ENGINEERING TOMORROW

Data Sheet

Electric regulating valves Type **CCMT 3L, 5L, 8L** and **10L**

One valve, 3 applications: HPV, GBV and EEV

The CCMT Light is an electrically operated valve designed specifically for operation in CO_2 systems.

The CCMT Light valve concept is designed to fulfill global refrigeration requirements.

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

Features:

- Designed for CO_2 systems with maximum working pressure of 140 bar / 2030 psig with steel connections
- Designed for CO_2 systems with maximum working pressure of 130 bar / 1885 psig (120 bar / 1740 psig for UL approval) with Bi-metal connection
- The CCMT Light is compatible with oil types PAG and POE
- All-in-one function module ensures optimum regulating accuracy, particularly at part load
- Patented cone and balance design
- The PTFE (TFM) seat provides excellent valve tightness
- Steel connections with combined butt weld, sleeve welding and brazing
- Unique bi-metal solder connections requiring small amount of heat
- MOPD up to 90 bar / 1305 psi
- Integrated M12 male connector for simple and flexible connection to the motor driver
- Low weight and compact design
- Easy to service from the top by removing a single function module insert
- For manual operation and service of the CCMT an AST-g service driver is available

Portfolio overview

Related products

Table 1: Portfolio overview

Superheat controller / driver, type EKE 2U	Superheat controller / driver, type EKE 1P	Electronic driver type AK-PC 572	Electronic driver type AK-PC 7XX	Electronic driver type AK-XM 208C [1]
				

[1] Please refer to CCMT Light installation guide for correct valve insulation recommendation related to usage of electronic driver type AK-XM-208C.

Applications

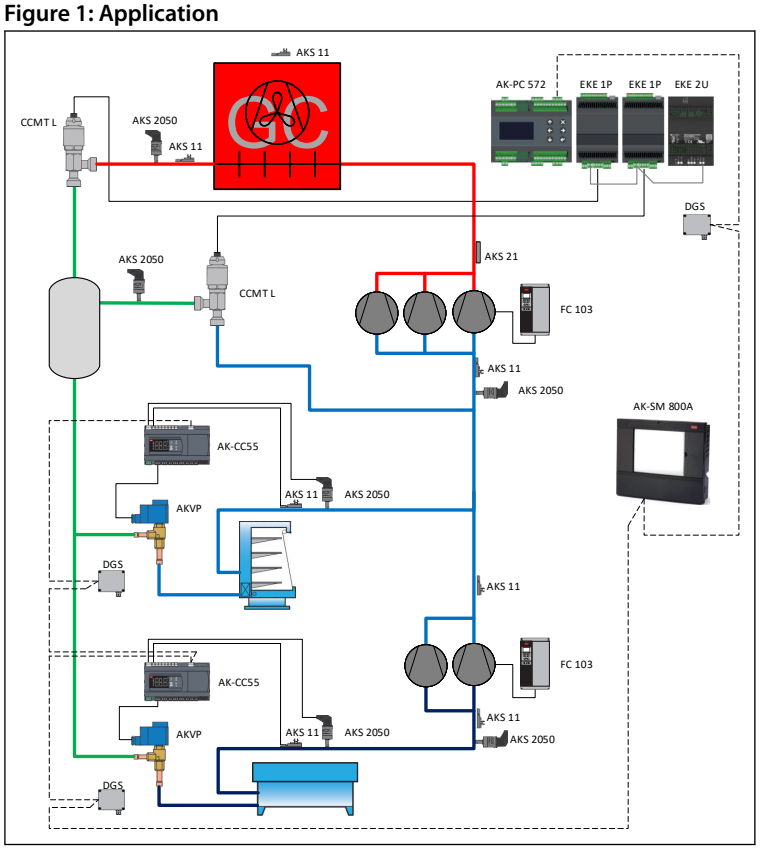
Application 1 and 2

The CCMT Light valve is developed for transcritical CO2 applications. The CCMT valve can be used in systems with flash gas bypass, parallel compression as well as in stand-alone applications.

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

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

Figure 1: Application



	HP High Pressure (120-140 bar)
	HP Receiver Pressure (60-90 bar)
	LP Suction Pressure MT (45-55 bar)
	LP Suction Pressure LT (25-30 bar)

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/CO2 for more information on CO_2 systems.

Application 2 - Gas bypass Valve (GPV)
A gas bypass valve is typically used to regulate the intermediate pressure in a transcritical CO2 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 transcritcal expansion, the pressure can be kept at a safe level for all components situated in the liquid lines of a transcritical CO2 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 applicaton the Danfoss AK controllers are recommended.

Product specification

Technical data

Table 2: Technical data

Parameter	CCMT 3L, 5L, 8L and 10L
Compatibility refrigerants	R744
Refrigerant oils	PAG and POE
MOPD	90 bar / 1305 psi
Max. working pressure (PS/MWP)	140 bar / 2030 psig with steel connections 130 bar / 1885 psig (120 bar / 1740 psig for UL approval) with Bi-metal connections
Refrigerant temperature range	-20 – 55 °C / 4 – 131 °F on valve inlet -40 – 55 °C / 40 – 131 °F on valve outlet
Ambient temperature	- 40 – 50 °C / - 40 – 122 °F
Internal leak rate	< 2000 sccm (40 bar)
Valve body material specification	Stainless steel
Built-in strainer / filter	No[1]
Comply with P.E.D.	Fluid group I / Article 3, paragraph 3
Approval	cURus, EAC

[1] Filter with a maximum mesh of 100 µm recommended to install on the inlet line that can resists particles size above 100 µm

Electrical data

Table 3: Electrical data

Parameter	CCMT 3L, 5L, 8L and 10L
Stepper motor type	Bi-polar - permanent magnet
Motor enclosure	IP 67
Step mode	2 phase full step, microstepping (recommended)
Phase resistance	15 Ω ±10%
Phase inductance	16 mH
Phase current	Using chopper drive: 350 mA RMS +/- 10 %
Holding current	No voltage driver. Current controller: 20% of max. current
Duty cycle	20% duty cycle of period time 50 sec
Max. total power	Current drive: 1.8 W
Step rate	Chopper current drive: 100 steps/sec
Total full steps	210 steps
Full travel time	2.1 sec. (at 100 steps sec.)
Reference position	Overdriving against full close position
Overdrive in close position	Max. 10% of total full steps
Overdrive in open position	Not Allowed
Electrical connection	Integrated M12 male connector
Compatible controllers	EKE 1P, EKE 2U, AK-PC 572, AK-PC 7xx, AK-XM 208C[1]

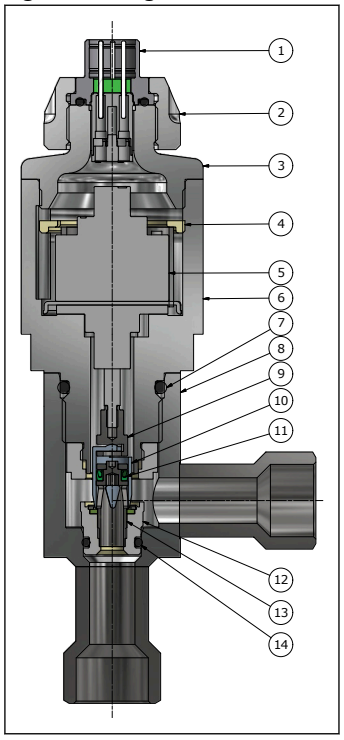
[1] Please refer to CCMT Light installation guide for correct valve insulation recommendation related to usage of electronic driver type AK-XM 208C

⚠ 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.

Design

Figure 2: Design



1	Connector socket
2	Top nut
3	Actuator cover
4	Lock ring for motor
5	Motor
6	Motor housing
7	O-ring
8	Valve housing with connectors
9	Actuator joint
10	Slider
11	Seal
12	Nozzle holder assembly
13	Nozzle
14	O-ring

Stepper motor switch sequence

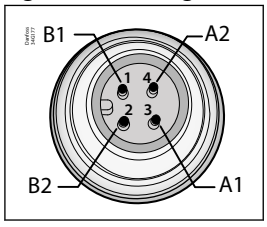
Table 4: Stepper motor switch sequence

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

Table 5: Danfoss cable connections

Pin	Wire color
A1	White
A2	Black
B1	Red
B2	Green

Figure 3: CCMT Light valve

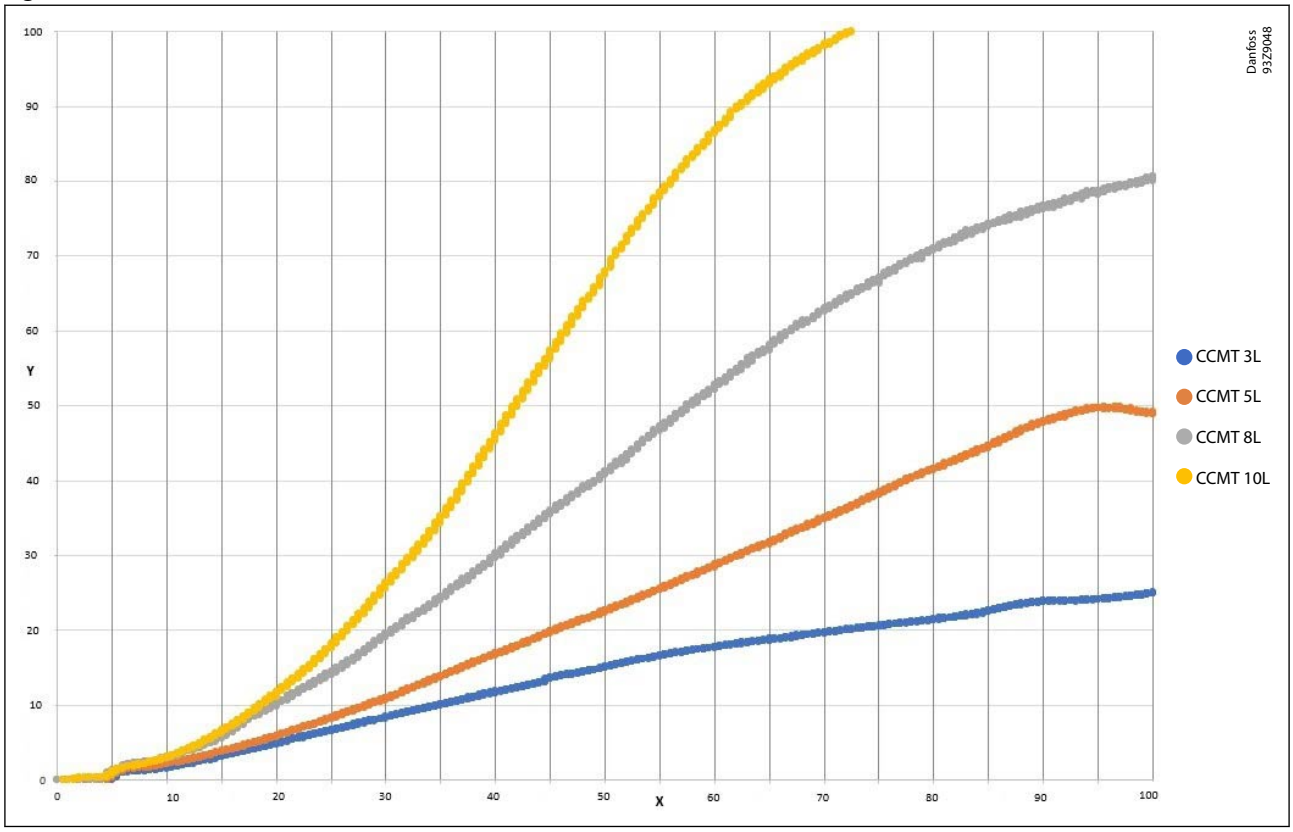


If the controller driving the CCMT Light valve is from another manufacturer than Danfoss or a custom design, the following points must be considered in order to overcome potential step loss.

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.

Flow Characteristic

Figure 4: Flow characteristic



X	Opening %
Y	% of capacity full open

Accessories

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.

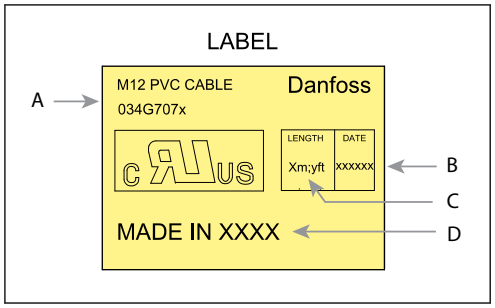
Specification

Table 6: Specification

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

Identification

Figure 5: Identification



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

Connections and Dimensions

Figure 6: Connections

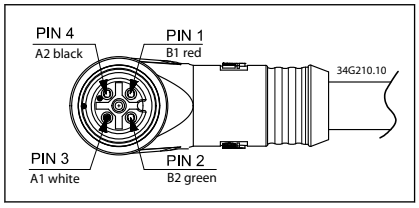


Figure 7: Connections

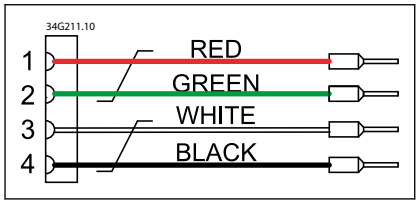
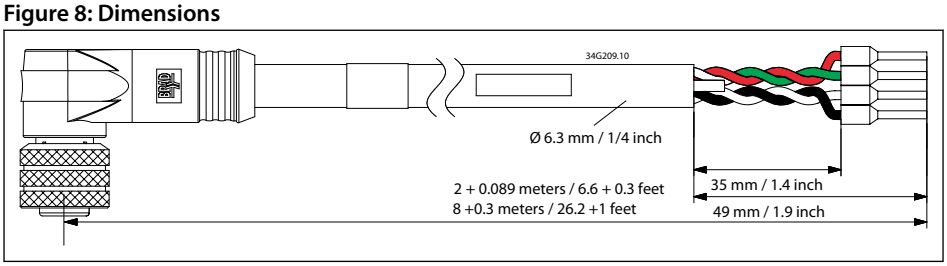
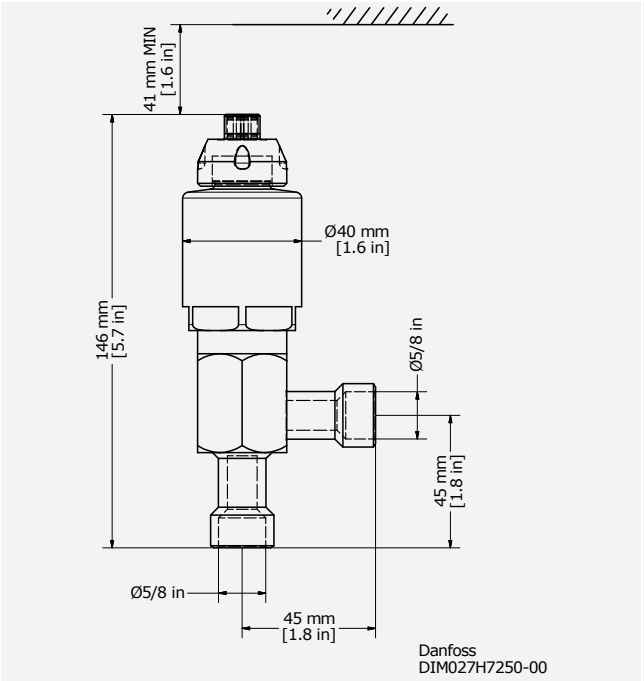


Figure 8: Dimensions



Dimensions

Table 7: Valve dimensions with steel connections



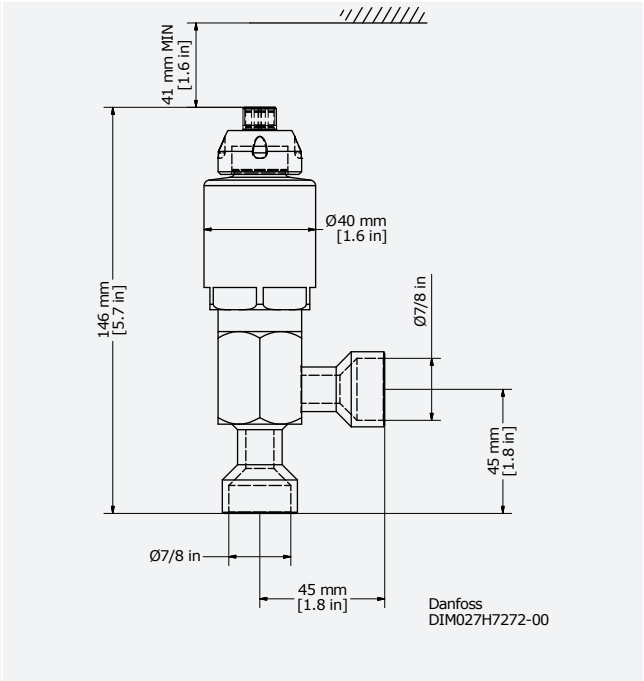
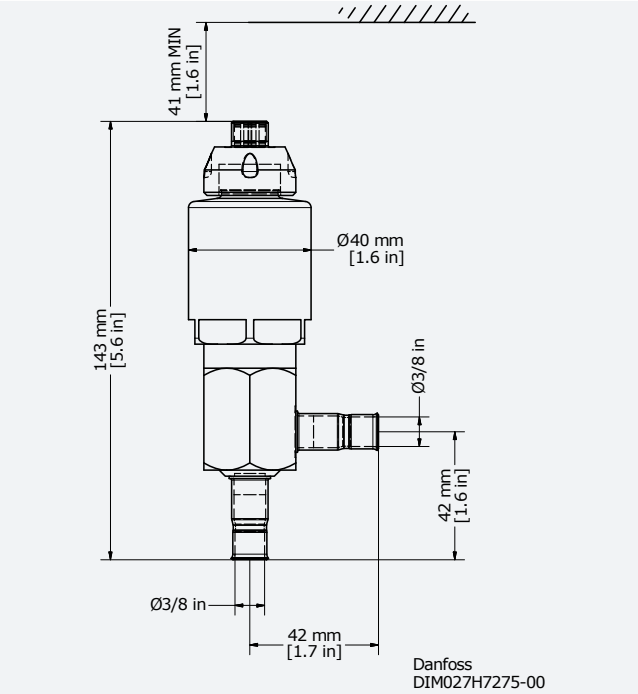
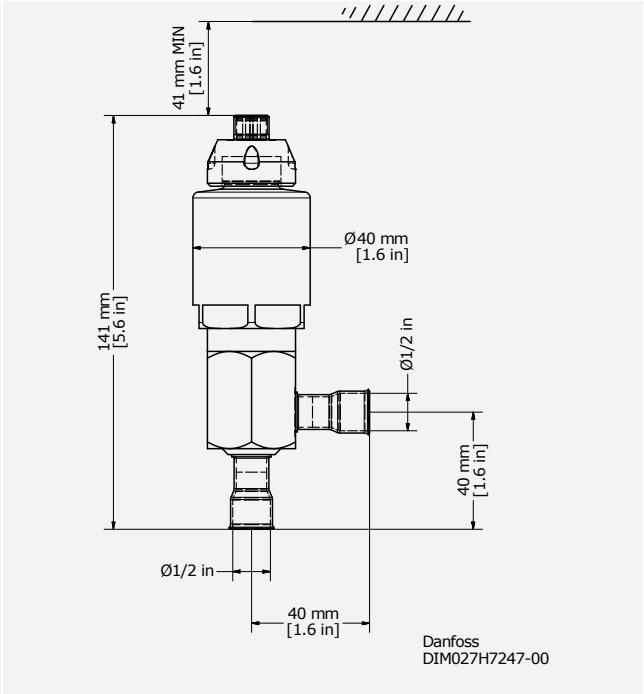


Table 8: Valve dimensions with bi-metal connections





Ordering

Valve including actuator

Table 9: Valve including actuator

Type	Connections [in]		Flow rate		Packing format	Code no.
	Bi-metal	Steel	kv [m3/h]	Cv [gpm]	Single pack	
CCMT 3L	3/8 × 3/8	-	0.26	0.3	1	027H7239
CCMT 3L	1/2 × 1/2	-	0.26	0.3	1	027H7240
CCMT 3L	-	5/8 × 5/8	0.26	0.3	1	027H7241
CCMT 3L	-	7/8 x 7/8	0.26	0.3	1	027H7273
CCMT 5L	3/8 × 3/8	-	0.5	0.57	1	027H7242
CCMT 5L	1/2 × 1/2	-	0.5	0.57	1	027H7243
CCMT 5L	-	5/8 × 5/8	0.5	0.57	1	027H7245
CCMT 5L	-	7/8 x 7/8	0.5	0.57	1	027H7274
CCMT 8L	3/8 × 3/8	-	0.8	0.92	1	027H7275
CCMT 8L	1/2 × 1/2	-	0.8	0.92	1	027H7247
CCMT 8L	-	5/8 × 5/8	0.8	0.92	1	027H7250
CCMT 8L	-	7/8 x 7/8	0.8	0.92	1	027H7272
CCMT 10L	1/2 × 1/2	-	1.10	1.28	1	027H7277
CCMT 10L	-	5/8 × 5/8	1.10	1.28	1	027H7278
CCMT 10L	-	7/8 x 7/8	1.10	1.28	1	027H7279

Spareparts

Table 10: Spareparts

Type	Description	Single pack	Code no.
Gasket	O-ring spare part kit for CCMT Light 3L, 5L, 8L and 10L	1	027H7276

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.

Table 12: Certificates, declarations, and approvals

File name	Document type	Document topic	Approval authority
19.10034.262	Marine - Safety Certificate		RMRS
RU Д-DK.АИ30.В.04995	EAC Declaration	PED	EAC

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