

## Data Sheet

# Electric regulating valve

## Types **CCMT 2 - 8** and **CCMT 16 - 42**

One valve, 4 applications: HPV, GBV, EV and EPR



The CCMT is an electrically operated valve designed specifically for operation in CO<sub>2</sub> systems.

The CCMT valve concept is designed to fulfil global refrigeration requirements.

The valve is capable of functioning either as an expansion valve, as a pressure regulator for the gascooler or as a gas bypass valve with back-pressure regulation in transcritical or subcritical applications.

**Features:**

- Designed for CO<sub>2</sub> systems with maximum working pressure of 140 bar / 2030 psig.
- Applicable to R744 (CO<sub>2</sub>). The CCMT is compatible with the oil types PAG, POE and PVE.
- Regulating cone ensures optimum regulating accuracy, particularly at part load.
- Patented cone and balance design.
- The PEEK seat provides excellent valve tightness and robustness.
- Combined butt weld and solder connections.
- Top part with built-in strainer / filter.
- MOPD up to 90 bar / 1305 psi
- CCMT 16 – CCMT 42 are available with or without integrated pressure transmitter.
- Standard M12 connector for simple and flexible connection to the motor driver.
- Low weight and compact design.
- Easy to service. Insert easily taken out by removing top part.
- For manual operation and service of the CCMT an AST-g service driver is available.







**Portfolio overview**

**Related products**

Table 1: Related products

Type	Description	Code no.
AK-PC 782B	Pack controller for transcritical booster CO <sub>2</sub> systems	080Z0202
AK-XM 208C	Electronic driver AK-XM 208 for up to 4 stepper valves, used with AK-PC 78x B controllers	080Z0023
AK-CC55 Single Coil	Case/Cold room controller with EEV stepper valve solution	084B4182
EKE 1P	Electronic driver EKE 1P for 1 stepper valve	080G0325
EKE 1C	Superheat controller	080G5400
EKE 2U	Backup power module	080G5555
AST-G	Manual service driver	034G0013

Table 2: Portfolio overview

<p><b>Pack Controller AK-PC for CO<sub>2</sub></b></p> 	<p><b>Electronic driver AK-XM 208C to be mounted with AK-PC 78x B</b></p> 	<p><b>Case/room controller AK-CC55 Single Coil, for air evaporators</b></p> 
<p><b>Electronic driver EKE 1P</b></p> 	<p><b>Superheat controller EKE 1C</b></p> 	<p><b>Backup power module EKE 2U</b></p> 

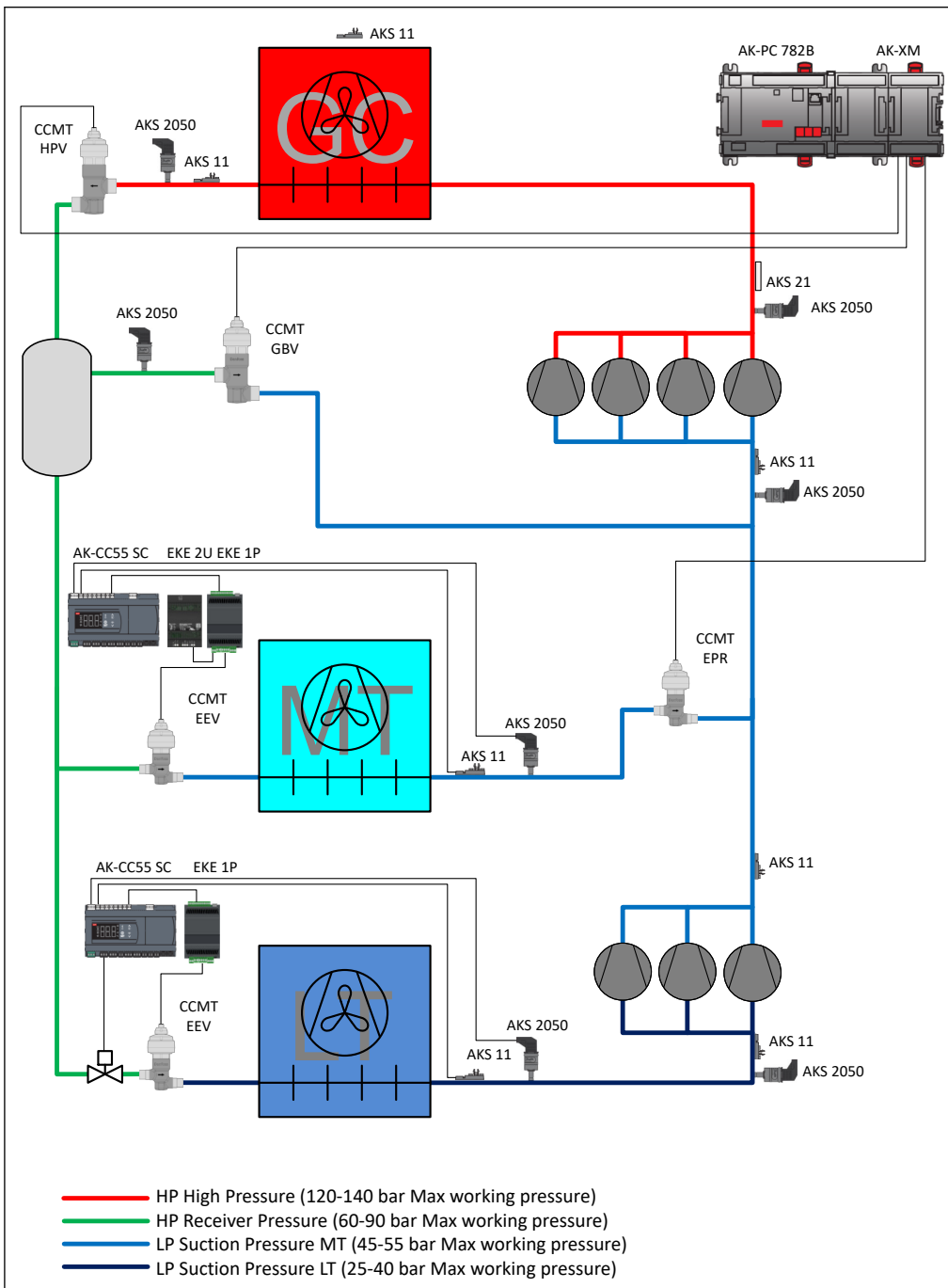
## Applications

The CCMT valve is developed for transcritical CO<sub>2</sub> applications. The CCMT valve can be used in systems with flash gas bypass, parallel compression as well as in stand-alone applications.

The CCMT valve can be used in transcritical and subcritical conditions.

CCMT valves are typically used as flash gas bypass and high pressure regulation.

**Figure 1: Application**



### Application 1 - High Pressure Valve (HPV)

The function of the high pressure valve is to control the high pressure in the system according to the reference from the controller. The reference can be set to obtain the optimum COP, optimum capacity or any other factors. Pressure

control is performed by the CCMT valve, which is installed at the outlet of the gas cooler (see the figure above) and a matching Danfoss controller. This design provides the possibility to optimize gas cooler pressure in all situations and intermediate receiver pressure independently.

### **Application 2 - Gas bypass Valve (GBV)**

A gas bypass valve is typically used to control the receiver pressure in a transcritical CO<sub>2</sub> refrigeration system. By venting flash gas generated after the transcritical expansion through a gas bypass valve to the suction side of the compressor, the pressure can be kept at a safe level for all components situated in the liquid lines of a transcritical CO<sub>2</sub> system. The two phase mixture after HPV valve has to be separated in the receiver before gas enters the gas bypass.

### **Application 3- Expansion Valve (EV)**

CCMT as an evaporator expansion valve is used on bigger air cooled evaporators or plate heat exchangers to control liquid injection according to measured superheat. For controlling all processes at air evaporators, including superheat control, it can be used AK-CC55 Single Coil+EKE 1P and for plate heat exchangers EKE 1C superheat controller with AKS 11 temperature and AKS 2050 pressure sensor.

### **Application 4 – Electric pressure regulator (EPR)**

With CCMT valves, it is possible to obtain an accurate pressure control in the evaporator.

Please refer to the [www.danfoss.com/en/markets/food-and-beverage/dcs/co2-in-food-retail/](http://www.danfoss.com/en/markets/food-and-beverage/dcs/co2-in-food-retail/) for more information on CO<sub>2</sub> systems.

## Product specification

### Technical data

Table 3: Technical data

Features	Description	
Valve types	CCMT 2 – CCMT 8	CCMT 16 - CCMT 42
Compatibility refrigerants	- R744 - R1234yf	- R744 - R1234yf only for CCMT without integrated pressure transmitter
Refrigerant oils	PAG, POE and PVE	PAG, POE and PVE
MOPD	90 bar / 1305 psi	90 bar / 1305 psi
Max. working pressure (PS/MWP)	140 bar / 2030 psig	140 bar / 2030 psig
Refrigerant temperature range <sup>(1)</sup>	-40 – 60 °C / -40 – 140 °F	-40 – 60 °C / -40 – 140 °F
Ambient temperature	-40 – 60 °C / -40 – 140 °F	-40 – 60 °C / -40 – 140 °F
Material specification	Stainless steel	Stainless steel
Expected lifetime	Min. 15 years	Min. 10 years
Build in strainer / filter	Yes, 6 slots, 1.1 mm height x 10 mm wide	Yes, 250 micron
Comply with P.E.D.	Fluid Groups 1 & 2 / Article 4, paragraph 3	Fluid Groups 1 & 2 / Article 4, paragraph 3
Approval	CE and UL approved	CE, UL, EAC, cUL, CRN

<sup>(1)</sup> Measured at inlet of the valve

### Electrical data

Table 4: Electrical data

Features	Description	
Valve types	CCMT 2 – CCMT 8	CCMT 16 - CCMT 42
Stepper motor type	Bi-polar - permanent magnet	Bi-polar - permanent magnet
Motor enclosure	IP 67	IP 67
Step mode	2 phase full step, microstepping (recommended)	2 phase full step, microstepping (recommended)
Phase resistance	52 Ω ±10%	29 Ω ±10%
Phase inductance	85 mH	36.7 mH
Phase current	Using chopper drive: 100 mA RMS -4 % +15 %	Using chopper drive: 300 mA RMS -4 % +15 %
Holding current	Voltage driver: Depends on application. Current controller: Full current allowed	Not needed.
Duty cycle	100% duty cycle is allowed / 20% recommended	100% duty cycle is allowed / 20% recommended
Max. total power	Voltage drive: 5.5 W Current drive: 1.3 W (UL: NEC class 2)	Voltage drive: 10W Current drive: 2.8 W
Step rate	Chopper current drive: Max. 300 steps/sec. (Recommended step rate: 200 steps/sec.) Constant voltage drive: Max. 150 steps/sec.	Chopper current drive: Max. 300 steps/sec. (Recommended step rate: 200 steps/sec.) Constant voltage drive: Max. 150 steps/sec.
Total full steps	CCMT 2, 4 and 8: 1100 steps	CCMT 16 : 800, CCMT 24 : 1400, CCMT 30 : 2300 and CCMT 42 : 2200
Full travel time	CCMT 2, 4 and 8: 5 sec. (at 220 steps/sec.)	CCMT 16 : 4 sec., CCMT 24 : 7 sec. CCMT 30 : 11.5 sec. and CCMT 42 : 11 sec. (at 200 steps/sec.)
Reference position	Overdriving against full close position	Overdriving against full close position
Overdrive in close position	Max. 10% of total full steps	Max. 10% of total full steps and maximum one overdrive performed per hour.
Overdrive in open position	Not Allowed	Not Allowed
Electrical connection	Integrated M12 male connector	Integrated M12 male connector
Compatible controllers	EKE 1A, EKE 1B, EKE 1C, EKC 313, EKC 326A , AK-XM 208C	EKE 1A, EKE 1B, EKE 1C, AK-XM 208C

Table 5: Pressure transmitter DST P310 (CCMT 16 - CCMT 42 with integrated pressure transmitter)

Pressure range	- 1 to 159 bar / -14.5 to 2306 psi sealed gauge
Electrical connection	Round Packard Metripack
Output signal	10 - 90 % of V supply
Supply voltage	5V DC ± 0.5V
Process connection	7/16-20 UNF-2A ISO 228/1; Viton o-ring

## Stepper motor switch sequence

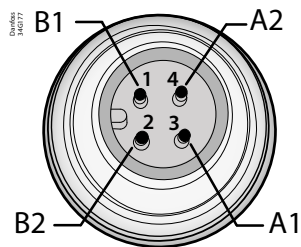
Table 6: Stepper motor switch sequence

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

Table 7: Danfoss cable connections

Pin	Wire color
A1	White
A2	Black
B1	Red
B2	Green

Figure 2: CCMT valve



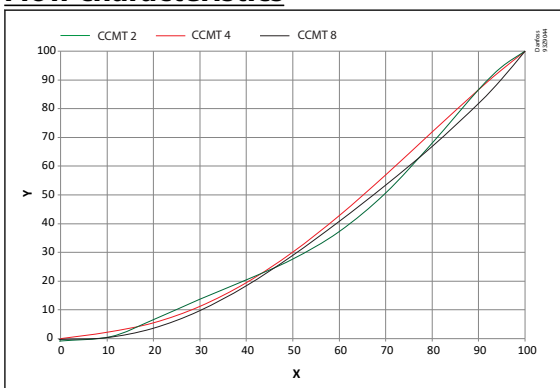
If the controller driving the CCMT valve is from another manufacturer than Danfoss or a custom design, the following points must be considered in order to overcome potential step loss.

To ensure total closing of the valve, and to compensate the lost steps after a defined number of changes in opening degree, the controller should have a function to overdrive the valve in the closing direction. It is recommended to overdrive ten percent of the full steps range at appropriate intervals.

**⚠ WARNING:**

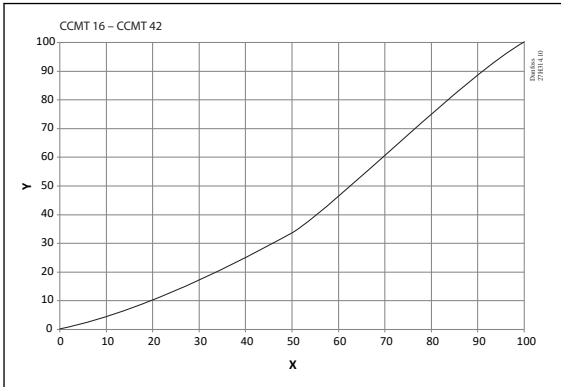
At power failure the CCMT valve will remain in the actual opening position it has at the moment of power failure, unless a safety device in the form of a battery backup is installed.

## Flow characteristics



X	Opening %
Y	% of capacity full open

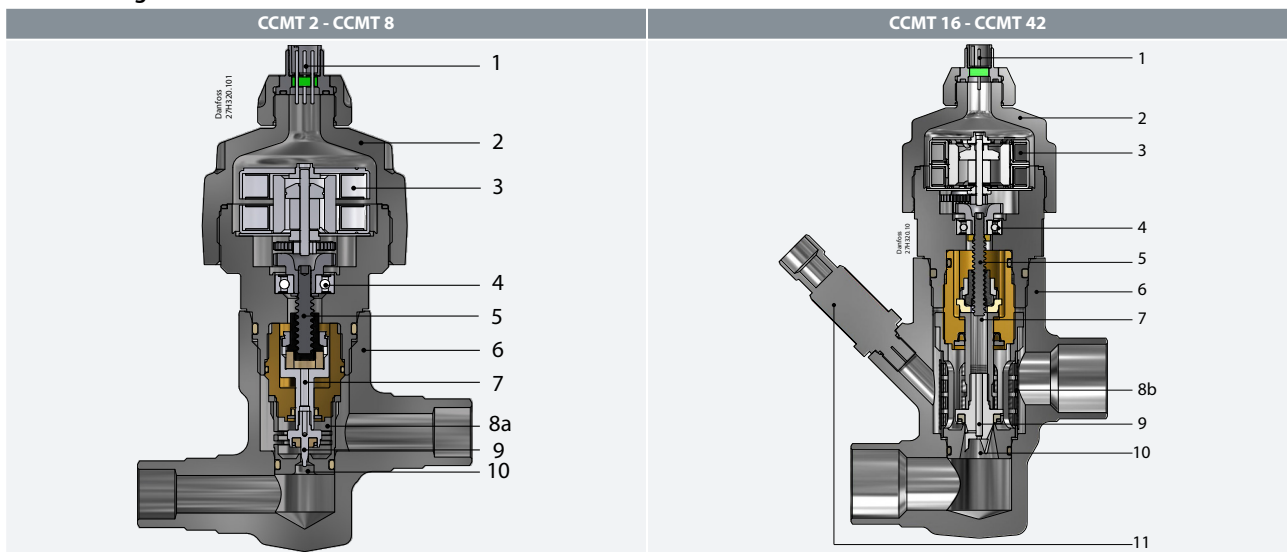
Electric regulating valve, types CCMT 2 - 8 and CCMT 16 - 42



X	Opening %
Y	% of capacity full open

**Design**

Table 8: Design



<b>1</b>	M12 connector	<b>8a</b>	Strainer
<b>2</b>	Actuator housing	<b>8b</b>	Filter
<b>3</b>	Stepper motor	<b>9</b>	Valve cone
<b>4</b>	Ball bearing	<b>10</b>	Nozzle
<b>5</b>	Spindle	<b>11</b>	Pressure transmitter (not included in CCMT 16 - CCMT 42 without integrated pressure transmitter)
<b>6</b>	Valve housing		
<b>7</b>	Balance piston		

## Dimensions

Table 9: Dimensions of CCMT without integrated pressure transmitter

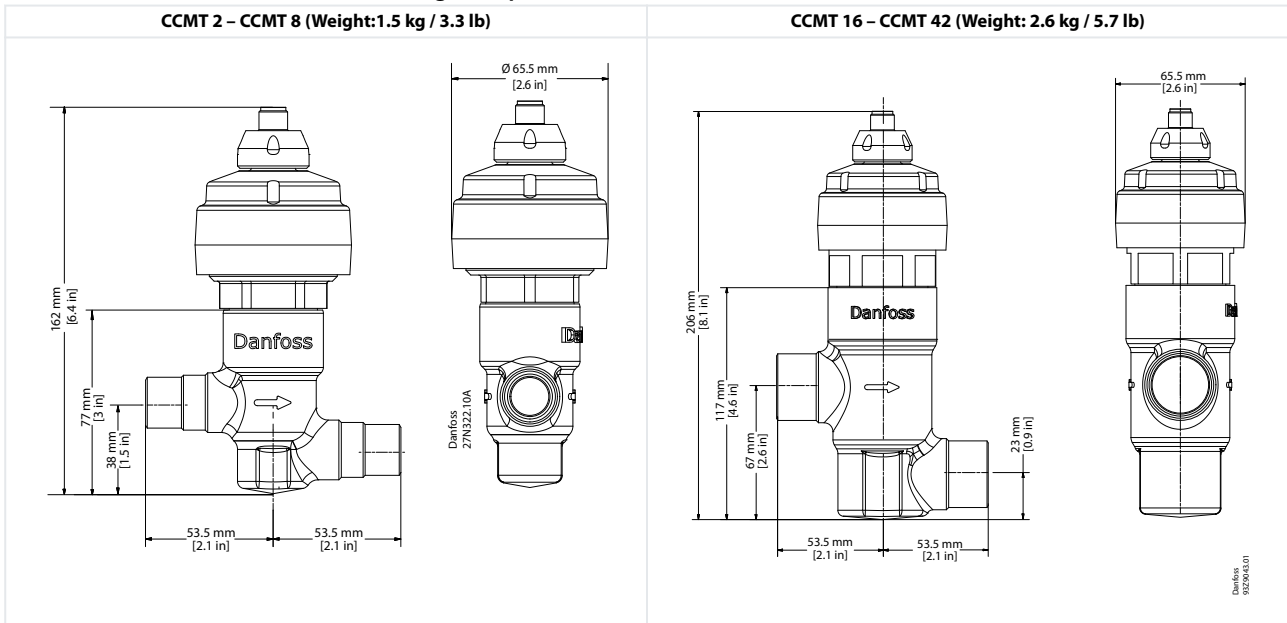
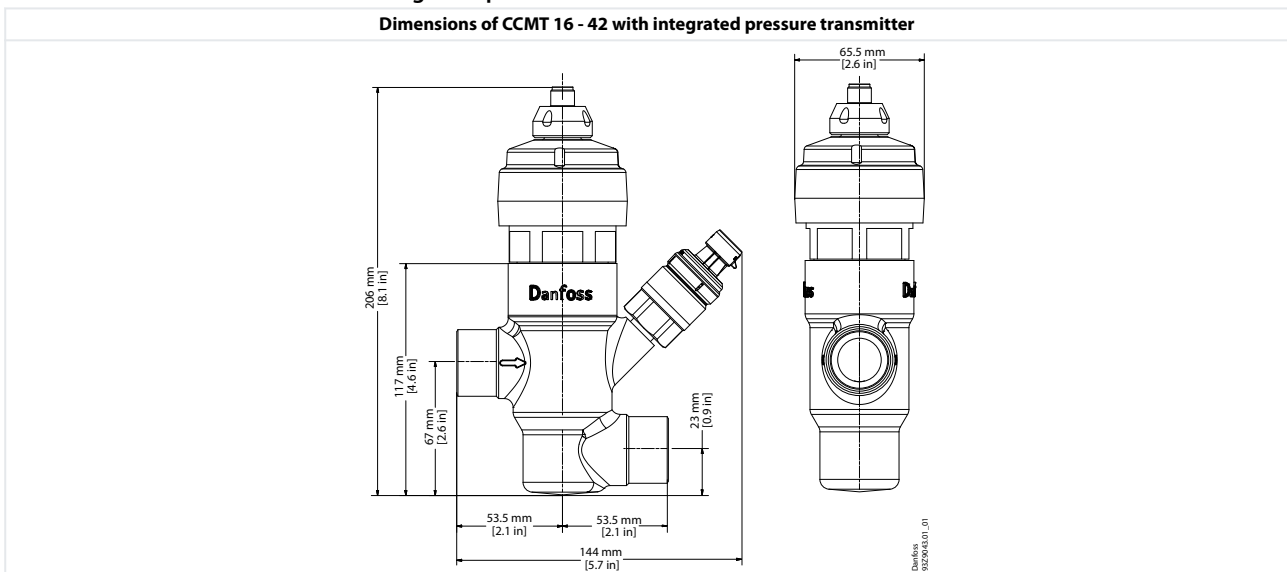


Table 10: Dimensions of CCMT with integrated pressure transmitter





## Ordering

### Valve including actuator

Table 11: Ordering CCMT without pressure transmitter

Type	Connections		Flow rate		Packing format	Code no.
	Weld <sup>(1)</sup> [in]	Solder ODF x ODF [in]	$k_v$ [m <sup>3</sup> /h]	$C_v$ [gpm]		
CCMT 2	1/2 x 1/2	5/8 x 5/8	0.17	0.19	Single pack	027H7200
CCMT 4	1/2 x 1/2	5/8 x 5/8	0.45	0.52	Single pack	027H7201
CCMT 8	1/2 x 1/2	5/8 x 5/8	0.8	0.92	Single pack	027H7202
CCMT 16	1 x 1	1 1/8 x 1 1/8	1.6	1.85	Single pack	027H8231
CCMT 24	1 x 1	1 1/8 x 1 1/8	2.4	2.77	Single pack	027H8232
CCMT 30	1 x 1	1 1/8 x 1 1/8	3	3.47	Single pack	027H8233
CCMT 42	1 x 1	1 1/8 x 1 1/8	4.2	4.86	Single pack	027H8234

<sup>(1)</sup> OD according to EN 10220

Table 12: Ordering CCMT 16-42 special version with integrated pressure transmitter

Type	Connections		Flow rate		Packing format	Code no.
	Weld <sup>(2)</sup> [in]	Solder ODF x ODF [in]	$k_v$ [m <sup>3</sup> /h]	$C_v$ [gpm]		
CCMT 16	1 x 1	1 1/8 x 1 1/8	1.6	1.85	Single pack	027H7231
CCMT 24	1 x 1	1 1/8 x 1 1/8	2.4	2.77	Single pack	027H7232
CCMT 30	1 x 1	1 1/8 x 1 1/8	3	3.47	Single pack	027H7233
CCMT 42	1 x 1	1 1/8 x 1 1/8	4.2	4.86	Single pack	027H7234

<sup>(2)</sup> OD according to EN 10220

### Accessories

#### Spare parts

Table 13: Spare parts

Type	Description	Packing format	Code no.
Gasket	O-ring spare part kit for CCM / CCMT 2 - CCMT 42	Single pack	027H7230
Filter and gasket <sup>(1)</sup>	Filter spare part kit for CCMT 16 - CCMT 42	Single pack	027H7280

<sup>(1)</sup> Two O-rings for CCMT 16 - CCMT 42 are included in 027H7280

#### Packard cable for DST P310 pressure transmitter

Table 14: Packard cable for DST P310 pressure transmitter

Type	Description	Packing format	Code no.
Packard cable	10 m / 32.8 ft cable for DST P310 pressure transmitter	Industrial pack (14 pcs per pack)	064G0910
		Single pack	064G0950

#### M12 angle cable

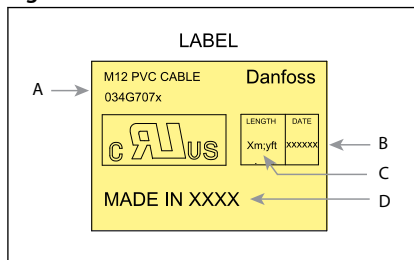
M12 angle female connector is intended for use with the standard M12 male connector on CCMT valves.

The Danfoss cable is designed to offer high flexibility and proper tensile strength.

The Danfoss M12 cable also consists of paired, twisted wires, which decreases mutual influence between signals transmitted along the cable and reduces influence of external sources of interference. The cable thus provides a higher degree of protection against lost steps compared to other cables.

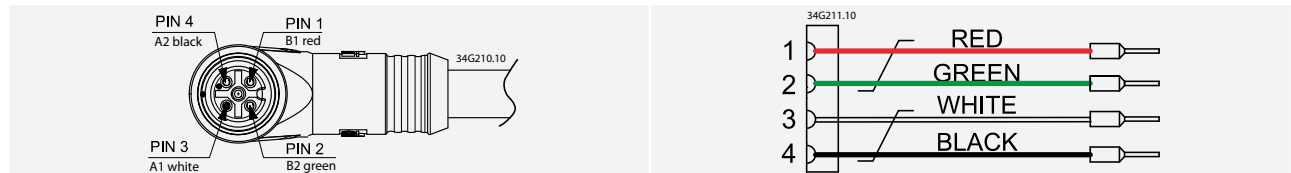
## Electric regulating valve, types CCMT 2 - 8 and CCMT 16 - 42

**Figure 3: Identification**



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

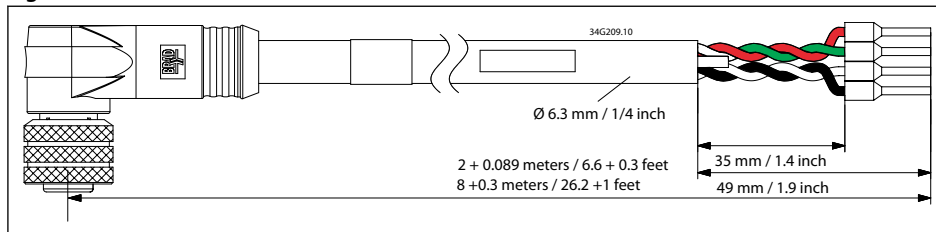
**Table 15: Connections**



**Table 16: 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 mm <sup>2</sup>
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

**Figure 4: Dimensions**



**Table 17: Ordering M12 angle cable**

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.

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