ENGINEERING TOMORROW

Data sheet

Pressure switch and Thermostat
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 switches the position of the contacts depends on the pressure in the inlet connection and the set scale value.

For KPS thermostats 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 control 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

CE-marked in accordance with:
– LVD 2014/35/EU
(EN 60947-1, EN 60947-4-1, EN 60947-5-1)

Underwriters Laboratories Inc., US-UL (excluding KPS 39)
China Compulsory Certificate, CCC

Ship approvals

American Bureau of Shipping, ABS
Det Norske Veritas, DNV
Germanischer Lloyd, GL
Registro Italiano Navale, RINA (KPS 43, KPS 45, KPS 47, KPS 76, KPS 77, KPS 79, KPS 80, KPS 81, KPS 83)
Maritime Register of Shipping, RMRS
Nippon Kaiji Kyokai, NKK (KPS 31, KPS 33, KPS 35, KPS 37, KPS 39, KPS 43, KPS 45, KPS 47)
China Classification Society, CCS
Bureau Veritas, BV
Korean Register of Shipping, KR (KPS 35, KPS 37, KPS 39, KPS 43, KPS 45, KPS 47)
Lloyds Register of Shipping, LR

THERMOSTAT

Technical data and ordering

KPS with rigid sensor

KPS with remote sensor

KPS with remote sensor and armoured capillary tube

When ordering, please state type and code number

Type	Setting range P_e	Mech. diff. adjust-able/ fixed	Max. sensor temp.	Suitable sensor pocket length see also "Accessories"				Cap. tube length	Code no.		
	[°C]	[°C]	[°C]	[mm]				[m]			
KPS 76	-10 – 30	3 – 10	80	65	75	110	160	2	–	**060L311266**	**060L311366**
KPS 77	20 – 60	3 – 14	130	–	75	–	–	–	**060L311866**	–	–
KPS 77	20 – 60	3 – 14	130	–	–	110	–	–	**060L310066**	–	–
KPS 77	20 – 60	3 – 14	130	–	–	–	160	–	**060L313666**	–	–
KPS 77	20 – 60	3 – 14	130	65	75	110	160	2	–	**060L310166**	**060L310266**
KPS 77	20 – 60	3 – 14	130	–	–	110	160	5	–	**060L311966**	–
KPS 79	50 – 100	4 – 16	200	–	75	–	–	–	**060L312166**	–	–
KPS 79	50 – 100	4 – 16	200	–	–	110	–	–	**060L310366**	–	–
KPS 79	50 – 100	4 – 16	200	–	–	–	160	–	**060L313766**	–	–
KPS 79	50 – 100	4 – 16	200	65	75	110	160	2	–	**060L310466**	**060L310566**
KPS 79	50 – 100	4 – 16	200	–	–	110	160	5	–	**060L312266**	–
KPS 79	50 – 100	4 – 16	200	–	–	110	160	8	–	**060L312466**	–
KPS 79	50 – 100	4 – 16	200	65	75	110	160	3	–	**060L314366**	–
KPS 80	70 – 120	4.5 – 18	220	–	75	–	–	–	**060L312666**	–	–
KPS 80	70 – 120	4.5 – 18	220	–	–	110	–	–	**060L312766**	–	–
KPS 80	70 – 120	4.5 – 18	220	–	–	–	160	–	**060L313866**	–	–
KPS 80	70 – 120	4.5 – 18	220	–	–	–	200	–	**060L315766**	–	–
KPS 80	70 – 120	4.5 – 18	220	65	75	110	160	2	–	**060L312866**	**060L312966**
KPS 80	70 – 120	4.5 – 18	220	65	75	110	160	3	–	**060L315666**	–
KPS 80	70 – 120	4.5 – 18	220	–	–	110	160	5	–	**060L313066**	–
KPS 80	70 – 120	4.5 – 18	220	–	–	110	160	8	–	**060L313266**	–
KPS 81	60 – 150	5 – 25	250	65	75	110	160	2	–	**060L310666**	**060L310766**
KPS 81	60 – 150	5 – 25	250	–	–	110	160	5	–	**060L313466**	–
KPS 81	60 – 150	5 – 25	250	–	–	110	160	8	–	**060L311166**	–
KPS 81	60 – 150	5 – 25	250	–	–	200	–	–	**060L311066**	–	–
KPS 83	100 – 200	6.5 – 30	300	65	75	110	160	2	–	**060L310866**	**060L310966**
KPS 83	100 – 200	18	300	65	75	110	160	2	–	**060L313966** [1)]	–

Electrical connection

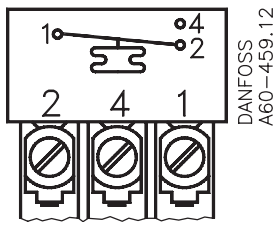


Fig. 11

KPS thermostats are fitted with a Pg 13.5 screwed cable entry suitable for cables from 5 – 14 mm. Contact function is shown in fig. 11

Technical data

Switch	Single pole changeover (SPDT)	Contact material: Gold-plated silver contact	
Contact load (when Au surface is burnt away)	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)
	Direct current	12 W, 220 V, DC-13, see fig. 12	
Ambient temperature	-40 – 70 °C		
Vibration resistance	Vibration-stable in the range 2 – 30 Hz, amplitude 1.1 mm og 30 – 300 Hz, 4 G.		
Enclosure	IP67 to EN 60529 / IEC 60529. 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 – 14 mm.		
Identification	The type designation and code no. of the unit is stamped in the side of the housing.		

Types	Scale accuracy *) [°C]	Snap point variation after 400 000 operations [°C]
KPS 76	±3	max. drift 2
KPS 77	±3	max. drift 2
KPS 79	±3	max. drift 2
KPS 80	±3	max. drift 2
KPS 81	±6	max. drift 2
KPS 83	±6	max. drift 2

*) Scale values are indicative only. Results given in table are measured in laboratory conditions for factory set values (scale center). The scale accuracy for min and max positions could differ significantly. There are many factors which could influence on product working and scale accuracy.

Direct current (DC) -load

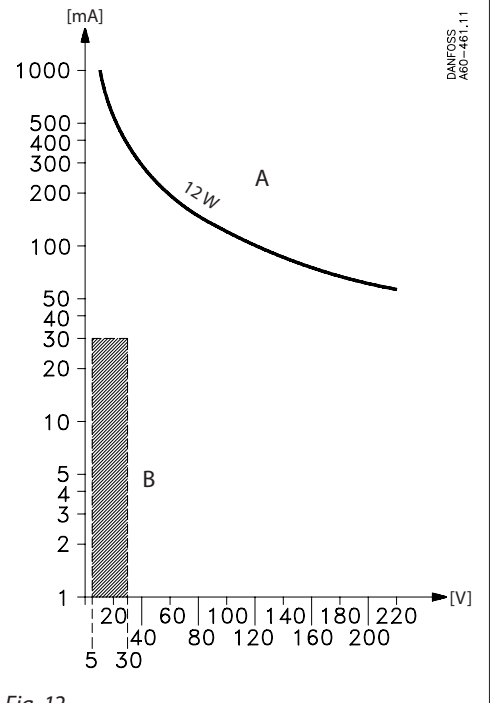


Fig. 12

Curve A:
gives the maximum load

Hatched area B:
Acceptable load for the gold plating of the contact

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 temperature control. 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,
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. 13.

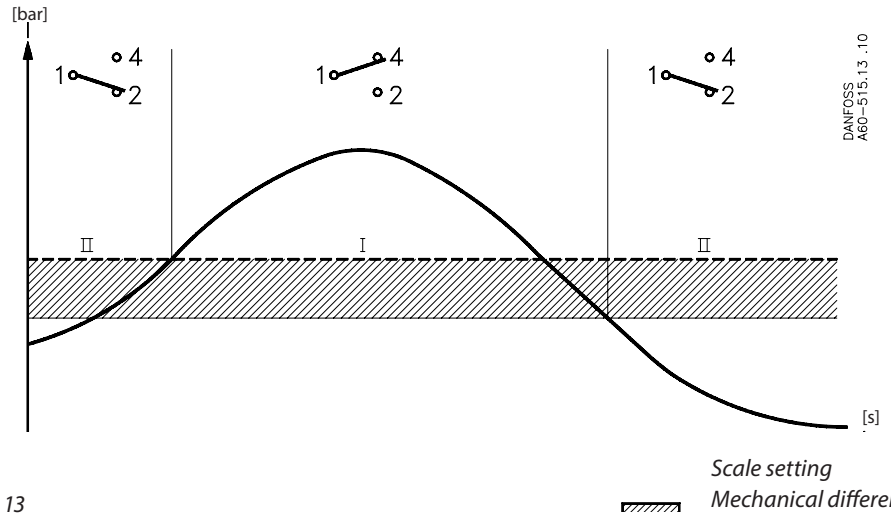


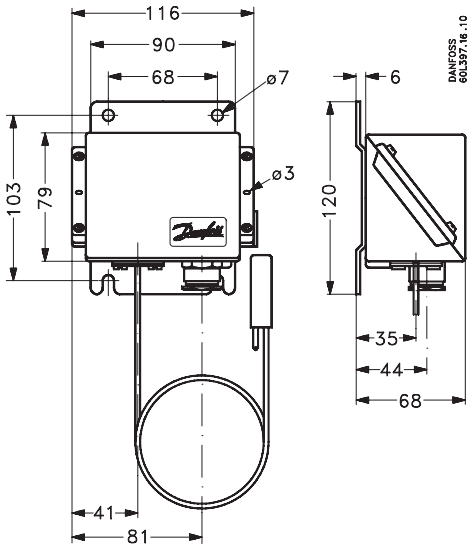
Fig. 13

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*

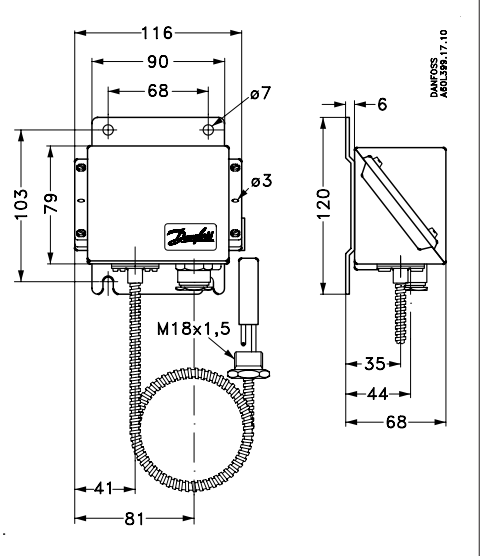
Dimensions [mm] and weights [kg]

KPS with remote sensor



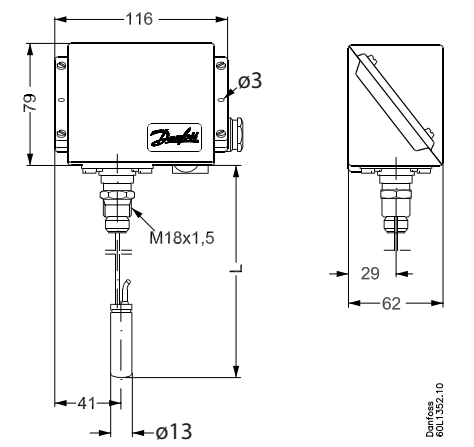
Net weight: ca 1.2 kg (incl. 2 m capillary tube)

KPS with remote sensor and armoured capillary tube



Net weight: ca 1.4 kg (incl. 2 m capillary tube)

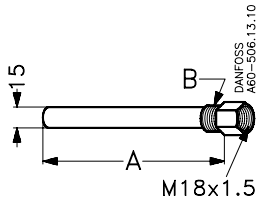
KPS with rigid sensor



Net weight: ca 1.0 kg

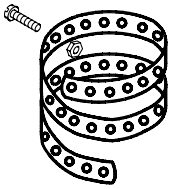
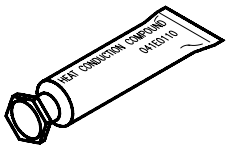
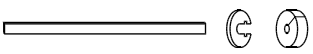
Sensor pocket length "A"	Sensor length "L"
75	105
110	138
160	190
200	230

Accessories



Supplied without gland nut, gaskets and washer

Brass sensor pocket			Steel 18/8 sensor pocket		
A [mm]	B Thread	Code no.	A [mm]	B Thread	Code no.
65	1/2 NPT	**060L326566**	–	–	–
75	1/2 NPT	**060L326466**	75	G 1/2 A	**060L326766**
75	G 1/2 A	**060L326266**	–	–	–
75	G 3/4 A	**060L326666**	–	–	–
75	G 1/2 A	**060L328166**	–	–	–
110	1/2 NPT	**060L328066**	110	G 1/2 A	**060L326866**
110	G 1/2 A	**060L327166**	110	1/2 NPT	**060L327066**
110	G 1/2 A	—	–	–	–
110	G 3/4 A	**060L340366**	–	–	–
160	G 1/2 A	**060L326366**	160	G 1/2 A	**060L326966**
200	G 1/2 A	**060L320666**	–	–	–
200	G 1/2 A	**060L340866**	–	–	–
250	G 1/2 A	**060L325466**	–	–	–
330	G 1/2 A	**060L325566**	–	–	–

Part	Description	Code no.
Clamping band 	For KPS thermostats with remote sensor (L = 392 mm)	**017-420466**
WHeat-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: between pocket and sensor. Application range for compound: -20 – 150 °C, momentarily up to 220 °C.	**041E0114**
Gasket set 	For KPS thermostats without armoured capillary tubes	**060L327366**
Gasket set 	For KPS thermostats with armoured capillary tubes	**060L036666**

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 ø13 mm × 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. 14.

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

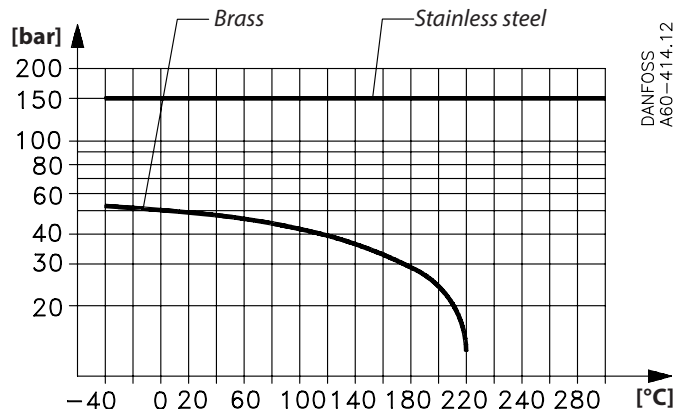


Fig. 14

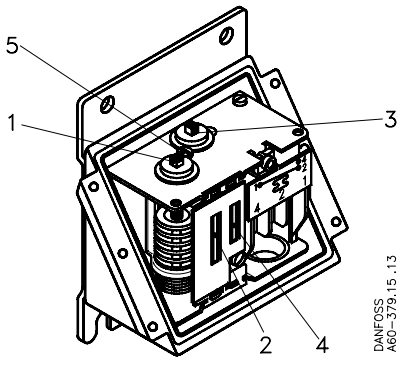


Fig. 15

Setting

When the thermostat cover is removed, and the locking screw (5, fig. 15) 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.

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

Installation
(continued)

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 temperature control 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. 16, while a is the correction factor from the table below.

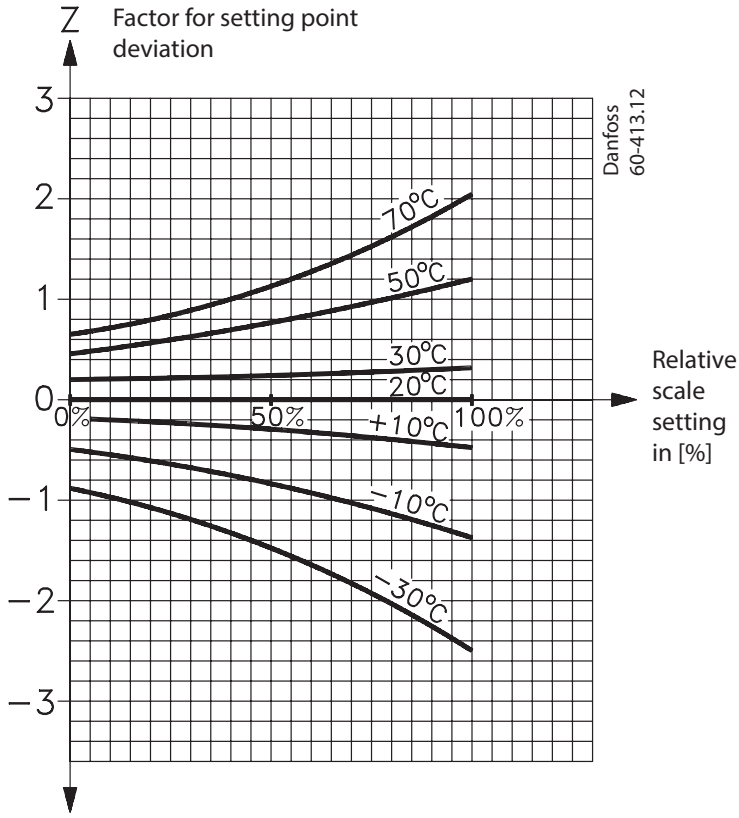


Fig. 16

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	–

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 – 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:

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

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

Factor for scale deviation Z (fig. 16 page 17), $Z \approx 0.7$
Correction factor a (table under fig. 16 page 17) = 2.4
Scale correction = $Z \times a = 0.7 \times 2.4 = 1.7$ °C
The KPS must be set at 95+1.7 = 96.7 °C