



Pressure Controls type KPU

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Introduction

KPU pressure controls are designed for use in refrigeration and air-conditioning systems to protect the systems from excessively low suction pressure or too high discharge pressure. They can also be applied to start and stop compressors and the fans of air-cooled condensers.

KPU pressure controls, in single and dual versions cover a comprehensive range of applications, and are designed for use with fluorinated and non-aggressive refrigerants.


Features

- Snap action electrical contacts minimize chatter, bounce, and wear, and ensure long-term electrical and mechanical reliability
- The fail-safe dual bellows used in KPU 6 and KPU 16 prevent refrigerant loss and enable primature cut-out when a fault occurs
- SPDT or SPST switch a in single control models. SPST or SPDT with high-low pressure signal in dual control models
- Manual trip allows electrical function test without tools
- Easily replaces Johnson Controls and Ranco products
- Wide pressure range: from low pressure KPU 2 with narrow differential to KPU 6 and KPU 16 for high pressure refrigerants (R 410A, CO₂)
- Automatic, manual or convertible reset versions available
- Vibration and shock resistant
- Integrated bellows-spring assembly, computer design for maximum accuracy
- Repeatability less then 0.1 psi drift, even after 400 000 cycles

Approvals

cS UL listed for USA and Canada, file E31024 according to UL 873

CE-marked in accordance with EN 60947-4/-5

KPU6W, KPU6B, KPU16W and KPU16B:
CE-marked in accordance with PED 97/23/EC, category IV, safety equipment - EN 12263

Materials in contact with medium

Unit type	Material
KPU 1, 2, 5, 15	Tin bronze, no. 2.1020 to DIN 17662 Nickel plated free cutting steel, no. 1.0737/ 1.0718 to DIN 1651
KPU 6 and 16	Stainless steel bellows
KPU with capillary tube	Copper SF-CU no. 2.0090 to DIN 1787

Technical data
Ambient temperature

-40 to 122 °F (+ 175 °F for max 2 hours)

Maximum working pressure

Low pressure (LP) controls KPU 1, KPU 2 and LP side of KPU15, KPU16: 250 psig

High pressure (HP) controls

KPU 5 and KPU15 on HP side: 510 psig

KPU 6 and 16 on HP side: 675 psig

Maximum testing pressure

Low pressure (LP) controls

KPU 1 and KPU 2: 290 psig

High pressure (HP) controls

KPU 5 and KPU 15 on HP side: 530 psig

KPU 6 and 16 on HP side: 725 psig

Cable entry

7/8" cable entry for 1/2" male pipe thread connection (conduit boss)

Contact load

Alternating current:

FLA = 24 A @ 120 Vac

24 A @ 240 Vac

LRA = 144 A @ 120 Vac

144 A @ 240 Vac

LRA is rated for make only

Direct current:

240 V DC: 12W pilot duty

Alternating current (acc. to EN 60947)

AC1: 16 A, 400 V

AC3: 16 A, 400 V

AC15: 10 A, 400 V

Direct current:

DC 13: 12 W, 220 V, control current

Wire dimension:

10 AWG maximum

Enclosure

NEMA 1 acc. to NEMA Standard Publication 250 - 1997

Ordering
Pressure controls for fluorinated refrigerant

Pressure	Control type	Low pressure (LP)		High pressure (HP)		Reset		Contact type	Code no,	
		Range psig	Differential psi	Range psig	Differential psi	Low pressure LP	High pressure HP		1/4" male flare	3/8" cap. tube w. 1/4" flare nut
Low	KPU 1	6" to 108	10 to 60			Aut.		A	060-5231	060-5233
Low	KPU 1	6" to 108	10 to 60			Aut.		B	060-5236	
Low	KPU 1B	28" to 100	10 fixed			Man.		A	060-5232	060-5234
Low	KPU 2	6" to 73	6 to 30			Aut.		B	060-5237	060-5235
Low	KPU 2	6" to 73	6 to 30			Aut.		A	060-5239	060-5240
Fan cycling	KPU 5			100 to 465	25 to 85		Aut.	B	060-5241	060-5242
Dual	KPU 15	6" to 108	10 to 60	100 to 465	60 fixed	Aut.	Aut.	C	060-5247	060-5248
Dual	KPU 15B	6" to 108	10 to 60	100 to 465	60 fixed	Aut.	Man.	C	060-5249	060-5250

Fail-safe controls for high pressure refrigerants (R410A, CO₂)
PED approved according to EN 12263

Pressure	Control type	Low pressure (LP)		High pressure (HP)		Reset		Contact type	Code no,	
		Range psig	Differential psi	Range psig	Differential psi	Low pressure LP	High pressure HP		1/4" male flare	3/8" cap. tube w. 1/4" flare nut
High	KPU 6W			100 to 600	58 to 145		Aut.	A	060-5243	060-5245
High	KPU 6B			100 to 600	60 fixed		Man.	A	060-5244	060-5246
Dual	KPU 16W	6" to 108	10 to 60	100 to 600	60 fixed	Aut.	Aut.	D	060-5251	060-5252
Dual	KPU 16B	6" to 108	10 to 60	100 to 600	60 fixed	Conv.	Conv.	D	060-5253	060-5254

Contact system and application

	Switch type	Switch action	Application
A	<p>Danfoss 60-1279.10</p> <p>SPDT</p>	<p>1. Terminals 1-4 close high and open low Terminals 1-2 can be used as low pressure alarm</p> <p>2. Terminals 1-2 open high and close low Terminals 1-4 can be used as high pressure alarm</p>	<p>1. Low pressure cut-out</p> <p>2. High pressure cut-out</p>
B	<p>Danfoss 60-1281.10</p> <p>SPST</p>	<p>Terminals 1-4 close high and open low</p>	<p>1. Low pressure cut-out</p> <p>2. Condenser fan cycling control</p>
C	<p>Danfoss 60-1280.10</p> <p>SPST, dual pressure (LP/HP)</p>	<p>Dual pressure control employs an SPST switch that is open when either high or low pressure beyond the control setting is sensed on the two bellows sensing elements</p>	<p>Dual pressure control Protects the system against too low suction pressure and against too high discharge pressure</p>
D	<p>Danfoss 60-1282.10</p> <p>SPDT with LP/HP signal</p>	<p>Contact opens on pressure drop below LP set point (turns on the LP signal light) and on pressure rise above HP set point (turns on HP signal light). Contact action is controlled by two bellows sensing elements. Note: max. contact D rating is 50 VA</p>	<p>Dual pressure control. Protects the system against too low suction pressure (LP cut-out signal on terminal B) and against too high discharge pressure (HP signal on terminal D).</p>

Load

Signal

Bellows movement on pressure drop

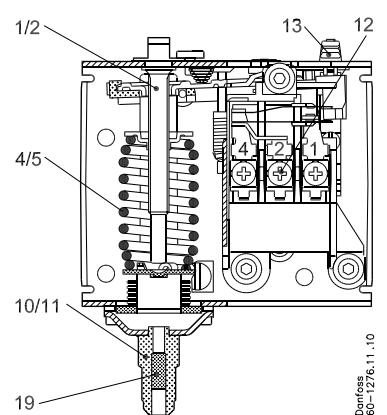
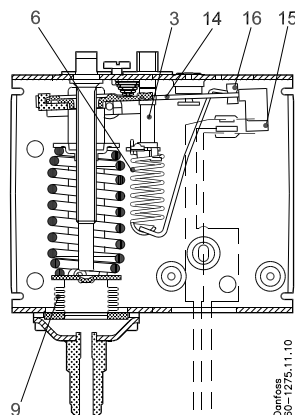
Bellows movement on pressure rise

Pressure control setting with convertible reset

Low pressure	Manual reset ¹⁾	Automatic reset	Automatic reset	Manual reset
High pressure	Manual reset ¹⁾	Manual reset	Automatic reset	Automatic reset

¹⁾ Factory setting

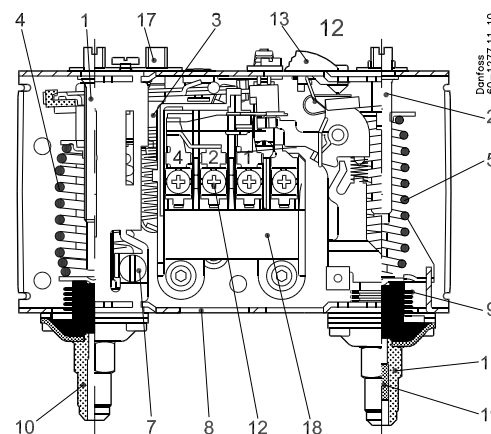
Design and function



Key sketch of KPU kontrol

- 1. Low pressure (LP) setting spindle
- 2. High pressure (HP) setting spindle
- 3. Differential
- 4. Low pressure main spring
- 5. High pressure main spring
- 6. Differential spring
- 7. Ground terminal
- 8. Cable entry
- 9. Bellows
- 10. LP connection
- 11. HP connection
- 12. Control terminals
- 13. Reset button
- 14. Arm
- 15. Switch
- 16. Tumbler
- 17. Locking plate
- 18. Contact housing
- 19. Damping device

KPU single (KPU 1, 2, 5, 6) without front cover



KPU dual (KPU 15, 16) without front cover

Switch function

The switch in KPU control has a snap-action function and the bellows moves only when cut-in or cut-out set point is reached.

This design has following advantages:

- high contact load
- ultra-short bounce time
- long mechanical and electrical lifetime
- high resistance to pulsation and vibrations

Reset

Version with automatic reset cut-in again automatically when the pressure falls or rises to the set point minus differential.

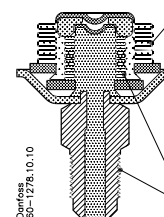
Version with manual reset have to be cut in manually with external reset button when the pressure in KPU 1 rises min. 10 psi above the set point value, and in KPU 6 falls min. 60 psi under the set point value.

All KPU pressure controls operate independently of changes in ambient temperature around the control. Therefore the setting for cut-out pressure and differential stay constant unless the permissible ambient temperature is exceeded.

Fail-safe bellows concept

in KPU 6 and high pressure side of KPU 16.

- 1. Pressure connection
- 2. Regulating bellows
- 3. Outer bellows



KPU 6 and high pressure side of KPU 16 have double bellows: an outer bellow and a regulating bellow. When system pressure exceeds the set value, the KPU will automatically stop the system. The double bellows system prevents the loss of charge in the event of bellows rupture. Rupture in the outer bellows causes the control cut-out pressure to fall about 40 psi under the set value, thus providing fail-safe function.

Terminology

Set point

A predetermined value to which a control is adjusted and at which it performs its intended function

Reset

1. Manual reset

A unit with manual reset can only be restored to operational mode by activating the external reset button.

2. Automatic reset

A unit with automatic reset is restored to operational mode automatically.

3. Convertible reset

A unit with convertible reset can be adjusted for either automatic or manual reset.

Maximum working pressure

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

Maximum test pressure

The maximum pressure applied in strength or leakage tests on refrigeration systems or components thereof.

Differential

Differential is the number of psi (or bar) by which cut-in and cut-out set points are separated

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 KPU control remains very accurate and completely independent of the magnitude of the current load.

Fail-safe control

A control is fail-safe if it has the capability to remain in a safe condition or transition to a safe condition when a fault occurs.

FLA -Motor Full Load Amperes

The current rating, in amperes, of the motor when a full load is applied to it for work being done.

LRA - Locked Rotor Amperes

The current drawn, in amperes, by an electric motor with the shaft or rotor stopped and locked in position.

Setting

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

Low Pressure setting for controls with automatic reset

1. Set the LP cut-in pressure on the "CUT-IN" scale (range scale). One rotation of the low pressure spindle ~ 5.2 psi for KPU2 and ~6.8 psi for KPU1
2. Set the LP differential on the "DIFF" scale. One rotation of the differential spindle ~ 3.2 psi for KPU2 and 2.9 psi for KPU1.

Note:

The LP cut-out pressure is LP cut-in pressure minus differential value.
The LP cut-out pressure must be above absolute vacuum (Pe = 29.5 in. Hg).

High pressure setting for controls with automatic reset

1. Set the HP cut-out pressure on the "CUT-OUT" scale. One rotation of the HP spindle ~ 22 psi for KPU5 and ~ 28 psi for KPU6.
2. Set the HP differential on the "DIFF" scale. One rotation of the differential spindle ~ 5.3 psi for KPU5 and ~ 8.6 for KPU6.

Note:

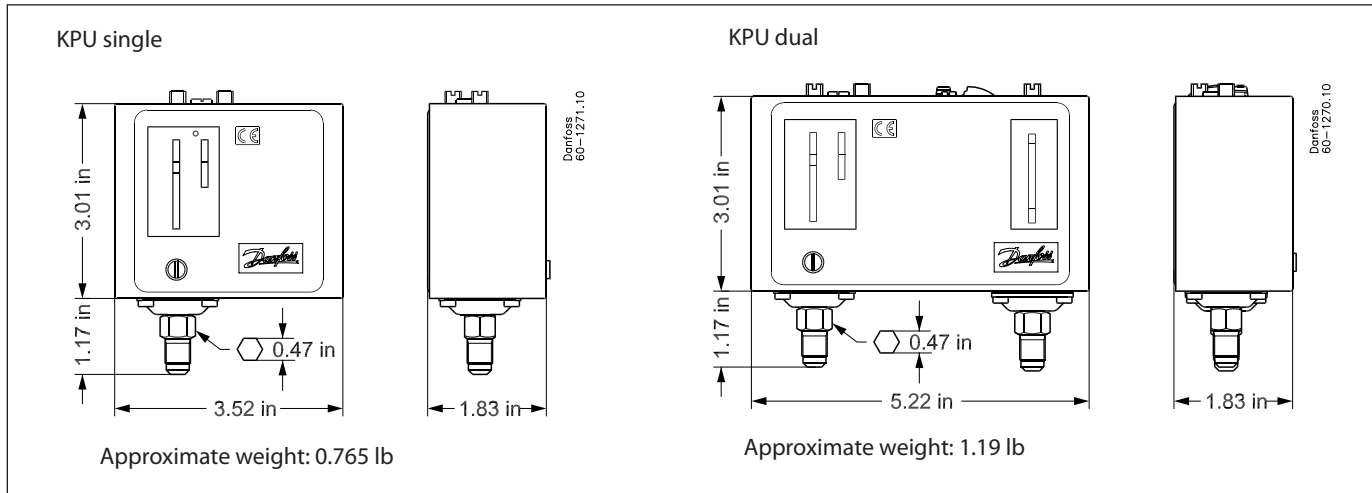
The HP restart pressure is equal to HP cut-out pressure minus differential.

Pressure controls with manual reset

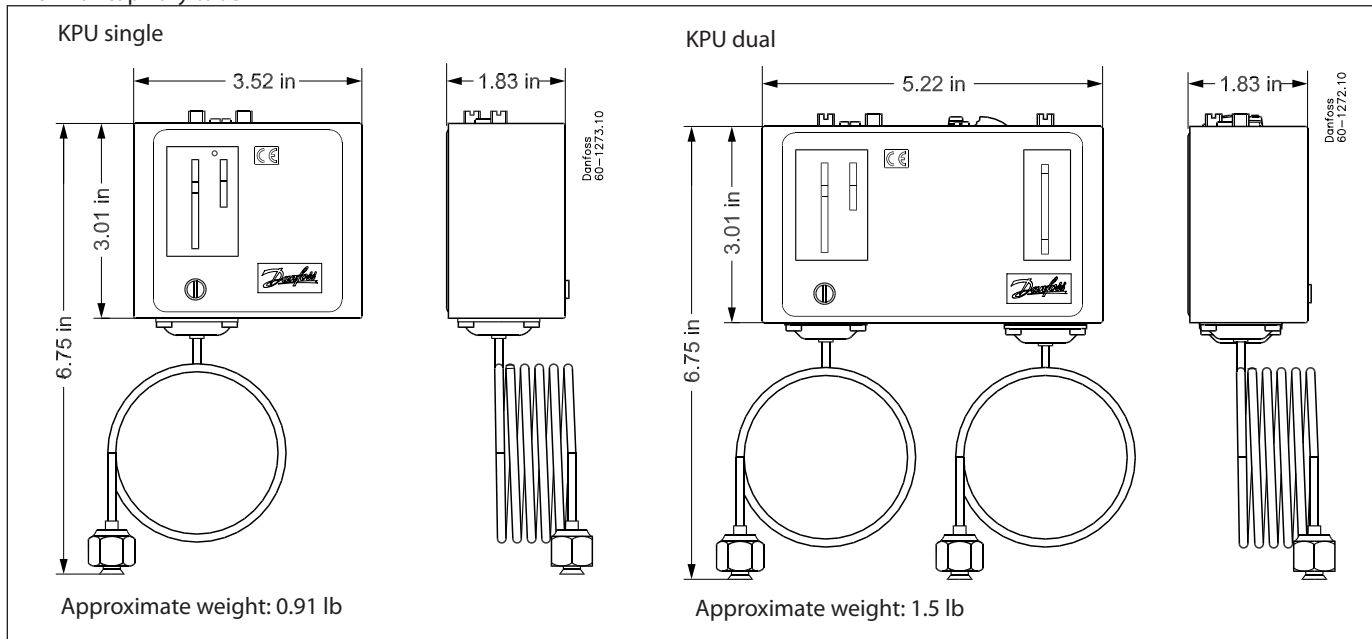
Set the cut-out pressure on the "CUT-OUT" scale (range scale). Low pressure controls can be manually reset when the pressure is above the cut-out pressure plus the differential. High pressure controls can be manually reset when the pressure is below cut-out minus differential.

Dimensions and weight

KPU with flare connection



KPU with capillary tube



All controls are supplied with universal mounting bracket and mounting screws as standard accessory.

Approximate weight of the bracket and mounting screws: 0.615 lb