

# Pressure Controls and Thermostats

## Pressure Controls

### Basic Terms and Technical Information

#### Characteristics

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.

These functions are performed by operating a set of electrical contacts when exceeding a preset lower or upper pressure limit. Depending on whether they are type tested (TÜV approved) or not, they may be referred to by the following terms:

without TÜV approval:	Pressure Control
with TÜV approval:	Pressure Limiter, Pressure Cut-Out or Safety Pressure Cut-Out

Pressure controls with TÜV approval are tested according to EN 12263 as required by DIN 8901 and EN 378.

- 1. Pressure Controls (Without TÜV Approval)**  
Pressure controls without type approval may either be of the automatic or manual reset type. Manual reset versions are available for decreasing (manual reset min.) or increasing pressure (manual reset max.).
- 2. Pressure Limiters PSL/PSH**  
Pressure limiters are of the automatic reset type. Limiters for high pressure applications have a double bellows design to act as fail-safe controls.
- 3. Pressure Cut-outs PZH/PZL**  
Pressure cut-outs are of the manual reset type where reset is possible from the outside of the control without the need for a tool (external reset). Cut-outs for high pressure applications have a double bellows design to act as fail-safe controls.
- 4. Safety Pressure Cut-outs PZHH/PZLL**  
Pressure cut-outs are of the manual reset type where the reset requires the use of a tool. Typically, the removal of a cover is required in order to press the reset button (internal reset). Cut-outs for high pressure applications have a double bellows design to act as fail-safe controls.

#### Adjustment of Switching Points

A pressure gauge should always be used for comparison when adjusting the switching points on pressure controls. The setting scale on the

device is intended to serve for orientation, showing the setting range of the upper switching point  $p_{max}$  in bar/psig and the value of the pressure differential  $\Delta p$  as difference between upper switching point  $p_{max}$  and the lower switching point  $p_{min}$ . The upper switching point  $p_{max}$  has to be adjusted on the scale, whereas the lower switching point  $p_{min}$  is given by adjustment of the desired switching differential  $\Delta p$ .

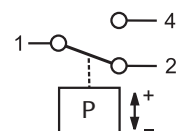
The formula is:

$$\text{Upper switching point} - \text{Differential} = \text{Lower switching point}$$

$$P_{max} - \Delta p = P_{min}$$

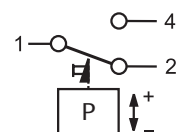
#### Function of Contacts SPDT

On pressure rise above setting 1-2 opens and 1-4 closes. On pressure drop below setting 1-2 closes and 1-4 opens.



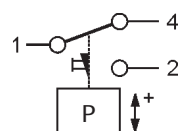
#### SPDT With Manual Reset Max.

On pressure rise above setting 1-2 opens and 1-4 closes and latches. The device can be manually reset when the pressure has dropped below setting.



#### SPDT With Manual Reset Min.

On pressure drop below setting 1-2 closes, 1-4 opens and latches. The device can be manually reset when the pressure has risen above setting.



#### Unit of Pressure

All pressures are given in gauge pressure

$$P_{absolute} = P_{gauge} + 1 \text{ bar}$$

$$1 \text{ bar} = 100 \text{ kPa}$$

$$1 \text{ bar} = 14.5 \text{ psi}$$

#### Pulsation Damping

All high pressure controls with connection (7/16-20UNF, 1/4" SAE male) are equipped with a snubber to protect the pressure element from pulsations.



## Standards and Regulations

<b>BGV D4 (VBG20)</b>	Accident prevention regulations for refrigeration plant.
<b>DIN 8901</b>	Heat pumps with fluorocarbon refrigerants. Protection of soil, underground and surface water.
<b>EN 60947-1/ EN 60947-5-1</b>	Specifications for low-voltage switch gear.
<b>EN 378</b>	Refrigerating systems and heat pumps - safety and environmental requirements.
<b>EN 12263</b>	Refrigerating systems and heat pumps - safety switching devices for limiting the pressure requirements and tests.

## Selection Table for Pressure Controls

Series	Selection Criteria					
	Design	Number of Contacts (SPDT)	Adjustable	Protection DIN 40050 IEC 529	Rated Operational Current at 230 V AC	
					Inductive Amp. AC 15	Motor Rating UL
PS1 / CS1 (for CO <sub>2</sub> applications)	Pressure Control (single packaging) Model	1	yes	IP 44	10 A	24 A
PS2	Dual Pressure Control (single packaging)	1+1	yes	IP 44	10 A	24 A
PS3	Pressure Controls Standard types (single packaging)	1	Factory set to fixed values	IP 30 / IP 65	3 A	6 A
	Pressure Control Special types (100 pieces packaging)	1	Other fixed values acc. to agreed specification	IP 30 / IP 65	3 A	6 A
CS3 (for CO <sub>2</sub> Applications)	Pressure Controls Standard types (60 pieces packaging)	1	Factory set to fixed values	IP 30 / IP 65	3 A	6 A
	Pressure Control Special types (60 pieces packaging)	1	Other fixed values acc. to agreed specification	IP 30 / IP 65	3 A	6 A
PS4	Pressure Controls standard types (100 pieces packaging)	(SPST)	Factory set to fixed values	IP67 (cable) IP00 (terminals)	6 A	6 A
FD 113	Differential Pressure Control	1	yes pressure diff. + time delay	IP 30	3 A / 6 A	-

# Pressure Controls Series PS1 / PS2

## Features

- Adjustable pressure setpoint
- Automatic and manual reset versions
- Flare and solder pressure connections
- Chatter-resistant (bounce-free) contacts
- High operational current, locked rotor max. 144 A (LRA)
- Standard SPDT with same operational current rating for both contacts
- Dual pressure control with independent SPDT switches (single pole double throw) for high and low pressure side
- Locking plate and mounting screws included

Options (minimum order quantity 100 pieces)

- Convertible reset to reduce stock
- Other types of pressure connections upon agreement
- Factory set to customer specification



PS2



PS1

## Standards

- per Low Voltage Directive
- per PED Directive. TÜV appr. versions only
- Underwriter Laboratories (File Nr. E85974) (PS1 / PS2 only)
- German Lloyd for use on ships, only when used with marine cable glands (accessory)

## Selection Table Single Pressure Controls PS1

Type	Part No.	Adjustment Range		Lowest Setpoint (bar)	Factory Setting (bar)	Leakage Test Pressure (bar)	Pressure Connection
		Upper Setpoint (bar)	Differential (bar)				
Low Pressure Controls							
PS1-A3A	4 370 700	-0.5 ... 7	0.5 ... 5	-0.9	3.5 / 4.5	24	7/16"-20 UNF
PS1-A3U	4 712 201						solder tube 6 mm
PS1-A3X	4 713 430						solder tube 1/4"
PS1-R3A	4 350 100	-0.5 ... 7	External Reset Approx. 1 bar Above Setpoint	-0.9	3.5	24	7/16"-20 UNF
High Pressure Controls							
PS1-A5A	4 350 500	6 ... 31	2 ... 15	3	16 / 20	35	7/16"-20 UNF
PS1-A5L	4 715 136						cap./solder tube 1/4"
PS1-A5U	4 713 325						solder tube 6 mm
PS1-A5X	4 713 434						solder tube 1/4"
PS1-R5A	4 350 700	6 ... 31	Ext. Manual Reset Approx. 3 bar Below Setpoint	-	20	35	7/16"-20 UNF

## Selection Table Single Pressure Controls PS1 TÜV (EN 12263)

Type	Part No.	Adjustment Range		Lowest Setpoint (bar)	Factory Setting (bar)	Leakage Test Pressure (bar)	Pressure Connection
		Upper Setpoint (bar)	Differential (bar)				
Pressure Limiter for Low Pressure Protection PSL - Automatic Reset							
PS1-W3A	4 368 300	-0.5 ... 7	0.5 ... 5	-0.9	3.5 / 4.5	24	7/16"-20 UNF
PS1-W3U	4 713 437						solder tube 6 mm
Pressure Cut Out for Low Pressure Protection PZL - External Manual Reset							
PS1-B3A	4 470 400	-0.5 ... 7	Reset Approx. 1 bar Above Setpoint	-0.9	3.5	24	7/16"-20 UNF
PS1-B3U	4 715 141						solder tube 6 mm
Pressure Limiter for High Pressure Protection PSH - Automatic Reset							
PS1-W5A	4 353 200	6 ... 31	2 ... 15	3	16 / 20	35	7/16"-20 UNF
PS1-W5U	4 713 439						solder tube 6 mm
Pressure Cut Out for High Pressure Protection PZH - External Manual Reset							
PS1-B5A	4 353 300	6 ... 31	Reset Approx. 3 bar Below Setpoint	-	20	35	7/16"-20 UNF
PS1-B5U	4 712 332						solder tube 6 mm
Safety Pressure Cut Out for High Pressure Protection PZHH - Internal Manual Reset (with tool)							
PS1-S5A	4 368 400	6 ... 31	Reset Approx. 3 bar Below Setpoint	-	21	35	7/16"-20 UNF
PS1-S5U	4 711 591						solder tube 6 mm

## Technical Data PS1/PS2/CS1

<b>Type of Contacts</b>	- PS1/CS1: 1 x SPDT contact - PS2: 2 x SPDT contacts
<b>Resistive load (AC1) Inductive load (AC15) Inductive load (DC 13)</b>	24 A / 230 V AC 10 A / 230 V AC 0.1 A / 230 V DC 3 A / 24 V DC 6 A / 12 V DC
<b>Motor rating UL (FLA) Startup / Locked Rotor UL</b>	24 A / 120 / 240 V AC 144 A / 120 / 240 V AC

<b>Medium Compatibility</b>	HFC, HCFC, HFO/HFO Blends, A2L*, CO <sub>2</sub> (CS1 only)
<b>Protection Acc. EN 60529 / IEC 529</b>	IP 44
<b>Ambient Temperature Range Max. Temperature at Pressure Connection</b>	-50 ... +70°C +70°C
<b>Cable Entry</b>	Grommet PG 16
<b>Locking Device</b>	Blocking Plate
<b>Mounting Screws</b>	M4 / UNC 8-32

Note: For A2L applications please check the Operating Instructions.

## Dual Pressure Controls Series PS2



PS2

### Selection Table Dual Pressure Controls PS2

Type	Part No.	Adjustment Range				Factory Setting (bar)		Leakage Test Pressure (bar)		Pressure Connection
		Upper Setpoint (bar)		Differential (bar)		Left	Right	Left	Right	
		Left	Right	Left	Right					
<b>Combined Low and High Pressure Controls (automatic and manual reset)</b>										
PS2-A7A	4 353 400									7/16"-20 UNF
PS2-A7U	4 713 415	-0.5 ... 7	6 ... 31	0.5* ... 5	ca. 4 fix	3.5 / 4.5	20	24	35	solder tube 6 mm
PS2-A7X	4 713 416									solder tube 1/4"
PS2-L7A	4 351 100									7/16"-20 UNF
PS2-L7U	4 713 417	-0.5 ... 7	6 ... 31	0.5* ... 5	external manual reset approx. 4 bar under setpoint	3.5 / 4.5	20	24	35	solder tube 6 mm
PS2-R7A	4 351 300									7/16"-20 UNF
PS2-R7U	4 713 419	-0.5 ... 7	6 ... 31	0.5* ... 5	external manual reset approx. 1 bar above setpoint	3.5	20	24	35	solder tube 6 mm
<b>Combined Low and High Pressure Controls, High Side Convertible from Automatic to Manual Reset</b>										
PS2-M7A	4 361 300	-0.5 .. 7	6 ... 31	0.5* ... 5	-	3.5 / 4.5	21	24	35	7/16"-20 UNF

### Selection Table - Dual Pressure Controls PS2 TÜV (EN12263)

Type	Part No.	Adjustment Range				Factory Setting (bar)		Leakage Test Pressure (bar)		Pressure Connection
		Upper Setpoint (bar)		Differential (bar)		Left	Right	Left	Right	
		Left	Right	Left	Right					
<b>Combined Pressure Limiter for Low Pressure / High Pressure protection EN 12263 PSL / PSH (Automatic / Automatic)</b>										
PS2-W7A	4 360 100									7/16"-20 UNF
PS2-W7L	4 450 300	-0.5 ... 7	6 ... 31	0.5* ... 5	ca. 4 fix	3.5 / 4.5	20	24	35	cap./solder 1/4"
PS2-W7U	4 712 436									Solder 6 mm
<b>Combined Pressure Limiter / Pressure Cut-Out for Low Pressure / High Pressure Protection PSL / PZH (Automatic / External Manual Reset)</b>										
PS2-C7A	4 353 500	-0.5 ... 7	6 ... 31	0.5* ... 5	external manual reset approx. 4 bar below setpoint	3.5 / 4.5	20	24	35	7/16"-20 UNF
<b>Combined Pressure Limiter Safety Pressure Cut Out for Low Pressure / High Pressure Protection EN 12263 PSL / PZH (Automatic / Automatic Convertible to External Manual Reset)</b>										
PS2-N7A	4 715 756	-0.5 .. 7	6 ... 31	0.5* ... 5	-	3.5 / 4.5	21	24	35	7/16"-20 UNF

Note: \*) Lowest Possible Setpoint: -0.9 bar

## Selection Table - Dual Pressure Controls PS2 TÜV (EN12263)

Type	Part No.	Adjustment Range				Factory Setting (bar)		Leakage Test Pressure (bar)		Pressure Connection
		Upper Setpoint (bar)		Differential (bar)		Left	Right	Left	Right	
		Left	Right	Left	Right					
Combined Pressure Limiter / Safety Pressure Cut-Out for Low Pressure / High Pressure Protection PSL / PZHH - Automatic / Internal Manual Reset										
PS2-T7A	4 368 500	-0.5 ... 7	6 ... 31	0.5* ... 5	Internal reset approx. 4 bar below setpoint	3.5 / 4.5	21	24	35	7/16"-20 UNF
PS2-T7U	4 713 424									solder tube 6 mm
Combined Pressure Cut-Out for Low Pressure / High Pressure Protection PZL / PZH External Manual Reset / External Manual Reset										
PS2-B7A	4 360 200	-0.5 ... 7	6 ... 31	External reset approx. 1 bar above setpoint	Internal reset approx. 4 bar below setpoint	3.5	20	24	35	7/16"-20 UNF
PS2-B7U	4 449 400									solder tube 6 mm
Combined Pressure Cut-Out / Safety Pressure Cut-Out for High Pressure Protection PZH / PZHH External Manual Reset / External Manual Reset										
PS2-G8A	4 368 600	6 ... 31	6 ... 31	External manual reset approx. 4 bar below setpoint	Internal manual reset approx. 4 bar below setpoint	20	21	35	35	7/16"-20 UNF
PS2-G8U	4 713 427									solder tube 6 mm
PS2-G8X	4 713 428									Solder 1/4"

Note: \*) Lowest Possible Setpoint: -0.9 bar

## Pressure Controls Series CS1

CS1 is an adjustable safety pressure for application in refrigeration systems in compliance with standard EN 378.

### Features

- Adjustable pressure range
- Narrow adjustable differential
- Range and differential pointer in units bar and psig
- High rated SPDT contacts for all versions
- Chatter resistant bounce free contacts
- Captive terminal and cover screws
- 2 million cycles reliability (TÜV approved according to EN 12263 to meet requirements of EN 378)
- Locking plate and mounting screws included



CS1

### Options

- Customer specific types available, minimum order quantity 100 pieces

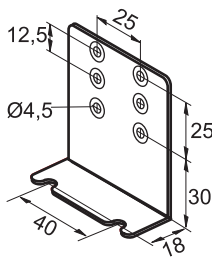
### Standards

- acc. PED 2014/68/EU & LVD 2014/35/EU

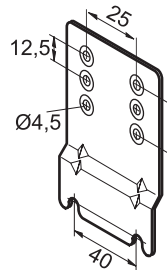
## Selection Table - Pressure Limiter for High Pressure Protection EN 12263 PSH

Type	Part No.	Adjustment Range		Lowest Setpoint (Cut-in) (bar)	Factory Setting (bar)	Max. Allowable Pressure PS (bar)	Test Pressure (bar)	Pressure Connection
		Upper Setpoint (cut-out) (bar)	Differential Setpoint (bar)					
CS1-W6A	812004/ 812004M*	10...45	4 - 10	6	28 / 20	70	77	7/16"-20 UNF male
CS1-W7A	812005/ 812005M*	15...65	5 - 10	10	40 / 32	70	77	

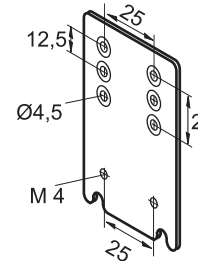
### Accessories



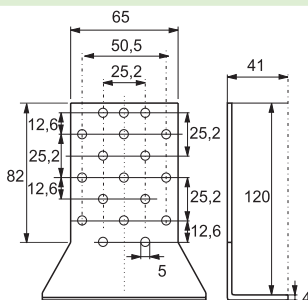
Mounting Bracket Angle  
Part No.: 803 799



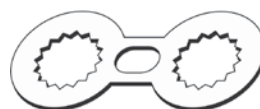
Mounting Plate for Units with Hood  
Part No.: 803 801



Extension Bracket  
Part No.: 803 800



Universal Mounting Bracket  
Part No.: 803 798



Locking Plate  
Part No.: 803783 (20 pcs)

Copper Gasket Set for R 1/4"  
(7/16"-20 UNF. Female)  
100 pcs Package  
Part No.: 803 780



# Pressure Controls Series PS3 / Standard Types

## Fixed Settings in Single Packaging

### Features

- Maximum allowable pressure up to 45 bar / test pressure up to 50 bar
- High and low pressure switches
- High temperature version with snubber for direct compressor mounting (range 6)
- Direct mounting reduces the number of joints and thus avoiding potential leakage
- Precise setting and repeatability
- IP 65 protection if used with PS3-Nxx cables with plug (acc. EN 175301-803), no additional gasket required (molded into plug)
- Cables with plug to be ordered separately



PS3

### Standards

- per Low Voltage Directive
- per PED Directive, TÜV appr. versions only
- Underwriter Laboratories (File No. E85974) (Released for 43 bar)

### Selection Table PS3- Standard Types

Pressure Control Type	Part No.	Fixed setting		Reset	Max. Temperature		Leakage Test Pressure	Pressure Connection
		Cut-out	Cut-in		Ambient	Pressure Connection		
High Pressure Controls								
PS3-A6S	0 715 603	16.0 bar	11.0 bar	Auto	+70°C	+150°C	50 bar	7/16"-20UNF Female Thread with Schrader Opener
PS3-A6S	0 715 604	19.0 bar	15.0 bar					
PS3-A6S	0 715 600	26.5 bar	22.5 bar					
Low Pressure Controls / Pressure Limiter for Low Pressure Protection PSL TÜV / EN 12263								
PS3-W1S	0 714 760	-0.3 bar	1.2 bar	Auto	+70°C	+70°C	30 bar	7/16"-20UNF Female Thread with Schrader Opener
PS3-W1S	0 714 761	0.3 bar	1.8 bar					
PS3-W1S	0 714 762	2.0 bar	3.5 bar					
Pressure Limiter for High Pressure Protection PSH with snubber for direct compressor mounting TÜV / EN 12263								
PS3-W6S	0 715 831	14.0 bar	10.0 bar	Auto	+70°C	+150°C	50 bar	7/16"-20UNF Female Thread with Schrader Opener and Snubber
PS3-W6S	0 715 556	21.0 bar	16.0 bar					
PS3-W6S	0 715 555	25.0 bar	20.0 bar					
PS3-W6S	0 715 567	29.0 bar	23.0 bar					
PS3-W6S	0 715 550	33.5 bar	27.5 bar					
PS3-W6S	0 715 553	40.0 bar	33.0 bar					
Pressure Cut-Out for High Pressure Protection PZH with Snubber for Direct Compressor Mounting TÜV / EN 12263								
PS3-B6S	0 715 568	19.2 bar	Approx. 5 bar below cut-out	External manual reset	+70°C	+150°C	50 bar	7/16"-20UNF Female Thread with Schrader Opener and Snubber
PS3-B6S	0 715 564	22.7 bar						
PS3-B6S	0 715 563	27.3 bar						
PS3-B6S	0 715 569	29.5 bar						
PS3-B6S	0 715 560	36.0 bar						



## Accessories Cable Assemblies

Type	Part No.	Length	Temperature Range	Leads
PS3-N15	804 580	1.5 m	-50...80°C / No UL	3 x 0.75 mm <sup>2</sup>
PS3-N30	804 581	3.0 m		
PS3-N60	804 582	6.0 m		

Note: PS3-M... are not in compliance with EN60335-1/2-40, clause 30 in term of glue wire test.

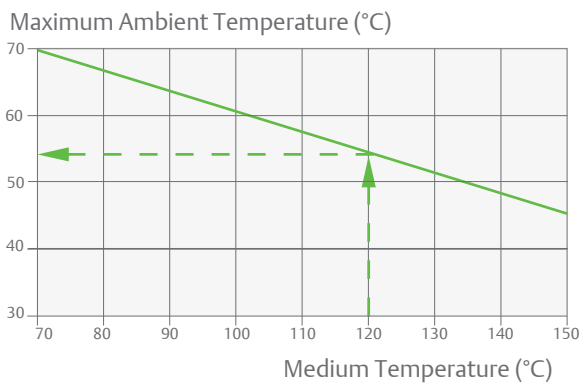


Plug According to EN 175301	Part No.
PG9	801 012
PG11	801 013

## Technical Data

<b>Protection According to EN 60529 / IEC 529</b>	IP 00 IP 30 with Terminal Cover IP 65 with PS3-Nxx Cables with Plug or Plug DIN 43650
<b>Inductive Load (AC15)</b>	3 A / 230 V AC
<b>Inductive Load (DC)</b>	0.1 A / 230 V DC
<b>Motor Rating Amps (FLA)</b>	6 A / 120/240 V AC
<b>Lock Rotor Amps (LRA)</b>	36 A / 120/240 V AC

<b>Temperature Range TS * Ambient, Storage and Transportation Medium</b>	-40 ... 70 °C -40 ... 70 °C (150°C Range 6)
<b>Pressure Range PS</b>	- 0.6 .. 43 bar
<b>Type of Contacts</b>	1 SPDT
<b>Medium Compatibility</b>	HFC, HCFC, HFO/HFO Blends (refrigerant safety group A1)



Note: \*) For high temperature applications, i. e., medium temperatures between 70 °C and 150 °C, the maximum ambient temperature must be derated as per drawing. E.g.: on medium temperature 120 °C the ambient temperature of 55 °C around the switch housing should not be exceeded.

# Pressure Controls Series PS3/PSC Special Types

## According to Agreed Specification, 100 Pieces Packaging

### Features

- Maximum allowable pressure up to 45 bar / test pressure up to 50 bar
- For direct mounting on a pressure connection (free standing) or with a capillary tube
- Direct mounting reduces the number of joints and thus avoids potential leakage
- Direct mounting saves cost for flexible hose and additional fittings
- Precise setting and repeatability
- High temperature version with snubber, for direct compressor mounting (range 6)
- Micro switch for narrow pressure differentials
- Gold plated contacts for low voltage / current applications
- Worldwide approvals
- Easy mounting
- Housing with integrated console for free-standing installation
- Low pressure switch with automatic or manual reset
- High pressure switch with automatic or manual reset, standard or high temperature version
- Pressure limiter PSH - standard or high temperature version
- Pressure cut-out PZH - external reset, standard or high temperature version
- Safety pressure cut-out PZHH - internal reset, standard or high temperature version
- Cables with plug in lengths of 1.5m, 3.0m and 6.0m available. No additional gasket required.
- Appliance socket DIN 43650
- Electrical contact single pole double throw
- Electrical micro switch single pole double throw (SPDT)
- Gold plated contacts upon request

### Technical Data

<b>Protection According to EN 60529 / IEC 529</b>	IP 00 IP 30 with Terminal Cover IP 65 with PS3-Nxx Cables with Plug or Plug DIN 43650
<b>Inductive Load (AC15)</b>	3 A / 230V AC 1.5 A with Microswitch Standard 0.1 A with Gold Plated Contacts
<b>Inductive Load (DC)</b>	0.1 A / 230V DC
<b>Motor Rating Amps (FLA)</b>	6 A / 120/240V AC 2.5 A with Microswitch
<b>Lock Rotor Amps (LRA)</b>	36 A / 120/240V AC 15 A with Microswitch

Note: For more information see the technical bulletin of PS3



### Standards

- **CE** per Low Voltage Directive
- **CE** per PED Directive TÜV appr. versions only
- **UL LISTED** Underwriter Laboratories (File No. E85974) (Released for 43 bar)

### Pressure Connections

- S: 7/16"-20UNF, female with Schrader opener and snubber (snubber only with high temperature diaphragm)
- A: 7/16"- 20UNF, 1/4" SAE male
- U: 6 mm solder. 80 mm length. ODF
- X: 1/4" solder. 80 mm length. ODF
- K: 1 m capillary tube with 1/4" SAE flare nut and Schrader opener
- L: 1 m capillary tube and 1/4" ODM solder connector

<b>Temperature Range TS Ambient. Storage and Transportation Medium</b>	-40 ... 70°C -40 ... 70°C (150°C Range 6)
<b>Pressure Range PS</b>	-0.6 .. 43 bar
<b>Type of Contacts</b>	1 SPDT
<b>Medium Compatibility</b>	HFC, HCFC, HFO/HFO Blends (refrigerant safety group A1)

# Pressure Controls Series CS3 for R744/ CO<sub>2</sub>

## Standard Types with Fixed Settings and Special Types, 60 Pieces Packaging

### Features

- Pressure range 8/Q
  - Versions with fixed factory cut-out setting available between 60 bar to 140 bar
  - Maximum allowable pressure of 140 bar
  - Factory test pressure of 154 bar
  - Narrow differential (approx. 6 bar) between cut-out and cut-in (in Microswitch version)
- Pressure range 7/P
  - Versions with fixed factory cut-out setting available between 40 bar to 70 bar
  - Maximum allowable pressure of 90 bar
  - Factory test pressure of 100 bar
  - Narrow differential (approx. 4 bar) between cut-out and cut-in (in Microswitch version)
- Manual reset versions available
- Precise switching and repeatability; Snap Action Contacts => Chatter Free (Bounce free) and Accurate Operation
- Contacts are designed as SPDT (Single pole double throw) for control function and alarm/status reporting
- Direct compressor mounting with adapter option
- 2 million cycles reliability (TUV EN 12263 approved)
- IP65 protection if used with PS3-Nxx with plug (acc. EN 175301-803), no additional gasket required (molded into plug)



CS3

### Applied Standards

- per Low Voltage Directive
- per PED Directive
- US LISTED Underwriter Laboratories (File No. E85974)

## Selection Table

### 1. Standard Types

#### Pressure Range 8/Q

Type	Part No. (Multi-Pack 60 Pcs)	Fixed Setting		Reset	Electrical Switch	Pressure Connection
		Cut-out	Cut-in			
Pressure Limiter CS3-WQS	0718008M	106 bar	100 bar	Automatic	Micro Switch	7/16"-20 UNF Female Thread with Schrader Opener
Pressure Limiter CS3-W8S	0718009M	106 bar	80 bar		Standard Switch	
Pressure Cut-out CS3-B8S	0718001M	108 bar	Approx. 25 bar below cut-out	External Manual	Standard Switch	
Safety Pressure Cut-out CS3-S8S	0718002M	108 bar	Approx. 25 bar below cut-out	Internal Manual	Standard Switch	

#### Pressure Range 7/P

Type	Part No. (Multi-Pack 60 Pcs)	Fixed Setting		Reset	Electrical Switch	Pressure Connection
		Cut-out	Cut-in			
Pressure Limiter CS3-WPS	0718007M	54 bar	50 bar	Automatic	Micro Switch	7/16"-20 UNF Female Thread with Schrader Opener
Pressure Limiter CS3-W7S	0718006M	54 bar	41 bar		Standard Switch	
Pressure Cut-out CS3-B7S	0718004M	54 bar	Approx. 13 bar Below Cut-out	External Manual	Standard Switch	
Safety Pressure Cut-out CS3-S7S	0718005M	54 bar	Approx. 13 bar Below Cut-out	Internal Manual	Standard Switch	

Note: Cables with plug must be ordered separately (see next page).

## 2. Pressure Controls CS3 Special Type According to Agreed Specification, 60 Pieces Packaging

Pressure Range 8/Q: Versions with fixed factory cut-out settings available between 60 bar to 140 bar  
Pressure Range 7/P: Versions with fixed factory cut-out settings available between 40 bar to 70 bar

### Accessories Cable Assemblies

Type	Part No.	No. of Leads	Diameter of Lead	Temperature Range	Cable Length
PS3-N15	804 580	3	0.75 mm <sup>2</sup>	-50...+80 °C	1.5 m
PS3-N30	804 581				3.0 m
PS3-N60	804 582				6.0 m

Note: PS3-M... are not in compliance with EN60335-1/2-40, clause 30 in term of glue wire test

Plug According to EN75301	Part No.
PG9	801 012
PG11	801 013

### Technical Data

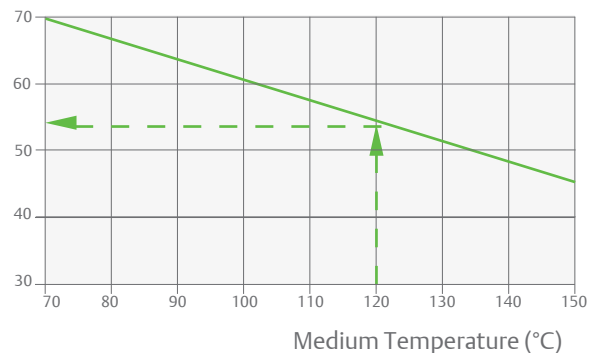
<b>Protection Class Acc. to EN 60529</b>	IP 65 with PS3-Nxx IP00 without Appliance Socket
<b>Max. Allowable Pressure PS</b>	Pressure Range 8/Q: 140 bar Pressure Range 7/P: 90 bar
<b>Factory Test Pressure PT</b>	Pressure Range 8/Q: 154 bar Pressure Range 7/P: 100 bar
<b>Tolerances (As Per EN 12263) - Only for Standard Types (See page 1)</b>	Pressure Range 8/Q Cut-out Tolerance: 0 to -6 bar Cut-in Tolerance: +/-3 bar
<b>Note: Tolerances are Valid Between -20...+55°C.</b>	Pressure Range 7/P Cut-out Tolerance: 0 to -3 bar Cut-in Tolerance: +/-1.5 bar

<b>Storage and Transportation Temperature</b>	-40 ...+70°C
<b>Ambient Temperature (Housing)*</b>	-40 ...+70°C
<b>Medium Temperature*</b>	-40 ...+150°C

\*) Note: For high temperature applications, i.e. medium temperatures between 70°C and 150°C, the maximum ambient temperature must be derated as per drawing.

E.g.: On medium temperature 120°C the ambient temperature of 55°C around the switch housing should not be exceeded.

Maximum Ambient Temperature (°C)



### Electrical Data





	Standard (SPDT)	Micro Switch (SPDT)
Inductive Load (AC15)	3 A / 230 VAC	1.5 A / 230 VAC
Inductive Load (DC)	0.1 A / 230 VDC	0.1 A / 230 VDC
Motor Rating Amps (FLA)	6 A / 120 / 240 VAC	2.5 A / 120 / 240 VAC
Lock Rotor Amps (LRA)	36 A / 120 / 240 VAC	15 A / 120 / 240 VAC

## Pressure Controls Series PS4 with Fixed Settings for OEM Applications; Minimum Order Quantity 100 Pieces

### Features

- High- and low pressure switches
- Precise settings and repeatability
- Cable version with IP67 (IP20 for terminal version)
- Normally open/closed electrical contacts (under standard operating conditions)
- TUV approved versions (W & B)
- UL approved
- Released for A2L applications, please check the Operating Instructions

### Standards

-  According to low Voltage Directive and European scheme EN60950
-  According to Electrical Equipment Directive 14/35/EU
-  0035 According to Pressure Equipment Directive 14/68/EU
-  Underwriter Laboratories file Nr. E258370



PS4

### Selection Table - Low Pressure Switches with Automatic Reset; Open On Falling Pressure

Type	Part No.	Setting		Connector (QC) Cable	Test Pressure	EN 12263	Contact Function	Application	Pressure Connection
		Cut-out	Cut-in						
PS4-W1	808269	0.3 bar	1.5 bar	3.0 m	25 bar	PSL	Open on falling pressure	Low pressure	6 mm
PS4-A1	808266	0.4 bar	1.4 bar	1.5 m		none			7/16"-20UNF*
PS4-W1	808208	0.6 bar	1.8 bar	1.5 m		PSL			6 mm
PS4-W3	808235	0.6 bar	1.8 bar	QC					7/16"-20UNF*
PS4-W1	808251	0.6 bar	1.8 bar	3.0 m		PSL			6 mm
PS4-W1	808209	0.7 bar	2.1 bar	1.5 m					7/16"-20UNF*
PS4-W1	808241	0.7 bar	2.4 bar	3.0 m		none			6 mm
PS4-W3	808284	1.2 bar	1.9 bar	QC					7/16"-20UNF*
PS4-A1	808247	1.5 bar	2.5 bar	2.5 m		PSL			6 mm
PS4-A1	808229	1.5 bar	3.0 bar	1.5 m					7/16"-20UNF*
PS4-W1	808210	1.7 bar	3.4 bar	1.5 m		PSL			6 mm
PS4-W1	808249	1.7 bar	3.4 bar	1.5 m					7/16"-20UNF*
PS4-W1	808271	1.8 bar	3.2 bar	1.5 m		None			6 mm
PS4-A1	808276	3.3 bar	4.8 bar	1.5 m					7/16"-20UNF*

Note: \*) 7/16-20UNF female with Schrader valve opener

## Selection Table - High Pressure Switches with Automatic Reset; Open On Rising Pressure

Type	Part No.	Setting		Connector (QC) Cable	Test Pressure	EN 12263	Contact Function	Application	Pressure Connection
		Cut-out	Cut-in						
PS4-W1	808200	18 bar	13 bar	1.5 m	41 bar	PSH	Open on rising pressure	High pressure	7/16-20UNF*
PS4-W1	808265	18 bar	13 bar	3.0 m					6mm
PS4-W1	808201	26 bar	20 bar	1.5 m					7/16-20UNF*
PS4-W1	808224	26 bar	20 bar	3.0 m					6mm
PS4-W1	808 282	24 bar	18 bar	5.0 m					7/16-20UNF*
PS4-W3	808236	26 bar	20 bar	QC					1/4"
PS4-A1	808260	26 bar	20 bar	1.5 m					None
PS4-W1	808203	28 bar	21 bar	1.5 m	55 bar	PSH	Open on rising pressure	High pressure	7/16-20UNF*
PS4-A1	808233	28 bar	21 bar	1.5 m					none
PS4-A1	808244	28 bar	21 bar	1.5 m					PSH
PS4-W3	808273	29 bar	22.8 bar	QC					None
PS4-A1	808237	29.5 bar	22.5 bar	1.5 m					None
PS4-A1	808238	31 bar	24 bar	1.5 m					None
PS4-A1	808248	32 bar	24 bar	2.5 m					None
PS4-W1	808205	42 bar	33 bar	1.5 m	69 bar	PSH	Open on rising pressure	High pressure	7/16-20UNF Female with Schrader Opener
PS4-W3	808242	42 bar	33 bar	QC					
PS4-W5	808287	45 bar	34 bar	1.5 m					
PS4-W1	808261	45 bar	35 bar	1.5 m					PSH

## Selection Table - High Pressure Switches with Automatic Reset; Close on Rising Pressure

Type	Part No.	Setting		Connector (QC) Cable	Test Pressure	EN 12263	Contact Function	Application	Pressure Connection	
		Cut-Out	Cut-in							
PS4-A2	808212	13 bar	18 bar	1.5 m	41 bar	None	Close on Rising Pressure	Fan control	7/16-20UNF Female with Schrader Opener	
PS4-W2	808274	14.6 bar	20 bar	1.5 m						PSH
PS4-A2	808264	17 bar	22.6 bar	1.5 m						None
PS4-W2	808227	22 bar	28 bar	1.5 m	55 bar	PSH				

## Selection Table - High Pressure Switches with Manual Reset; Open on Rising Pressure

Type	Part No.	Setting		Connector (QC) Cable	Test Pressure	EN 12263	Contact Function	Application	Pressure Connection
		Cut-Out	Cut-in						
PS4-BL	808202	26 bar	-	1.5 m	41 bar	PZH	Open on Rising Pressure	high pressure EN 378	7/16"-20UNF Female with Schrader Opener
PS4-BL	808204	28 bar	-	1.5 m	55 bar				
PS4-BL	808206	42 bar	-	1.5 m	55 bar				

## Technical Data

Type	PS4-A	PS4-W	PS4-BL
<b>Electrical Data:</b> <b>Silver contact:</b> Inductive Load 230 VAC Inductive Load (DC <28V) Motor rating FLA 230 VAC Motor rating LRA 230 VAC		0.1...6 A 2 A 6 A 36 A	0.1...6 A 2 A 3 A 15 A
<b>Gold Contact:</b>		25-100 mA	
<b>Electrical Connection</b>	Cable or Terminal (QC) Version		Cable Version
<b>Life Time</b>	> 100.000 cycles -B and -R versions 10.000 cycles (6.000 for UL approved)		
<b>Protection Class IEC 529 / DIN 40050</b>	IP67 (IP20 for Terminal Version)		

# Differential Pressure Controls Series FD 113



## Features

- Immediate reset (no cooling down period)
- Precise timing
- Adjustable time delay from 30 ... 150 sec (ZU types)
- Separate output signals for operation and alarm
- Suitable for supply voltage 24 ... 240 V AC / DC
- Pressure connection: Flare 7/16"-20 UNF, 1/4" SAE male



FD 113

## Standards

-  per Low Voltage Directive
-  File No. E85974

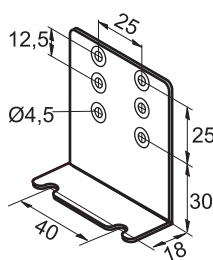
Type	Part No.	Time Delay		Cut out		Cut in Fixed Setting	Max. Differential Pressure	Max. Proof Pressure
		Adjustable	Factory Setting	Adjusting Range $\Delta p$	Factory Setting			
FD 113	0 710 173	-	-	0.3 ... 4.5 bar	0.7 bar	0.2 bar above cut-out		
FD 113 ZU	3 465 300	20 ... 150 s	120 s*					
FD 113 ZU (A22-057) Copeland™ brand products	0 711 195	-	115 s* Fix	-	0.63 bar Fix	Appr. 0.9 bar	-0.8 ... 12 bar	25 bar

Note: \*) Time Delay tolerance +/- 20%.

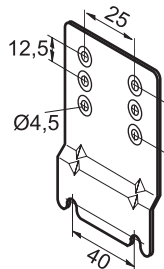
## Technical Data

<b>Inductive Amp. (AC)</b>	3.0 A / 230 V AC
<b>Inductive Amp. (DC)</b>	0.1 A / 230 V DC
<b>Protection Acc. to EN 60 529</b>	IP 30
<b>Max. Temperature at Pressure Connection</b>	+70°C

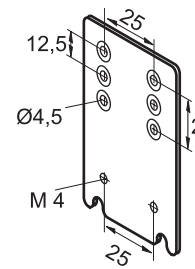
## Accessories



Mounting Bracket Angle  
Part No.: 803 799



Mounting Plate for Units with Hood  
Part No.: 803 801



Extension Bracket  
Part No.: 803 800





## Thermostats

### Basic Terms and Technical Information

#### Characteristics

Alco thermostats are electric circuit control devices which open or close an electric contact depending on temperature changes at the bulb.

#### Description of Bulb Charges

The application range of thermostats is mainly determined by the charge. Accordingly, various bulb shapes and sizes are necessary.

- **Vapor Charge, Bulb Type A, E, P**

The thermosystem is filled with a medium in vapor phase. A thermostat with vapor charge operates in accordance with temperature changes at the bulb as long as the bulb is the coldest part in the whole system (bellows, capillary tube, bulb). Alco thermostats are equipped with a bellows heater (82 k Ohm, 230 V) to avoid such conditions. On applications with low current the bellows heater has to be removed. Max. bulb temperature is 150°C (70°C for bulb type E). Response time is very fast.

- **Adsorption Charge, Bulb Type F**

This charge only reacts on temperature changes at the bulb. Max. bulb temperature is 100°C. Response time is slow but perfectly suitable for common refrigeration systems.

#### Adjustment of Switching Points

A thermometer should always be used for comparison when adjusting the switching points on temperature controls. The setting scale on the device is intended to serve for orientation, showing the setting range of the upper switching point  $t_{\max}$  in °C and °F and the value of the temperature differential  $\Delta t$  in K as difference between the upper switching point  $t_{\max}$  and the lower switching point  $t_{\min}$ . The upper switching point  $t_{\max}$  has to be adjusted on the scale, whereas the lower switching point  $t_{\min}$  is given by adjustment of the desired switching differential  $\Delta t$ . The formula is:

$$\text{Upper switching point} - \text{Differential} = \text{Lower switching point}$$

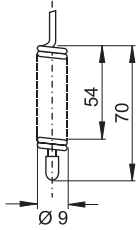
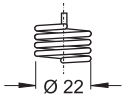
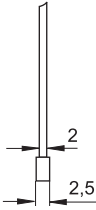
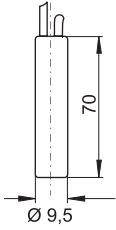
$$t_{\max} - \Delta t = t_{\min}$$

#### Important!

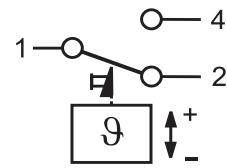
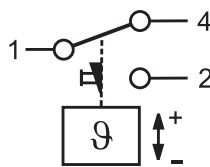
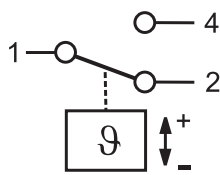
The differential  $\Delta t$  mentioned on the differential scale and in the technical data refers to the upper part of the setting range and the upper switching point.

In the lower part of the setting range an increase of the differential  $\Delta t$  can be expected. The lowest possible lower switching point  $t_{\min}$  is mentioned in the selection tables and is helpful to select switching points with large differentials  $\Delta t$  in the lower temperature range.

## Bulb Sizes

A	E	P	F
			
Vapor 2 m, Capillary with Bulb	Vapor Coil, 0 m	Vapor 2 m, Capillary with Function C and D 6 m	Adsorption 2 m, Capillary with Bulb

## Function of Contacts



### SPDT

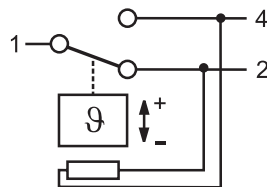
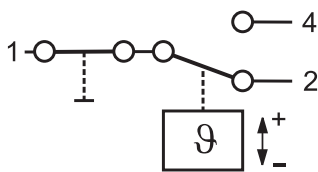
- On temperature rise above setting 1-2 opens and 1-4 closes.
- On temperature drop below setting 1-2 closes and 1-4 opens.

### SPDT with manual reset min.

- On temperature drop below setting 1-2 closes. 1-4 opens and latches.
- The device can be manually reset when the temperature has risen at least 2K above setting.

### SPDT with manual reset max.

- On temperature rise above setting 1-2 opens and 1-4 closes and latches.
- The device can be manually reset when the temperature has dropped 2K below setting.



SPDT with off switch  
AUTOmatic - STOP

SPDT with bellows heater  
includes a 82 k Ohm, 230 V AC/DC resistor

## Standards and Regulations

Important for the installation of thermostats:

EN 60730-2-9 Specification for temperature controls and temperature cut-outs.

EN 60947-1/ Specifications for low-voltage switchgear.  
EN 60947-5-1

# Thermostats Series TS1

## Features

- Adjustable temperatures and differentials
- Chatter resistant contacts (bounce-free)
- High operational current, locked rotor max. 144 A (LRA)
- Standard SPDT with same operational current rating for both contacts
- Captive terminal and cover screws
- Range and differential individually lockable by wire seal

## Technical Data

Type of Contacts	1 SPDT
Heating Load (AC1)	24 A / 230 V AC
Inductive Load (AC15)	10 A / 230 V AC
Inductive Load (DC13)	0.1 A / 230V DC, 3 A / 24 V DC
Motor Rating (FLA):	24 A / 120/240 V AC
Locked Rotor (LRA):	144 A / 120/240 V AC
Ambient Temperature Range	-50 ... +70°C
Cable Entry	Grommet PG 16
Protection Acc. to EN 60529 / IEC 529	IP 44 (IP 30 with Selector Switch)
Bellows Heater at Vapor Charge	82 K Ohm. 230 V AC / DC (12 and 24 V DC upon request) sensing range: -55...+180°C



TS1 Top Operated

TS1 Flush Mounted

TS1 Front Operated

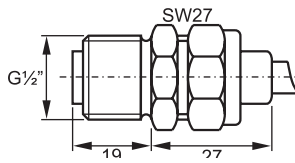
## Standards

- per Low Voltage Directive
- US LISTED Underwriter Laboratories File Nr: E85974

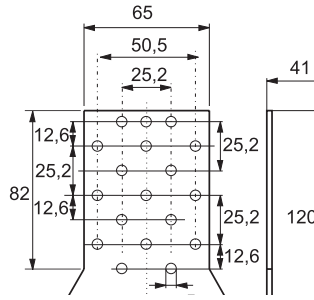
Type	Part No.	Adjustment Range		Lowest Setpoint	Factory Setting	Max. Bulb Temp.	Temperature Sensor	
		Upper Setpoint	Differential Setpoint ΔT				Charge	Cap. Tube Length
Thermostats Top Operated Thermostats without Off-Switch								
TS1-A2P	4 530 400	-30 ... +15°C	1.5 ... 16 K	-36°C	-1°C / -6°C	+150°C	Vapor	2 m Capillary and Bulb
TS1-A3P	4 356 700	-10 ... +35°C	1.5 ... 16 K	-23°C	+3°C / -2°C			
TS1-A1A	4 351 500	-45 ... -10°C	1.5 ... 16 K	-55°C	-18°C / -20°C			
TS1-A2A	4 351 600	-30 ... +15°C	1.5 ... 16 K	-36°C	-1°C / -6°C	+150°C	Vapor	
TS1-A3A	4 352 500	-10 ... +35°C	1.5 ... 16 K	-23°C	+3°C / -2°C			
TS1-A4F Defrost- and Universal Thermostat	4 351 800	-30 ... +35°C	2.8 ... 20°C	-35°C	+5°C / 0°C	+100°C	Adsorption	
TS1-A5F	4 458 400	+20 ... +60°C	3 ... 10 K	+10°C	+35°C / +30°C			
Thermostats with Off-Switch								
TS1-B2A	4 366 800	-30 ... +15°C	1.5 ... 16 K	-36°C	-1v / -6°C	+100°C	Adsorption	
TS1-B3A	4 366 900	-10 ... +35°C	1.5 ... 16 K	-23°C	+3°C / -2°C			
TS1-B4F	4 367 000	-30 ... +35°C	2.8 ... 20 K	-35°C	+5°C / 0°C			
Frost Monitors Top Operated Frost Monitors without Off-Switch								
TS1-C0P	4 352 100	+4.5 ... +20°C	2.5 K fix	+2°C	4,5°C / +2°C	+150°C	Vapor	6 m Capillary
TS1-D0P Low Temp. Cut Out	4 352 200	+4.5 ... +20°C	Man. Reset ca. 2.5 K fix	+2°C	+2°C			

Type	Part No.	Adjustment Range		Lowest Setpoint	Factory Setting	Max. Bulb Temp.	Temperature Sensor	
		Upper Setpoint	Differential Setpoint $\Delta T$				Charge	Cap. Tube Length
Room Thermostats Top Operated Room Thermostats without Off-Switch, Including Insulation Console								
TS1-A3E	4 355 300	-10 ... +35°C	1.5 ... 16 K	-23°C	+20 / +18°C	+70°C	Vapor	0 m coil
Room Thermostats with Off-Switch, Including Insulation Console								
TS1-B3E	4 344 500	-10 ... +35°C	1.5 ... 16 K	-23°C	+20 / +18°C	+70°C	Vapor	0 m coil
Thermostats Front Operated Thermostats without Off-Switch								
TS1-E1A	4 361 000	-45 ... -10°C	2 ... 16 K	-55°C	-18 / -20°C	+150°C	Vapor	2 m capillary and bulb
TS1-E2A	4 356 200	-30 ... +10°C	1.5 ... 15 K	-36°C	+4 / +2°C			
TS1-E3A	4 365 200	-10 ... +25°C	1.5 ... 15 K	-23°C	+3 / -2°C			
TS1-E4F Defrost- and universal thermostat	4 367 500	-25 ... +30°C	2.8 ... 20 K	-30°C	+5 / 0°C	+100°C	Adsorption	
TS1-E5F	4 338 100	+20 ... +60°C	3 ... 10 K	+10°C	+35 / +30°C			
Thermostats with Off-Switch								
TS1-F1A	4 367 100	-45 ... -10°C	2 ... 16 K	-55°C	-18 / -20°C	+150°C	Vapor	2 m capillary and bulb
TS1-F2A	4 367 200	-30 ... +10°C	1.5 ... 15 K	-36°C	-1 / -6°C			
TS1-F3A	4 367 400	-10 ... +25°C	1.5 ... 15 K	-23°C	+3 / -2°C			
Room Thermostats Front Operated Room Thermostats without Off-Switch, Including Insulation Console								
TS1-E1E	4 365 300	-45 ... -10°C	2 ... 16 K	-55°C	-18 / -20°C	+70°C	Vapor	0 m coil
TS1-E2E	4 356 800	-30 ... +10°C	1.5 ... 15 K	-36°C	+4 / +2°C			
Room Thermostats with Off-Switch, Including Insulation Console								
TS1-F1E	4 368 000	-45 ... -10°C	2 ... 16 K	-55°C	-18 / -20°C	+70°C	Vapor	0 m coil
TS1-F2E	4 368 100	-30 ... +10°C	1.5 ... 15 K	-36°C	+4 / +2°C			
TS1-F3E	4 368 200	-10 ... +25°C	1.5 ... 15 K	-23°C	+20 / +18°C			
Thermostats for Flush Mounting Thermostats for Flush Mounting without Off-Switch								
TS1-G2A	4 355 400	-30 ... +15°C	1.5 ... 15 K	-36°C	+4 / +2°C	+150°C	Vapor	2 m capillary and bulb
TS1-G4F Defrost- and universal thermostat	4 355 600	-30 ... +35°C	2.8 ... 20 K	-35°C	+5 / 0°C	+100°C	Adsorption	
Thermostats for Flush Mounting with Off-Switch								
TS1-H2A	4 355 500	-30 ... +15°C	1.5 ... 15 K	-36°C	-1 / -6°C	+150°C	Vapor	2 m capillary and bulb
TS1-H3A	4 367 900	-10 ... +35°C	1.5 ... 15 K	-23°C	+3 / +2°C			

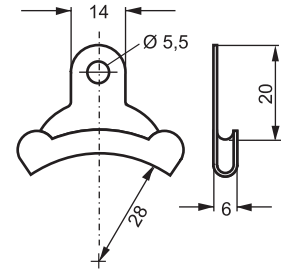
# Accessories



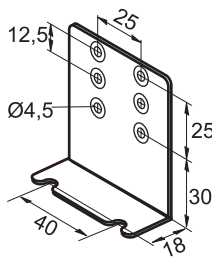
Capillary Tube Gland. Brass  
for Bulb Style A / C  
Part No.: 803 807



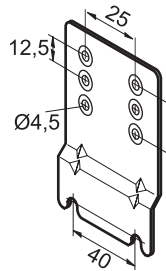
Universal Mounting Bracket  
Part No.: 803 798



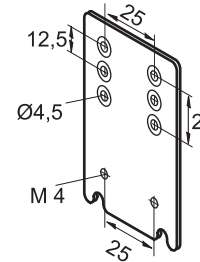
Capillary Tube Holder  
for Frost Monitors Standard  
Part No.: 803 778



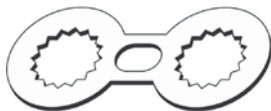
Mounting Bracket Angle  
Part No.: 803 799



Mounting Plate  
for Units with Hood  
Part No.: 803 801



Extension Bracket  
Part No.: 803 800



Locking Plate  
Part No.: 803783 (20 pcs)