

ENGINEERING
TOMORROW

Danfoss

North America

Hydronic Specialties

Controls Catalog & Application Guide

Radiant Heating & Cooling, Snow/Ice Melt Controls, Heat Exchanger Control Solutions & more...

Choose

your application &
find the Danfoss
solution that fits
your needs.

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New **Application Focused** Catalog Makes It **Easier** to Find the Products You Need!

Danfoss makes it easier than ever to find the correct solution for your heating or cooling application. Simply find the application that fits your HVAC system needs and look for the corresponding color coded tabs throughout the catalog. This catalog also includes application drawing examples of typical applications for each of the sections.

New Application and Product Based Sections Include:

- **2-Way Control & Mixing**
- **3-Way Mixing & Diverting**
- **4-Way Mixing**
- **Actuators for Rotary Mixing Valves**
- **Set Point Controls**
- **Boiler Return Protection, Solid Fuel & Solar Controls**
- **Injection Mixing**
- **Thermostats**
- **Snow Melt Controls**
- **Balancing**

Danfoss has been manufacturing quality comfort control solutions for over 80 years. Our wide variety of products help to accurately control your hydronic system, leading to increased system efficiency, occupant comfort, and maximized energy savings.



To learn more about our products please visit our website.

ENGINEERING
TOMORROW

Danfoss

TABLE OF CONTENTS

Description	Page
APPLICATION DRAWINGS	
2-Way Thermostatic/Electronic Injection Mixing Controls	4
2-Way Thermostatic/Electronic Domestic Hot Water Controls	4
2-Way Plate Heat Exchanger Controls	5
2-Way Water to Air Heat Exchanger Controls	5
2-Way Single Loop Thermostatic Radiator Valve Controls	6
3-Way Thermostatic Mixing Controls	6
3-Way Return Water Temperature Control & Mixing	6
3-Way Mixing with Setpoint Control	7
3-Way Diverting with Setpoint Control	7
3-Way Mixing or Diverting	7
4-Way Mixing with Setpoint Control	8
Snow & Ice Melt - 1 Zone Activation Controller	8
Snow & Ice Melt - 2 Zone Control System	9
Snow & Ice Melt - 1 Zone Regulated Snow Melt System	9
Circuit Balancing Valves	10
Boiler Water Return Temperature Protection	10
Boiler Water Return Temperature Protection on Converted Gravity Heating Systems	11
Zoning with Electronic Room Thermostats	11
Solar & Solid Fuel Boiler Specialties	12
Thermostatic Damper Control Regulator	13

2-WAY CONTROL & MIXING

RAVK*	Self-Acting Thermostatic Operators	14
VMT	Valve Body for Thermostatic & Electric Actuators	14
KOVM	Mixing Valve Body	14
FTC	Self Acting Thermostatic Operators	14
RA2000	Valve Bodies	15
RA-C	Heating and Cooling Valve Bodies	15
ABV	Adjustable Flow Limitation and Manual Operation Actuator	15
AVTB	Thermostatic Valves	16
AVTB-RA	Thermostatic Valves	16
AVTB-RA	Sensor Pockets	16

3-WAY MIXING & DIVERTING

VRG130	ESBE Series VRG130 3-Way Mixing Valves	17
TYPE F	ESBE Type F 3-Way Mixing Valves	17
VTA	ESBE Lead Free Thermostatic Mixing Valves	17
VTA 570	ESBE VTA 570 3-Way Mixing or Diverting Valves	18
VTC511	ESBE VTC511 Valve Bodies	18
	ESBE VTC511 Thermostats	18

4-WAY MIXING

VRG140	ESBE Series VRG140 4-Way Mixing Valves	19
TYPE F	ESBE Type F 4-Way Mixing Valves	19
	DIN Flange and Gaskets	19

ACTUATORS FOR ROTARY MIXING VALVES

ARA	ESBE Actuators	20
SERIES 90	ESBE Control Actuators	20
VM-GIB	High Torque Actuators	21

SET POINT CONTROLS

CRA	ESBE Set Point Controls	22
-----	-------------------------	----

BOILER RETURN PROTECTION, SOLID FUEL & SOLAR CONTROL

VTC511	ESBE Thermostatic Valve Bodies	23
	ESBE Thermostats	23
ATA	ESBE Thermostatic Draft Regulator	23

Description	Page	
INJECTION MIXING		
RAVK	Self-Acting Thermostatic Operators	24
VMT	Valve Body for Thermostatic Operators & Electric Actuators	24
FTC	Self-Acting Thermostatic Operators	24
RA2000	Valve Bodies	25
RA-C	Heating and Cooling Valve Bodies	25
AVTB	Thermostatic Valves	26

THERMOSTATS

FHV-R	Floor Temperature Control	27
FHV-A	Room Temperature Control	27
RMT	Room Thermostats	27
RET	Electronic Room Thermostats	28
RET2000B	Battery Powered Room Thermostats	28
TP7001	Programmable Heat Only Room Thermostats	28
MTC	Microline® Hydronic Floor Heating Thermostats	28
FH	Hydronic Floor Heating Thermostats	29

SNOW MELT CONTROLS

ETO2	Advanced Ice & Snow Melt Controller	30
DS-224	Snow Melting System Controller	30
DS-824	Snow Melting System Controller (Remote)	30

BALANCING

STV/STVL	Circuit Balancing Valves	31
STVA	Circuit Balancing Valves	31

SPARE PARTS AND ACCESSORIES

RA2000	Thermostatic Radiator Valves & Operators	32
AVTB	Thermostatic Valves	33

DIMENSIONS

RAVK	34	VTA LF	38	RET	41
VMT	34	VTA570	38	ETO2	41
KOVM	34	VTC511	39	RET2000B	42
FTC	34	ARA	39	TP7001	42
RA-C	34	SERIES90	39	FH	42
RA2000	35	CRA112	40	DS-224	43
ABV	36	CRA122	40	DS-824	43
AVTB	36	FHV-R	40	STV	43
VRG	37	FHV-A	40	STVL	43
TYPE F	37	RMT	41	STVA	43

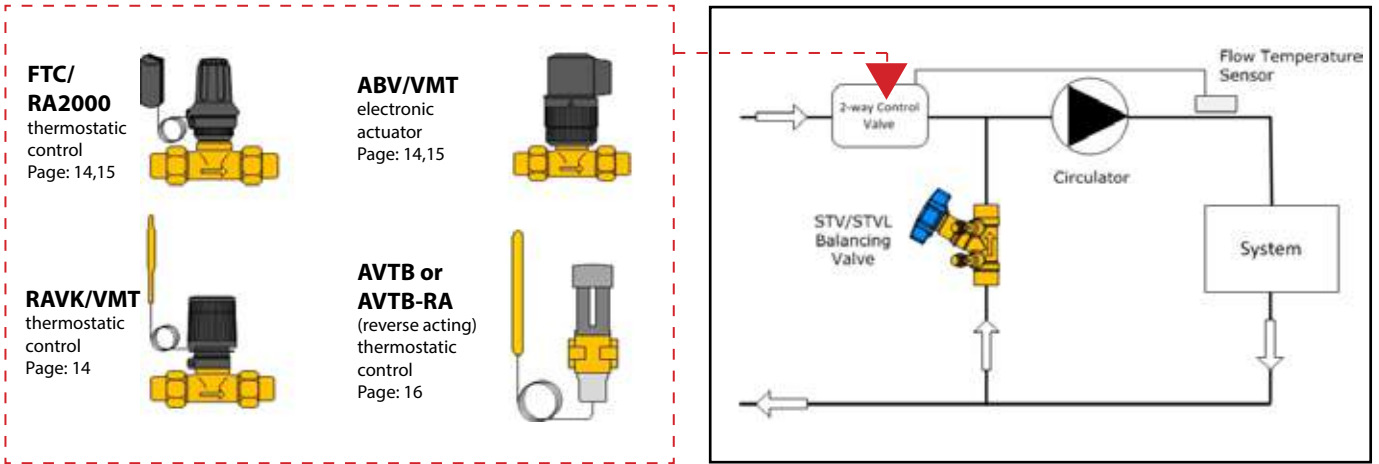
NUMERICAL CODE NUMBER LISTING 44

CONDITIONS AND WARRANTY 45

*RAVK replaces RAVV.

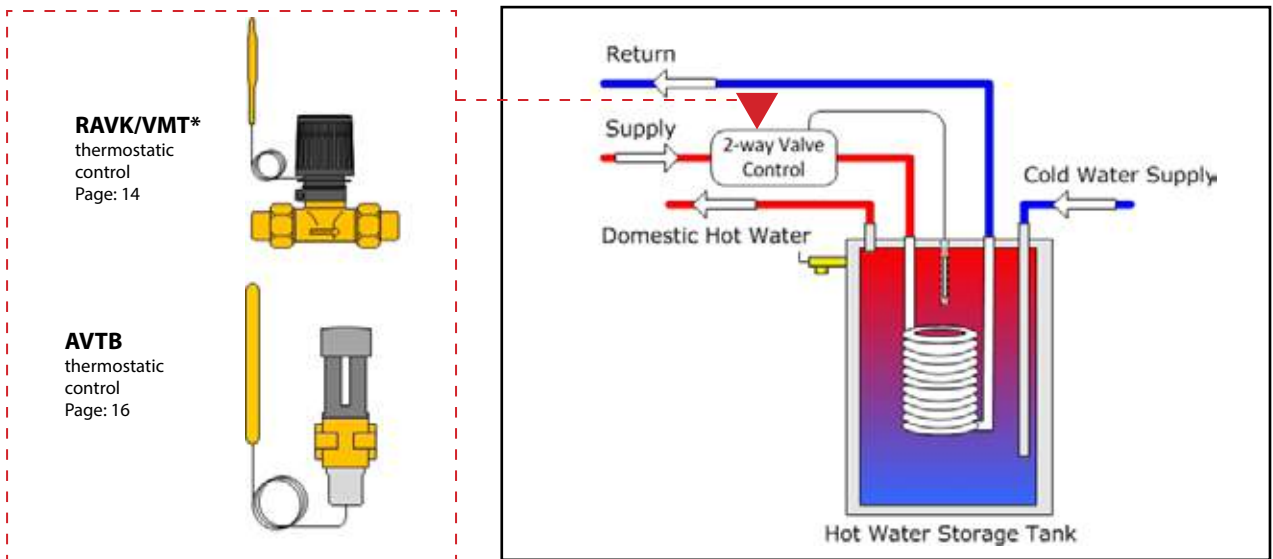
2-Way Thermostatic or Electronic Injection Mixing Controls

Typical piping schematic showing two-way injection mixing allows for flow temperature control of secondary circuits.



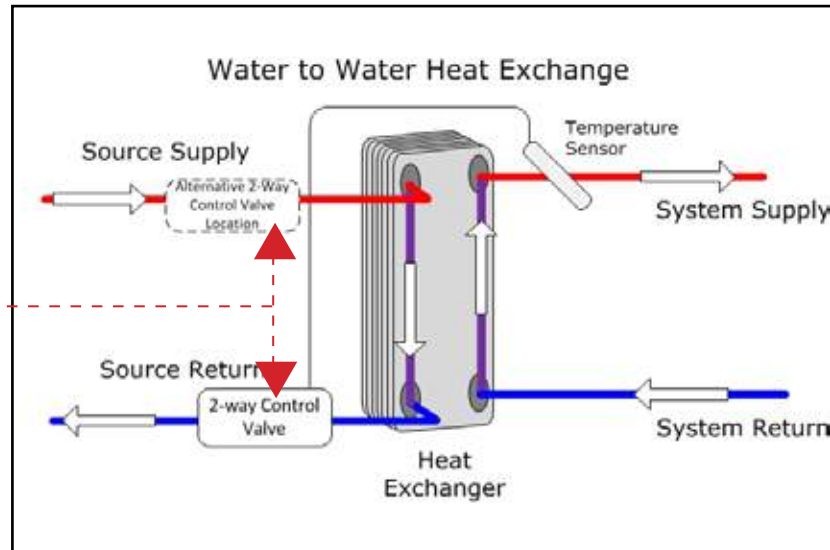
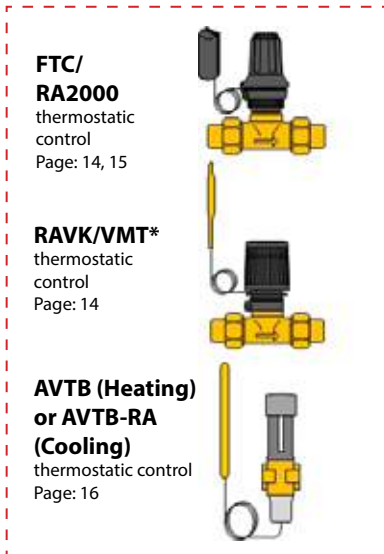
2-Way Thermostatic or Electronic Domestic Hot Water Controls

Typical piping schematic showing two-way control of domestic hot water storage tanks. *See alternative TWA (24V) option in Thermostatic Radiator Valve Catalog.



2-Way Plate Heat Exchanger Controls

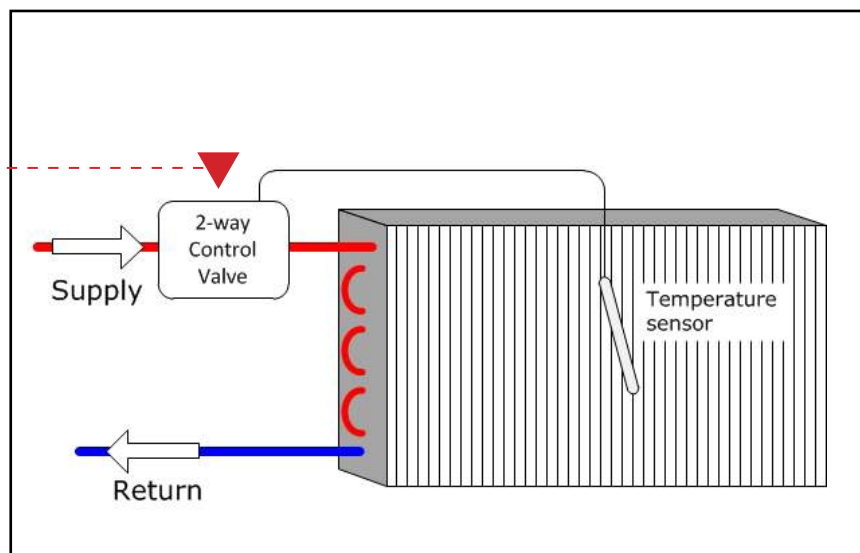
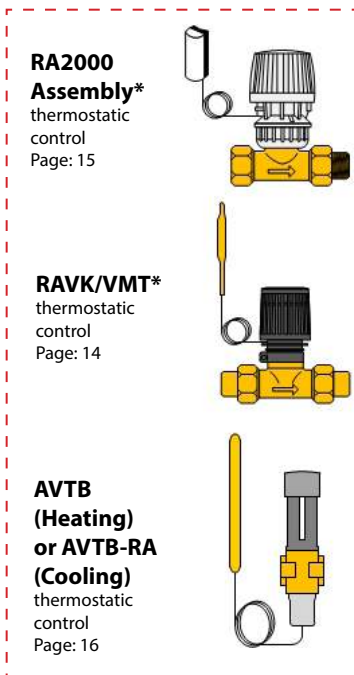
Control of secondary temperature for heating, snow/ice melt and domestic hot water. Cooling application not shown. ***See alternative TWA (24V) option in Thermostatic Radiator Valve Catalog.**



2-WAY PLATE HEAT EXCHANGER CONTROLS

2-Way Water to Air Heat Exchanger Controls

Two-way thermostatic control of discharge air temperature from an air handler. ***See alternative TWA (24V) option in Thermostatic Radiator Valve Catalog.**



2-WAY WATER TO AIR HEAT EXCHANGER CONTROLS

Application Drawings

2-Way Single Loop Thermostatic Radiator Valve Controls

FHV regulating valves provide temperature control of individual under-floor heated rooms and systems using floor heating in conjunction with radiators.

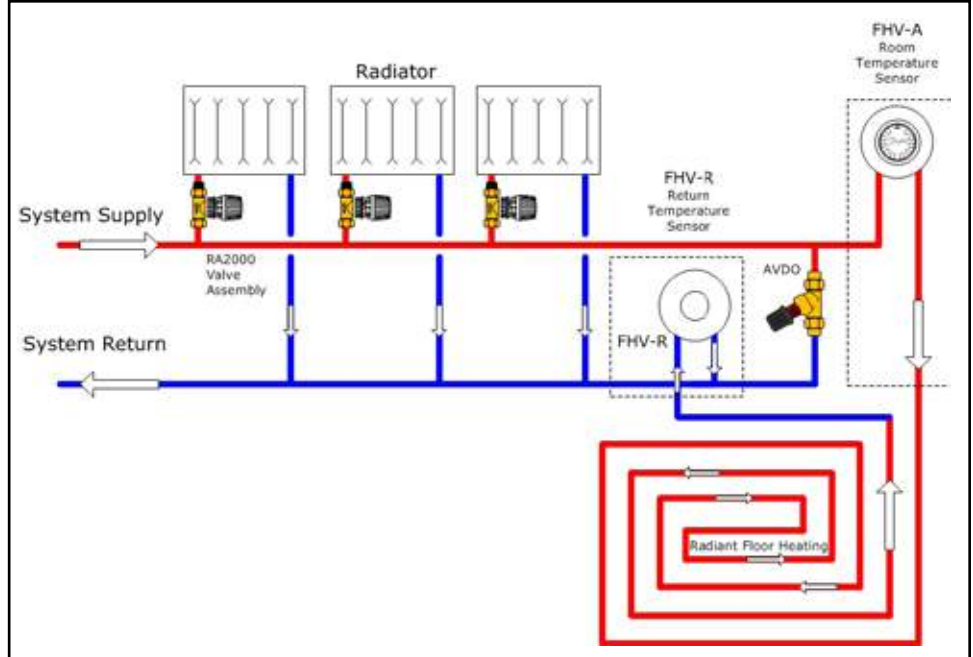
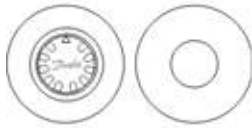
*See Thermostatic Radiator Valve catalog for further information on RA2000 and AVDO.

2-WAY SINGLE LOOP THERMOSTATIC RADIATOR VALVE CONTROLS

RA2000 Assembly*
thermostatic control
Page: 15



FHV-A, FHV-R
single loop control valves
Page: 27

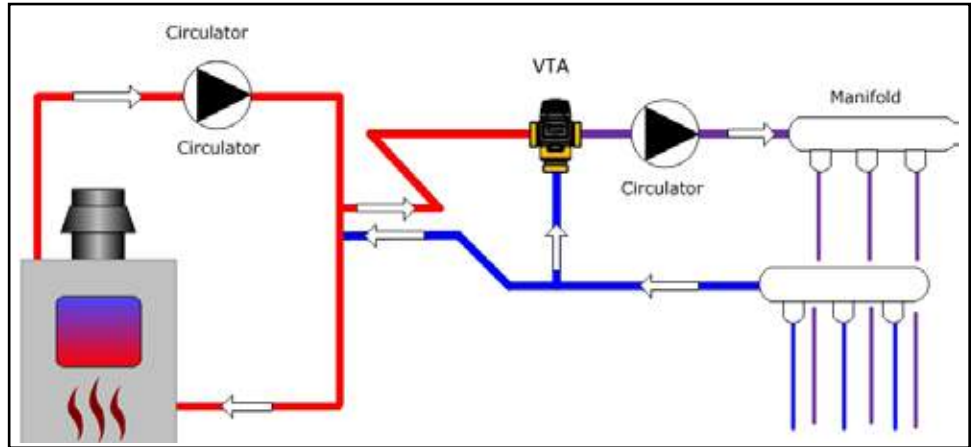


3-Way Thermostatic Mixing Controls

Typical piping schematic for temperature control of water feeding radiant floor circuits.

3-WAY THERMOSTATIC MIXING CONTROLS

VTA THERMOSTATIC MIXING VALVE
Page: 17

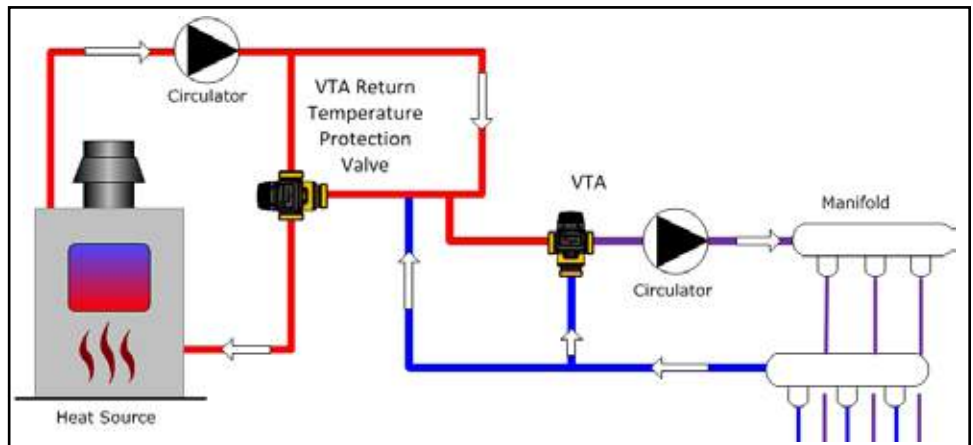


3-Way Return Water Temperature Control & Mixing

Typical piping schematic for temperature control of water feeding radiant floor circuits and minimum return temperature protection for the heat source.

3-WAY RETURN WATER TEMP. CONTROL & MIXING

VTA THERMOSTATIC MIXING VALVE
Page: 17



3-Way Mixing with Setpoint Control

Typical piping schematic for electronic temperature control provides a fixed temperature for radiant floor circuits or snow/ice melt.

*CRA 112/122 can control up to two unique temperature setpoints based on external input signal.

VRG SERIES

Page: 17

CRA112*

Setpoint Control
Page: 22

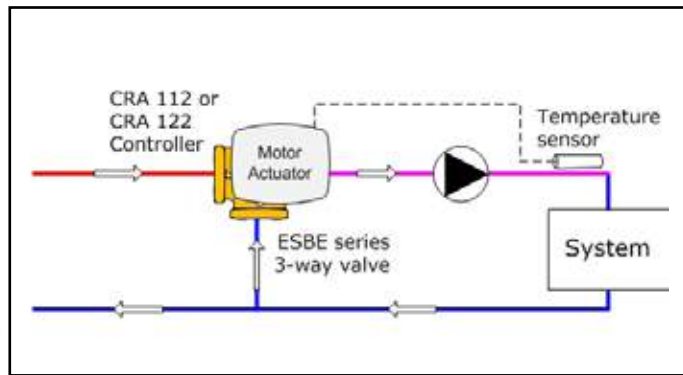
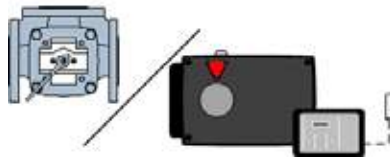


TYPE F SERIES

Page: 17

CRA122*

Setpoint Control
Page: 22



3-Way Diverting with Setpoint Control

Typical piping schematic for electronic temperature control provides a fixed space or discharge temperature for a variety of uses such as air handlers. Alternate sensor location allows for return temperature protection to heat source. *CRA 112/122 can control up to two unique temperature setpoints based on external input signal.

VRG SERIES

Page: 17

CRA112*

Setpoint Control
Page: 22

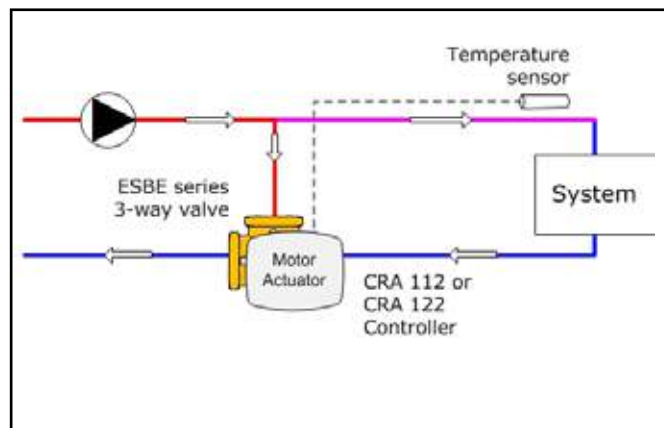
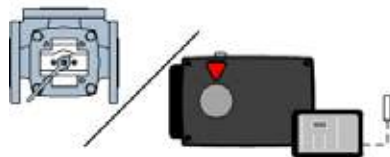


TYPE F SERIES

Page: 17

CRA122*

Setpoint Control
Page: 22



3-Way Mixing or Diverting

Typical primary/secondary piping schematic.

ESBE VRG SERIES

Page: 17



TYPE F SERIES

Page: 17



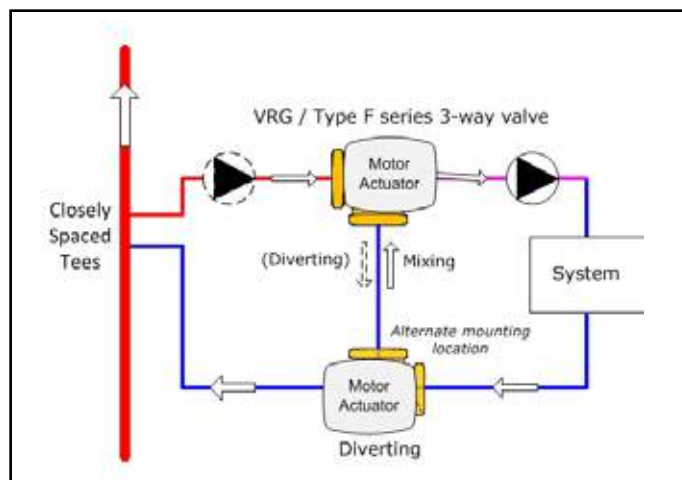
ARA 600 SERIES

Page: 20



SERIES 90

Page: 20



4-Way Mixing with Setpoint Control

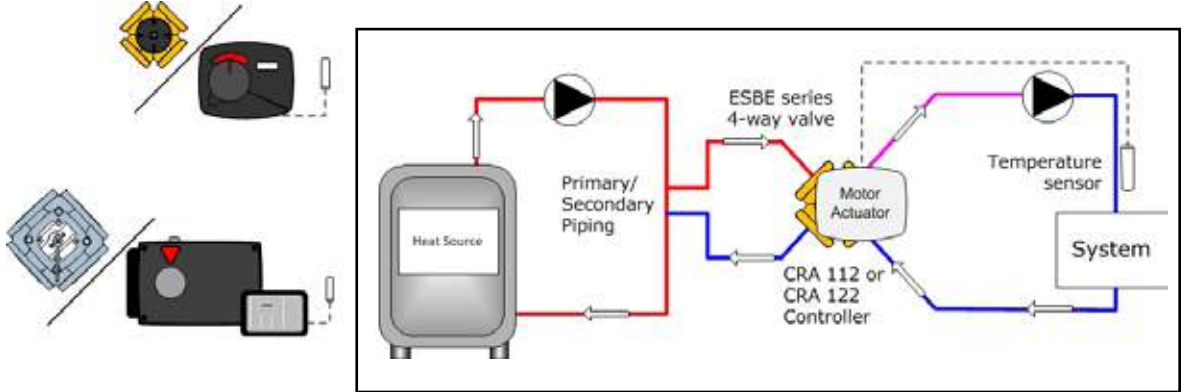
Typical 4-way motorized valve for use with radiant floor heating. For use with outdoor reset use ARA600 or Series 90 actuators.

VRG SERIES
Page: 19

CRA112
Setpoint Control
Page: 22

TYPE F SERIES
Page: 19

CRA122
Setpoint Control
Page: 22

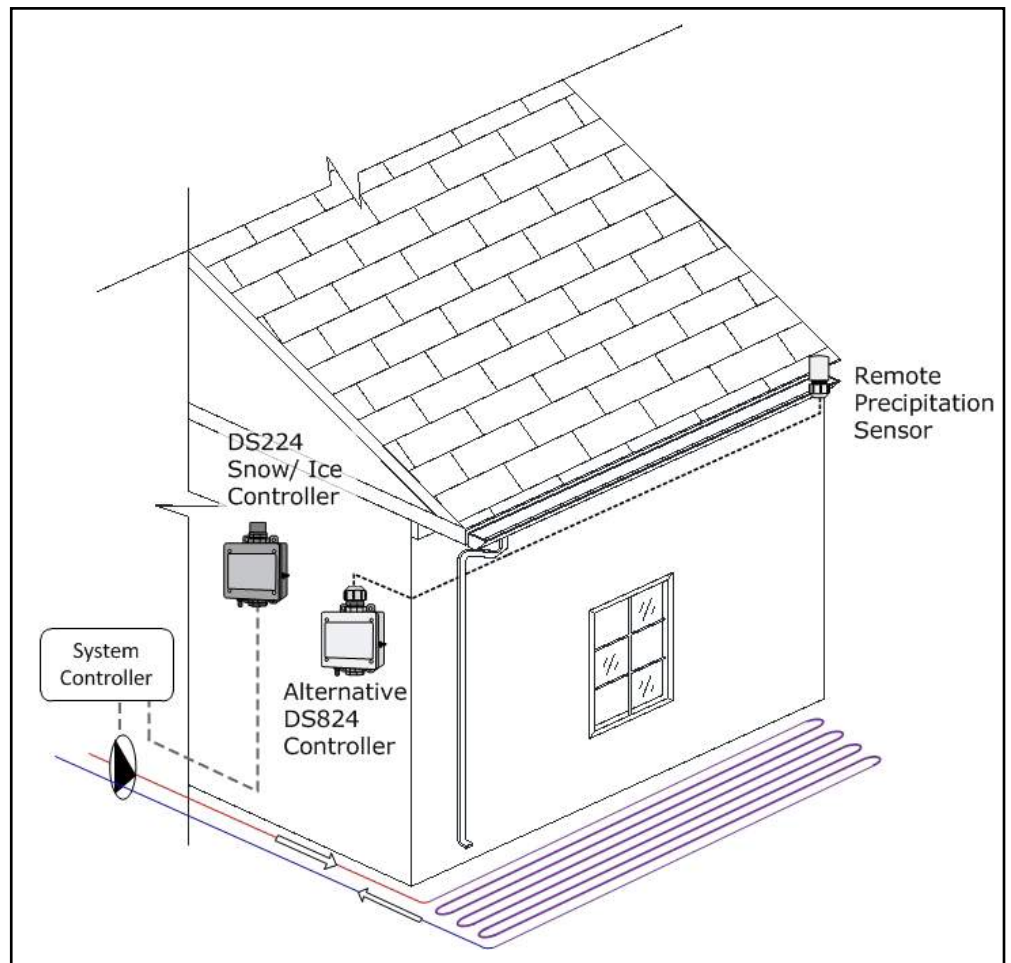
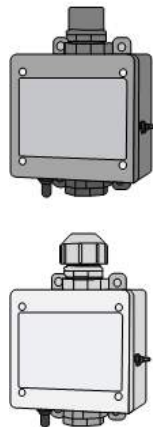


Snow & Ice Melt - 1 Zone Activation Controller

Economical control of single zone snow/ice melt systems.

DS224
Snow/Ice
Controller
Page: 30

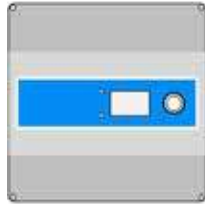
DS824
Snow/Ice
Controller
Page: 30



Snow & Ice Melt - 2 Zone Control System

Automatic control of single or dual zone snow and ice melt systems with many advanced features.

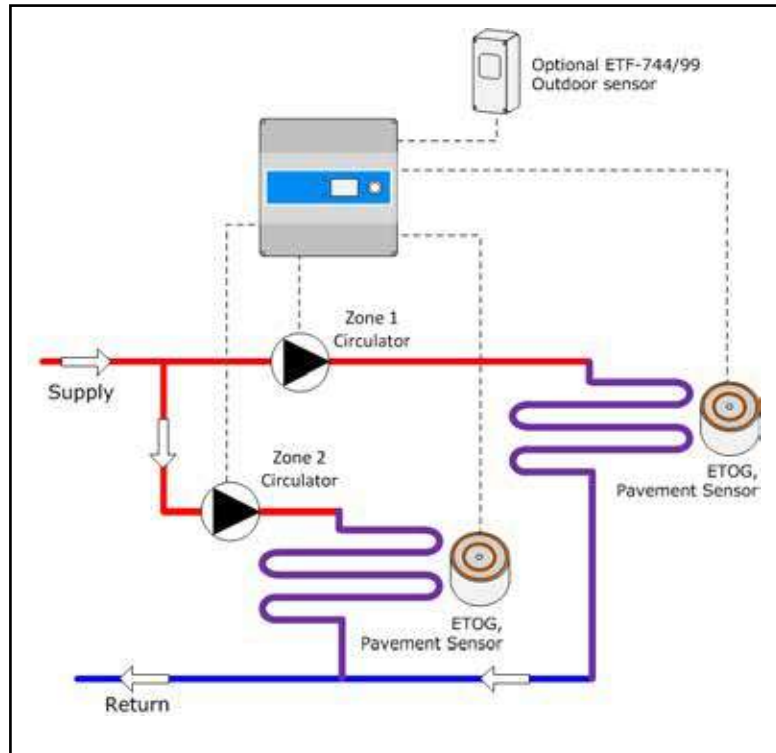
ETO2
Snow/Ice
Controller
Page: 30



ETF-744/99
Outdoor Sensor
Page: 30



ETOG-56
Pavement Sensor
Page: 30



SNOW & ICE MELT / 2 ZONE

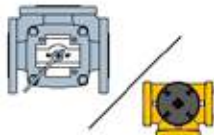
Snow & Ice Melt - 1 Zone Regulated Snow Melt System

Automatic control of supply temperature regulated snow and ice melt systems with many advanced features.

ETO2
Snow/Ice
Controller
Page: 30



TYPE F SERIES
Page: 17



VRG SERIES
Page: 17

ARA639
Page: 20



SERIES 92P
Page: 20



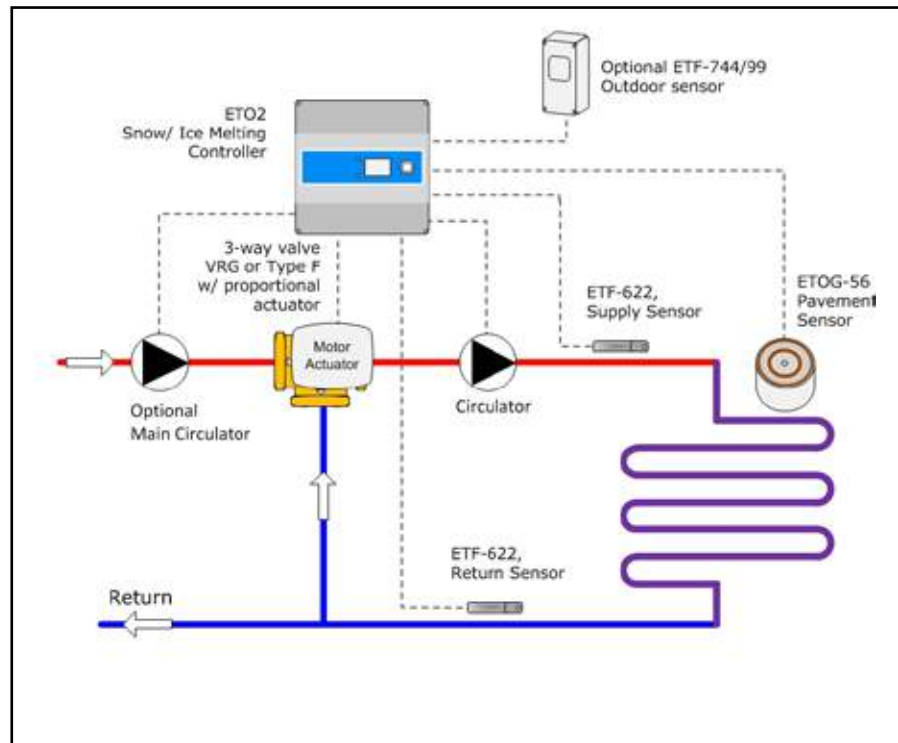
ETF-744/99
Outdoor Sensor
Page: 30



ETF-622
Supply/Return Sensor
Page: 30



ETOG-56
Pavement Sensor
Page: 30



SNOW & ICE MELT / 1 ZONE REGULATED

Circuit Balancing Valves

Manual balancing of hydronic heating and cooling circuits. *See Thermostatic Radiator Valve Catalog for additional options.

CIRCUIT BALANCING VALVES

STV/STVL
Balancing Valve
Page: 31



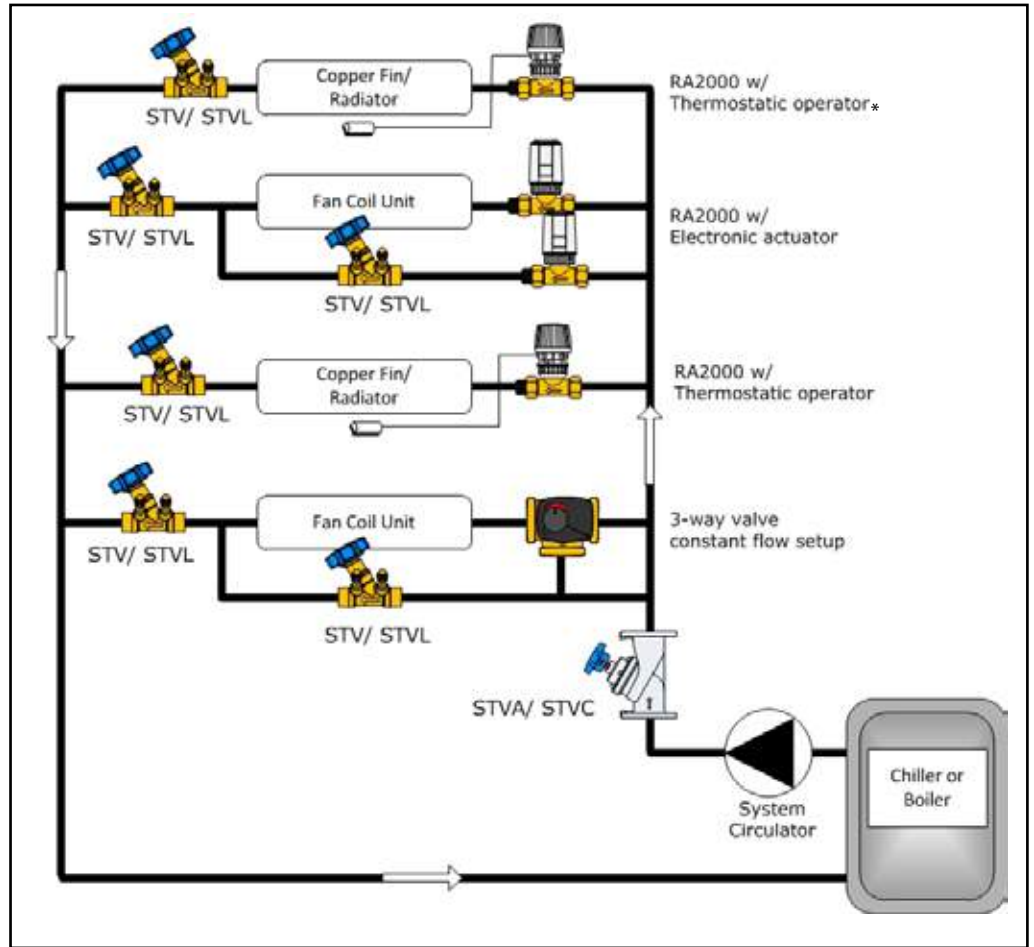
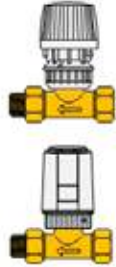
STVA/STVC
Balancing Valve
Page: 31



3-WAY VRG/ARA
3-Way Valve & Proportional Actuator
Page: 17, 20



RA2000*
with Thermostatic Operator or Electronic Actuator
Page: 25

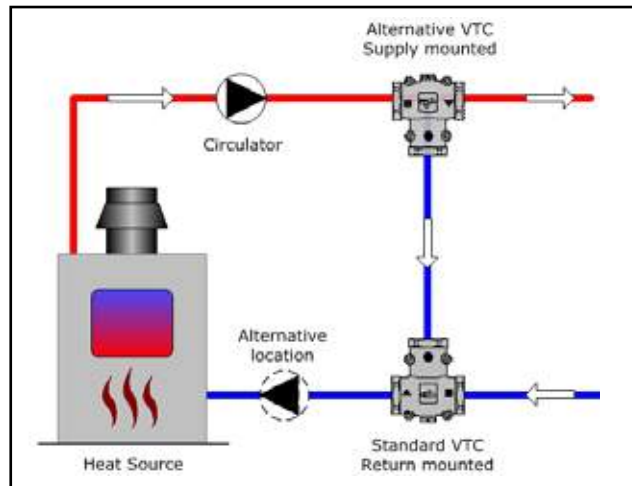
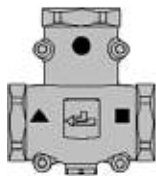


Boiler Water Return Temperature Protection

Automatically maintains a minimum return water temperature (various temperature settings available).

BOILER PROTECTION

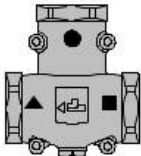
VTC
Thermic Valve
Page: 23



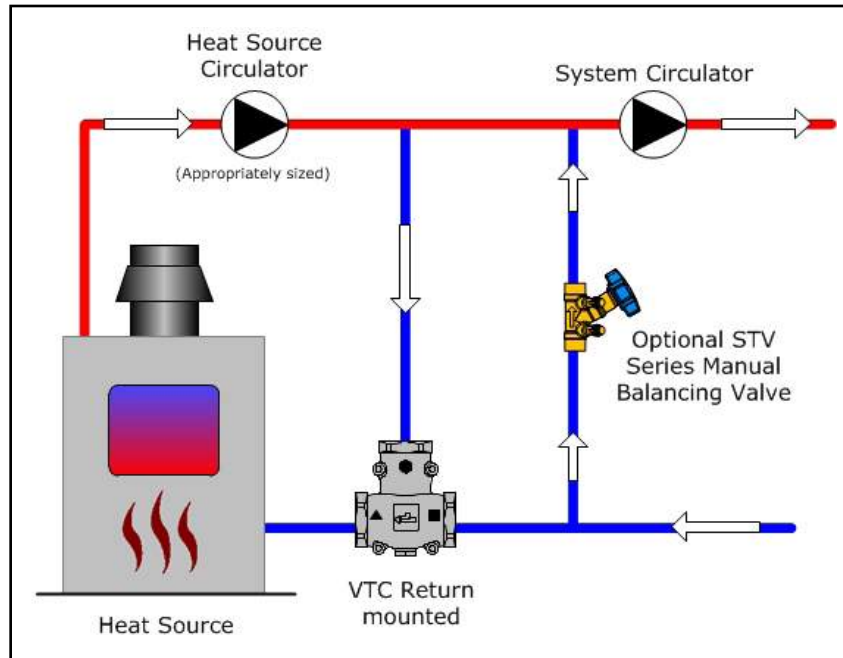
Boiler Water Return Temperature Protection on Converted Gravity Heating Systems

Automatically maintains a minimum return water temperature (various temperature settings available).

VTC
Thermic Valve
Page: 23



STV Series
Manual Balancing Valve
Page: 31



BOILER PROTECTION

Zoning with Electronic Room Thermostats

Choose from a variety of analog, digital, or programmable electronic thermostats with either ambient temperature sensing or ambient temperature plus floor temperature sensing. *See **Thermostatic Radiator Valve Catalog** for additional RA2000 valves.

RMT
Thermostat
Page: 27



RET
Thermostat
Page: 28



RET-2000B
Thermostat
Page: 28



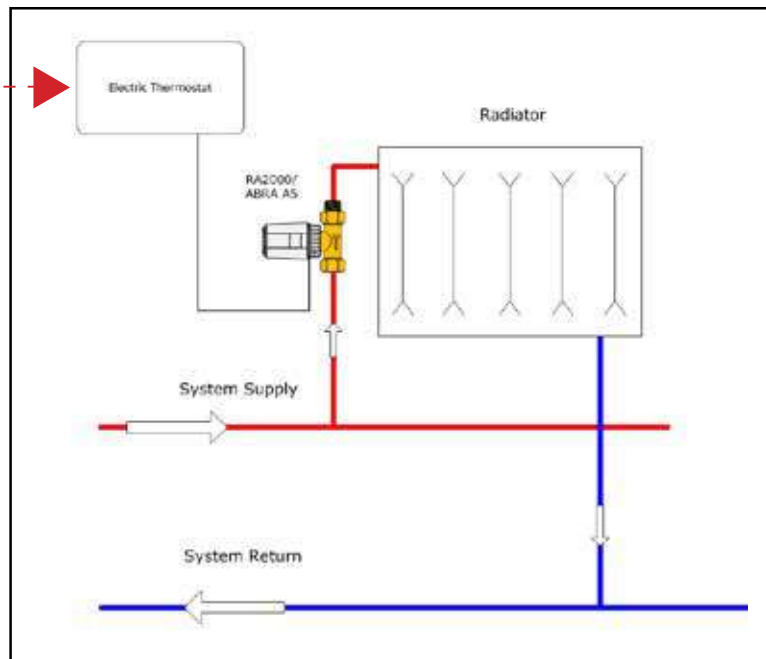
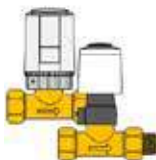
FH-WS
Thermostat
Page: 29



TP7001
Thermostat
Page: 28



**RA2000/
ABRA A5 or
TWA-A***
Valve & actuator
Page 25

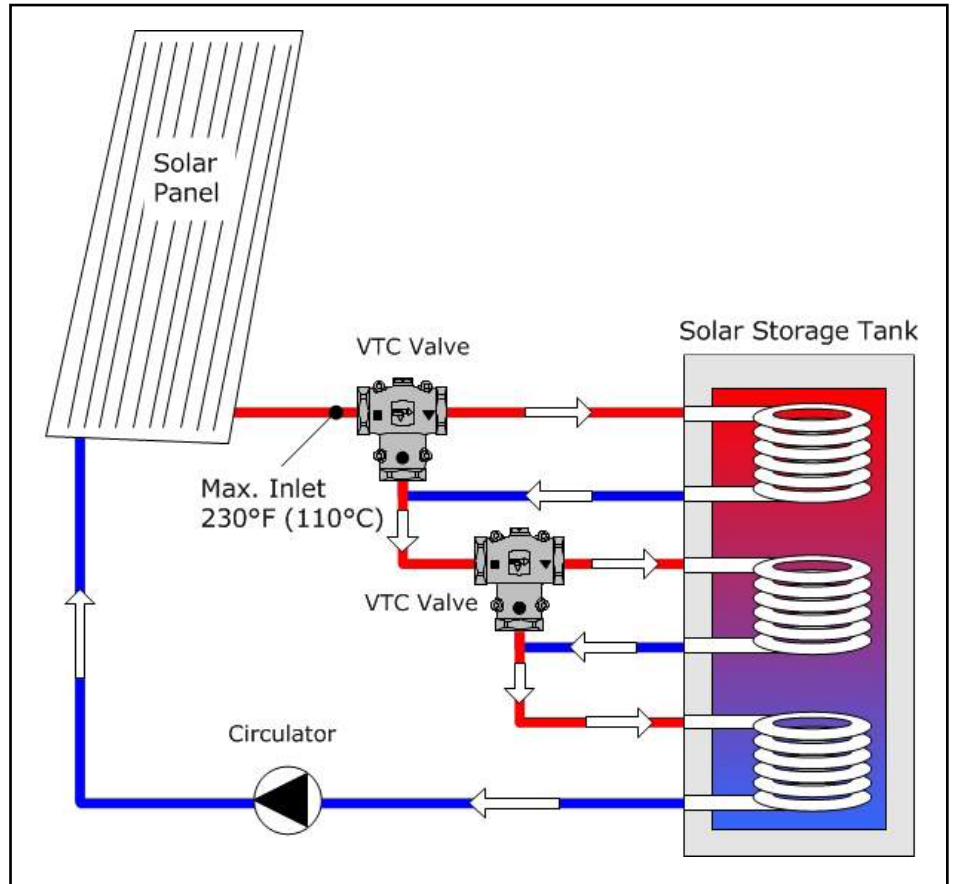
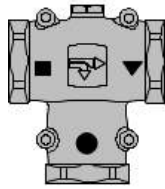


ZONING THERMOSTATS

Solar & Solid Fuel Boiler Specialties

Efficient charging of storage tanks through solar heating provides maximum output and low tank stratification.

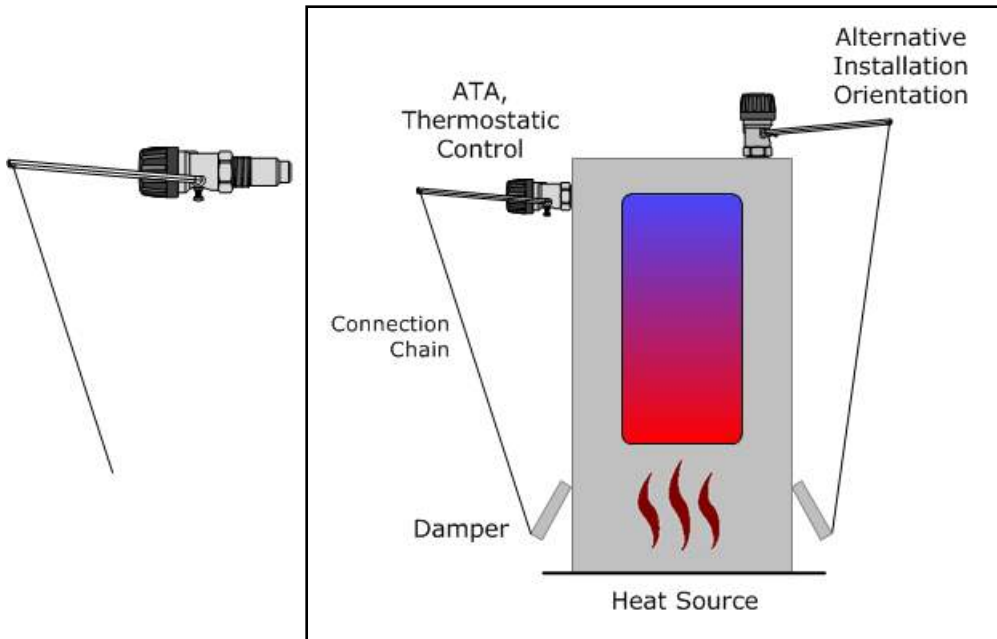
VTC
Thermic Valve
Page: 23



Thermostatic Damper Control Regulator



ATA draft regulator maintains or regulates the water temperature of solid fuel boilers.

ATA
Draft Regulator
Page: 23




2-Way Control and Mixing

RAVK is a self-acting thermostatic element used to control temperatures in small hot-water cylinders (i.e. storage tanks) or heat exchangers in radiator heating systems. RAVK closes on rising sensor temperature.


RAVK	Code No.	Type	Temperature Range	Required Valve Body	Capillary Length
	003L3530	Thermostatic	50° - 86°F (10° - 30°C)	VMT or KOVM	6 ft. 6 in. (2 m)
	013U8063		77° - 149°F (25° - 65°C)		
	003L3531		95° - 167°F (35° - 75°C)		
	017-4370	½" Brass Sensor Well for RAVK			

VMT is a 2-way seated valve, used primarily for heating systems. The valve can be combined with thermostatic element RAVK, ABV, TWA-V or RA 2000 wall mount operators.


VMT	Code No.	Description				
		Connection		Cv	Design	Application
		Size	Type			
	065F0102	1/2"	Solder	1.8	Straight Union	RAVK, ABV, TWA-V*, RA 2000* Wall Mount Operators
	065F0104	3/4"		2.7		
	065F8960	1/2"		3.3		
	065F8961	3/4"		5.9		
	065F1242	1"	NPT (M)	9.4		

*(065F0102 or 065F0104 only).

KOVM mixing valve bodies are designed to maintain room temperature by controlling hot (or chilled) water flow through radiators, fans, convectors, etc. Due to the KOVM's unique bypass design, a constant system flow is achieved regardless of the room's heating (or cooling) requirements, therefore system pressures and flow rates are automatically kept constant without the need for pressure controlled bypass valves. (Not suitable for diverting applications)

KOVM	Code No.	Connection			Design	For use with
		Size	Type	Cv		
	013U3017	1/2"	NPT	1.75	3 Way Heating or Cooling Mixing Valve	RAVK, RA 2000 (013G8564)
	013U301501		Comp.			
	013U302001			2.34		

FTC is a self-acting thermostatic sensor used for flow temperature control of floor heating and radiator heating systems. The water temperature is measured by a surface sensor, which is easily mounted on the pipe by means of a strip (enclosed with the product). The snap-lock connector of the sensor element secures a firm connection to the valve. Closes on rising sensor temperature. Maximum ambient temp. 150° F (65° C). Maximum flow temp. 250° F (120° C). Capillary tube length 0 to 6.5' (0 - 2.0 m).

FTC	Code No.	Description		
		Type	Temperature Range	Required Valve Body
	013G5081	Self Acting Thermostatic Operator c/w 6' 6" (2 m) capillary and strap on sensor. Celsius temperature scale on dial.	59° - 122°F (15° - 50°C)	RA 2000 or RA-C
	013G5080		95° - 158°F (35° - 70°C)	

2-Way Control and Mixing

RA 2000 valve bodies are designed to meet the demands of the residential, commercial and industrial sectors.

RA 2000	Code No.	Description				
		Connection		Cv	Design	Application
		Size	Type			
	013G8013	1/2"	FPT x MPT Union Tailpiece	1.6	Side Mount Angle	Water or 2 Pipe Low Pressure Steam
	013G8018	3/4"		2.1		
	013G8023	1"		2.8		
	013G8030	1-1/4"		2.8		
	013G8015	1/2"	FPT x MPT Union Tailpiece	1.6	Straight	
	013G8020	3/4"		2.7		
	013G8025	1"		2.8		
	013G8032	1-1/4"		2.8		
	013G8014	1/2"	FPT x MPT Union Tailpiece	1.6	Angle	
	013G8019	3/4"		2.7		
	013G8024	1"		2.8		
	013G8031	1-1/4"		2.8		
	013G8042	1/2"	Solder Union	1.6	Straight	2 Pipe Hot Water
	013G8044	3/4"		2.7		

RA-C valves, together with Danfoss self-acting and electronic controllers, make up a perfect combination for control of cooling and heating circuits. RA-C is a normally open valve. In an application with FEK or FED controllers, RA-C valves open when room temperature rises above set point. The RA-C valves have four possible pre-settings, ensuring the correct water flow to each circuit.

RA-C	Code No.	Conn. Size	Presettings: Cv Value				Water Temp.
			1	2	3	N	
	013G3094	1/2"	0.35	0.64	0.88	1.05	50° - 248°F (10° - 120°C)
	013G3096	3/4"	0.94	1.29	1.99	3.04	
	013U0496	1/2"	Nut				
	013U8608		Tailpiece - Female Solder				
	013U0476		Tailpiece - Male Threaded				
	013U0499	3/4"	Nut				
	013U8609		Tailpiece - Female Solder				
	013U0479		Tailpiece - Male Threaded				


Note: Separate nut and tailpiece (threaded or solder) required (2 sets per valve).

ABV is a thermo-hydraulic actuator for two point control used to control floor temperature, floor heating systems, hot-water service systems, zone valves and district heating systems. Adjustable flow limitation and manual operation. Maximum ambient temperature 140°F (60°C).


ABV	Code No.	Description		
		Type	Model	Required Valve Body
	082F0002	NO	ABV Actuator 24VAC 9.0 VA	VMT or KOVM
	082F0052	NC		

2-Way Control and Mixing


AVTB direct acting proportional controllers are used to regulate the temperature of water in heating applications. AVTB valves closes on a rise in sensor temperature.

AVTB	Code No.	Model	Connection		Cap. Length	Temperature Range
			Size (FNPT)	Cv		
	003N6032	AVTB 15	1/2"	2.2	6' 6" (2.0 m)	32°-86°F (0°-30°C)
	003N6252					70°-140°F (20°-60°C)
	003N6272					125°-190°F (50°-90°C)
	003N7032	AVTB 20	3/4"	4.0		32°-86°F (0°-30°C)
	003N7252					70°-140°F (20°-60°C)
	003N7272					125°-190°F (50°-90°C)
	003N8032	AVTB 25	1"	6.4		32°-86°F (0°-30°C)
	003N8252					70°-140°F (20°-60°C)
	003N8272					125°-190°F (50°-90°C)

AVTB-RA reverse acting proportional controllers are used to regulate the temperature of water in cooling applications. AVTB-RA valves opens on a rise in sensor temperature.


AVTB - RA	Code No.	Model	Connection		Cap. Length	Temperature Range
			Size (FNPT)	Cv		
	003N6032RA	AVTB-RA 15	1/2"	2.2	6' 6" (2.0 m)	32° - 86°F (0° - 30°C)
	003N6252RA					77° - 149°F (25° - 65°C)
	003N6272RA					122° - 194°F (50° - 90°C)
	003N7032RA	AVTB-RA 20	3/4"	4.0		32° - 86°F (0° - 30°C)
	003N7252RA					77° - 149°F (25° - 65°C)
	003N7272RA					122° - 194°F (50° - 90°C)
	003N8032RA	AVTB-RA 25	1"	6.4		32° - 86°F (0° - 30°C)
	003N8252RA					77° - 149°F (25° - 65°C)
	003N8272RA					122° - 194°F (50° - 90°C)

AVTB-RA Sensor Pockets


	AVTBWELL	Sensor Pocket, max. pressure 341 Psi, L = 8.7" (25 bar / 220 mm)	3/4" NPT, Brass for 0.7" sensor
	003N0053		3/4" NPT, Stainless Steel for 0.7" sensor

3-Way Mixing and Diverting


ESBE Series VRG130 is a range of compact, low leakage mixing valves. For easy manual operation the valves are equipped with non-slip knobs and end stops for an operational angle of 90°. The valve position scale can be turned over and rotated allowing many different mounting positions. Together with ARA600 and Series 90 actuators, the VRG valves are easily automated and have excellent regulating accuracy due to the unique valve to actuator interface. *Note: If 90 series actuators are used on valves 2" and below, mounting kit 193B1616 must be used.

ESBE VRG	Code No.	Description				
		Connection		Cv	Body	Series
		Size	Type			
	193B1500	1/2"	FNPT	2.9	3 Way DZR Brass	VRG 131
	193B1501	3/4"		4.7		
	193B1502	3/4"		7.3		
	193B1503	1"		7.3		
	193B1504	1"		11.7		
	193B1505	1-1/4"		18.7		
	193B1506	1-1/2"		29.3		
	193B1507	2"		46.8		

ESBE Type F 3-way valves are ideal for mixing or diverting applications in heating and cooling systems. The required system temperature is obtained by adding a suitable portion of return water to the boiler flow. The mixing proportions are adjusted manually or, in automatically controlled applications, by means of an actuator (driven from a reset controller or DDC system). The scale is graduated on both sides and can be turned, allowing a choice of mounting positions.


ESBE Type F	Code No.	Description				
		Connection		Cv	Body	Reference
		Size	Type			
	065B8960	2-1/2"	ANSI Flange	75	3 Way Cast Iron	3 F 65-50
	065B8961	2-1/2"		105		3 F 65
	065B8962	3"		175		3 F 80
	065B8963	4"		265		3 F 100
	065B8964	5"		325		3 F 125
	065B8965	6"		465		3 F 150

ESBE VTA Series Lead Free Thermostatic Mixing Valves The VTA Series replaces Series 20 & 30MR styles of valves and are designed for Point of Source in domestic hot water distribution systems and/or regulation of supply in hydronic heating systems.

Female NPT Connection (For Open & Closed Loop)	Code No.	Description			
		Connection		Cv	Temperature Range
		Size	Type		
	065B8868LF	3/4"	Female NPT	1.9	70° - 110°F (20° - 45°C)
	065B8869LF	3/4"		1.9	85° - 120°F (30° - 49°C)
	065B8870LF	3/4"		1.9	95° - 140°F (35° - 60°C)
	065B8871LF	3/4"		1.9	85° - 160°F (30° - 70°C)
	31622111LF	1"		4.1	85° - 120°F (30° - 49°C)
	31622011LF	1"		4.1	95° - 140°F (35° - 60°C)

3-WAY MIXING & DIVERTING


3-Way Mixing and Diverting

Solder & CPVC Connections (*For Closed Loop Only. Not for installation in domestic hot water.)	Valve Body			+	Required Tailpieces	
	Code No.	Cv	Temperature Range		Code No.	Size/Description
	065B8877LF	1.9	85° - 120°F (30° - 49°C)		065B8901	½" solder tailpcs
	065B8878LF	1.9	95° - 140°F (35° - 60°C)		065B8892	¾" solder tailpcs
	065B8872LF*	1.9	85° - 160°F (30° - 70°C)		065B8895	¾" solder with two check valves
			065B8898		¾" CPVC	
			065B8899		1" solder	


Note: Union valve bodies and tailpiece kits for ESBE VTA series of valves with solder and CPVC connections are ordered separately. If the CPVC tailpieces are used with the union valve body, always follow the pipe manufacturer's instructions.


Example: Requirement: ¾" Solder valve with Two Check Valves. 85° - 120°F (30° - 49°C) Temperature Range.
Order one (1) 065B8877LF union valve body and one (1) 065B8895 Solder tailpiece kit complete with two check valves.

ESBE VTA 570 3-Way Thermostatic Mixing or Diverting Valve (Closed Loop, Not for Potable Water) The VTA 570 can be utilized in a mixing or diverting application for hydronic closed looped systems. Typically, this thermostatic control is used as a non-electric alternative for a 2-pipe changeover diverting application.

VTA 570	Code No.		Connection		Cv	Temperature Range
	Valve Body	Required Tailpiece Kit	Size	Type		
	31700100	+	¾"	Union x (¾" F.) solder	5.2	50° - 86°F (10° - 30°C)
				Union x (1" F.) solder		
	31700200	+		Union x (¾" F.) solder		65° - 105°F (20° - 43°C)
				Union x (1" F.) solder		


ESBE VTC511 Thermostatic Valves are used to protect boilers from low return temperatures and to efficiently load accumulation tanks. *Required thermostats ordered separately. Order one valve body and one thermostat to assemble a complete valve.

VTC Valves	Code No.	Series	Description			
			Connection		Cv	Valve Housing
			Size	Type		
	193B1700	VTC511	1"	FNPT	10.4	Cast Iron
	193B1701	VTC511	1-1/4"		16.2	


VTC Thermostats	Code No.	Series	Description	Opening Temperature	Typical Piping
	193B1702	VTC511	Thermostat	122°F (50°C)	Return
	193B1703	VTC511	Thermostat	131°F (55°C)	Return
	193B1704	VTC511	Thermostat	140°F (60°C)	Return
	193B1709	VTC511	Thermostat	149°F (65°C)	Supply
	193B1705	VTC511	Thermostat	158°F (70°C)	Supply
	193B1706	VTC511	Thermostat	Thermostat	167°F (75°C)

4-Way Mixing



ESBE Series VRG140 4 Way Mixing Valve is a range of compact, low leakage mixing valves. For easy manual operation the valves are equipped with non-slip knobs and end stops for an operational angle of 90°. The valve position scale can be turned over and rotated allowing many different mounting positions. Together with ARA600 and Series 90 actuators, the VRG valves are easily automated and have excellent regulating accuracy due to the unique valve to actuator interface.

ESBE VRG	Code No.	Description				
		Connection		Cv	Body	Series
		Size	Type			
	193B1531	3/4"	FNPT	4.7	4 Way DZR Brass	VRG 141
	193B1532	3/4"		7.3		
	193B1533	1"		11.7		
	193B1534	1-1/4"		18.7		
	193B1535	1-1/2"		29.3		
	193B1536	2"		46.8		
	193B1537	3/4"	Solder	2.9		
	193B1538	1"		7.3		
	193B1539	1 1/4"		13.9		

ESBE Type F 4-way valves are designed for use in commercial or residential heating and cooling systems, to control and distribute water or non-corrosive liquids to different zones. The ESBE four-way valve features a double mixing function. When hot water from the boiler is mixed with the return water, the temperature of the returned water rises (higher than can be achieved with a 3- way valve), reducing the risk of condensation and assuring a longer boiler life. The mixing proportions can be adjusted manually, or in automatically controlled applications, by means of a control actuator. The scale is graduated on both sides and can be turned, allowing a choice of mounting positions.

ESBE Type F	Code No.	Description				
		Connection		Cv	Body	Reference
		Size	Type			
	065B6150	2"	DIN Flange	75	4 Way Cast Iron	4 F 50
	065B6165	2-1/2"		105		4 F 65
	065B6180	3"		175		4 F 80
	065B6200	4"		265		4 F 100
	065B6225	5"		325		4 F 125
	065B6250	6"		465		4 F 150


DIN Flange & Gaskets Sets for use with ESBE "F" Series 4-way mixing valves.

DIN Flanges / Gaskets	Code No.	Size	Description
	065F8950	2"	DIN Flange (Four Flanges Required per 4 Way Valve)
	082F8961	2-1/2"	
	082F8962	3"	
	082F8963	4"	
	082F8964	5"	
	082F8965	6"	
	065F8951	2"	Gasket for DIN Flange (Four Gaskets Required per 4 Way Valve)
	082F8966	2-1/2"	
	082F8967	3"	
	082F8968	4"	
	082F8969	5"	
	082F8970	6"	


Actuators for Rotary Mixing Valves

ESBE Series ARA600 are compact actuators for operating ESBE mixing valves up to 2". The actuators have an operating range of 90° and can easily be manually operated. Actuators are supplied with mounting kits for ESBE rotary valves.


3 Point (Floating) 24VAC. Recommended for mixing and diverting applications.

ARA Actuator	Code No.	Series	Running Time for 90° @ 60 Hz (seconds)	Internal Auxiliary Switch	Torque in. lb. (Nm)	Designed for Use With
	193B1600	ARA663	96	No	53 (6)	ESBE Valves up to 2"
	193B1601	ARA644	24	Yes		
	193B1602	ARA654	48			
	193B1603	ARA664	96			

2 Point 24VAC. Recommended for diverting applications & can also be wired as 3 Point.


ARA Actuator	Code No.	Series	Running Time for 90° @ 60 Hz (seconds)	Internal Auxiliary Switch	Torque in. lb. (Nm)	Designed for Use With
	193B1604	ARA638	12	Yes	26 (3)	ESBE Valves up to 1¼"
	193B1605	ARA648	24		53 (6)	ESBE Valves up to 2"

Proportional 24V AC/DC. Recommended for mixing and diverting applications. Supplied with internal wiring terminal, cable is included with ARA639 however is not wired to the ARA actuator. The ARA659 wire whip is wired to the ARA actuator.

ARA Actuator	Code No.	Series	Running Time for 90° @ 60 Hz (seconds)	Signal	Internal Auxiliary Switch	Torque in. lb. (Nm)	Designed for Use With
	193B1606	ARA639	15 / 30 / 60 / 120	Proportional 0-10Vdc, 2-10Vdc, 0-20mA, 4-20mA	No	53 (6)	ESBE Valves up to 2"
	193B1607	ARA659	45 / 120				

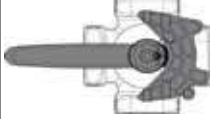
ESBE Series 90 are direct mount, compact actuators designed to operate 3 and 4-way ESBE mixing valves. The actuators are reversible and their rotation can be set between 15° and 180°.

NOTE: If using with VRG style valves, must use mounting kit **193B1616** on next page.

ESBE Series 90 Actuators	Code No.	Series	Volt.	Operation	Running Time for 90° @ 60 Hz (seconds)	Torque in. lb. (Nm)	Designed for Use With
	065F8952	91EM	24 V	Floating (3 point)	12	45 (5)	Valves up to 2" only
	065F8953	92EM		Floating (3 point) c/w aux. switch	50	135 (15)	All ESBE Valve Sizes
	065F8959	92-2EM			100		
	065F8954	93EM			240		
	065F8955	92P		Proportional (0-10 V, 2-10 V, 0-20 mA, 4-20 mA)	60 / 90 / 120		Max. Differential pressure drop: 1½" - 2": 8 psi 2½" - 6": 5 psi


* 91EM recommended for diverting applications only due to short running time.

Actuators for Rotary Mixing Valves

VRG Mounting Kit	Code No.	Description
	193B1616	Series 90 Actuator to VRG Valve Body Mounting Kit

VM-GIB non-spring return actuators are used with VL24 mounting kits to operate 3 and 4-way ESBE rotary mixing valves. Actuators have manual override, stall protection and are field reversible. Rotation is adjustable between 0° and 90° at 5-degree intervals. Cable Connection: 18 AWG, 3 ft (0.9 m) . Enclosure Rating: NEMA 2.

Note: VM-GIB actuator can only be used with ESBE F series.

VM-GIB	Code No.	Model No.	Input Signal	Feedback Signal	Power Requirement	Torque in. lb. (Nm)	Run Time for 90° @ 60 Hz (seconds)
	193B1790	VM-GIB131.1U	3 point	N/A	24 vac ± 20% 8 VA	310 (35)	125
	193B1791	VM-GIB161.1U	0 to 10 Vdc	0 to 10 Vdc			



VL24	Code No.	Model No.	Description
	193B1792	VL24	Required Mounting Kit for VM-GIB actuators to ESBE rotary mixing valves.

ACTUATORS FOR ROTARY MIXING VALVES

Set Point Controls

ESBE CRA SET POINT CONTROLS (with digital display)

CRA complete control packages include actuator, sensor (4.9 ft/1.5 m) and controller. Optional 16 ft/5 m sensor can be ordered separately.

CRA Set Point Controls	Code No.	Series	Power Supply	Signal	Display	Run Time (90 ° @ 60 Hz)	Designed for Use With
	12720212	CRA112	24V	Floating (3 point)	°F and °C	25 seconds	ESBE Valves up to 2" only
	12742212	CRA122				Selectable 12/25/50/200/398 seconds	ESBE (All Valve Sizes)

Boiler Return Protection, Solid Fuel & Solar Control

ESBE VTC511 Thermostatic Valves are used to protect boilers from return temperatures that are too low and to efficiently load accumulation tanks. *Required thermostats ordered separately. Order one valve body and one thermostat to assemble a complete valve.

VTC Valves	Code No.	Series	Description			
			Connection		Cv	Valve Housing
			Size	Type		
	193B1700	VTC511	1"	FNPT	10.4	Cast Iron
	193B1701	VTC511	1-1/4"		16.2	

VTC Thermostats	Code No.	Series	Description	Opening Temperature	Typical Piping
	193B1702	VTC511	Thermostat	122°F (50°C)	Return
	193B1703	VTC511	Thermostat	131°F (55°C)	Return
	193B1704	VTC511	Thermostat	140°F (60°C)	Return
	193B1709	VTC511	Thermostat	149°F (65°C)	Supply
	193B1705	VTC511	Thermostat	158°F (70°C)	Supply
	193B1706	VTC511	Thermostat	167°F (75°C)	Supply



ESBE ATA draft regulator is a self contained thermostatic expansion control device intended to regulate the temperature of solid fuel boilers without requiring any electrical installation or complicated linkage. The thermostatic control head senses the boiler temperature and regulates the air damper position, controlling combustion air flow.

ESBE ATA	Code No.	Conn. Size	Lifting Force	Lifting Stroke	Chain Length	Regulating Range
	065B8900	3/4" NPT	2.2 Pound-force (10N)	2.2 (55 mm)	5.25 ft. (1.6 m)	95° - 203°F (35° - 95°C)


BOILER RETURN PROTECTION, SOLID FUEL & SOLAR CONTROL

Injection Mixing

RAVK is a self-acting thermostatic element used to control temperatures in small hot-water cylinders (i.e. storage tanks) or heat exchangers in radiator heating systems. RAVK closes on rising sensor temperature.


RAVK	Code No.	Type	Temperature Range	Required Valve Body	Capillary Length
	003L3530	Thermostatic	50° - 86°F (10° - 30°C)	VMT or KOVM	6 ft. 6 in. (2 m)
	013U8063		77° - 149°F (25° - 65°C)		
	003L3531		95° - 167°F (35° - 75°C)		
	017-4370	1/2" Brass Sensor Well for RAVK			

VMT is a 2-way seated valve, used primarily for heating systems. The valve can be combined with thermostatic element RAVK, ABV, TWA-V or RA 2000 wall mount operators.

VMT	Code No.	Description				
		Connection		Cv	Design	Application
		Size	Type			
	065F0102	1/2"	Solder	1.8	Straight Union	RAVK, ABV, TWA-V*, RA 2000* Wall Mount Operators
	065F0104	3/4"		2.7		
	065F8960	1/2"		3.3		
	065F8961	3/4"		5.9		
	065F1242	1"	NPT (M)	9.4		

*(065F0102 or 065F0104 only).

FTC is a self-acting thermostatic sensor used for flow temperature control of floor heating and radiator heating systems. The water temperature is measured by a surface sensor, which is easily mounted on the pipe by means of a strip (enclosed with the product). The snap-lock connector of the sensor element secures a firm connection to the valve. Closes on rising sensor temperature. Maximum ambient temp. 150° F (65° C). Maximum flow temp. 250° F (120° C). Capillary tube length 0 to 6.5' (0 to 2.0 m).

FTC	Code No.	Description		
		Type	Temperature Range	Required Valve Body
	013G5081	Self Acting Thermostatic Operator c/w 6' 6" (2 m) capillary and strap on sensor. Celsius temperature scale on dial.	59° - 122°F (15° - 50°C)	RA 2000 or RA-C
	013G5080		95° - 158°F (35° - 70°C)	

Injection Mixing

RA 2000 valve bodies are designed to meet the demands of the residential, commercial and industrial sectors.

RA 2000	Code No.	Description				
		Connection			Design	Application
		Size	Type	Cv		
	013G8013	1/2"	FPT x MPT Union Tailpiece	1.6	Side Mount Angle	Water or 2 Pipe Low Pressure Steam
	013G8018	3/4"		2.1		
	013G8023	1"		2.8		
	013G8030	1-1/4"		2.8		
	013G8015	1/2"		1.6	Straight	
	013G8020	3/4"		2.7		
	013G8025	1"		2.8		
	013G8032	1-1/4"		2.8		
	013G8014	1/2"	1.6	Angle		
	013G8019	3/4"	2.7			
	013G8024	1"	2.8			
	013G8031	1-1/4"	2.8			
	013G8042	1/2"	Solder Union	1.6	Straight	2 Pipe Hot Water
	013G8044	3/4"	2.7			


RA-C valves, together with Danfoss self-acting and electronic controllers, make up a perfect combination for control of cooling and heating circuits. RA-C is a normally open valve. In an application with FEK or FED controllers, RA-C valves open when room temperature rises above set point. The RA-C valves have four possible pre-setting Cv values, ensuring the correct water flow to each circuit.

RA-C	Code No.	Conn. Size	Presettings: Cv Value				Water Temp.
			1	2	3	N	
	013G3094	1/2"	0.35	0.64	0.88	1.05	50° - 248°F (10° - 120°C)
	013G3096	3/4"	0.94	1.29	1.99	3.04	
	013U0496	1/2"	Nut				
	013U8608		Tailpiece - Female Solder				
	013U0476		Tailpiece - Male Threaded				
	013U0499	3/4"	Nut				
	013U8609		Tailpiece - Female Solder				
	013U0479		Tailpiece - Male Threaded				

Note: Separate nut and tailpiece (threaded or solder) required (2 sets per valve).

Injection Mixing

AVTB direct acting proportional controllers are used to regulate the temperature of water in heating applications. AVTB valves close on a rise in sensor temperature.

AVTB	Code No.	Model	Connection		Cap. Length	Temperature Range
			Size (FNPT)	Cv		
	003N6032	AVTB 15	1/2"	2.2	6' 6" (2.0 m)	32°-86°F (0°-30°C)
	003N6252					70°-140°F (20°-60°C)
	003N6272					125°-190°F (50°-90°C)
	003N7032	AVTB 20	3/4"	4.0		32°-86°F (0°-30°C)
	003N7252					70°-140°F (20°-60°C)
	003N7272					125°-190°F (50°-90°C)
	003N8032	AVTB 25	1"	6.4		32°-86°F (0°-30°C)
	003N8252					70°-140°F (20°-60°C)
	003N8272					125°-190°F (50°-90°C)

Thermostats

FHV-R provides temperature control of under floor heating circuits, using a return temperature limiting valve fitted with a type FJVR sensor element. FHV-R is used in applications where a desired floor temperature is required (e.g. a bathroom where a constant warm floor is preferred regardless of room temperature to ensure comfort and to quickly dry water on the floor). Set includes wall enclosure box, front cover, bleed key and valve (return temperature limiter) with air vent. An FJVR sensor is required for controlling the return temperature. Also required are two union nuts and tailpieces per control. When the FHV-R is used for controlling floor heating, the heated floor area should not be more than 100 sq.ft. (10 m2).

FHV-R	Code No.	Model	Description
	003L1000	FHV-R	Single Zone Return Temperature Sensing Control Valve
	013U0496	For FHV-R control valve (Order two nuts and two tailpieces per control valve)	1/2" Union Nut
	013U8608		1/2" Solder Female Tailpiece
	013U0476		1/2" Male Threaded Tailpiece
	003L1040	FJVR	Return Temperature Limiter Sensor. Setting range: 50° - 122°F (10° - 50°C)
	003L1070		Return Temperature Limiter Sensor. Setting range: 50° - 176°F (10° - 80°C)

FHV-A enables room temperature control via a pre-settable thermostatic valve fitted with a type RA 2000 sensor element. Set includes wall enclosure box, front cover, bleed key and pre-settable valve with air vent. A type RA 2000 sensor element is required for controlling the room temperature. Also required are two union nuts and tailpieces per control. **NOTE:** If using the FHV-A for room temperature control, the flow temperature should not be permitted to exceed the maximum recommended by the flooring manufacturer.


FHV-A	Code No.	Model	Description
	003L1001	FHV-A	Single Zone Ambient Room Temperature Control Valve
	013U0496	For FHV-R control valves (Order two nuts and two tailpieces per control valve)	1/2" Union Nut
	013U8608		1/2" Solder Female Tailpiece
	013U0476		1/2" Male Threaded Tailpiece
	013G8250	RA 2000	Room Temperature Operator

RMT (Mechanical Only) mechanical room thermostats are for use on 24V heating systems. Built-in ambient temperature sensor.


RMT	Code No.	Model No.	Operating Voltage	Switching Voltage	Scale	Night Set Back
	087N119601	RMT-24	24 VAC	24 VAC	°F	No
	087N1196	RMT-24			°C	No
	087N1197	RMT-24R			°C	Yes External timer required

Thermostats


RET (Heating Only) electronic thermostats incorporate an anticipator heater to improve thermal performance. Built-in ambient temperature sensor. LED status indicator.

RET	Code No.	Model No.	Operating Voltage	Switching Voltage	Scale	Night Set Back	
	087N7014	RET 24	24 VAC	24 VAC	°C	No	
	087N7015	RET 24-U			°F		
	087N7016	RET 24VF		Dry Contacts for up to 24 VAC	°C		Yes External timer required
	087N7017	RET 24VF-U			°F		
	087N7018	RET 24NSB		°C			
	087N7019	RET 24NSB-U		°F			



RET2000B (Heating or Cooling)

RET2000B	Code No.	Model No.	Power Supply	Switching Voltage	Scale
	087N6441NA	RET2000B	2 x AA Batteries (included)	Dry Contacts rated for 10 - 24 VAC	°F or °C

TP7001 (Heating or Cooling)


TP7001	Code No.	Model No.	Power Supply	Stages	Sensor	Control Type	Operation	Events per Day
	087N8002	TP7001	2 x AA Alkaline Batteries (included)	1 H	Built-in	On/Off or Chrono-Proportional (3/6/9/12 cycles per hour)	Selectable 24 hour, 5/2 day, A/B day or 7 day	Up to 6
	087N8009	TP7001A			Remote (included)			
	087N7748	TS2A	TP7001 Accessory - Replacement Remote Sensor					

MTC Microline®

MTC Microline®	Code No.	Scale	Voltage (AC)	Sensor
	MTC-39914-UF	°F	24V	Floor 10 ft. (3 m)
	MTC-39914-UC	°C	24V	


Thermostats

FH room thermostats are designed to provide single room temperature control in Hydronic floor heating systems.


FH	Code No.	Type	Power Supply	Scale	Temperature Range	Night Setback	Floor Sensor
	088H0024	FH-WS	24 VAC	°C	6 - 30° C	Manual (Automatic via external timer, not included)	Optional

Snow Melt Controls





ETO2 CONTROLLER

ETO2 CONTROLLER	Code No.	Power Supply	Mounting	Output Relay	Temperature Setting Range
	ETO2-4550	120-240V	Within ETO2-BOX or equivalent UL/CSA enclosure	2 x 16A Dry Contacts	32° - 50°F (0° - 10°C)

BOX ENCLOSURE



BOX ENCLOSURE	Code No.	Rating	Dimensions (HxWxD)	Weight
	ETO2-BOX	UL/CSA Approved	10.4 x 6.4 x 3.6 (263 x 162 x 91 mm)	5.1 lbs (2.3 kg)

SENSORS

SENSORS	Code No.	Sensor Style or Detection	Dimensions (HxL)	Cable Length	Weight	Ambient Temperature	Mounting
	ETOG-56	Ground Sensor	1.25" x 2.4" (32 x 60 mm)	82 ft (25 m)	5.29 lbs (2.4 kg)	-58° - 178°F (-50° - 70°C)	Outdoor Surface (Pavement)
	ETOK-1	Sensor Cup	3.1" x 2.5" (78 x 63.50 mm)	-	.88 lbs (.4 kg)		
	ETF-744/99	Outdoor Sensor	3.4" x 1.8" x 1.4" (86 x 45 x 35 mm)	-	1.3 lbs (.59 kg)	-58° - 178°F (-50° - 70°C)	Exterior Wall
	ETF-622	Pipe Sensor	0.31" x 0.47", Ø 0.14 (8x12 mm, Ø 3.5mm)	8.2 ft (2.5 m)	.21 lbs (.096 kg)	-40° - 248°F (-40° - 120°C)	Surface Pipe
	ETOR-55	Moisture	4.15" x 1.2" x 0.5" (105 x 30 x 13 mm)	33ft (10m)	1.94 lbs (.88kg)	-58° - 178°F (-50° - 70°C)	Gutter or downspout, used in combination with ETF-744/99


ECONOMY SNOW/ICE MELT CONTROLS

The **DS-224/824** are primarily designed for hydronic pavement snow melting applications. The units can be powered from a 24VAC/VDC source.


	Code No.	Model	Power Supply	Mounting	Relay	Ambient Temperature	Temp. Sensor	Precipitation Sensor
	088L3041	DS-224	24VAC or DC	Rigid conduit or surface	Single 30A, Dry contact	-40° - 185°F (-40° - 85°C)	Integrated	Integrated
	088L3042	DS-824						Remote, 10ft (3m)

Balancing

STV (THREADED) / STVL (SOLDER) provide a high level of balancing accuracy using an easy to adjust wheel with a digital display. Valves include memory stop and dual differential pressure read out ports as standard equipment.


STV/STVL	Code No.	Connection		Cv	Valve Body Material
		Size	Type		
	065F8965	1/2"	NPT	4.1	Brass
	065F896501		Solder		
	065F8966	3/4"	NPT	5.9	
	065F896601		Solder		
	065F8967	1"	NPT	10.2	
	065F896701		Solder		
	065F8968	1-1/4"	NPT	15.2	
	065F896801		Solder		
	065F8969	1-1/2"	NPT	22.6	
	065F896901		Solder		
	065F8970	2"	NPT	36.5	
	065F897001		Solder		

STVA (FLANGED) provide a high level of balancing accuracy using an easy to adjust wheel with a digital display. Valves include memory stop and dual differential pressure read out ports as standard equipment.

STVA	Code No.	Connection		Cv	Valve Body Material
		Size	Type		
	065F8971	2-1/2"	Flanged (ANSI 125) (Flanges not supplied)	108	Cast Iron
	065F8972	3"		128	
	065F8973	4"		220	
	065F8974	5"		349	
	065F8975	6"		493	
	065F8993	8"		696	
	065F8994	10"		1405	
	065F8995	12"		1764	

Spare Parts & Accessories

THERMOSTATIC RADIATOR VALVE & OPERATOR SPARE PARTS

Thermostatic Radiator Valves	Code No.	Description	For Use With
	013G8591	Item # 1 Replacement Socket Body	RA 2000 Wall Mount Operators + RA 2000 Valve Bodies
	013G5503	Item # 2 Bellows Holder (set of 2 pcs)	RA 2000 Wall Mount Operators + RA 2000 Valve Bodies
	013G8593	Item # 1 Replacement Socket Body	RA 2000 Wall Mount Operators + RAV, VMT, and KOVM Valve Bodies
	013G5503	Item # 2 Bellows Holder (set of 2 pcs)	RA 2000 Wall Mount Operators + RAV, VMT, and KOVM Valve Bodies
	013U7175	Spare Vacuum Breaker	RA 2000 1-pipe steam valve, 013G0140
	013G0290	Packing Gland	All RA 2000 Valves
	013U0070	Packing Gland	VMT, KOVM, RAV, FHV-R and RAVL Valves
	013G8070	RA to RA 2000 Adapter	Allows RA 2000 Operators to fit RA Valves
	013-7045	Gasket	013G8070 Adapter
	013G8072	RAV to RA 2000 Adapter	Allows RA 2000 Operators to fit RAV Valves
	013G1236	Tool Set - 2mm Allen Key and Locking Pin Tool	All RA 2000 Operators
	013G1237	Limitation Pins (1 bag containing 30 pcs.)	013G8240 & 013G2922 RA2000 Operators
	013G1232	Cover Plugs for locking screws (Available in lots of 50 pcs.)	013G8240 & 013G2922 RA2000 Operators
	013G1672	Cover Plate for scale (Available in lots of 20 pcs.)	013G8240 & 013G2922 RA2000 Operators
	013G1246	Limitation Pins (1 bag containing 10 pcs.)	013G8250 & 013G8252 RA2000 Operators
	013G5245	Anti-theft protection clips (1 bag containing 20 pcs. - must order in multiples of 20 pieces)	013G8250 & 013G8252 RA2000 Operators

Spare Parts & Accessories

Thermostatic Radiator Valves	Code No.	Description	For Use With	
	013U0476	Tailpiece for RA2000, RA-C, & VMT	1/2"	NPT
	013U0479		3/4"	
	013U0489		1"	
	013U0504		1-1/4"	Solder
	013U8608		1/2"	
	013U8609		3/4"	
	013U0496	Union Nut for RA2000, RA-C, & VMT	1/2"	NPT / Solder
	013U0499		3/4"	
	013U0501		1"	
	013U0507		1-1/4"	

AVTB SPARE PARTS

Service Element

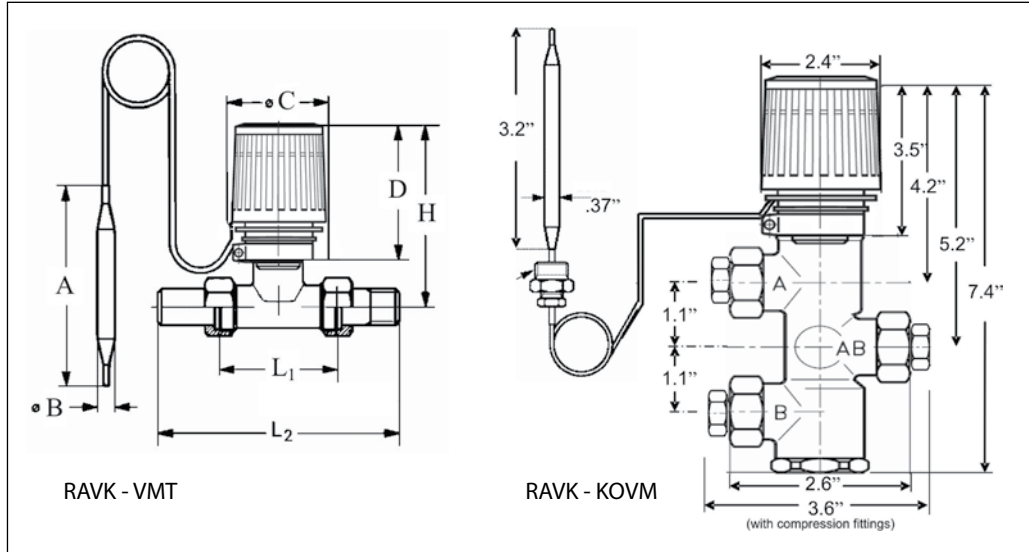
AVTB	Code No.	Description	Temperature Range	Capillary Tube Length
	003N0075	Service Element with Capillary Tube and Sensor - Sensor diameter 0.7" x 8.3" (18 x 210 mm)	32° - 86°F (0° - 30°C)	6' 6" (2 m)
	003N0078		77° - 149°F (25° - 65°C)	
	003N0062		122° - 194°F (50° - 90°C)	

Accessories

AVT	Code No.	Description	
	AVTBWELL	Sensor Pocket, max. pressure 341 psi, L = 8.7" (25 bar / 220 mm)	3/4" NPT, Brass for 0.7" sensor
	003N0053		3/4" NPT, S/S for 0.7" sensor
	003N0056	Capillary Tube Gland	3/4" All Sensors
	003N0388	Mounting Bracket	All AVT Sensors
	003N4006	Valve Repair Kit O-ring (2-off) Diagram (2-off) Valve Cone (1-off) Screws (8-off)	1/2" AVT
	003N4007		3/4" AVT
	003N4008		1" AVT
	003N6100	Brass AVT Body and Top Section, less element	1/2" AVT
	003N7100		3/4" AVT
	003N8100		1" AVT
	003N0520	AVT Handle	All

Dimensions

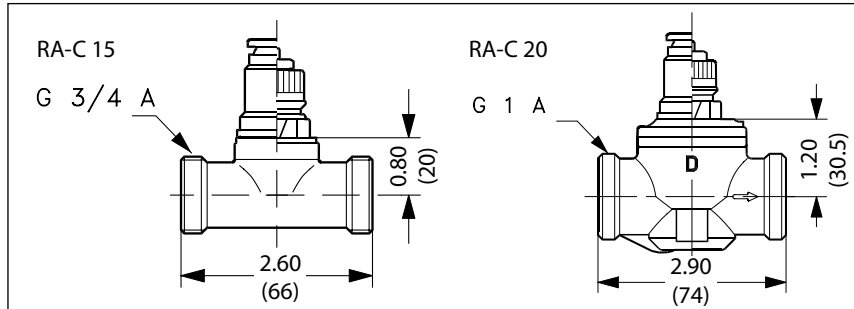
RAVK, VMT, & KOVM DIMENSIONS



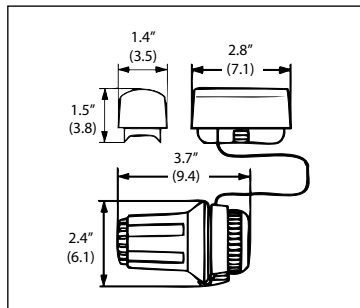
RAVK-VMT Valve

Size	L1 in (mm)	L2 in (mm)	H in (mm)	A in (mm)	B in (mm)	C in (mm)	D in (mm)
1/2"	2.60 (66)	3.54 (89.9)	4.06 (103)	3.15 (80)	0.37 (9.4)	2.39 (60.7)	3.53 (90)
3/4"	2.91 (74)	3.98 (101)	4.06 (103)				

RA-C DIMENSIONS

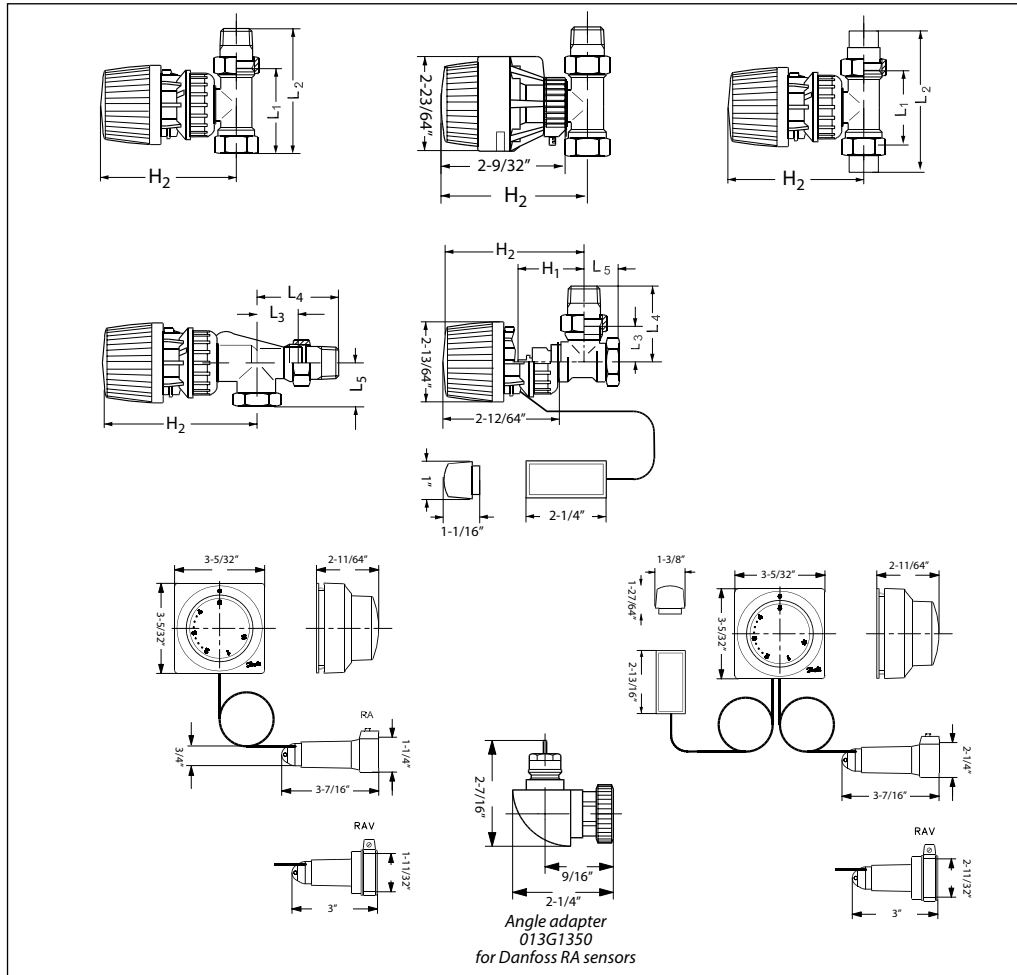


FTC DIMENSIONS



Dimensions

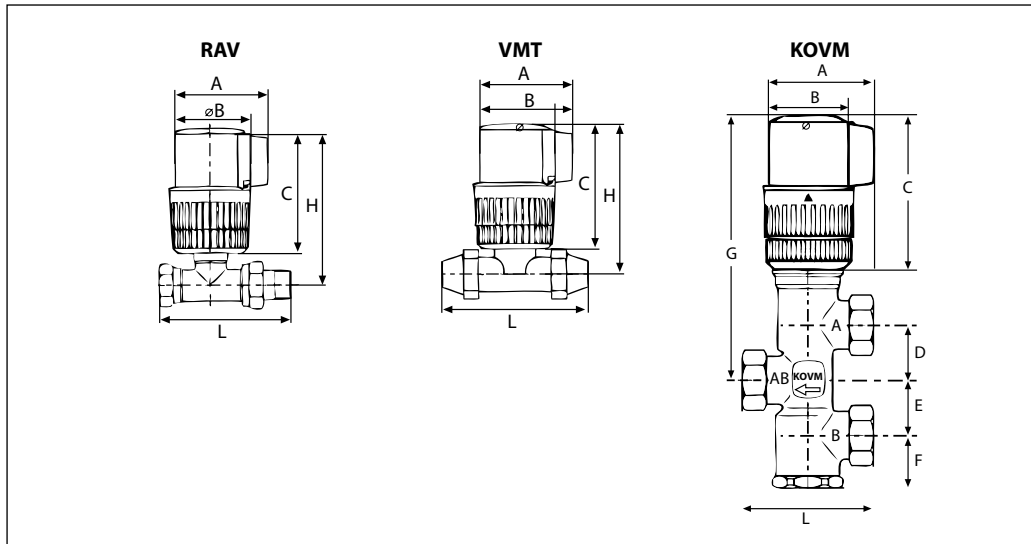
RA2000 VALVE DIMENSIONS



Valve Type	Connection Type	L1	L2	L3	L4	L5	H1	H2
Straight	1/2" NPT	2-5/8"	3-3/4"				1-57/64"	3-3/4"
	3/4" NPT	2-29/32"	4-3/16"				2-1/16"	3-15/16"
	1" NPT	3-17/32"	4-31/32"				2-1/16"	3-15/16"
	1-1/4" NPT	4-1/4"	5-29/32"				2-9/64"	4-1/64"
Angle	1/2" NPT			1-3/16"	2-9/32"	1-1/64"	1-57/64"	3-3/4"
	3/4" NPT			1-11/32"	2-5/8"	1-9/64"	2-1/16"	3-15/16"
	1" NPT			1-9/16"	3"	1-11/32"	2-1/16"	3-15/16"
	1-1/4" NPT			1-3/4"	3-3/8"	1-9/16"	2-1/16"	3-15/16"
Side Mount	1/2" NPT			1-1/8"	2-1/4"	1-1/64"	2-3/8"	4-1/4"
	3/4" NPT			1-11/32"	2-5/8"	1-9/64"	2-7/16"	4-5/16"
	1" NPT			1-9/16"	3"	1-11/32"	2-3/8"	4-1/4"
	1-1/4" NPT			1-3/4"	3-3/8"	1-9/16"	2-3/8"	4-1/4"
Double Solder	1/2"	2-5/8"	3-15/16"				1-57/64"	3-3/4"
	3/4"	2-15/16"	4-5/8"				2-1/16"	3-15/16"

Dimensions

ABV DIMENSIONS



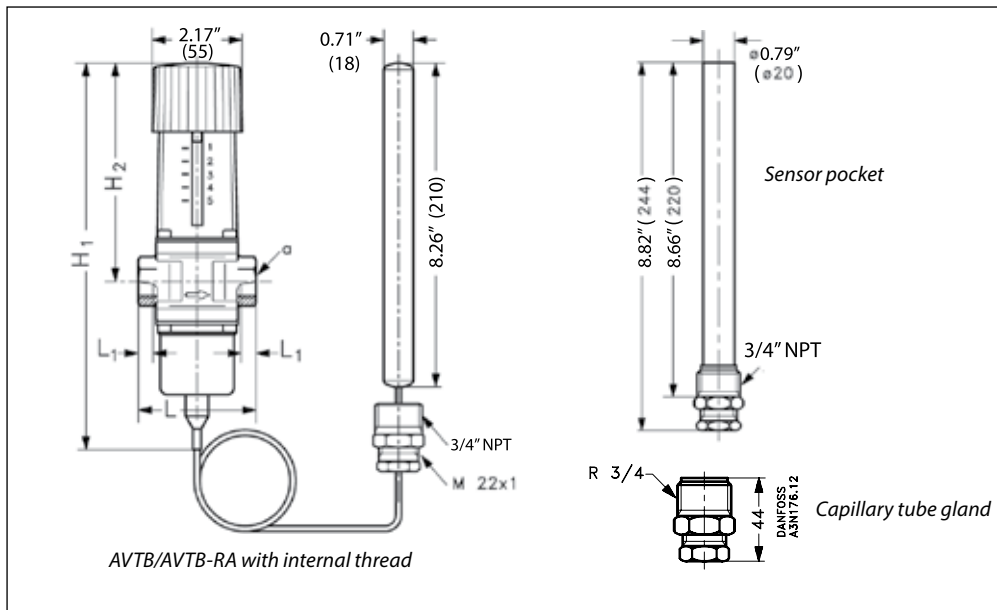
Size	Type	H	L
1/2"	RAV	4.4"	3.7"
3/4"		4.4"	4.2"
1"		4.9"	4.9"
1/2"	VMT	4.4"	4.1"
3/4"		4.4"	4.8"
1"		4.9"	5.7"

A	2.8"
B	2.0"
C	3.6"

		L	D	E	F	G
1/2"	KOVM	2.3"	1.1"	1.1"	1.0"	4.6"

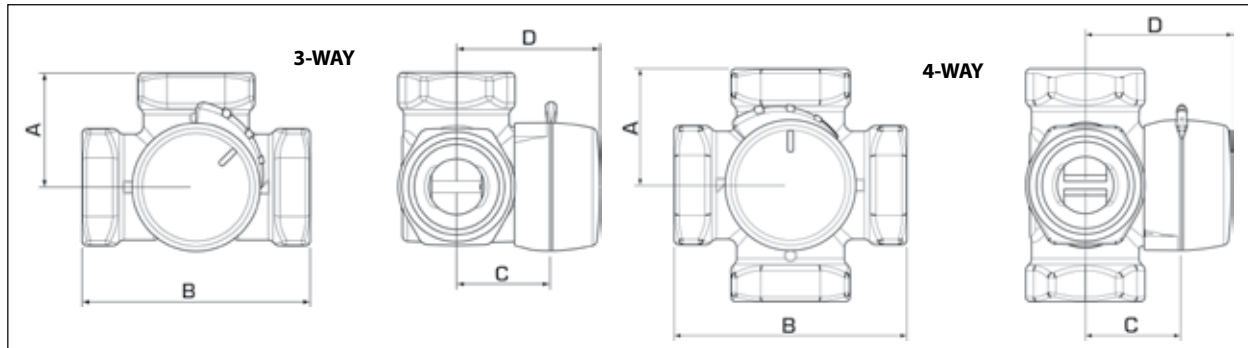
AVTB & AVTB-RA DIMENSIONS

Type	H ₁ in (mm)	H ₂ in (mm)	L in (mm)	L ₁ in (mm)	L ₂ in (mm)	L ₃ in (mm)	L ₄ in (mm)	a (int. thread)
AVTB/AVTB-RA 15	8.54 (217)	5.24 (133)	2.84 (72)	0.56 (14)	5.6 (141)	5.87 (149)	2.95 (75)	1/2" NPT
AVTB/AVTB-RA 20	8.54 (217)	5.24 (133)	3.55 (90)	0.63 (16)	6.06 (154)	6.45 (164)	3.15 (80)	3/4" NPT
AVTB/AVTB-RA 25	8.54 (227)	5.43 (138)	3.74 (95)	0.75 (19)	6.61 (168)	6.57 (167)	3.27 (83)	1" NPT



Dimensions

ESBE VRG 3 & 4-WAY VALVE DIMENSIONS



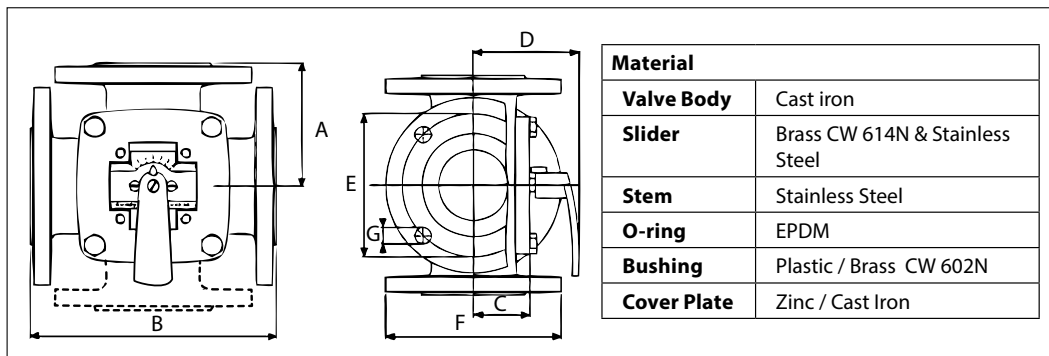
VRG 3-WAY

Code Number	Connection		A		B		C		D		Weight	
	Size	Type	inch	mm	inch	mm	inch	mm	inch	mm	lb.	kg
193B1500	1/2"	NPT	1.42	36	2.83	72	1.26	32	1.97	50	0.88	0.40
193B1501	3/4"		1.42	36	2.83	72	1.26	32	1.97	50	0.95	0.43
193B1502	3/4"		1.42	36	2.83	72	1.26	32	1.97	50	0.95	0.43
193B1503	1"		1.61	41	3.23	82	1.34	34	2.05	52	1.54	0.70
193B1504	1"		1.61	41	3.23	82	1.34	34	2.05	52	1.54	0.70
193B1505	1-1/4"		1.85	47	3.70	94	1.46	37	2.17	55	2.09	0.95
193B1506	1-1/2"		2.09	53	4.17	106	1.73	44	2.36	60	3.70	1.68
193B1507	2"		2.36	60	4.72	120	1.81	46	2.52	64	5.07	2.30

VRG 4-WAY

Code Number	Connection		A		B		C		D		Weight		
	Size	Type	inch	mm	inch	mm	inch	mm	inch	mm	lb.	kg	
193B1531	3/4"	NPT	1.42	36	2.83	72	1.26	32	1.97	50	1.15	0.52	
193B1532	3/4"		1.42	36	2.83	72	1.26	32	1.97	50	1.15	0.52	
193B1533	1"		1.61	41	3.23	82	1.34	34	2.05	52	1.76	0.80	
193B1534	1-1/4"		1.85	47	3.70	94	1.46	37	2.17	55	2.38	1.08	
193B1535	1-1/2"		2.09	53	4.17	106	1.73	44	2.36	60	4.17	1.89	
193B1536	2"		2.36	60	4.72	120	1.81	46	2.52	64	5.62	2.55	
193B1537	3/4"		Solder	2.44	62	4.88	124	1.26	32	1.97	50	1.15	0.52
193B1538	1"			2.56	65	5.12	130	1.34	34	2.05	52	1.76	0.80
193B1539	1-1/4"	3.03		77	6.06	154	1.46	37	2.17	55	2.38	1.08	

ESBE TYPE F 3 & 4-WAY ROTARY VALVES DIMENSIONS

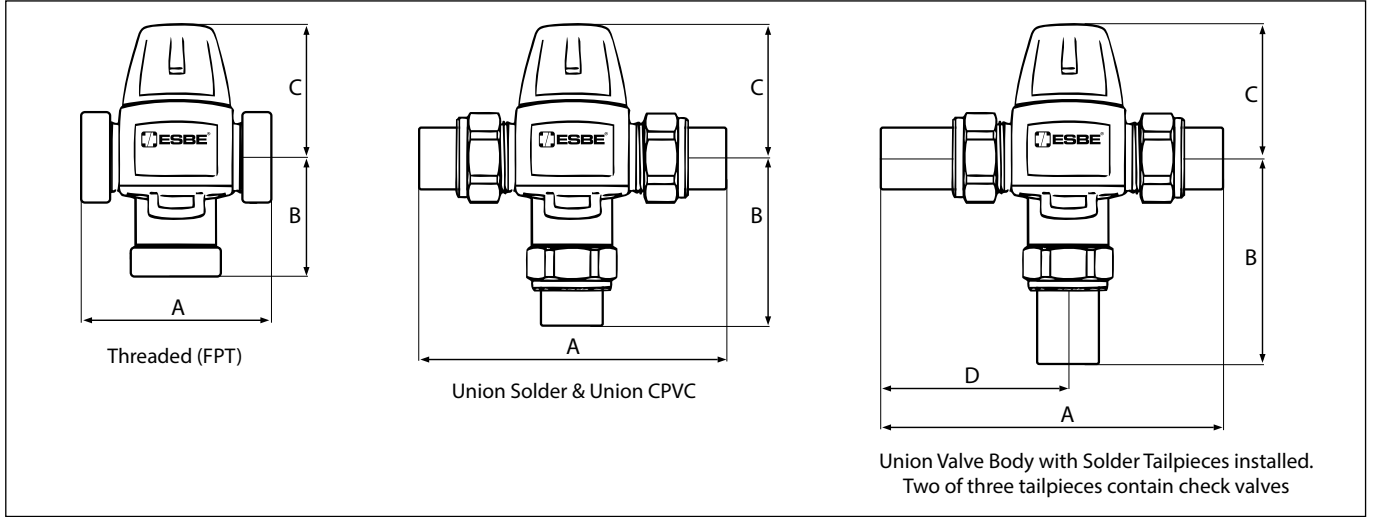


Type F

	Size	Reference	A	B	C	D	E	F	G	Weight
3-Way	2-1/2"	3 F65-50	3.9 (100)	7.9 (200)	2.0 (52)	3.7 (95)	5.1 (130)	6.3 (160)	4 x 3/4"	32.0 (14.5)
	2-1/2"	3 F65	3.9 (100)	7.9 (200)	2.0 (52)	3.7 (95)	5.1 (130)	6.3 (160)	4 x 3/4"	32.0 (14.5)
	3"	3 F180	4.7 (120)	9.4 (240)	2.5 (63)	4.2 (106)	5.9 (150)	7.5 (190)	4 x 3/4"	37.0 (16.8)
	4"	3 F100	5.2 (132.5)	10.4 (265)	2.9 (73)	4.6 (116)	6.7 (170)	8.3 (210)	8 x 3/4"	60.0 (27.2)
	5"	3 F125	5.9 (150)	11.8 (300)	3.1 (80)	4.8 (123)	7.9 (200)	9.4 (240)	8 x 3/4"	72.0 (32.7)
	6"	3 F150	6.9 (175)	13.8 (350)	3.5 (88)	5.1 (130)	8.9 (225)	10.4 (265)	8 x 3/4"	90.0 (40.8)
4-Way	2"	4 F50	3.8 (97.5)	7.7 (195)	2.0 (50)	3.6 (92)	4.3 (110)	5.5 (140)	4 x .6"	24.3 (11.0)
	2-1/2"	4 F65	3.9 (100)	7.9 (200)	2.0 (50)	3.6 (92)	5.1 (130)	6.3 (160)	4 x .6"	26.9 (12.2)
	3"	4 F80	4.7 (120)	9.4 (240)	2.6 (65)	4.3 (108)	5.9 (150)	7.5 (190)	4 x .7"	44.1 (20.0)
	4"	4 F100	5.2 (132.5)	10.4 (265)	3.2 (81)	4.9 (124)	6.7 (170)	8.3 (210)	4 x .7"	55.1 (25.0)
	5"	4 F125	5.9 (150)	11.8 (300)	3.2 (81)	4.9 (124)	7.9 (200)	9.4 (240)	8 x .7"	77.2 (35.0)
	6"	4 F150	6.9 (175)	13.8 (350)	3.5 (89)	5.2 (131)	8.9 (225)	10.4 (265)	8 x .7"	99.2 (45.0)

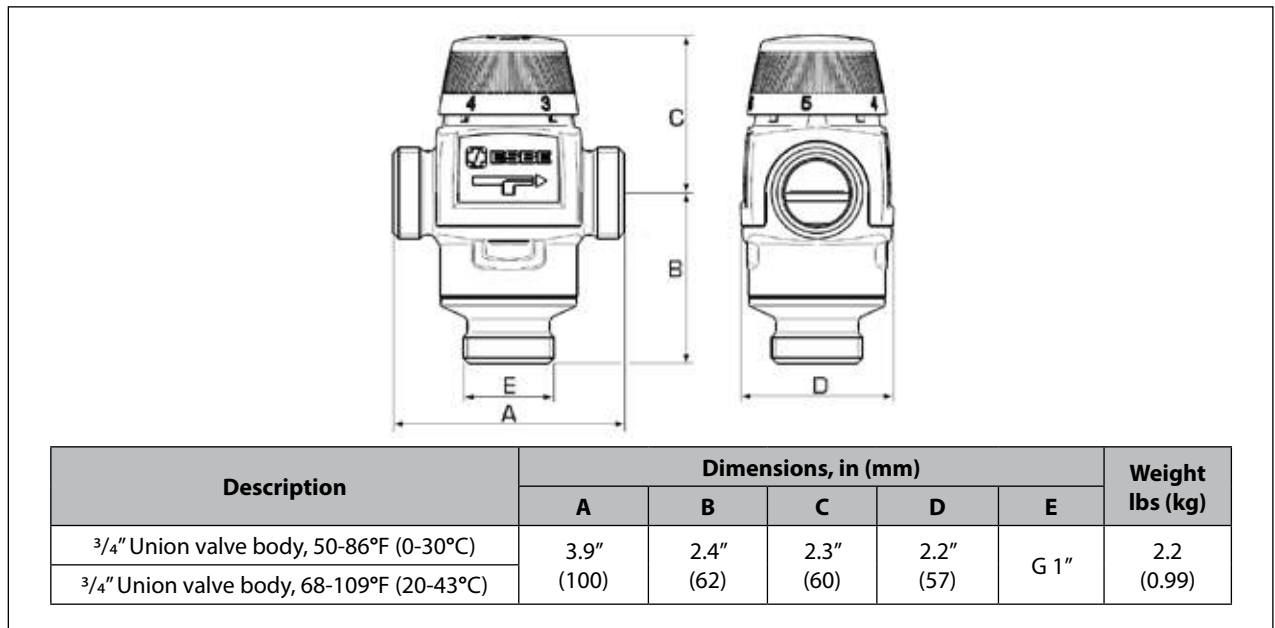
Dimensions

ESBE VTA SERIES LEAD FREE THERMOSTATIC MIXING VALVE DIMENSIONS



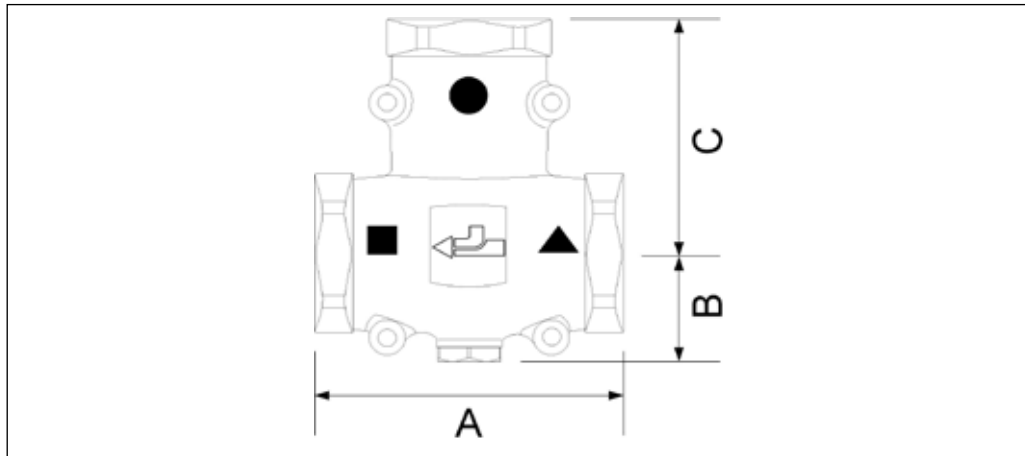
Description	Dimensions, in (mm)				Weight lbs (kg)
	A	B	C	D	
union valve w/ 1/2" solder tailpcs	4.1" (104)	2.3" (59)	2.1" (53)	2.0" (52)	1.7 (0.8)
union valve w/ 3/4" solder tailpcs	4.8" (122)	2.7" (69)	2.1" (53)	2.4" (61)	1.7 (0.8)
union valve w/ 3/4" solder & 2 check valves	5.8" (147)	3.7" (94)	2.1" (53)	3.4" (86)	1.9 (0.9)
union valve w/ 3/4" CPVC	4.7" (119)	2.6" (66)	2.1" (53)	2.4" (61)	1.5 (0.7)
union valve w/ 1" solder tailpcs	6.2" (156)	3.4" (86)	2.1" (53)	3.1" (78)	2.0 (0.9)
3/4" valve female NPT connections	2.8" (71)	1.7" (43)	2.1" (53)	1.4" (36)	1.1 (0.5)
1" valve female NPT connections	3.75" (95)	2.5" (63)	2.4" (61)	1.9" (48)	2 (0.95)

ESBE VTA 570 DIMENSIONS



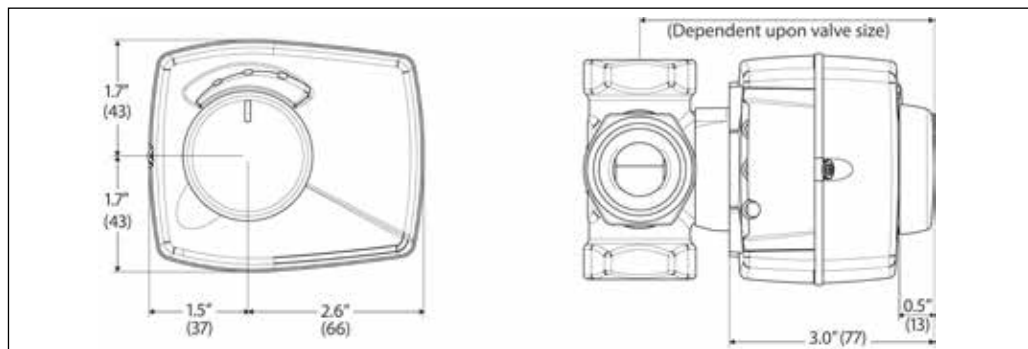
Dimensions

ESBE VTC511 VALVE DIMENSIONS

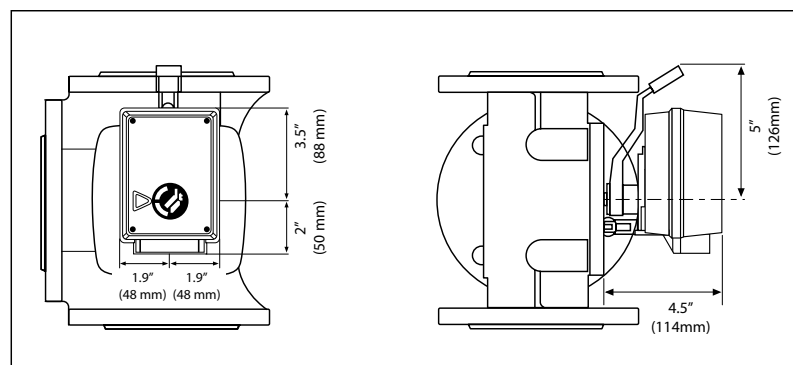


	A	B	C	Depth	Weight
Size	in (mm)	in (mm)	in (mm)	in (mm)	lbs (kg)
1"	3.66 (93)	1.34 (34)	2.72 (69)	1.85 (47)	1.85 (0.84)
1-1/4"	4.13 (105)	1.50 (38)	2.95 (75)	2.17 (55)	3.04 (1.38)

ESBE ARA ACTUATOR DIMENSIONS

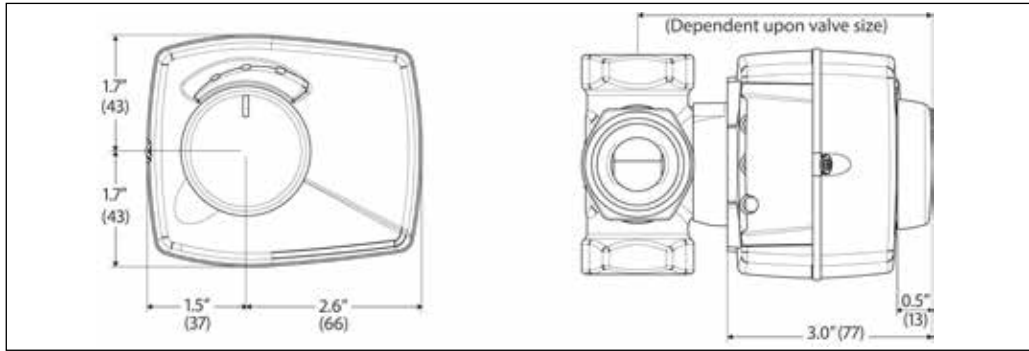


ESBE SERIES 90 ACTUATOR DIMENSIONS



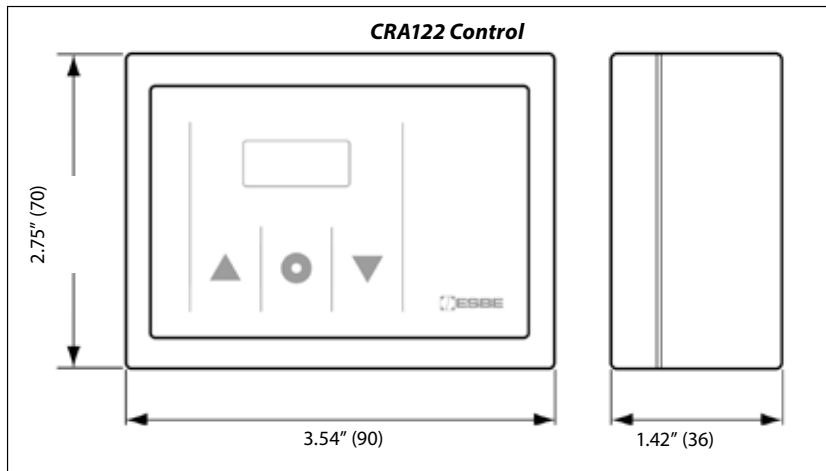
Dimensions

ESBE CRA112 SETPOINT CONTROL DIMENSIONS

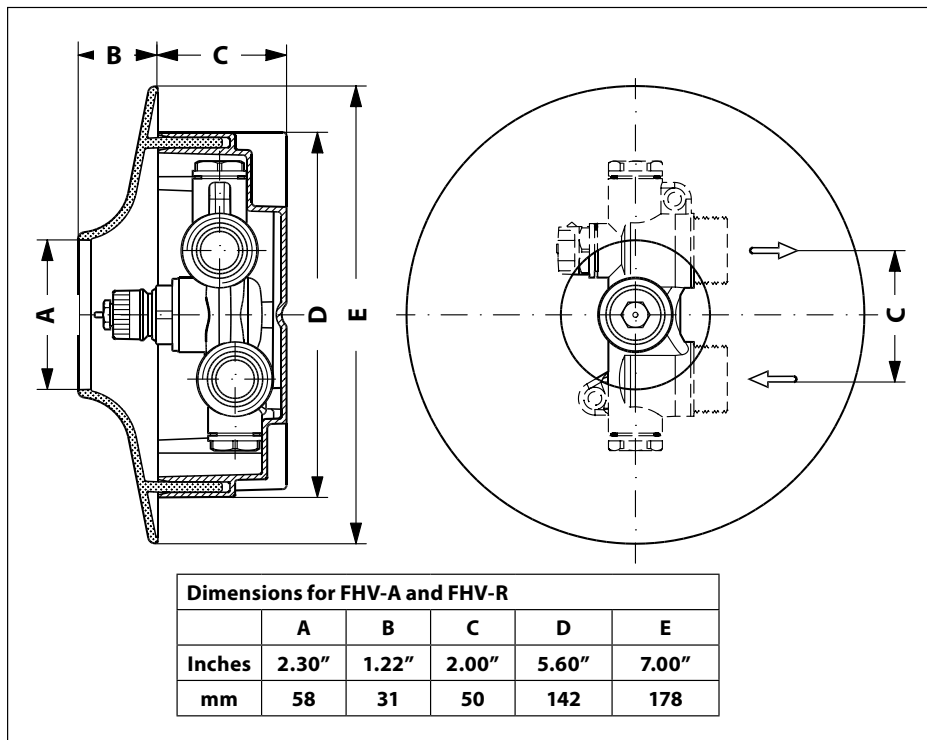


ESBE CRA122 SETPOINT CONTROL KEYPAD DIMENSIONS

For actuator dimensions see page 90. For series actuator information see page 39.

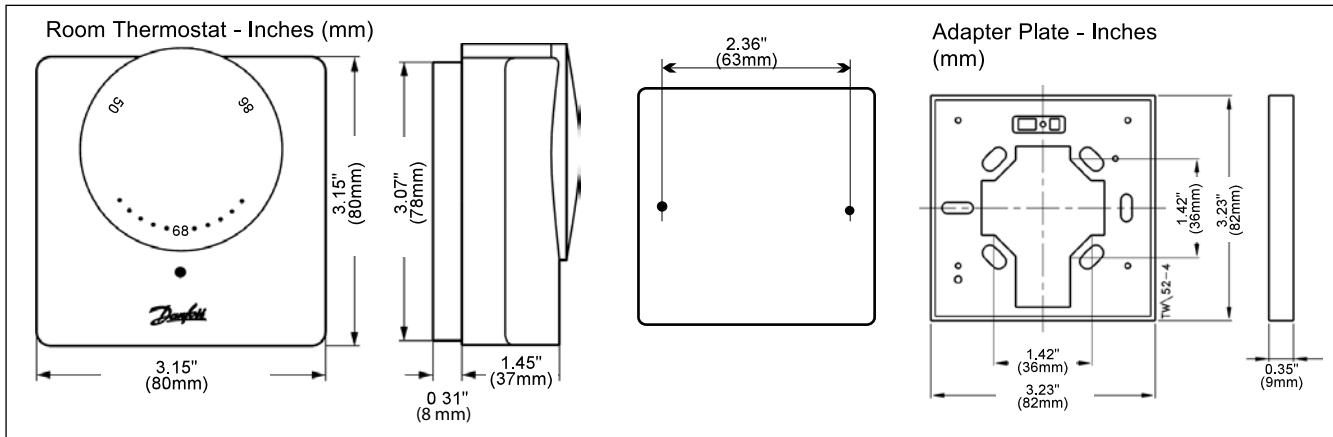


FHV-R & FHV-A THERMOSTAT DIMENSIONS

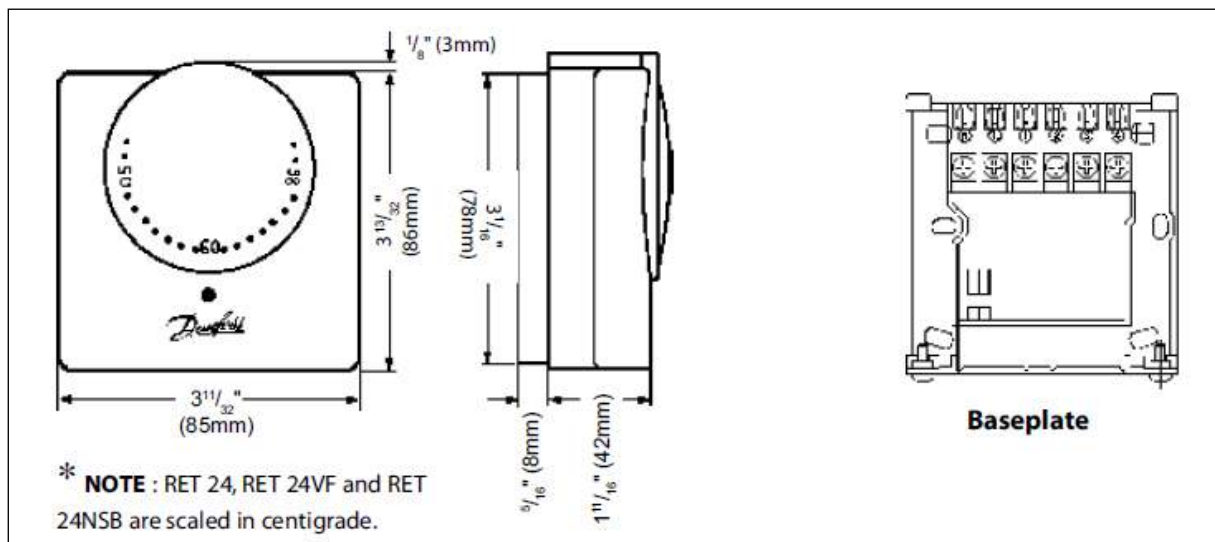


Dimensions

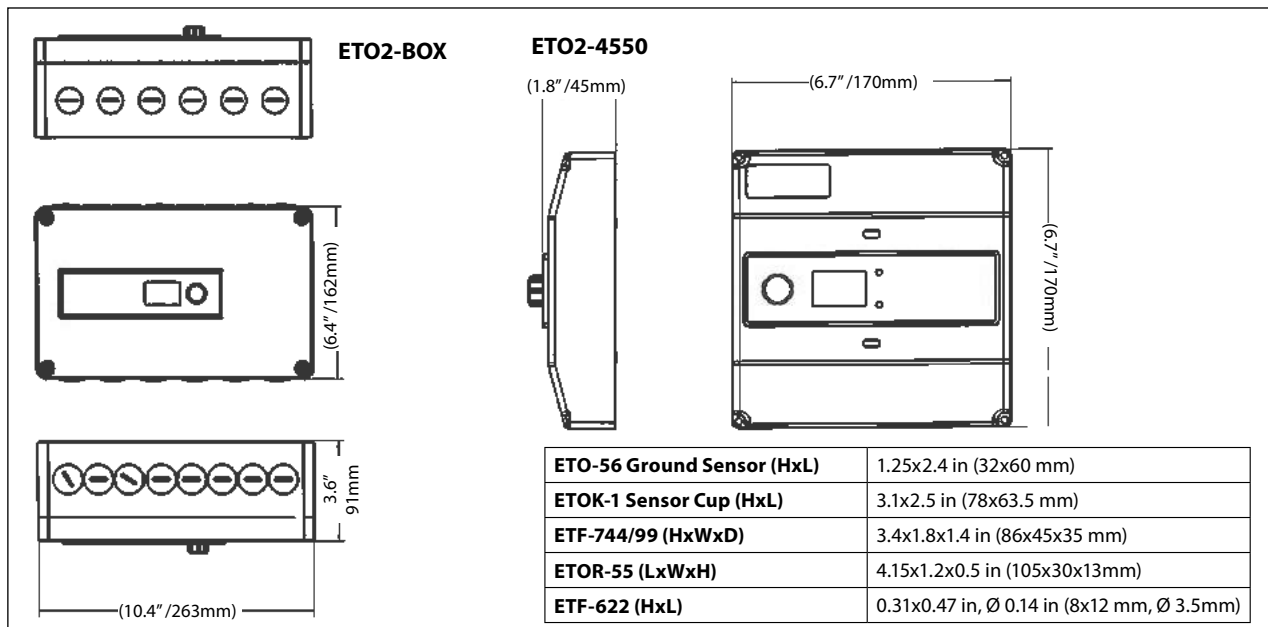
RMT THERMOSTAT DIMENSIONS



RET THERMOSTAT DIMENSIONS

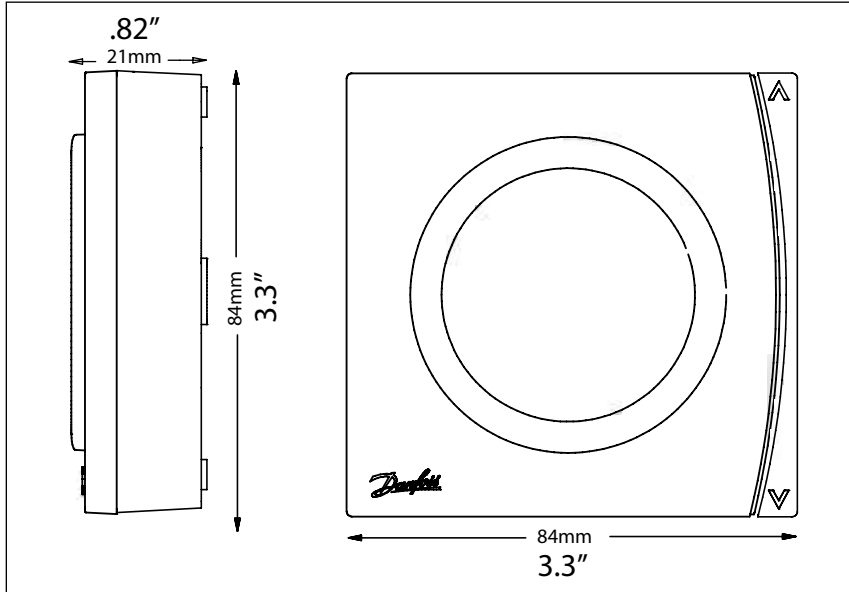


ETO2 DIMENSIONS

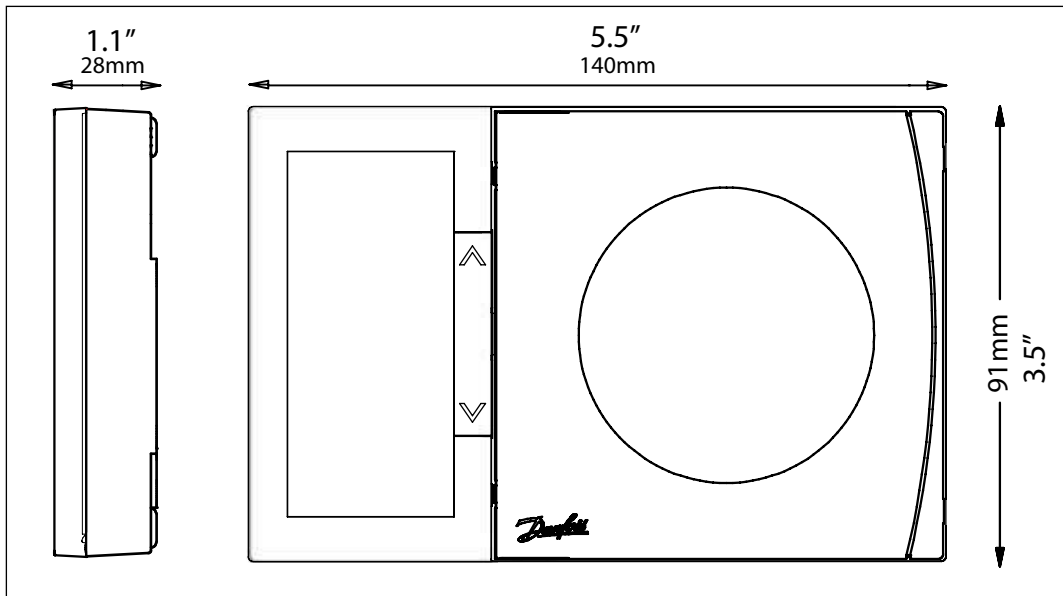


Dimensions

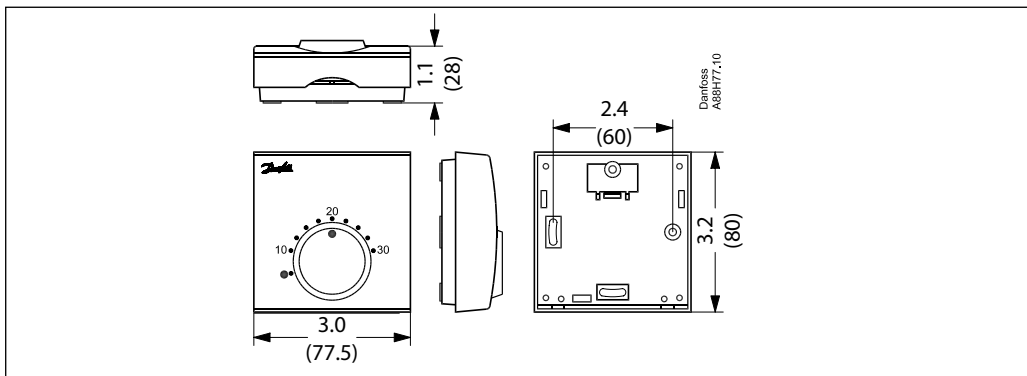
RET2000B THERMOSTAT DIMENSIONS



TP7001 THERMOSTAT DIMENSIONS

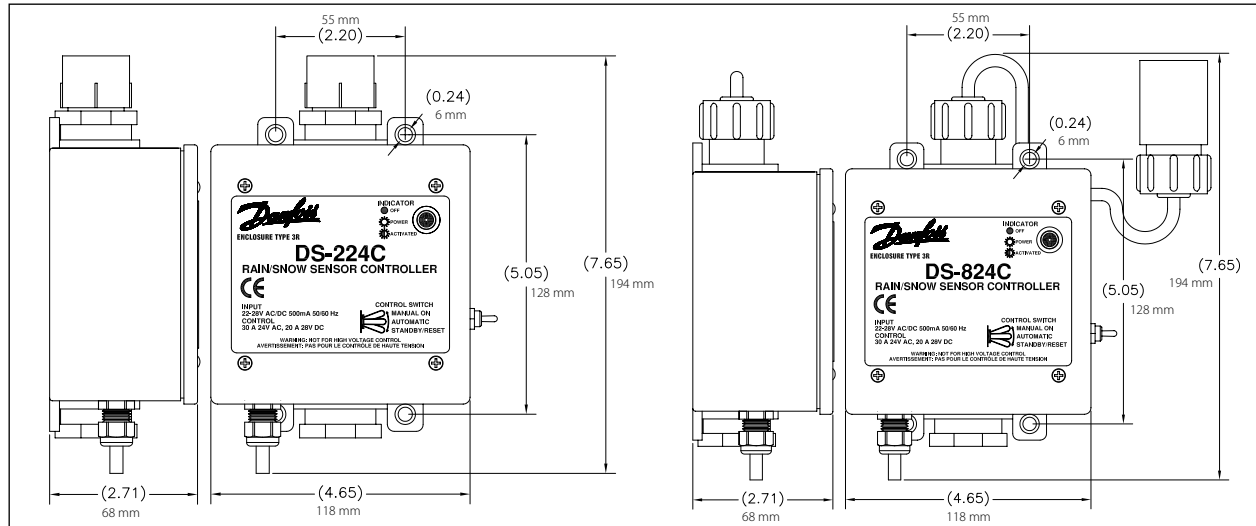


FH THERMOSTAT DIMENSIONS

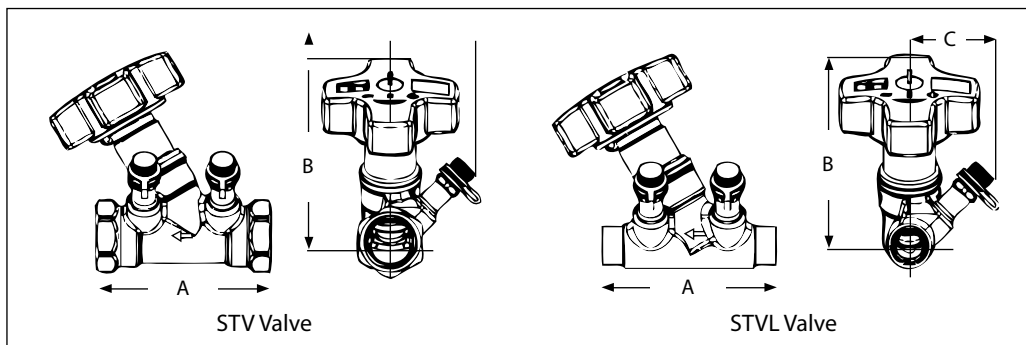


Dimensions

DS-224/DS-824 DIMENSIONS



STV/STVL/STVA DIMENSIONS



STV / STVL ⁽¹⁾ STVL F.Solder version, ⁽²⁾ P/T Tap offset			
Size	A in (mm)	B in (mm)	C ⁽²⁾ in (mm)
1/2"	3.4 (86.4)	3.7 (93.9)	1.6 (40.6)
3/4"	3.5 (88.9)	3.7 (93.9)	1.7 (43.2)
1"	4.0 (104.1)	3.8 (96.5)	1.7 (43.2)
1-1/4"	4.7 (119.4)	3.8 (96.5)	1.9 (45.7)
1-1/2"	5.2 (132.1)	4.3 (109.2)	1.9 (45.7)
2"	6.1/6.5 (153.9/164.1) ⁽¹⁾	4.4 (111.7)	2.1 (53.1)

Body and parts in contact with liquid	Dezincification resistant brass
Gaskets:	EPDM
Seat Seal:	EPDM
Handwheel:	Polyamide Plastic

STVA / STVC			
	Size	H1	
		L1 in (mm)	in (mm)
STVA	2-1/2"	11.4 (290.1)	8.9 (227.1)
	3"	12.2 (309.9)	9.5 (241.3)
	4"	13.8 (350.0)	10.2 (259.1)
	5"	15.8 (400.1)	11.7 (297.9)
	6"	18.9 (480.1)	12.1 (306.1)
STVC	8"	23.6 (599.4)	20.1 (510.5)
	10"	28.7 (729.9)	20.9 (530.9)
	12"	33.5 (850.9)	24.0 (609.6)

DIMENSIONS

Numerical Code Number Listing

Code No.	Page
003L1000	27
003L3530	14, 24
003L3531	14,24
003N0053	16
003N0056	33
003N0062	33
003N0075	33
003N0078	33
003N0388	33
003N0520	33
003N4006	33
003N4007	33
003N4008	33
003N6032	16
003N6032RA	16
003N6100	33
003N6252	16
003N6252RA	16
003N6272	16
003N6272RA	16
003N7032	16,26
003N7032RA	16
003N7100	33
003N7252	16,26
003N7252RA	16
003N7272	16,26
003N7272RA	16
003N8032	16,26
003N8032RA	16
003N8100	33
003N8252	16,26
003N8252RA	16
003N8272	16,26
003N8272RA	16
013-7045	32
013G0290	32
013G1232	32
013G1236	32
013G1237	32
013G1246	32
013G1672	32
013G3094	15,25
013G3096	15,25
013G5080	14,24
013G5081	14,24
013G5245	32
013G5503	32
013G8013	15,25
013G8014	15,25
013G8015	15,25
013G8018	15,25
013G8019	15,25
013G8020	15,25
013G8023	15,25

Code No.	Page
013G8024	15,25
013G8025	15,25
013G8030	15,25
013G8031	15,25
013G8032	15,25
013G8042	15,25
013G8044	15,25
013G8070	32
013G8072	32
013G8250	27
013G8591	32
013G8593	32
013U0070	32
013U0476	15,25,27,33
013U0479	15,25,33
013U0489	33
013U0496	15,25,27,33
013U0499	15,25,33
013U0501	33
013U0504	33
013U0507	33
013U3017	14
013U301501	14
013U302001	14
013U7175	32
013U8063	14,24
013U8608	15,25,27,33
013U8609	15,25,33
017-4370	14,24
065B6150	19
065B6165	19
065B6180	19
065B6200	19
065B6225	19
065B6250	19
065B8868LF	17
065B8869LF	17
065B8870LF	17
065B8871LF	17
065B8872LF	18
065B8877LF	18
065B8878LF	18
065B8892	18
065B8895	18
065B8898	18
065B8899	18
065B8900	23
065B8901	18
065B8960	17
065B8961	17
065B8962	17
065B8963	17
065B8964	17
065B8965	17

Code No.	Page
065F0102	14,24
065F0104	14,24
065F1242	14,24
065F8950	19
065F8951	19
065F8952	20
065F8953	20
065F8954	20
065F8955	20
065F8959	20
065F8960	14,24
065F8961	14,24
065F8965	31
065F896501	31
065F8966	31
065F896601	31
065F8967	31
065F896701	31
065F8968	31
065F896801	31
065F8969	31
065F896901	31
065F8970	31
065F897001	31
065F8971	31
065F8972	31
065F8973	31
065F8974	31
065F8975	31
065F8993	31
065F8994	31
065F8995	31
082F0002	15
082F0052	15
082F8961	19
082F8962	19
082F8963	19
082F8964	19
082F8965	19
082F8966	19
082F8967	19
082F8968	19
082F8969	19
082F8970	19
087N1196	27
087N1197	27
087N119601	27
087N6441NA	28
087N7014	28
087N7015	28
087N7016	28
087N7017	28
087N7018	28
087N7019	28

Code No.	Page
087N7748	28
193B1700	18,23
193B1701	18,23
193B1702	18,23
193B1703	18,23
193B1704	18,23
193B1705	18,23
193B1706	18,23
193B1709	18,23
193B1790	21
193B1791	21
193B1792	21
31622011LF	17
31622111LF	17
31700100	18
31700200	18
AVTBWELL	16,33
ETF-622	30
ETF-744/99	30
ETO2-4550	30
ETO2-BOX	30
ETOG-56	30
ETOK-1	30
ETOR-55	30
MTC-39914-UC	28
MTC-39914-UF	28

GENERAL CONDITIONS FOR SALE AND WARRANTY

The acceptance of the order confirmation by the purchaser includes the acceptance of our "General Conditions of Sale and Warranty" as the only ruling condition. No modification of these conditions will be recognized by Danfoss. Any express or implied condition, statement or warranty, statutory or otherwise - not stated herein is excluded.

1. INCOTERMS

The international rules for the interpretation of trade terms "Incoterms" shall apply to the commercial terms used herein.

2. CONFIRMATION OF ORDER

Danfoss shall not be deemed to have accepted an order until written confirmation of the order from Danfoss is dispatched to the prospective purchaser. Quotations, pro forma invoices and the like, shall be subject to confirmation by Danfoss.

3. TERMS OF DELIVERY

At Danfoss' option, the goods can be delivered from any of the Danfoss factories, subsidiaries, or affiliated companies in or outside North America. Failing special instructions, the goods will be dispatched in the way which Danfoss deems best without guaranteeing this to be the cheapest way of transport.

4. PRICE REGULATIONS

Danfoss reserves the right to adjust accepted prices in the event of alterations in rates of exchange, variations in costs of materials, changes in wages, interference on the part of the Government or similar conditions over which Danfoss has no control.

5. PACKING

Disposable packing is included in the price and will not be credited if returned. Reusable packing is not included in the price and shall be returned in accordance with Danfoss' instructions at purchaser's expense.

6. RISK

Goods are shipped EXW Danfoss Warehouse North America. Danfoss shall not be responsible for loss or damage incurred during transportation.

7. TERMS OF PAYMENT

Where payment is not received when due, an interest rate of 10% per annum over and above the actual total back charge will be payable. This rate of interest will also be used in cases where an extension of the period of credit has been granted. The purchaser shall not be allowed to retain payments, or to settle debts by setting off same against possible counterclaims, disputed by Danfoss, or to reduce the invoiced price.

8. TRANSFER OF OWNERSHIP

Until full payment for the goods has been received by Danfoss, the goods shall remain the property of Danfoss and shall not be pawned or pledged in any way.

9. TIME OF DELIVERY

Time of delivery is stated approximately. Danfoss shall not be liable for any delay due to causes beyond Danfoss' control, including but not restricted to strikes, lockouts, labour disturbances or the like, or in consequence of extraordinary measures on the part of government, hindrances to transportation including ice or other transport difficulties, delayed, incomplete or defective delivery of

material ordered in due time from sub-suppliers, failing supply of electricity and similar obstacles to production, fire or workshop accidents at own factories or at sub-suppliers.

10. INFORMATION

The information and technical data contained in catalogues, leaflets and other written material constitutes an approximate guide only. No responsibility for errors or wrong interpretation can be placed on Danfoss. The purchaser cannot claim any rights based on this material. Such reservation shall also apply to suggestions, advice and other services rendered to customers, including installation and servicing instruction for the product delivered.

11. ALTERATIONS

Danfoss reserves the right to make alterations to their products without notice, also to products already placed on order.

12. WARRANTY

Provided that the terms of payment are observed, the purchaser is offered a warranty of 18 months from date of Danfoss sale to purchaser. The warranty covers faulty manufacture, design and/or defective materials. The warranty shall cease to be valid if the product is repaired or altered without the consent of Danfoss, applied for purposes for which it is not designed or installed and applied contrary to the instructions given by Danfoss. Expenses in connection with dismantling and mounting shall not be paid by Danfoss. If defects occur while under warranty, the product shall be forwarded to Danfoss, insurance and freight paid. A description of the reason for returning the product shall be enclosed. Products returned shall be free of extraneous equipment. Products repaired under warranty will be returned to the purchaser, freight paid by Danfoss.

Parts which have been replaced shall be the property of Danfoss. Any other liabilities are not accepted. Guarantee for products not of Danfoss' own manufacture is only given to the same extent as given to Danfoss, however, not exceeding the normal Danfoss warranty.

13. SECONDARY DAMAGES

Danfoss shall not be held responsible for any indirect or consequential damage e.g. damages to person or property, consequential loss, including loss of production, loss of profit, loss on goods in store or the like, which might arise out of defects and/or delay in delivery of the products sold, irrespective of the cause, including faulty manufacture, design of material.

14. NOTICE OF CLAIMS

Any claim or complaint as to defects and/or delay in delivery of the products shall be submitted in writing by the purchaser to Danfoss immediately.

GENERAL CONDITIONS FOR SALE AND WARRANTY

Taxes:

All applicable taxes are extra.

Minimum Order:

Handling charges of \$50 will be added to all orders less than \$100 net.

Freight:

All prices are FOB point of shipment.

Shipments:

All damages or shortages must be reported within 48 hours from date of receipt.

Payment Terms:

Net 30 days.
All orders subject to credit approval.
Interest rate of 1% per month applies to late payment.

Returns:

Returns accepted only with Returned Goods Authorization (RGA) obtained from Danfoss Customer Service. Return Goods Authorization (RGA) must be received *prior* to return.

Any Returns received without a Returned Goods Authorization Number will be returned to sender collect.

All returns subject to a restocking fee as follows: Up to 12 months - 25%, 12-18 months - 50%, Over 18 months-No Value. Danfoss reserves the right to limit the number of returns.

Goods returned must be new, unused, in original packaging, and in resalable condition. Goods are subject to inspection at Danfoss and goods failing inspection will be returned collect to customer with no credit issued.

No returns on special order items. Returns must be shipped prepaid.

Warranty:

Danfoss products in this pricelist are warranted for a period of 18 months from date of sale from manufacturing defects.

Warranty Returns accepted only with Returned Goods Authorization (RGA) obtained from Danfoss Customer Service. Warranty items must be identified with explanation of defect.

Warranty Returns must be shipped pre-paid.

Danfoss reserves the right to repair and/or replace product when deemed defective. Goods are subject to inspection at Danfoss and goods failing inspection will be returned collect to customer with no credit issued.

Further information regarding the specific warranty details and period for each Danfoss product can be found online, and in the instruction manual and/or warranty card included with the product.

See Previous Page for Complete Terms & Conditions.

Danfoss engineers technologies that enable the world of tomorrow to do more with less. We meet the growing need for infrastructure, food supply, energy efficiency and climate-friendly solutions. Our products and services are used in areas such as refrigeration, air conditioning, heating, motor control and mobile machinery. We are also active in the field of renewable energy as well as district heating infrastructure for cities and urban communities. Visit our website for the complete line of energy saving, comfort increasing, and safety enhancing HVAC solutions.



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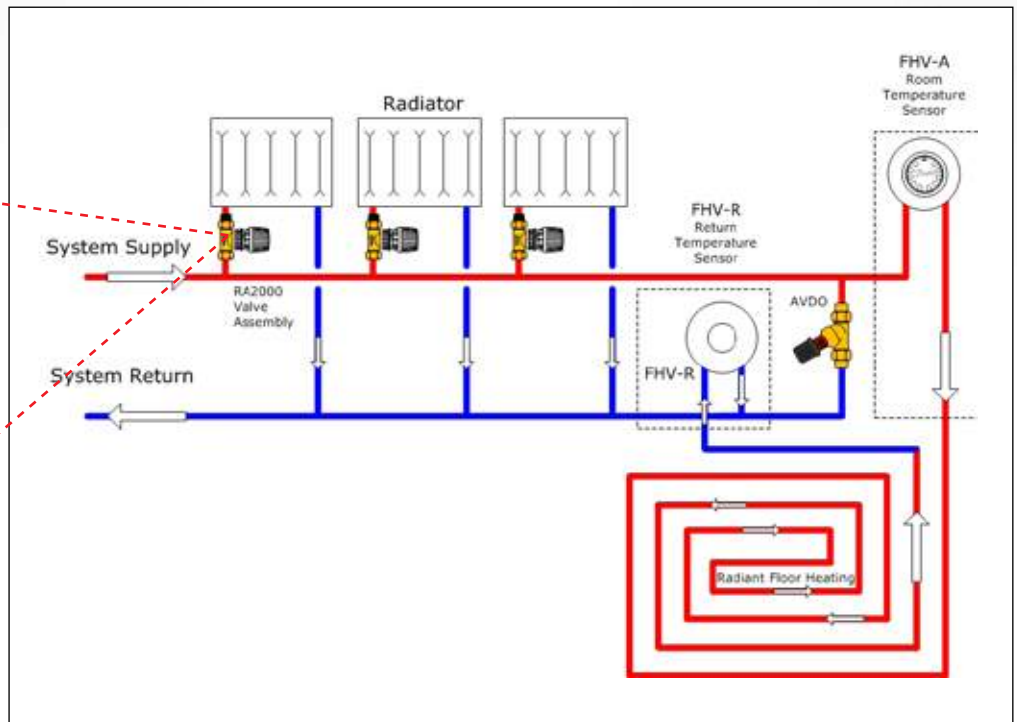
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