

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 (3/4" and 3") pipe sizes
- Threaded and flanged connections
- Tamper-proof temperature settings from 35°C to 82°C (95°F to 180°F)
- Pressure ratings up to 45 bar (650 psi)



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Thermostatic Control Valve - Model R

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.

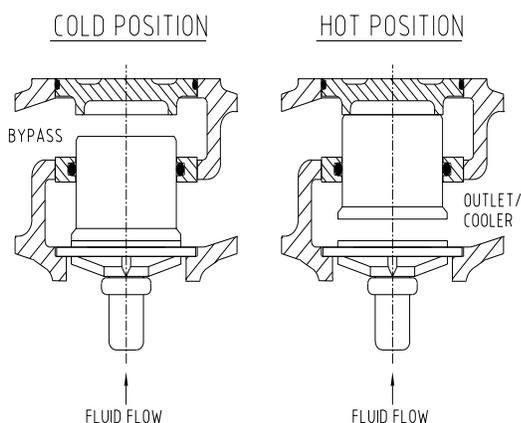
The temperature control power is created by the expansion of a wax/copper mixture which is highly sensitive to temperature changes.

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.

In applications where a valve is used as 2-way, with port 'B' blocked and when the circuit is cold and the valve closed, a leak hole is necessary to ensure small flow in order to detect a temperature change in the system.

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.

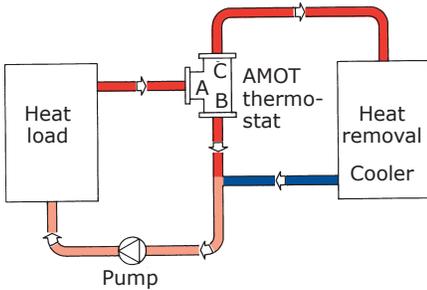
For mixing and oil circuits the temperature may be one to two degrees Centigrade higher due to flow, viscosity and other system parameters.

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Applications

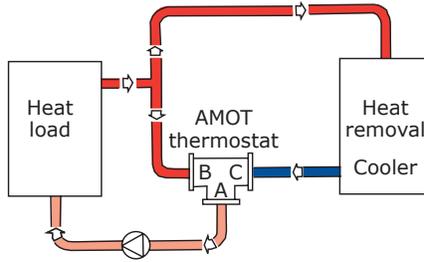
Diverting Applications

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.



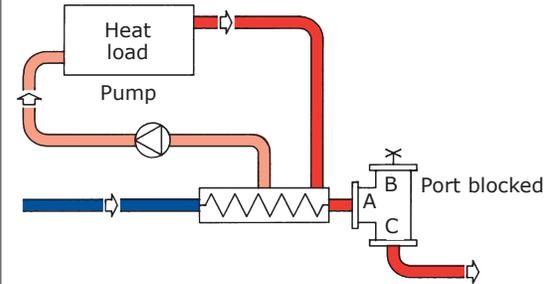
Mixing Applications

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.



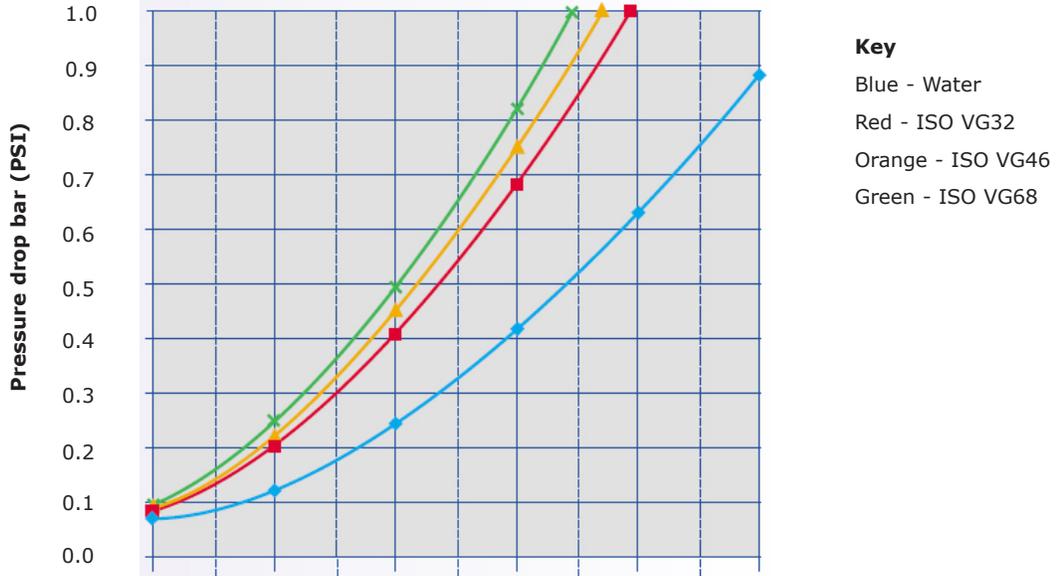
Specification

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	10 - 45 bar	(145 - 650 psi)
Recommended pressure drop	0.14 to 0.48 bar	(2 to 7 psi)

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Valve characteristics

Pressure drop Metric Units (English Units)



Size	Kv	3	5	7	9	11	13
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:

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

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:

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

Q = Flow in US gallons
 DP = Pressure drop (psi)
 SG = Specific gravity of fluid (Water = 1.0)
 Cv = Valve flow coefficient

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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.

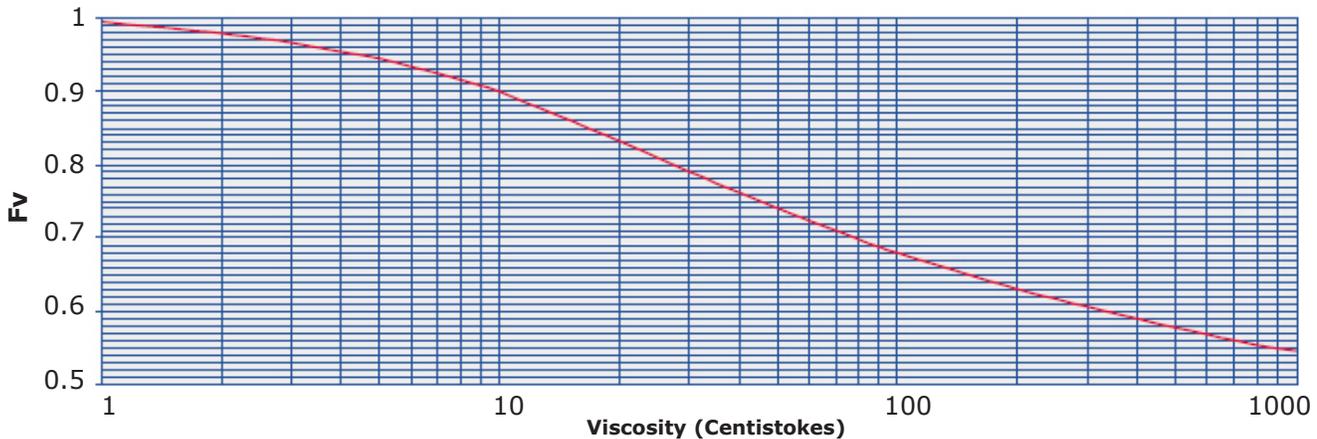
The correction value that is produced by the graph should then be multiplied by the original Flow Coefficient. This gives the corrected Flow Coefficient, which can then be used in the standard formulae.

e.g:

100 cST = correction factor of 0.68

$0.68 \times \text{Flow Co.} = \text{corrected Flow Co. (Kv or Cv)}$

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.

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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

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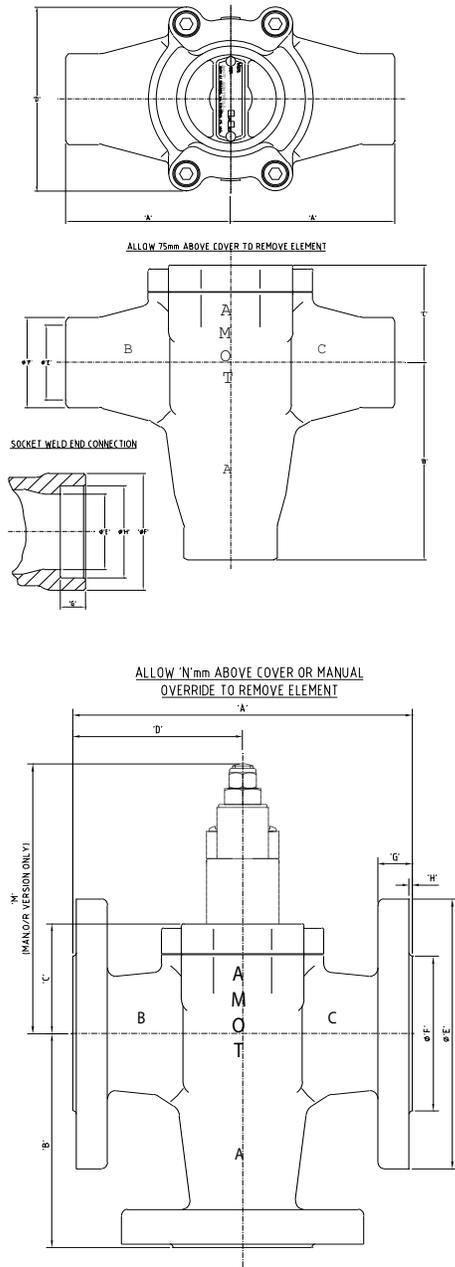
How to order

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		
Material	S								Steel BS:3146 CLA 1A - ASTM A216 WCB - DIN 17245 GSC25N				
									Connection		Size availability		
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											

Thermostatic Control Valve - Model R

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)

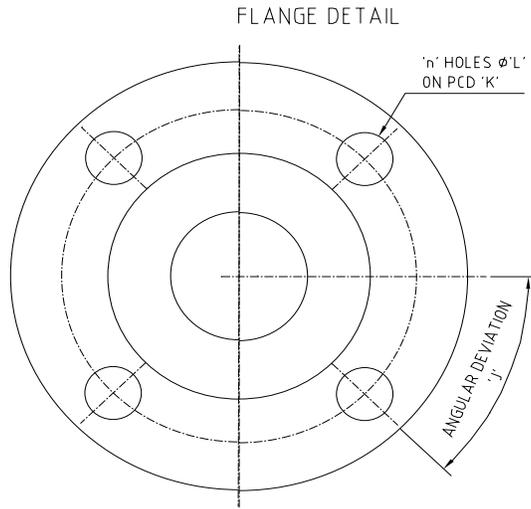
Butt weld schedule 40						
Nominal bore	20 (3/4")	25 (1")	40 (1 1/2")	50 (2")	65 (2 1/2")	80 (3")
Dia E	20.9	26.6	40.9	52.5	N/A	N/A
Dia F	27	34	48	60	N/A	N/A
Weight Kg (lbs)	3.2 (7)	3.2 (7)	3.5 (8)	7 (15)	N/A	N/A

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

General - dimensions in mm (inches)								Weight Kg (lbs)		
Type	Size	A	B	C	D	M	N	Metric	ANSI 150lb	ANSI 300lb
RF3	25 (1")	178 (7")	101 (4")	52 (2")	89 (3.5")	127 (5")	90 (3.54")	6 (13)	5.5 (12)	7 (15)
RF5	40 (1 1/2")	178 (7")	101 (4")	52 (2")	89 (3.5")	127 (5")	90 (3.54")	9 (19)	7.5 (17)	10 (22)
RF6	50 (2")	225 (8.86")	149 (5.87")	63 (2.48")	113 (4.45")	TBA	125 (4.92")	15 (33)	13.5 (30)	15 (33)
RF7	65 (2 1/2")	254 (10")	165 (6.5")	63 (2.48")	127 (5")	TBA	125 (4.92")	16 (36)	17 (37)	19.5 (43)
RF8	80 (3")	267 (10.5")	171 (6.73")	72 (2.83")	134 (5.28")	114 (4.49")	140 (5.51")	29 (64)	30 (66)	31 (68)

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Dimensions continued



Flange details - ND10/ND16								
Type	Dia E	Dia F	G	H	Dia K	Dia L	N	J
RF3	115 (4.53")	68 (2.68")	16 (0.63")	2 (0.08")	85 (3.35")	14 (0.55")	4	45°
RF5	150 (5.91")	88 (3.46")	18 (0.71")	3 (0.12")	110 (4.33")	18 (0.71")	4	45°
RF6	165 (6.5")	102 (4.02")	20 (0.79")	3 (0.12")	125 (4.92")	18 (0.71")	4	45°
RF7	185 (7.28")	122 (4.80")	20 (0.79")	3 (0.12")	145 (5.71")	18 (0.71")	4	45°
RF8	200 (7.87")	138 (5.43")	22 (0.87")	3 (0.12")	160 (6.3")	18 (0.71")	8	22.5°

Flange details - ANSI 150lb								
Type	Dia E	Dia F	G	H	Dia K	Dia L	N	J
RF3	108 (4.25")	66.5 (2.62")	14.2 (0.56")	1.52 (0.06")	79.2 (3.12")	15.7 (0.62")	4	45°
RF5	127 (5")	73.2 (2.88")	17.5 (0.69")	1.52 (0.06")	98.6 (3.88")	15.7 (0.62")	4	45°
RF6	152.4 (6")	92 (3.62")	19.5 (0.77")	1.52 (0.06")	120.7 (4.75")	19.5 (0.77")	4	45°
RF7	177.8 (7")	104.6 (4.12")	22.4 (0.88")	1.52 (0.06")	139.7 (5.5")	19.5 (0.77")	4	45°
RF8	190.5 (7.5")	127 (5")	25.5 (1")	1.52 (0.06")	152.4 (6")	19.05(0.75")	4	45°

Flange details - ANSI 300lb								
Type	Dia E	Dia F	G	H	Dia K	Dia L	N	J
RF3	124 (4.88")	66.5 (2.62")	17.5 (0.69")	1.52 (0.06")	88.9 (3.5")	19.05 (0.75")	4	45°
RF5	155.4 (6.12")	73.2 (2.88")	20.6 (0.81")	1.52 (0.06")	114.3 (4.5")	22.4 (0.88")	8	22.5°
RF6	165.1 (4.5")	92 (23.62")	22.5 (0.89")	1.52 (0.06")	127 (5")	22.4 (0.88")	8	22.5°
RF7	190.5 (7.5")	104.6 (4.12")	25.4 (1")	1.52 (0.06")	149.4 (5.88")	22.4 (0.88")	8	22.5°
RF8	209.6 (8.25")	127 (5")	28.4 (1.12")	1.52 (0.06")	168.1 (6.62")	22.4 (0.88")	8	22.5°

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