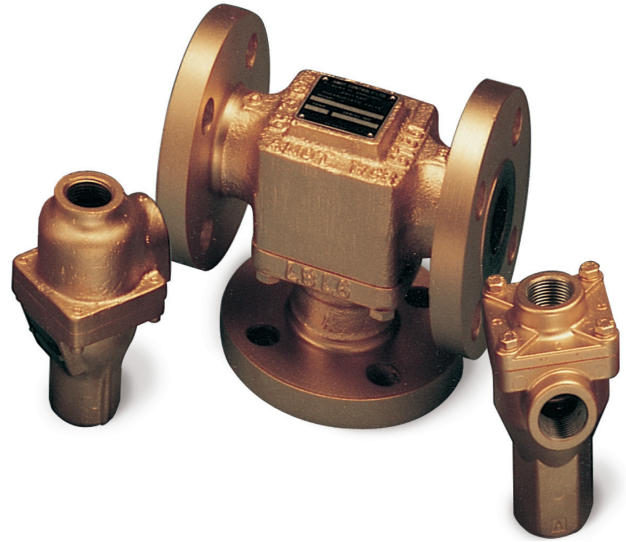


Thermostatic Control Valve

Model C

Typical applications

- Lubricating oil temperature control
- Jacket water high temperature (HT)
- Secondary water low temperature (LT)
- Heat recovery
- Water saving applications
- Boiler inlet temperature control
- Co-generation, cooling towers
- Temperature mixing or diverting
- Engine and compressor cooling system



Model C



Key benefits

- No external power source required
 - Simple, low cost installation
- No user setting needed
 - 'Fit and forget' solution
- Small number of parts
 - Simple maintenance and low cost of ownership
- Robust design capable of high vibration and shock applications
- Easy installation, operates in any mounting position
- Automatic self-sensing control with positive proportional valve action

Key features

- Flow rates of 0.3 - 13.1 m³/hr (1.3 - 57.7 US gpm)
- Combinations available:
 - Housings in cast iron, aluminum, bronze, carbon steel, stainless steel
- DN15 - DN40 (1/2" - 1 1/2") pipe sizes
- Threaded and flanged connections
- Tamper-proof temperature settings from 18°C - 113°C (65°F - 235°F)
- Pressure ratings up to 72 bar (1050 psi)

Accreditations available

- PED Suitable for Group 1 & 2 liquids (Ensure materials are compatible)
- ATEX  II 2G TX X
-  Complies with all relevant EU directives

Thermostatic Control Valve - Model C

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Thermostatic Control Valve - Model C

Overview

AMOT Model C thermostatic valves are available in a wide selection of sizes and settings to fill a multitude of fluid temperature control requirements. These valves may be mounted in any position and use the proven expanding wax principle to actuate the 3-way temperature element assemblies. The model C valves may be used for diverting or mixing service.

They make very economical temperature limiting valves to prevent scalding in hot water supply systems; such as in emergency water systems for labs. Radiant heating systems can use these valves in limiting water temperature to prevent surface cracking and over-heating of plastic piping. Other applications include electronic and battery cooling circuits, pump temperature relief valves etc.

Housing materials

- Cast iron
- Aluminum
- Bronze
- Steel
- Stainless steel

Seal materials

- Buna N/Nitrile
- Viton
- Neoprene

Element materials

- Bronze, brass and stainless steel
- Nickel plated/stainless steel
- Stainless steel

Leakholes

In some applications, it is necessary to have leak holes drilled in the element to ensure a small flow between ports A and C. Leak holes are available in sizes ranging from 0.8 mm - 6.3 mm ($1/32''$ - $1/4''$).

Please refer to the Leakhole size (G) section of the valve selection table on page 8 to determine the hole size required for specific applications.

Temperature settings

A wide selection of element materials, seals and temperatures are available. Follow the equipment manufacturers' guidelines for heating/cooling systems.

Temperature settings are available from 18°C - 113°C (65°F - 235°F). Refer to the temperature and element characteristics table on page 7 for specific temperature settings. In general the temperature quoted is the nominal operating temperature in diverting mode on water systems.

For long life, AMOT valves should not be operated continuously at temperatures in excess of 14°C (25°F) of their maximum continuous rating. If this condition is anticipated then consult AMOT for suitable alternatives.

For mixing and oil circuits the temperature may be one to two degrees higher due to flow, viscosity and other system parameters.

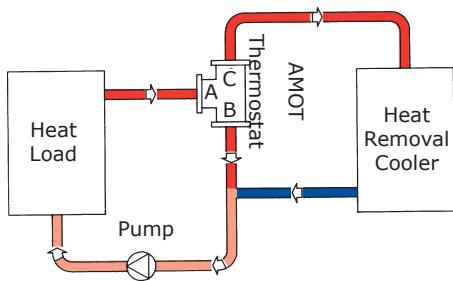
Elements and seals are available in a variety of materials. These materials are suitable for most applications. Please contact AMOT for material compatibility information.

Thermostatic Control Valve - Model C

Applications

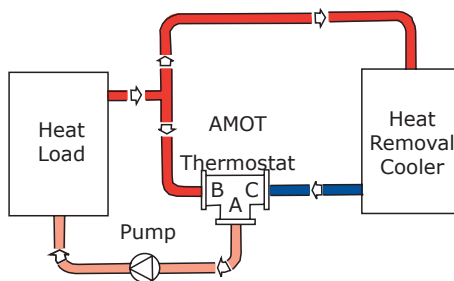
Diverting Applications

When valves are used for diverting services, the inlet is Port A (temperature sensing port), with Port C being connected to the cooler, and Port B connected to the cooler by-pass line.



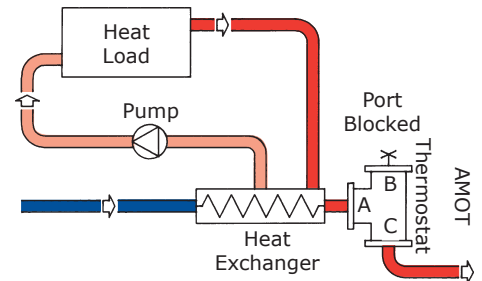
Mixing Applications

When valves are used for mixing service, Port C is the cold fluid inlet from the cooler, Port B is the hot by-pass fluid inlet, and Port A is the common outlet. Port A is the temperature sensing port and will mix the hot and cold fluids in the correct proportion so as to produce the desired outlet temperature leaving Port A.



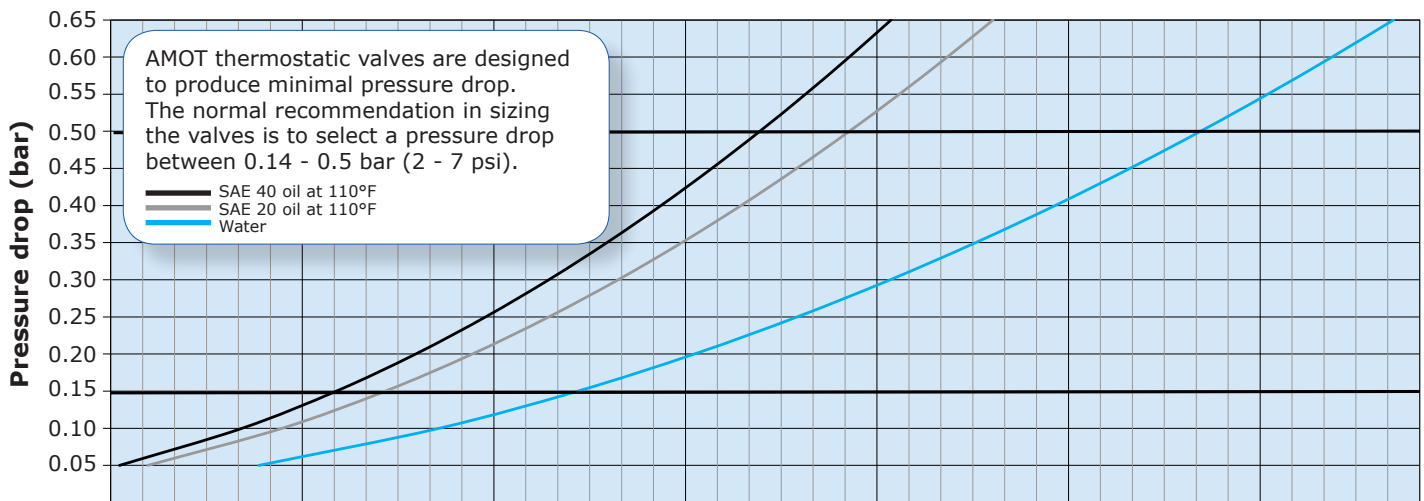
2-Way Water Saving Applications

Valve as shown maintains minimum flow through cooler to conserve water. Requires internal leak hole to permit small flow for sensing.



Valve Characteristics

Pressure drop (Metric units)



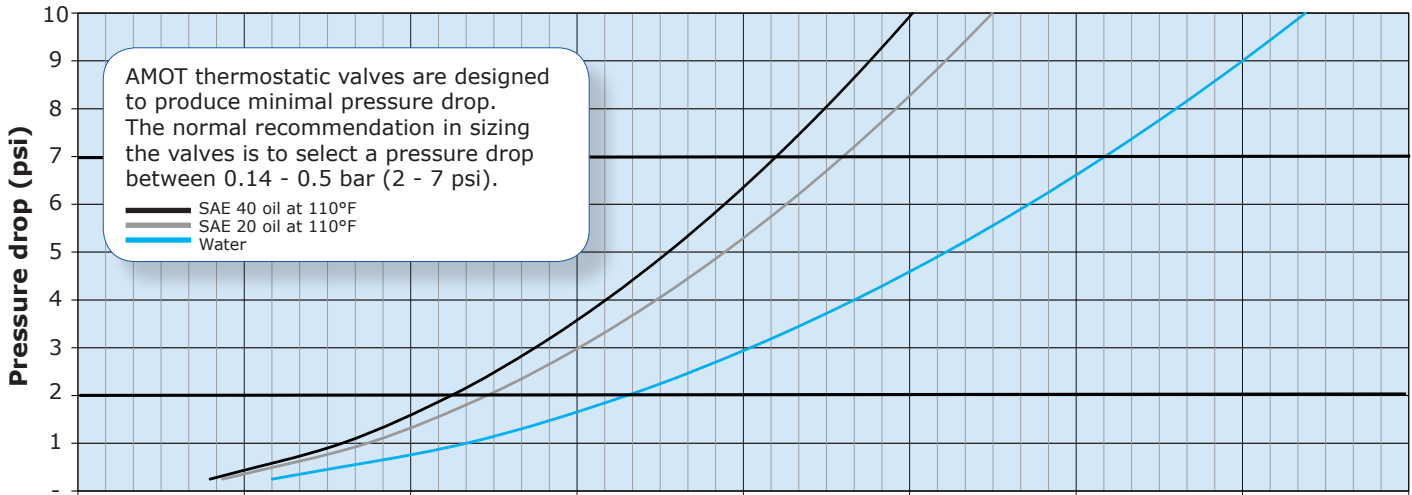
Size	0.9	1.2	1.5	1.9	2.2	2.6
1/2" CL	0.9	1.2	1.5	1.9	2.2	2.6
1/2" CM	1.5	2.1	2.7	3.3	3.9	4.5
3/4" CL	1.0	1.3	1.7	2.1	2.5	2.9
3/4" CM	2.0	2.8	3.6	4.4	5.2	6.0
1" CL	1.0	1.3	1.7	2.1	2.5	2.9
1" CM	2.2	3.1	4.0	4.9	5.8	6.6
1 1/4" CCM	4.4	6.1	7.8	9.6	11.3	13.1
1 1/4" CM	2.3	3.3	4.2	5.1	6.1	7.0
1 1/2" CL	1.1	1.5	1.9	2.3	2.7	3.2
1 1/2" CM/CF	2.3	3.3	4.2	5.1	6.1	7.0

Flow rate (m³/hr) - Water

Thermostatic Control Valve - Model C

Valve Characteristics Continued

Pressure drop (English units)



Size	◆	◆	◆	◆	◆	◆	◆
1/2" CL	1.7	3.4	5.1	6.9	8.6	10.3	12.0
1/2" CM	3.0	6.0	9.0	12.0	15.0	18.0	21.0
3/4" CL	1.9	3.9	5.8	7.7	9.6	11.6	13.5
3/4" CM	4.1	8.1	12.2	16.3	20.4	24.4	28.5
1" CL	1.9	3.9	5.8	7.7	9.6	11.6	13.5
1" CM	4.5	8.9	13.4	17.8	22.3	26.7	31.2
1 1/4" CCM	8.8	17.6	26.4	35.1	43.9	52.7	61.5
1 1/4" CM	4.7	9.4	14.1	18.9	23.6	28.3	33.0
1 1/2" CL	2.1	4.3	6.4	8.6	10.7	12.9	15.0
1 1/2" CM/CF	4.7	9.4	14.1	18.9	23.6	28.3	33.0

Flow rate (US gpm) - Water

Flow coefficient

Flow coefficient (calculated)		
Size	Kv	Cv
1/2 CL	3.5	4.0
1/2 CM	6.1	7.0
3/4 CL	3.9	4.5
3/4 CM	8.2	9.5
1 CL	3.9	4.5
1 CM	9.0	10.4
1 1/4 CCM	17.7	20.5
1 1/4 CM	9.5	11.0
1 1/2 CL	4.3	5.0
1 1/2 CM/CF	9.5	11.0

Kv is the flow coefficient in metric units. It is defined as the flow rate in cubic meters per hour (m³/hr) of water at a temperature of 16° Celsius with a pressure drop across the valve of 1 bar. The basic formula to find a valve's Kv is shown below:

$$Kv = Q \sqrt{\frac{SG}{DP}} \quad Q = Kv \sqrt{\frac{DP}{SG}} \quad DP = \left[\frac{Q}{Kv} \right]^2 SG$$

Q = Flow in m³/hr
 DP = Pressure drop (bar)
 SG = Specific gravity of fluid (Water = 1.0)
 Kv = Valve flow coefficient (Metric units)

Cv is the imperial coefficient. It is defined as the flow rate in US Gallons per minute (gpm) of water at a temperature of 60° Fahrenheit with a pressure drop across the valve of 1 psi. The basic formula to find a valve's Cv is shown below:

$$Cv = Q \sqrt{\frac{SG}{DP}} \quad Q = Cv \sqrt{\frac{DP}{SG}} \quad DP = \left[\frac{Q}{Cv} \right]^2 SG$$

Q = Flow in US Gallons/Min
 DP = Pressure drop (psi)
 SG = Specific gravity of fluid (Water = 1.0)
 Cv = Valve flow coefficient (English units)

Kv = 0.865 Cv

Cv = 1.156 Kv

Thermostatic Control Valve - Model C

Valve Characteristics Continued

Viscosity correction

For the selection of valves for use with more viscous fluids than water, the following must be calculated in addition to using the previously mentioned formulae:

- Viscosity

Find the viscosity of the fluid to be used in the valve. This will generally be in centistokes (cST).

ISO grade oil is easy to calculate as the grade no. is the viscosity.

I.e. ISO VG 46 = 46 centistokes at 43°C (110°F)

- Viscosity correction

Once the viscosity value has been found, the flow coefficient correction factor can be established using the viscosity correction graph below.

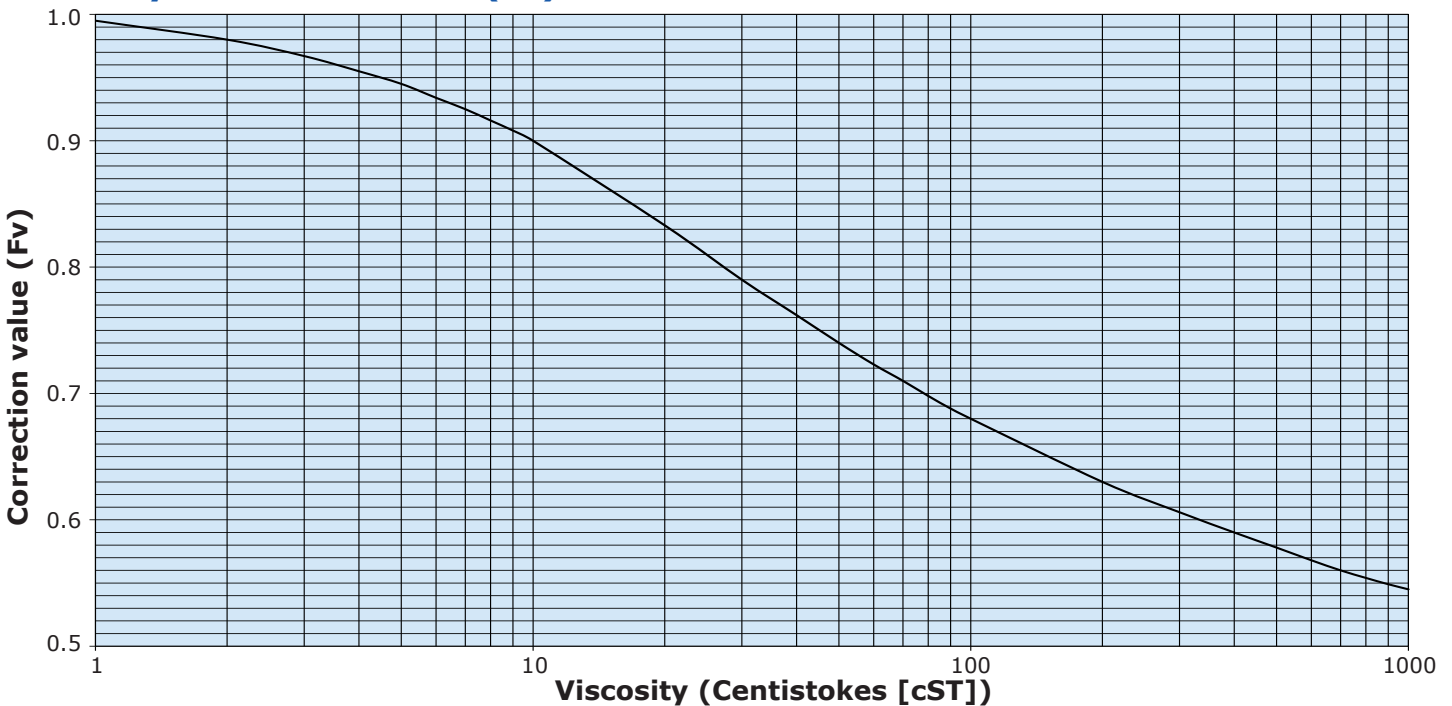
The correction value (Fv) that is produced by the graph should then be multiplied by the original flow coefficient. This gives the corrected flow coefficient, which can then be used in the standard formula.

e.g.:

100 cST = correction factor of 0.68

0.68 x flow co. = corrected flow co. (Kv or Cv)

Viscosity correction curve (Fv)



SAE oils viscosities

Engine oils	
Oil	cST
SAE 5W	6.8
SAE 10W	32
SAE 20	46
SAE 20W	68
SAE 30	100
SAE 40	150
SAE 50	220
6 B	394
8 B	571

Gear oils	
Oil	cST
SAE 75W	22
SAE 80W	46
SAE 85W	100
SAE 90	150
SAE 140	460

Approximate viscosities of SAE oils at 43°C (110°F) (cST).

Based on leading oil manufacturers' published data.

Thermostatic Control Valve - Model C

Valve Characteristics Continued

Available versions

Cast iron	Bronze	Aluminum	Steel	Stainless steel
Threaded	Threaded	Threaded	Threaded	Threaded
½ CL/CM	½ CL/CM	¾ CL/CM	¾ CL/CM	¾ CL/CM
¾ CL/CM	¾ CL/CM	1 CL/CM	1 CL/CM	1 CL/CM
1 CL/CM	1 CL/CM	Flanged	Flanged	Flanged
1 ¼ CCM	1 ¼ CCM	None	1 ½ CF/CL	1 ½ CF/CL
1 ¼ CM	1 ¼ CM		Welded	Welded
1 ½ CL/CM	1 ½ CL/CM		¾ CL/CM	¾ CL/CM
Flanged	Flanged		1 CL/CM	1 CL/CM
1 ½ CF	1 ½ CF			

Temperature and element characteristics


Code	Control temp.		Rated range				Max temp cont.	
			Crack open		Full open			
	°C	°F	°C	°F	°C	°F	°C	°F
065	18	65	15	59	25	77	47	116
075	24	75	20	68	29	85	60	140
085	30	85	24	75	34	93	63	145
095	35	95	30	86	40	104	73	163
100	38	100	33	91	42	108	61	143
110	43	110	38	100	47	117	82	180
120	49	120	43	110	55	131	96	187
130	54	130	49	120	60	140	95	203
140	60	140	54	130	65	150	95	203
150	66	150	60	140	71	160	100	212
160	71	160	65	150	76	170	100	212
170	77	170	72	163	82	180	100	212
175	79	175	76	170	85	185	105	221
180	82	180	79	175	88	190	110	230
190	87	190	85	185	93	200	110	230
200	93	200	90	194	100	212	110	230
205	96	205	93	200	103	218	110	230
215	101	215	96	205	107	225	115	239
225	107	225	101	214	114	237	120	248
235	113	235	107	225	133	253	124	257

Element type and seal material

Code	Valve model	Element type	Element construction	Seal material
01	CCM/CF/CM	1125X	Standard	Buna N/Nitrile
	CL	10765X		
02	CCM/CF/CM	1125P	Nickel plated	Viton
	CL	10765P		
06	CCM/CF/CM	1125X	Standard	Viton
	CL	10765X		
09	CCM/CF/CM	1125P	Nickel plated	Buna N/Nitrile
	CL	10765P		
35	CCM/CM	9778R	Short stroke, high overtemp.	Viton
86	ALL	44844X	Salt water (SS)	Viton
99	CCM/CF/CM	3362U	Special standard	Neoprene
	CL	10765U		

Thermostatic Control Valve - Model C

Specification

		Metric units	English units
Flow rate		0.3 - 13.1 m ³ /hr	1.3 - 57.7 gpm
Body materials & pressure ratings	Cast iron	10 bar	150 psi
	Bronze	10 bar	150 psi
	Aluminum	24 bar	350 psi
	Cast steel/stainless steel threaded	48 bar	700 psi
	Cast steel/stainless steel 150 lb flanged	16 bar	230 psi
	Cast steel/stainless steel 300 lb flanged	45 bar	655 psi
	Cast steel/stainless steel 600 lb flanged	72 bar	1050 psi
Seal materials	Buna N/Nitrile, Viton, and Neoprene		
Mounting position	Any orientation		
Ports	Below nominal temperature	Ports A and B connected	
	Above nominal temperature	Ports A and C connected	
Port connections	Threaded	15, 20, 25, 32 & 40 mm	1/2", 3/4", 1", 1 1/4" & 1 1/2"
	Flanged	40 mm	1 1/2"
Valve sizes (nominal bore)		15, 20, 25, 32 & 40 mm	1/2", 3/4", 1", 1 1/4" & 1 1/2"
Recommended pressure drop		0.14 - 0.5 bar	2 - 7 psi
Control temperatures		18°C - 113°C	65°F - 235°F
Accreditations available	PED	Suitable for Group 1 & 2 liquids. (Ensure materials are compatible)	
	ATEX	 II 2G TX X	
	CE	Complies with all relevant EU directives	

Weights

Approximate weights in kg (lbs)

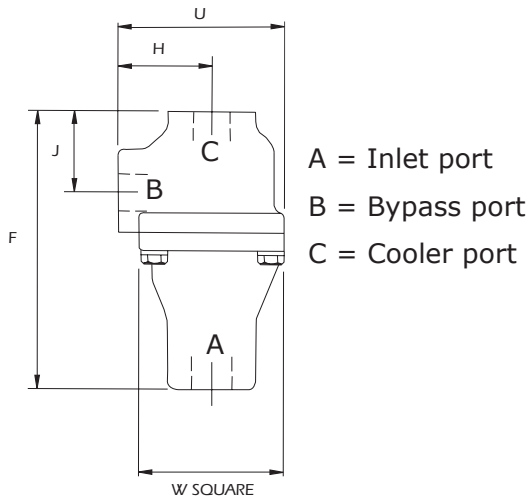
Material	Valve size and model							
	1/2 CL/CM	3/4 CL/CM 1 CL/CM	1 1/4 CM 1 1/2 CL/CM	1 1/4 CCM	1 1/2 CFCF	1 1/2 CFRJ 1 1/2 CFSJ	1 1/2 CFRH 1 1/2 CFSH	1 1/2 CFRK 1 1/2 CFSK
Aluminum	-	1.2 (3)	-	-	-	-	-	-
Bronze	2 (4)	2 (4)	3 (6.6)	-	-	-	-	-
Cast iron	2 (4)	2 (4)	3 (6.6)	4.3 (9.5)	11 (24)	-	-	-
Stainless steel	-	3.6 (8)	-	-	-	9 (20)	13.5 (30)	16.3 (36)
Steel	-	3.6 (8)	-	-	-	9 (20)	13.5 (30)	16.3 (36)

Thermostatic Control Valve - Model C

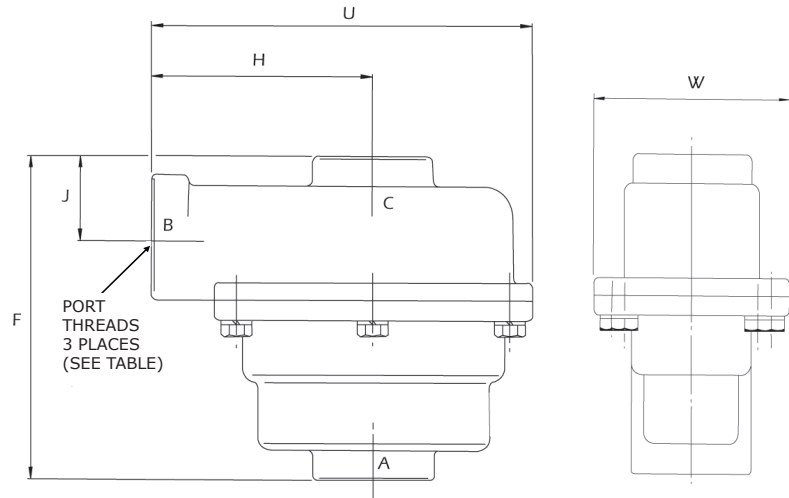
Valve Dimensions

Threaded models

Model CM



Model 1 ¼ CCM



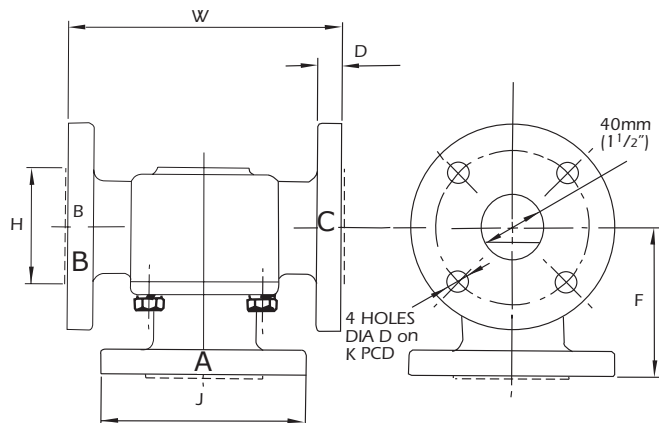
Dimensions - mm (inches)

Threaded dimensions	Valve size and type				
	½", ¾" & 1" CLB, CLC, CMB, CMC	¾" & 1" CLA, CMA	¾" & 1" CLR, CLS, CMR, CMS	1 ¼" CM 1 ½" CL, CM	1 ¼" CCM
F	152.4 (6")	160.3 (6 5/16")	160.3 (6 5/16")	158.8 (6 ¼")	155.6 (6 1/8")
H	50.8 (2")	54 (2 1/8")	54 (2 1/8")	73 (2 7/8")	111 (4 3/8")
J	44.5 (1 ¾")	54 (2 1/8")	54 (2 1/8")	38.1 (1 ½")	39.7 (1 5/16")
U	90.5 (3 9/16")	95.3 (3 ¾")	95.3 (3 ¾")	115.9 (4 9/16")	190.5 (7 ½")
W	79.4 (3 1/8")	82.6 (3 ¼")	85.7 (3 3/8")	85.7 (3 3/8")	98.4 (3 7/8")

Flanged models

Model 1 ½ CF

Dimensions - mm (inches)



Flange dimensions	Port connection (D) ¹			
	F	J	H	K
H	-	73 (2 7/8")	73 (2 7/8")	73 (2 7/8")
J	150 (6")	127 (5")	156 (6 7/50")	156 (6 7/50")
F	100.8 (4")	100.8 (4")	120.6 (4 3/4")	130 (5 6/50")
W	178 (7")	178 (7")	203.2 (8")	223 (8 39/50")
D	16 (5/8")	16 (5/8")	22 (31/36")	22.2 (7/8")
K	98.4 (3 7/8")	98.4 (3 7/8")	114.3 (4 ½")	114.3 (4 ½")

NOTES:

¹ See 'Port connection (D)' section in the How to Order table on page 8.

Thermostatic Control Valve - Model C

Maintenance and Service Parts

Over time, exposure to foreign chemicals and particulate matter as well as prolonged operation at extreme conditions may reduce the effectiveness of the valve. At such time, AMOT Thermostatic Valves can be restored to original performance by installing an AMOT thermostatic valve service kit or a seal kit and new temperature element(s).

Service kits are ONLY available for purchase from the Americas and Canada locations. If ordering from the Europe or Asia-PAC locations please purchase a seal kit and element to properly service your valve.

Service kits include all new thermostatic element(s) and seals required for normal maintenance. Seal kits include new seals and gasket. Whenever elements are replaced, the seals and gasket should also be replaced.

Ordering from Americas and Canada

Service kits

Service kits are ONLY available for purchase from the Americas and Canada locations.

Service kits are available with elements and seals required to service the valve. Order service kits using the AMOT valve part number and nominal temperature setting. Refer to the AMOT valve part number that is printed on the valve nameplate and the AMOT valve part number structure on page 8. The nominal temperature setting is also stamped onto the element flange.

Service kit model number structure

- 1) Omit Valve size (A).
- 2) Keep the first three digits of the Valve model (B) and Body material (C).
- 3) Replace Port connection (D) with "KIT-".
- 4) If Special (J) is not blank, please contact the facility.

Ordering from Europe and Asia-PAC

Seal kits

Seal kits are available with seals and gasket only. Order seal kits using the seal kit model number which is identified by the port connection code and seal code from the AMOT valve part number. Refer to the AMOT valve part number that is printed on the valve nameplate and the AMOT valve part number structure on page 8.

AMOT recommends fully servicing thermostatic control valves with each regularly scheduled major overhaul of the turbine, engine, compressor or other associated equipment. AMOT recommends a service interval of not more than 24 months to ensure optimum valve performance.

AMOT designs and tests all its products to ensure that high quality standards are met. For good product life, carefully follow AMOT's installation and maintenance instructions; failure to do so could result in damage to the equipment being protected or controlled.

Thermostatic service kits may also be used for adapting valves to new service temperatures. Please request a new nameplate when adapting valves to a new service temperature by contacting the facility.

AMOT does NOT offer service kits for CFRK, CFSK, and CLSK Model C Thermostatic Valves. In order to properly service an CFRK, CFSK, and/or CLSK please purchase an element and seal kit. Refer to the ordering instructions on page 12.

Example valve part number							
A	B	C	D	E	F	G	-J
1	CM	S	M	130	02	B	
Example service kit model number							
A	B	C	D	E	F	G	-J
	CMS		KIT-	130	02	B	

A - Valve size D - Port connection G - Leakhole size
B - Valve model E - Control temperature (°F) J - Special
C - Body material F - Element and seal material

Element(s)

Order temperature elements using the element part number which is identified by the valve model, element/seal material code and nominal temperature setting from the AMOT valve part number. Refer to the AMOT valve part number that is printed on the valve nameplate and the AMOT valve part number structure on page 8.

Thermostatic Control Valve - Model C

Maintenance and Service Parts Continued

Ordering from Europe and Asia-PAC continued

Seal kit model number structure

- 1) Identify the port connection code, located in the Port connection (D) section of the AMOT valve part number. Use that value to identify the basic model number in Table 1.
- 2) Identify the element/seal material code, located in the Element and seal material (F) section of the AMOT valve part number. Use that value to identify the corresponding seal code in Table 2.
- 3) Place the seal code after "X0" or "X1" in the basic model number to complete the seal kit model number, as shown in Table 3.

Basic model no.	Port connection (D) ²
9170X0	All EXCEPT K
9170X1	K

Seal code	Element/seal material (F) ³
01	01, 09
11	02, 06, 35, 86
21	99

	Basic model no. (Table 1)	Seal code (Table 2)
	9170X0	01, 11, 21
	9170X1	
Examples		
Valve part number	Seal kit model number	
1 ¼CCMCT07506-B2-AA	9170X0 11	
1 ½CFSK13099-00-AA	9170X1 21	

Element part number structure

- 1) Identify the valve model, located in the Valve model (B) section of the AMOT valve part number.
- 2) Identify the element/seal material code, located in the Element and seal material (F) section of the AMOT valve part number.
- 3) Identify the temperature, located in the Control temperature °F (E) section of the AMOT valve part number.
- 4) Use those 3 codes to identify the proper element part number, as shown in Table 4.

Table 4 - Element part number identification										
Valve model (B)		Temperature °F (E)			Element/seal material (F) ³		Element part number		Qty.	
CCM/CF/CM				065-235	01, 06			1125X(Temp.)	Refer to the Comments on the Valve body (B) section of the How to Order table on page 8.	
					02, 09			1125P(Temp.)		
					86			44844X(Temp.)		
					99			3362U(Temp.)		
CL				065-235	01, 06			10765X(Temp.)		
					02, 09			10765P(Temp.)		
					99			10765U(Temp.)		
CCM/CM				065-235	35			9778R(Temp.)		
Examples										
Valve part number								Element part number	Qty.	
1 ¼	CCM	C	T	075	06	-B	2	-AA	1125X075	2
1 ½	CF	S	K	130	99	-0	0	-AA	3362U130	1

NOTES:

² If your port connection code does not correspond with the given values, please contact the facility to confirm your port connection code.

³ If your element/seal material code does not correspond with the given values, please contact the facility to confirm your element/seal material code.

Thermostatic Control Valve - Model C

Maintenance and Service Parts Continued

Service parts

Service kit parts ⁴			
Ref no.	Qty.		Description
	CF, CL, CM	CCM	
3	1	2	Element
4	1	2	Element seal
5	1	2	Housing seal
6 ⁵	1	-	Seal

Seal kit parts			
Ref no.	Qty. ⁶		Description
	9170X0(--)	9170X1(--)	
4	1	1	Element seal
5	1	-	Housing seal
5	-	1	Housing gasket
6 ⁵	1	1	Seal

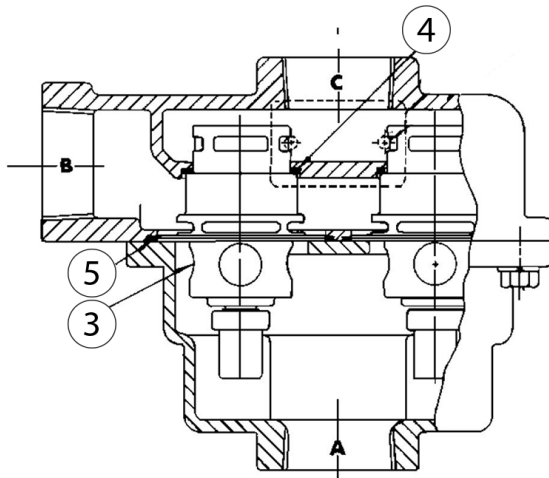
NOTES:

⁴ Does NOT include CFRK, CFSK, or CLSK models.

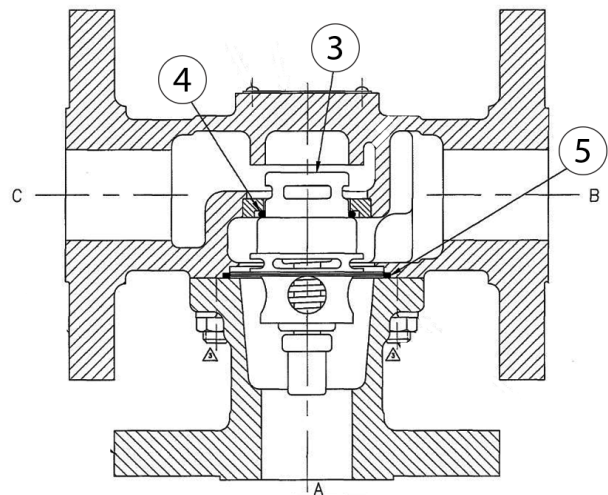
⁵ CMA, CMR, CMS, CLA, CLR, CLS models ONLY.

⁶ CCM model requires 2 sets of parts. Please purchase 2 seal kits in order to properly service the CCM model valve.

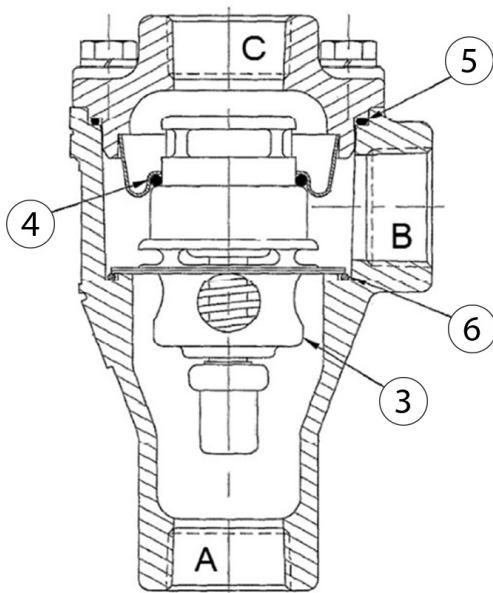
Model CCM Cast Iron



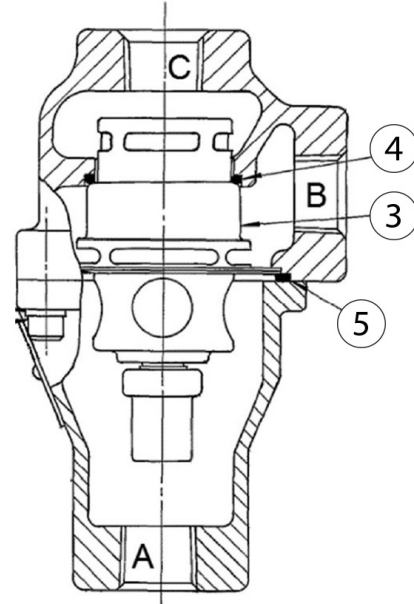
Models CFC, CFR, CFS



Models CLA, CLR, CLS, CMA, CMR, CMS



Models CLB, CLC, CMB, CMC



Thermostatic Control Valve - Model C

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