ENGINEERING TOMORROW

Data Sheet

Electric regulating valve Type **CCM**

Expansion and gas bypass valve for CO_2

The CCM is an electrically operated valve designed specifically for operation in CO_2 systems. The valve is capable of functioning both as an expansion valve, and as a gas bypass valve with back-pressure regulation in subcritical applications.

The pressure rating allows for operation in environments where system standby capability is required without the need for auxiliary cooling systems during servicing or power outages.

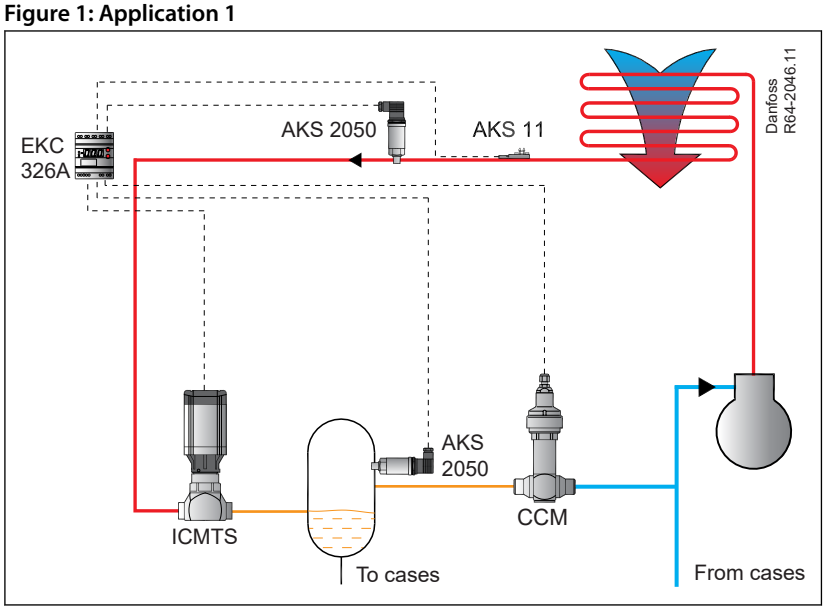
Features:

- Up to 90 bar (1305 psi) working pressure to accomodate CO_2 system pressures during standstill conditions.
- Precise positioning for optimal control of intermediate pressures in transcritical CO_2 systems or liquid injection in heat exchangers.
- MOPD up to 50 bar (725 psi).
- Combined stainless steel butt weld/solder connections for installation in copper piped systems (K65 alloy or standard) as well as steel piped systems.
- Standard M12 connector for simple and flexible connection to the motor driver.
- For manual operation and service of the CCM an AST-g service driver is available. For further information please contact Danfoss (Commercial Refrigeration and Air Conditioning Controls).
- UL recognized.

Applications

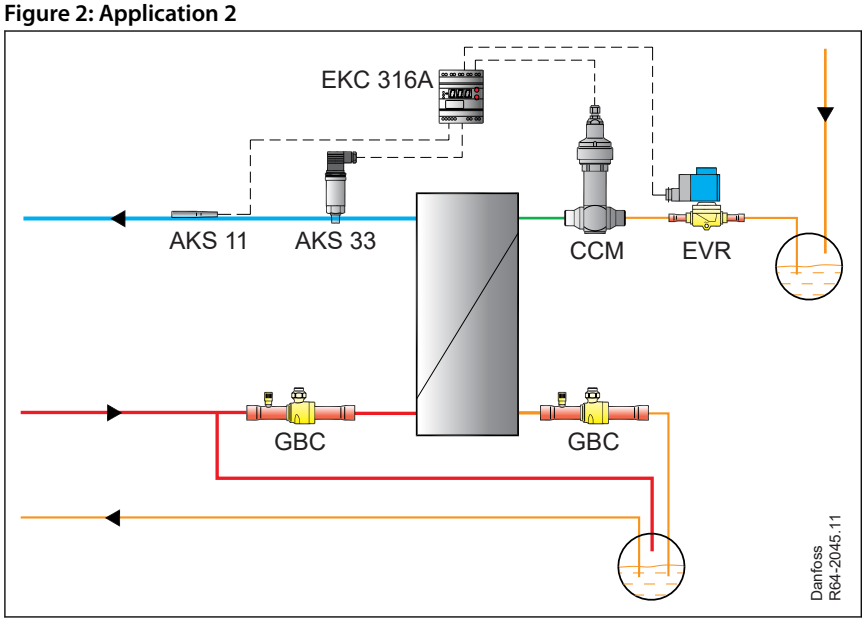
The CCM can be used in a variety of applications within CO_2 refrigeration systems. Typically it is used as a gas bypass valve in a transcritical CO_2 booster system or as an expansion valve.

Figure 1: Application 1



A gas bypass valve is typically used to regulate the intermediate pressure in a transcritical CO_2 refrigeration system. By venting flashgas generated after the transcritical expansion, the pressure can be kept at a safe level for all components situated in the liquid lines of a transcritical CO_2 system. For use in the gas bypass application the EKC326A controller is recommended.

Figure 2: Application 2



A liquid expansion valve is typically used for injection in plate heat exchangers of CO_2/CO_2 cascades, or as an expansion valve for CO_2 evaporators. For the liquid injection applications CCM is used with EKC 316A controller.

Product specification

Technical data

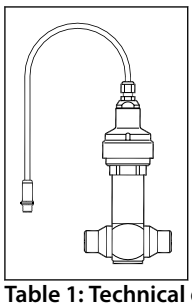


Table 1: Technical data

Parameter	CCM
Compatibility	R744
MOPD	50 bar (725 psi)
Max. working pressure (PS/MWP)	90 bar (1305 psi)
Refrigerant temperature range[1]	–40°C to 60°C (–40°F to 140°F)
Ambient temperature	–40°C to 60°C (–40°F to 140°F)
Material of construction	Stainless steel

[1] Measured at inlet of the valve

Electrical data

Table 2: Electrical data

Parameter	CCM	
Motor enclosure	IP 67	
Stepper motor type	Bi-polar - permanent magnet	
Step mode	2 phase full step	
Phase resistance	52Ω ±10%	
Phase inductance	85 mH	
Holding current	Depends on application Full current allowed (100% duty cycle)	
Step angle	7.5° (motor), 0.9° (lead screw), Gearing ration 8.5:1. (38/13)2:1	
Nominal voltage	(Constant voltage drive) 12 V dc -4% +15%, 150 steps/sec.	
Phase current	(Using chopper drive) 100 mA RMS -4% +15%,	
Max. total power	Voltage / current drive: 5.5 / 1.3 W (UL: NEC class 2)	
Step rate	150 steps/sec. (constant voltage drive) 0-150 steps/sec. 150 recommended (chopper current drive)	
Total steps	CCM 10, 20, 30 CCM 40	2625 [+160 / -0] steps 3530 [+160 / -0] steps
Total stroke	13 mm / 16 mm (0.5 in. / 0.6 in.)	
Full travel time	CCM 10, 20, 30 CCM 40	17 sec. 23 sec.
Lifting height	CCM 10, 20, 30 CCM 40	13 mm (0.5 in.) 16 mm (0.6 in.)
Reference position	Overdriving against the full close position	
Electrical connection	4 wire 0.5 mm^2 (0.02 in^2), 0.3 m (1 ft) long cable	

Stepper motor switch sequence

Table 3: Stepper motor switch sequence

CCM valve Connector			Cable plug
	4	Black	4
	3	White	3
	2	Green	2
	1	Red	1
	Connection 1	Wire Color	Connection 2
		Pin Out	

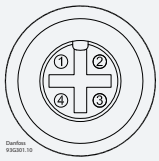
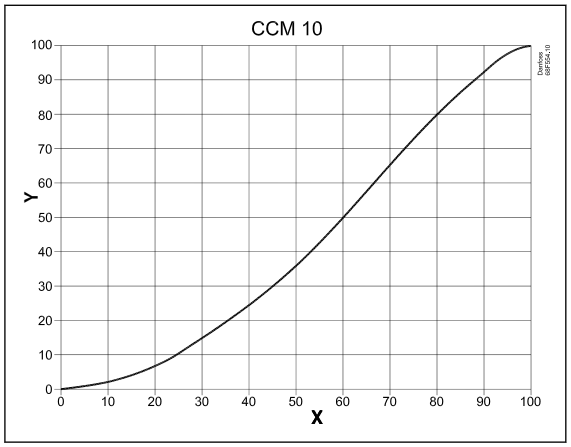


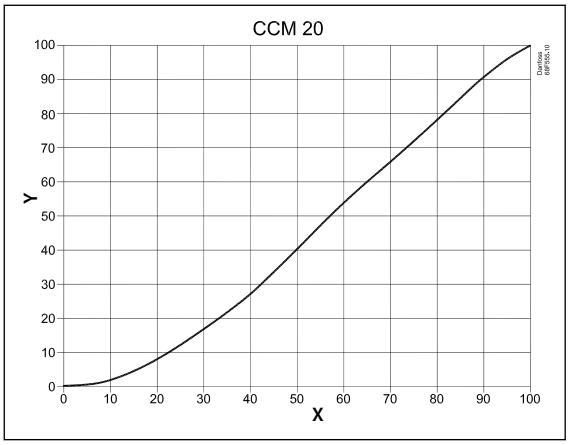
Table 4: Stepper motor switch sequence

	STEP	Coil I (B)		Coil II (A)		
		Red	Green	White	Black	
CLOSING	1	+	-	+	-	OPENING
	2	+	-	-	+	
	3	-	+	-	+	
	4	-	+	+	-	
	1	+	-	+	-	

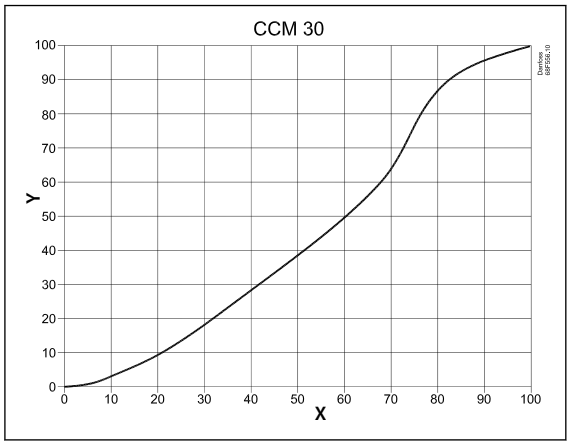
Flow characteristics



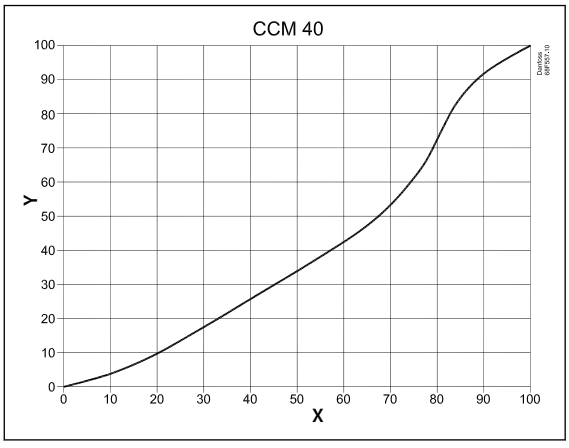
X	Opening %
Y	% of capacity full open



X	Opening %
Y	% of capacity full open



X	Opening %
Y	% of capacity full open



X	Opening %
Y	% of capacity full open

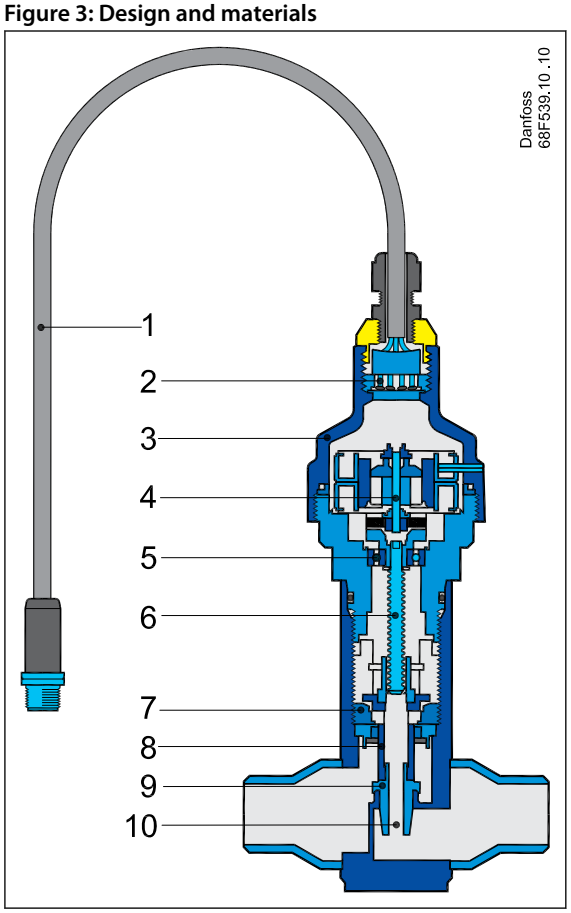
Valve selection based on capacity calculation

As for extended capacity calculations and valve selection based on capacities and refrigerants, please refer to Coolselector®2. Rated and extended capacities are calculated with the Coolselector®2 calculation engine to ARI standards with the ASEREP equations based on laboratory measurements of selected valves.

Download Coolselector®2 for free at coolselector.danfoss.com.

Design and materials

Figure 3: Design and materials



1	Cable
2	Glass seal
3	Motor housing
4	Stepper motor
5	Bearing
6	Spindle
7	Insert
8	Valve piston
9	Valve seat
10	Valve port

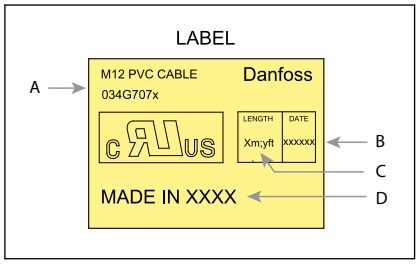
M12 angle cable

M12 angle female connector is intended for use with a standard M12 male connector, available on stepper motor valves.

This cable is designed to offer high flexibility and small outer diameters with tensile strength. The angle way M12 cable consist of paired, twisted wires, which decreases mutual influence between signals transmitted along the cable and reduces influence of external sources of interference. The cables thus provides a higher degree of protection against lost steps compared to other cables.

Identification

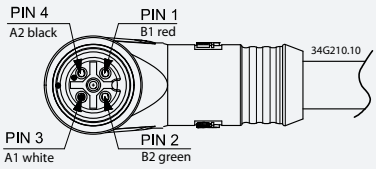
Figure 4: Identification

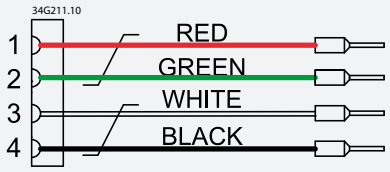


A	Product type Code no.
B	Manufacturing date
C	Meters/Feets
D	Country

Connections

Table 5: Connections





Specification

Table 6: Specification

Features	Description
Jacket	PVC - black
Cable outer sheath	Oil - resistant
Water proof rating	IP 67
Operating temperature range	-40 – +80 °C
Wire type	Twisted pair, cross section 20 AWG / 0.5 mm2
Cable outer diameter	7.0 mm
Minimum bending radius	10 x cable diameter
Cable combustibility / test	Flame retardant / VW-1 / CSA FT - 1
M12 standard	EN 61076-2-101
Reference standard	UL style 2464 and DIN VDE 0812
LVD directive	73/23/EEC and 93/68/EEC

Dimension and weight

Figure 5: Dimensions

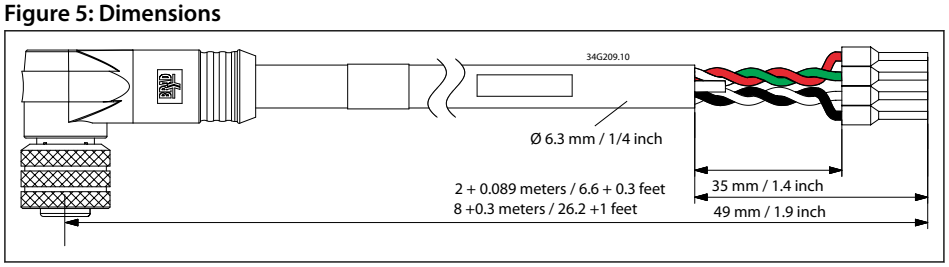


Figure 6: Dimension and weight

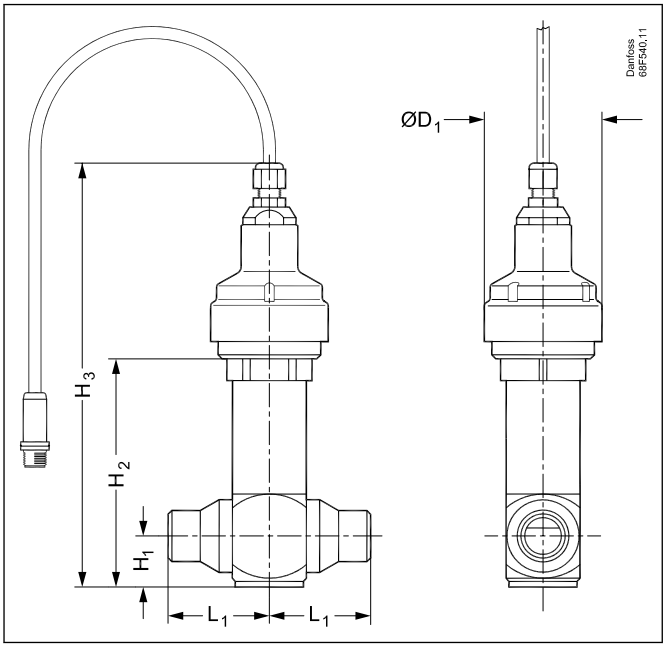


Table 7: Dimension and weight

Type	H1		H2		H3		L1		ØD1		Weight	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	kg	lb.
CCM	26.2	1	120	4.7	225	8.9	53	2.1	62	2.4	1.8	4

For further information please contact Danfoss

Ordering

Valve incl. actuator - Single pack

Table 8: Valve incl. actuator - Single pack

Type	K_v m³/h	Connections (Combi)		Code nos single pack
		Weld(1) [in]	Solder ODF x ODF [in]	
CCM 10	0.8	1/2 x 1/2	5/8 x 5/8	027H7188
CCM 20	1.7	3/4 x 3/4	7/8 x 7/8	027H7187
CCM 30	2.5	1 x 1	1 1/8 x 1 1/8	027H7186
CCM 40	4.2	1 x 1	1 1/8 x 1 1/8	027H7185

(1) OD according to EN 10220

Accessories

Table 9: Accessories

Type	Description	Code number
AST-G	Manual valve driver for service	034G0013

Spareparts

Table 10: Spareparts

Type	Description	Code number
AST	Actuator for CCM CO2 valve	027H7184
-	O-ring spare part kit for CCM/CCMT (2 O-rings)	027H7230

Ordering

Table 11: Ordering

Cable	Cable length (L)	Insulation	Packing format	Code no.
PVC - black	2 + 0.089 m / 6.6 +0.3 ft	SR-PVC	Single pack	034G7073
	8 + 0.3 m / 26.2 +1 ft	SR-PVC	Single pack	034G7074

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.

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