

Data Sheet

Pressure switch
Type **KPU**

The KPU pressure switches 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.

The KPU pressure switches, in single and dual versions cover a comprehensive range of applications, and are designed for use with HCFC and non-flammable HFC refrigerants.

Features:

- Snap action electrical contacts minimize chatter, bounce, and wear, and ensure longterm electrical and mechanical reliability
- The fail-safe dual bellows used in KPU 6 and KPU 16 prevent refrigerant loss and enable premature 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 function (electrical contact function can be tested without the use of 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 (R410A, R744)
- Automatic, manual or convertible reset versions available
- Vibration and shock resistant

Product specification

Materials in contact with medium

Table 1: Materials

Unit type	Material
KPU 1, KPU 2, KPU 5, KPU 15	Tin bronze, no. CW452K, EN 1652 Nickel plated free cutting steel, no. 1.0737/ 1.0718 to EN 10277
KPU 6, KPU 16	Stainless steel bellows
KPU with capillary tube	Copper SF-CU no. 2.0090 to DIN 1787

Technical data

Table 2: Technical data

Ambient temperature		-40 – 122 °F (175 °F for max 2 hours)	
Maximum working pressure	Low pressure (LP)	KPU 1, KPU 2 and LP side of KPU 15, KPU 16: 250 psig	
	High pressure (HP)	KPU 5 and KPU 15 on HP side: 510 psig KPU 6 and KPU 16 on HP side: 675 psig KPU 6 and KPU 16 on HP side: 610 psig for products used according to 2014/68/EU PED directive	
Maximum testing pressure	Low pressure (LP)	KPU 1, KPU 2 and LP side of KPU15, KPU16: 290 psig	
	High pressure (HP)	KPU 5 and KPU 15 on HP side: 530 psig KPU 6 and 16 on HP side: 725 psig	
Cable entry		7/8 in cable entry for 1/2 in male pipe thread connection (conduit boss)	
Contact load	Alternating current	FLA = 24 A @ 120 V AC	24 A @ 240 V AC
		LRA = 144 A @ 120 V AC	144 A @ 240 V AC
	Direct current	LRA is rated for make only	
		240 V DC: 12W pilot duty	
Wire dimension		10 AWG maximum	
Enclosure		~NEMA 1	

Terminology

Set point

A predetermined value to which a switch 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 switch remains very accurate and completely independent of the magnitude of the current load.

Fail-safe switch

A switch 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 switches 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 KPU 2 and ~6.8 psi for KPU 1.
2. Set the LP differential on the “DIFF” scale. One rotation of the differential spindle ~ 3.2 psi for KPU 2 and 2.9 psi for KPU 1.

NOTE:

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

High Pressure setting for switches with automatic reset

1. Set the HP cut-out pressure on the “CUT-OUT” scale. One rotation of the HP spindle ~ 22 psi for KPU 5 and ~ 28 psi for KPU 6.
2. Set the HP differential on the “DIFF” scale. One rotation of the differential spindle ~ 5.3 psi for KPU 5 and ~ 8.6 psi for KPU 6.

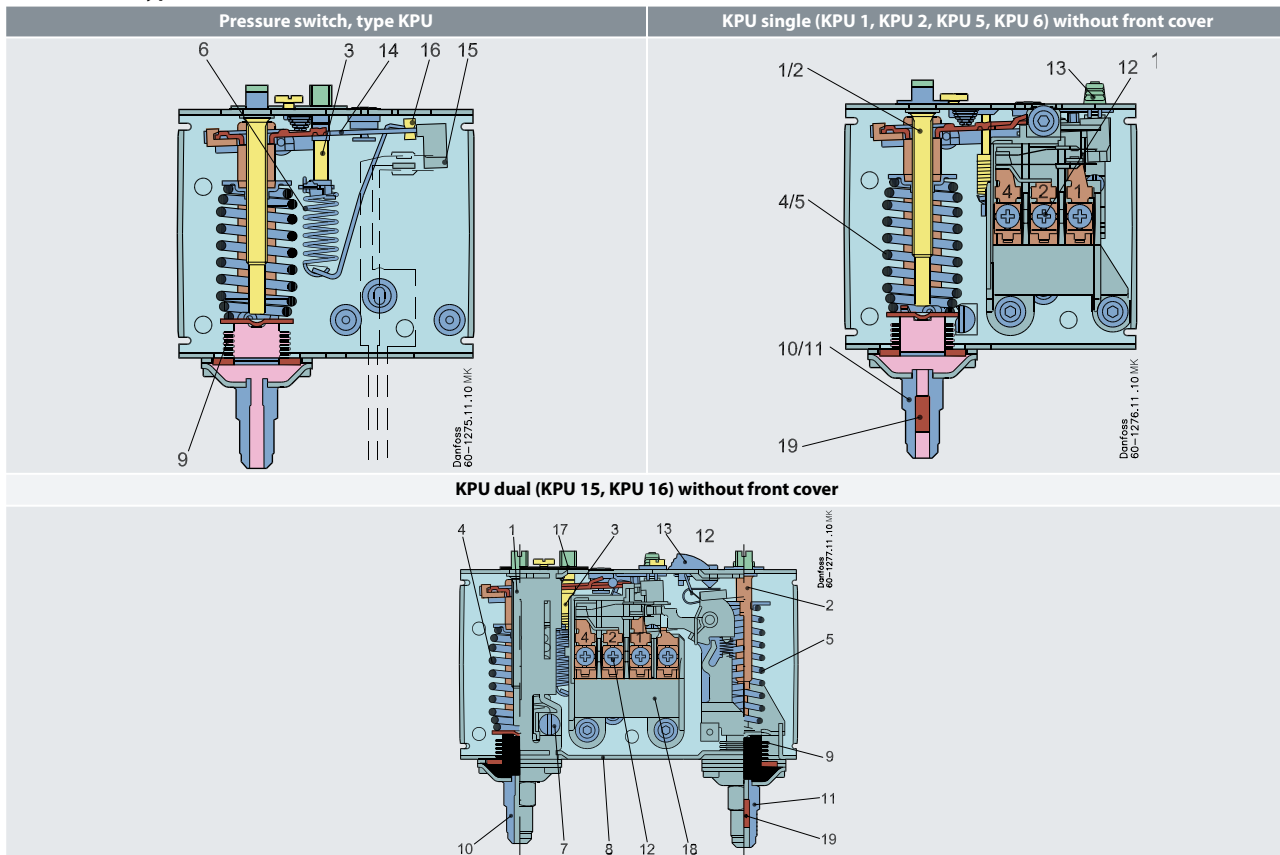
NOTE:

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

Pressure switches with manual reset Set the cut-out pressure on the “CUT-OUT” scale (range scale). Low Pressure switches can be manually reset when the pressure is above the cut-out pressure plus the differential. High Pressure switches can be manually reset when the pressure is below cut-out minus differential.

Design and Function

Table 3: KPU types



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

Switch function

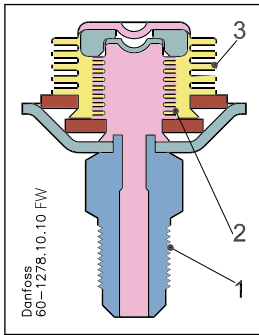
The switch in KPU control has a snap-action function and the bellows moves only when cut-in or cut-out set point is reached.

This design has following advantages:

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

Pressure switch, KPU

Figure 1: 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.

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

Dimensions and weight

Table 4: KPU with flare connection

KPU single	KPU dual
<p>Approx. net weight: 0.765 lbs</p>	<p>Approx. net weight: 1.19 lbs</p>

Table 5: KPU with capillary tube

KPU single	KPU dual
<p>Approx. net weight: 0.91 lbs</p>	<p>Approx. net weight: 1.5 lbs</p>

All switches are supplied with universal mounting bracket and mounting screws as standard accessory. Approximate weight of the bracket and mounting screws: 0.615 lbs

Ordering

For complete list of approved refrigerants, visit www.products.danfoss.com and search for individual code numbers, where refrigerants are listed as part of technical data.

Table 6: For R22, R134a, R404A, R407A, R407C, R407F, R422B, R422D, R438A, R448A, R449A, R450A, R452A, R507A, R513A

Pressure	Control type	Low pressure (LP)		High pressure (HP)		Reset		Contact type	Code no.	
		Range [inHg][psig]	Differential [psi]	Range [psig]	Differential [psi]	Low pressure (LP)	High pressure (HP)		Connection	
									¼ in male flare	36 in cap. tube w. ¼ in flare nut
Low	KPU 1	6 – 108	10 – 60	–	–	Auto	–	A	060-5231	060-5233
Low	KPU 1	6 – 108	10 – 60	–	–	Auto	–	B	060-5236	–
Low	KPU 1B	28 – 100	10	–	–	Man. (Min.)	–	A	060-5232	060-5234
Low	KPU 2	6 – 73	6 – 30	–	–	Auto	–	B	060-5237	060-5235
Low	KPU 2	6 – 73	6 – 30	–	–	Auto	–	A	060-5239	060-5240
Fan cycling	KPU 5	–	–	100 – 465	25 – 85	–	Auto	B	060-5241	060-5242
Dual	KPU 15	6 – 108	10 – 60	100 – 465	60	Auto	Auto	C	060-5247	060-5248
Dual	KPU 15B	6 – 108	10 – 60	100 – 465	60	Auto	Man. (Max.)	C	060-5249	060-5250

Table 7: Fail-safe switches for high pressure refrigerants (R410A, R744) PED 2014/68/EU approved according to EN 12263

Pressure	Control type	Low pressure (LP)		High pressure (HP)		Reset		Contact type	Code no.	
		Range [inHg][psig]	Differential [psi]	Range [psig]	Differential [psi]	Low pressure (LP)	High pressure (HP)		Connection	
									¼ in male flare	36 in cap. tube w. ¼ in flare nut
High	KPU 6W	–	–	100 – 600	58 – 145	–	Auto	A	060-5243	060-5245
High	KPU 6B	–	–	100 – 600	60	–	Man. (Max.)	A	060-5244	060-5246
Dual	KPU 16W	6 – 108	10 – 60	100 – 600	60	Auto	Auto	D	060-5251	060-5252
Dual	KPU 16B	6 – 108	10 – 60	100 – 600	60	Min. Conv.	Max. Conv.	D	060-5253	060-5254

During standstill the ambient temperature cannot be higher than 82 °F for R410A and higher than -11 °F for R744 as the LP side bellows MWP (250 psig) will be exceeded.

Contact system and application

Table 8: Contact system and application

Switch type	Switch action	Application
<p>SPDT</p> <p>Danfoss 60-127/9, 10 fW</p>	<ol style="list-style-type: none"> Terminals 1-4 close high and open low. Terminals 1-2 can be used as low pressure alarm. Terminals 1-2 open high and close low Terminals 1-4 can be used as high pressure alarm. 	<ol style="list-style-type: none"> Low pressure cut-out. High pressure cut-out.
<p>SPST (NO)</p> <p>Danfoss 60-128, 1, 10</p>	Terminals 1-4 close high and open low	<ol style="list-style-type: none"> Low pressure cut-out. Condenser fan cycling control.
<p>SPST (NO + NC)</p> <p>Danfoss 60-129/10, 10 fW</p>	Dual Pressure switch 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 of the switch.	Dual Pressure switch Protects the system against too low suction pressure and against too high discharge pressure.
<p>SPDT + SPST (NO)</p> <p>Danfoss 60-128, 10 fW</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	Dual Pressure switch. 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).

Pressure switch, KPU

	Load
	Signal option
	Bellows movement on pressure rise
	Bellows movement on pressure drop

Pressure switch setting with convertible reset

Table 9: Pressure switch 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

Certificates, declarations, and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

Table 10: Certificates, declarations, and approvals

File name	Document type	Document topic	Approval authority
UA.10146.D.00075-19	UA Declaration	EMCD/LVD	LLC CDC EURO TYSK
UL E31024 Certificate	Electrical - Safety Certificate	-	UL
TÜV 01 202 PL-Q-11 0004	Quality - Assurance Certificate	-	PED

UL listed for USA and Canada, E31024

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