (in the case of call orders, the date agreed for the respective partial delivery) shall be deemed to be effective exceeds four months, PINTER shall have the right to reasonably increase the delivery price if the above costs have increased.
- (2) The customer shall bear the shipment costs. All shipments are insured for transport. The customer shall bear the packaging costs.
- (3) All specifications given in sketches as well as dimensions and weight specifications are approximate values only.
- (4) In cases of small orders with a net purchase value of less than EUR 50.00, PINTER will charge a processing fee of EUR 10.00 in addition to shipping and packaging.
- (5) We reserve the full right of property and title to sketches, cost estimates and similar documents as well as tools which were produced for the order even if the customer is charged separately for such items.
- (6) Partial delivery is possible.
- (7) The delivery period specified shall commence on the day on which all details concerning the contract are finalised. If the customer has to provide technical specifications, materials or tools or has to make down payments, the delivery period shall commence with receipt by us of such specifications, materials, tools or payments. If the delivery period is exceeded for reasons for which we are responsible, the customer shall have the right - after giving reasonable notice - to withdraw from the contract. Further claims are excluded, unless they are the result of at least gross negligence on our part.

§ 3 Passage of risk - Production delay

- (1) All deliveries are made at the risk of the customer.
- (2) We have fulfilled our delivery obligations as soon as the goods are returned over to the post office, the rail way station, the carrier or the carrying agent or as soon as they have been loaded on one of our vehicles.
- (3) Circumstances beyond our control which obstruct or make impossible the production or the delivery of the ordered goods, e.g. acts of God, war, measures of the authorities, shutdowns, strikes, lockouts in our or in our sub-contractors' facilities, release us from our delivery obligations for as long as these obstacles and their after-effects last.

§ 4 Warranty

- (1) Notices of defect must be made immediately upon receipt of the goods. A sample must be provided.
- (2) Notices of defect concerning latent defects must be made immediately after the discovery of the defect. A sample must be provided. Our warranty obligations end 12 months after the passage of risk. This does not apply to parts subject to wear and tear. If the notice of defect is legitimate, the customer shall have the right to request us to take back the goods and to make a replacement delivery. We shall have the right to remedy the defect at our discretion. If the goods continue to be defective after such remedy, the customer shall have the right to request a price reduction or to withdraw from the contract, at the customer's discretion. We shall bear the cost of replacement deliveries to customers. Further warranty claims, especially reimbursement of mounting/installation costs and other costs of third parties, are excluded. Further claims are excluded unless a warranted quality is lacking.
- (3) We shall not be liable for defects caused by an inappropriate carelessness or incorrect mounting, installation, commissioning or operation.
- (4) Insignificant or typical variations in colour, dimensions, weight and quality shall not be considered to be defects.

§ 5 Customer's violation of rights of third parties

If an order is to be filled (design, etc.) according to customer specifications, the customer shall be responsible for his rights of commercial exploitation of the documents. If the production according to these specifications of the customer violates the rights of third parties or labelling provisions, the customer shall be obliged to exempt us from all possible compensation claims and cost claims of third parties and to reimburse any costs incurred.

§ 6 Terms of payment

- (1) Payment shall be due in advance as long as no other agreement is made. Payment shall be considered to have been made in due time if it is made available in PINTER's account in due time.
- (2) If no other agreements are made, the customer shall be obliged to pay the usual bank interest after delivery and the 1st day following the last day of the regular agreed payment terms.
- (3) If no other agreements are made, payments are set off against the oldest outstanding account including corresponding accessory claims. For each written request for payment and/or reminder caused by default, we charge a fee of EUR 10.00.
- (4) We accept bills only upon prior agreement. The discount depends on our bank's rates and shall be due starting with the due date of payment. The customer shall bear the discount and collection fees for bills and cheques. Such fees shall be due for immediate payment. Payment by bills and cheques shall be considered as payment only after such bills and cheques are cashed.
- (5) A right of retention shall be excluded unless it results from rights/claims of the customer not disputed by us, or from final and conclusive legal titles.
- (6) Offset against our claims shall only be possible in the case of undisputed or final and conclusive counterclaims of the customer.
- (7) In the case of customer default, we shall not be obliged to deliver or manufacture ordered goods until all overdue amounts are paid. In such cases as well as in case of the deterioration of the customer's financial position (e.g. protest for non-payment) or the transfer of the customer's business to a third party or the liquidation of the customer's business or the death of the customer, we shall have the right to demand cash before delivery for all delivered goods. If the customer refuses to accept this procedure, all claims shall become due for immediate payment.

§ 7 Retention of title

- (1) We retain the title to the delivered goods until all claims resulting from the business relations are fulfilled. This includes interest, accessory claims, costs of possible prosecution and costs of necessary intervention resulting from a seizure of the delivered goods by a third party. In the event that an execution is levied upon the delivered goods, the customer shall be obliged to notify us immediately. The customer shall bear the costs of the necessary intervention.
- (2) In case of violations of the contract by the customer, in particular default in payment, we shall have the right to take back the delivered goods. In case we take back the delivered goods, this does not constitute a withdrawal from the contract by us, unless we have explicitly declared the termination of the contract. Seizure of the delivered goods by us shall always constitute termination of the contract. After taking back the goods, we shall have the right to exploit such goods. The returns from such exploitations shall be offset against claims against the customer, with reasonable exploitation costs being deducted from such offset.
- (3) In case of seizure or other interventions of third parties, the customer shall immediately notify us in writing so that we can institute an action as per § 771 ZPO (German Rules of Civil Procedure). If the third party is unable to reimburse the legal and extra-judicial costs, the customer shall be liable for the loss incurred by us.
- (4) The customer shall be entitled to resell the delivered goods within the course of regular business. If the customer resells the goods, all claims against customer's buyer or third parties to the complete invoice amount (including VAT) shall be assigned to us, regardless of whether the goods are sold as they are or further processed. The customer shall remain entitled to collect such claims even after the assignment. This does not affect our right to collect such claims ourselves. We undertake not to collect such claims under the following conditions: the customer meets his payment obligations from the returns and is not defaulting in payment, no insolvency proceedings are filed against the customer, payment is not stopped. If any of the latter conditions are not met, we shall be entitled to request the customer to notify us of the assigned claims and the corresponding debtors and provide us with any information and the appropriated documents necessary for us to collect such claims, and to notify its customer of such assignment.
- (5) Processing or modification of the delivered goods by the customer shall always be made on behalf of us. If the delivered goods are combined with other goods not belonging to us, we shall hold the title to the new product to a proportion that corresponds to the ratio of the value of the goods delivered by us and the value of the other objects used in the new product at the time of processing. The same provision shall apply to the goods delivered under retention of title shall apply to the new product resulting from further processing.
- (6) If the goods delivered by us are combined with other objects not belonging to us in a way that it is impossible to separate such goods and objects, we shall acquire co-ownership to such new product to a proportion that corresponds to the ratio of the value of the goods delivered by us and the value of the other objects used in the combination at the time of processing. If the goods and objects are combined in such a way that the object of the customer is the main object, we shall acquire co-ownership to a proportional share. The customer shall keep such sole ownership or co-ownership for us.
- (7) The customer shall also assign the claim to secure our claims against him which result against a third party from the combination of the delivered goods with real estate.
- (8) Upon request by the customer, we undertake to release these securities if the value of our securities exceeds the claim to secure by more than twenty percent. The selection of the securities to be released shall be at our discretion.

§ 8 Liability

- (1) We shall not be liable in case of violations of immaterial contractual obligations caused by slight negligence. In other cases of slight negligent violations of obligations, our liability shall be limited to the foreseeable, contractually typical direct average damage with regard to the type of goods or services covered by the contract. This shall also apply to slightly negligent violations of obligations committed by your legal representatives and vicarious agents (such as employees, other staff, subcontractors, etc.).
- (2) In case of gross negligence committed by simple vicarious agents, the amount of damages shall be limited to the foreseeable, contractually typical direct average damage with regard to the type of goods or services covered by the contract.
- (3) Customer's liability claims shall be subject to a period of limitation of one year after delivery of the goods or acceptance of the service.
- (4) Above liability limitations as per § 8 section 1 and § 8 section 2 as well as the period of limitation as per § 8 section 3 shall not apply in case of injury or loss of life. Above liability limitations as per § 8 section 1 and § 8 section 2 as well as the period of limitation as per § 8 section 3 shall neither apply in case of claims according to the product liability act nor in case we have guaranteed certain qualities. Above liability limitations as per § 8 section 1 and § 8 section 2 as well as the period of limitation as per § 8 section 3 shall not apply in case of willful or gross negligence on our part. However, in case of gross negligence on the part of simple vicarious agents, the liability limitation as per § 8 section 2 as well as the period of limitation as per § 8 section 3 shall remain in effect. Above liability limitations as per § 8 section 1 and § 8 section 2 as well as the period of limitation as per § 8 section 3 shall not apply in case of inability or impossibility to perform, provided we are responsible for such inability or impossibility to perform.
- (5) Any other liability claims against us, regardless of the legal grounds, shall be excluded.
- (6) If our liability is excluded or limited, such exclusion or limitation shall also apply to the personal liability of our legal representatives and our vicarious agents.

§ 9 Governing law - Place of performance - Jurisdiction

- (1) The legal relations between us and our customers are subject exclusively to the law of the Federal Republic of Germany.
- (2) Schoenbrunn is the place of performance of our contractual obligations; this is also the place of performance of the customer's contractual obligations.
- (3) Our place of business in 69436 Schoenbrunn, Germany, shall be the exclusive place of jurisdiction in case there is no other legal, exclusive place of jurisdiction.

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