



PS1 / PS2 Series

Pressure Controls

Technical Data

Document Nr.: A3.5.037
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Adjustable Single and Dual Pressure Controls for high and low pressure applications

Features

- Adjustable pressure range
- Narrow adjustable differential depending on model
- Range and differential pointer in units bar and psig
- Range and differential individually lockable by wire seal
- High rated SPDT contacts for all versions
- Captive terminal and cover screws
- Dual pressostats with two independent SPDT switches
- Manual toggle for system checkout and override
- Standard pressure connection 7/16"-20 UNF for 1/4" SAE male flare connection
- Low pressure and high pressure versions available with TÜV approval according to DIN 32733 to meet requirements of DIN 8901 and DIN 8975
- Automatic and manual reset versions
- Convertible auto/manual reset for dual pressure controls

Options

- Alternative pressure connectors including 6 mm ODF solder connection
- Gold plated contacts for electronic applications (low voltage/current)
- Factory set to customer specification
- Factory installed wire bridge for reduced installation effort
- Different types of mounting brackets
- Special approvals



Single Pressure Control Series PS1



Dual Pressure Control Series PS2

Introduction

The PS1 / PS2 Series is ALCO's range of adjustable pressostats for application in refrigeration and heat pump systems.

In these systems, pressure controls serve various functions, which may be divided into control and protection functions. Examples for control functions are compressor cycling, pump-down or defrost control. Protection functions include, pressure limiting and cut out against excessive pressures, against loss of charge or for freeze protection.

Whereas the need for control functions is mainly founded in the desire for acceptable or optimised system performance, protection functions are normally requested by national legislation. National and international standards assist in meeting these legal requirements. Standardisation is an ongoing process in the European Community and where this data sheet makes reference to national standards, corresponding European standards are referenced as far as

known. The most important standards for safety requirements in refrigeration systems are DIN 8975^a and DIN 8901.

DIN 8901 defines safety and environmental requirements for the protection of soil, ground and surface water. In simple terms, when applied to pressure controls, DIN 8901 aims at the prevention of refrigerant charge leaking to the environment. Pressure controls designed and tested according to DIN 32733^b fulfill the requirements of DIN 8901.

DIN 8975 is concerned with control devices in refrigeration plants for protection against unpermissible pressure stresses. It also asks for pressure controls, which are approved in accordance with DIN 32733.

^a to be replaced by EN 378

^b superseded by EN 12263



PS1 / PS2 Series Pressure Controls

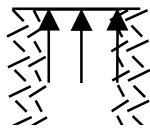
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The ALCO PS1 / PS2 series includes products, which are designed and tested in accordance with DIN 32733 and can therefore be used in order to meet the requirements of DIN 8901 and DIN 8975.

Pressure sensing

All pressures mentioned in this data sheet are understood as gauge pressures. PS1 / PS2 controls sense pressure by means of bellows which expand or contract when exposed to medium pressure.

High pressure limiters and pressure cut outs with type approval according to DIN 32733 feature a double bellows design. The inner bellows serves as the operating bellows and is enclosed by the outer bellows featuring a larger surface area.



Should the inner bellows leak, then the larger surface area of the outer bellows creates a larger force and causes the pressostat to a pre-empted cut out. This represents a fail-safe function.

Standard controls for refrigeration applications are equipped with a bronze bellows and can be used with all common HFC, HCFC and CFC refrigerants. For ammonia applications controls with steel bellows are available on request.

Pressure connectors

A variety of pressure connectors, including male and female flare type connectors, capillary and solder connectors are available. The standard connector is a 7-16"-20 UNF male flare connector, which, in its high pressure versions, is equipped with a snubber to protect against pressure pulsations.

Refer to the Nomenclature Section of this data sheet for a complete listing of available connector types.

Electrical contacts

PS1 / 2 pressure controls are equipped with high rated double snap action contacts for shatter-free and reliable operation.

All contacts throughout this range of controls are designed as Single Pole Double Throw (SPDT) contacts. One contact may be used for control and the other contact for alarm/status indication or auxiliary control. In addition, Dual Pressostats PS2 come with two independently actuated SPDT contacts, providing for even further application flexibility by allowing for a variety of wiring options.

Gold plated contacts are available on request for low electrical loads, for example in electronic signalling applications.

Setpoints

PS1 / PS2 are adjustable controls with internal adjustment spindles for range and differential^c. By turning the range spindle, the *upper setpoint* is defined and by adjusting the differential spindle, the differential and hence the *lower setpoint* is defined.

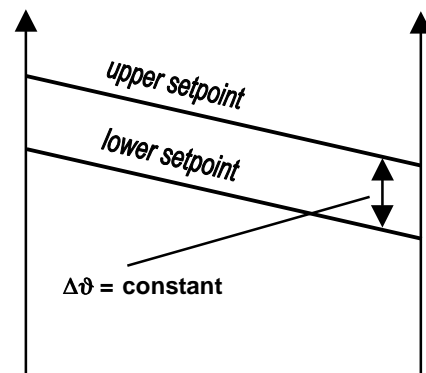
The dependency between upper and lower setpoint is always as follows:

$$\text{lower setpoint} = \text{upper setpoint} - \text{differential}$$

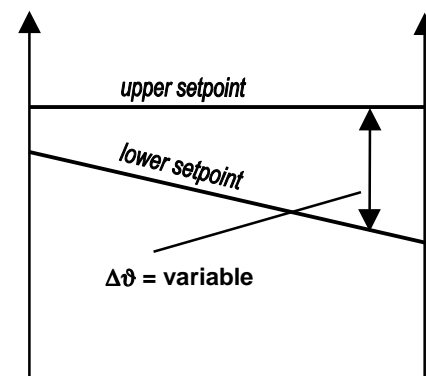
The following two rules should be kept in mind:

- An adjustment of the range spindle always affects both, upper and lower setpoint.
- An adjustment of the differential spindle affects the lower setpoint, only.

The following diagrammes depict this dependency:



Effect of turning range spindle



Effect of turning differential spindle

^c Manual reset controls have a fixed differential and no differential spindle



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The controls are equipped with display scale and pointers to indicate the approximate settings. The display scales are printed in relative pressure units "bar" and "psi".

For precise setting of the controls, external gauges must be used.

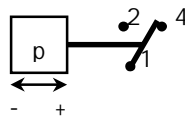
Contact function

Contacts on Single Pressostats PS1 are labelled 1-2-4 where '1' refers to the common pole, '2' refers to the lower setpoint and '4' refers to the upper setpoint. This is true for all types of controls, irrespective whether they are low pressure controls, high pressure controls, manual or automatic reset types.

The contact function for automatic and manual reset versions is as described below.

Automatic reset

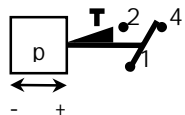
On pressure rise above the upper setpoint, contacts 1-2 open and contacts 1-4 close. On decreasing pressure below lower setpoint contacts 1-4 open and contacts 1-2 close.



Automatic reset contact function

Manual reset low pressure

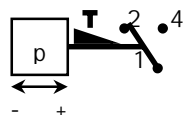
On decreasing pressure below the lower setpoint, contacts 1-4 open, contacts 1-2 close and latch. Only on pressure rise above upper setpoint and after pressing the manual reset button contacts 1-2 will open and contacts 1-4 will close again.



Manual reset low pressure contact function

Manual reset high pressure

On increasing pressure above the upper setpoint, contacts 1-2 open, contacts 1-4 close and latch. Only on falling pressure below lower setpoint and after pressing the manual reset button, contacts 1-4 will open and contacts 1-2 will close again.



Manual reset high pressure contact function

For operational safety, all PS1 / PS2 with manual reset are designed as *trip-free* controls, i.e. pressing the manual reset button while the pressure has not reached its reset threshold will not operate the electrical contacts.

The contact function for controls with internal and external manual reset is alike. The only difference between the two is that for internal manual reset the cover has to be undone, whereas the external reset controls can be reset without removing the cover.

As Dual Pressostats PS2 have two complete sets of contacts, their function is the same as on Single Pressostats PS1 with the only difference that the contact labels are preceded by an additional index. One side of the control is labelled 11-12-14 whereas the second side is 21-22-24.

The contact function of controls with convertible reset is as described above but depends on the actual position of the convertible reset toggle, i.e. automatic or manual reset position.

Installation and maintenance

Controls come with a lockplate which may be used to protect the settings by wire-seal if desired. Range and differential spindle may be sealed independent from each other.

A front access manual toggle is provided for checking out control operation. On low pressure controls this toggle may be used to override the low pressure signal during system evacuation, avoiding the need to undo the electrical wiring for this purpose.

All PS1 / PS2 controls come with heavy duty terminal blocks which are finger-proof and feature wire clamps plus non-loosable terminal screws for ease of wiring.

Available accessories include mounting brackets of various types, including flat and angle brackets. A universal mounting bracket which matches the most common whole patterns encountered in the field is also available.

The standard mounting holes for mounting brackets are equipped with a universal thread to fit both, M4 and UNC 8-32 screws. The standard wholesale package includes two mounting screws. Several hole patterns for surface mounting are provided.



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Nomenclature

The following two charts explain the nomenclature of the PS1/PS2 controls for ease of reference. The basic structure is that of a three digit *Product Name* followed by a three digit code, describing *Function*, *Pressure Range* and *Pressure Connector*.

Customised versions, which deviate from standard catalogue products are available on request and use a different *Product Name*. They are called *PSA* in the case of Single Pressostats and *PSB* in the case of Dual Pressostats.

Type code

PS1 -

Product Name
PS1: Adjustable single pressostat
PSA: Customer special version

Function
A = Pressure control, automatic
B = Pressure cut out, external manual reset, DIN/TÜV
R = Pressure control; external manual reset
S = Safety pressure cut out, internal man. reset, DIN/TÜV
U = Convertible from R to A
W = Pressure limiter, automatic, DIN / TÜV

Low pressure reset
 Function types B, R, S in combination with Pressure Range 1 or 3 have a low pressure manual reset function

High pressure reset
 Function types B, R, S in combination with Pressure Range 4 or 5 have a high pressure manual reset function

Pressure Connector
A = 7/16"-20 UNF male
C = R 1/4" st. steel w. steel bellows
K = 7/16"-20 UNF flare nut with 1 m cap. tube and schrader valve opener
L = 1/4 ODM solder with 1 m cap. tube
U = 6 mm OD F solder, 80 mm length
X = 1/4" ODF solder, 80 mm length
R = R1/4"
F = 1/4-18 NPTF steel (incl. bellows)

Pressure Range
1 = -0.75 ... 3 bar
2 = -0.8 ... 1.5 bar
3 = -0.5 ... 7 bar
4 = 1 ... 20 bar
5 = 6 ... 31 bar



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Type code

PS2 -

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Product Name
PS2: Adjustable dual pressostat
PSB: Customer special version

Pressure Connector
A = 7/16"-20 UNF male
C = R 1/4" st. steel w. steel bellows
K = 7/16"-20 UNF flare nut, 1 m cap. tube and schrader opener
L = 1/4 ODM solder, 1m cap. tube
U = 6 mm ODF solder, 80 mmlength
X = 1/4" ODF solder, 80 mmlength
R = R1/4"
F = 1/4-18 NPTF steel (incl. bellows)

Function
A = Both sides: automatic pressure controls
B = Both sides: cut out, external manual reset, DIN
C = Left side: pressure limiter, automatic, DIN
 Right side: cut out external manual reset, DIN
G = Left side: cut out, external manual reset, DIN
 Right side: safety cut out, intern. man. reset, DIN
L = Left side: automatic pressure control
 Right side: external manual reset
M = Left side: automatic pressure control
 Right side: convertible reset from **R** to **A**
R = Both sides: external manual reset
S = Both sides: safety cut out, internal man. reset,
T = Left side pressure limiter, automatic, DIN
 Right side: safety cut out, intern. man. reset, DIN
U = Both sides: convertible from **R** to **A**
W = Both sides: pressure limiter, automatic,
Low pressure reset
 Cut outs w. manual reset function and in combination with the low pressure side of Pressure Ranges 7 and 9 have a low pressure reset function
High pressure reset
 Cut outs w. manual reset function and in combination w. the high pressure side of Pressure Ranges 7 and 9 have a high pressure reset

Pressure Range
7 = -0.5 ... 7 bar
 6 ... 31 bar
8 = 6 ... 31 bar
 6 ... 31 bar
9 = -0.75 ... 3 bar
 6 ... 31 bar



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Environmental conditions

Ambient temperatures storage and transportation:	-50 °C to +70 °C
operation:	-50 °C to +70 °C
Medium temperature range at pressure connector:	-50 °C to +70 °C
Dust and water protection EN 60529 / IEC 529:	IP44 Control mounted flush against wall!
Vibration resistance:	4 g @ 10 ... 1000 Hz

Materials and compatibility

Housing materials	cover: Polycarbonate (PC) frame: Steel, yellow chromated
Materials w. medium contact pressure conn. (A) /bellows:	brass /bronze
pressure conn. (C) /bellows:	st. steel / steel
pressure conn. (K,L) / bellows:	copper / bronze
Medium compatibility	HFC, HCFC, CFC
NOTE: PS1/PS2 are not released for use with inflammable refrigerants	

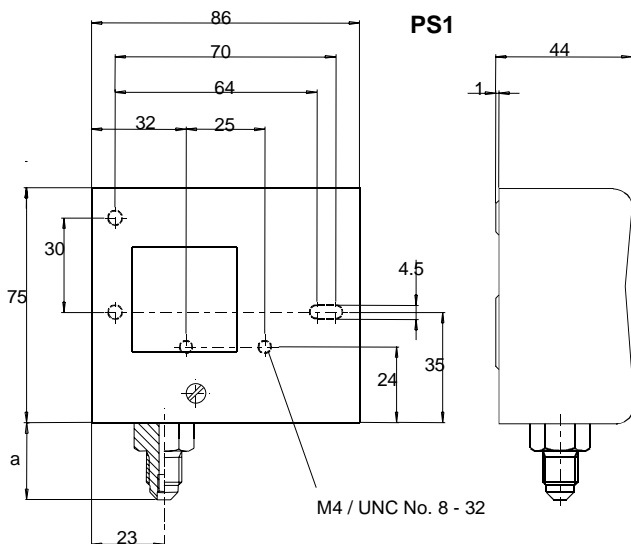
Electrical contacts

Type of contacts	- PS1: 1 x SPDT contact - PS2: 2 x SPDT contacts
Contact material	- standard: CuAg3 - options: gold plated contacts
Heating load (AC1):	24 A / 230 V AC
Inductive load (AC15):	10 A / 230 V AC
Inductive load (DC 13):	0.1 A / 230 V DC 3 A / 24 V DC 6 A / 12 V DC
Motor rating UL (FLA):	24 V AC
Locked rotor UL (LRA)/Startup (AC3):	144 A / 230 V AC

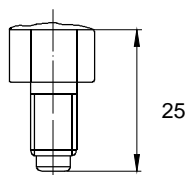
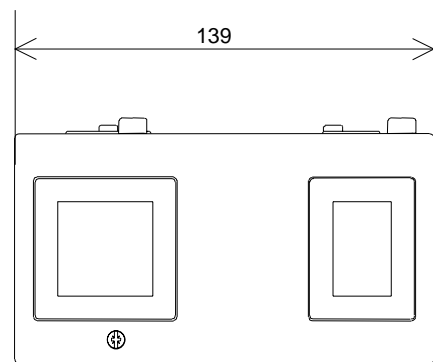
Approvals

TÜV DIN 32733 required by DIN 8901 and DIN 8975:	specific models (<i>approval pending</i>)
Low Voltage Directive 73/23/EWG 93/68/EWG; EN 60947-1, EN 60947-5-1	all models (CE-Label)
Germanic Lloyd:	standard models when used with marine cable glands (accessory)
UL / CSA:	all models (<i>pending</i>)

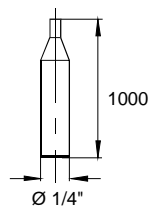
Physical dimensions and drawings



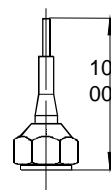
PS2



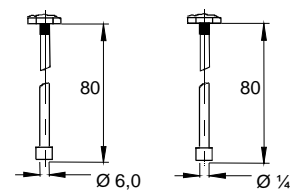
A
7/16" -20 UNF
male (1/4"SAE)



L
Ø 1/4" Solder Tube
with 1m length



K
1 m capillary tube,
Schrader depressor



U / X
6 mm / 1/4" ODF Solder Tube
with 80mm length



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Standard Pressure Controls

Most refrigeration applications are covered by controls using a low pressure range of -0.5 to 7 bar and a high pressure range between 6 and 31 bar. For Single Pressure Controls PS1 this corresponds to Pressure Ranges 3 and 5, for Dual Pressure Controls this corresponds to Pressure Ranges 7 and 8. Pressure controls should be selected such, that the target upper and lower setpoints fall well inside the adjustment range and not at the end of the specified range.

Pressure Controls Type	PCN	Adjustment Upper Setpoint bar	Range Differential Setpoint bar	Lowest Setpoint bar	Factory Setting	Leakage Test Pressure bar	Pressure Connection
Single Pressure Controls PS1							
Low Pressure Controls							
PS1-A3A	4370700	-0.5 ... 7	0.5 ... 5	-0.9	3.5 / 4.5	25	7/16"-20 UNF
PS1-A3K	4370600						capillary/nut
PS1-A3L	4714945						cap./solder
PS1-A3U	4712201						solder 6 mm
PS1-A3X	4713430						solder tube "
PS1-R3A	4350100	-0.5 ... 7	<i>external reset low pressure ca. 1 bar fix</i>	-0.9	3.5	25	7/16"-20 UNF
PS1-R3K	4713431						capillary nut
PS1-R3L	4715135						cap./solder
PS1-R3U	4713432						solder 6 mm
PS1-R3X	4713433						solder ¼"
High Pressure Controls							
PS1-A5A	4350500	6 ... 31	2 ... 15	3	16 / 20	36	7/16"-20 UNF
PS1-A5K	4370400						capillary/nut
PS1-A5L	4715136						cap./solder
PS1-A5U	4713325						solder 6 mm
PS1-A5X	4713434						solder ¼"
PS1-R5A	4350700	6 ... 31	<i>ext. manual reset low pressure ca. 3 bar fix</i>	-	20	36	7/16"-20 UNF
PS1-R5K	4370300						capillary/nut
PS1-R5L	4715137						cap./solder
PS1-R5U	4713435						solder 6 mm
PS1-R5X	4713436						solder ¼"
Single Pressure Controls PS1 DIN/TÜV (TÜV Approved DIN 32733)							
Pressure Limiter for low pressure protection DIN 32733 DWFK / PSL (automatic reset)							
PS1-W3A	4368300	-0.5 ... 7	0.5 ... 5	-0.9	3.5 / 4.5	25	7/16"-20 UNF
PS1-W3K	4321400						capillary/nut
PS1-W3L	4715138						cap./solder
PS1-W3U	4713437						solder 6 mm
PS1-W3X	4713438						solder ¼"



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Pressure Controls Type	PCN	Adjustment Upper Setpoint bar	Range Differential Setpoint bar	Lowest Setpoint bar	Factory Setting	Leakage Test Pressure bar	Pressure Connection
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Single Pressure Controls PS1 DIN/TÜV (TÜV Approved DIN 32733)

Pressure Cut Out for low pressure protection DIN 32733 DBFK / PZL (external reset)

PS1-B3A	4470400	-0.5 ... 7	<i>ext. manual reset low pressure ca. 1 bar fix</i>	-0.9	3.5	25	7/16"-20 UNF
PS1-B3K	4715139						capillary/nut
PS1-B3L	4715140						cap./solder
PS1-B3U	4715141						solder 6 mm
PS1-B3X	4715142						solder ¼"

Pressure Limiter for high pressure protection DIN 32733 DWK / PSH (automatic reset)

PS1-W5A	4353200	6 ... 31	2 ... 15	3	16 / 20	36	7/16"-20 UNF
PS1-W5K	4359100						capillary/nut
PS1-W5L	4715143						cap./solder
PS1-W5U	4713439						solder 6 mm
PS1-W5X	4713440						solder ¼"

Pressure Cut Out for high pressure protection DIN 32733 DBK / PZH (external manual reset)

PS1-B5A	4353300	6 ... 31	<i>ext. manual reset low pressure ca. 3 bar fix</i>	-	20	36	7/16"-20 UNF
PS1-B5K	4359200						capillary/nut
PS1-B5L	4715144						cap./solder
PS1-B5U	4712332						solder 6 mm
PS1-B5X	4713441						solder ¼"

Safety Pressure Cut Out for high pressure protection DIN 32733 DBK / PZHH (internal manual reset)

PS1-S5A	4368400	6 ... 31	<i>internal manual reset low pressure ca. 3 bar fix</i>	-	21	36	7/16"-20 UNF
PS1-S5K	4359400						capillary/nut
PS1-S5L	4715145						cap./solder
PS1-S5U	4711591						solder 6 mm
PS1-S5X	4713442						solder ¼"

Single Pressure Controls PS1 for dedicated applications

Pressure Controls Type	PCN	Adjustment Upper Setpoint bar	Range Differential Setpoint bar	Application	Remark
PS1-_1_	<i>on request and dep. on exact type</i>	-0.75 ... 3	0.25 ... 2	<i>narrow differentials inside specified pressure range</i>	<i>leakage test pressure 16 bar</i>
PS1-_2_		-0.8 ... 1.5	0.2 ... 1		<i>leakage test pressure 12 bar</i>
PS1-_4_		1 ... 20	0.5 ... 7		<i>leakage test pressure 23 bar</i>
PS1-_6_		4 ... 12	0.5 ... 7		<i>leakage test pressure 16 bar</i>
PS1-_8_		-0.5 ... 8	0.5 ... 5		<i>leakage test pressure 12 bar</i>
PS1-U__		<i>complete range</i>	<i>complete range</i>		<i>convert. reset to reduce stock ammonia (NH₃)</i>
PS1-__C					<i>R ¼" pressure connector</i>



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Dual Pressure Controls		Adjustment		Range		Factory Setting		Leakage Test Pressure		Pressure Connection
Type	PCN	left bar	right bar	left bar	right bar	left bar	right bar	left bar	right bar	
Dual Pressure Controls PS2										
Combined Low and High Pressure Controls										
PS2-A7A	4353400	-0.5 ... 7	6 ... 31	0.5 ^a ... 5	ca. 4 fix	3.5 / 4.5	20	25	36	7/16"-20 UNF
PS2-A7K	4350900									capillary/nut
PS2-A7L	4713565									cap./solder
PS2-A7U	4713415									solder 6 mm
PS2-A7X	4713416									solder tube "
PS2-L7A	4351100	-0.5 ... 7	6 ... 31	0.5 ^a ... 5	<i>external reset high pressure ca. 4 fix</i>	3.5 / 4.5	20	25	36	7/16"-20 UNF
PS2-L7K	4370500									capillary nut
PS2-L7L	4440800									cap./solder
PS2-L7U	4713417									solder 6 mm
PS2-L7X	4713418									solder 1/4"
PS2-R7A	4351300	-0.5 ... 7	6 ... 31	<i>external reset low pressure ca. 1 fix</i>	<i>external reset high pressure ca. 4 fix</i>	3.5	20	25	36	7/16"-20 UNF
PS2-R7K	4713421									capillary nut
PS2-R7L	4715134									cap./solder
PS2-R7U	4713419									solder 6 mm
PS2-R7X	4713420									solder 1/4"
Dual Pressure Controls PS2 DIN / TÜV										
Combined Pressure Limiter for low Pressure / high pressure protection										
DIN 32733 DWFK / DWK; PSL / PSH (automatic / automatic)										
PS2-W7A	4360100	-0.5 ... 7	6 ... 31	0.5 ^a ... 5	ca. 4 fix	3.5 / 4.5	20	25	36	7/16"-20 UNF
PS2-W7K	4450200									capillary/nut
PS2-W7L	4450300									cap./solder
PS2-W7U	4712436									solder 6 mm
PS2-W7X	4713429									solder tube "
Combined Pressure Limiter / Pressure Cut Out for low Pressure / high pressure protection										
DIN 32733 DWFK / DBK; PSL / PZH (automatic / external manual reset)										
PS2-C7A	4353500	-0.5 ... 7	6 ... 31	0.5 ^a ... 5	<i>external reset high pressure ca. 4 fix</i>	3.5 / 4.5	20	25	36	7/16"-20 UNF
PS2-C7K	4348400									capillary/nut
PS2-C7L	5715131									cap./solder
PS2-C7U	4713422									solder 6 mm
PS2-C7X	4713423									solder tube "

^a lowest possible setpoint: -0.9 bar



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Dual Pressure Controls Type	PCN	Adjustment		Range		Factory Setting		Leakage Test Pressure		Pressure Connection
		Upper Setpoint left bar	right bar	left bar	right bar	left bar	right bar	left bar	right bar	

Dual Pressure Controls PS2 DIN / TÜV

Combined Pressure Limiter / Safety Pressure Cut Out for low Pressure / high pressure protection
DIN 32733 DWFK / DBK; PSL / PZHH (automatic / internal manual reset)

PS2-T7A	4368500	-0.5 ... 7	6 ... 31	0.5 ^a ... 5	<i>internal reset high pressure ca. 4 fix</i>	3.5 / 4.5	21	25	36	7/16"-20 UNF
PS2-T7K	4448000									capillary/nut
PS2-T7L	4715132									cap./solder
PS2-T7U	4713424									solder 6 mm
PS2-T7X	4713425									solder tube "

Combined Pressure Cut Out for low Pressure / high pressure protection
DIN 32733 DBFK / DBK; PZL / PZH (external manual reset / external manual reset)

PS2-B7A	4360200	-0.5 ... 7	6 ... 31	<i>external reset low pressure ca. 1 fix</i>	<i>external reset high pressure ca. 4 fix</i>	3.5	20	25	36	7/16"-20 UNF
PS2-B7K	4446600									capillary nut
PS2-B7L	4446700									cap./solder
PS2-B7U	4449400									solder 6 mm
PS2-B7X	4713426									solder ¼"

Combined Pressure Cut Out / Safety Pressure Cut Out for high pressure / high pressure protection
DIN 32733 DBK / DBK; PZH / PZHH (external manual reset / internal manual reset)

PS2-G8A	4368600	6 ... 31	6 ... 31	<i>external reset high pressure ca. 4 fix</i>	<i>internal reset high pressure ca. 4 fix</i>	20	21	36	36	7/16"-20 UNF
PS2-G8K	4445500									capillary/nut
PS2-G8L	4715133									cap./solder
PS2-G8U	4713427									solder 6 mm
PS2-G8X	4713428									solder ¼"

Dual Pressure Controls PS2 for dedicated applications

Dual Pressure Controls		Adjustment Range				Application	Remark
Type	PCN	Upper Setpoint		Differential			
		left bar	right bar	left bar	right bar		
PS2-M7A	4361300	-0.5 ... 7	6 ... 31	0.5 ^a ... 5		convertible reset to reduce stock	7/16"-20 UNF
PS2-U7K	4362700	-0.5 ... 7	6 ... 31	<i>convertible reset from auto to manual</i>			capillary/nut
PS2-M_ _	<i>on requ.</i>	<i>dep. on range</i>					<i>w/o TÜV approval only</i>
PS2-U_ _	<i>on requ.</i>	<i>dep. on range</i>					
PS2-_9_	<i>on requ.</i>	-0.75...3	6 ... 31	<i>dep. on function</i>			<i>narrow diff. low pressure ammonia (NH₃)</i>
PS2-_ _ C	<i>on requ.</i>	<i>dep. on range</i>					<i>R ¼" press. connector</i>



PS1 / PS2 Series
Pressure Controls

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Accessories

<p>Univ. mounting bracket 0714147 (incl. screws) 0153962 (w/o screws)</p>	<p>Mounting bracket angle 0714144 (incl. screws) 0411746 (w/o screws)</p>	<p>Extension bracket 0714146 (incl. screws) 0411761 (w/o screws)</p>	<p>Welding stub steel G1/4"; 6 mm 0710544</p>

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