

Pressure switches and thermostats, types KP and KPI



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ISO 9001 quality approval



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.

Features



- Wide regulating range
- Can be used for pumps and compressors
- Small dimensions.
Space-saving – easy to install in panels
- Shock and impact resistant
- Ultra-short bounce times.
Limits wear to an absolute minimum and increases reliability
- Electrical connection from front of unit. Makes rack mounting easier and also saves space
- Suitable for both alternating current and direct current
- Cable entry for 6-14 mm diameter cables
- Screwed cable entry makes rewiring easy.
Standard screwed cable entry
Pg 13.5 and Pg 16

Description

Danfoss KP/KPI pressure switches are used for regulating, monitoring and alarm systems in industry.
KP pressure switches are recommended for gaseous media (also water, but only when mounted directly on the pipe - do not use capillary tube mounting).

KPI pressure switches are suitable for plant in connection with liquid and gaseous media. The pressure switches are fitted with a single-pole switch changeover (SPDT). The position of the switch depends on the setting of the pressure control and the pressure in the connector.

Definitions

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

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.
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.

Ordering

Pressure switches type **KP 35 and 36**

Setting range p_e [bar]	Differential [bar]	Permissible operating pressure p_e [bar]	Max. test pressure [bar]	Pressure connection	Contact material	Code no.	Type
-0.2 → 7.5	0.7 → 4	17	22	G ¼ A	Ag	060-113366	KP 35
					Au	060-504766	
2 → 14	0.7 → 4	17	22	G ¼ A	Ag	060-110866	KP 36
					Au	060-113766	
4 → 12	0.5 → 1.6	17	22	G ¼ A	Ag	060-122166	KP 36
					Au	060-114466	

Pressure switches type **KPI 35 - 38**

Setting range p_e [bar]	Differential [bar]	Permissible operating pressure p_e [bar]	Max. test pressure [bar]	Pressure connection	Contact material	Code no.	Type
-0.2 → 8	0.4 → 1.5	18	18	G ¼ A	Ag	060-121766	KPI 35
					Au	060-316466	
-0.2 → 8	0.5 → 2	18	18	G ¼ A	Ag	060-121966	KPI 35
4 → 12	0.5 → 1.6	18	18	G ¼ A	Ag	060-118966	KPI 36
					Au	060-113866	
2 → 12	0.5 → 1.6	18	18	G ¼ A	Ag	060-316966	KPI 36
8 → 28	1.8 → 6	30	30	G ¼ A	Ag	060-508166	KPI 38

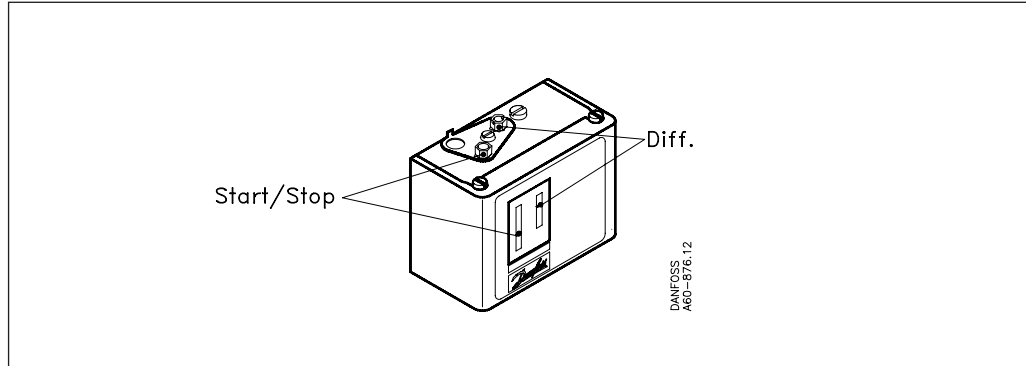
Technical data

Description		KP 35, 36	KPI 35, 36	KPI 38
Ambient temperature °C		-40 °C - +65 °C (for short periods up to +80 °C)		
Media temperature °C		-40 °C - +100 °C		
Media		Gaseous media (also water, but only when mounted directly on the pipe - do not use capillary tube mounting).	Gaseous media and liquids	
Parts in contact with medium	Bellows	Tinbronze W.no. 2.1020 to DIN 17662	Tinbronze W.no. 2.1020 to DIN 17662	
	Pressure connector	Free-cutting steel (nickel plated) W. no. 1.0737 to EN 10277-3	Brass W. no. 2.0401 to DIN 17660	Free-cutting steel (nickel plated) W. no. 1.0737 to EN 10277-3
Contact system		<p>Single-pole changeover switch (SPDT)</p>		
Contact load, Ag contact set	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		
Contact material AgCdO	Direct current: DC-13 12 W, 220 V	Direct current: DC-13 12 W, 220 V		
Contact load, Au contact set	See information page 4			
Enclosure, IP 33 grade	Unit must be mounted on a flat surface/ a flat fitting and all unused holes covered			
Enclosure, IP 44 grade	Mounted as IP 33 plus fitting of top cover, code no. 060-109766			
Cable connection	Entry for 6-14 mm diameter cables			
Mounted on back plate/ wall bracket	Vibration proof in the range 0 to 1000 Hz, 4 g (1 g = 9.81 m/s ²)			
Mounted on angle bracket	Not recommended in areas where vibrations occur			
Approvals	EN 60 947-4,5 RINA, Registro Italiano Navale RMRS, Maritime Reg. of Shipping, Russia UL approved version are available CCC, China Compulsory Certificate		EN 60 947-4,5	

Setting

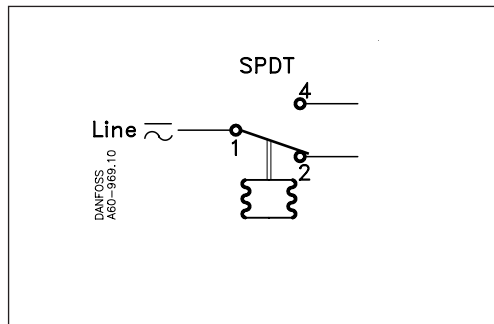
KP/KPI pressure switches with automatic reset:
Set the upper limit pressure on the range scale

Then set the lower limit pressure on the DIFF scale (the upper limit minus the differential).



Gold contacts

Contact system
Single-pole changeover switch (SPDT) Contact material: Gold-plated silver



Contact load (when Au surface is burnt away)

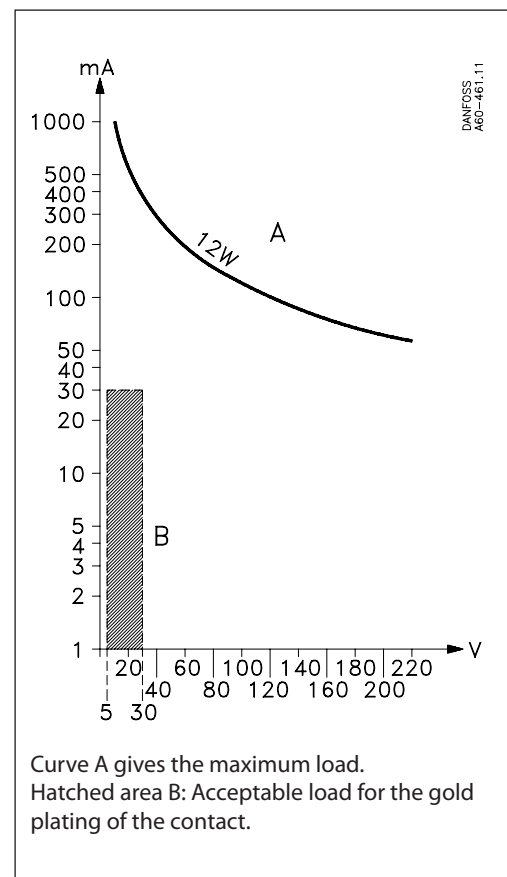
Alternating current:

Ohmic load: AC-1: 10 A, 440 V

Inductive load: AC-3: 6 A, 440 V

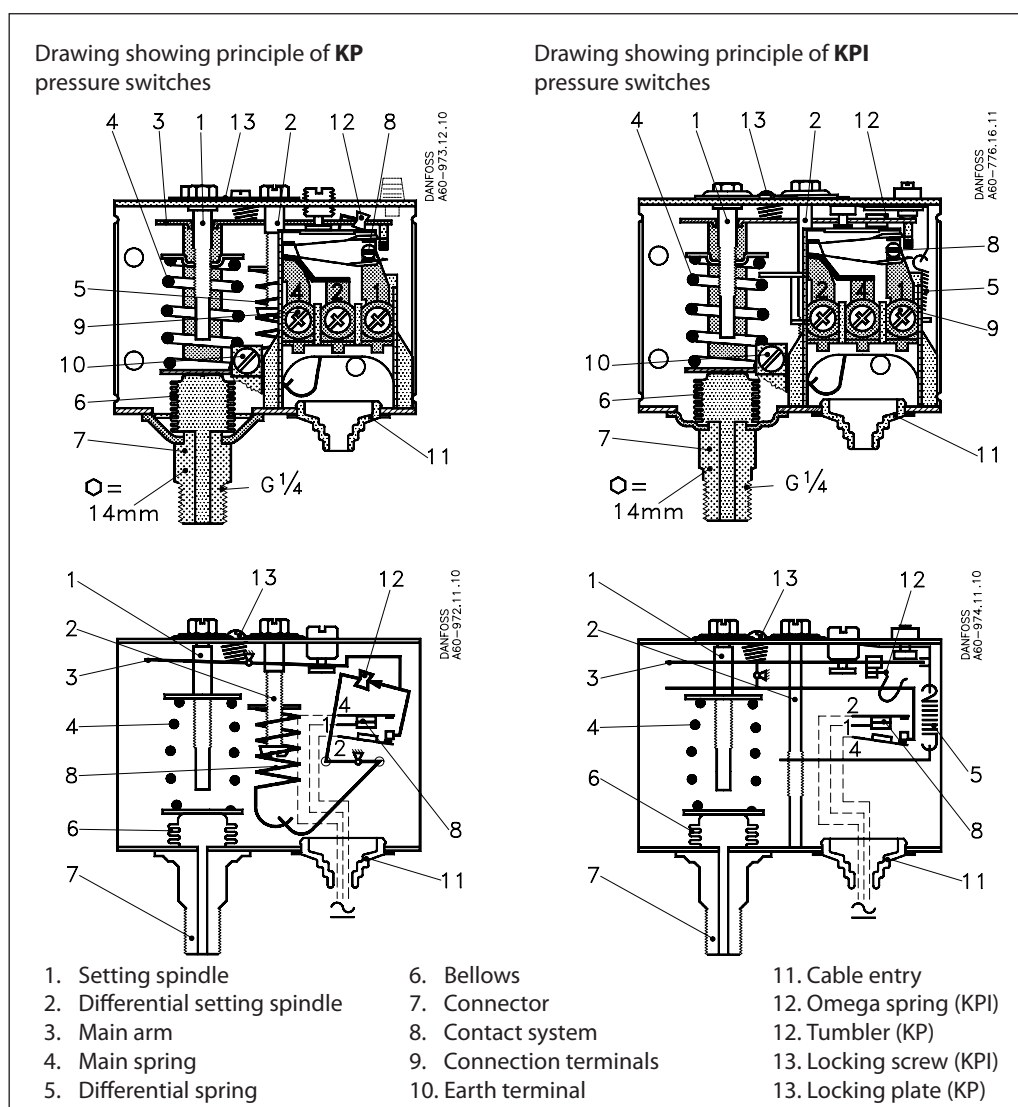
AC-15: 4 A, 440 V

Direct current: DC-13 12 W, 220 V,



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

Design and function



KP features

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).

The design of KP pressure switches gives the following advantages:

- High contact load
- Ultra-short bounce times
- Vibration-proof in the range 0-1000 Hz, 4 g (1 g = 9.81 m/s²)
- Long operating life
- High pulsation protection
- Small dimensions – Easy to mount in panels

KPI features

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

The design of KPI pressure switches gives the following advantages:

- High contact load
- Ultra-short bounce times
- Vibration-proof in the range 0-1000 Hz, 4 g (1 g = 9.81 m/s²)
- Long operating life
- Can be used for both liquids and gases
- Small dimensions – Easy to mount in panels

Dimensions and weights

Pressure switches KP 35, KP 36, KPI 35, KPI 36 and KPI 38:
Weight approx. 0.3 kg

Accessories for KP/ KPI pressure switches

Part	Symbol	Description	Total	Code no.
Brackets with mounting screws and washers		Wall bracket	10	060-105566
		Angle bracket	10	060-105666
Screwed cable entry		Screwed cable entry Pg 13.5 with special nut for 6-14 mm cables A standard Pg 16 screwed cable entry can be used for 8-16 mm cables	5	060-105966
Sealing screw		For sealing the setting on KP	20	060-105766
Top cover		If a bracket is mounted on the bracketplate of the housing, the KP/KPI pressure switch will have an IP 44 grade of enclosure. The cover covers the setting spindles	10	060-109766
Protective cap		Protective cap for KP/KPI pressure switches. To protect the unit against rain and humidity. Grade of enclosure: IP 44 Material: Polyethylene Max. ambient temperature: 65°C Min. ambient temperature: -40°C	7	060-003166

Features



- Wide regulating range
- Can be used for pumps and compressors
- Small dimensions.
Space-saving – easy to install in panels
- Ultra-short bounce times.
Limits wear to an absolute minimum and increases reliability
- Electrical connection from front of unit. Makes rack mounting easier and also saves space
- Suitable for both alternating current and direct current
- Cable entry for 6-14 mm diameter cables
- Screwed cable entry makes rewiring easy.
Standard screwed cable entry
Pg 13.5 and Pg 16
- Efficient protection of water pumps in case of water supply fails.

Description

Danfoss dual pressure switch KP 44 is designed for use as a pump guard to control and protect supply water pumps. The KP 44 pump guard combines the function of a pressure switch and a flow monitoring device.

The lefthand pressure bellows switches the pump pressure. The righthand bellows cuts out the pump if the pump suction pressure is too low. In this way the pump is protected from running dry and consequent bearing damage.

Definitions

Range setting

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

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.

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.

Ordering

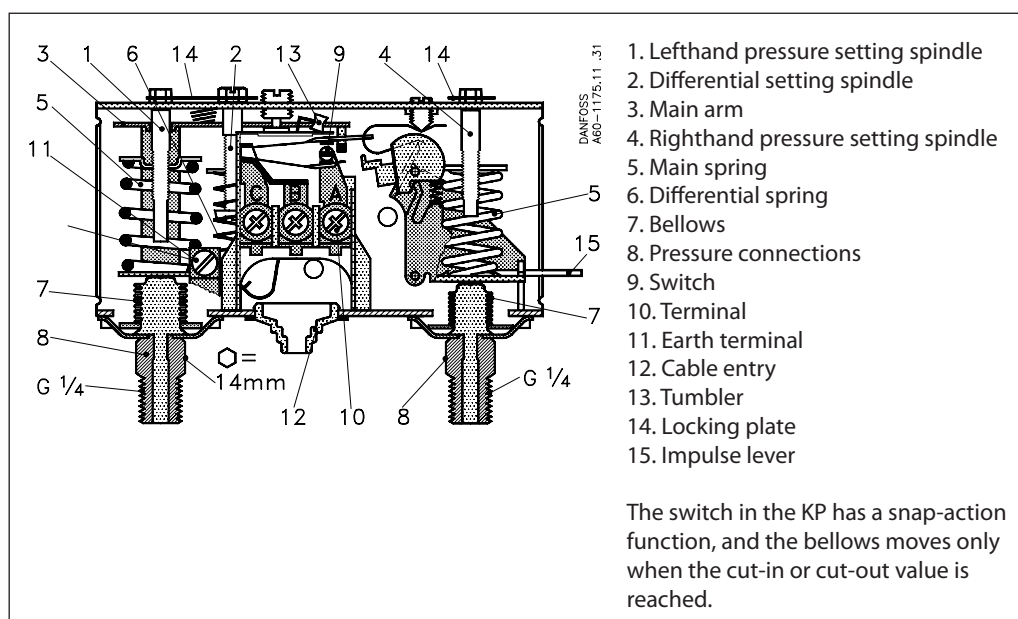
Pressure switch type KP 44, IP 22

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 → 12	0.5 → 6	0.7 → 4.0	1.0	LP/HP: 17	22	2 × G ¼ A	Ag	060-001366

Technical data

Ambient temperature °C		-40°C to +65°C (for short periods up to +80°C)
Media temperature °C		Max. + 100°C
Media		Fresh water
Parts in contact with media	Bellows	Tinbronze W.no. 2.1020 to DIN 17662
	Pressure connector	Free-cutting steel (nickel plated) W. no. 1.0737 to EN 10277-3
Contact material AgCdO		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
Approvals		EN 60 947-4.-5
Cable connection		Entry for 6-14 mm diameter cables
Mounted on backplate or wall bracket		Vibration-proof in the range 0-1000 Hz, 4g (1g = 9.81m/s ²)
Mounting on angle bracket		Not recommended for areas where vibration occurs

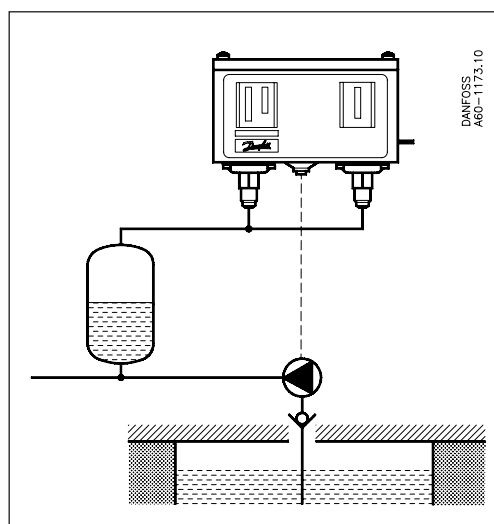
Design and function



Water supply from reservoir or well

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 pump guard 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.

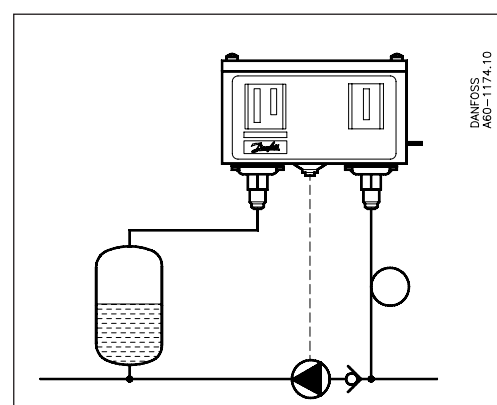


In a hydrophore system where water is pumped from a well or an open tank, both bellows are connected to a pressure outlet on the air side in the pump pressure line, if possible.

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 pump guard 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 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.

Pressure settings

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* bar

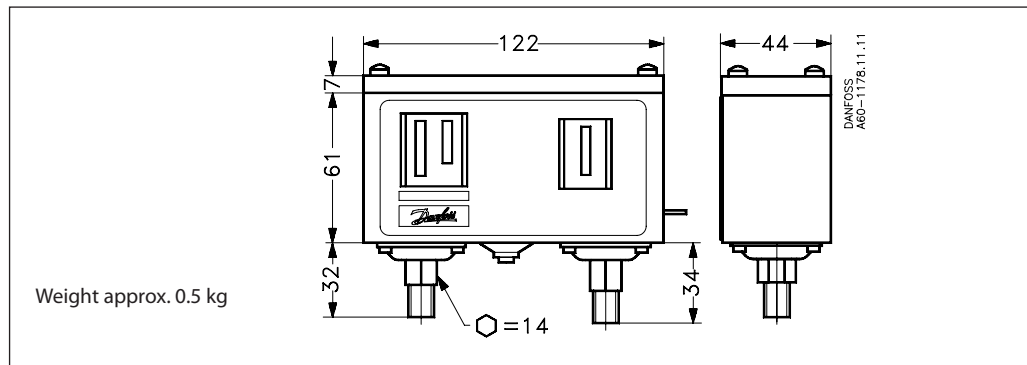
* 6.0 bar is the normal max. setpoint

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 and weight



Accessories for KP 44 pressure switches

Part	Symbol	Description	Total	Code no.
Brackets with mounting screws and washers		Wall bracket	10	060-105566
		Angle bracket	10	060-105666
Screwed cable entry		Screwed cable entry Pg 13.5 with special nut for 6-14 mm cables A standard Pg 16 screwed cable entry can be used for 8-16 mm cables	5	060-105966
Sealing screw		For sealing the setting on KP	20	060-105766

Features



- Wide regulating range
- Small dimensions
Space-saving - easy to install in panels
- Ultra-short bounce time.
Limits wear to an absolute minimum and increases reliability.
- Electrical connection at front of unit.
Makes rack mounting easier and also saves space
- Suitable for both alternating current and direct current
- Cable entry for 6-14 mm diameter cables
- Screwed cable entry makes rewiring easy
- Standard screwed cable entry Pg 13.5 and Pg 16

Description

Danfoss KP thermostats are used for regulating, monitoring and alarm systems in industry. KP thermostats are temperature-operated electric circuit breakers. The thermostats are fitted with a single-pole switch (SPDT)

The position of the switch depends on the thermostat setting and sensor temperature. A KP thermostat can be connected and switch to single-phase alternating current motors of up to about 2 kW.

Definitions

Differential

The difference between cut-in and cut-out temperature. The differential is a condition for stable automatic plant operation.

Mechanical differential (intrinsic differential)

The differential set on the differential spindle of the unit.

Working differential (thermal differential)

The differential on which the plant operates. The working differential is the sum of the mechanical differential and the differential arising from the time constant.

Reset

1. *Manual reset.*

Resets only when the reset button is pressed. Min. reset units will restart after the temperature at the thermostat sensor has risen by a value greater than that of the fixed differential. Max. reset units will restart after the temperature at the thermostat sensor has fallen by a value greater than that of the fixed differential

2. *Automatic reset.*

Units with automatic reset restart automatically after stop.

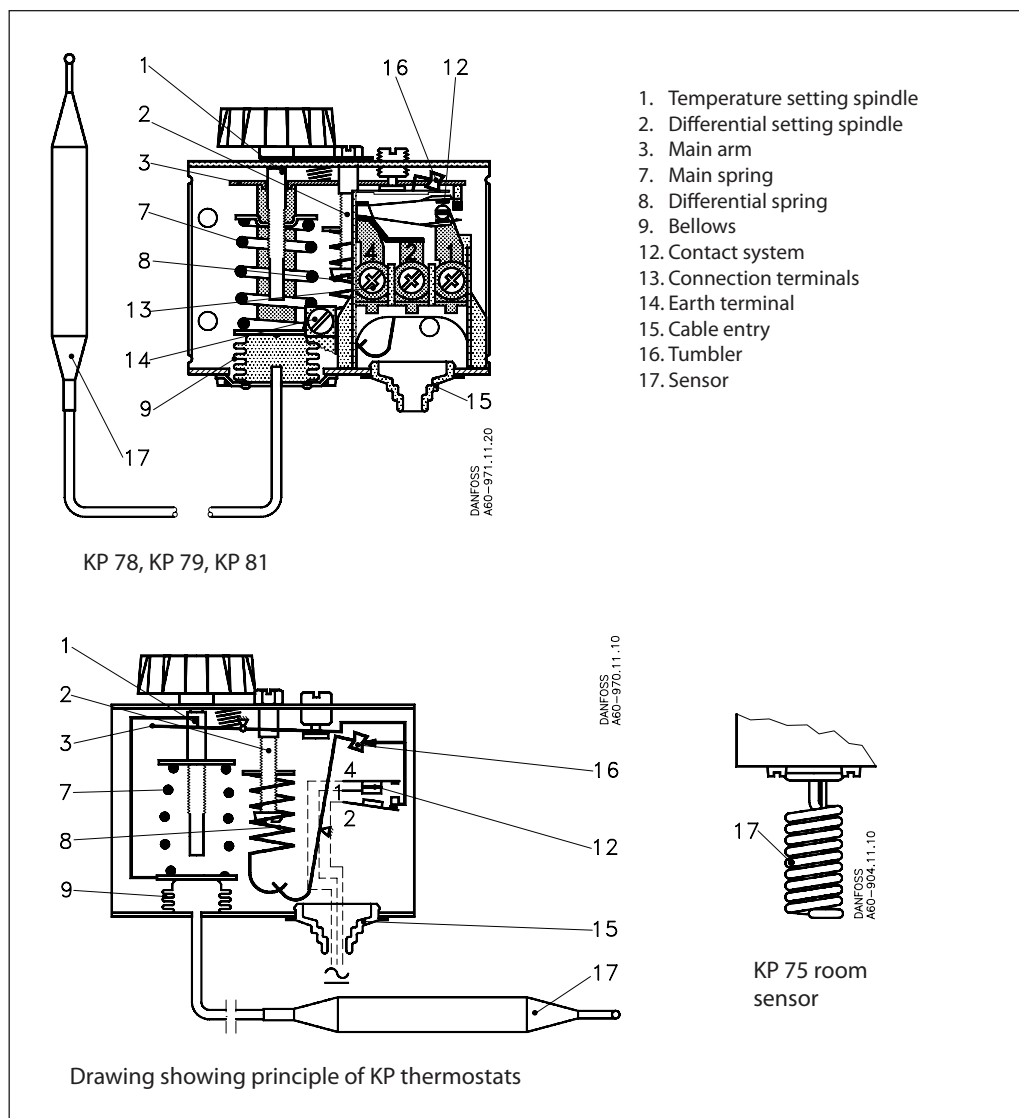
Ordering
Thermostats type KP 75 - KP 81

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

Technical data

Ambient temperature °C	-40 °C - +65 °C (for short periods up to +80 °C)
Sensor material	Tinned copper Cu/Sn5
Contact system	<p>Single-pole changeover switch (SPDT)</p>
Contact load, Ag contact set	Alternating current: AC-1: 16 A, 400 V AC-3: 16 A, 400 V AC-15: 10 A, 400 V
Contact material AgCdO	Direct current: DC-13: 12 W, 220 V
Contact load, Au contact set	See Information page 14
Enclosure, IP 33 grade	Unit must be mounted on a flat surface / a flat fitting and all unused holes covered
Enclosure, IP 44 grade	Mounted as IP 33 plus fitting of top cover, code no. 060-109766
Approvals	EN 60 947-4. -5 RINA, Registro Italiano Navale RMRS, Maritime Reg. of Shipping, Russia Bureau Veritas Germanischer Lloyd, Germany DNV, Det Norske Veritas, Norway UL approved version are available CCC, China Compulsory Certificate
Cable connection	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

Design and function



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.

The design of KP thermostats gives the following advantages:

- High contact load
- Ultra-short bounce times. Limits wear to an absolute minimum and increases reliability.
- Vibration-proof in the range 0-1000 Hz, 4 g (1 g = 9.81 m/s²)
- Long operating life

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

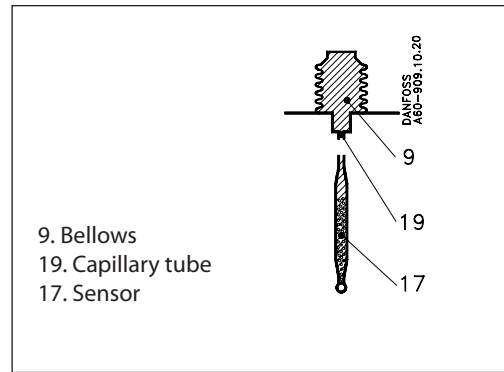
Charges

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 (17), and consequently it is always the sensor that comprises the temperature-regulating part of the thermostatic element.

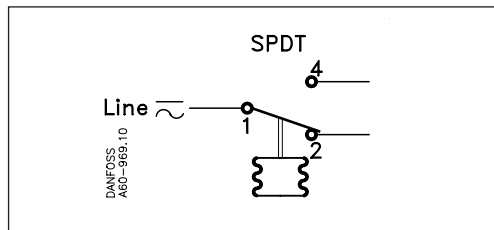
The sensor can be placed both warmer or colder than the thermostat housing and capillary tube. However, placing it in an ambient temperature higher or lower than +20 °C can affect the accuracy of the scale.



Gold contacts

Contact system

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

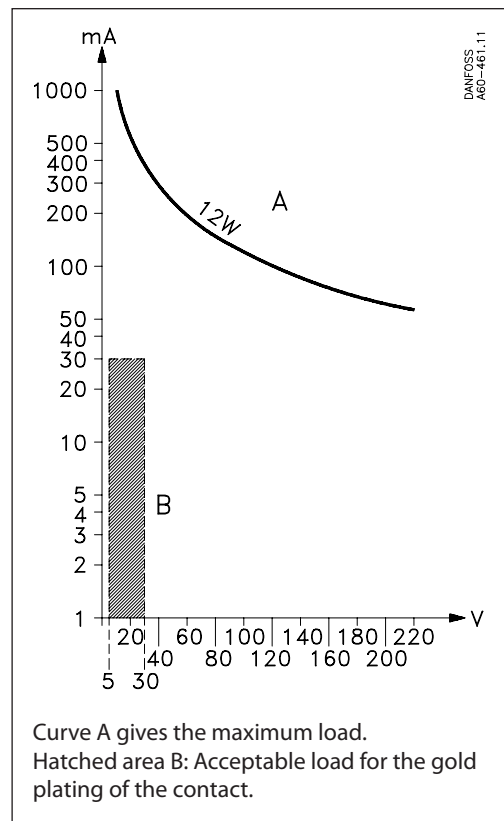


Contact load (when Au surface is burnt away)

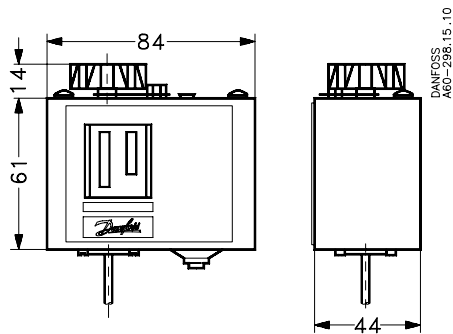
Alternating current:

- Ohmic load: AC-1: 10 A, 440 V
- Inductive load: AC-3: 6 A, 440 V
- AC-15: 4 A, 440 V

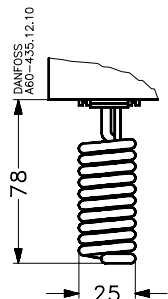
Direct current: DC-13: 12 W, 220 V



Dimensions and weight

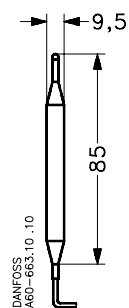


Thermostats KP 75, KP 78, KP 79, KP 81
Weight approx. 0.4 kg

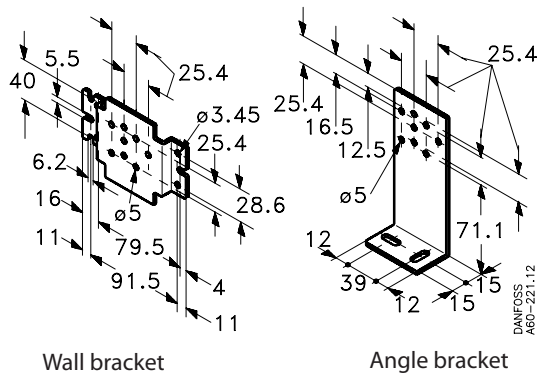


KP 62

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	10	060-105566
		Angle bracket for KP	10	060-105666
Capillary tube gland		Oil-resistant rubber gasket for max. 110°C and 90 bar	5	060-422066
Sensor holder		Sensor holder for wall mounting with four capillary tube clips and 9-off 12 mm pins	20	017-420166
Knob			20	060-106366
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	5	060-105966
Sealing screw		For sealing the setting on KP	20	060-105766
Top cover		If a bracket is mounted on the backplate of the housing, the KP thermostat will have an IP 44 grade of enclosure. The cover protects the setting spindles.	10	060-109766
Protective cap		Protective cap for KP thermostats. To protect the unit against rain and humidity. Grade of enclosure: IP 44 Material: Polyethylene Max. ambient temperature: 65°C Min. ambient temperature: -40°C	7	060-003166
Sensor pocket	<p>bar</p> <p>200 150 100 80 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 A60-414.12</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
		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 to 150°C (short-lived + 220°C)	1	041E0114
		Tube with 5 g aluminium paste		

IP 33/44 enclosure

IP 33 grade of enclosure is obtained by mounting the unit on a flat surface or a flat fitting and then covering all unused holes. IP 44 grade of enclosure is obtained by mounting the unit as for IP 33 grade of

enclosure and then fitting a top cover, code no. **060-109766**. Alternatively the unit can be mounted in a poly-ethylene protective cap, type no. **060-003166**.

IP testing

An IP grade of enclosure certification is obtained when the product has been submitted to an IP test. The IP classification contains two digits, the first IP digit denoting

the degree of enclosure against foreign bodies, the second digit denoting the degree of watertightness. The corresponding tests are as follows:

IP 1st digit	Foreign body test	IP 2nd digit	Watertightness test ¹⁾
0	No test	0	No test
1	A ball of Ø50 mm cannot enter	1	Vertically falling drops, dripping water
2	A ball of Ø12.5 mm and a test probe of Ø12 mm, L = 80 mm, cannot be inserted	2	Vertically (±15°) falling drops
3	A rod of Ø2.5 mm cannot enter	3	Water sprays ±60° from vertical
4	A wire of Ø1 mm cannot enter	4	Water sprays from all directions
5	As 4 + Dust in amounts that might cause damage cannot enter	5	Water jets from all directions, 12 l/mm
6	As 4 + Dust cannot enter	6	Water jets from all directions, 100 l/mm
		7	Immersion in 1 m water
		8	Subject to agreement

¹⁾ After all these tests, water in amounts that might cause damage must not have entered the enclosure and not have collected in electrically conductive parts or cable entries.

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