Technical brochure

Pressure and temperature controls, Type KPS

The KPS Series consists of a series of pressure- and temperature controlled switches. In this series, special attention has been given to meeting demands for a high level of enclosure, robust and compact construction, and resistance to shock and vibration.

For KPS pressure controls the position of the contacts depends on the pressure in the inlet connection and the set scale value. For KPS temperature controls the position of the contacts depends on the temperature of the sensor and the set scale value.

The series covers most outdoor as well as indoor application requirements and is suitable for use in monitoring alarm and regulation systems in factories, diesel plants, compressors, power stations and on board ships.

Features

- A high level of enclosure
- Adjustable differential
- Robust and compact construction
- Resistance to shock and vibration
- Available with all major marine approvals

Approvals

EN 60 947-4-1
EN 60 947-5-1

Underwriters Laboratories Inc., US-UL
China Compulsory Certificate, CCC

Ship approvals

American Bureau of Shipping, ABS
Det Norske Veritas, DNV
Germanischer Lloyd, GL
Registro Italiano Navale, RINA
Maritime Register of Shipping, RMRS
Nippon Kaiji Kyokai, NKK
China Classification Society, CCS

Bureau Veritas, BV - Includes thermostats with fixed sensor and pressure controls with amoured capillary tube
Korean Register of Shipping, KR (KPS 35, KPS 37, KPS 39, KPS 43, KPS 45, KPS 47)
Lloyds Register of Shipping, LR

Survey

1. Standard pressure controls

-1 0 10 20 30 40 50 60 bar	Range P_e bar	Type	Further information page
	0 - 2.5	KPS 31	3
	0 - 3.5	KPS 33	3
	0 - 8	KPS 35	3
	6 - 18	KPS 37	3
	10 - 35	KPS 39	3

2. Type KPS pressure controls for high pressure and strongly pulsating media

-1 0 10 20 30 40 50 60 bar	Range P_e bar	Type	Further information page
	1 - 10	KPS 43	3
	4 - 40	KPS 45	3
	6 - 60	KPS 47	3

3. Type KPS temperature controls

-50 0 50 100 150 200 200 °C	Range P_e bar	Type	Further information page
	-10 - 30	KPS 76	8
	20 - 60	KPS 77	8
	50 - 100	KPS 79	8
	70 - 120	KPS 80	8
	60 - 150	KPS 81	8
	100 - 200	KPS 83	8

ISO 9001 quality approval

ISO 9001

Danfoss A/S is certificated by BSI in accordance with international standard ISO 9001. This means that Danfoss fulfils the international standard in respect of product development, design, production and sale. BSI exercises continuous inspection to ensure that Danfoss observes the requirements of the standard and that Danfoss' own quality assurance system is maintained at the required level.

Pressure controls

Technical data and ordering

When ordering, please state type and code number

KPS 31, 33

KPS 35, 37, 39

KPS 43, 45, 47

1. Pressure controls

Setting range P_e [bar]	Adjustable/ fixed differetial [bar]	Permissible operating pressure P_e [bar]	Max. test pressure [bar]	Pressure connection	Code no.	Type
0 - 2.5	0.1	6	6	G 1/4	**060-311066**	KPS 31
0 - 2.5	0.1	6	6	G 3/8 A	**060-310966**	KPS 31
0 - 3.5	0.2	10	10	G 1/4	**060-310466**	KPS 33
0 - 3.5	0.2	10	10	G 3/8 A	**060-310366**	KPS 33
0 - 8	0.4 - 1.5	12	12	G 1/4	**060-310566**	KPS 35
0 - 8	0.4 - 1.5	12	12	G 3/8 A	**060-310066**	KPS 35
0 - 8	0.4	12	12	G 1/4	**060-310866**	KPS 35
6 - 18	0.85 - 2.5	22	27	G 1/4	**060-310666**	KPS 37
6 - 18	0.85 - 2.5	22	27	G 3/8 A	**060-310166**	KPS 37
10 - 35	2.0 -6	45	53	G 1/4	**060-310766**	KPS 39
10 - 35	2.0 - 6	45	53	G 3/8 A	**060-310266**	KPS 39

2. Pressure controls for high pressure and strongly pulsating media

Setting range P_e [bar]	Adjustable diff. see also figs. 1, 2, and 3	Permissible overpres-sure [bar]	Max. test pressure [bar]	Min. burst pressure [bar]	Pressure connection	Code no.	Type
1 - 10	0.7 - 2.8	120	180	240	G 1/4	**060-312066**	KPS 43
4 - 40	2.2 - 11	120	180	240	G 1/4	**060-312166**	KPS 45
6 - 60	3.5 - 17	120	180	240	G 1/4	**060-312266**	KPS 47

Terminology

Range setting
The pressure range within which the unit will give a signal (contact changeover).

Differential
The difference between make pressure and break pressure (see also fig. 8, page 6).

Permissible overpressure
The highest permanent or recuiring pressure the unit can be loaded with.

Max. test pressure
The highest pressure the unit may be subjected to when, for example, testing the system for leakage. Therefore, this pressure must not occur as a
recurring system pressure.

Min. bursting pressure
The pressure which the pressure-sensitive element will withstand without leaking.

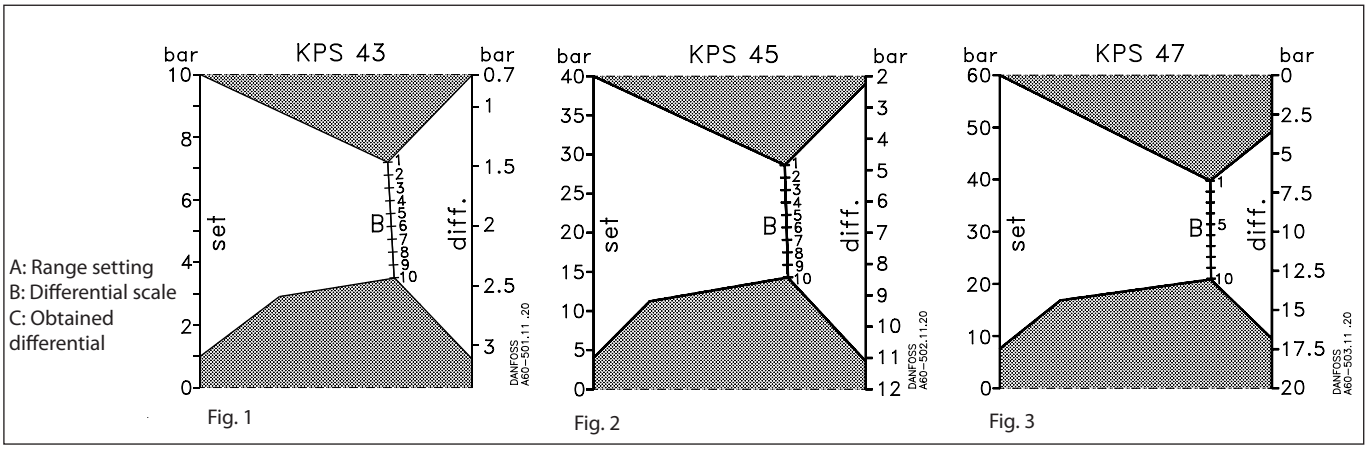


Fig. 1 Fig. 2 Fig. 3

Technical data

Switch
Single pole changeover (SPDT)
Contact material: Gold-plated silver contact

Contact load
(when Au surface is burnt away)
1. Alternating current:
Ohmic: 10 A, 440 V, AC-1
Inductive: 6 A, 440 V, AC-3
4 A, 440 V, AC-15
Starting current max. 50 A (locked rotor)

2. Direct current: 12 W, 220 V, DC-13
See curve, fig. 4

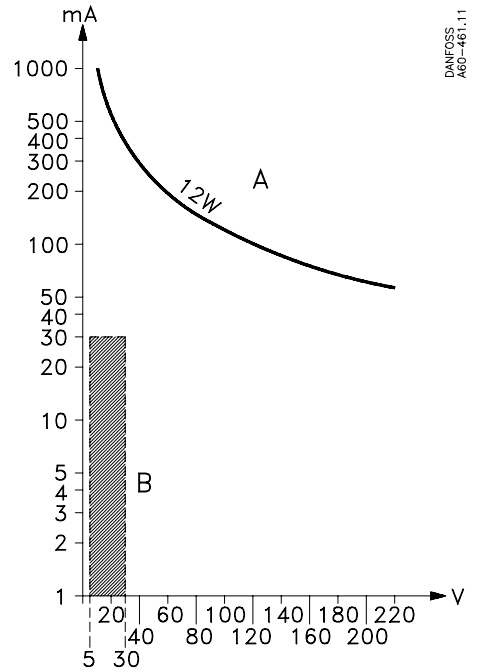


Fig. 4. d.c.-load
Curve A gives the maximum load.
Hatched area B: Acceptable load for the gold plating of the contact.

Ambient temperature
KPS 31 - 39: –40 to +70 °C
KPS 43 - 47: –25 to +70 °C

Temperature of medium
KPS 31 - 39: –40 to +100 °C
KPS 43 - 47: –25 to +100 °C
For water and seawater, max. 80°C.

Vibration resistance
Vibration-stable in the range 2-30 Hz, amplitude 1.1 mm og 30-300 Hz, 4 G.

Enclosure
IP 67 to IEC 529 and DIN 40050.
The pressure switch housing is enamelled pressure die cast aluminium (GD-AlSi 12). The cover is fastened by four screws which are anchored to prevent loss.
The enclosure can be sealed with wire.

Cable entry
Pg 13.5 for cable diameters from 5 to 14 mm.

Identification
The type designation and code no. of the unit is stamped in the side of the housing.

Scale accuracy

KPS 31: ±0.2 bar	KPS 39: ±3.0 bar
KPS 33: ±0.3 bar	KPS 43: ±1.0 bar
KPS 35: ±0.5 bar	KPS 45: ±4.0 bar
KPS 37: ±1.0 bar	KPS 47: ±6.0 bar

Mean value of snap point variation after 400 000 operations

KPS 31: ±0.1 bar	KPS 39: ±0.7 bar
KPS 33: ±0.2 bar	KPS 43: ±0.2 bar
KPS 35: ±0.3 bar	KPS 45: ±1.0 bar
KPS 37: ±0.4 bar	KPS 47: ±1.5 bar

Materials in contact with the medium

KPS 31, 33	Bellows capsule: Bellows: Pressure connection:	Deep-drawn plate, material no. 1.0524 (DIN 1624) Stainless steel,material no. 1.4306 (DIN 17440) Steel C20, material no. 1.0420 (DIN 1652)
KPS 35, 37,39	Bellows: Pressure connection:	Stainless steel, material no. 1.4306 (DIN 17440) Brass,W.No. 2.0401 (DIN 17660)
KPS 43, 45, 47	Diaphragm capsule: Diaphragm:	Nickel-plated brass, DIN 50 968 Cu/Ni 5 (DIN 1756) Nitrile-Butadien rubber

Function

1. KPS 31
Contacts 1-2 make and contacts 1-4 break when the pressure falls under the set range value. The contacts changeover to their initial position when the pressure again rises to the set range value plus the differential (see fig. 8).

I. Alarm for falling pressure given at the set range value.
II. Alarm for rising pressure given at the set range value plus the differential.

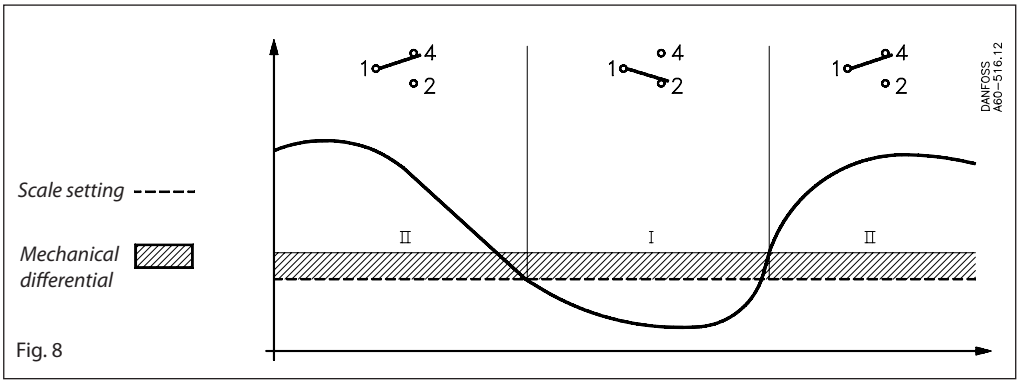


Fig. 8

2. All other KPS pressure switches
Contacts 1-4 make and contacts 1-2 break when the pressure rises above the set range value. The contacts changeover to their initial position when the pressure again fails to the range value minus the differential (see fig. 9).

I. Alarm for rising pressure given at the set range value.
II. Alarm for falling pressure given at the set range value minus the differential.

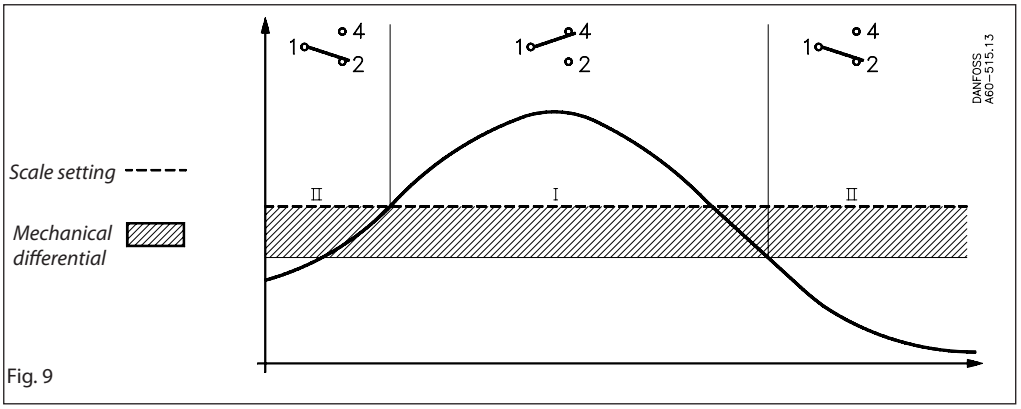
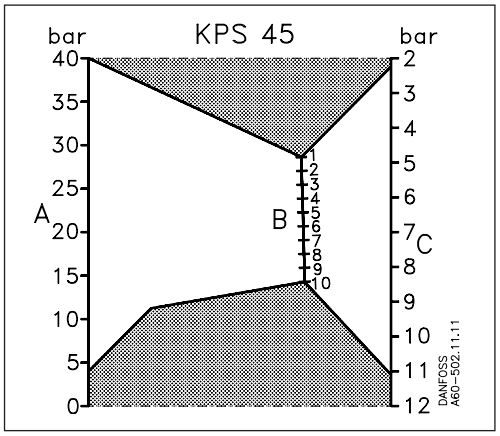


Fig. 9

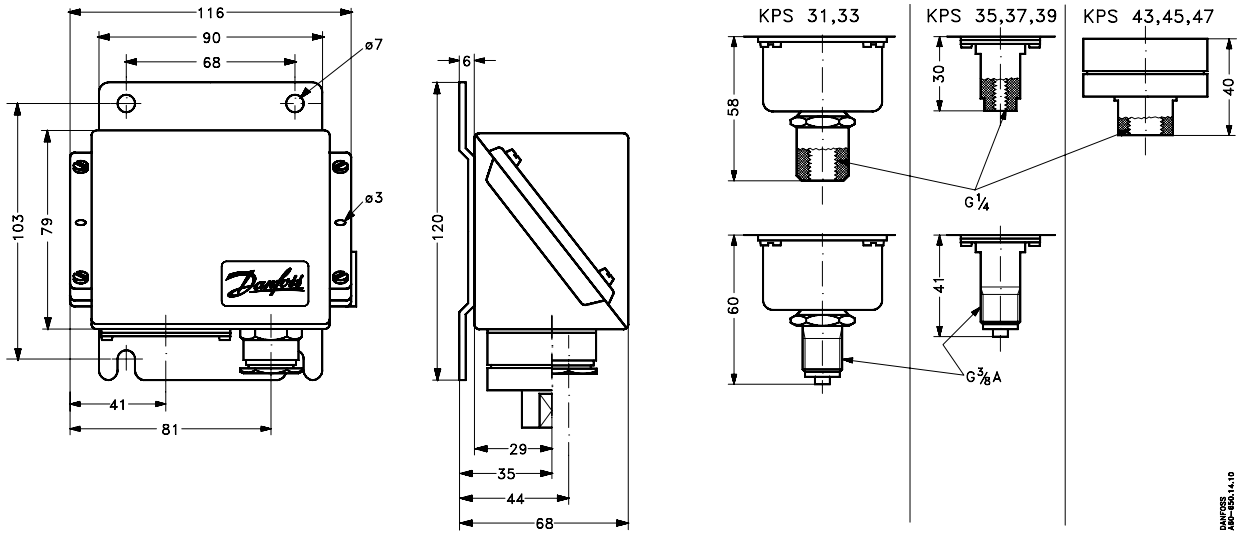
Example 1
An alarm must be given when the lubricating oil pressure in a motor fails below 0.8 bar. The alarm is in the form of a lamp.
Choose a KPS 31 (range 0 to 2.5 bar).
The minimum permissible lubricating oil pressure of 0.8 bar must be set on the range spindle.
The differential is fixed at 0.1 bar, i.e. the alarm will not cut out before the pressure rises to 0.9 bar. The lamp must be connected to terminals 1 and 2 in the pressure control.

Example 2
An alarm must be given by a bell when the pressure in a boiler rises to 10 bar. The normal operating pressure is 9 bar.
Choose a KPS 36 (range from 6 to 18 bar).
The range value of the pressure control must be set at 10 bar, the differential at 1 bar.
The bell must be connected to terminals 1 and 4.

Example 3
The pressure in a start air reservoir must be regulated with a compressor controlled by a KPS pressure switch so that it lies between 30 and 36 bar.
Choose a KPS 45 (range 4 to 40 bar).
The range value must be set at 36 bar.
The differential of 6 bar must be set in accordance with the nomogram, fig. 10, at approx. 2 on the differential scale.
The required start function is obtained by connection to terminals 1 and 2 in the pressure control.

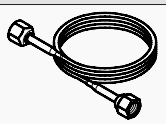
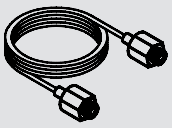
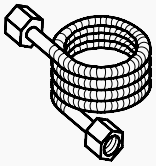


Dimensions and weight



Weight:
KPS 31 - 39 approx. 1.0 kg
KPS 43 - 47 approx. 1.3 kg

Accessories

Part		Description	Code no.
Connector with nipple		G 3/8 connector, nipple and washer (10 mm) o.d. x 6.5 mm i.d.), for brazing	**017-436866**
Connector with nipple		G 3/8 connector, nipple and washer (10 mm o.d. x 6.5 mm i.d.) for welding	**017-422966**
Reducer		G 3/8 x 7/16 - 20 UNF (1/4 flare) reduction with washer	**017-420566**
Adapter		G 3/8 x 1/8 - 27 NPT with washer	**060-333466**
Nipple		G 3/8 o.d x 7/16 - 20 UNF (1/4 flare)	**060-324066**
Nipple		G 3/8 A - 1/4 NPT with washer	**060-333566**
Adapter		G 3/8 x 1/4 - 18 NPT with washer	**060-333666**
Nipple		G 1/4 A x G 3/8 A	**060-333266**
		G 1/4 A x o.d. M10 x 1 with washer	**060-333866**
Damping coil		Damping coil with 1/4 flare connectors and 1 m copper capillary tube. Damping coils used for applications with 3/8 RG connector requires the use of reducer. For informations about capillary tube lengths, please contact Danfoss	**060-007166**
Damping coil		Damping coil with G 3/8 connectors and 1.5 m copper capillary tube	**060-104766**
Armoured damping coil		Damping coil with G 3/8 connectors and 1 m armoured copper capillary tube. Standard washers included.	**060-333366**

Installation

Installation
KPS pressure switches are fitted with a 3 mm steel mounting plate. The units should not be allowed to hang from the pressure connection.

Pressure connection
When fitting or removing pressure lines, the spanner flats on the pressure connection should be used to apply counter-torque.

Steam plant
To protect the pressure element from excessive heat, the insertion of a water-filled loop is recommended. The loop can, for example, be made of 10 mm copper tube as shown in fig. 5.

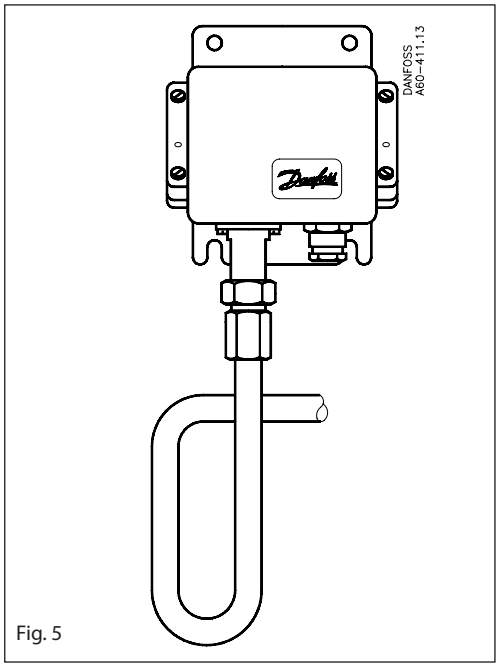


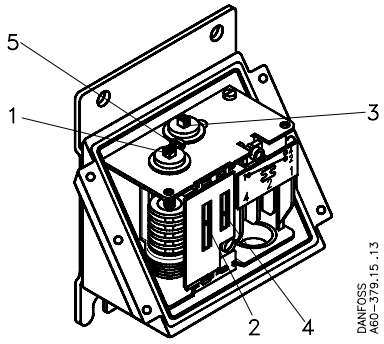
Fig. 5

Water systems
Water in the pressure element is not harmful, but if frost is likely to occur a water-filled pressure element may burst. To prevent this happening, the pressure control can be allowed to operate on an air cushion.

Media-resistance
See table of materials in contact with the medium, page 4. If seawater is involved, types KPS 43, 45, 47 are recommended.

Pulsations
If the pressure medium is superimposed with severe pulsations, which occur in automatic sprinkler systems (fire protection), fuel systems for diesel motors (priming lines), and hydraulic systems (e.g. propeller systems), etc., types KPS 43,45,47 are recommended. The maximum permissible pulsation level for these types is 120 bar.

Setting
When the pressure switch cover is removed, and the locking screw (5) is loosened, the range can be set with the spindle (1) while at the same time the scale (2) is being read. In units having an adjustable differential, the spindle (3) must be used to make the adjustment. The differential obtained can be read direct on the scale (4) or, with types KPS 43, 45, 47, can be determined by reading the scale value and using the nomograms in figs. 1, 2, 3 (page 3). The working line for determining the differential must not intersect the shaded areas in the nomograms.



1. Range spindle
2. Range scale
3. Differential spindle
4. Differential scale
5. Locking screw

Fig. 6

Selection of differential
To ensure that the plant functions properly, a suitable differential pressure is necessary. Too small a differential will give rise to short running periods with a risk of hunting. Too high a differential will result in large pressure oscillations.

Electrical connection
KPS pressure switches are fitted with a Pg 13.5 screwed cable entry that is suitable for cable diameters from 5 to 14 mm.
Contact function is shown in fig. 7.

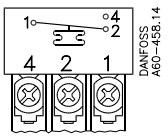


Fig. 7