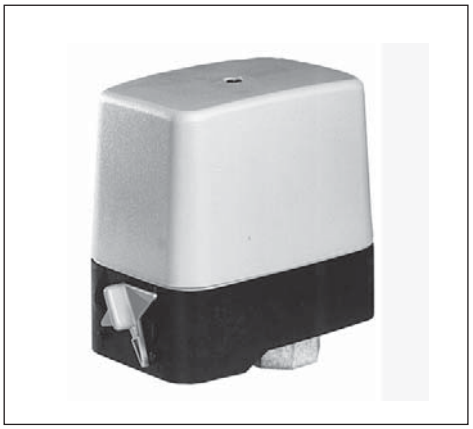
Data sheet

Pressure switch, type CS

Description



Pressure switch type CS is part of the Danfoss pressure control range. All CS pressure switches have a built-in pressure-operated, three-pole or one-pole switch, the contact position of which depends on
– the pressure in the connector
– the range setting.
The pressure switches are fitted with a manual switch that will lock the contact system in the open position independently of the pressure in the system.

CS product range
- Standard CS pressure switches
  – pressure connection: G ½ or G ¼
- CS pressure switches with special pressure connection made of polyacetal
  – suitable in drinking water applications
  – pressure connection: G ½

Stop pressure range
Pressure switches are supplied in the following three versions:
– low-pressure, 2-6 bar
– intermediate pressure, 4-12 bar
– high-pressure, 7-20 bar.

Contact system
Three-pole (TPST), contact system which opens on rising pressure. The contact system is touch-safe with open terminals, self-lifting terminal screws and star/slot screws.

Cable entry
The pressure switches have threads for two PG 16 screwed cable entries.

Screwed cable entries
Screwed cable entries are supplied with single pack CS pressure switches. Screwed cable entries for CS in industrial packs must be ordered separately under code no. 031E029366 containing seals and Pg 16 nuts.

Pressure relief valve
This valve relieves pressure on the compressor piston. It can be supplied as an accessory and must be ordered separately. The valve has an M10 x 1 external thread, union nut and cutting ring. The nut and cutting ring are both available in 6 mm and 1/4 inch sizes.

Manual switch
When the manual switch has been used to lock the contact system in its open position, the cover can be removed without the plant starting.

Enclosure
The enclosure is made of plastic (PA 6) and is obtainable in IP 43 or IP 55 versions to IEC 529. A knockout in the base of the enclosure can be removed to provide a drain hole for condensate.

Application

The CS pressure switch is used for the automatic start and stop of
– air compressors
– pumps for pressure water systems (pressure storage tanks).

The CS with pressure relief valve is used in compressed air systems where pressure relief on the compressor piston before start is required.

Approvals

EN 60 947-4,-5

Ordering

Preferred versions

Standard pressure switch type CS

Stop pressure p_e bar	Min. differential Δp bar	Max. differential Δp bar	Max. test pressure p_e bar	Grade of enclosure	Pressure connection	**Code no.**	Type
2 - 6	0.72 - 1.0	1.0 - 2.0	10	IP 43	G ¼	**031E020266**	1-pole
2 - 6	0.72 - 1.0	1.0 - 2.0	10	IP 43	G ¼	**031E020066**	3-pole
2 - 6	0.72 - 1.0	1.0 - 2.0	10	IP 55	G ¼	**031E020566**	
2 - 6	0.72 - 1.0	1.0 - 2.0	10	IP 43	G ½	**031E021066**	
2 - 6	0.72 - 1.0	1.0 - 2.0	10	IP 55	G ½	**031E021566**	
4 - 12	1 - 1.5	2.0 - 4.0	20	IP43	G ¼	**031E022066**	
4 - 12	1 - 1.5	2.0 - 4.0	20	IP 55	G ¼	**031E022566**	
4 - 12	1 - 1.5	2.0 - 4.0	20	IP 43	G ½	**031E023066**	
4 - 12	1 - 1.5	2.0 - 4.0	20	IP 55	G ½	**031E023566**	
7 - 20	2 - 3.5	3.5 - 7.0	32	IP 43	G ¼	**031E024066**	
7 - 20	2 - 3.5	3.5 - 7.0	32	IP 55	G ¼	**031E024566**	
7 - 20	2 - 3.5	3.5 - 7.0	32	IP 43	G ½	**031E025066**	
7 - 20	2 - 3.5	3.5 - 7.0	32	IP 55	G ½	**031E025566**	

Special versions with Polyacetal pressure connection - suitable for drinking water

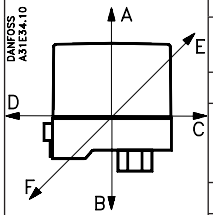
Stop pressure p_e bar	Min. differential Δp bar	Max. differential Δp bar	Max. test pressure p_e bar	Grade of enclosure	Pressure connection	**Code no.**	Type
2 - 6	0.72 - 1.0	1.0 - 2.0	10	IP 43	G ½	**031E101066**	3-pole
4 - 12	1 - 1.5	2.0 - 4.0	20	IP 43	G ½	**031E101266**	
7 - 20	2 - 3.5	3.5 - 7.0	32	IP 43	G ½	**031E101466**	

Accessories and spare parts

Description	**Code no.**
Three pole contact system (TPST)	**031E029166**
Pressure relief valve, incl. fixing screw (for 6 mm pipe/hose)	**031E029866**
Pressure relief valve, incl. fixing screw (for 1/4 in. pipe/hose)	**031E029766**
Two Pg 16 screwed cable entries with gaskets (cable diam. 6.5 - 15 mm)	**031E029366**
Nipple with 7/16-20 UNF and M10 x 1 int.	**031E029666**

Technical data

Specifications

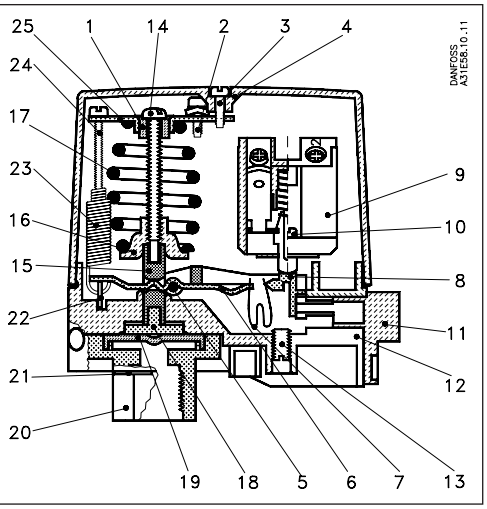
	Contact load a.c.		I_e	U_e
		AC-3	12 A	220 to 415 V
			9 A	600 V
		DC-13/14	2 A	220 V 3 contacts in series
	Electrical life on rated load		100.000 operations	
	Mechanical life		1.000.000 operations	
	Ambient temperature		–20 to +70 °C	
	Temperature of medium	Water Air	0 to +70 °C –20 to +70 °C	
	Vibration-proof		0 - 1000 Hz ved 4 G	
	Resonance frequency		Direction A-B: 341 Hz Direction C-D: 332 Hz Direction E-F: 488 Hz	
	Diaphragm material		Hytrel	
	Pressure connector		Special: Polyacetal, G½ Others: Silumin, G¼ or G½	
	Pressure relief valve (capacity)		2000 cm^3 from 10 → 1 bar på 18.8 sec.	
	Grade of enclosure to IEC 529		IP 43 or IP 55	

Properties according to EN 60947

Wire dimension	
solid/stranded	0.7 - 2.5 mm^2
flexible, with/ without ferrules	0.75 - 2.5 mm^2
flexible, with ferrules	0.5 - 1.5 mm^2
Tightening torque	max. 1.2 NM
Rated impulse voltage	4 kV
Pollution degree	3
Short circuit protection, fuse	25 Amp
Insulation	600 V
IP-index	43/55

Design and function

1. Slide ring
2. Earth screw
3. Cover screw
4. Cover
5. Spindle
6. Toggle arm
7. Snap spring
8. Snap arm
9. Switch housing assy
10. Self-tapping screw
11. Manual switch
12. Base
13. Grubscrew
14. Stop pressure screw
15. Pressure pad
16. Spring retainer
17. Compression spring
18. Pressure shoe
19. Diaphragm
20. Flange, G ¼ or G ½
21. Cap
22. Differential arm
23. Tension spring
24. Differential pressure screw
25. Bracket



The pressure switch is built up of the following main elements: connector, diaphragm, snap system, main spring, differential spring and a 3-pole or one-pole contact system.
The stop pressure must be set on the main spring and the difference between start and stop pressures on the differential spring.

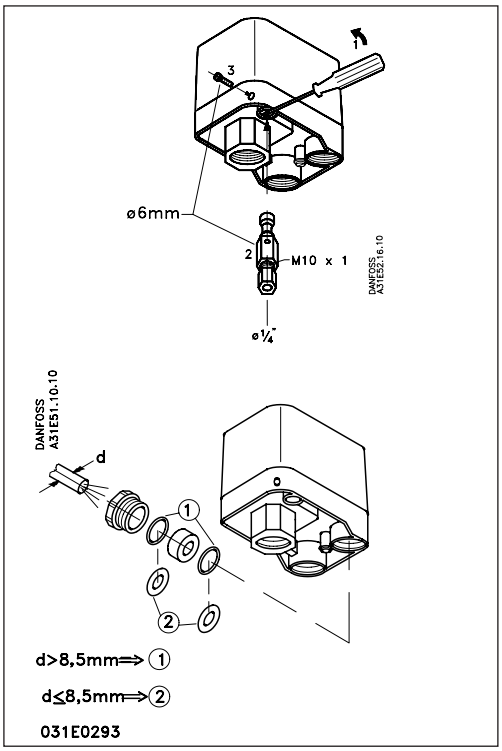
Pressure from the controlled system is led, via the connector, to the diaphragm. The diaphragm converts this pressure to a mechanical movement which is transferred by the snap system to the contact system.
In this way, the contact system starts or stops a compressor/pump.

Installation

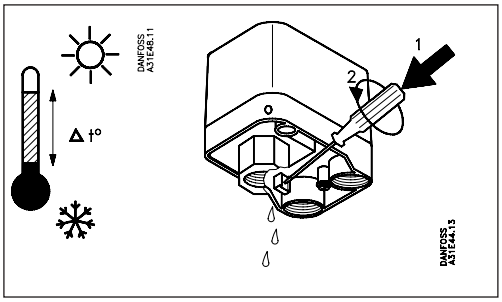
Recommended orientation
The pressure switches will operate regardless of their orientation. However, to meet the enclosure requirements of IP 43 and IP 55, they must be mounted vertically with the connection downwards. The CS pressure switches are self-supporting (on the connection).

Fitting a pressure relief valve
1. Remove the blanking plug
2. Fit the pressure relief valve
3. Fit the plastoform screw

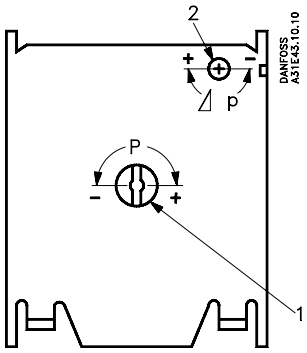
Fitting screwed cable entries
The accessory bag contains two sets of metal gaskets each with different internal diameters. These will give a sufficient cord relief if used correctly with the cable diameter concerned.



Drain hole
If because of large temperature variations there is a risk of condensate forming in the pressure switch, a screwdriver can be used to make a drain hole in the enclosure.



Setting



All standard versions of CS pressure switches are preset and supplied with springs under minimum compression.

1. Turn the stop pressure screw (1) the given number of times towards + (high stop pressure), see stop pressure graph.
2. Turn the differential screw (2) the given number of times towards + (max. differential), see differential pressure nomogram.
3. Start the plant and let it run until the required stop pressure is reached.
4. Turn the stop pressure screw (1) towards minus (lower stop pressure) until the plant stops.
5. Reduce the pressure to the required start pressure.
6. Turn the differential screw (2) towards minus (smaller differential) until the plant starts.
7. Check that the plant stops and starts at the required pressures.

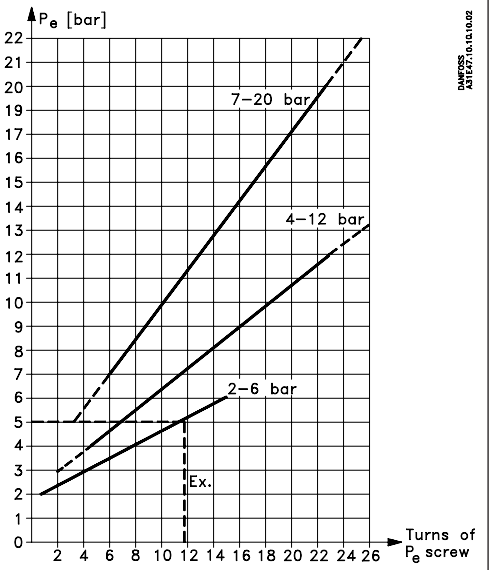
Note!
If the differential is set at a value greater than the stop pressure the plant cannot start. If this is the case, set the differential at a smaller value (towards minus).

Example

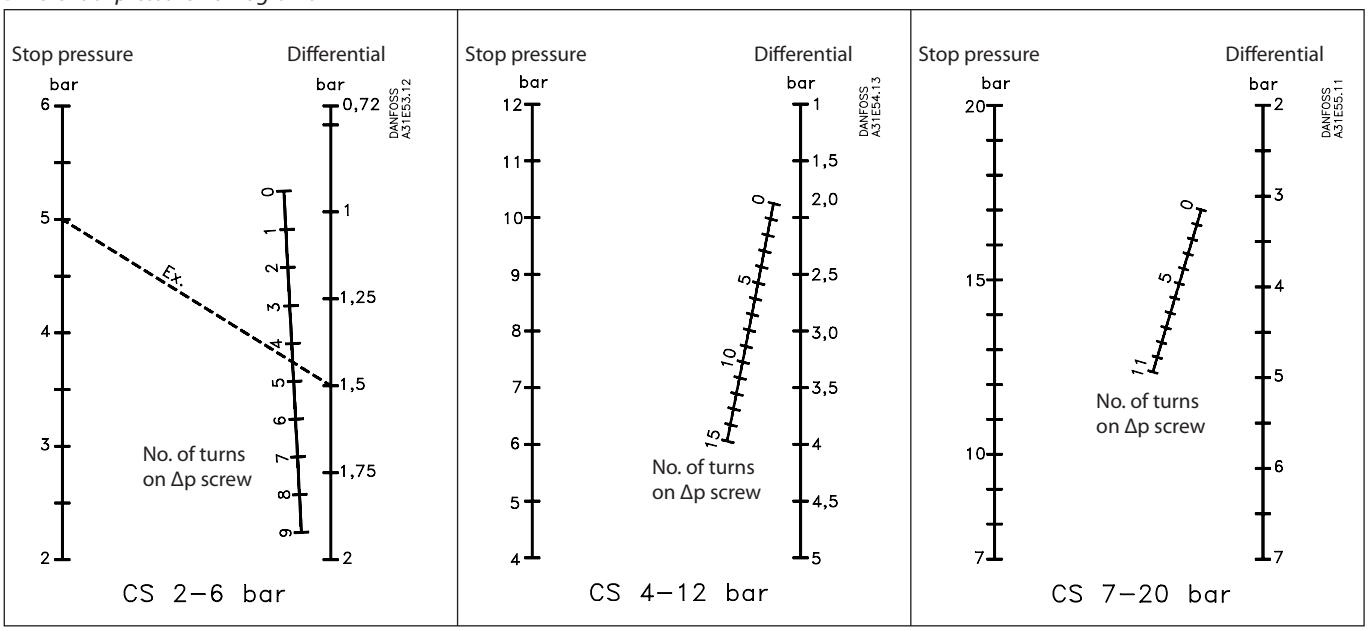
A compressor is to be regulated by a CS pressure switch. The start pressure is 3.5 bar, and the stop pressure 5 bar. The choice should be a CS with a range of 2 - 6 bar.

1. Turn the stop pressure screw (1) about 12 times. See cut-off pressure graphs.
2. Turn the differential screw (2) about 4.5 times. See CS 2 -6 nomogram.
   Take a straight line from 5 bar stop pressure on the nomogram to the differential, 1.5 bar and read off the number of turns, i.e. 4.5.

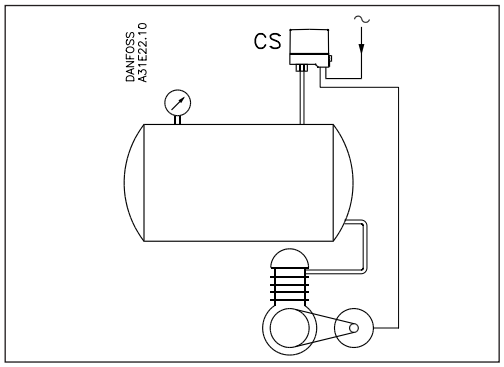
Stop pressure graph



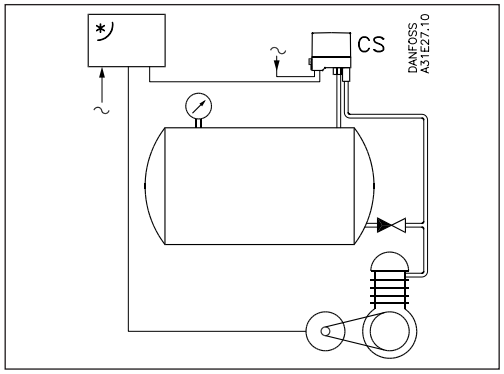
Differential pressure nomograms



Application examples

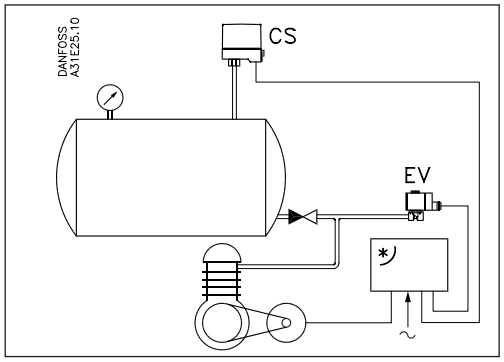


Example 1
Control of an air compressor with a CS pressure switch.



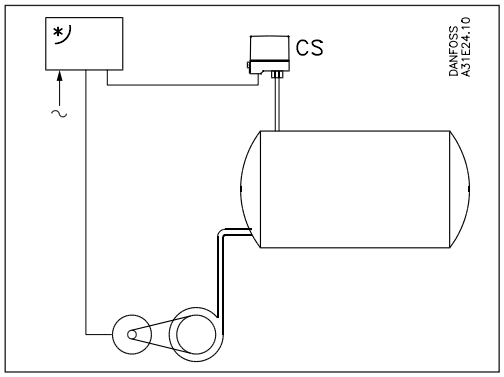
Example 2
Control of a compressor with a CS pressure switch fitted with pressure relief valve. Note the check valve between pressure relief line and reservoir.

* Motor starter or automatic start-delta switch



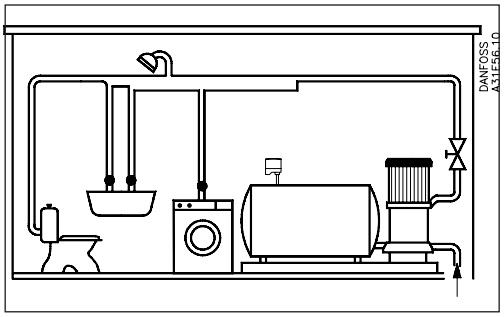
Example 3
Control of an air compressor with a CS. An EV210B 3B solenoid valve is recommended where there is need for especially fast pressure relief.

* Motor starter or automatic start-delta switch



Example 4
Control of a centrifugal pump with a CS, via an automatic star-delta switch, motor starter, or similar.

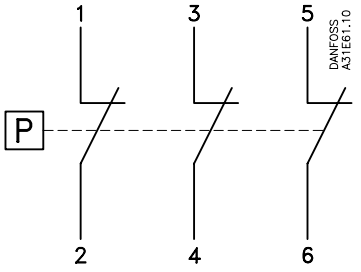
* Motor starter or automatic start-delta switch



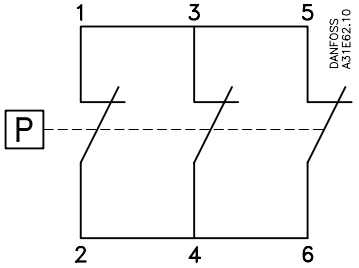
Example 5
Pressure boosting system for domestic circuits. A type CS switch is used to start/stop the pump.

Mains connection

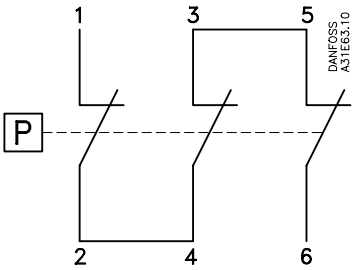
3-pole



1-pole a.c.

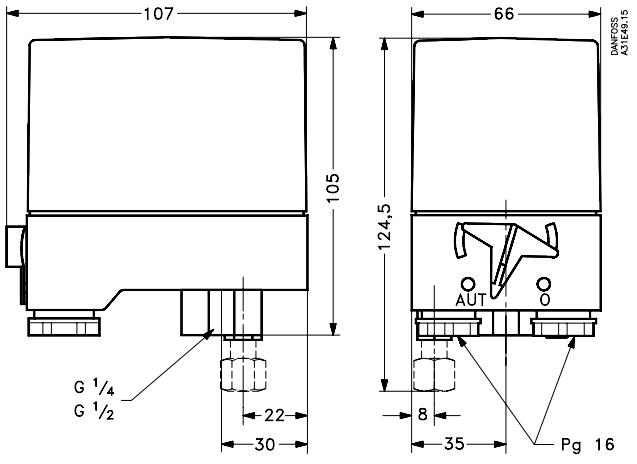


1-pole d.c. load



		I_e	U_e
Contact load	AC-3	12 A	220 V ® 415 V
		9 A	600 V
	DC-13/14	2 A	220 V (3 contacts in series)

Dimensions



Weight approx. 0.5 kg

Danfoss A/S 05-2005, IC-MC, mr