

## Data Sheet

# Electric regulating valve Type **CCMT 2, 8, 16** and **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>) and other common refrigerants. 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 is 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	Single pack	Code no.
AK-XM 208C	Stepper output module	1	080Z0023
EKE 1 Series	Superheat controller / driver	1	080G5300
			080G5350
			080G5400
AST-G	Manual service driver	1	034G0013

Table 2: Portfolio overview

Superheat controller / driver, type EKE 1 series	Electronic controller type EKC 326 and EKC 313	Electronic driver type AK-XM 208C	Temperature sensors type AKS and pressure transmitters type DST
			

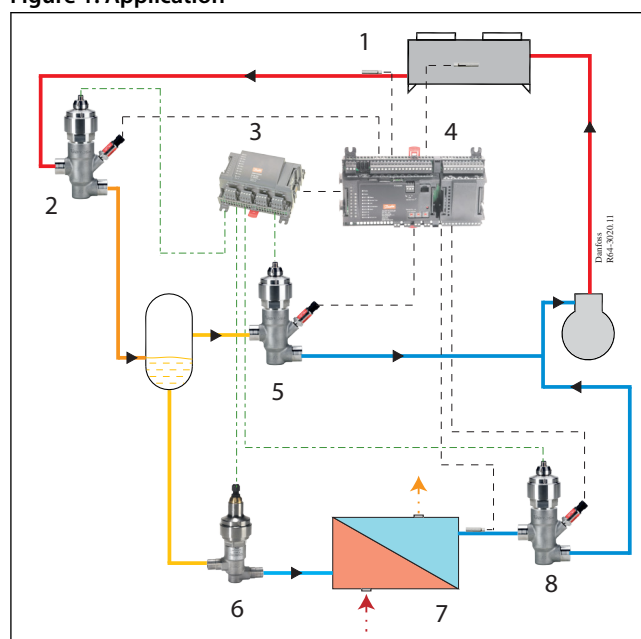
## Applications

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



1	Gas cooler
2	High pressure valve
3	Stepper motor driver
4	Master controller
5	Gas by-pass valve
6	Electric expansion valve
7	Evaporator
8	Electric pressure regulator

### 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 optimization 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. Please refer to the [www.danfoss.com/CO<sub>2</sub>](http://www.danfoss.com/CO2) for more information on CO<sub>2</sub> systems.

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

A gas bypass valve is typically used to regulate the intermediate pressure in a transcritical CO<sub>2</sub> refrigeration system, in order to keep the intermediate pressure low. By venting flash gas generated through a gas bypass valve to the suction side of the compressor 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<sub>2</sub> system. The two phase mixture from the CCMT valve has to be separated before gas enters the gas bypass. For use in the gas bypass application the EKC 326A controller is recommended for CCMT 2 to CCMT 8.

### Application 3- Expansion Valve (EV)

A liquid expansion valve is typically used for injection in plate heat exchangers of CO<sub>2</sub>/CO<sub>2</sub> cascades, or as an expansion valve for CO<sub>2</sub> evaporators. For the liquid injection applications CCMT 2 to CCMT 8 is used with EKC 313 controller.

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

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

## Product specification

### Technical data

Table 3: Technical data

Features	Description	
Parameter	CCMT 2 – CCMT 8	CCMT 16 - CCMT 42
Compatibility refrigerants	R744 and other refrigerants. Not applicable for flammable refrigerants and Ammonia.	R744 and other refrigerants. Not applicable for flammable refrigerants and Ammonia.
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.	Please change the text from "Fluid group I / Article 3, paragraph 3" to "Fluid group II / Article 4, paragraph 3"	Please change the text from "Fluid group I / Article 3, paragraph 3" to "Fluid group II / 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	
Parameter	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	M12 male connector with 0.3 m / 1 ft long cable (4 wire: 0.5 mm <sup>2</sup> / 20 AWG)	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 – 2306 psi sealed gauge
Electrical connection	Round Packard Metripack
Output signal	10 - 90 % of V supply
Supply voltage	5V DC $\pm$ 0.5V
Process connection	7/16-20 UNF-2A ISO 228/1; Viton o-ring

## Stepper motor switch sequence

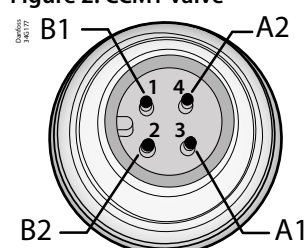
**Table 6: Stepper motor switch sequence**

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

**Table 7: Danfoss cable connections**

Pin	Wire color
A1	White
A2	Black
B1	Red
B2	Green

**Figure 2: CCMT valve**



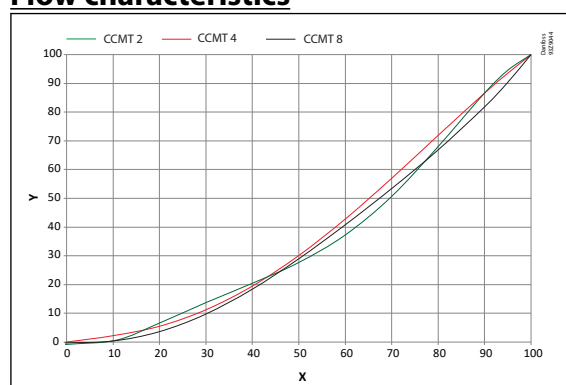
If the controller driving the CCMT Light valve is from another manufacturer than Danfoss or a custom design, the following points must be considered in order to overcome potential step loss.

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:**

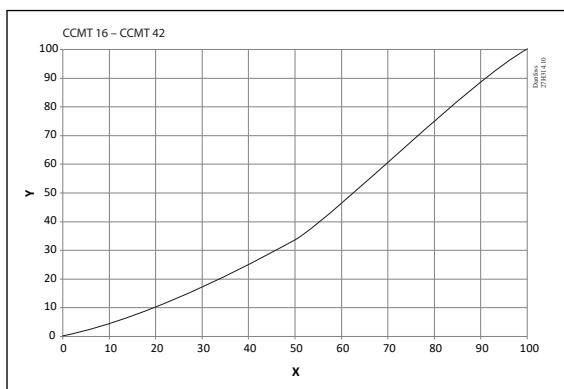
At power failure the CCMT Light valve will remain in the actual opening position it has at the moment of power failure, unless a safety device in the form of a battery backup is installed.

## Flow characteristics



X	Opening %
Y	% of capacity full open

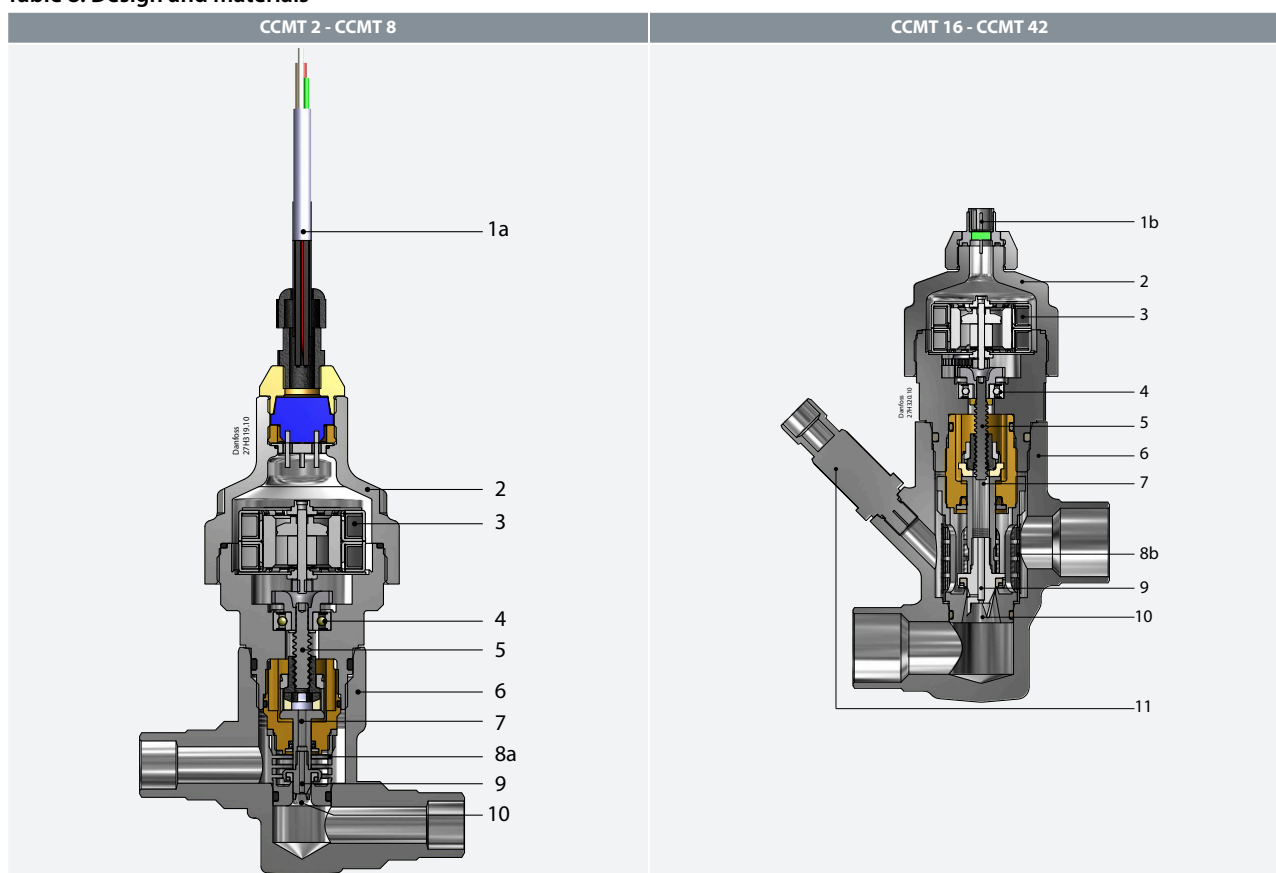
## Electric regulating valve, type CCMT 2, 8, 16 and 42



X	Opening %
Y	% of capacity full open

## Design and materials

Table 8: Design and materials



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

## M12 angle cable

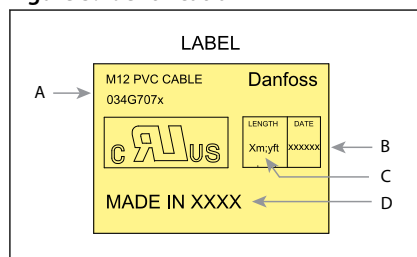
### M12 angle cable

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

## Identification

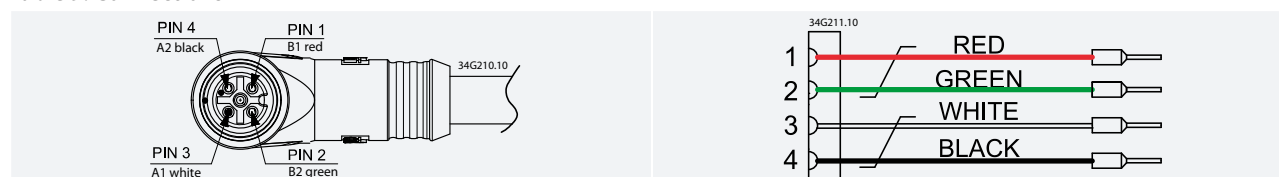
Figure 3: Identification



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

## Connections

Table 9: Connections



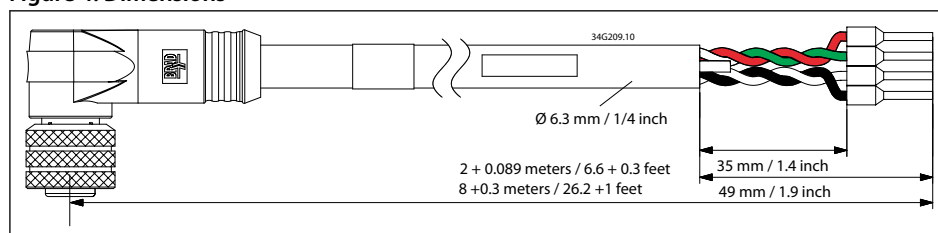
## Specification

Table 10: 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

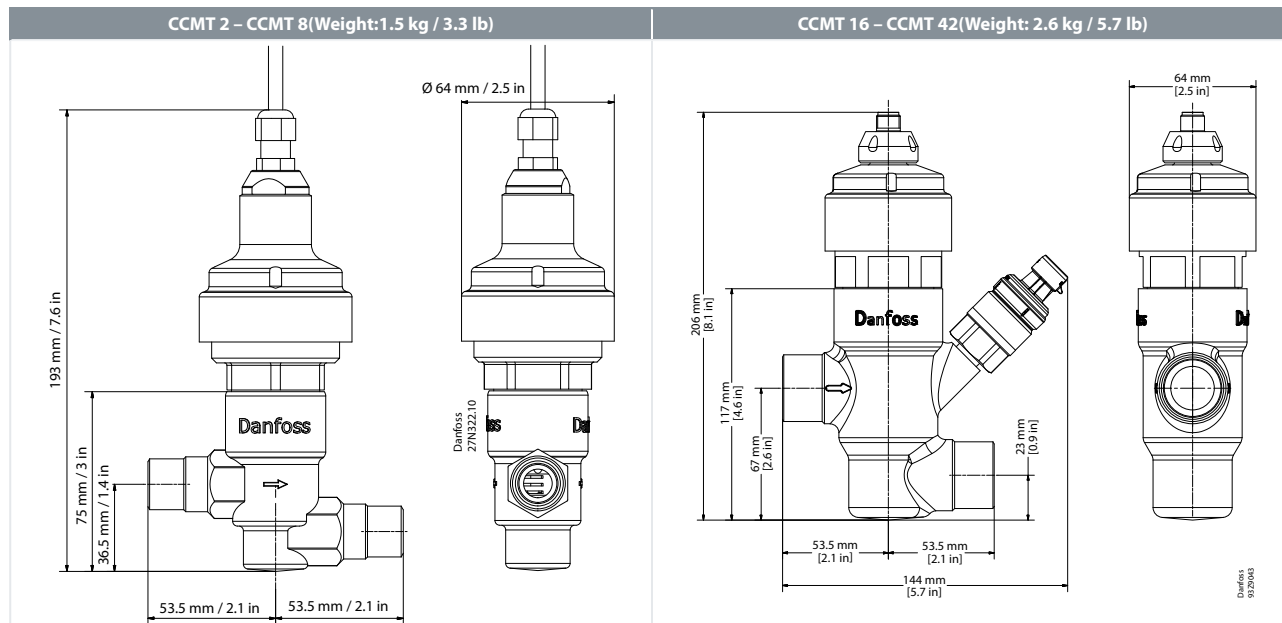
## Dimensions

Figure 4: Dimensions



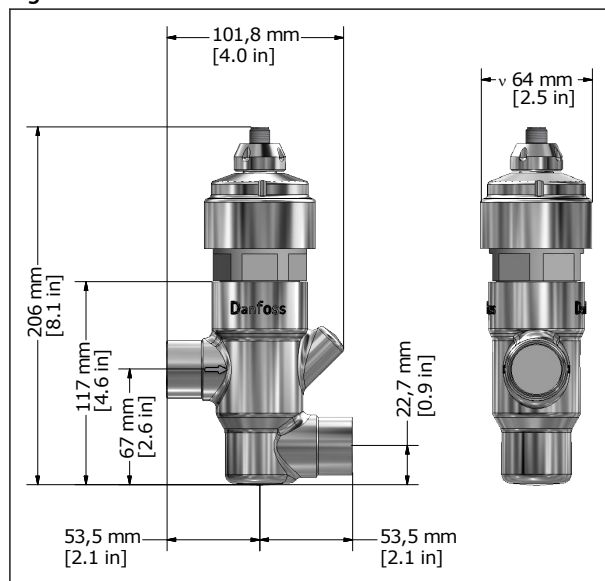
## CCMT 2 – CCMT 8

Table 11: CCMT 2 – CCMT 8



## CCMT 16 – CCMT 42 (without integrated pressure transmitter)

Figure 5: CCMT 16 – CCMT 42





## Ordering

### Valve including actuator

Type	Connections		Flow rate		Single pack	Code no.
	Weld <sup>(1)</sup> [in]	Solder ODF x ODF [in]	k <sub>v</sub> [m <sup>3</sup> /h]	C <sub>v</sub> [gpm]		
CCMT 2	1/2 × 1/2	5/8 × 5/8	0.17	0.19	1	027H7200
CCMT 4	1/2 × 1/2	5/8 × 5/8	0.45	0.52	1	027H7201
CCMT 8	1/2 × 1/2	5/8 × 5/8	0.8	0.92	1	027H7202
CCMT 16	1 × 1	1 1/8 × 1 1/8	1.6	1.85	1	027H7231
CCMT 24	1 × 1	1 1/8 × 1 1/8	2.4	2.77	1	027H7232
CCMT 30	1 × 1	1 1/8 × 1 1/8	3	3.47	1	027H7233
CCMT 42	1 × 1	1 1/8 × 1 1/8	4.2	4.86	1	027H7234
CCMT 16 <sup>(2)</sup>	1 × 1	1 1/8 × 1 1/8	1.6	1.85	1	027H8231
CCMT 24 <sup>(2)</sup>	1 × 1	1 1/8 × 1 1/8	2.4	2.77	1	027H8232
CCMT 30 <sup>(2)</sup>	1 × 1	1 1/8 × 1 1/8	3	3.47	1	027H8233
CCMT 42 <sup>(2)</sup>	1 × 1	1 1/8 × 1 1/8	4.2	4.86	1	027H8234

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

<sup>(2)</sup> Without integrated pressure transmitter

### Accessories

#### Spareparts

Table 12: Spareparts

Type	Description	Single pack	Code no.
Gasket	O-ring spare part kit for CCM / CCMT 2 - CCMT 42	1	027H7230

#### Packard cable for DST P310 pressure transmitter

Table 13: Packard cable for DST P310 pressure transmitter

Type	Description	Industrial pack	Code no.
Packard cable	10 m / 32.8 ft cable for DST P310 pressure transmitter	14	064G0910
		1	064G0950

## Ordering

Table 14: 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.

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