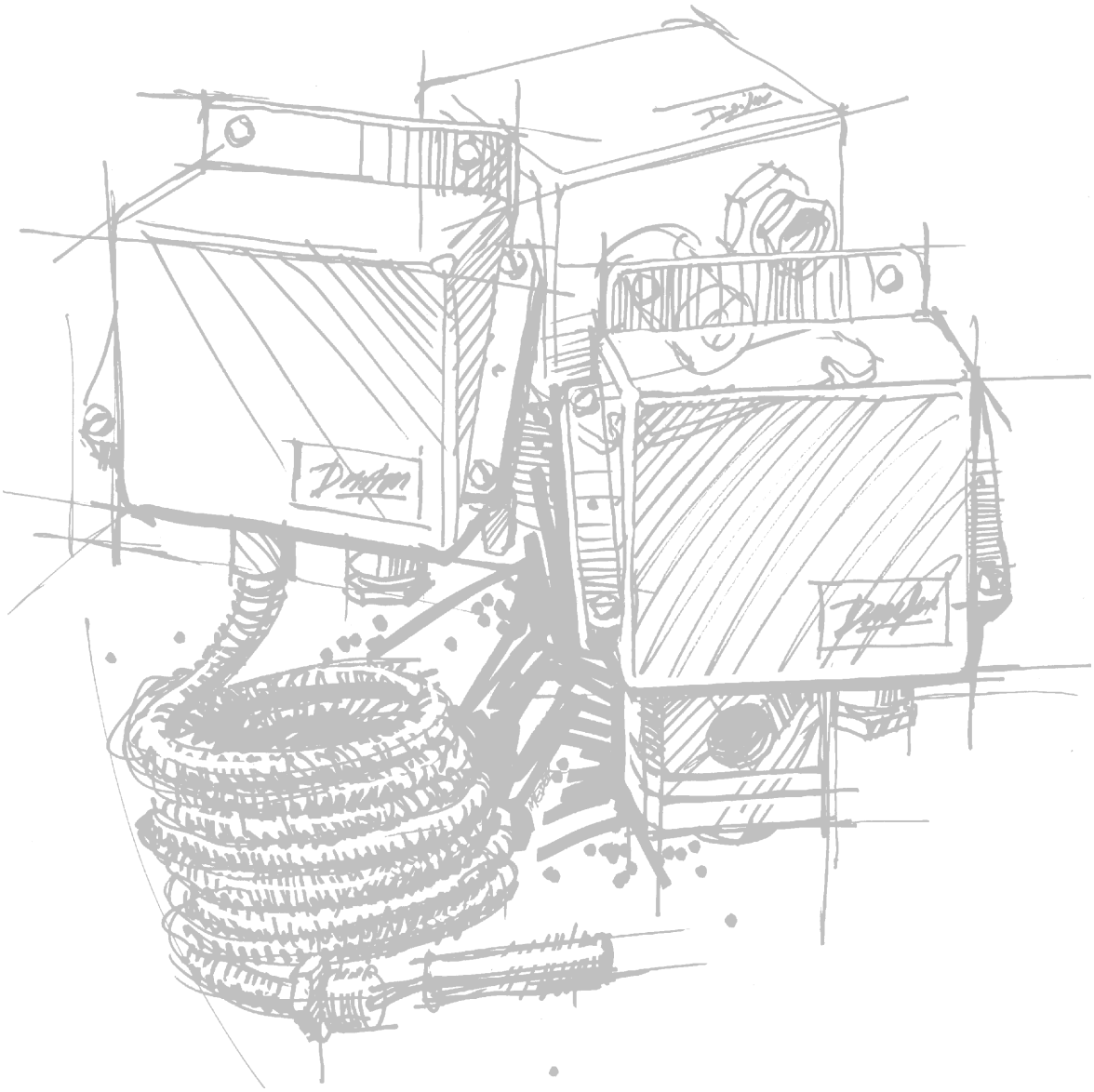
Data sheet



Pressure switches and thermostats
Type KPS

Survey

Type KPS pressure switches

1. Standard pressure switches

-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 switches 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

Thermostats

-50 0 50 100 150 200 250 °C	Range °C	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.

Introduction

KPS units are pressure-controlled switches. The position of the contacts depends on the pressure in the inlet connection and the set scale value. In this series, special attention has been given to meeting important demands for:

- a high level of enclosure,
- robust and compact construction,
- resistance to shock and vibration.

The KPS series covers most outdoor as well as indoor application requirements.
KPS pressure switches are suitable for use in alarm and regulation systems in factories, diesel plant, compressors, power stations and on board ship.

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 switches

Setting range p_e [bar]	Adjustable/ fixed differential [bar]	Permissible operating pressure P_B [bar]	Max. test pressure [bar]	Pressure connection	**Code no.**	Type
0 → 2.5	0.1	6	6	G 1/4	**060-3110**	KPS 31
0 → 2.5	0.1	6	6	G 3/8 A	**060-3109**	KPS 31
0 → 3.5	0.2	10	10	G 1/4	**060-3104**	KPS 33
0 → 3.5	0.2	10	10	G 3/8 A	**060-3103**	KPS 33
0 → 8	0.4 - 1.5	12	12	G 1/4	**060-3105**	KPS 35
0 → 8	0.4 - 1.5	12	12	G 3/8 A	**060-3100**	KPS 35
0 → 8	0.4	12	12	G 1/4	**060-3108**	KPS 35
6 → 18	0.85 - 2.5	22	27	G 1/4	**060-3106**	KPS 37
6 → 18	0.85 - 2.5	22	27	G 3/8 A	**060-3101**	KPS 37
10 → 35	2.0 - 6	45	53	G 1/4	**060-3107**	KPS 39
10 → 35	2.0 - 6	45	53	G 3/8 A	**060-3102**	KPS 39

2. Pressure switches for high pressure and strongly pulsating media

Setting range p_e [bar]	Adjustable diff. (see also figs. 1, 2 and 3) [bar]	Permissible overpressure [bar]	Max. test pressure [bar]	Min. bursting pressure [bar]	Pressure connection	**Code no.**	Type
1 → 10	0.7 - 2.8	120	180	240	G 1/4	**060-3120**	KPS 43
4 → 40	2.2 - 11	120	180	240	G 1/4	**060-3121**	KPS 45
6 → 60	3.5 - 17	120	180	240	G 1/4	**060-3122**	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 7).

Permissible overpressure
The highest permanent or recurring 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.

A: Range setting
B: Differential scale
C: Obtained differential

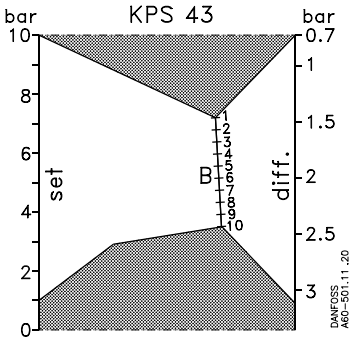


Fig. 1

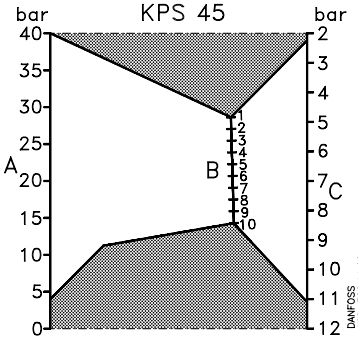


Fig. 2

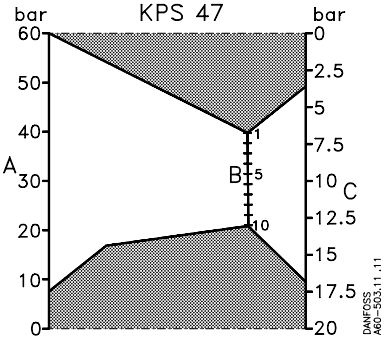


Fig. 3

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

Contact load
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

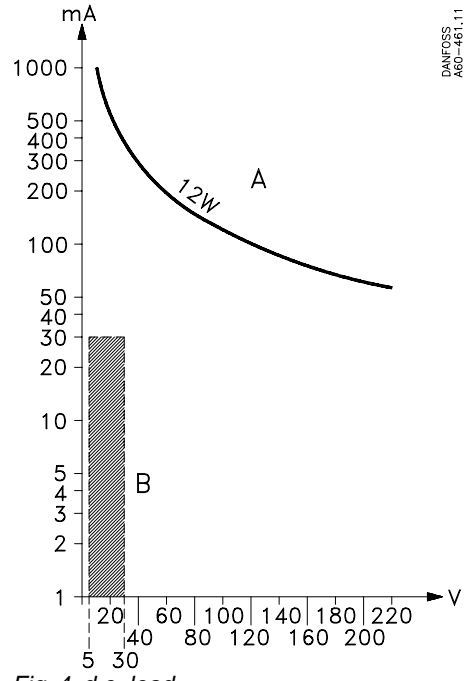


Fig. 4. d.c.-load
Curve A gives the maximum load.
Hatched area B: Acceptable load for the gold plating of the contact.

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

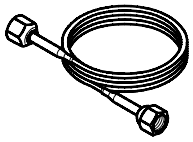
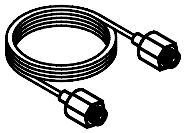
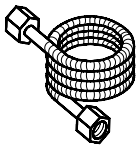
Approvals
EN 60 947-4-1
EN 60 947-5-1
Det norske Veritas, Norway

Ship approvals
American Bureau of Shipping
Lloyds Register of Shipping, UK
GL Germanischer Lloyd, Federal Republic of Germany (FRG)
Bureau Veritas, France
Includes thermostats with fixed sensor and pressure controls with armoured capillary tube.
Registro Italiano Navale, Italy

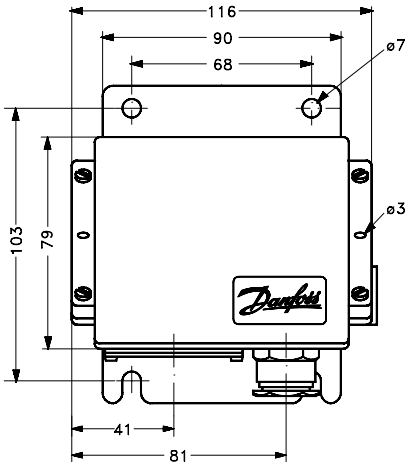
UL Underwriters Laboratories Inc., USA

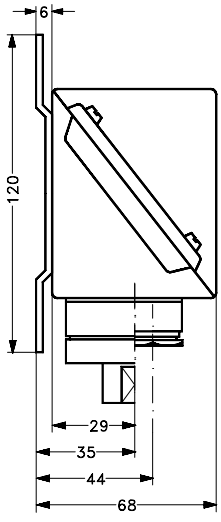
PR Polski Rejestr Statków, Poland
MRS, Maritime Register of Shipping, Russia
Nippon Kaiji Kyokai, Japan

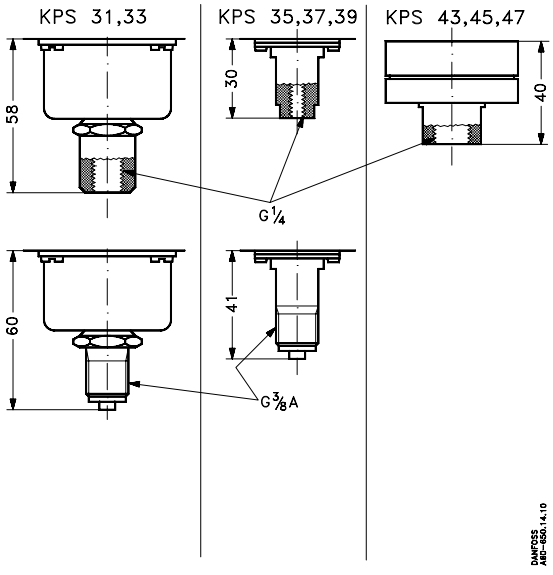
Accessories

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	**017-4368**
Connector with nipple		G $^{3}/_{8}$ connector, nipple and washer (10 mm o.d. x 6.5 mm i.d.) for welding	**017-4229**
Reducer		G $^{3}/_{8}$ x $^{7}/_{16}$ - 20 UNF ($^{1}/_{4}$ flare) reduction with washer	**017-4205**
Adaptor		G $^{3}/_{8}$ x $^{1}/_{8}$ - 27 NPT with washer	**060-3334**
Nipple		R $^{3}/_{8}$ o.d x $^{7}/_{16}$ - 20 UNF ($^{1}/_{4}$ flare)	**060-3240**
Nipple		G $^{3}/_{8}$ A - $^{1}/_{4}$ NPT with washer	**060-3335**
Adaptor		G $^{3}/_{8}$ x $^{1}/_{4}$ - 18 NPT with washer	**060-3336**
Nipple		G $^{1}/_{4}$ A x G $^{3}/_{8}$ A	**060-3332**
		G $^{1}/_{4}$ A x o.d. M10 x 1 with washer	**060-3338**
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	**060-0071**
Damping coil		Damping coil with G $^{3}/_{8}$ connectors and 1.5 m copper capillary tube	**060-1047**
Armoured damping coil		Damping coil with G $^{3}/_{8}$ connectors and 1 m armoured copper capillary tube. Standard washers included.	**060-3333**

Dimensions and weight







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

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.

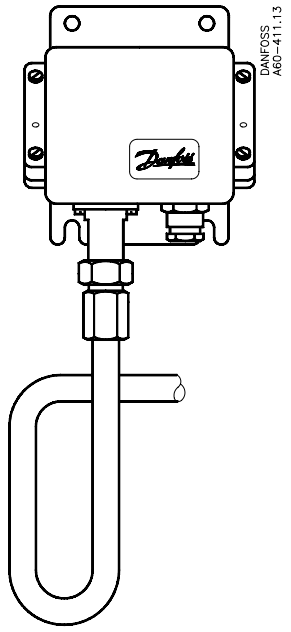


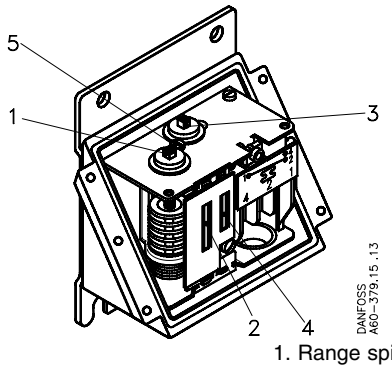
Fig. 5

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.
GL approval is however conditional on the use of a special ship's cable entry. Contact function is shown in fig. 7.

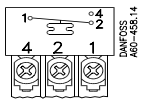


Fig. 7

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.

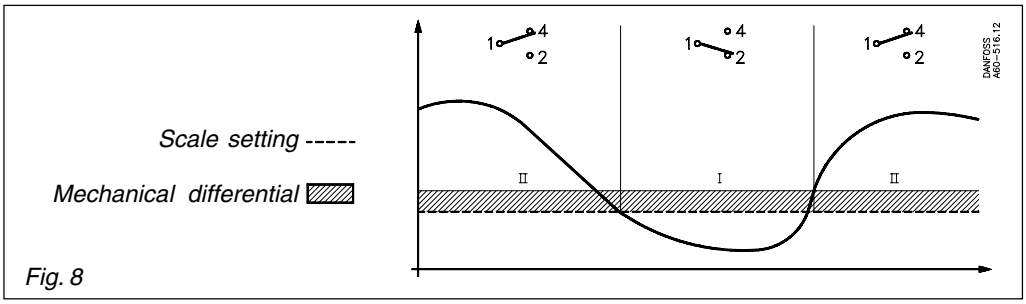


Fig. 8

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.

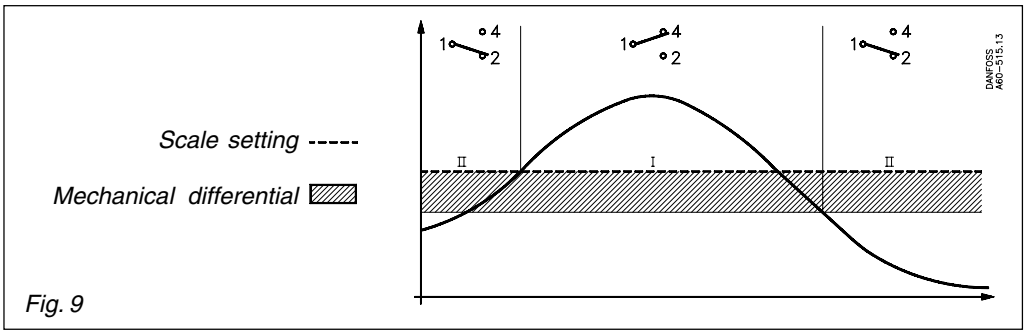


Fig. 9

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.

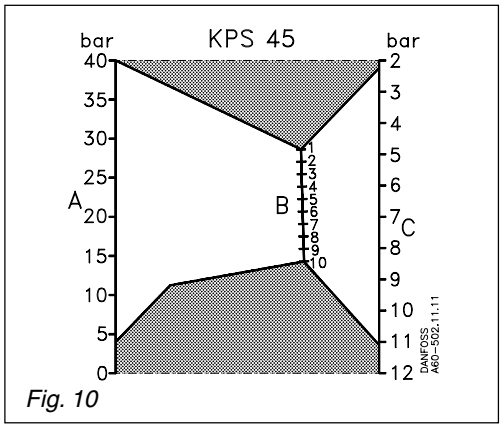


Fig. 10

Thermostats, introduction

KPS thermostats are temperature-controlled switches. The position of the contacts depends on the temperature of the sensor and the set scale value. In this series, special attention has been given to meeting demands for :

- a high level of enclosure,
- robust and compact construction,
- resistance to shock and vibration.

The KPS series covers most outdoor as well as indoor application requirements.
KPS thermostats are suitable for use in monitoring, alarm and regulation systems in factories, diesel plant, compressors, power stations and on board ship.

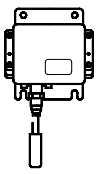
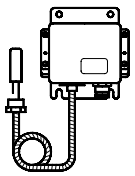
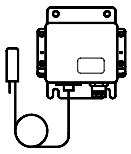
Technical data and ordering

When ordering, please state type and code number

KPS with rigid sensor

KPS with remote sensor

KPS with remote sensor and armoured capillary tube

Setting range °C	Mech. diff. adjustable/ fixed °C	Max. sensor temp. °C	Suitable sensor length (see also "Accessories") mm				Cap. Tube length m	Code nos.			Type
											
–10- 30	3-10	80	65	75	110	160	2		**060L3112**	**060L3113**	KPS 76
20- 60	3-14	130	-	75	-	-	-	**060L3118**			KPS 77
20- 60	3-14	130	-	-	110	-	-	**060L3100**			KPS 77
20- 60	3-14	130	-	-		160	-	**060L3136**			KPS 77
20- 60	3-14	130	65	75	110	160	2	-	**060L3101**	**060L3102**	KPS 77
20- 60	3-14	130	-	-	110	160	5		**060L3119**	**060L3120**	KPS 77
50-100	4-16	200	-	75	-	-	-	**060L3121**			KPS 79
50-100	4-16	200	-	-	110	-		**060L3103**			KPS 79
50-100	4-16	200				160		**060L3137**			KPS 79
50-100	4-16	200	65	75	110	160	2		**060L3104**	**060L3105**	KPS 79
50-100	4-16	200	-	-	110	160	5		**060L3122**	**060L3123**	KPS 79
50-100	4-16	200	-	-	110	160	8		**060L3124**	**060L3125**	KPS 79
50-100	4-16	200	-	75	110	160	3		**060L3143**		KPS 79
50-100	9	200	-	75	-	-	-	**060L3141**[1]			KPS 79
70-120	4.5-18	220	-	75	-	-	-	**060L3126**			KPS 80
70-120	4.5-18	220	-	-	110	-	-	**060L3127**			KPS 80
70-120	4.5-18	220	-	-	-	160	-	**060L3138**			KPS 80
70-120	4.5-18	220	-	-	-	200	-	**060L3157**			KPS 80
70-120	4.5-18	220	65	75	110	160	2		**060L3128**	**060L3129**	KPS 80
70-120	4.5-18	220	-	75	110	160	3		**060L3156**		KPS 80
70-120	4.5-18	220	-	-	110	160	5		**060L3130**	**060L3131**	KPS 80
70-120	4.5-18	220	-	-	110	160	8		**060L3132**	**060L3133**	KPS 80
60-150	5-25	250	65	75	110	160	2		**060L3106**	**060L3107**	KPS 81
60-150	5-25	250	-	-	110	160	5		**060L3134**	**060L3135**	KPS 81
60-150	5-25	250			110	160	8		**060L3111**		KPS 81
60-150	5-25	250			200			**060L3110**			KPS 81
100-200	6.5-30	300	65	75	110	160	2		**060L3108**	**060L3109**	KPS 83
100-200	18	300	65	75	110	160	2		**060L3139**[1]	**060L3140**[1]	KPS 83

1) Thermostat with max. reset.

Approvals

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

Underwriters Laboratories Inc., USA

Ship approvals

Det norske Veritas, Norway
American Bureau of Shipping
Lloyds Register of Shipping, UK
Germanischer Lloyd, Federal Republic of Germany (FRG)
Bureau Veritas, France
Includes thermostats with fixed sensor and pressure controls with armoured capillary tube.

Registro Italiano Navale, Italy
Polski Rejestr Statków, Poland
MRS, Maritime Register of Shipping, Russia
Nippon Kaiji Kyokai, Japan

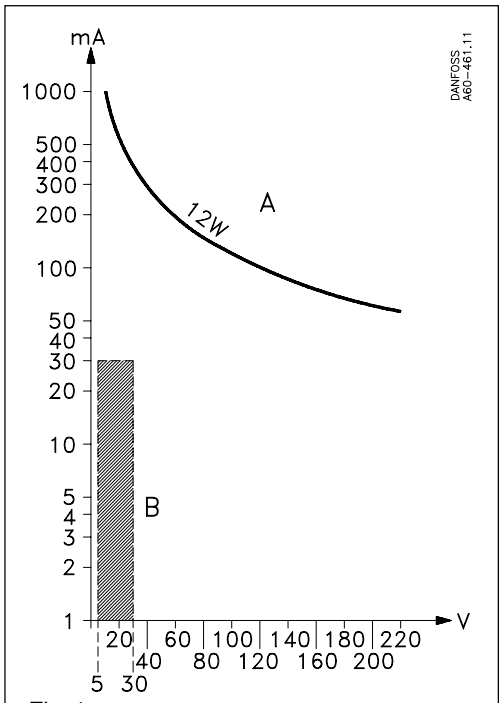


Fig. 1
Curve A gives the maximum load.
Hatched area B: Acceptable load for the gold plating of the contact.

Switch
Single-pole changeover switch (SPDT).
Contact material: Gold-plated silver contact.
Direct current: 12 W, 220 V, DC-13 – See fig. 1

Contact load (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)

Ambient temperature –40 to +70 °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 thermostat housing is enamelled pressure die cast aluminium (GID-AlSi 12). The cover is fastened by four screws which are anchored to prevent loss.
The enclosure can be sealed with fuse wire.

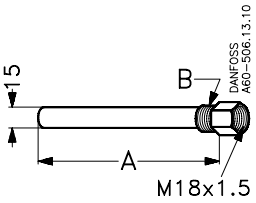
Cable entry
Pg 13.5 for cable diameters from 5 to 14 mm.

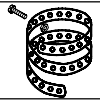
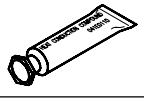
Identification
The type designation and code no. of the unit is stamped in the side of the housing,

Scale accuracy

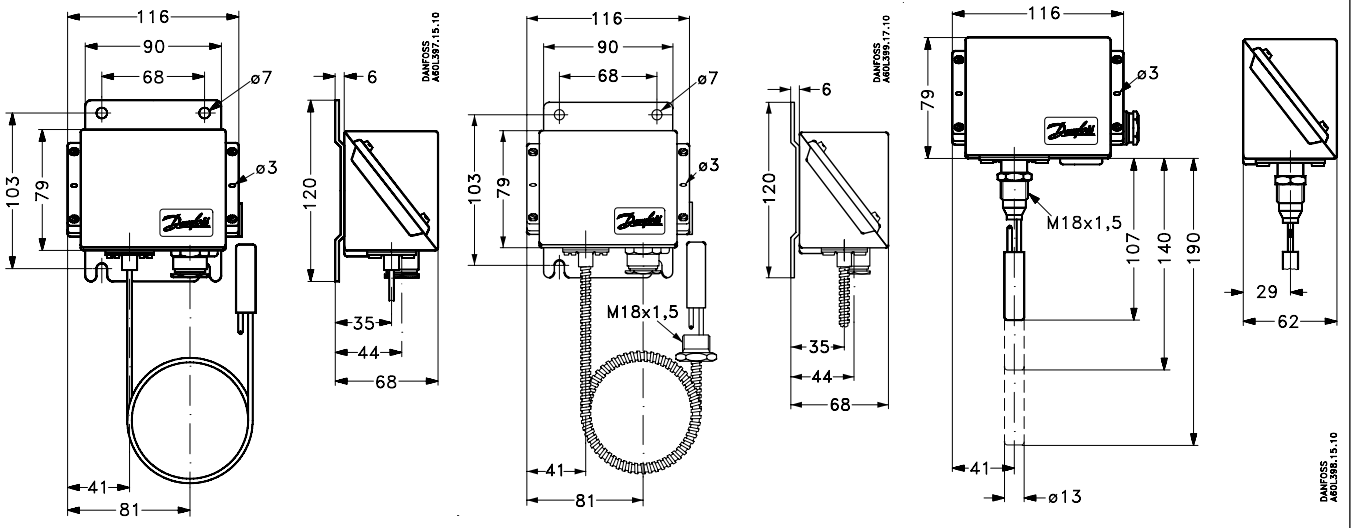
KPS 76:	±3 °C	KPS 80:	±3 °C
KPS 77:	±3 °C	KPS 81:	±6 °C
KPS 79:	±3 °C	KPS 83:	±6 °C

Snap point variation after 400 000 operations.
KPS 76-83: max. drift 2 °C.

Accessories: Sensor pockets for KPS-thermostats	Sensor pocket	A mm	Thread B	**Code no.**	Sensor pocket	A mm	Thread B	**Code no.**
	Brass	65	1/2 NPT	**060L3265**				
	Brass	75	1/2 NPT	**060L3264**	Steel 18/8	75	G 1/2 A	**060L3267**
		75	G 1/2 A	**060L3262**				
		75	G 3/4 A	**060L3266**				
		75	G 1/2 A (ISO 228/1)	**060L3281**				
		75	G 3/4 A (ISO 228/1)	**060L3404**				
	Brass	110	1/2 NPT	**060L3280**	Steel 18/8	110	G 1/2 A	**060L3268**
		110	G 1/2 A	**060L3271**		110	1/2 NPT	**060L3270**
		110	G 1/2 A (ISO 228/1)	**060L3406**				
		110	G 3/4 A (ISO 228/1)	**060L3403**				
	Brass	160	G 1/2 A	**060L3263**	Steel 18/8	160	G 1/2 A	**060L3269**
		160	G 1/2 A (ISO 228/1)	**060L3407**				
		160	G 3/4 A (ISO 228/1)	**060L3405**				
	Brass	200	G 1/2 A	**060L3206**	Steel 18/8	200	G 1/2 A	**060L3237**
		200	G 1/2 A (ISO 228/1)	**060L3408**		200	G 3/4 A	**060L3238**
		200	G 3/4 A (ISO 228/1)	**060L3402**				
	Brass	250	G 1/2 A	**060L3254**				
	Brass	330	G 1/2 A	**060L3255**				
	Brass	400	G 1/2 A	**060L3256**				
Supplied without gland nut, gaskets and washer	Brass	500	G 1/2 A	**060L3257**				

Part		Description	No. of per unit	**Code no.**
Clamping band		For KPS thermostats with remote sensor (L = 392 mm)	X	**017-4204**
Heat-conductive compound (4.5 cm² tube)		For KPS thermostats with sensor fitted in a sensor pocket. Compound for filling sensor pocket to improve heat transfer between pocket and sensor. Application range for compound: –20 to +150 °C, momentarily up to 220°C.	As required	**041E0110**

Dimensions and weight



KPS with remote sensor
Weight: ca 1.2 kg
(incl. 2 m capillary tube)

KPS with remote sensor and armoured capillary tube
Weight : ca 1.4 kg (incl. 2 m capillary tube)

KPS with rigid sensor
Weight: ca 1.0 kg

Installation

Installation
Location of unit: KPS thermostats are designed to withstand the shocks that occur, e.g. in ships, on compressors and in large machine installations. KPS thermostats with remote sensor are fitted with a base of 3 mm steel plate for fixing to bulkheads, etc. KPS thermostats with bulb sensor are self-supporting from the sensor pocket.

Resistance to media
Material specifications for sensor pockets:

Sensor pocket, brass
The tube is made of Ms 72 to DIN 17660, the threaded portion of So Ms 58Pb to DIN 17661.

Sensor pocket, stainless steel 18/8
Material designation 1.4305 to DIN 17440.

Sensor position
As far as possible the sensor should be positioned so that its longitudinal axis is at right angles to the direction of flow. The active part of the sensor is ∅13 mm x 50 mm long on thermostats with rigid sensors and 2 m capillary tube. The active length on the other thermostats is 70 mm (5 m and 8 m capillary tubes).

The medium
The fastest reaction is obtained from a medium having high specific heat and high thermal conductivity. It is therefore advantageous to use a medium that fulfills these conditions (provided there is a choice).

flow velocity of the medium is also of significance. (The optimum flow velocity for liquids is about 0.3 m/s).
For permissible media pressure see fig. 2.

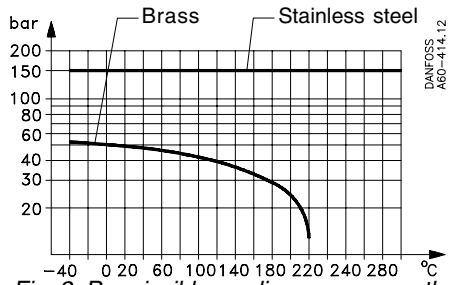


Fig. 2. Permissible media pressure on the sensor pocket as a function of temperature

Setting
When the thermostat cover is removed, and the locking screw (5, fig. 3) 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) can be used while the scale (4) is being read.

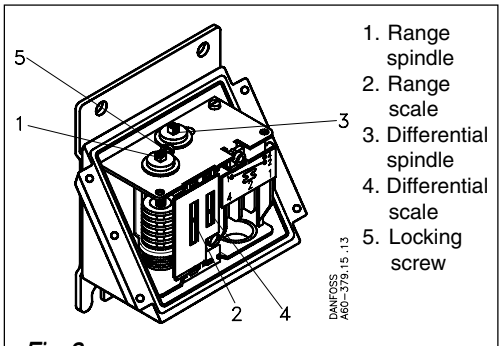


Fig. 3

Scale correction
The sensor on KPS thermostats contains an adsorption charge. Therefore function is not affected whether the sensor is placed warmer or colder than the remaining part of the thermostatic element (bellows and capillary tube). However, such a charge is to some extent sensitive to changes in the temperature and bellows and capillary tube. Under normal conditions this is of no importance, but if the thermostat is to be used in extreme ambient temperatures there will be a scale deviation. The deviation can be compensated for as follows:
Scale correction = Z × **a**
Z can be found from fig. 4, while **a** is the correction factor from the table below.

Type	Regulation range °C	Correction factor **a** for thermostats with rigid sensor	with 2 and 5 m cap.tube	with 8 m cap.tube
KPS 76	–10 - +30		1.1	
KPS 77	20 - 60	1.0	1.4	
KPS 79	50 - 100	1.5	2.2	2.9
KPS 80	70 - 120	1.7	2.4	3.1
KPS 81	60 - 150		3.7	
KPS 83	100 - 200		6.2	

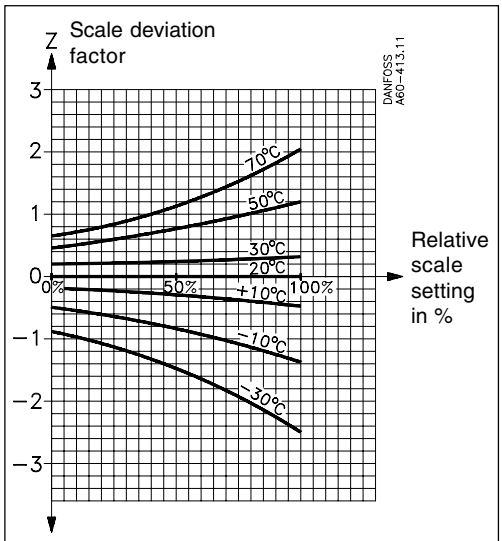


Fig. 4

Electrical connection
KPS thermostats are fitted with a Pg 13.5 screwed cable entry suitable for cables from 5 to 14 mm. GL approval is conditional on the use of a ship's cable entry.
Contact function is shown in Fig. 5

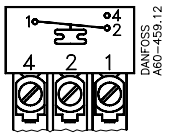


Fig. 5

Examples

Example 1
A diesel engine with cooling water temperature of 85 °C (normal). An alarm must be triggered if the cooling water temperature exceeds 95 °C.
Choose a KPS 80 thermostat (range 70 to 120 °C).
Main spindle setting: 95 °C.
Differential spindle setting: 5 °C.
The required alarm function is obtained by connecting to thermostat terminals 1-4. After the system has been in operation, assess the operating differential and make a correction if necessary.

Example 2
Find the necessary scale correction for a KPS 80 set at 95 °C in 50 °C ambient temperature.

The relative scale setting Z can be calculated from the following formula:

$$\frac{\text{Setting value} - \text{min. scale value}}{\text{max. scale value} - \text{min. scale value}} \times 100 = \%$$

Relative scale setting: $\frac{95 - 70}{120 - 70} \times 100 = 50\%$

Factor for scale deviation Z (fig. 4 page 11), Z ≅ 0.7
Correction factor **a** (table under fig. 4 page 11) = 2.4

Scale correction = Z × **a** = 0.7 × 2.4 = 1.7 °C
The KPS must be set at 95 + 1.7 = 96.7 °C

Function

Selection of differential
To ensure that the plant functions properly, a suitable differential 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 temperature variations

Differentials
The mechanical differential is the differential that is set by the differential spindle in the thermostat. The thermal differential (operating differential) is the differential the system operates on.

The thermal differential is always greater than the mechanical differential and depends on three factors:
1) the flow velocity of the medium,
2) the temperature change rate of the medium, and
3) the heat transmission to the sensor

Thermostat function
Contacts 1-4 make while contacts 1-2 break when the temperature rises above the scale setting. The contacts changeover to their initial position when the temperature falls to the scale setting minus the differential. See fig. 6.

I. Alarm for rising temperature given at range setting value.
II. Alarm for falling temperature given at range setting value minus the differential.

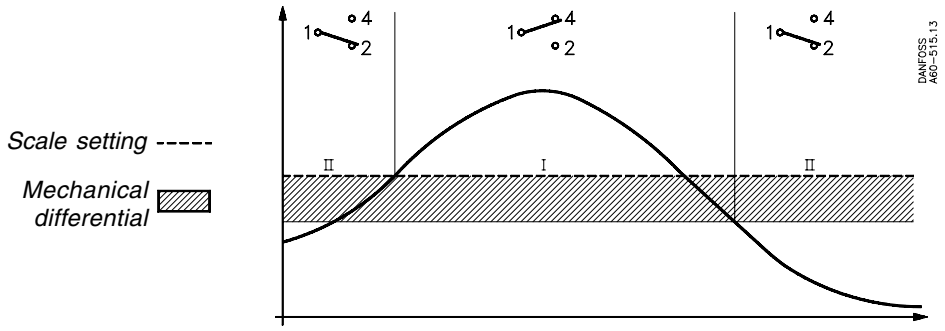


Fig. 6

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