

Data sheet

Pressure switch and Thermostat

KP and KPI



The KP and KPI pressure switches and thermostats are used for control, monitoring and alarm systems in a wide variety of industry applications.

KP pressure switches are mainly used for gaseous fluid whereas KPI pressure switches are more for liquid and gaseous fluid. The products are available in IP30 enclosure as well as IP55 enclosure.

The KP pressure range include special designed pressure switches and limiters for steam boilers and other heating applications.

For water pump control and protection (dry run) the dual pressure switch KP44 is suitable and secure improved life time of the water pump.

Features

- Wide setting range
- Shock and impact resistant
- Snap action electrical contacts minimize chatter, bounce, and wear, and ensure long term electrical and mechanical reliability
- Small dimensions - space saving and easy to install in panels
- Electrical connection from front of the unit makes rack mounting easier and also saves space
- Suitable for alternating current and direct current
- Single pressure switches and thermostats are fitted with a single pole double throw contact system (SPDT)
- Can be used for both liquids and gases (KPI)
- Manual trip function enables electrical connections verification without any tools or pressure changes in the application
- Versions with automatic and manual reset available
- For demineralized water, there are special KP models with wetted parts made of stainless steel (AISI 316L)

Approvals

CE-marked in accordance with LVD 2014/35/EU: EN 60947-1, EN 60947-4-1, EN 60947-5-1
Underwriters Laboratories Inc., UL

China Compulsory Certificate, CCC (excluding boiler versions)
GOST (excluding KPI)

Technical data
Single pressure switch

Description		KP 35, KP 36	KPI 35, KPI 36	KPI 38	KP 34, KP 35, KP 36, KP 37 boiler version
Ambient temperature [°C]		-40 – 65 °C (for max. 2 hours up to 80 °C)			
Media temperature [°C]		-40 – 100 °C			
Fluid		Gaseous media	Gaseous media and liquids		Steam, air, gaseous media & liquids
Parts in contact with fluid	Bellows	Phosphor bronze or Stainless steel	Phosphor bronze		Stainless steel
	Pressure connector	Free-cutting steel (nickel plated) or Stainless steel	Brass	Free-cutting steel (nickel plated)	
Contact system		<p style="text-align: center;">SPDT</p> <p style="text-align: center;">Single-pole double throw (SPDT)</p>			
Contact load, Silver		Alternating current: AC-1: 16 A, 400 V AC-3: 16 A, 400 V AC-15: 10 A, 400 V	Alternating current: AC-1: 10 A, 440 V AC-3: 6 A, 440 V AC-15: 4 A, 440 V	Alternating current: AC-1 : 16 A, 400 V AC-3 : 16 A, 400 V AC-15 : 10 A, 400 V	
		Direct current: DC-13: 12 W, 220 V	Direct current: DC-13: 12 W, 220 V	Direct current: DC-13: 12 W, 220 V	
Contact load, Gold plated contact set		See information page 15			
Enclosure, IP30 grade		Unit must be mounted on a flat surface / a flat fitting and all unused holes covered			
Enclosure, IP44 grade		Mounted as IP30 plus fitting of top cover, code no. 060-109766			
Enclosure, IP55 grade		Unit mounted in a special IP55 enclosure, code no. 060-033066 or 060-062866			
Cable entry		Rubber cable gland entry for 6 – 14 mm diameter cables			
Mounted on back plate / wall bracket		Vibration proof in the range 0 – 1000 Hz, 4 g [1 g = 9.81 m/s ²]			
Mounted on angle bracket		Not recommended in areas where vibrations occur			

Ordering
Pressure switch, types KP 35 and KP 36

Type	Setting range P _e	Differential	Permissible operating pressure P _e	Max. test pressure	Pressure connection	Contact material	Code no.
	[bar]						
KP 35	-0.2 – 7.5	0.7 – 4.0	17	22	G 1/4 A	silver	060-113366 060-113391 ¹⁾
	-0.2 – 7.5	0.7 – 4.0	17	22	G 1/4 A	gold-plated	060-504766
	-0.2 – 7.5	0.7 – 4.0	17	22	G 1/4 A	silver	060-538666 ²⁾
	-0.2 – 7.5	0.7 – 4.0	17	22	G 1/4 A	silver	060-450366 ³⁾
KP 36	2.0 – 14.0	0.7 – 4.0	17	22	G 1/4 A	silver	060-110866 060-110891 ¹⁾
	2.0 – 14.0	0.7 – 4.0	17	22	G 1/4 A	gold	060-113766
	2.0 – 14.0	0.7 – 4.0	17	22	G 1/4 A	silver	060-538766 ²⁾
	4.0 – 12.0	0.5 – 1.6	17	22	G 1/4 A	silver	060-122166
	4.0 – 12.0	0.5 – 1.6	17	22	G 1/4 A	gold	060-114466
	4.0 – 12.0	0.5 – 1.6	17	22	G 1/4 A	silver	060-450166 ³⁾

¹⁾ Available only in Asia market

²⁾ IP55 transparent enclosure

³⁾ Stainless steel version, IP55 non-transparent enclosure

Pressure switch, types KPI 35 – KPI 38

Type	Setting range P _e	Differential	Permissible operating pressure P _e	Max. test pressure	Pressure connection	Contact material	Code no.
	[bar]						
KPI 35	-0.2 – 8.0	0.4 – 1.5	18	18	G 1/4 A	silver	060-121766
	-0.2 – 8.0	0.4 – 1.5	18	18	G 1/4 A	gold-plated	060-316466
	-0.2 – 8.0	0.5 – 2.0	18	18	G 1/4 A	silver	060-121966
	-0.2 – 8.0	0.4 – 1.5	18	18	G 1/4 A	silver	060-315766 ¹⁾
KPI 36	4.0 – 12.0	0.5 – 1.6	18	18	G 1/4 A	silver	060-118966
	4.0 – 12.0	0.5 – 1.6	18	18	G 1/4 A	gold-plated	060-113866
	2.0 – 12.0	0.5 – 1.6	18	18	G 1/4 A	silver	060-316966
	2.0 – 12.0	0.5 – 1.6	18	18	G 1/4 A	silver	060-319366 ²⁾
KPI 38	8.0 – 28.0	1.8 – 6.0	30	30	G 1/4 A	silver	060-508166
	8.0 – 28.0	1.8 – 6.0	30	30	G 1/4 A	silver	060-541866 ²⁾

¹⁾ IP55 transparent enclosure

²⁾ IP55 non-transparent enclosure

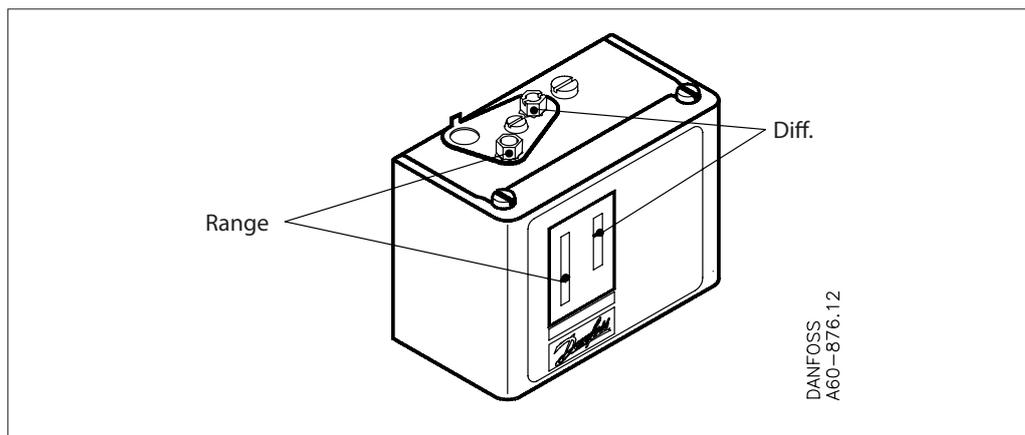
Pressure switch, types KP 34 – KP 37, boiler version

Type	Setting range p _e	Differential	Reset	Pressure connection	Max. test pressure	Contact material	Code no.
	[bar]			[bar]			
KP 34	0.1 – 1.0	0.1 – 0.4	Automatic	G 1/2 A	4.0	silver	060-216466
	0.1 – 1.0	0.2	Manual	G 1/2 A	4.0	silver	060-216366
KP 35	0.4 – 3.4	0.4 – 2.2	Automatic	G 1/2 A	10	silver	060-216666
	0.4 – 3.4	0.5	Manual	G 1/2 A	10	silver	060-216566
KP 36	1.0 – 10.0	0.7 – 4.0	Automatic	G 1/2 A	17	silver	060-215966
	1.0 – 10.0	0.7	Manual	G 1/2 A	17	silver	060-216066
KP 37	4.0 – 20.0	1.8 – 3.1	Automatic	G 1/2 A	28	silver	060-216166
	4.0 – 20.0	3.0	Manual	G 1/2 A	28	silver	060-216266

Contact system and application

Switch type – single pole double throw	Switch action	Application
	1. Terminal 1 – 4 close high and open low Terminal 1 – 2 can be used as low pressure alarm	1. Low pressure cut-out
SPDT	2. Terminal 1 – 2 open high and close low Terminal 1 – 4 can be used as high pressure alarm	2. High pressure cut-out

Setting



Cut-in and cut-out pressures of the system should always be checked with an accurate pressure gauge.

Pressure setting for switches with automatic reset.

1. Set the cut-in pressure on the "CUT-IN" scale (range scale).
2. Set the differential on the "DIFF" scale.

Note:

For low pressure switches the restart pressure is equal to cut-out pressure plus differential value.

The cut-out pressure must be above absolute vacuum ($p_e = -1$ bar).
 For high pressure switches the restart pressure is equal to cut-out pressure minus differential.

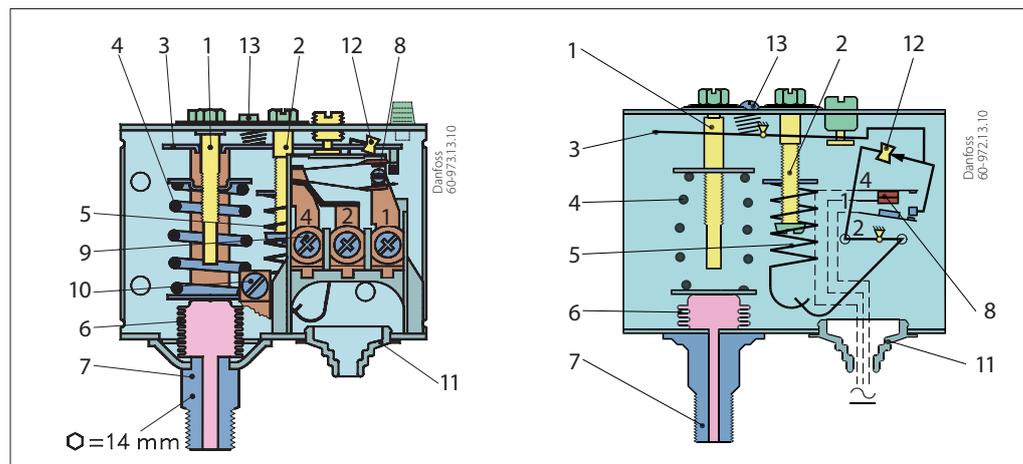
Pressure switches with manual reset

Set the cut-out pressure on the "CUT-OUT" scale (range scale).
 High pressure limiters can be manually reset when the pressure is equal to the stop pressure minus the differential.

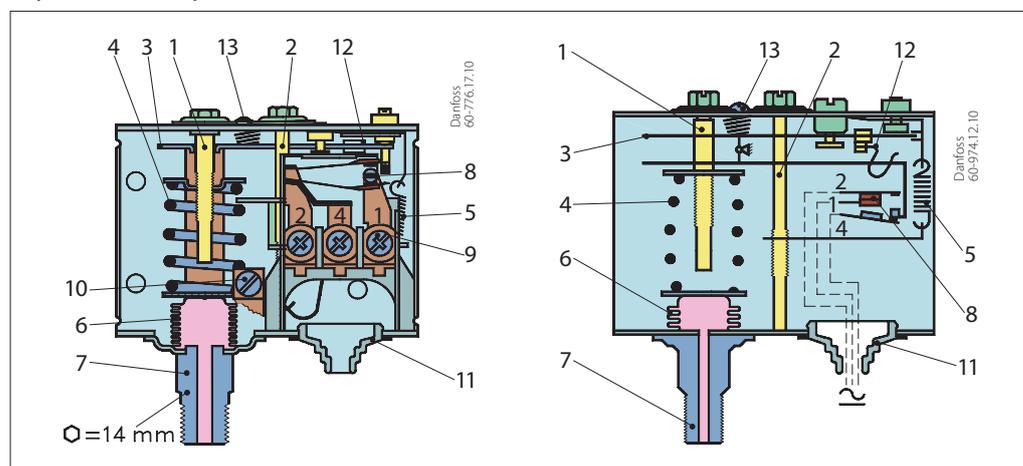
Design / Function

1. Setting spindle
2. Differential setting spindle
3. Main arm
4. Main spring
5. Differential spring
6. Bellows
7. Pressure connector
8. Contact system
9. Connection terminals
10. Earth terminal
11. Cable entry
12. Omega spring (KPI)
12. Tumbler (KP)
13. Locking screw
14. Manual reset

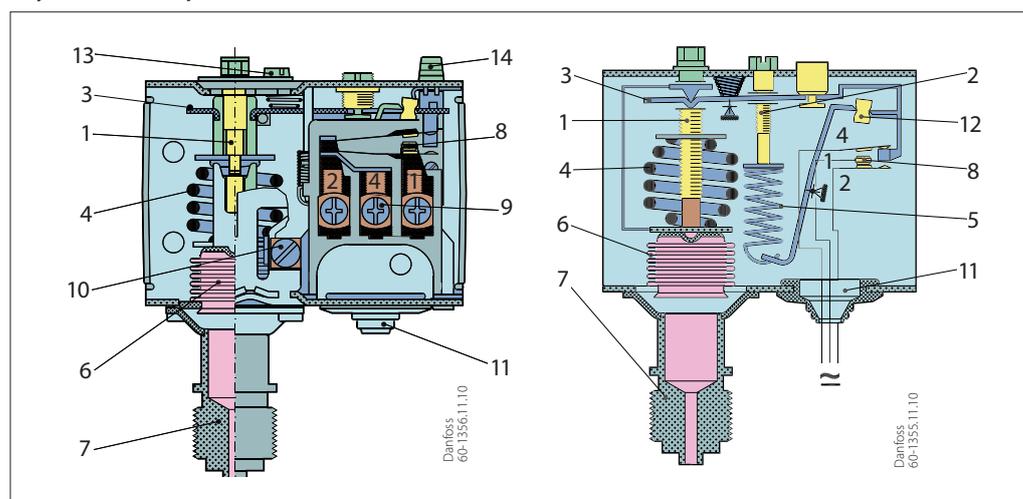
Key sketch of KP pressure switch



Key sketch of KPI pressure switch



Key sketch of KP pressure switch, boiler version

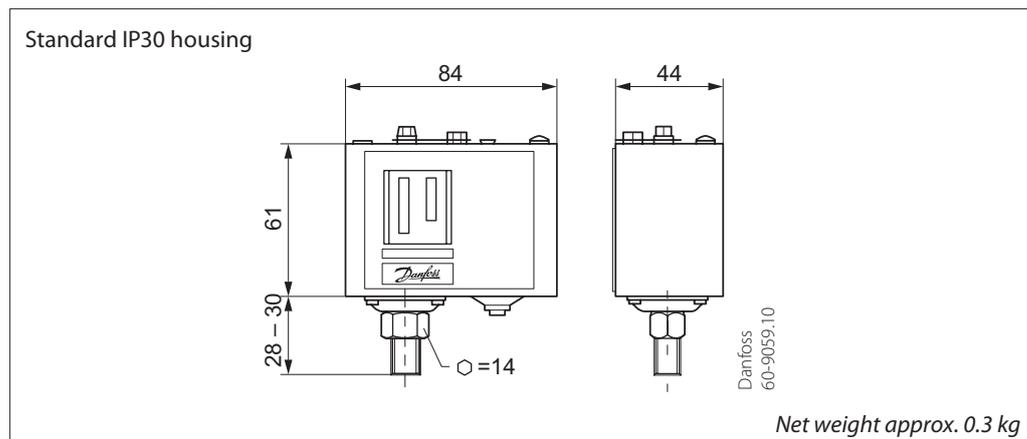


The contact system in KP pressure switches has a snap function. This means that the bellows is active only when the cut-in or cut out value is reached. The bellows is connected to the pressure of the controlled plant via the connector (7).

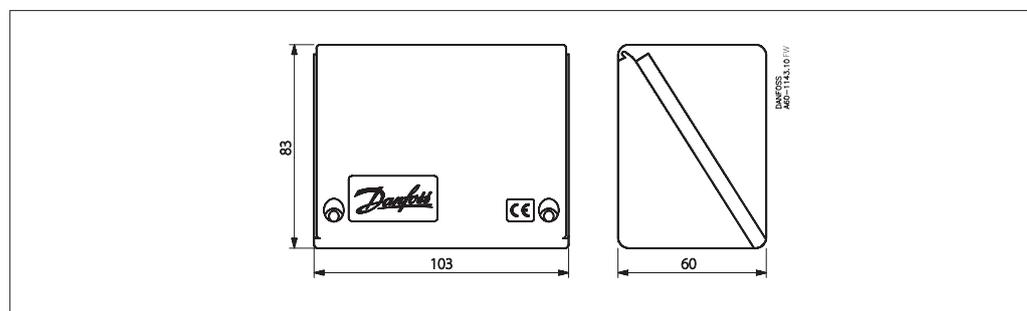
Danfoss KPI pressure switches are designed so that the bellows moves in the same proportion as the pressure switches change. To ensure a snap function on contact change over, an omega spring is located between bellows and contact system.

Dimensions [mm]
and weights [kg]

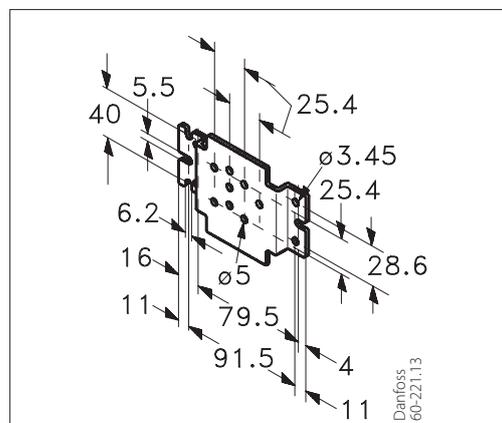
Pressure switch, types KP 35, KP 36, KPI 35, KPI 36 and KPI 38



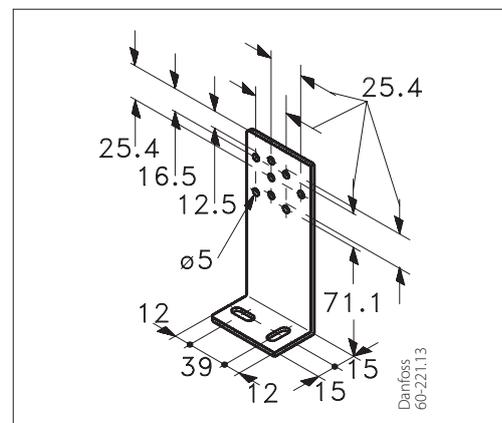
IP55 enclosure



Wall bracket

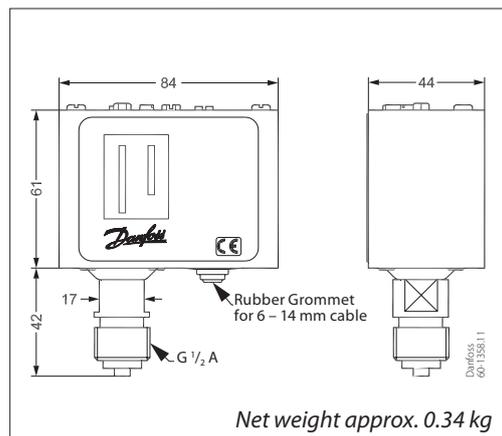


Angle bracket

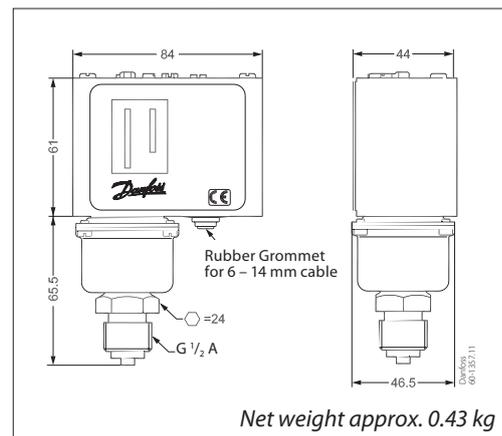


Dimensions [mm]
and weights [kg]
(Boiler version)

Pressure switch, types KP 35 and KP 36



Pressure switch, type KP 34



Accessories for KP pressure switches

Part	Symbol	Description	Total	Code no.
Brackets with mounting screws and washers		Wall bracket for KP	1	060-105566
		Angle bracket for KP	1	060-105666
Screwed cable entry		PG 13.5 with special nut For 6 –14 mm diameter cables	1	060-105966
Sealing screw		For sealing the setting on KP	2	060-105766
Top cover		If a bracket is mounted on the backplate of the housing, the KP thermostats will have an IP44 grade of enclosure. The cover protects the setting spindles	1	060-109766
Protective cap		Protective cap for KP pressure switches and thermostats. To protect the unit against rain and humidity. Grade of enclosure: IP44 Material: Polyethylene Max. ambient temperature: 65 °C Min. ambient temperature: -40 °C	1	060-003166
IP55 non-transparent enclosure		If the unit risk being exposed to heavy water influence a better grade of enclosure can be achieved when mounting product in a special IP55 enclosure	1	060-033066
IP55 transparent enclosure		If the unit risk being exposed to heavy water influence a better grade of enclosure can be achieved when mounting product in a special IP55 enclosure	1	060-062866

Technical data

Dual pressure switch

Ambient temperature [°C]	-40 – 65 °C (for max. 2 hours up to 80 °C)	
Media temperature [°C]	Max. 100 °C	
Fluid	Liquids	
Parts in contact with fluid	Bellows	Phosphor bronze, CuSn6
	Pressure connector	Free-cutting steel (nickel plated)
Contact system		
Contact load, Silver	Alternating current: AC-1: 16 A, 400 V AC-3: 16 A, 400 V AC-15: 10 A, 400 V	
	Direct current: DC-13: 12 W, 220 V	
IP level	IP22	
Cable entry	Rubber cable gland entry for 6 – 14 mm diameter cables	
Mounted on backplate or wall bracket	Vibration-proof in the range 0 – 1000 Hz, 4 g [1 g = 9.81 m/s ²]	
Mounting on angle bracket	Not recommended for areas where vibration occurs	

Ordering

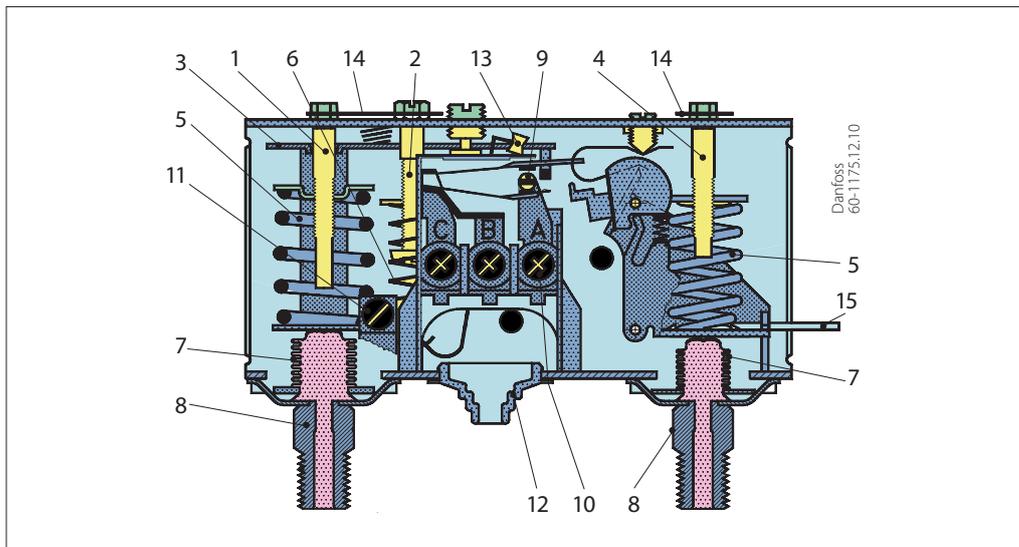
Pressure switch, type KP 44

Pressure range		Differential		Permissible operating pressure p _e [bar]	Max. test pressure [bar]	Pressure connection	Contact material	Code no.
Control [bar]	Safety [bar]	Control [bar]	Safety [bar]					
2.0 – 12.0	0.5 – 6.0	0.7 – 4.0	1.0	Left side: 17 Right side: 17	Left side: 25 Right side: 19	2 × G 1/4 A	silver	060-001366

Design / Function

Key contact system of KP 44 pressure switch

1. Lefthand pressure setting spindle
2. Differential setting spindle
3. Main arm
4. Righthand pressure setting spindle
5. Main spring
6. Differential spring
7. Bellows
8. Pressure connections
9. Contact system
10. Terminal
11. Earth terminal
12. Cable entry
13. Tumbler
14. Locking plate
15. Impulse lever

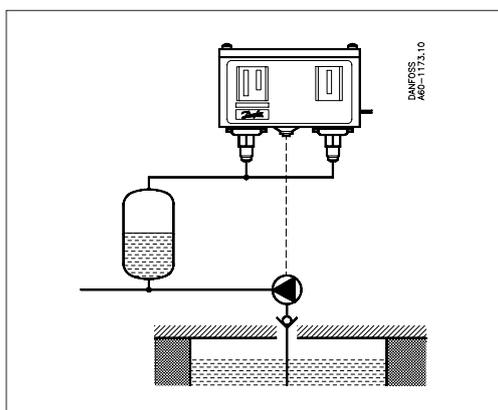


Water supply from reservoir or well

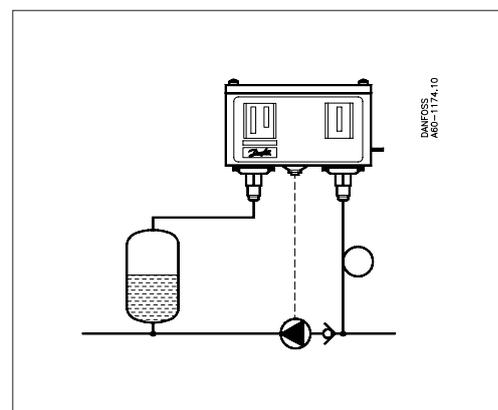
The contact system in the KP 44 has a snap-action function and allows the bellows moves only when the cut-in or cut-out value is reached. If water is running short in the well or reservoir, the pump will no longer be able to increase the pressure to the cut-out value. Consequently the pump will keep running - perhaps without water. However, the KP 44 pressure switch will stop the pump as soon as the righthand bellows pressure drops below the safety cut-out setting. The pump can be started again by lifting the impulse lever. The pump will continue to operate when the impulse lever is released, provided that the righthand bellows pressure is higher than the safety cut-out setting plus a fixed differential of 1 bar. If this is not the case, the pump will cut-out again indicating insufficient water supply.

Pressurized water supply direct to pump

When water supply fails on the inlet side, the pump will no longer be able to boost the pressure to the cut-out value. Consequently the pump will keep running - perhaps without water. However, the KP 44 pressure switch will stop the pump as soon as the pressure in the pump suction line drops below the safety cut-out setting. The pump will automatically start again when the pump suction pressure has reached the level of 1 bar above the safety cut-out setting. Automatic start-up will only take place if the righthand bellows is connected to the pump suction line. Air pockets should be avoided to prevent the pump from starting up on air pressure rise, without the presence of water.



In a hydrophore system where water is pumped from a well or an open tank, both bellows are connected to a pressure outlet on the air side in the pump pressure line, if possible.



In a booster system receiving pressurized water the righthand bellows is connected

- to the low pressure side of the pump for automatic start-up
- to the high pressure side of the pump for manual start-up

The lefthand bellows is always connected to the high pressure side of the pump.

Setting
Safety cut-out setting

The righthand bellows will automatically cut-out the pump at the safety cut-out setpoint. Automatic start-up, if any, will take place when the pressure has reached the level of 1 bar above the setpoint. Manual cut-in is made by lifting the impulse lever and releasing it again when the pressure has increased by min. 1 bar.

The safety cut-out setpoint is normally determined by the static pressure (the water column). However, in order to avoid disturbing signal interaction, care should be taken to ensure that the safety cut-out setting is at least 1.5 bar lower than the control pressure cut-in setting. See table with pressure setting examples below.

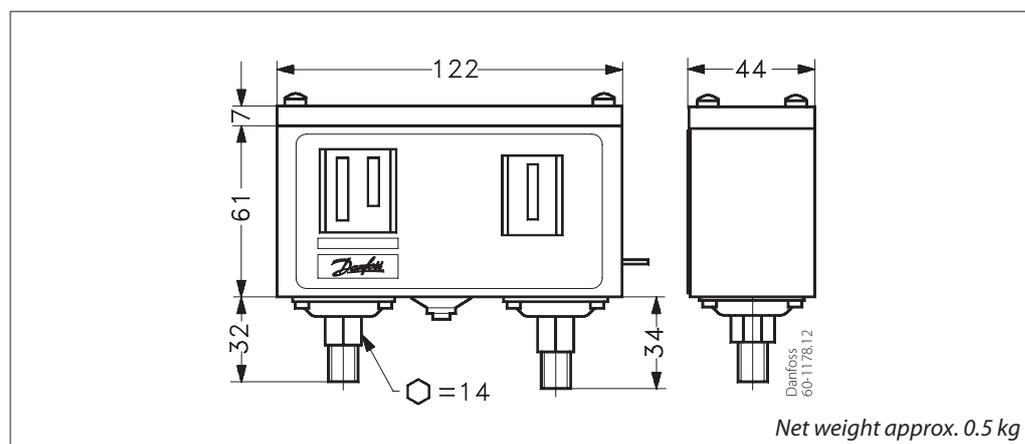
Required tap water pressure	≥ 2.3 bar	≥ 4.0 bar	≥ 5.0 bar	≥ 8.0 bar
Control pressure cut-out setting	3.0 bar	5.0 bar	8.0 bar	12 bar
Differential	0.7 bar	1.0 bar	3.0 bar	4.0 bar
Control pressure cut-in setting	2.3 bar	4.0 bar	5.0 bar	8.0 bar
Max. safety cut-out setting	0.8 bar	2.5 bar	3.5 bar	6.0 ¹⁾ bar

¹⁾6.0 bar is the normal max. setpoint

Control pressure settings

Control pressure cut-out setpoint is set on the lefthand pressure setting scale.

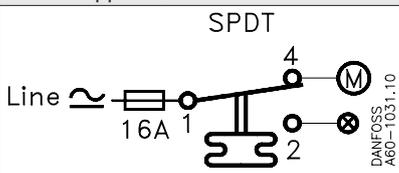
The differential is set between 0.7 and 4 bar. The control pressure cut-in setting will be the cut-out control pressure less the differential.

Dimensions[mm] and weights [kg]

Accessories for KP 44 pressure switches

Part	Symbol	Description	Total	Code no.
Brackets with mounting screws and washers		Wall bracket	1	060-105566
		Angle bracket	1	060-105666
Screwed cable entry		Screwed cable entry Pg 13.5 with special nut for 6 – 14 mm cables	1	060-105966
Sealing screw		For sealing the setting on KP	2	060-105766

Technical data

Single thermostat

Ambient temperature [°C]	-40 – 65 °C (for max. 2 hours up to 80 °C)
Sensor material	Tinned copper Cu/Sn5
Contact system	 <p>Single-pole double throw (SPDT)</p>
Contact load, Silver	Alternating current: AC-1: 16 A, 400 V AC-3: 16 A, 400 V AC-15: 10 A, 400 V Direct current: DC-13: 12 W, 220 V
Contact load, Gold plated contact set	See Information page 15
Enclosure, IP30 grade	Unit must be mounted on a flat surface / a flat fitting and all unused holes covered
Enclosure, IP44 grade	Mounted as IP30 plus fitting of top cover, code no. 060-109766
Enclosure, IP55 grade	Unit mounted in a special IP55 enclosure, code no. 060-033066 or 060-062866. Exception: KP 75
Cable entry	Entry for 6 – 14 mm diameter cable
Mounted on backplate or wall bracket	Vibration-proof in the range 0 – 1000 Hz, 4 g [1 g = 9.81 m/s ²]
Mounted on angle bracket	Not recommended for areas where vibration occurs

Ordering

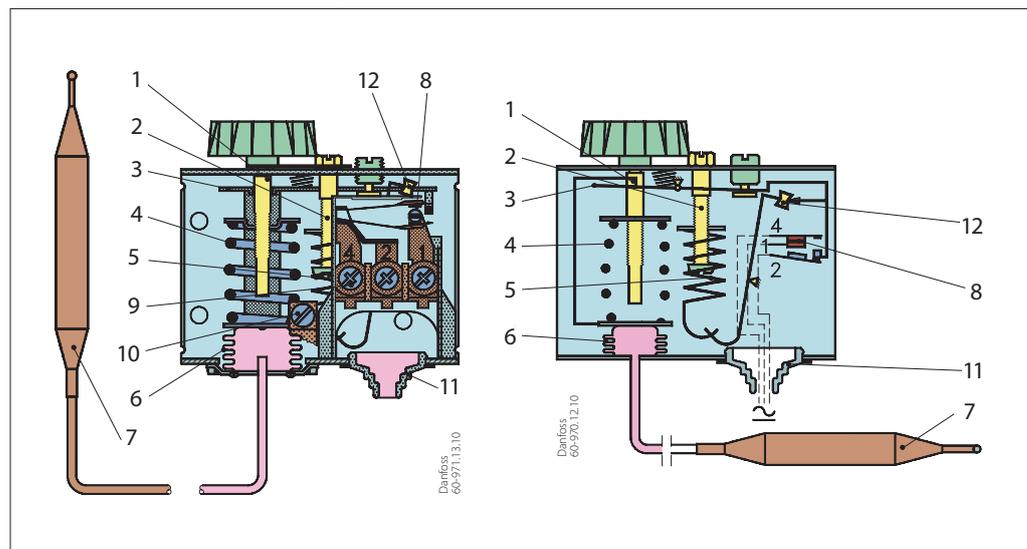
Thermostat, types KP 75 – KP 81

Type	Setting range [°C]	Differential [°C]	Max. sensor temperature [°C]	Capillary tube length [m]	Contact material	Code no.
KP 75	0 – 40	3 – 10	80	Room sensor	silver	060L121266
	0 – 40	3 – 10	80	Room sensor	gold-plated	060L117166
KP 78	30 – 90	5 – 15	150	2	silver	060L118466
KP 79	50 – 100	5 – 15	150	2	silver	060L112666
KP 81	80 – 150	7 – 20	200	2	silver	060L112566
KP 81	80 – 150	7 – 20	200	3	silver	060L118366
KP 81	80 – 150	7 – 20	200	5	silver	060L117066
KP 81 (max. reset)	80 – 150	8 (max. reset)	200	2	silver	060L115566

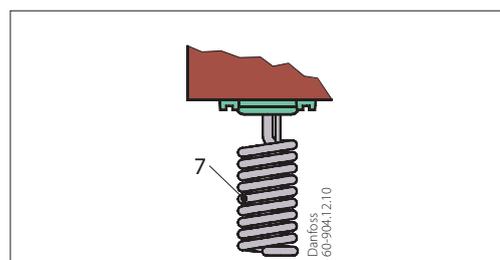
Design / Function

1. Temperature setting spindle
2. Differential setting spindle
3. Main arm
4. Main spring
5. Differential spring
6. Bellows
7. Sensor
8. Contact system
9. Connection terminals
10. Earth terminal
11. Cable entry
12. Tumbler

Key sketch of KP thermostat, types KP 78, KP 79, KP 81



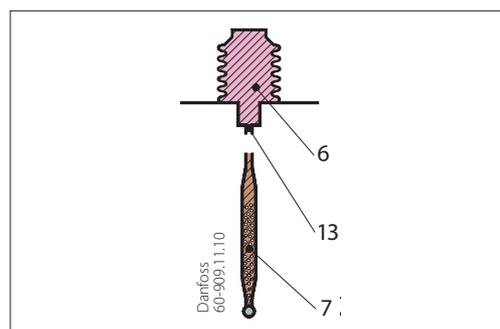
KP 75 room sensor



The contact system in KP thermostats has a snap function. This means that the bellows is active only when the cut-in or cut-out value is reached.

Charges

6. Bellows
7. Sensor
13. Capillary tube



Absorption charge

The charge consists partly of a superheated gas and partly of a solid substance with a large absorption surface. The solid substance is concentrated in the sensor (7), and consequently it is always the sensor that comprises the temperature-regulating part of the thermostatic element. The sensor can be placed both warmer or colder than the thermostat housing and capillary tube. However, placing it in an ambient temperature higher or lower than 20 °C can affect the accuracy of the scale.

Setting

Thermostats with automatic reset

Set the upper limit temperature on the range scale. Then set the differential on the DIFF scale. The temperature set on the range scale is also the temperature at which contact changeover re-occurs on rising temperature. The contacts changeover when the temperature has fallen to a value lower than that set on the DIFF scale. If at lower settings the plant will not start/stop, the reason might be that the differential has been set too high.

Thermostats with minimum reset

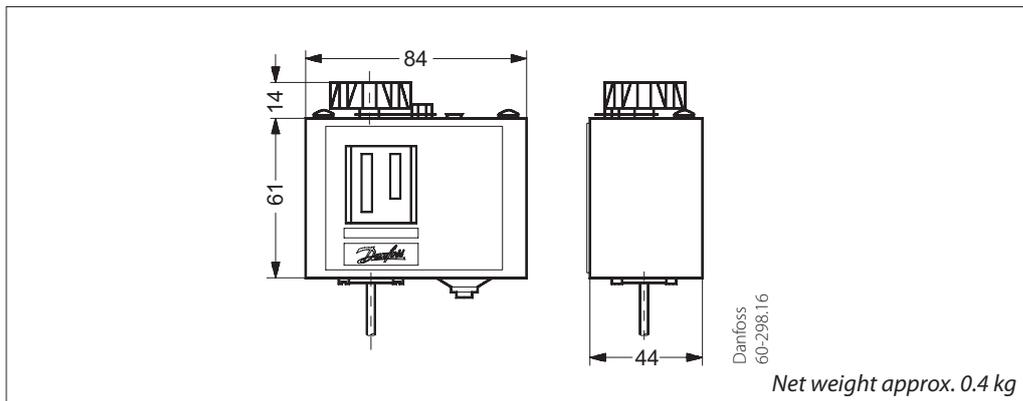
Set the temperature on the range scale. The differential setting is fixed. Min. reset units will restart after the temperature at the thermostat sensor has risen by a value greater than that of the fixed differential.

Thermostats with maximum reset

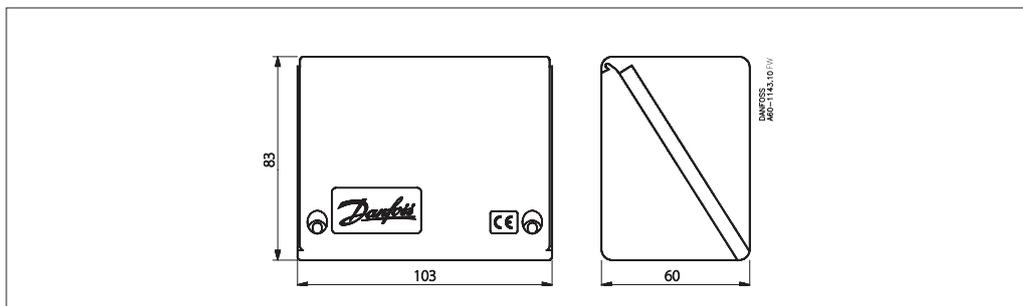
Set the stop temperature on the range scale. The differential setting is fixed. Max. reset units will restart after the temperature at the thermostat sensor has fallen by a value greater than that of the fixed differential.

Dimensions [mm]
and weights [kg]

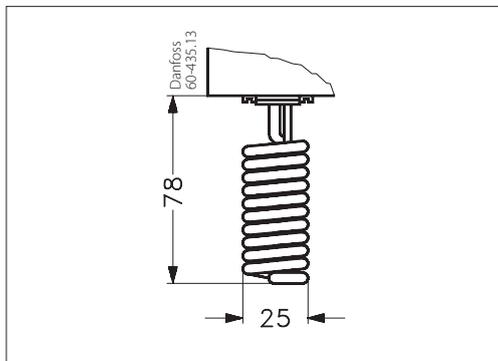
Thermostat, types KP 75, KP 78, KP 79, KP 81



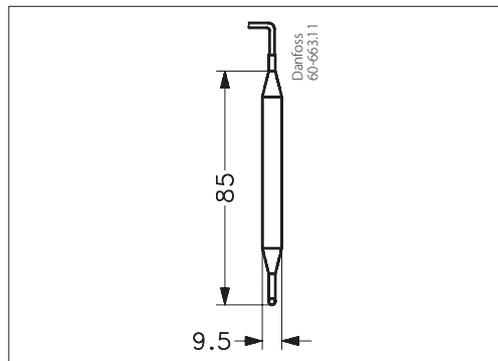
IP55 enclosure



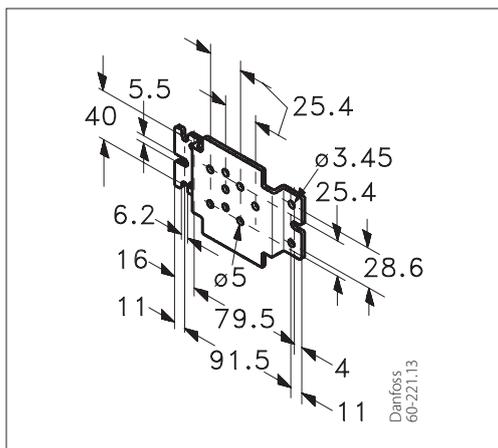
KP 75 Sensor: Tinned copper Cu/Sn 5



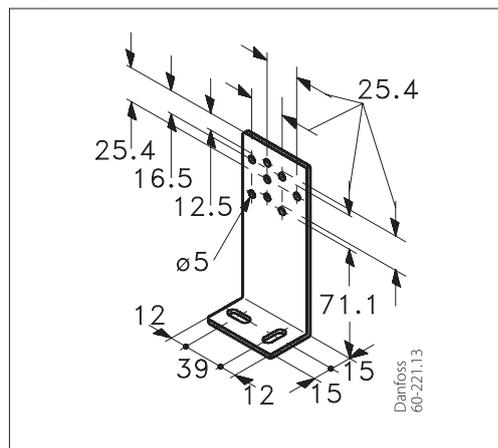
KP 78, 79, 81 Sensor: Tinned copper Cu/Sn 5



Wall bracket



Angle bracket

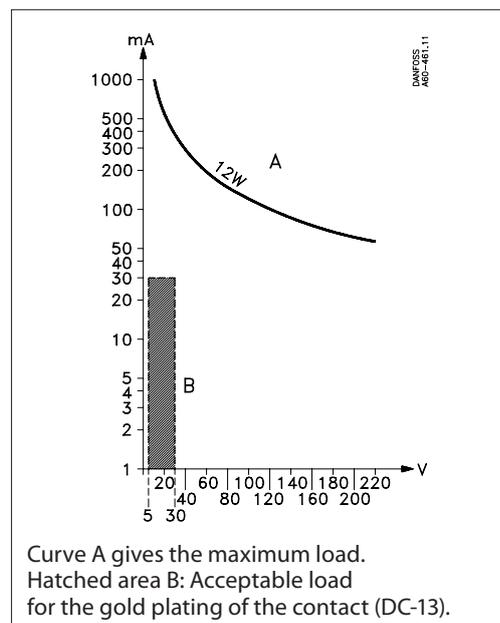


Accessories for KP thermostats

Part	Symbol	Description	Total	Code no.
Brackets with mounting screws and washers		Wall bracket for KP	1	060-105566
		Angle bracket for KP	1	060-105666
Sensor holder	<p>dia. 3/8 in. dia. 9.5 → 10mm</p>	Sensor holder for wall mounting with four capillary tube clips and 9-off 12 mm pins	1	017-420166
Screwed cable entry		PG 13.5 with special nut For 6 – 14 mm diameter cables A standard Pg 16 cable entry can be used for 8 – 16 mm diameter cables	1	060-105966
Sealing screw		For sealing the setting on KP	2	060-105766
Top cover		If a bracket is mounted on the backplate of the housing, the KP thermostats will have an IP44 grade of enclosure. The cover protects the setting spindles	1	060-109766
Protective cap		Protective cap for KP pressure switches and thermostats. To protect the unit against rain and humidity. Grade of enclosure: IP44 Material: Polyethylene Max. ambient temperature: 65 °C Min. ambient temperature: -40 °C	1	060-003166
Sensor pocket	<p>DANFOSS A17-3574.14</p>	For all KP thermostats with cylindrical remote sensor. Sensor pocket, gasket and union for screwing into G $\frac{1}{2}$ connectors welded onto tubes, containers, etc.		
		Int. diameter 9.6 mm, insert depth 112 mm (brass). Ext. diameter 11 mm	1	017-437066
		Int. diameter 9.6 mm, insert depth 112 mm (st 18/8). Ext. diameter 11 mm	1	017-436966
		Int. diameter 9.6 mm, insert depth 465 mm (brass). Ext. diameter 11 mm	1	017-421666
	<p>bar</p> <p>200 150 100 60 40 30 20</p> <p>Brass Stainless steel</p> <p>-40 0 20 60 100 140 180 220 240 280 °C</p> <p>Permissible pressure of sensor pipe medium</p> <p>DANFOSS A16-414.12</p>	Media temperature for sensor: 250 °C This temperature can be increased by applying a different gasket material		
Heat-conductive aluminium paste	<p>Tube</p>	For KP and RT thermostats with sensor mounted in a sensor pocket. Temperature range: -20 – 150 °C (short-lived 220 °C) Tube with 5 g aluminium paste	1	041E0114

General information
Gold contacts

Contact material	Gold-plated silver
Contact system	<p>SPDT</p> <p>Line</p> <p>DANFOSS A60-969.10</p> <p>Single-pole double throw (SPDT)</p>
Contact load (when Au surface is burnt away)	<p>Alternating current:</p> <p>Ohmic load: AC-1: 10 A, 440 V</p> <p>Inductive load: AC-3: 6 A, 440 V</p> <p>AC-15: 4 A, 440 V</p> <p>Direct current: DC-13: 12 W, 220 V</p>



Terminology

Range setting / Set point

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

Manual reset

A unit with manual reset can only be restored to operational mode by activation of the external reset button.
Min. reset units will restart after the pressure has risen by a value greater than that of the fixed differential.
Max. reset units will restart after the pressure has fallen by a value greater than that of the fixed differential.

Permissible operating pressure

The highest permissible constant pressure or pressure variation the unit can be exposed to.

Maximum working pressure

The maximum permissible pressure for safe functioning of a heating system or any of its parts.

Snap function

A specific contact force is maintained until snap is initiated. The time over which contact force reaches zero is a few milliseconds; therefore, contact bounce cannot occur as a result, for example, of slight vibrations before cut-out.
The snap-action contact system will continue to function even when micro-welds are created between the contacts during cut-in.
The force created to separate the contacts is strong, and instantly shears off all contact surface welds that have been created as the result of cut-in action.
These design features ensure that the cut-out point of the KP control remains very accurate and completely independent of the magnitude of the current load.

Differential

The difference between contact changeover on rising and falling pressure.
The differential is a condition for stable automatic plant operation.

Automatic reset

Units with automatic reset restart automatically after stop.

Maximum test pressure

The maximum pressure applied in strength or leakage tests on heating system or components thereof.

Current ratings:

AC – 1

The alternating current rating, in amperes, of the non-inductive, slightly inductive loads or resistive furnaces

AC – 3

The alternating current rating, in amperes, of the squirrel-cage motors: starting, plugging, inching

AC – 15

The alternating current rating, in amperes, of electromagnetic loads (>72VA)

DC – 13

The direct current rating, in amperes, of electromagnets