Data sheet

Hot gas bypass regulator, type CPCE
Liquid gas mixer, type LG (accessory)

CPCE hot gas bypass regulator adapt compressor capacity to actual evaporator load.

They are designed for installation in a bypass line between the low and high pressure sides of the refrigeration system, for hot gas injection between the evaporator and thermostatic expansion valve.

Injection should be arranged to occur through an LG liquid gas mixer.

Features

CPCE hot gas bypass regulator

- Superior control accuracy
- Direct connection to system suction line regulates hot gas injection independent of evaporator pressure drop
- The regulator increases evaporator gas velocity, thus ensuring better oil return to compressor
- Protection against too low an evaporating temperature, i.e. prevents evaporator icing
- Compliant with ATEX hazard zone 2

LG liquid gas mixer

- LG provides homogeneous mixing of the liquid and hot gas refrigerant injected into the evaporator
- Prevents high suction superheat by combining hot gas injection with expansion valve characteristics
- LG can be used for hot gas defrosting or reverse cycle systems

Approvals

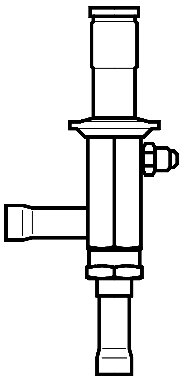
UL listed, file SA7200

Technical data

Refrigerants	HCFC, HFC and HC
Regulating range	p_e = 0 – 6 bar
	Factory setting = 0.4 bar
Maximum working pressure	PS/MWP = 28 bar
Maximum test pressure	Pe = 31 bar
Maximum differential pressure	Δp = 18 bar
Maximum media temperature	140 °C
Minimum media temperature	-50 °C

Ordering

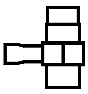
Hot gas bypass regulator



Type	Connection				Rated capacity[1)] [kW]				Code no.
	Flare		Solder		R22	R134a	R404A/ R507	R407C	
	[in.]	[mm]	[in.]	[mm]					
CPCE 12	1/2	12	—	—	17.4	7.9	16.4	19.0	**034N0081**
CPCE 12	—	—	1/2	12	17.4	7.9	16.4	19.0	**034N0082**
CPCE 15	—	—	5/8	16	25.6	11.6	24.2	27.9	**034N0083**
CPCE 22	—	—	7/8	22	34.0	15.2	32.0	37.1	**034N0084**

[1)] The rated capacity is the regulator capacity at
evaporating temperature t_e = -10 °C,
condensing temperature t_c = 30 °C,
reduction of suction temperature/suction pressure Δt_s = 4 K.

Liquid gas mixer



Type	Connection						Code no.
	Outlet ODM		Inlet hot gas ODF		Inlet liquid ODF		
	[in.]	[mm]	[in.]	[mm]	[in.]	[mm]	
LG 12 – 16	5/8	16	1/2	12	5/8	16	**069G4001**
LG 12 – 22	7/8	22	1/2	12	7/8	22	**069G4002**
LG 16 – 28	1 1/8	28	5/8	16	1 1/8	28	**069G4003**
LG 22 – 35	1 3/8	35	7/8	22	1 3/8	35	**069G4004**

Sizing

For optimum performance, it is important to select a CPCE valve according to system conditions and application.

The following data must be used when sizing a CPCE valve:

- Refrigerant: HCFC, HFC and HC
- Minimum suction temperature: t_s in [°C]/[bar]
- Compressor capacity at minimum suction temperature: Q_1 in [kW]
- Evaporator load at minimum suction temperature: Q_2 in [kW]
- Liquid temperature ahead of expansion valve: t_l [°C]
- Reduction of suction temperature/suction pressure in [K]
- Connection type: flare or solder
- Connection size in [in.] or [mm]

Selection

Example
When selecting the appropriate valve it may be necessary to convert the actual capacity using a correction factor. This is required when system conditions are different from table conditions.

The following examples illustrate how this is done.
- Refrigerant: R404A
- Minimum suction temperature: ts = -30 °C
- Compressor capacity at -30 °C, Q_1 = 80 kW
- Evaporator load at -30 °C, Q_2 = 60 kW
- Liquid temperature ahead of expansion valve: t_l = 40 °C
- Reduction of suction temperature/suction pressure = 5 K
- Connection type: solder
- Connection size = $^1/_2$ in.

Step 1

Determine the replacement capacity. This is done by taking the compressor capacity at minimum suction temperature Q_1 minus evaporator load at minimum suction temperature Q_2.
$Q_1 - Q_2 = 80 - 60 = 20$ kW

Step 2

Determine the correction factor for the reduction of suction temperature/suction pressure.

From the correction factor table (see below) a suction temperature reduction of 5 K (R404A) corresponds to a factor of 1.3.

Suction temp. t_s after reduction [°C]	Refrigerant	Suction temperature Δt_s [K]						
		1	2	3	4	5	6	7
10	**R134a**	0.1	0.5	0.9	1.0	1.0	1.0	1.0
	R22, R404A, R507, R407C	0.3	0.9	1.0	1.0	1.0	1.0	1.0
0	**R134a**	0.1	0.3	0.7	1.0	1.0	1.0	1.0
	R22, R404A, R507, R407C	0.2	0.9	1.0	1.0	1.0	1.0	1.0
-10	**R134a**	0.1	0.3	0.6	1.0	1.3	1.4	1.4
	R22, R404A, R507, R407C	0.1	0.5	1.0	1.0	1.0	1.0	1.0
-20	**R134a**	0.1	0.3	0.6	1.0	1.5	2.2	2.4
	R22, R404A, R507, R407C	0.1	0.3	0.7	1.0	1.0	1.0	1.0
-30	**R134a**	0.1	0.3	0.6	1.0	1.5	2.2	2.9
	R22, R404A, R507, R407C	0.1	0.3	0.6	1.0	1.3	1.4	1.4
-40	**R22, R404A, R507, R407C**	0.1	0.3	0.6	1.0	1.5	2.0	2.2

The correction table is used when suction temperature change deviates from 4 K.

The replacement capacity must be divided by the correction factor determined.

Step 3

Corrected replacement capacity is
$Q = 20/1.3 = 15.4$ kW

Step 4

Now select the appropriate capacity table for R404A and choose the column with a suction temperature of t_s = -30 °C.

Using the corrected replacement capacity, select a valve that provides an equivalent or greater capacity.

A CPCE 12 delivers a replacement capacity of 17.9 kW at a minimum suction temperature of -30 °C.

Step 5

CPCE 12, $^1/_2$ in. solder connection, **code no. 034N0082** (see Ordering).

Capacity

Type	Suction temperature t_s after pressure/ temperature reduction [°C]	Regulator capacity Q [kW] at condensing temperature t_c [°C]				
		20	30	40	50	60
R22						
CPCE 12	10	7.9	16.3	21.6	26.9	33.4
	0	12.9	17.3	21.7	27.1	33.4
	-10	13.6	17.4	22.0	27.4	33.4
	-20	13.7	17.6	22.2	27.7	33.4
	-30	8.0	11.0	14.7	18.6	33.4
	-40	4.3	5.7	7.6	—	33.4
CPCE 15	10	11.5	24.0	31.7	39.4	49.0
	0	18.8	25.4	32.0	39.9	49.0
	-10	20.0	25.6	32.3	40.2	49.0
	-20	20.1	25.8	32.6	40.7	49.0
	-30	11.5	16.0	21.2	27.1	49.0
	-40	5.9	7.8	10.6	—	49.0
CPCE 22	10	15.2	31.7	42.0	52.3	64.9
	0	25.0	33.6	42.4	52.8	64.9
	-10	26.5	34.0	42.8	53.4	64.9
	-20	26.6	34.2	43.1	53.8	64.9
	-30	15.4	21.3	28.1	35.9	64.9
	-40	8.0	10.7	14.3	—	64.9
R134a						
CPCE 12	10	2.3	10.4	14.4	18.0	22.6
	0	7.8	11.3	14.4	18.1	22.6
	-10	5.8	7.9	10.8	14.4	18.1
	-20	3.4	4.6	6.1	8.3	10.6
	-30	2.0	2.8	3.7	4.9	6.2
CPCE 15	10	2.3	15.2	21.1	26.5	33.2
	0	11.4	16.6	21.2	26.6	33.2
	-10	8.3	11.6	15.7	21.1	26.6
	-20	4.8	6.6	8.8	11.9	15.2
	-30	2.6	3.5	4.9	6.4	8.0
CPCE 22	10	3.1	20.4	28.0	35.2	43.9
	0	15.1	22.8	28.1	35.2	43.9
	-10	10.9	15.2	20.9	27.7	35.2
	-20	6.4	8.8	11.8	15.7	20.3
	-30	3.7	5.0	6.8	8.9	11.3

The capacities are determined by reducing the suction temperature/suction pressure at Δt_s = 4 K. The given suction temperatures are minimum values, i.e. after reduction.

The capacities are made up of the CPCE hot gas capacity + the extra capacity given by the thermostatic expansion valve to keep the superheat constant after the evaporator.

Capacity
(continued)

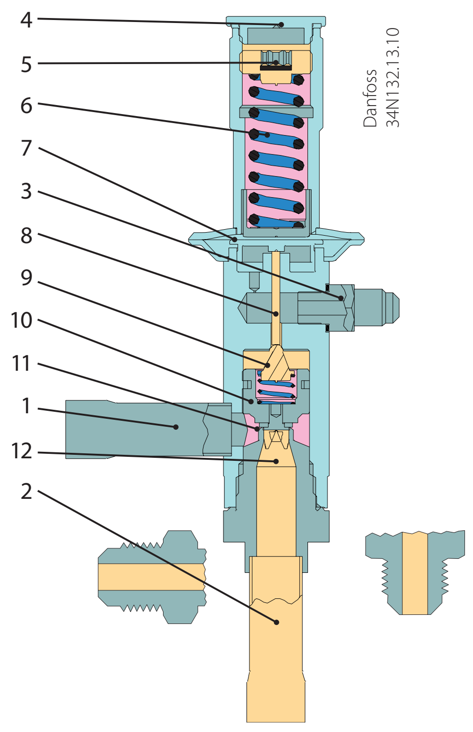
Type	Suction temperature t_s after pressure/ temperature reduction [°C]	Regulator capacity Q [kW] at condensing temperature t_c [°C]				
		20	30	40	50	60
R404A/R507						
CPCE 12	10	7.5	15.5	20.6	25.7	31.1
	0	12.2	16.4	20.6	25.7	31.1
	-10	12.9	16.4	20.7	25.7	31.1
	-20	13.1	16.4	20.7	—	31.1
	-30	10.3	13.8	17.9	—	31.1
	-40	5.5	7.5	9.5	—	31.1
CPCE 15	10	11.0	22.8	30.3	37.8	46.9
	0	18.0	24.2	30.3	37.8	46.9
	-10	19.1	24.2	30.4	37.8	46.9
	-20	19.1	24.3	30.4	—	46.9
	-30	15.0	20.3	26.5	—	46.9
	-40	8.0	10.6	13.4	—	46.9
CPCE 22	10	14.6	30.2	40.1	49.9	62.3
	0	23.8	32.0	40.1	49.9	62.3
	-10	25.3	32.0	40.1	50.0	62.3
	-20	25.3	32.1	40.2	—	62.3
	-30	19.9	26.7	34.8	—	62.3
	-40	10.6	14.2	18.0	—	62.3
R407C						
CPCE 12	10	9.7	18.3	23.5	28.2	33.4
	0	14.4	19.0	23.2	27.9	33.4
	-10	15.1	19.0	23.3	27.4	33.4
	-20	15.1	18.8	23.1	27.4	33.4
	-30	8.7	11.7	15.0	18.0	33.4
	-40	4.6	5.9	7.6	—	33.4
CPCE 15	10	14.1	26.9	34.6	41.4	49.0
	0	21.1	27.9	34.2	41.1	49.0
	-10	22.2	27.9	34.2	40.2	49.0
	-20	22.1	27.6	33.9	40.3	49.0
	-30	12.5	17.0	21.6	26.3	49.0
	-40	6.3	8.1	10.6	—	49.0
CPCE 22	10	18.7	35.5	45.8	54.9	64.9
	0	28.0	37.0	45.4	54.4	64.9
	-10	29.4	37.1	45.4	53.4	64.9
	-20	29.3	36.6	44.8	53.3	64.9
	-30	16.8	22.6	28.7	34.8	64.9
	-40	8.6	11.1	14.3	—	64.9

The capacities are determined by reducing the suction temperature/suction pressure at Δt_s = 4 K. The given suction temperatures are minimum values, i.e. after reduction.

The capacities are made up of the CPCE hot gas capacity + the extra capacity given by the thermostatic expansion valve to maintain the superheat after of the evaporator constant.

Design/Function

CPCE



1. Inlet
2. Outlet
3. Pilot pressure connection
4. Protective cap
5. Setting screw
6. Main spring
7. Diaphragm
8. Pressure pin
9. Pilot orifice
10. Servo piston
11. Pressure equalising hole
12. Main orifice

Hot gas bypass regulator, type CPCE is servo-operated.

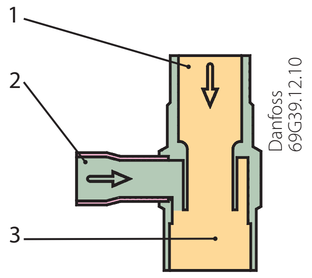
The diaphragm (7) is actuated on the upper side by the force developed by the spring (6) and on the lower side by the pilot pressure from (3).

When the pilot pressure drops below the preset value, the throttling ball is forced away from the pilot orifice (9) by the spring which acts via the pressure pin (8).

The pressure over the servo piston (10) is then relieved. The differential pressure which is thus created moves the servo piston up and causes the regulator to open so that hot gas is able to flow to the suction side.

When the pilot pressure rises above the setting, the pilot orifice shuts off the evacuation from the space over the servo piston. Pressure then builds up again over the piston via the pressure equalising hole (11), thus closing the regulator.

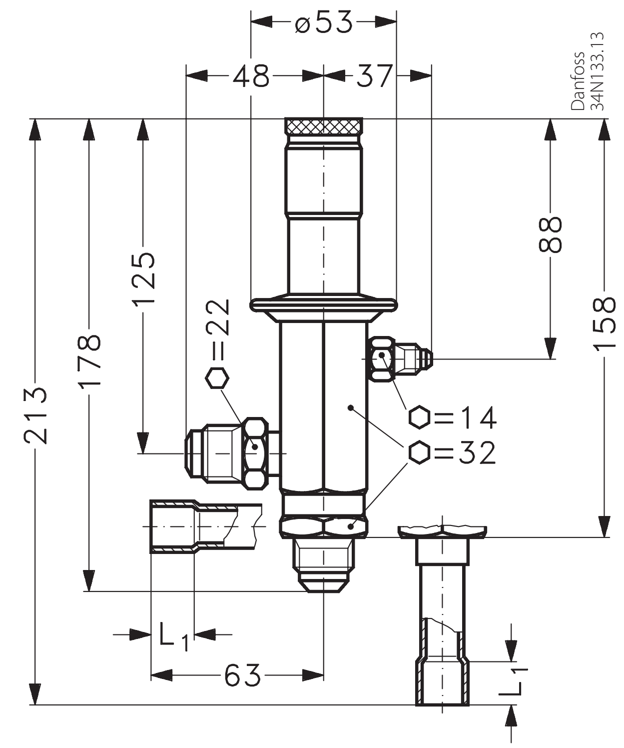
LG



1. Liquid inlet
2. Hot gas inlet
3. Outlet

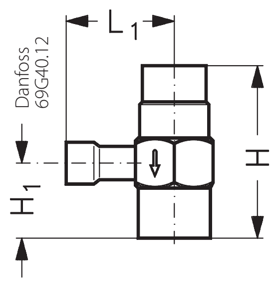
Dimensions [mm] and weights [kg]

CPCE



Type	L_1	Net weight
CPCE 12	10	0.9
CPCE 15	12	0.9
CPCE 22	17	0.9

LG



Type	H	H_1	L_1	NV	Net weight
LG 12 – 16	54	22	40	24	0.1
LG 12 – 22	62	26	42	28	0.2
LG 16 – 28	79	35	48	36	0.3
LG 22 – 35	89	40	66	41	0.4