Pressure controls
Type KP

REFRIGERATION AND
AIR CONDITIONING

Technical leaflet

Contents

Introduction

KP pressure controls are for use in refrigeration and air conditioning systems to give protection against excessively low suction pressure or excessively high discharge pressure.
KP pressure controls are also used for starting and stopping refrigeration compressors and fans on air-cooled condensers.
KP pressure controls are fitted with a single-pole double-throw (SPDT) switch. The position of the switch is determined by the pressure control setting and the pressure at the connector.
KP pressure controls are available in IP 30 and IP 44 enclosures.

Features

- Ultra-short bounce times
- Reduces wear to a minimum and increases reliability.
- Manual control
- Electrical contact function can be tested without the use of tools.
- KP 2 with low differential for low-pressure regulation
- KP 6 for HP refrigerants (R 410A, CO_2)
- KP 6, 7 and 17 with fail-safe bellows element
- Vibration and shock resistant
- Compact design
- Fully welded bellows element
- High reliability both electronically and mechanically.

Approvals

CE-marked in accordance with EN 60947-4-5 for sale in Europe.

KP 6, 7 and KP 17: CE marked in accordance with PED 97/23/23/EC, category IV, safety equipment

Germanischer Lloyd, Germany

DIN 32733, Germany (KP1, KP2, KP7, KP17)

UL approval for USA and Canada

DNV, Det Norske Veritas, Norway

RINA, Registro Italiano Navale, Italy

BV, Bureau Veritas, France

LR, Lloyd's Register, UK

RMRS, Russian Maritime Register of Shipping, Russia

CCC, China Compulsory Certificate

Materials in contact with the medium

Unit type	Material
KP 1, 2, 5, 6, 7, 15 and 17	Tinbronze, no. 2.1020 to DIN 17662 Free cutting steel, no. 1.0737 / 1.0718 to DIN 1651
KP 1A, 5A, 6, 7A and 15A only	Stainless steel 18/8, no. 1.0737 / 1.0718 to DIN 17440 Free cutting steel, no. 1.0719 to DIN 1651 Steel, no. 1.0330 to DIN 1624 Aluminium, no. 3.0255 to DIN 1712

Technical data

Ambient temperature
−40 → +65°C (+80°C for max. 2 hours).

DIN-approved units:
−25 → +65°C (+80°C for max. 2 hours).

Max. working pressure
LP: PB = 17 bar
HP: PB = 32 bar
KP 6: PB = 46.5 bar

Max. test pressure
LP: p' = 20 bar
HP: p' = 35 bar
KP 6: p' = 46.5 bar

Contact load
Alternating current:
AC1: 16 A, 400 V
AC3: 16 A, 400 V
AC15: 10 A, 400 V
Max. starting current (L.R.): 112 A, 400 V

Direct current:
DC13: 12 W, 220 V control current

Properties according to EN 60947:

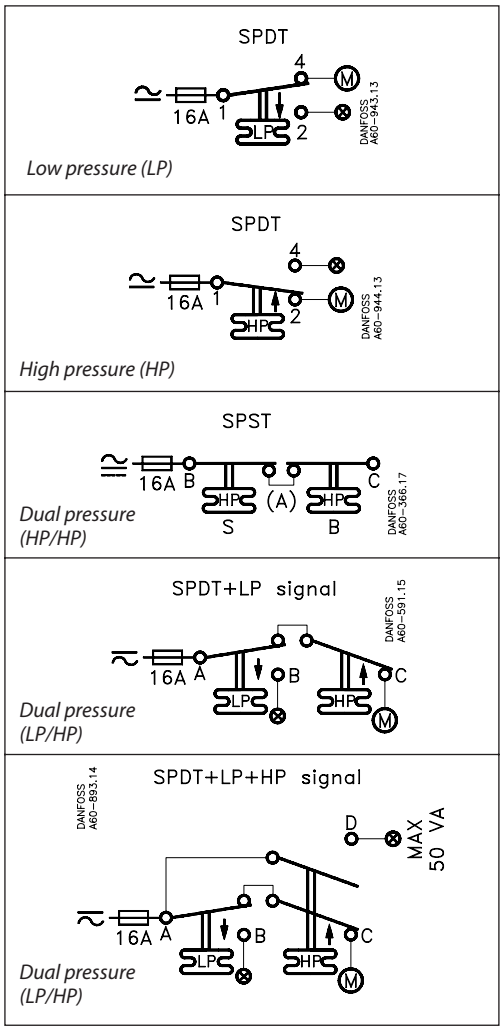
Wire dimensions	
solid/stranded	0.75 - 2.5 mm²
flexible, w/out ferrules	0.7 - 2.5 mm²
flexible, with ferrules	0.5 - 1.5 mm²
Tightning torque	max. 2 NM
Rated impulse voltage	4 kV
Pollution degree	3
Short circuit protection, fuse	10 Amp
Insulation	400 V
IP	30/44

Cable connection
The cable entry can be used for 6 → 14 mm dia. cables.
A Pg 13.5 screwed cable entry can also be used for 6 → 14 mm cable. With 8 → 16 mm cable a standard Pg 16 screwed cable entry can be used.

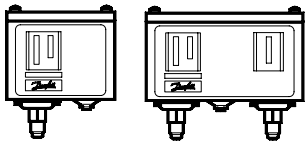
Enclosure
IP 30 to EN 60529 / IEC 60529
Enclosure IP 30 is obtained when the units without top cover are mounted on a flat surface or bracket. The bracket must be fixed to the unit so that all unused holes are covered.

IP 44 to EN 60529 / IEC 60529
Enclosure IP 44 is obtained when the units with top cover are mounted on a flat surface or bracket. The bracket must be fixed to the unit so that all unused holes are covered.
KP pressure controls with auto reset are supplied with top cover. For KP pressure controls with manual reset, the top cover must be separately ordered.

Contact systems



IP 55 to EN 60529 / IEC 60529
IP 55 is obtained when the KP pressure controls are mounted in an IP 55 enclosure, **(code no. 060-033066** for single pressure controls and **code no. 060-035066** for dual pressure controls). IP 55 enclosure has to be ordered separately.



Ordering

Pressure	Type	Low pressure (LP)		High pressure (HP)		Reset		Contact system	Code no.		
		Regulating range bar	Differential Δp bar	Regulating range bar	Differential Δp bar	Low pressure LP	High pressure HP		1/4 in. 6 mm flare	1/4 in. ODF solder	6 mm ODF solder
For fluorinated refrigerants											
Low	KP 1	−0.2 → 7.5	0.7 → 4.0			Aut.		SPDT	**060-110166**	**060-111266**	**060-111066**
Low	KP 1	−0.2 → 7.5	0.7 → 4.0			Aut.			**060-114166[1]**		
Low	KP 1	−0.9 → 7.0	Fixed 0.7			Man.			**060-110366**	**060-111166**	**060-110966**
Low	KP 2	−0.2 → 5.0	0.4 → 1.5			Aut.			**060-112066**		**060-112366**
High	KP 5			8 → 32	1.8 → 6.0		Aut.		**060-117166**	**060-117966**	**060-117766**
High	KP 5			8 → 32	Fixed 3		Man.		**060-117366**	**060-118066**	**060-117866**
Dual	KP 15	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Aut.	Aut.	SPDT + LP signal	**060-124166**	**060-125466**	
Dual	KP 15	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Aut.	Man.		**060-124366**		
Dual	KP 15	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Aut.	Man.		**060-114866[1]**		
Dual	KP 15	−0.9 → 7.0	Fixed 0.7	8 → 32	Fixed 4	Man.	Man.		**060-124566**		
Dual	KP 15	−0.9 → 7.0	Fixed 0.7	8 → 32	Fixed 4	Conv.[2]	Conv.[2]		**060-126166**		
Dual	KP 15	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Aut.	Aut.	SPDT + LP and HP signal	**060-126566**	**060-129966**	
Dual	KP 15	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Aut.	Man.		**060-126466**	**060-128466**	
Dual	KP 15	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Conv.[2]	Conv.[2]		**060-115466**	**060-001066**	
Dual	KP 15	−0.9 → 7.0	Fixed 0.7	8 → 32	Fixed 4	Conv.[2]	Conv.[2]		**060-122066**		

Pressure	Type	Low pressure (LP)		High pressure (HP)		Reset	Contact system	Code no.	
		Regulating range bar	Differential Δp bar	Regulating range bar	Differential Δp bar	LP/HP		M10 × 0.75 IP 44	1 m cap. tube with M10 × 0.75
For fluorinated refrigerants and R 717 (NH_3)									
Low	KP 1A	−0.2 → 7.5	0.7 → 4.0			Aut.	SPDT	**060-116266[4]**	**060-116066[4]**
Low	KP 1A	−0.9 → 7.0	Fixed 0.7			Man.			**060-116166[3]**
High	KP 5A			8 → 32	1.8 → 6.0	Aut.			**060-123066[4]**
High	KP 5A			8 → 32	Fixed 3	Man.		**060-115366[3]**	**060-123166[3]**
Dual	KP 15A	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Aut./Aut.	SPDT + LP and HP signal	**060-129566**	**060-129366[4]**
Dual	KP 15A	−0.2 → 7.5	0.7 → 4.0	8 → 32	Fixed 4	Aut./Man.		**060-129666[3]**	**060-129466[3]**
Dual	KP 15A	−0.9 → 7.0	Fixed 0.7	8 → 32	Fixed 4	Conv./Conv.[2]	SPDT LP signal		**060-128366[3]**

[1] Pressure controls with gold-plated contacts
[2] Conv.: optional automatic or manual reset
[3] Enclosure IP 30
[4] Enclosure IP 44

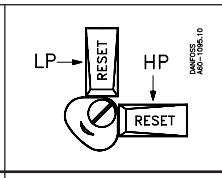
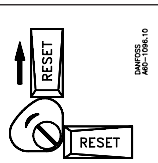
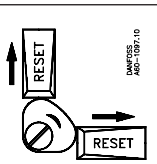
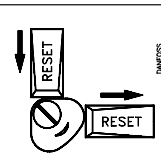
Accessories for KP pressure controls with M10 × 0.75 connections:

Weld connections: M10 × 0.75 nut and ∅6 × 150 mm seamless steel pipe, **code no. 060-005766**
Steel cap. tube: 1 m with 2 × M10 × 0.75 nuts, **code no. 060-007866**
Steel cap. tube: 1 m with 1 × M10 × 0.75 and G 3/8 nut, **code no. 060-008266**
Adaptor: M 10 × 0.75 1/4 to 1/8 NPT int. thread, **code no. 060-014166**
IP 55 enclosure for single pressure controls, **code no. 060-033066**
IP 55 enclosure for dual pressure controls, **code no. 060-035066**

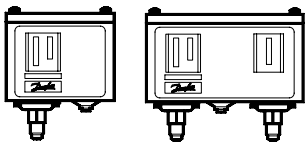
For other accessories: see "Spare parts and accessories", RX.5A.B3.02.

Ordering
(continued)

Pressure control setting with convertible reset

				
Low press.	Manual reset [1]	Automatic reset	Automatic reset	Manual reset
High press.	Manual reset [1]	Manual reset	Automatic reset	Automatic reset

[1]) Factory setting



Pressure controls with DIN 32733 approval [1])

Pressure	Type [2])	Low pressure (LP)		High pressure (HP)		Reset	Contact system	DIN approvals	**Code no.**	
		Regulating range bar	Differential Δp bar	Regulating range bar	Differential Δp bar	LP/HP			1/4 in. 6 mm flare	6 mm ODF solder
For fluorinated refrigerants										
Low	KP 1	−0.2 → 7.5	0.7 → 4.0			Aut.	SPDT	DWFK 4B06899	**060-110166**	**060-111066[4])**
Low	KP 1	−0.9 → 7	Fixed 0.7			Man.	SPDT	DBFK 4B06999	**060-110366**	**060-110966**
Low	KP 1	−0.5 → 3.0	Fixed 0.7			Aut.	SPDT	DWFK 4B06899		**060-111766[4])**
Low	KP 2	−0.2 → 5	0.4 → 1.5			Aut.	SPDT	DWFK 4B07099	**060-112066**	**060-112366**
High	KP 6W			8 → 42	4 → 10	Aut.	SPDT	EN 12263	**060-519066**	
High	KP 6B			8 → 42	Fixed 4	Man.	SPDT	EN 12263	**060-519166**	
High	KP 7W			8 → 32	4 → 10	Aut.	SPDT	DWK 4B00199	**060-119066[4])**	**060-120366[4])**
High	KP 7B			8 → 32	Fixed 4	Man.	SPDT	DBK 4B00399	**060-119166[3])**	
High	KP 7S			8 → 32	Fixed 4	Man.	SPDT	DBK 4B00399	**060-119266[4])**	
Dual	KP 7BS			8 → 32	Fixed 4	Man. / Man.	SPST	DBK 4B00299	**060-120066[3])**	
Dual	KP 17W	−0.2 → 7.5	0.7 → 4	8 → 32	Fixed 4	Aut. / Aut.	SPDT + LP and HP signal	DWK 4B00599	**060-127566[4])**	**060-127666[4])**
Dual	KP 17W	−0.2 → 7.5	0.7 → 4	8 → 32	Fixed 4	Aut. / Aut.	SPDT	DWK 4B00599	**060-126766[4])**	
Dual	KP 17B	−0.2 → 7.5	0.7 → 4	8 → 32	Fixed 4	Aut. / Man.	SPDT	DBK 4B00499	**060-126866[3])**	**060-127466[3])**

Pressure controls with DIN 32733 approval [1])

Pressure	Type [2])	Low pressure (LP)		High pressure (HP)		Reset	Contact system	DIN approvals	**Code no.**	
		Regulating range bar	Differential Δp bar	Regulating range bar	Differential Δp bar	LP/HP			M10 × 0.75 IP 44	1 m cap. tube with M10 × 0.75
For ammonia										
Low	KP 1A	-0.2 → 7.5	0.7→4.0			Aut.	SPDT	DBFK 4B06899	**060-116266[3])**	**060-116066[4])**
Low	KP 1A	0.9 → 7	Fixed 0.7			Man.	SPDT	DBFK 4B06999		**060-116166[3])**
High	KP 7ABS			8 → 32	Fixed 4	Man./Man.	SPST	DBK 4B00299		**060-120566[3])**

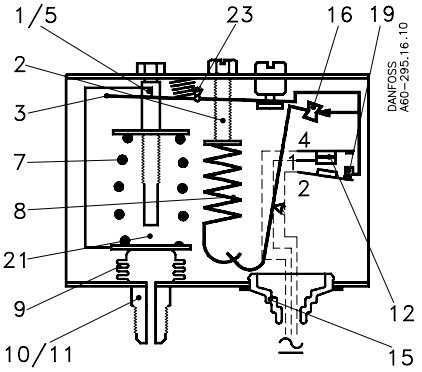
[1]) Meets the requirements in VBG 20 dealing with safety equipment and excess pressures.
KP6, 7 and KP 17 are CE marked acc. to PED, Pressure Equipment Directive.

[2]) W = Wächter (pressostat), B = Begrenzer (pressure control with ext. reset), S = Sicherheitsdruckbegrenzer (pressure control with int. reset).
A bellows rupture in inner bellows will cause the refrigeration plant compressor to stop.
A rupture of the outer bellows will cause the stop pressure to fall approx. 3 bar under the set value.

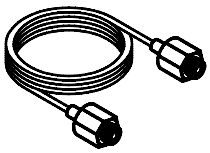
[3]) Enclosure IP 30.

[4]) Enclosure IP 44.

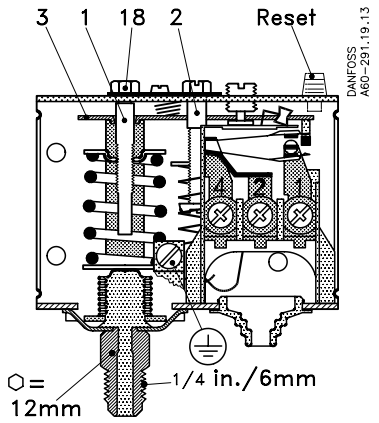
Design / Function



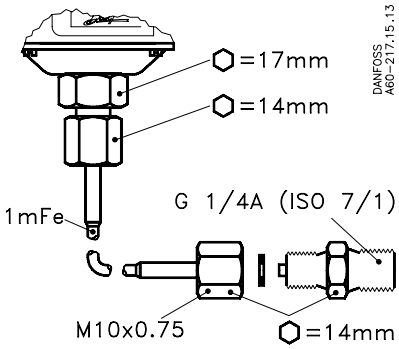
Key sketch of KP pressure control



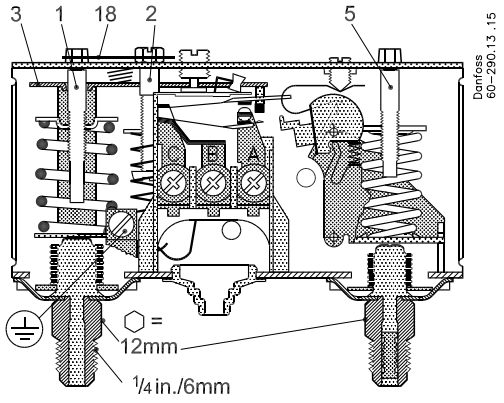
Capillary tube



KP 1



Capillary tube for KP 1A, 5A and 15A



KP 15

1. Low pressure (LP) setting spindle
2. Differential setting spindle, LP
3. Main arm
5. High pressure (HP) setting spindle
7. Main spring
8. Differential spring
9. Bellows
10. LP connection
11. HP connection
12. Switch
13. Terminals
14. Earth terminal
15. Cable entry
16. Tumbler
18. Locking plate
19. Arm
30. Reset button

The switch in the KP has a snap-action function and the bellows moves only when the cut-in or cut-out value is reached.

The bellows becomes connected to the low or high pressure side of the plant through connection (10) or (11).

The design of the KP affords the following advantages:

- high contact load
- ultra-short bounce time
- high resistance to pulsation
- vibration resistance up to 4 g in the range 0-1000 Hz
- long mechanical and electrical life

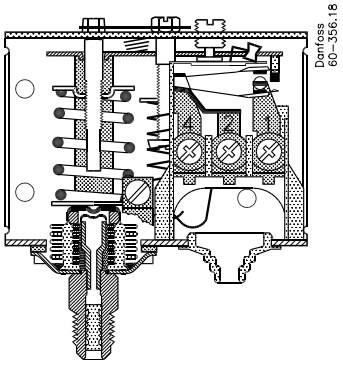
Design
(continued)

KP1, KP2, KP6, KP7 and KP17 units with designation W, B or S have been tested and approved by TÜV, Rheinland in accordance with DIN 32733 or EN 12263

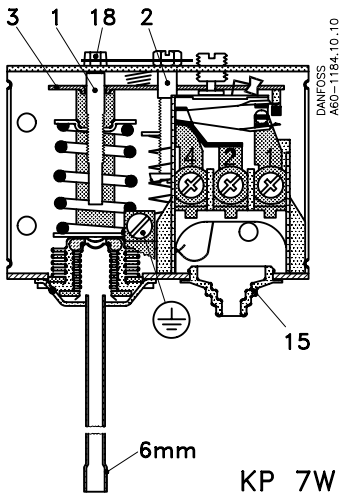
W = Wächter (pressure control)
B = Begrenzer
(pressure control with external reset)
S = Sicherheitsdruckbegrenzer
(pressure control with internal reset).

KP6, KP7 and KP17 have a double bellows: an outer bellows and a regulating bellows. When system pressure exceeds the set value, the KP will automatically stop the plant. The double bellows system prevents loss of charge in the event of bellows rupture.
A rupture in the outer bellows will cause the control cut-out pressure to fall to about 3 bar under the
set value, thus providing a fail-safe function.

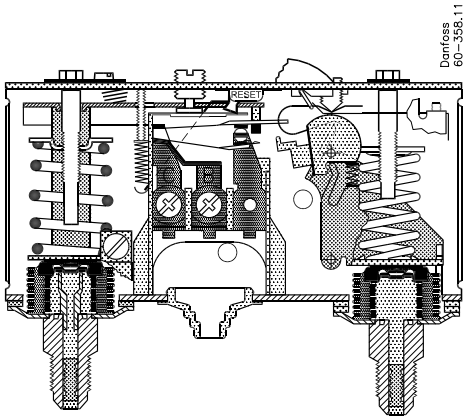
Versions with designation W or AW cut in again automatically when the pressure has fallen to the set value minus the differential.
Versions with designation B or AB can be cut in manually with the external reset button when the pressure in KP1 has raised 0.7 bar above set value and in KP6 and KP7 has fallen 4 bar under the set value.
Versions with designation S or AS can be cut in manually with the internal reset arm when the pressure has fallen 4 bar under the set value.
All KP pressure controls, including those which are DIN-approved, operate independently of changes in the ambient temperature around the control housing. Therefore the set cut-out pressure and differential are held constant provided the permissible ambient temperatures are not exceeded.



KP 7W, flare



KP 7W, solder



KP 7BS

1. Pressure setting spindle
2. Differential setting spindle
3. Main arm
5. Pressure setting spindle, DBK
15. Cable entry
18. Locking plate
19. Arm
25. Int. reset arm
30. Ext. reset button

Terminology

Reset

1. *Manual reset:*
   Units with manual reset can only be reset during operation by activation of the reset button.
2. *Automatic reset:*
   After operational stop, these units reset automatically.
3. *Convertible reset:*
   Units with optional reset can be activated by automatic and/or manual reset.

Permissible working pressure
The permissible working pressure is determined by the pressure that can be safely allowed in the refrigerating system or any of the units within it. The permissible working pressure is designated PB (Der zulässige Betriebsüberdruck).

Test pressure
The test pressure is the pressure used in strength tests and/or leakage tests on refrigerating systems or individual parts in systems. The test pressure is designated p'.

"Snap function"
A certain contact force is maintained until irrevocable "snap" is initiated. The time during which the contact force approaches zero is thus limited to a very few milliseconds. Therefore contact bounce cannot occur as a result of, for example, slight vibrations, before the cut-out point. Contact systems with "Snap function" will change over even when micro-welds are created between the contacts during cut-in. A very high force is created during cut-out to separate the contacts. This force immediately shears off all the welds. Thus the cut-out point of the unit remains very accurate and completely independent of the magnitude of the current load.

Setting

Pressure controls with automatic reset - LP:
Set the LP start pressure on the "CUT-IN" scale (range scale).
One rotation of the low pressure spindle ~ 0.7 bar.
Set the LP differential on the "DIFF" scale. One rotation of the differential spindle ~ 0.15 bar.
The LP stop pressure is the LP start pressure minus the differential.

Note:
The LP stop pressure must be above absolute vacuum (p_e = –1 bar)!

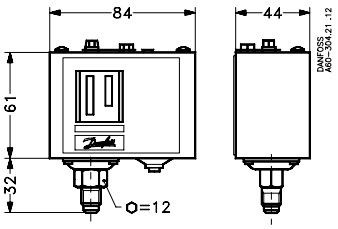
If with low stop pressure the refrigeration compressor will not stop, check to ensure that the differential value has not been set too high!

Pressure controls with automatic reset - HP:
Set the HP pressure on the "CUT-OUT" scale.
One rotation of the HP spindle ~ 2.3 bar.
Set the HP differential on the "DIFF" scale.
One rotation of the differential spindle ~ 0.3 bar.
The HP start pressure is the HP stop pressure minus the differential.
Start and stop pressures for both the LP and HP sides of the system should always be checked with an accurate pressure gauge.

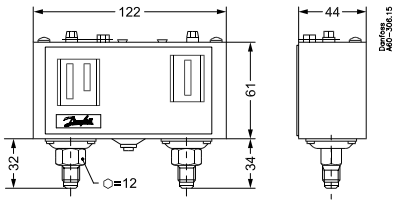
Pressure controls with manual reset
Set the stop pressure on "CUT-OUT" scale (range scale).
Low pressure controls can be manually reset when the pressure is equal to the stop pressure plus the differential.
High pressure controls can be manually reset when the pressure is equal to the stop pressure minus the differential.

Dimensions and weights

Flare connection

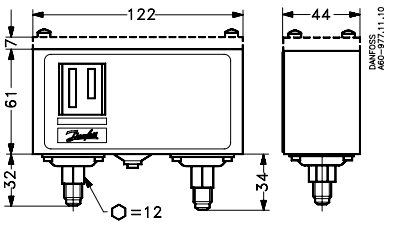


KP 1, 2, 5, 6, 7B, 7S and 7W

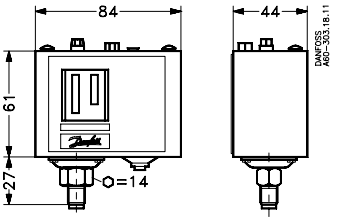


KP 15 and 17W

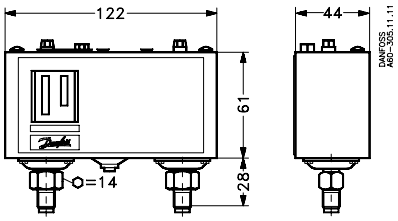
KP with top cover



M10 × 0.75 connection

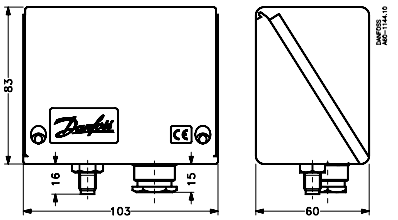


KP 1A, 2A and 5A

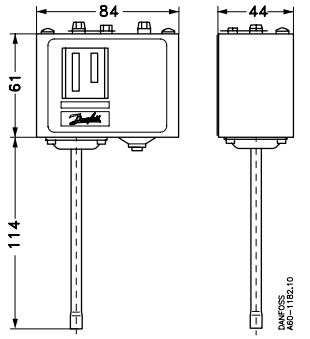


KP 15A, 7 AS and 7ABS

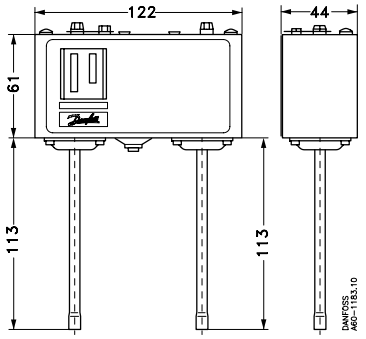
KP with IP 55 enclosure



Solder connection

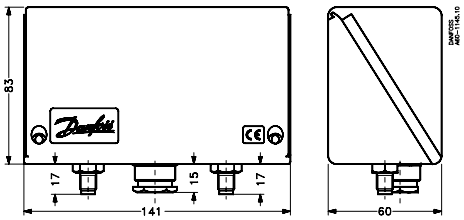


KP 1, 2, 5, 7B, 7S and 7W

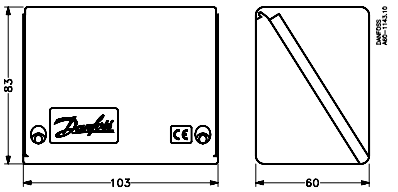


KP 15, 17W

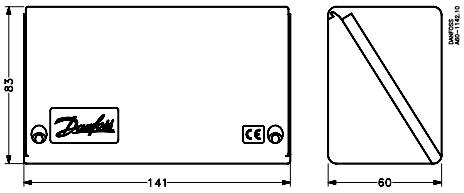
KP with IP 55 enclosure



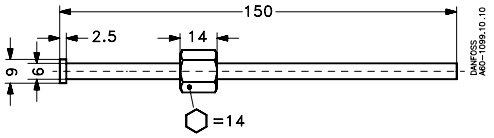
IP 55 enclosure



IP 55 enclosure



Weld nipple for KP-A



Weight
KP 1, 2, 5 and 7: approx. 0.3 kg
KP 15, 17 and 7BS: approx. 0.5 kg
KP 1A and 5A: approx. 0.3 kg
KP 15A and 7ABS: approx. 0.5 kg