Thermostatic Control Valve

Model R - Cast Steel

Typical applications

- Refrigeration compressors
- Industrial compressors
- Turbines
- Engines
- Gear boxes
- High pressure applications

R Valve Range

Key benefits

- No leak design
  - No external moving parts
  - No external dynamic seals
- Easily removable elements
- Environmentally friendly, reliable performance
- Easy installation - operates in any mounting position

Key features

- Flow rates of 3 - 82m³/hr (13 - 360 US gpm)
- DN20 and DN80 (¾" and 3") pipe sizes
- Tamper-proof temperature settings from 35°C to 82°C (95°F to 180°F)
- Pressure ratings up to 35 bar (500 psi)

Contents

Overview

AMOT thermostatic valves provide reliable control of fluid temperatures in cooling systems, heat recovery and many other temperature control applications.

They are also suitable for process control and industrial applications where fluids must be mixed or diverted depending upon temperature.

All AMOT internally sensed valves have positive 3-way action. This ensures that on process start up all of the flow is through the bypass line giving the fastest possible warm up time.

Operation and flow control is established by the temperature element, which constantly monitors and regulates the process fluid to the exact specified temperature setting.

When required the valve will positively shut off the bypass line to give full cooling.

A 3-way valve ensures constant volume flow in the system and gives no restriction during the warm up cycle, ensuring maximum performance. Where shut off is not required, bypass holes are available.

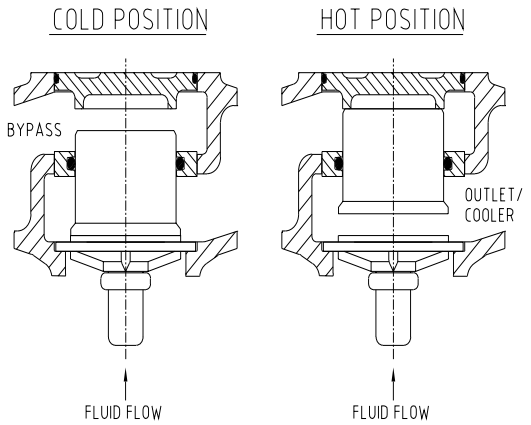
The temperature control power is created by the expansion of a wax/copper mixture which is highly sensitive to temperature changes.

Large forces are created by the warming/ expansion of the mixture which in turn acts upon the sliding valve, thus regulating the flow.

The diagram opposite shows the valve actuation in diverting mode at start and cooling positions.

During operation the sliding valve constantly modulates for accurate temperature control.

The reliable rugged construction provides a unit sensitive to temperature variations, not easily disturbed by pressure changes and sudden surges, which maintains stable temperatures over a wide range of operating conditions.



Leak holes

Leak holes can be drilled to allow fluid between ports B and C:

1. To allow small flows to cooler during start up which slows down warm up cycle.
2. To allow small flows to maintain some flow through cooler in order to prevent condensation or, in extreme cases, freezing. In applications where additives are not or cannot be used.

Temperature settings

A wide selection of temperatures are available. Follow the equipment manufacturers' guidelines for oil systems and for specific operating temperatures of cooling/heating systems.

In general the temperature quoted is the nominal operating temperature in diverting mode on water systems.

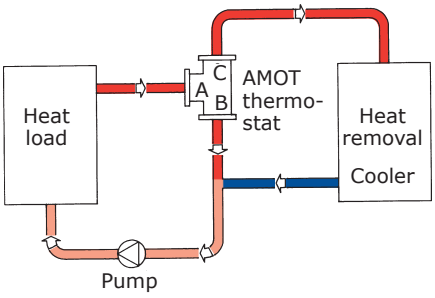
For long life AMOT valves should not be operated continuously at temperatures in excess of their maximum continuous rating. If this condition is anticipated then consult AMOT for suitable alternatives.

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

Applications

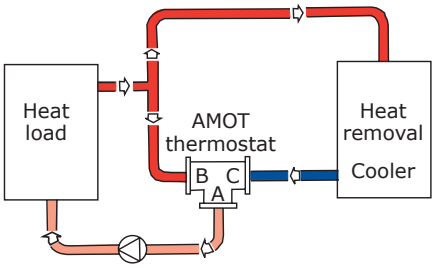
Diverting Applications

When valves are used for diverting service, 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.



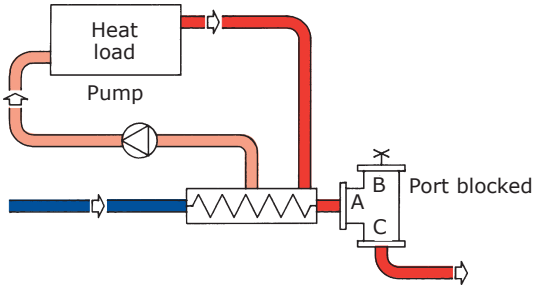
Mixing Applications

When valves are used for mixing service, Port C is the cold fluid inlet port from the cooler, Port B is the hot by-pass fluid inlet, and Port A 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.

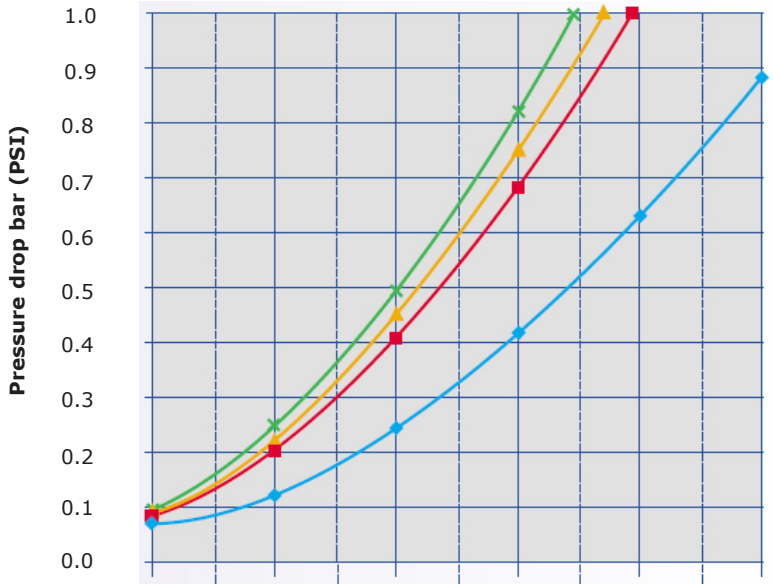


Specification

Body material	Cast steel BS 3146 CLA 1A-ASTM A216 WCB-DIN 17245 Grade 1.0169 (GSC 25N)	
Element material	Standard elements are of electroless nickel plated brass and bronze	Elements without plating available (Refer to How to order on page 8)
Seal materials	Neoprene/Viton	
Welded port connections	Butt weld DIN 2448 PN40	
	Butt weld ANSI B36:10 Schedule 40	
	Socket weld ANSI 16.11	
Valve sizes (nominal bore)	20 - 80mm	(3/4" - 3")
Control temperatures	35°C to 82°C	(95°F to 180°F)
Flow rate (based on water)	3 to 82 m^3/hour	(13 to 360 US gpm)
Pressure rating	35 bar	(500 psi)
Recommended pressure drop	0.14 to 0.5 bar	(2 to 7 psi)

Valve characteristics

Pressure drop Metric Units (English Units)



Key

Blue - Water

Red - ISO VG32

Orange - ISO VG46

Green - ISO VG68

Size	Kv						
20mm (3/4")	14	3 (13)	5 (22)	7(31)	9 (40)	11 (48)	13 (57)
25mm (1")	16	4 (18)	6 (26)	8 (35)	10 (44)	12 (53)	14 (61)
40mm (1 1/2")	22	5 (22)	8 (35)	11 (48)	14 (62)	17 (75)	20 (88)
50mm (2")	44	10 (44)	16 (70)	22 (97)	28 (123)	34 (150)	40 (176)
65mm (2 1/2")	79	20 (88)	27 (119)	40 (176)	50 (220)	62 (273)	74 (326)
80mm (3")	87	22 (97)	30 (132)	51 (224)	60 (264)	70 (308)	82 (360)

Flowrate m³/hr (US gpm) – water

Flow coefficient

AMOT valve flow coefficient (calculated)		
Size	**Kv**	**Cv**
20mm (3/4")	14	16
25mm (1")	16	18
40mm (1 1/2")	22	25
50mm (2")	44	51
65mm (2 1/2")	79	91
80mm (3")	87	101

Kv is the flow coefficient in metric units. It is defined as the flow rate in cubic meters per hour (m³/h) 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:

$$DP = \left(\frac{Q}{Kv}\right)^2 SG \qquad Q = Kv\sqrt{\frac{Dp}{SG}}$$

Q = Flow in m³/hr

Dp = Pressure drop (Bar)

SG = Specific gravity of fluid (Water = 1.0)

Kv = Valve flow coefficient

Cv is the flow coefficient in English units. 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:

$$DP = \left(\frac{Q}{Cv}\right)^2 SG \qquad Q = Cv\sqrt{\frac{Dp}{SG}}$$

Q = Flow in US gallons

Dp = Pressure drop (psi)

SG = Specific gravity of fluid (Water = 1.0)

Cv = Valve flow coefficient

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)

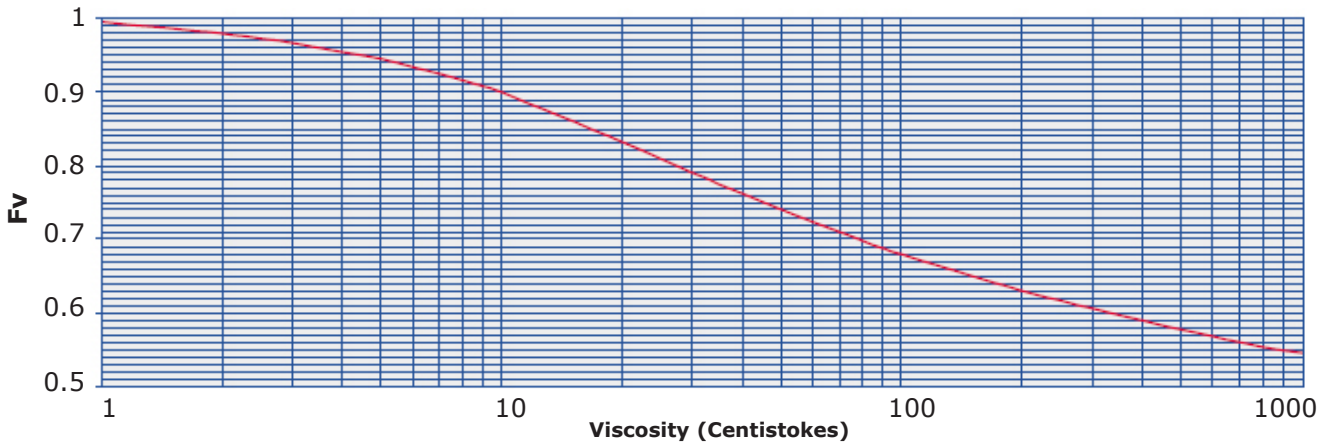
- Viscosity Correction

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

  The correction value 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 formulae.

  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.

Valve characteristics continued

Available versions

Size mm (")	Connection type		
	Butt weld DIN 2448 PN40 (X)	Socket weld ANSI B16.11 (Y)	Butt weld ANSI B36.10 SCH.40 (Z)
20 (3/4)	✔	✔	✔
25 (1)	✔	✔	✔
40 (1 1/2)	✔	✔	✔
50 (2)	✔	✔	✔
65 (2 1/2)	✔	✔	✔
80 (3)	✔		

Temperature and element characteristics

All temperatures in °C (°F)

Control temperature °C (°F)	Temperature range				Maximum continuous				Code
	20 - 40 mm	0.79 - 1.57 inches	50 - 80 mm	1.97 - 3.15 inches	20 - 40 mm	0.79 - 1.57 inches	50 - 80 mm	1.97 - 3.15 inches	
35 (95)	30-40	86-104	29-41	85-105	50	122	49	120	095
38 (100)	33-42	91-108	34-42	91-108	75	167	50	122	100
43 (110)	38-47	100-117	38-47	100-117	82	180	56	133	110
49 (120)	43-55	110-131	43-54	110-130	88	191	66	150	120
54 (130)	49-60	120-140	51-60	124-140	95	203	68	158	130
60 (140	54-65	130-150	57-66	135-151	99	210	74	165	140
66 (150)	60-71	140-160	63-72	145-161	100	212	82	180	150
71 (160)	65-76	150-170	68-78	155-173	100	212	88	190	160
77 (170)	73-82	163-180	74-83	165-181	100	212	93	200	170
79 (175)	77-85	170-185	77-85	170-185	105	221	102	215	175
82 (180)	79-88	175-191	79-88	175-191	110	231	104	220	180

Service kits

Size DN mm (inch)	Material	Kit number
20 - 40 (3/4 - 1 1/2)	Nitrile	46857X101
	Viton	46857X102
	Neoprene	46857X103
50 - 65 (2 - 2 1/2)	Nitrile	46758X101
	Viton	46758X102
	Neoprene	46758X103

Size DN mm (inch)	Material	Kit number
80 (3)	Nitrile	80660X101
	Viton	80660X102
	Neoprene	80660X103

How to order

Use the tables below to select the unique specification of your R Valve.

Example	RO	40	S	X	110	03	4	AA	Code Description
Basic Model	RO								Standard Construction

		Nominal bore		No. of elements	
		mm	inch		
Valve Size *two elements	20	20	¾	1	
	25	25	1	1	
	40	40	1 ½	1	
	50	55	2	1	
	65	65	2 ½	1	
	*80	80	3	2	

		Connection	Size availability
Material	S	Steel BS:3146 CLA 1A - ASTM A216 WCB - DIN 17245 GSC25N	
Connection	X	Butt weld DIN 2448 PN40	20mm to 80mm (¾" to 3")
	Y	Socket weld ANSI B16.11	20mm to 65mm (¾" to 2 ½")
	Z	Butt weld ANSI B36.10 SCH.40	20mm to 65mm (¾" to 2 ½")

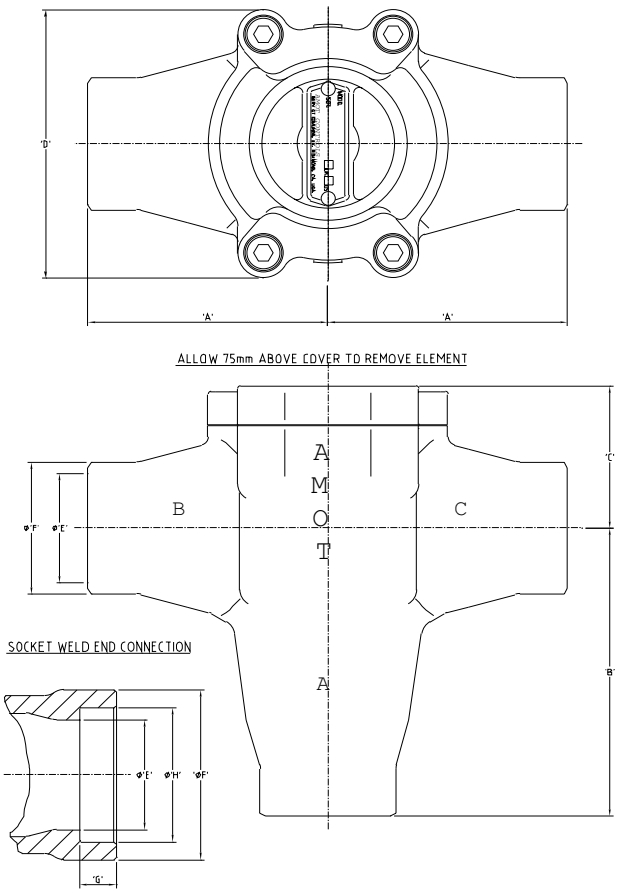
	Control temp. °C (°F)	Nominal temperature °C (°F)		Maximum continuous °C (°F)	
		20 to 44 mm (inch)	50 to 80 mm (inch)	20 to 44 mm (inch)	50 to 80 mm (inch)
Control Temp. 095	35 (95)	30-40 (86-104)	29-41 (85-105)	15 (122)	49 (120)
100	38 (100)	33-42 (91-108)	34-42 (93-108)	75 (167)	50 (122)
110	43 (110)	38-47 (100-117)	38-47 (100-117)	82 (180)	56 (133)
120	49 (120)	43-55 (110-131)	43-54 (110-130)	88 191)	66 (150)
130	54 (130)	49-60 (120-140)	51-60 (124-140)	95 (203)	68 (158)
140	60 (140)	54-65 (130-150)	57-66 (135-151)	99 (210)	74 (165)
150	66 (150)	60-71 (140-160)	63-72 (145-161)	100 (212)	82 (180)
160	71 (160	65-76 (150-170)	68-78 (115-173)	100 (212)	88 (190)
170	77 (170)	72-82 (163-180)	74-83 (165-181)	100 (212)	93 (200)
175	79 (175)	76-85 (170-185)	77-85 (170-185)	105 (221)	102 (215)
180	82 (180)	79-88 (175-191)	79-88 (175-191)	110 (231)	104 (220)

		Element		
		Seal material	Plating	Type
Element Code	01	Nitrile	None	Standard
	02	Viton		
	03	Neoprene		
	04	Nitrile	Electroless Nickel	
	05	Viton		
	06	Neoprene		

		Leakhole diameter	
		mm	inch
Leakhole diameter between ports B&C	0	None	None
	2	2	0.079
	3	3	0.118
	4	4	0.157
	5	5	0.197
	6	6	0.236
	8	8	0.315

		Customizations
Special requirements	AA	Please contact us for any special requirements

Dimensions



General				
Nominal bore	20, 25 & 40mm		50, 65 & 80mm	
Connection	Butt	Socket	Butt	Socket
A	85	95	100	110
B	105	115	132	142
C	52	52	64	64
D	102	102	123	123

Butt weld DIN 2448 PN40						
Nominal bore	20 (3/4")	25 (1")	40 (1 1/2")	50 (2")	65 (2 1/2")	80 (3")
Dia E	22.3	28.5	43.1	54.5	70.3	78
Dia F	27	34	48	60	76	89
Weight Kg (lbs)	3.2 (7)	3.2 (7)	3.5 (8)	7 (15)	7 (15)	17.5 (39)

Butt weld schedule 40						
Nominal bore	20 (3/4")	25 (1")	40 (1 1/2")	50 (2")	65 (2 1/2")	80 (3")
Dia E	20.9	26.6	40.9	52.5	N/A	N/A
Dia F	27	34	48	60	N/A	N/A
Weight Kg (lbs)	3.2 (7)	3.2 (7)	3.5 (8)	7 (15)	N/A	N/A

Socket weld ANSI 16.11						
Nominal bore	20 (3/4")	25 (1")	40 (1 1/2")	50 (2")	65 (2 1/2")	80 (3")
Dia E	20	25	40	50	65	N/A
Dia F	38	46	62	74	92	N/A
G	13	13	13	16	16	N/A
Dia H	27.2	33.9	48.8	61.2	74	N/A
Weight Kg (lbs)	3.5 (8)	3.5 (8)	4 (9)	7.5 (16)	7.5 (16)	N/A

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