

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 33 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 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.

- Germanischer Lloyd, Germany
- DIN 32733, Germany (KP1, KP2, KP7, KP17)
- Polski Rejestr Statków, Poland
- DnV, Det norske Veritas, Norway

RINA, Registro Italiano Navale, Italy
BV, France
LR, England
MRS, Maritime Register of Shipping, Russia

Versions with UL and CSA approvals can be supplied to special order.

Materials in contact with the medium

| Unit type | Material |
|----------------------------|--|
| KP 1, 2, 5, 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, 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

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

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.

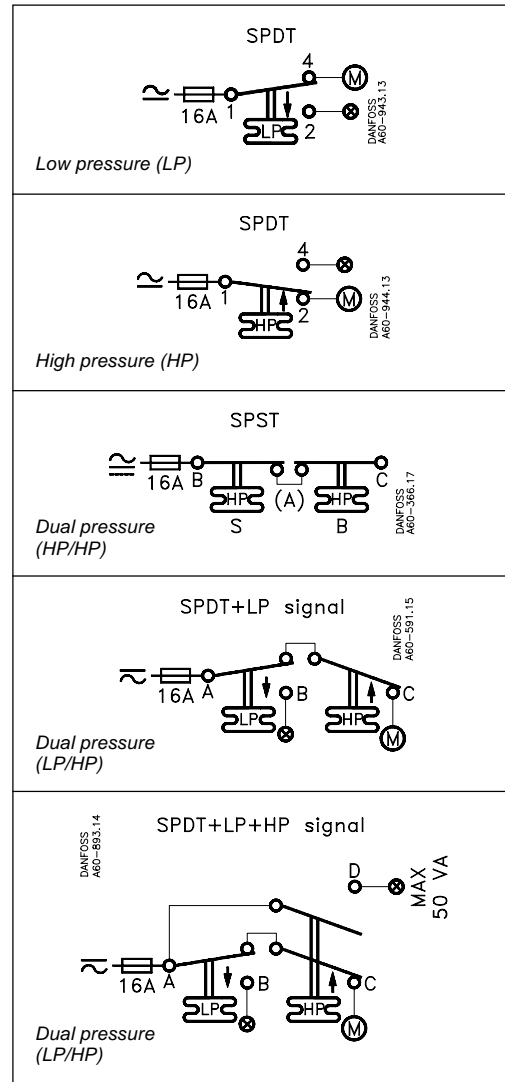
Enclosure
 IP 33 to EN 60529 / IEC 529
 Enclosure IP 33 is obtained when the units without top cover are mounted on a flat surface or bracket. The bracket must be fixed to the unit so that all unused holes are covered.

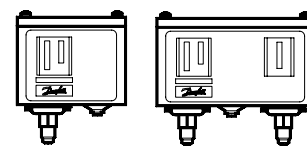
IP 44 to EN 60529 / IEC 529
 Enclosure IP 44 is obtained when the units with top cover are mounted on a flat surface or bracket. The bracket must be fixed to the unit so that all unused holes are covered.

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.

IP 55 to EN 60529 / IEC 529
 IP 55 is obtained when the KP pressure controls are mounted in an IP 55 enclosure, (code no. **060-0330** for single pressure controls and code no. **060-0350** for dual pressure controls).
 IP 55 enclosure has to be ordered separately.

Contact systems





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 | 060-1101 | 060-1112 | 060-1110 |
| Low | KP 1 | -0.2 → 7.5 | 0.7 → 4.0 | | | Aut. | | | 060-1141¹⁾ | | |
| Low | KP 1 | -0.9 → 7.0 | Fixed 0.7 | | | Man. | | | 060-1103 | 060-1111 | 060-1109 |
| Low | KP 2 | -0.2 → 5.0 | 0.4 → 1.5 | | | Aut. | | | 060-1120 | | 060-1123 |
| High | KP 5 | | | 8 → 32 | 1.8 → 6.0 | Aut. | | | 060-1171 | 060-1179 | 060-1177 |
| High | KP 5 | | | 8 → 32 | Fixed 3 | | Man. | | 060-1173 | 060-1180 | 060-1178 |
| Dual | KP 15 | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Aut. | Aut. | | 060-1241 | 060-1254 | |
| Dual | KP 15 | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Aut. | Man. | | 060-1243 | | |
| Dual | KP 15 | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Aut. | Man. | | 060-1148¹⁾ | | |
| Dual | KP 15 | -0.9 → 7.0 | Fixed 0.7 | 8 → 32 | Fixed 4 | Man. | Man. | | 060-1245 | | |
| Dual | KP 15 | -0.9 → 7.0 | Fixed 0.7 | 8 → 32 | Fixed 4 | Conv. ²⁾ | Conv. ²⁾ | 060-1261 | | | |
| Dual | KP 15 | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Aut. | Aut. | 060-1265 | 060-1299 | | |
| Dual | KP 15 | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Aut. | Man. | 060-1264 | 060-1284 | | |
| Dual | KP 15 | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Conv. ²⁾ | Conv. ²⁾ | 060-1154 | 060-0010 | | |
| Dual | KP 15 | -0.9 → 7.0 | Fixed 0.7 | 8 → 32 | Fixed 4 | Conv. ²⁾ | Conv. ²⁾ | 060-1220 | | | |

| Pressure | Type | Low pressure (LP) | | High pressure (HP) | | Reset LP / HP | Contact system | Code no. | |
|----------|------|----------------------|---------------------|----------------------|---------------------|---------------|----------------|------------------|-------------------------------|
| | | Regulating range bar | Differential Δp bar | Regulating range bar | Differential Δp bar | | | M10 × 0.75 IP 44 | 1 m cap. tube with M10 × 0.75 |

For fluorinated refrigerants and R 717 (NH₃)

| | | | | | | | | | |
|------|--------|------------|-----------|--------|-----------|---------------------------|-------------------------|--------------------------------|------------------------------|
| Low | KP 1A | -0.2 → 7.5 | 0.7 → 4.0 | | | Aut. / - | SPDT | 060-1162⁴⁾ | 060-1160⁴⁾ |
| Low | KP 1A | -0.9 → 7.0 | Fixed 0.7 | | | Man. / - | | 060-1161³⁾ | |
| High | KP 5A | | | 8 → 32 | 1.8 → 6.0 | - / Aut. | | 060-1230⁴⁾ | |
| High | KP 5A | | | 8 → 32 | 1.8 → 6.0 | - / Aut. | | 060-1147¹⁾⁴⁾ | |
| High | KP 5A | | | 8 → 32 | Fixed 3 | - / Man. | | 060-1153³⁾ | 060-1231³⁾ |
| Dual | KP 15A | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Aut./Aut. | SPDT + LP and HP signal | 060-1295 | 060-1293⁴⁾ |
| Dual | KP 15A | -0.2 → 7.5 | 0.7 → 4.0 | 8 → 32 | Fixed 4 | Aut./Man. | | 060-1296³⁾ | 060-1294³⁾ |
| Dual | KP 15A | -0.9 → 7.0 | Fixed 0.7 | 8 → 32 | Fixed 4 | Conv./Conv. ²⁾ | SPDT LP signal | | 060-1283³⁾ |

- 1) Pressure controls with gold-plated contacts
- 2) Conv.: optional automatic or manual reset
- 3) Enclosure IP 33
- 4) Enclosure IP 44

Accessories for KP pressure controls with M10 × 0.75 connections:

Weld connections: M10 × 0.75 nut and Ø6 × 150 mm seamless steel pipe, **code no. 060-0057**
 Steel cap. tube: 1 m with 2 × M10 × 0.75 nuts, **code no. 060-0078**
 Steel cap. tube: 1 m with 1 × M10 × 0.75 and G 3/8 nut, **code no. 060-0082**
 Adaptor: M 10 × 0.75 1/4 to 1/8 NPT int. thread, **code no. 060-0141**
 IP 55 enclosure for single pressure controls, **code no. 060-0330**
 IP 55 enclosure for dual pressure controls, **code no. 060-0350**

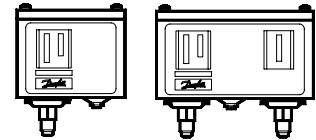
For other accessories: see "Spare parts and accessories", RK.OX.G2.02.

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 LP / HP | Contact system | DIN approvals | Code no. | |
|----------|--------------------|----------------------|-----------------------------|----------------------|-----------------------------|------------------|----------------|---------------|--------------------|-----------------|
| | | Regulating range bar | Differential Δp bar | Regulating range bar | Differential Δp bar | | | | 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 | 060-1101 | 060-1110⁴⁾ |
| Low | KP 1 | -0.9 → 7 | Fixed 0.7 | | | Man. / - | SPDT | DBFK 4B06999 | 060-1103 | 060-1109 |
| Low | KP 1 | -0.5 → 3.0 | Fixed 0.7 | | | Aut. / - | SPDT | DWFK 4B06899 | | 060-1117⁴⁾ |
| Low | KP 2 | -0.2 → 5 | 0.4 → 1.5 | | | Aut. / - | SPDT | DWFK 4B07099 | 060-1120 | 060-1123 |
| High | KP 7W | | | 8 → 32 | 4 → 10 | - / Aut. | SPDT | DWK 4B00199 | 060-1190⁴⁾ | 060-1203⁴⁾ |
| High | KP 7B | | | 8 → 32 | Fixed 4 | - / Man. | SPDT | DBK 4B00399 | 060-1191³⁾ | |
| High | KP 7S | | | 8 → 32 | Fixed 4 | - / Man. | SPDT | DBK 4B00399 | 060-1192³⁾ | |
| Dual | KP 7BS | | | 8 → 32 | Fixed 4 | Man. / Man. | SPST | DBK 4B00299 | 060-1200³⁾ | |
| Dual | KP 17W | -0.2 → 7.5 | 0.7 → 4 | 8 → 32 | Fixed 4 | Aut. / Aut. | SPDT + LP and HP signal | DWK 4B00599 | 060-1275⁴⁾ | 060-1276⁴⁾ |
| Dual | KP 17W | -0.2 → 7.5 | 0.7 → 4 | 8 → 32 | Fixed 4 | Aut. / Aut. | SPDT | DWK 4B00599 | 060-1267⁴⁾ | |
| Dual | KP 17B | -0.2 → 7.5 | 0.7 → 4 | 8 → 32 | Fixed 4 | Aut. / Man. | SPDT | DBK 4B00499 | 060-1268³⁾ | 060-1274³⁾ |

Pressure controls with DIN 32733 approval ¹⁾

| Pressure | Type | Low pressure (LP) | | High pressure (HP) | | Reset LP / HP | Contact system | DIN approvals | Code no. | |
|----------|------|--------------------|---------------------------|--------------------|---------------------------|------------------|----------------|---------------|------------------|-------------------------------|
| | | Regulat. range bar | Different. Δp bar | Regulat. range bar | Different. Δp bar | | | | 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 | 060-1162³⁾ | 060-1160⁴⁾ |
| Low | KP 1A | 0.9 → 7 | Fixed 0.7 | | | Man. / - | SPDT | DBFK 4B06999 | | 060-1161³⁾ |
| High | KP 7ABS | | | 8 → 32 | Fixed 4 | - / Man. | SPST | DBK 4B00299 | | 060-1205³⁾ |

¹⁾ Meets the requirements in VBG 20 dealing with safety equipment and excess pressures.

²⁾ W = Wächter (pressostat), B = Begrenzer (pressure control with ext. reset), S = Sicherheitsdruckbegrenzer (pressure control with int. reset).

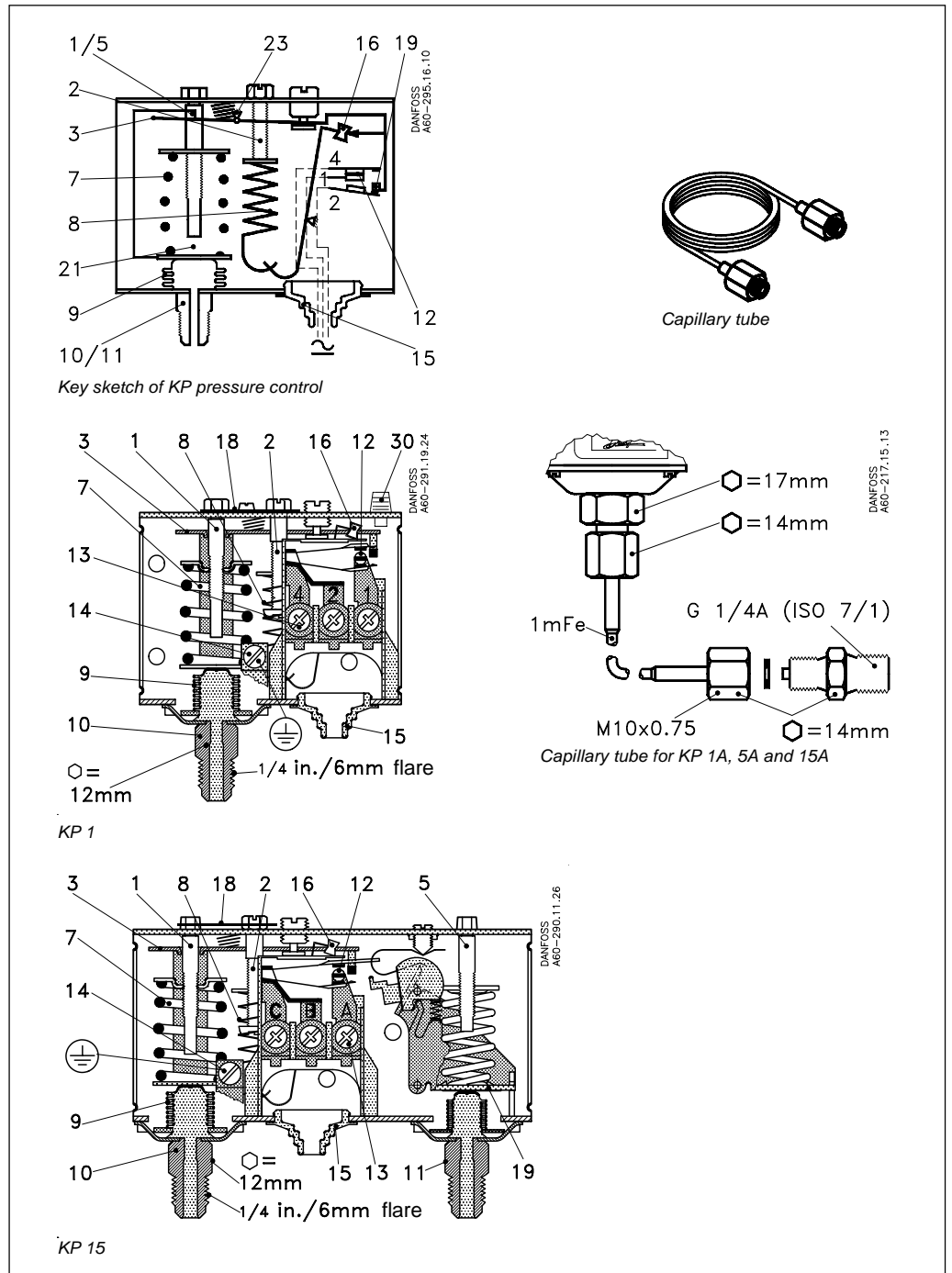
A bellows rupture in inner bellows will cause the refrigeration plant compressor to stop.

A rupture of the outer bellows will cause the stop pressure to fall approx. 3 bar under the set value.

³⁾ Enclosure IP 33.

⁴⁾ Enclosure IP 44.

Design



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)

KP 1, KP 2, KP 7 and KP 17 units with designation W, B or S have been tested and approved by TÜV (Technischer Überwachungs Verein, Federal Republic of Germany) in accordance with DIN 32733.
 W = Wächter (pressure control)
 B = Begrenzer (pressure control with external reset)
 S = Sicherheitsdruckbegrenzer (pressure control with internal reset).

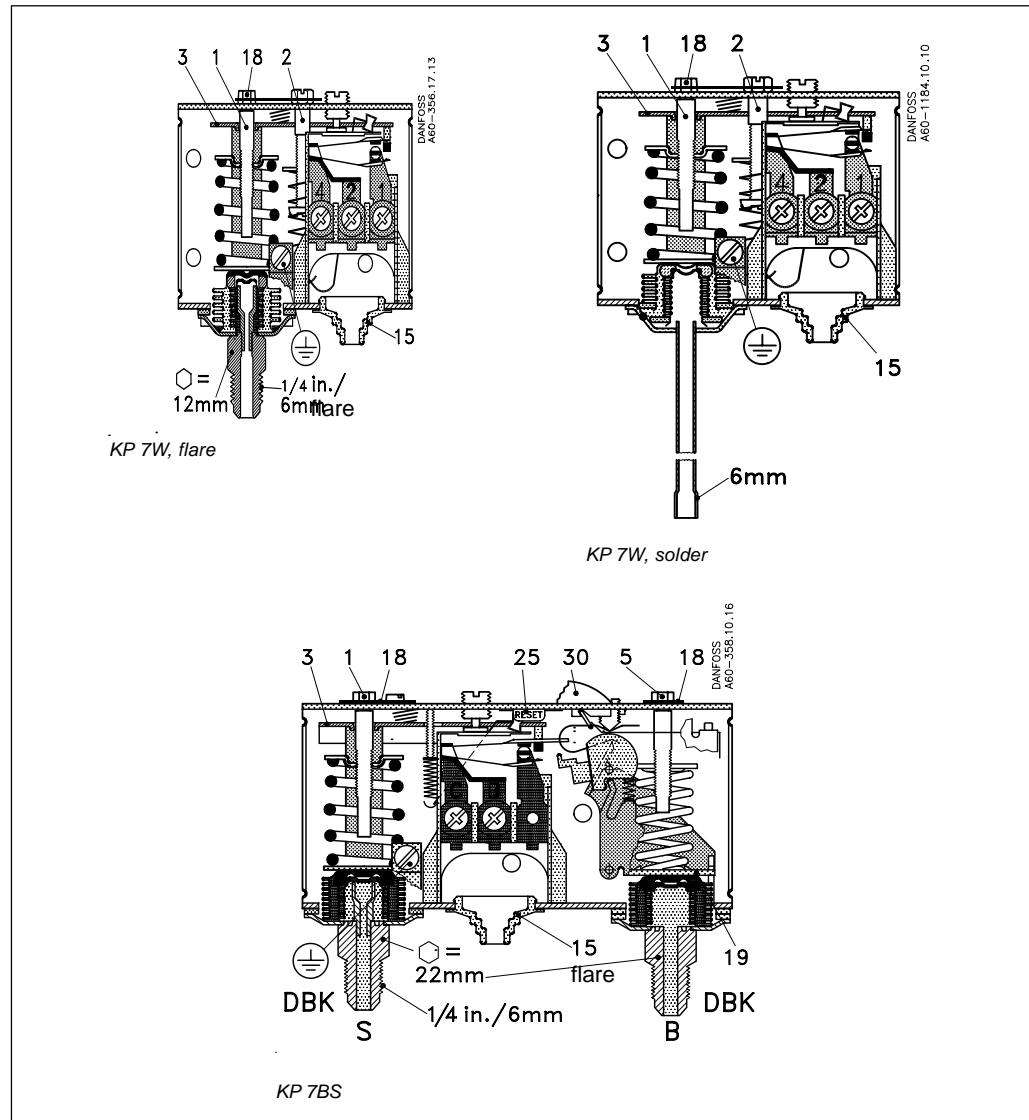
KP 7 and KP 17 have a double bellows: an outer bellows and a regulating bellows. When system pressure exceeds the set value, the KP will automatically stop the plant. The double bellows system prevents loss of charge in the event of bellows rupture.

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 KP 1 has raised 0.7 bar above set value and in KP 7 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.



- 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

| | |
|---|--|
| <p><i>Flare connection</i></p> <p>KP 1, 2, 5, 7B, 7S and 7W</p> <p>KP 15 and 17W</p> | <p><i>KP with top cover</i></p> <p>KP 1, 2, 5, 7B, 7S and 7W</p> <p>KP 15 and 17W</p> |
| <p><i>M10 × 0.75 connection</i></p> <p>KP 1A, 2A and 5A</p> <p>KP 15A, 7AS and 7ABS</p> | <p><i>KP with IP 55 enclosure</i></p> <p>KP 1, 2, 5, 7B, 7S and 7W</p> <p>KP 15, 17W</p> |
| <p><i>Solder connection</i></p> <p>KP 1, 2, 5, 7B, 7S and 7W</p> <p>KP 15, 17W</p> | <p><i>KP with IP 55 enclosure</i></p> <p>KP 1, 2, 5, 7B, 7S and 7W</p> <p>KP 15, 17W</p> |
| <p><i>Weld nipple for KP-A</i></p> <p>DANFOSS AFD-1188A.10.10</p> | <p><i>IP 55 enclosure</i></p> <p>DANFOSS AFD-118A.10</p> |
| | <p><i>Weight</i></p> <p>KP 1, 2, 5 and 7: approx. 0.3 kg</p> <p>KP 15, 17 and 7BS: approx. 0.5 kg</p> <p>KP 1A and 5A: approx. 0.3 kg</p> <p>KP 15A and 7ABS: approx. 0.5 kg</p> |

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