

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.

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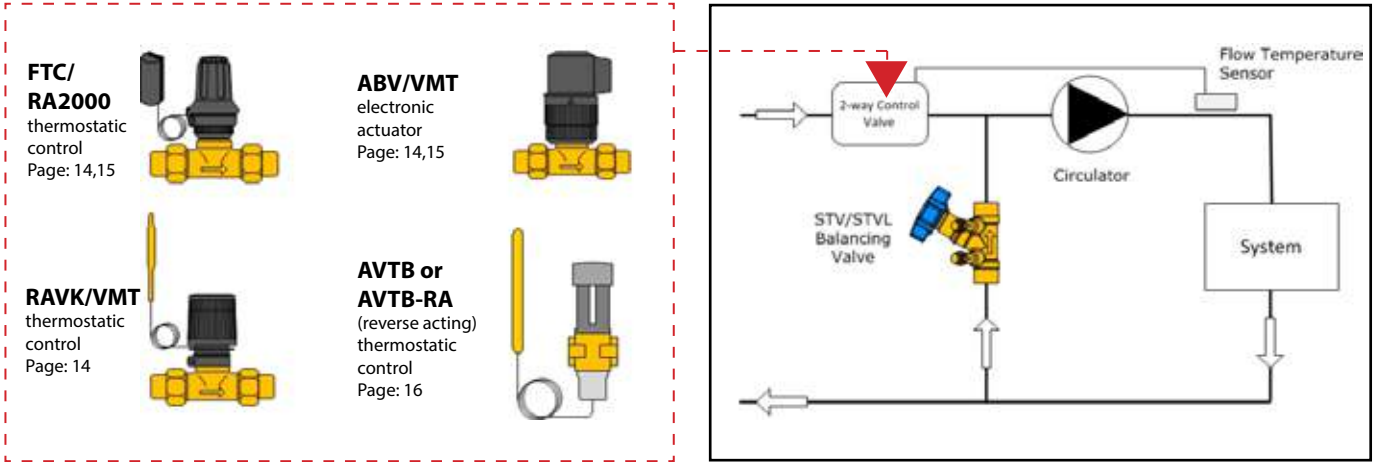
*Danfoss*

# TABLE OF CONTENTS

Description	Page	Description	Page	
<b>APPLICATION DRAWINGS</b>		<b>INJECTION MIXING</b>		
2-Way Thermostatic/Electronic Injection Mixing Controls	4	RAVK Self-Acting Thermostatic Operators	24	
2-Way Thermostatic/Electronic Domestic Hot Water Controls	4	VMT Valve Body for Thermostatic Operators & Electric Actuators	24	
2-Way Plate Heat Exchanger Controls	5	FTC Self-Acting Thermostatic Operators	24	
2-Way Water to Air Heat Exchanger Controls	5	RA2000 Valve Bodies	25	
2-Way Single Loop Thermostatic Radiator Valve Controls	6	RA-C Heating and Cooling Valve Bodies	25	
3-Way Thermostatic Mixing Controls	6	AVTB Thermostatic Valves	26	
3-Way Return Water Temperature Control & Mixing	6	<b>THERMOSTATS</b>		
3-Way Mixing with Setpoint Control	7	FHV-R Floor Temperature Control	27	
3-Way Diverting with Setpoint Control	7	FHV-A Room Temperature Control	27	
3-Way Mixing or Diverting	7	RMT Room Thermostats	27	
4-Way Mixing with Setpoint Control	8	RET Electronic Room Thermostats	28	
Snow & Ice Melt - 1 Zone Activation Controller	8	RET2000B Battery Powered Room Thermostats	28	
Snow & Ice Melt - 2 Zone Control System	9	TP7001 Programmable Heat Only Room Thermostats	28	
Snow & Ice Melt - 1 Zone Regulated Snow Melt System	9	MTC Microline® Hydronic Floor Heating Thermostats	28	
Circuit Balancing Valves	10	FH Hydronic Floor Heating Thermostats	29	
Boiler Water Return Temperature Protection	10	<b>SNOW MELT CONTROLS</b>		
Boiler Water Return Temperature Protection on Converted Gravity Heating Systems	11	ETO2 Advanced Ice & Snow Melt Controller	30	
Zoning with Electronic Room Thermostats	11	DS-224 Snow Melting System Controller	30	
Solar & Solid Fuel Boiler Specialties	12	DS-824 Snow Melting System Controller (Remote)	30	
Thermostatic Damper Control Regulator	13	<b>BALANCING</b>		
<b>2-WAY CONTROL &amp; MIXING</b>		STV/STVL Circuit Balancing Valves	31	
RAVK* Self-Acting Thermostatic Operators	14	STVA Circuit Balancing Valves	31	
VMT Valve Body for Thermostatic & Electric Actuators	14	<b>SPARE PARTS AND ACCESSORIES</b>		
KOVM Mixing Valve Body	14	RA2000 Thermostatic Radiator Valves & Operators	32	
FTC Self Acting Thermostatic Operators	14	AVTB Thermostatic Valves	33	
RA2000 Valve Bodies	15	<b>DIMENSIONS</b>		
RA-C Heating and Cooling Valve Bodies	15	RAVK 34	VTA LF 38	RET 41
ABV Adjustable Flow Limitation and Manual Operation Actuator	15	VMT 34	VTA570 38	ETO2 41
AVTB Thermostatic Valves	16	KOVM 34	VTC511 39	RET2000B 42
AVTB-RA Thermostatic Valves	16	FTC 34	ARA 39	TP7001 42
AVTB-RA Sensor Pockets	16	RA-C 34	SERIES90 39	FH 42
<b>3-WAY MIXING &amp; DIVERTING</b>		RA2000 35	CRA112 40	DS-224 43
VRG130 ESBE Series VRG130 3-Way Mixing Valves	17	ABV 36	CRA122 40	DS-824 43
TYPE F ESBE Type F 3-Way Mixing Valves	17	AVTB 36	FHV-R 40	STV 43
VTA ESBE Lead Free Thermostatic Mixing Valves	17	VRG 37	FHV-A 40	STVL 43
VTA 570 ESBE VTA 570 3-Way Mixing or Diverting Valves	18	TYPE F 37	RMT 41	STVA 43
VTC511 ESBE VTC511 Valve Bodies	18	<b>NUMERICAL CODE NUMBER LISTING 44</b>		
ESBE VTC511 Thermostats	18	<b>CONDITIONS AND WARRANTY 45</b>		
<b>4-WAY MIXING</b>		<b>*RAVK replaces RAVV.</b>		
VRG140 ESBE Series VRG140 4-Way Mixing Valves	19			
TYPE F ESBE Type F 4-Way Mixing Valves	19			
DIN Flange and Gaskets	19			
<b>ACTUATORS FOR ROTARY MIXING VALVES</b>				
ARA ESBE Actuators	20			
SERIES 90 ESBE Control Actuators	20			
VM-GIB High Torque Actuators	21			
<b>SET POINT CONTROLS</b>				
CRA ESBE Set Point Controls	22			
<b>BOILER RETURN PROTECTION, SOLID FUEL &amp; SOLAR CONTROL</b>				
VTC511 ESBE Thermostatic Valve Bodies	23			
ESBE Thermostats	23			
ATA ESBE Thermostatic Draft Regulator	23			

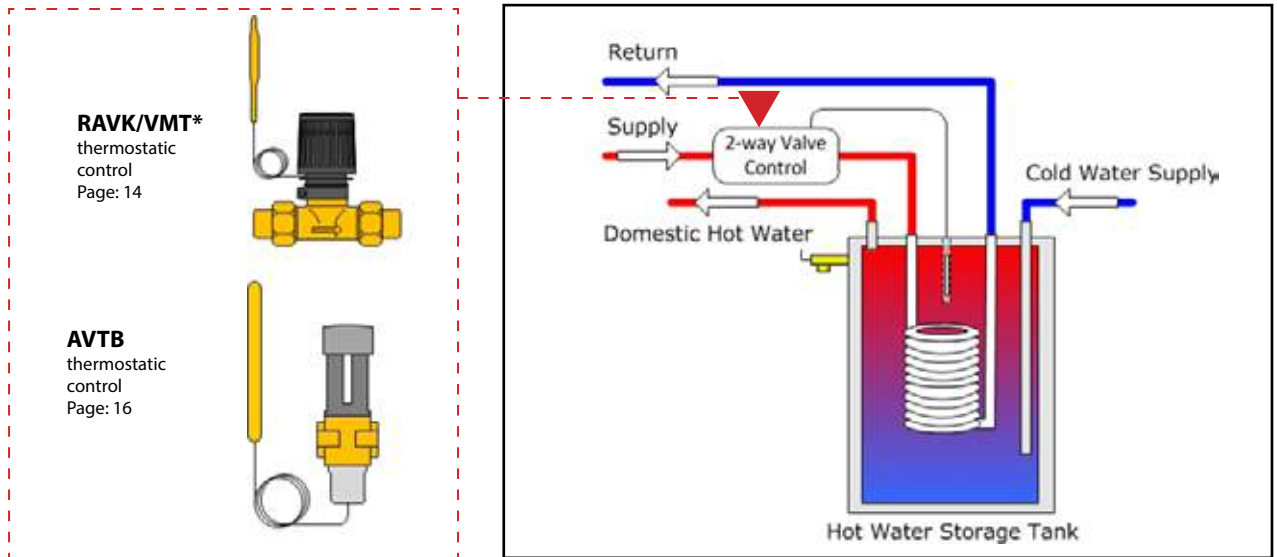
## 2-Way Thermostatic or Electronic Injection Mixing Controls

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

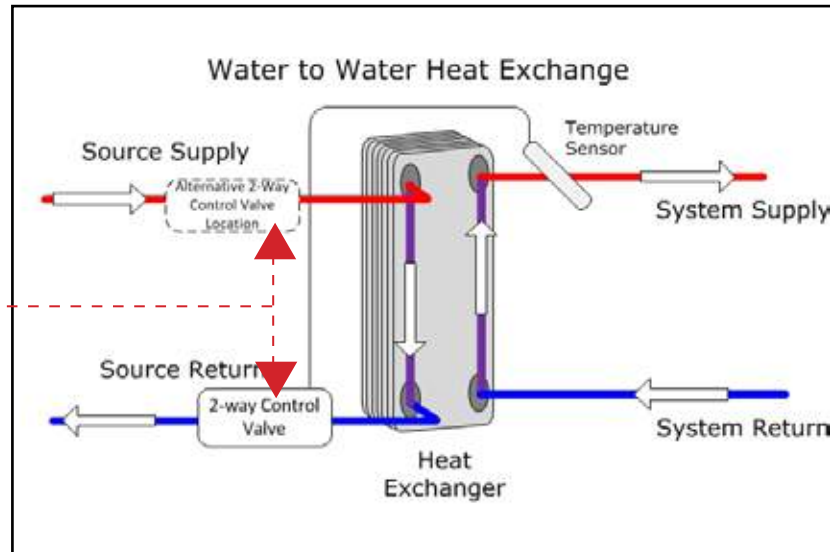
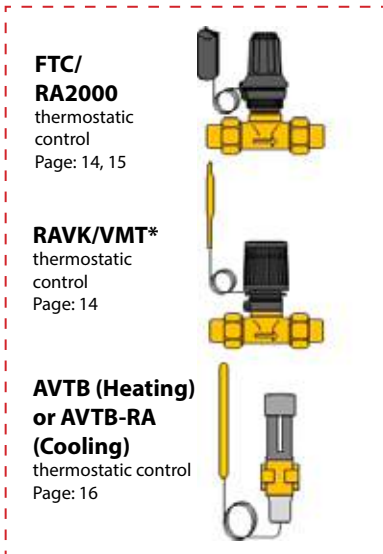
Typical piping schematic showing two-way control of domestic hot water storage tanks. \*See alternative TWA (24V) option in Thermostatic Radiator Valve Catalog.





## 2-Way Plate Heat Exchanger Controls

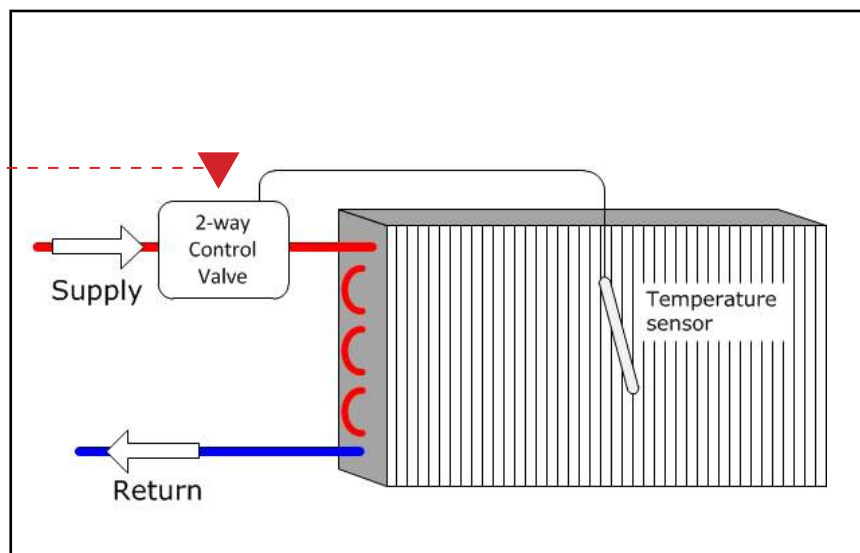
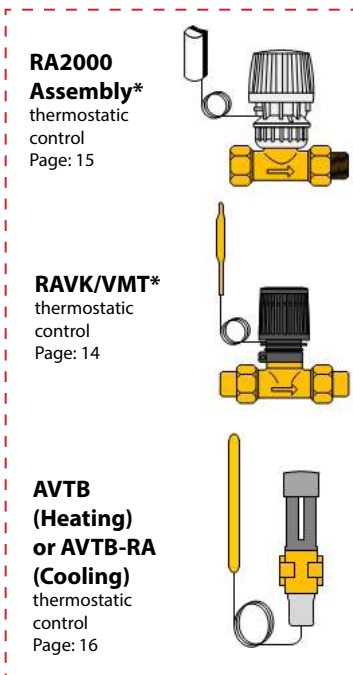
Control of secondary temperature for heating, snow/ice melt and domestic hot water. Cooling application not shown. **\*See alternative TWA (24V) option in Thermostatic Radiator Valve Catalog.**



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

## 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.

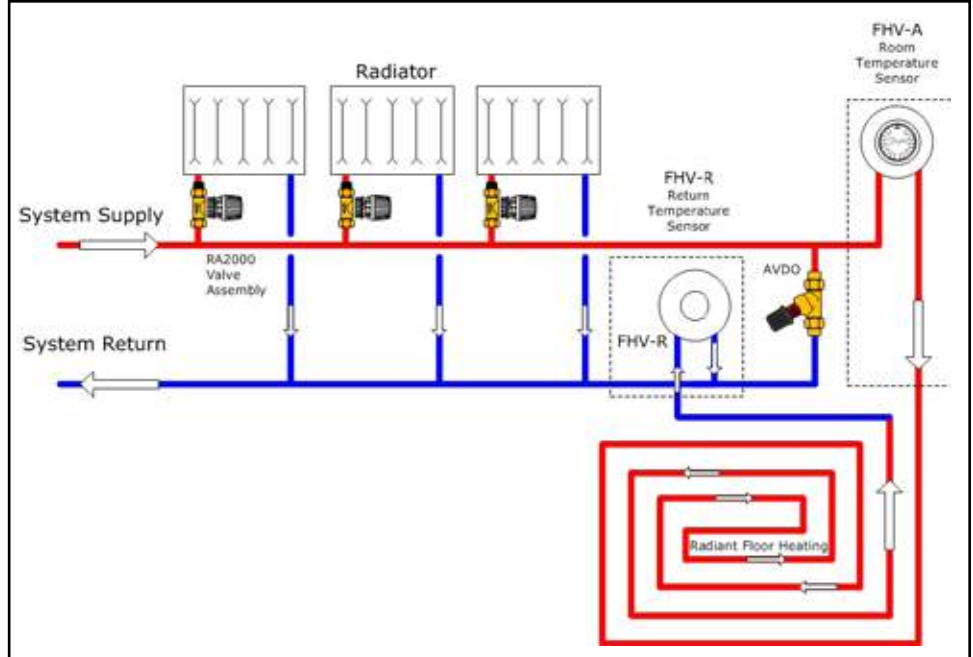
\*See Thermostatic Radiator Valve catalog for further information on RA2000 and AVDO.

2-WAY SINGLE LOOP THERMOSTATIC RADIATOR VALVE CONTROLS

**RA2000 Assembly\***  
thermostatic control  
Page: 15



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

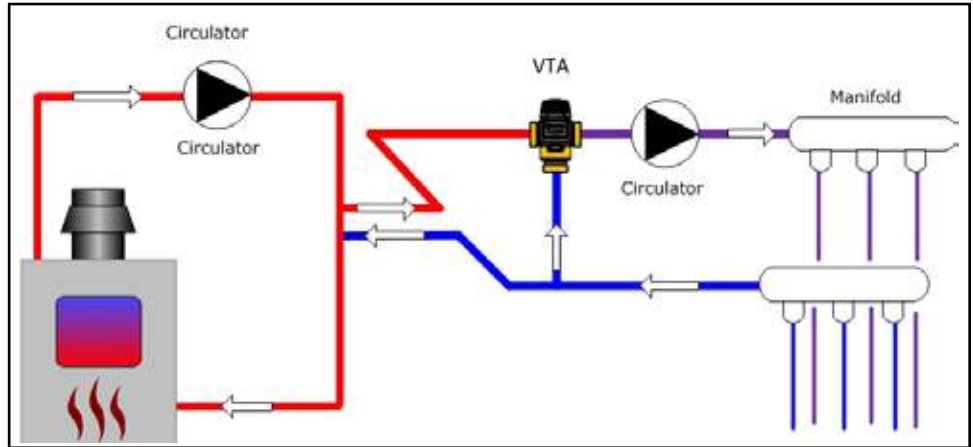


## 3-Way Thermostatic Mixing Controls

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

3-WAY THERMOSTATIC MIXING CONTROLS

**VTA THERMOSTATIC MIXING VALVE**  
Page: 17

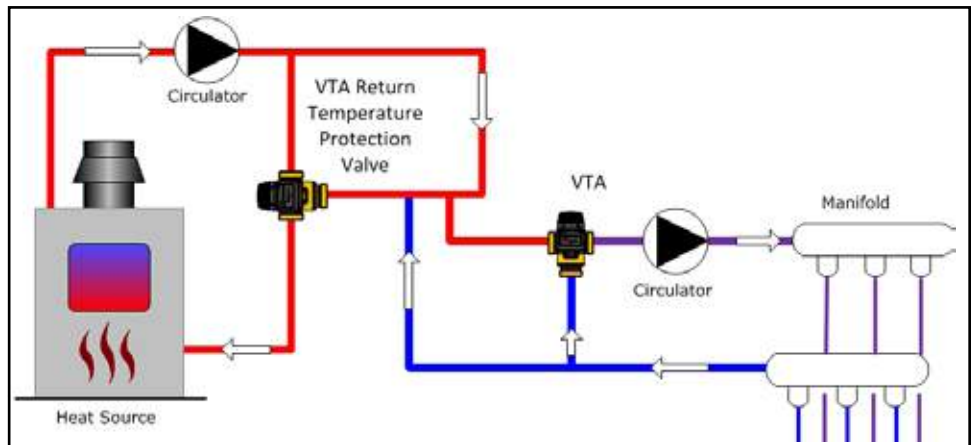


## 3-Way Return Water Temperature Control & Mixing

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

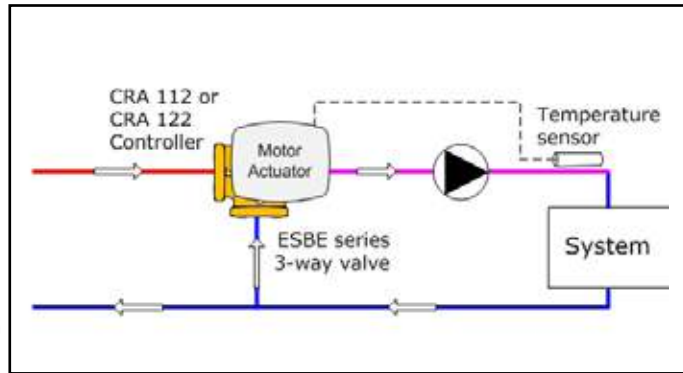
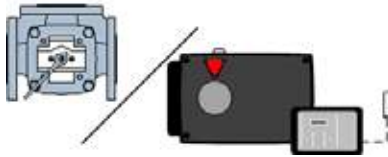


### TYPE F SERIES

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

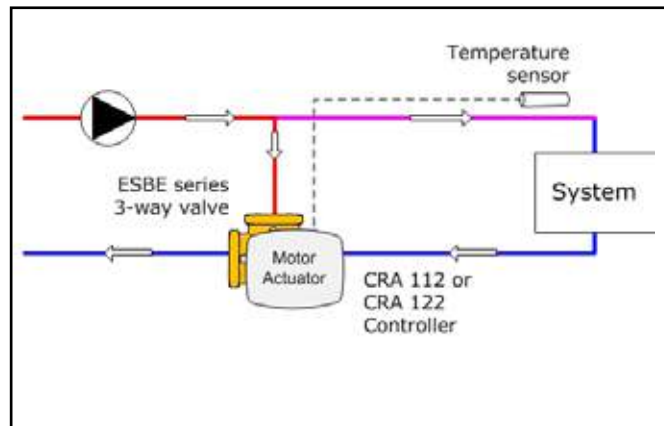
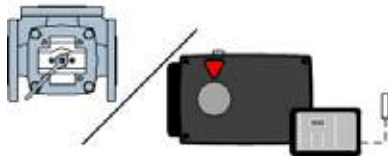


### TYPE F SERIES

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

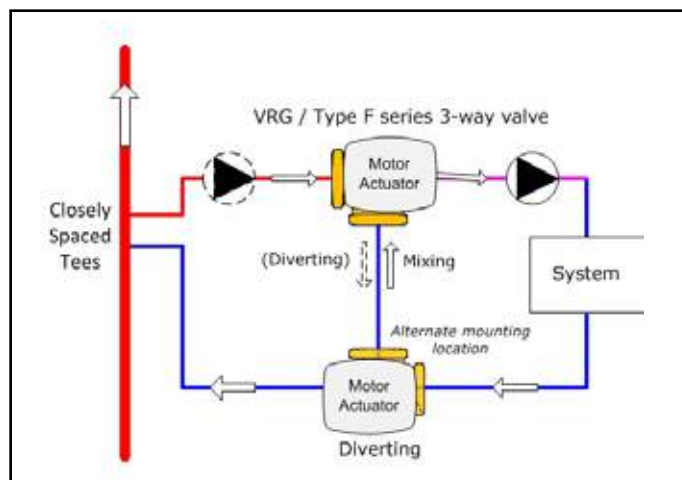
Page: 17

### ARA 600 SERIES

Page: 20

### SERIES 90

Page: 20



## 4-Way Mixing with Setpoint Control

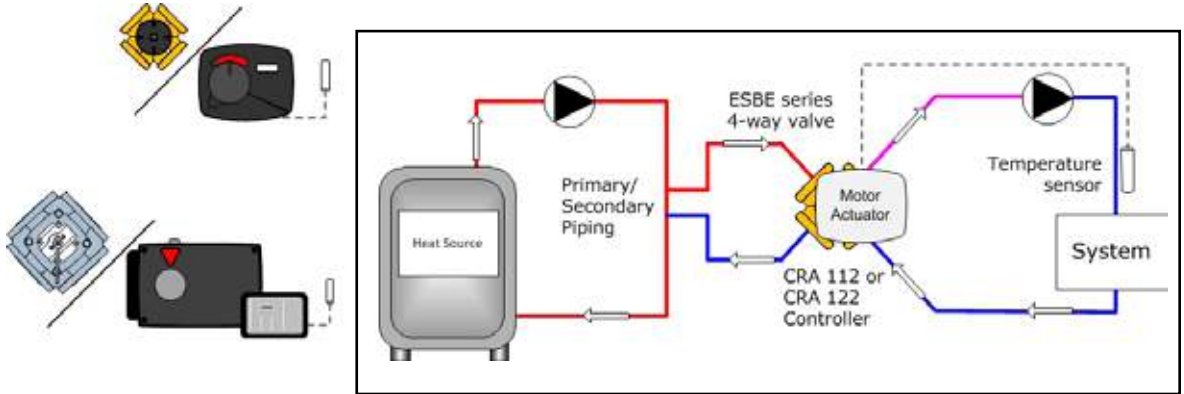
Typical 4-way motorized valve for use with radiant floor heating. For use with outdoor reset use ARA600 or Series 90 actuators.

**VRG SERIES**  
Page: 19

**CRA112**  
Setpoint Control  
Page: 22

**TYPE F SERIES**  
Page: 19

**CRA122**  
Setpoint Control  
Page: 22

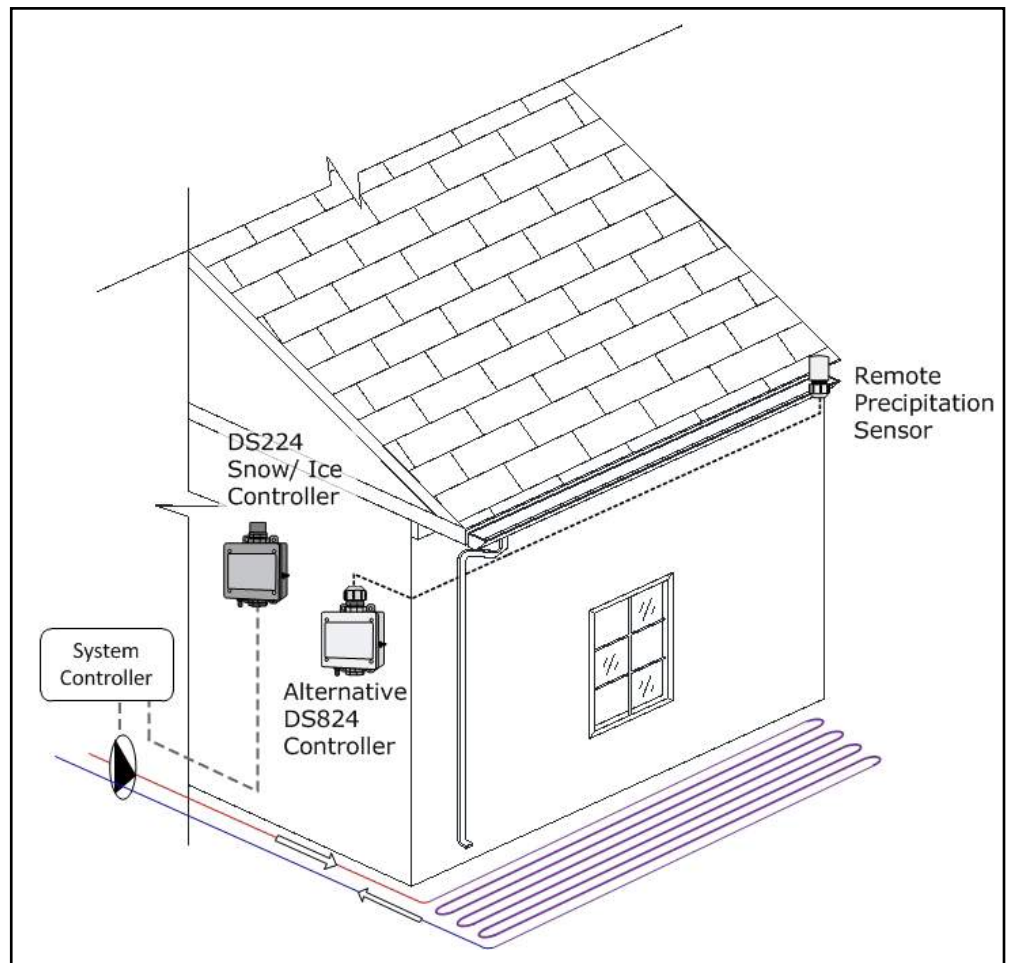
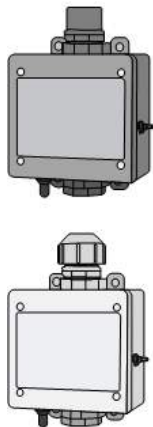


## Snow & Ice Melt - 1 Zone Activation Controller

Economical control of single zone snow/ice melt systems.

**DS224**  
Snow/Ice  
Controller  
Page: 30

**DS824**  
Snow/Ice  
Controller  
Page: 30

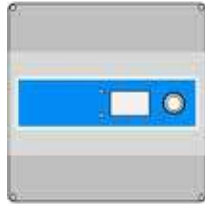




## Snow & Ice Melt - 2 Zone Control System

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

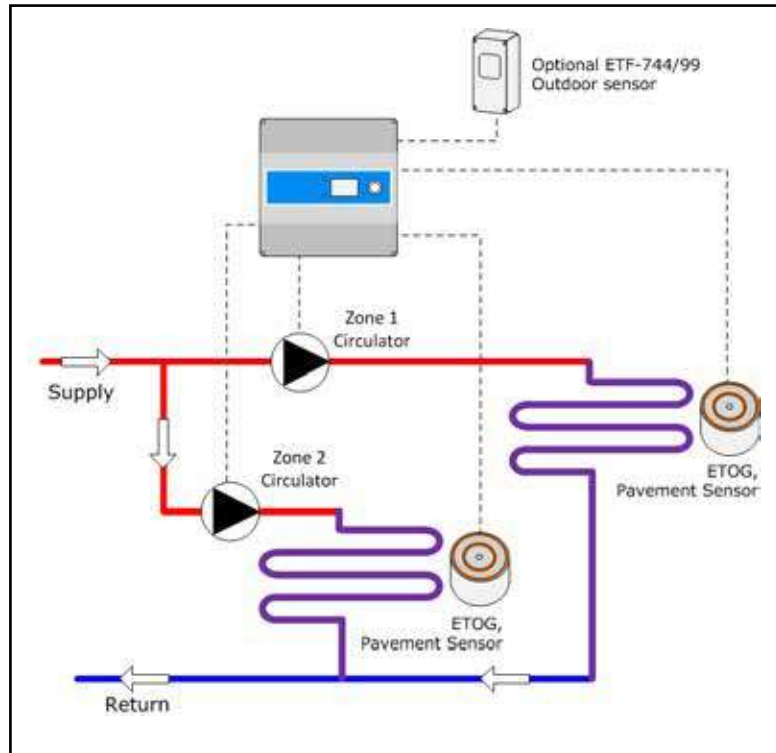
**ETO2**  
Snow/Ice  
Controller  
Page: 30



**ETF-744/99**  
Outdoor Sensor  
Page: 30



**ETOG-56**  
Pavement Sensor  
Page: 30



SNOW & ICE MELT / 2 ZONE

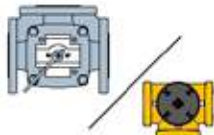
## Snow & Ice Melt - 1 Zone Regulated Snow Melt System

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



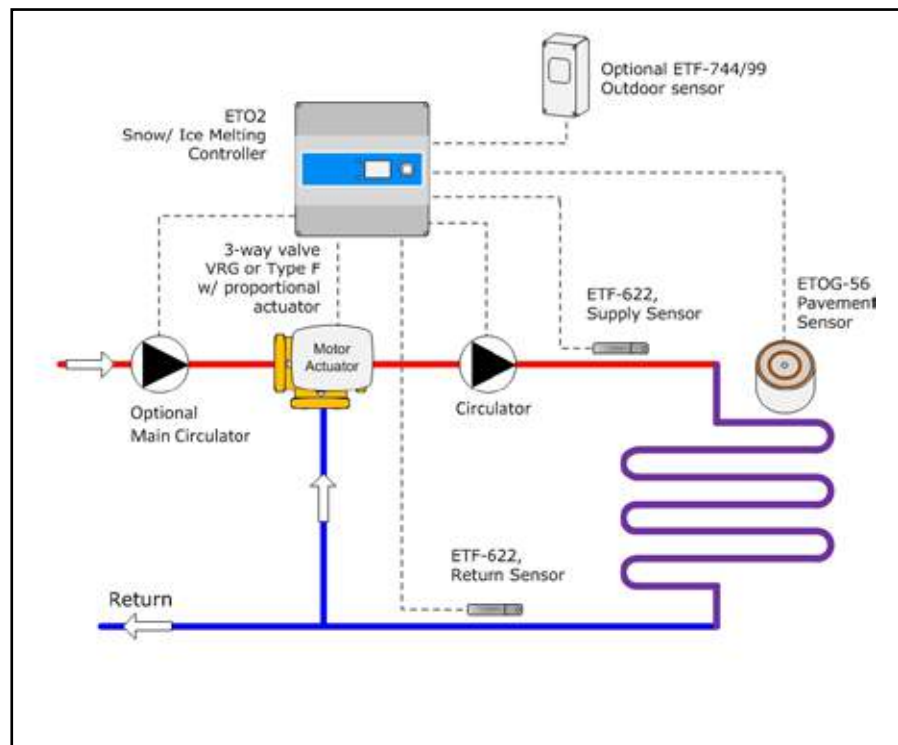
**ETF-744/99**  
Outdoor Sensor  
Page: 30



**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



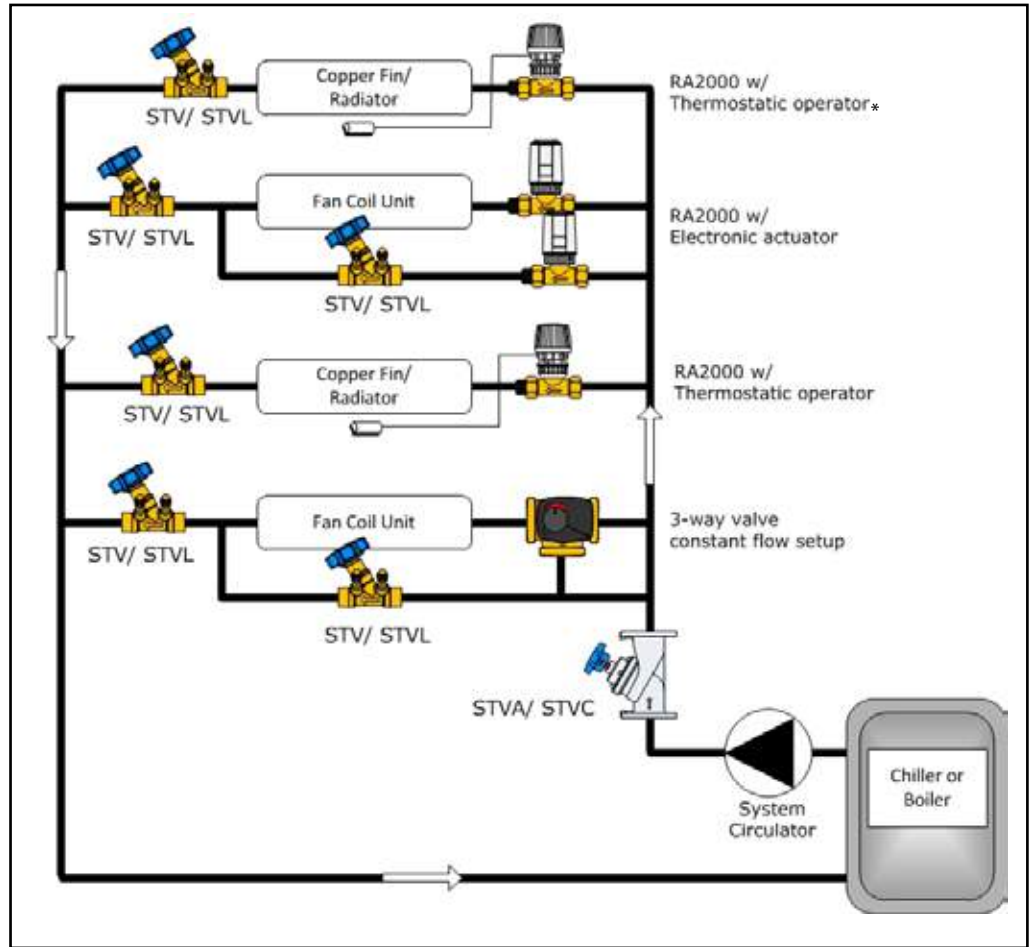
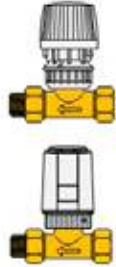
**STVA/STVC**  
Balancing Valve  
Page: 31



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



**RA2000\***  
with Thermostatic Operator or Electronic Actuator  
Page: 25

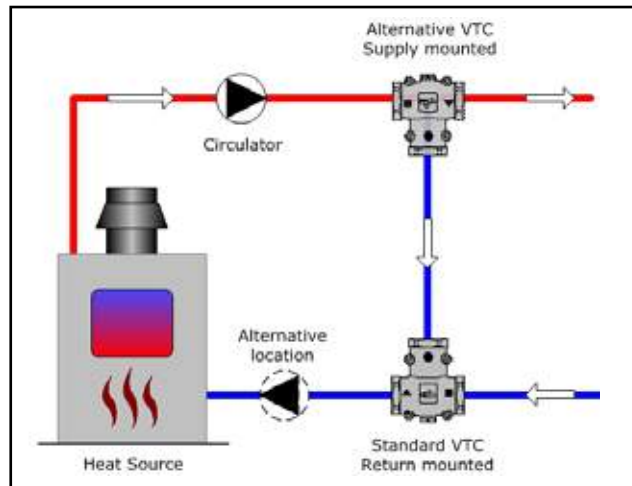
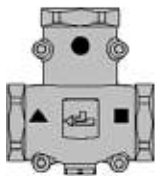


# Boiler Water Return Temperature Protection

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

BOILER PROTECTION

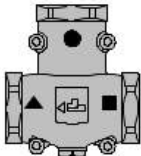
**VTC**  
Thermic Valve  
Page: 23



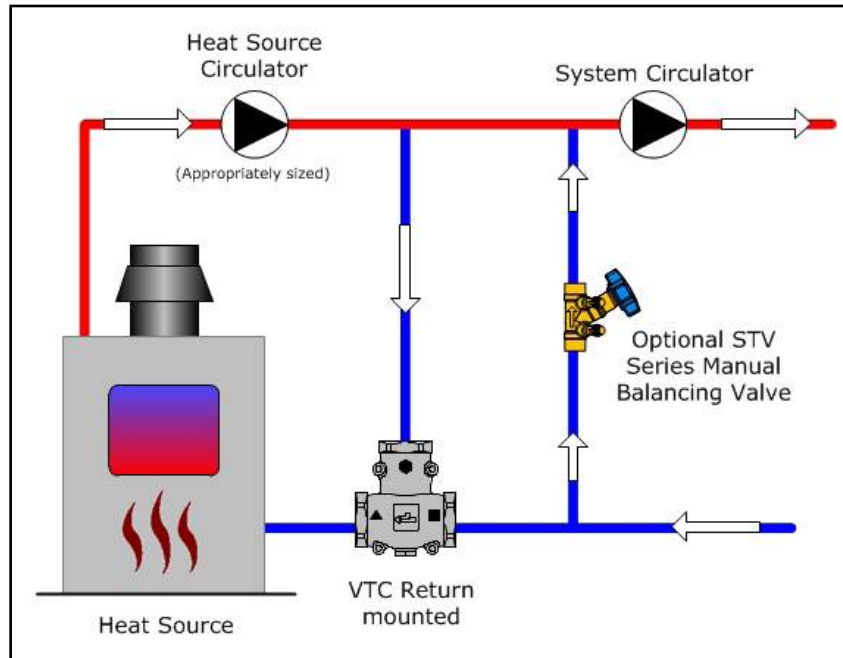
# Boiler Water Return Temperature Protection on Converted Gravity Heating Systems

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



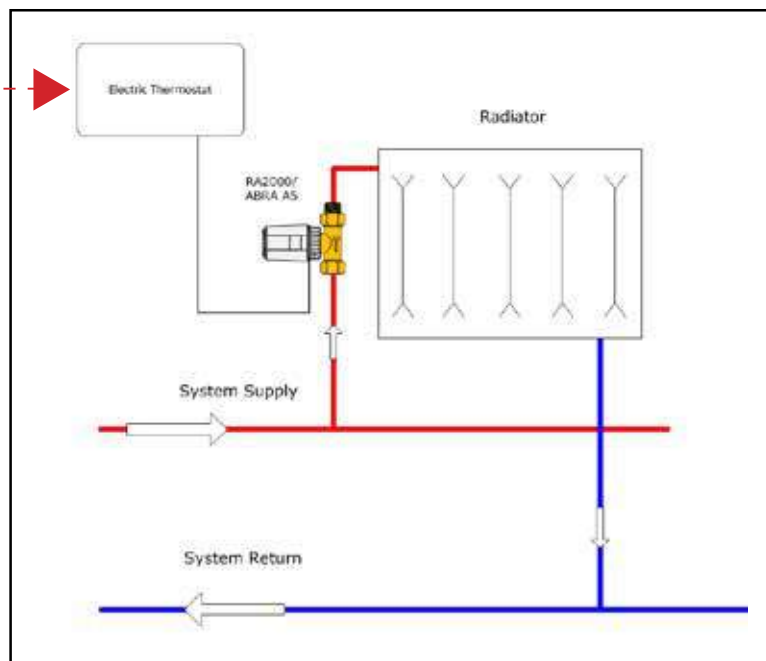
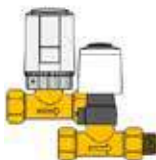
**FH-WS**  
Thermostat  
Page: 29



**TP7001**  
Thermostat  
Page: 28



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

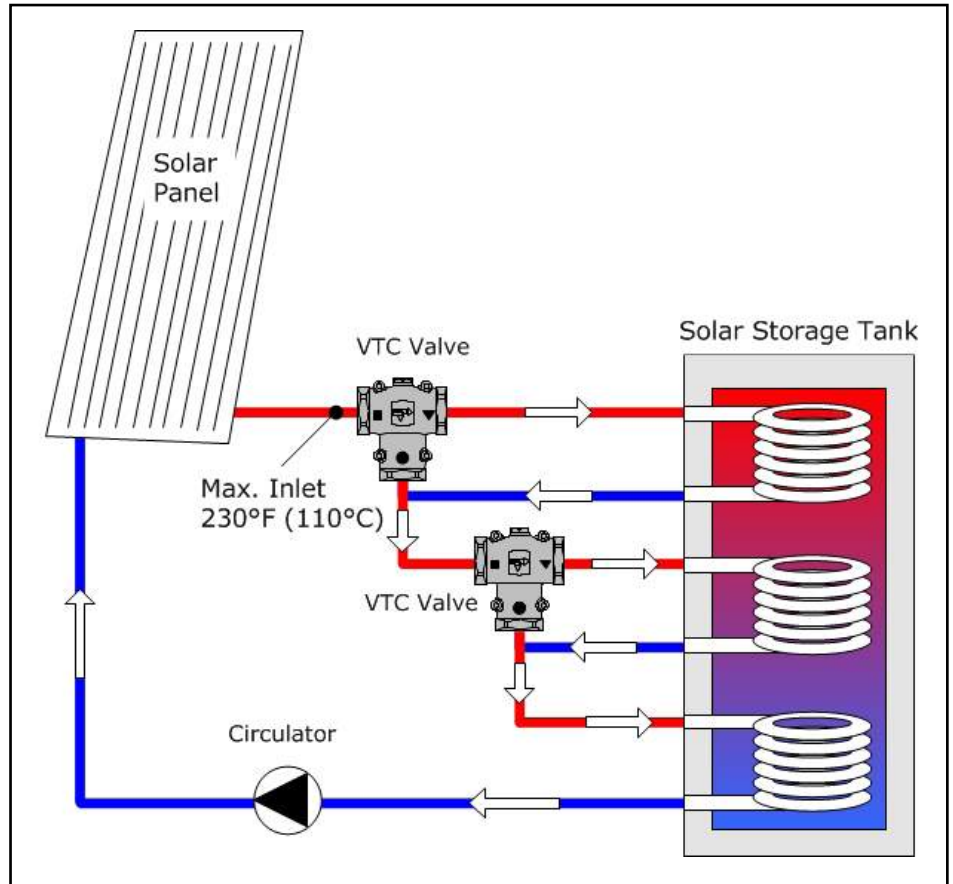
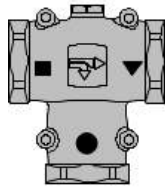


ZONING THERMOSTATS

## 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

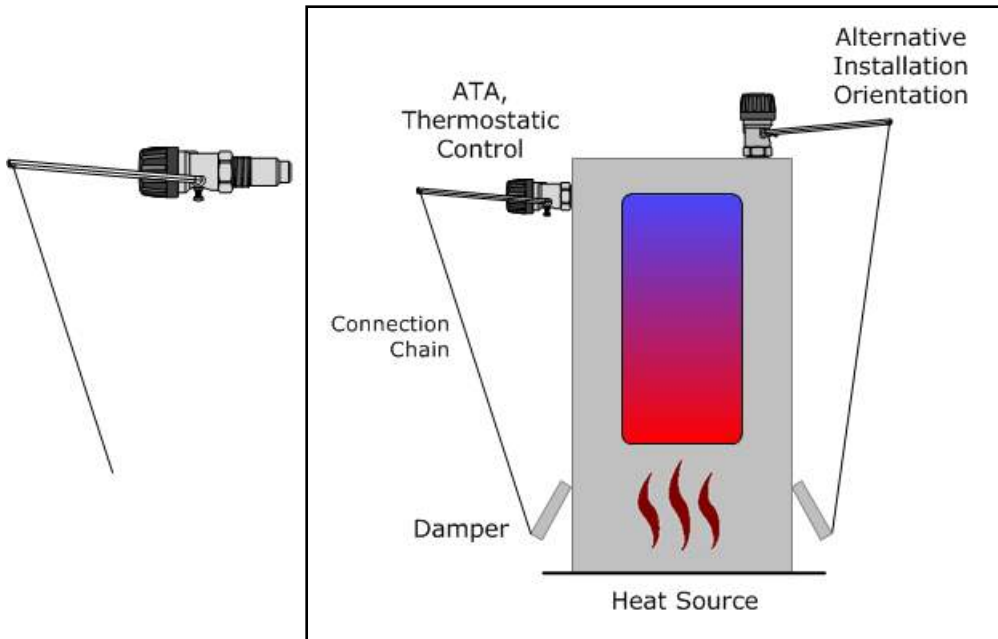




# Thermostatic Damper Control Regulator



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
	<b>003L3530</b>	Thermostatic	50° - 86°F (10° - 30°C)	VMT or KOVM	6 ft. 6 in. (2 m)
	<b>013U8063</b>		77° - 149°F (25° - 65°C)		
	<b>003L3531</b>		95° - 167°F (35° - 75°C)		
	<b>017-4370</b>	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			
	<b>065F0102</b>	1/2"	Solder	1.8	Straight Union	RAVK, ABV, TWA-V*, RA 2000* Wall Mount Operators
	<b>065F0104</b>	3/4"		2.7		
	<b>065F8960</b>	1/2"		3.3		
	<b>065F8961</b>	3/4"		5.9		
	<b>065F1242</b>	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		
	<b>013U3017</b>	1/2"	NPT	1.75	3 Way Heating or Cooling Mixing Valve	RAVK, RA 2000 (013G8564)
	<b>013U301501</b>		Comp.			
	<b>013U302001</b>			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
	<b>013G5081</b>	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
	<b>013G5080</b>		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 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			
	<b>193B1531</b>	3/4"	FNPT	4.7	4 Way DZR Brass	VRG 141
	<b>193B1532</b>	3/4"		7.3		
	<b>193B1533</b>	1"		11.7		
	<b>193B1534</b>	1-1/4"		18.7		
	<b>193B1535</b>	1-1/2"		29.3		
	<b>193B1536</b>	2"		46.8		
	<b>193B1537</b>	3/4"	Solder	2.9		
	<b>193B1538</b>	1"		7.3		
	<b>193B1539</b>	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			
	<b>065B6150</b>	2"	DIN Flange	75	4 Way Cast Iron	4 F 50
	<b>065B6165</b>	2-1/2"		105		4 F 65
	<b>065B6180</b>	3"		175		4 F 80
	<b>065B6200</b>	4"		265		4 F 100
	<b>065B6225</b>	5"		325		4 F 125
	<b>065B6250</b>	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
	<b>065F8950</b>	2"	DIN Flange (Four Flanges Required per 4 Way Valve)
	<b>082F8961</b>	2-1/2"	
	<b>082F8962</b>	3"	
	<b>082F8963</b>	4"	
	<b>082F8964</b>	5"	
	<b>082F8965</b>	6"	
	<b>065F8951</b>	2"	Gasket for DIN Flange (Four Gaskets Required per 4 Way Valve)
	<b>082F8966</b>	2-1/2"	
	<b>082F8967</b>	3"	
	<b>082F8968</b>	4"	
	<b>082F8969</b>	5"	
	<b>082F8970</b>	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
	<b>193B1600</b>	ARA663	96	No	53 (6)	ESBE Valves up to 2"
	<b>193B1601</b>	ARA644	24	Yes		
	<b>193B1602</b>	ARA654	48			
	<b>193B1603</b>	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
	<b>193B1604</b>	ARA638	12	Yes	26 (3)	ESBE Valves up to 1¼"
	<b>193B1605</b>	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
	<b>193B1606</b>	ARA639	15 / 30 / 60 / 120	Proportional 0-10Vdc, 2-10Vdc, 0-20mA, 4-20mA	No	53 (6)	ESBE Valves up to 2"
	<b>193B1607</b>	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°.

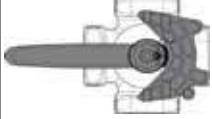
**NOTE:** If using with VRG style valves, must use mounting kit **193B1616** on next page.

ESBE Series 90 Actuators	Code No.	Series	Volt.	Operation	Running Time for 90° @ 60 Hz (seconds)	Torque in. lb. (Nm)	Designed for Use With
	<b>065F8952</b>	91EM	24 V	Floating (3 point)	12	45 (5)	Valves up to 2" only
	<b>065F8953</b>	92EM		Floating (3 point) c/w aux. switch	50	135 (15)	All ESBE Valve Sizes
	<b>065F8959</b>	92-2EM			100		
	<b>065F8954</b>	93EM			240		
	<b>065F8955</b>	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
	<b>193B1616</b>	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)
	<b>193B1790</b>	VM-GIB131.1U	3 point	N/A	24 vac ± 20% 8 VA	310 (35)	125
	<b>193B1791</b>	VM-GIB161.1U	0 to 10 Vdc	0 to 10 Vdc			



VL24	Code No.	Model No.	Description
	<b>193B1792</b>	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 seperately.

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		
	<b>193B1700</b>	VTC511	1"	FNPT	10.4	Cast Iron
	<b>193B1701</b>	VTC511	1-1/4"		16.2	

VTC Thermostats	Code No.	Series	Description	Opening Temperature	Typical Piping
	<b>193B1702</b>	VTC511	Thermostat	122°F (50°C)	Return
	<b>193B1703</b>	VTC511	Thermostat	131°F (55°C)	Return
	<b>193B1704</b>	VTC511	Thermostat	140°F (60°C)	Return
	<b>193B1709</b>	VTC511	Thermostat	149°F (65°C)	Supply
	<b>193B1705</b>	VTC511	Thermostat	158°F (70°C)	Supply
	<b>193B1706</b>	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
	<b>065B8900</b>	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
	<b>003L3530</b>	Thermostatic	50° - 86°F (10° - 30°C)	VMT or KOVM	6 ft. 6 in. (2 m)
	<b>013U8063</b>		77° - 149°F (25° - 65°C)		
	<b>003L3531</b>		95° - 167°F (35° - 75°C)		
	<b>017-4370</b>	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			
	<b>065F0102</b>	1/2"	Solder	1.8	Straight Union	RAVK, ABV, TWA-V*, RA 2000* Wall Mount Operators
	<b>065F0104</b>	3/4"		2.7		
	<b>065F8960</b>	1/2"		3.3		
	<b>065F8961</b>	3/4"		5.9		
	<b>065F1242</b>	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
	<b>013G5081</b>	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
	<b>013G5080</b>		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

# 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 m<sup>2</sup>).

FHV-R	Code No.	Model	Description
	<b>003L1000</b>	FHV-R	Single Zone Return Temperature Sensing Control Valve
	<b>013U0496</b>	For FHV-R control valve (Order two nuts and two tailpieces per control valve)	1/2" Union Nut
	<b>013U8608</b>		1/2" Solder Female Tailpiece
	<b>013U0476</b>		1/2" Male Threaded Tailpiece
	<b>003L1040</b>	FJVR	Return Temperature Limiter Sensor. Setting range: 50° - 122°F (10° - 50°C)
	<b>003L1070</b>		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
	<b>003L1001</b>	FHV-A	Single Zone Ambient Room Temperature Control Valve
	<b>013U0496</b>	For FHV-R control valves (Order two nuts and two tailpieces per control valve)	1/2" Union Nut
	<b>013U8608</b>		1/2" Solder Female Tailpiece
	<b>013U0476</b>		1/2" Male Threaded Tailpiece
	<b>013G8250</b>	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
	<b>087N119601</b>	RMT-24	24 VAC	24 VAC	°F	No
	<b>087N1196</b>	RMT-24			°C	No
	<b>087N1197</b>	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	
	<b>087N7014</b>	RET 24	24 VAC	24 VAC	°C	No	
	<b>087N7015</b>	RET 24-U			°F		
	<b>087N7016</b>	RET 24VF		Dry Contacts for up to 24 VAC	°C		Yes External timer required
	<b>087N7017</b>	RET 24VF-U			°F		
	<b>087N7018</b>	RET 24NSB		°C			
	<b>087N7019</b>	RET 24NSB-U		°F			



## RET2000B (Heating or Cooling)

RET2000B	Code No.	Model No.	Power Supply	Switching Voltage	Scale
	<b>087N6441NA</b>	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
	<b>087N8002</b>	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
	<b>087N8009</b>	TP7001A			Remote (included)			
	<b>087N7748</b>	TS2A	<b>TP7001 Accessory</b> - Replacement Remote Sensor					

## MTC Microline®

MTC Microline®	Code No.	Scale	Voltage (AC)	Sensor
	<b>MTC-39914-UF</b>	°F	24V	Floor 10 ft. (3 m)
	<b>MTC-39914-UC</b>	°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
	<b>088H0024</b>	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
	<b>ETO2-4550</b>	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
	<b>ETO2-BOX</b>	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
	<b>ETOG-56</b>	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)
	<b>ETOK-1</b>	Sensor Cup	3.1" x 2.5" (78 x 63.50 mm)	-	.88 lbs (.4 kg)		
	<b>ETF-744/99</b>	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
	<b>ETF-622</b>	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
	<b>ETOR-55</b>	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
	<b>088L3041</b>	<b>DS-224</b>	24VAC or DC	Rigid conduit or surface	Single 30A, Dry contact	-40° - 185°F (-40° - 85°C)	Integrated	Integrated
	<b>088L3042</b>	<b>DS-824</b>						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
	<b>013G8591</b>	Item # 1 Replacement Socket Body	RA 2000 Wall Mount Operators + RA 2000 Valve Bodies
	<b>013G5503</b>	Item # 2 Bellows Holder (set of 2 pcs)	RA 2000 Wall Mount Operators + RA 2000 Valve Bodies
	<b>013G8593</b>	Item # 1 Replacement Socket Body	RA 2000 Wall Mount Operators + RAV, VMT, and KOVM Valve Bodies
	<b>013G5503</b>	Item # 2 Bellows Holder (set of 2 pcs)	RA 2000 Wall Mount Operators + RAV, VMT, and KOVM Valve Bodies
	<b>013U7175</b>	Spare Vacuum Breaker	RA 2000 1-pipe steam valve, 013G0140
	<b>013G0290</b>	Packing Gland	All RA 2000 Valves
	<b>013U0070</b>	Packing Gland	VMT, KOVM, RAV, FHV-R and RAVL Valves
	<b>013G8070</b>	RA to RA 2000 Adapter	Allows RA 2000 Operators to fit RA Valves
	<b>013-7045</b>	Gasket	013G8070 Adapter
	<b>013G8072</b>	RAV to RA 2000 Adapter	Allows RA 2000 Operators to fit RAV Valves
	<b>013G1236</b>	Tool Set - 2mm Allen Key and Locking Pin Tool	All RA 2000 Operators
	<b>013G1237</b>	Limitation Pins (1 bag containing 30 pcs.)	013G8240 & 013G2922 RA2000 Operators
	<b>013G1232</b>	Cover Plugs for locking screws (Available in lots of 50 pcs.)	013G8240 & 013G2922 RA2000 Operators
	<b>013G1672</b>	Cover Plate for scale (Available in lots of 20 pcs.)	013G8240 & 013G2922 RA2000 Operators
	<b>013G1246</b>	Limitation Pins (1 bag containing 10 pcs.)	013G8250 & 013G8252 RA2000 Operators
	<b>013G5245</b>	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

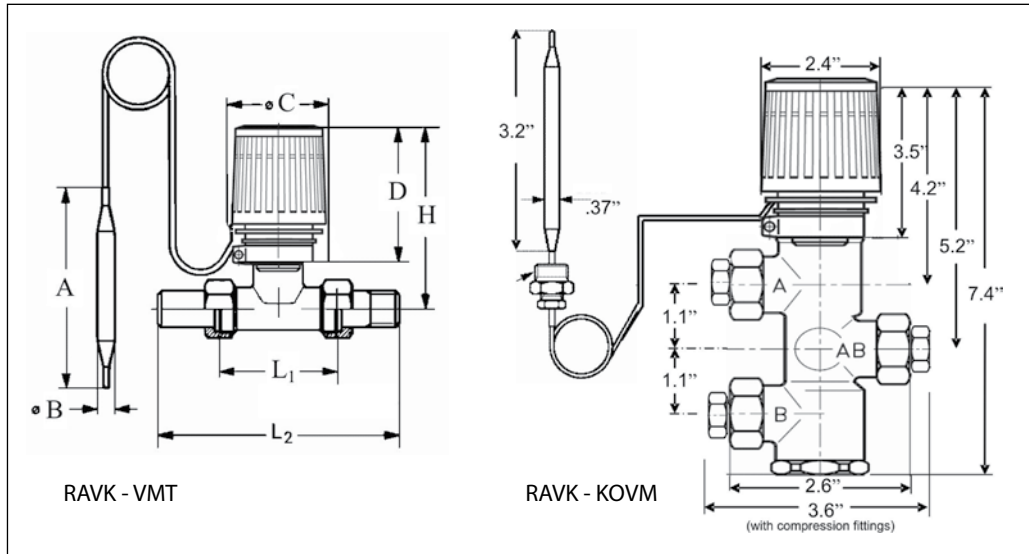
AVTB	Code No.	Description	Temperature Range	Capillary Tube Length
	003N0075	Service Element with Capillary Tube and Sensor - Sensor diameter 0.7" x 8.3" (18 x 210 mm)	32° - 86°F (0° - 30°C)	6' 6" (2 m)
	003N0078		77° - 149°F (25° - 65°C)	
	003N0062		122° - 194°F (50° - 90°C)	

#### 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

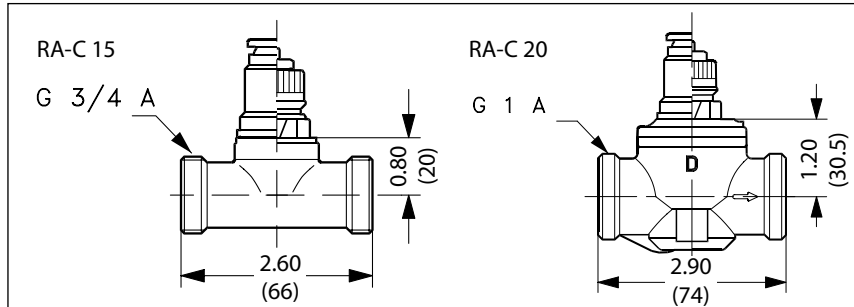
## RAVK, VMT, & KOVM DIMENSIONS



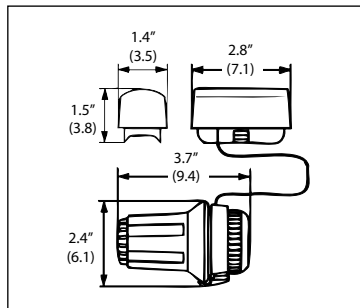
**RAVK-VMT Valve**

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

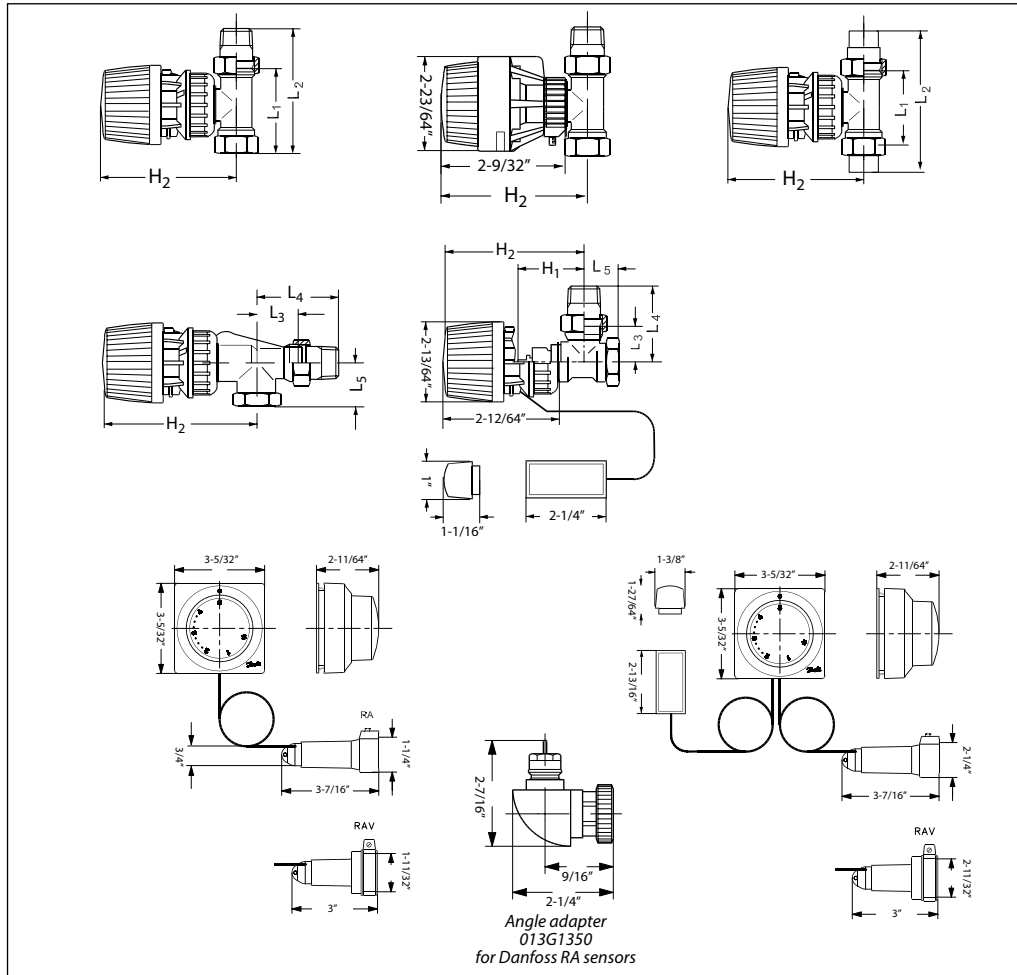


## FTC DIMENSIONS



# Dimensions

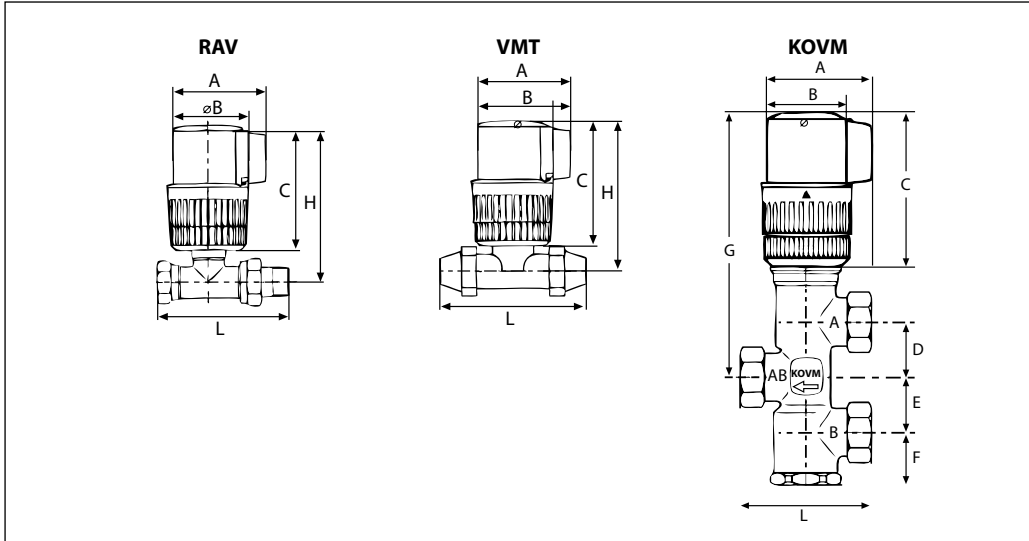
## RA2000 VALVE DIMENSIONS



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



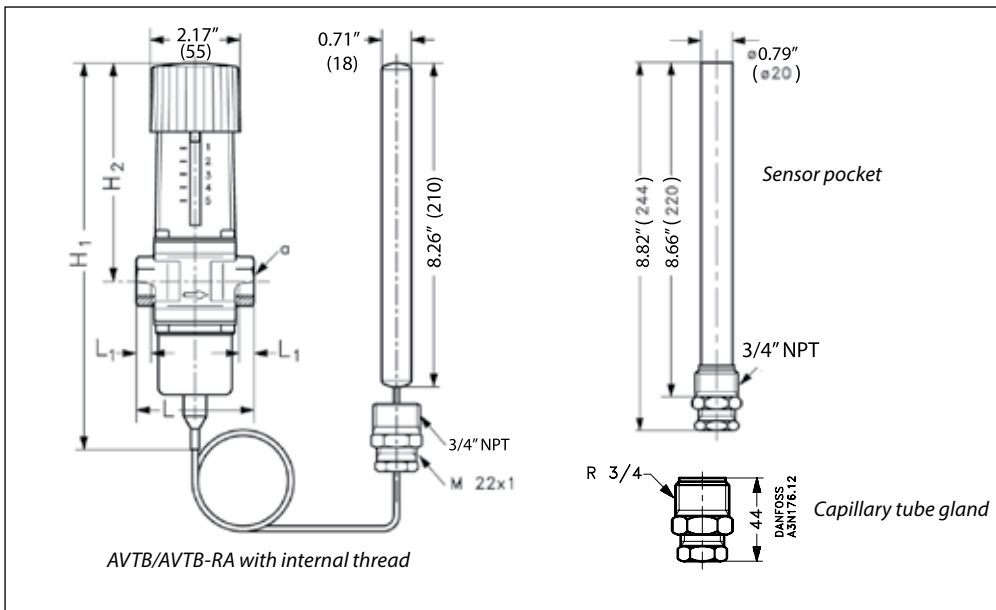
Size	Type	H	L
1/2"	RAV	4.4"	3.7"
3/4"		4.4"	4.2"
1"		4.9"	4.9"
1/2"	VMT	4.4"	4.1"
3/4"		4.4"	4.8"
1"		4.9"	5.7"

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

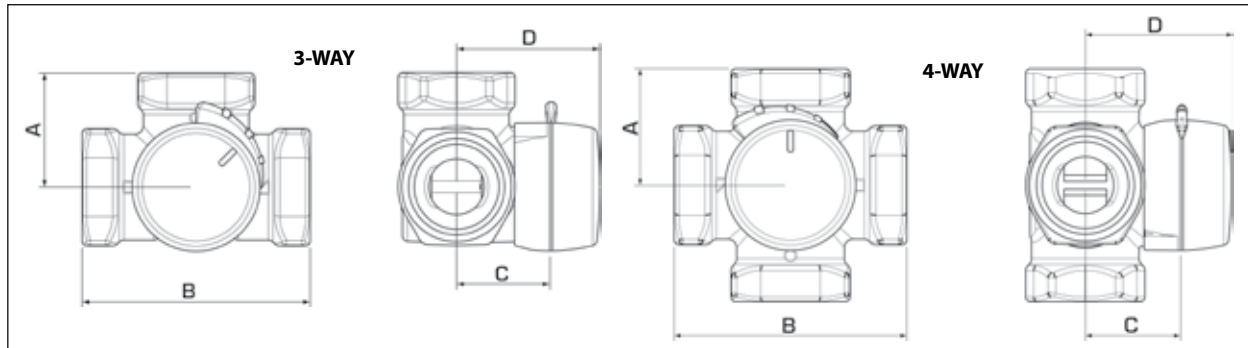
Type	H <sub>1</sub> in (mm)	H <sub>2</sub> in (mm)	L in (mm)	L <sub>1</sub> in (mm)	L2 in (mm)	L3 in (mm)	L4 in (mm)	a (int. thread)
AVTB/AVTB-RA 15	8.54 (217)	5.24 (133)	2.84 (72)	0.56 (14)	5.6 (141)	5.87 (149)	2.95 (75)	1/2" NPT
AVTB/AVTB-RA 20	8.54 (217)	5.24 (133)	3.55 (90)	0.63 (16)	6.06 (154)	6.45 (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

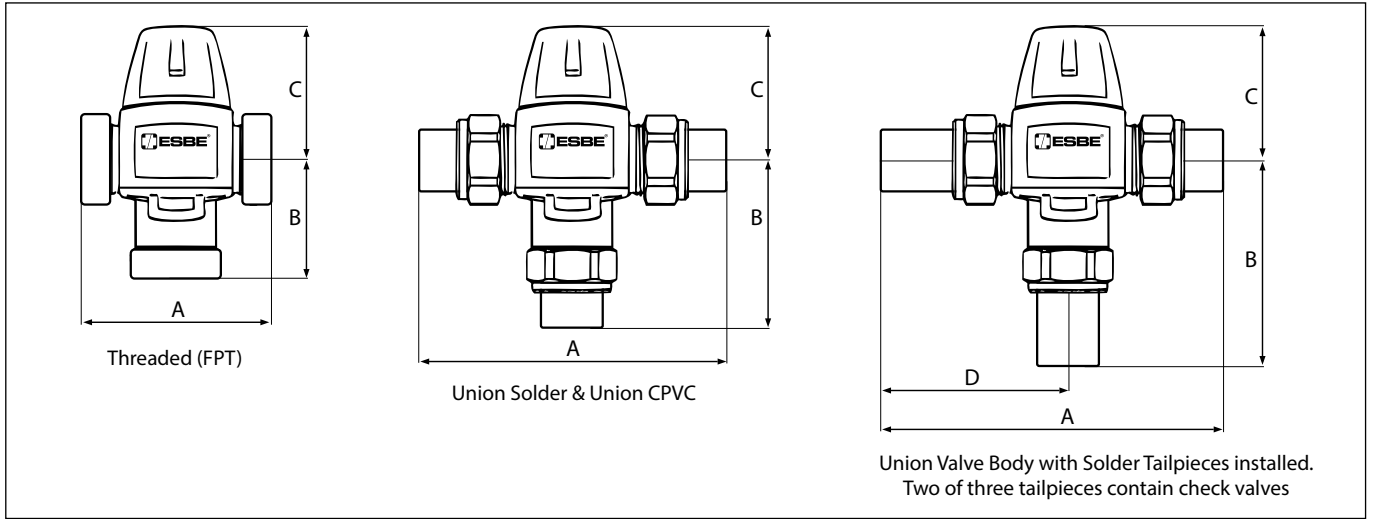
Material	
<b>Valve Body</b>	Cast iron
<b>Slider</b>	Brass CW 614N & Stainless Steel
<b>Stem</b>	Stainless Steel
<b>O-ring</b>	EPDM
<b>Bushing</b>	Plastic / Brass CW 602N
<b>Cover Plate</b>	Zinc / Cast Iron

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)

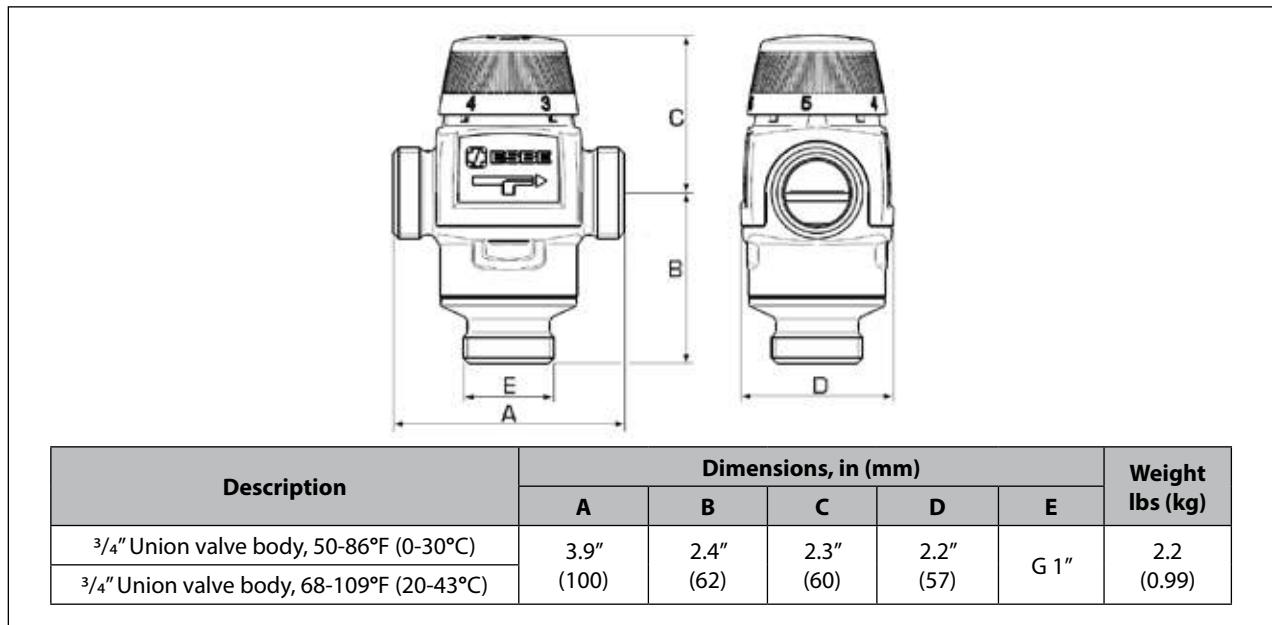
# Dimensions

## ESBE VTA SERIES LEAD FREE THERMOSTATIC MIXING VALVE DIMENSIONS



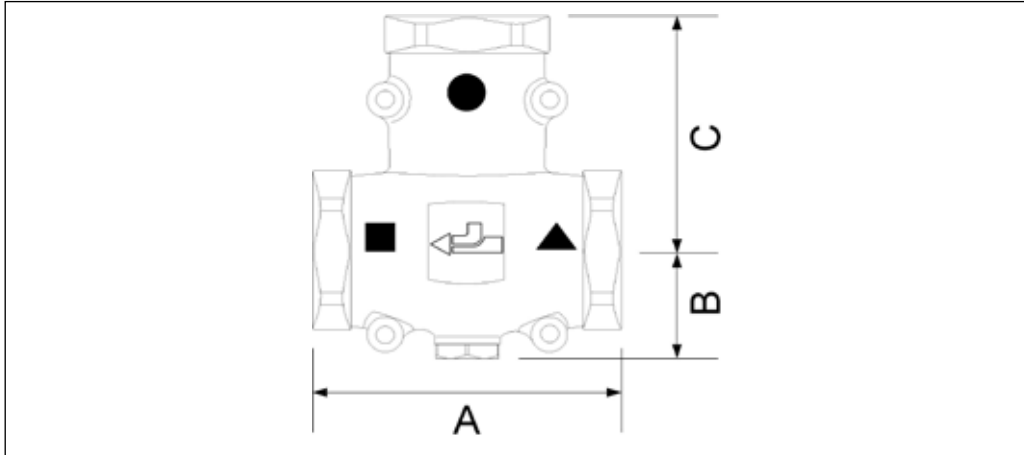
Description	Dimensions, in (mm)				Weight lbs (kg)
	A	B	C	D	
union valve w/ 1/2" solder tailpcs	4.1" (104)	2.3" (59)	2.1" (53)	2.0" (52)	1.7 (0.8)
union valve w/ 3/4" solder tailpcs	4.8" (122)	2.7" (69)	2.1" (53)	2.4" (61)	1.7 (0.8)
union valve w/ 3/4" solder & 2 check valves	5.8" (147)	3.7" (94)	2.1" (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" (83)	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



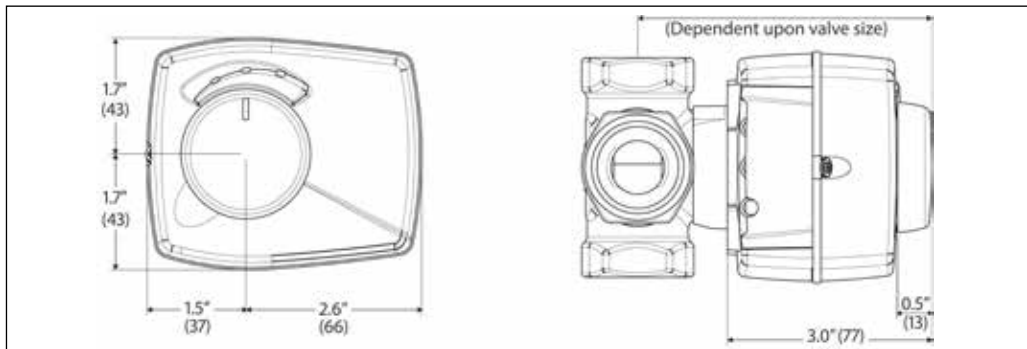
# Dimensions

## ESBE VTC511 VALVE DIMENSIONS

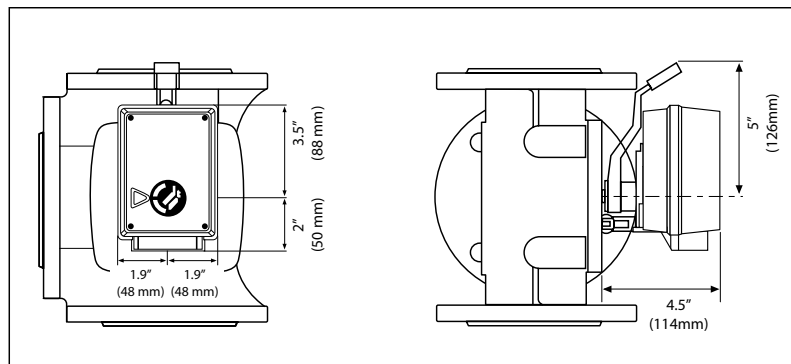


	A	B	C	Depth	Weight
Size	in (mm)	in (mm)	in (mm)	in (mm)	lbs (kg)
1"	3.66 (93)	1.34 (34)	2.72 (69)	1.85 (47)	1.85 (0.84)
1-1/4"	4.13 (105)	1.50 (38)	2.95 (75)	2.17 (55)	3.04 (1.38)

## ESBE ARA ACTUATOR DIMENSIONS

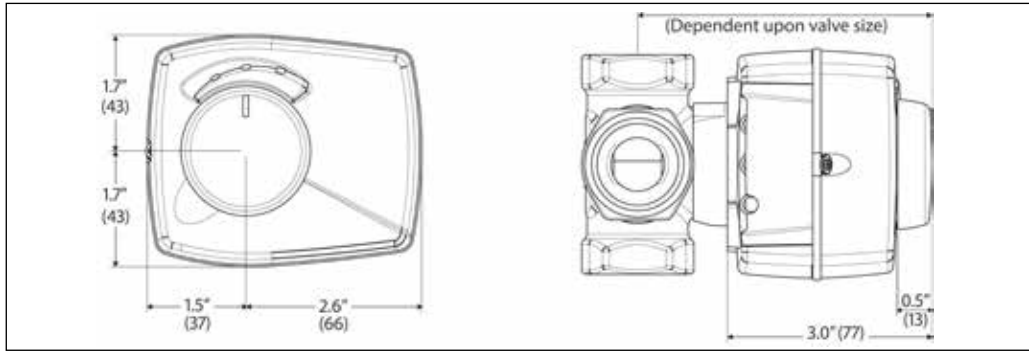


## ESBE SERIES 90 ACTUATOR DIMENSIONS



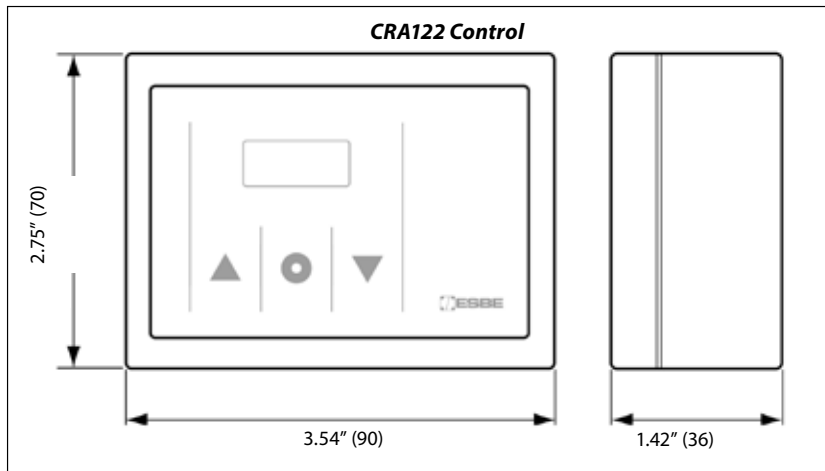
# Dimensions

## ESBE CRA112 SETPOINT CONTROL DIMENSIONS

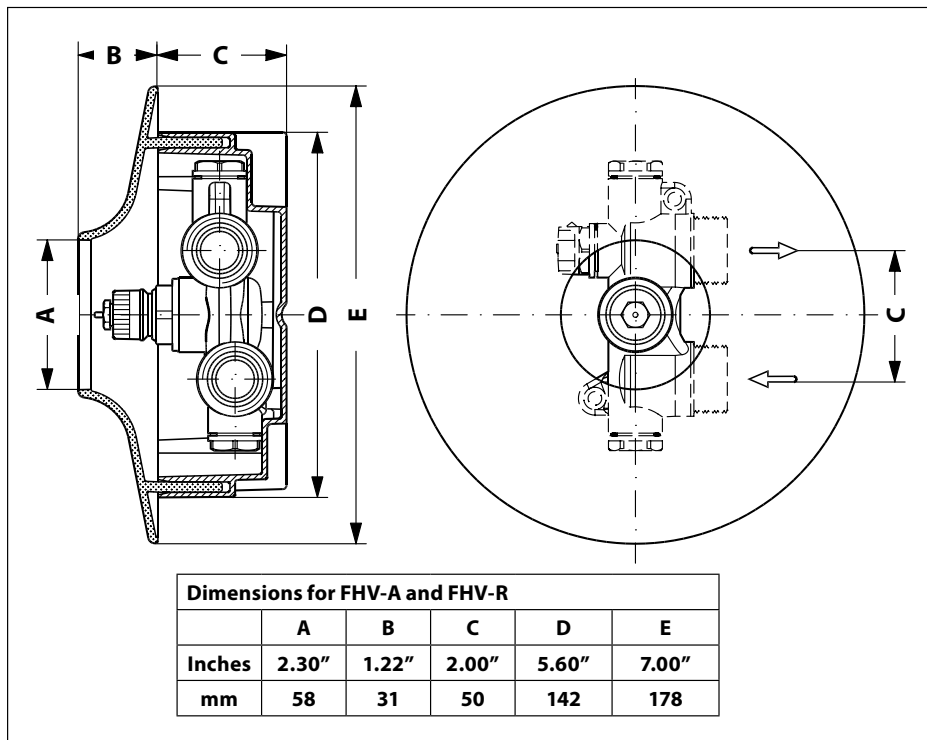


## ESBE CRA122 SETPOINT CONTROL KEYPAD DIMENSIONS

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

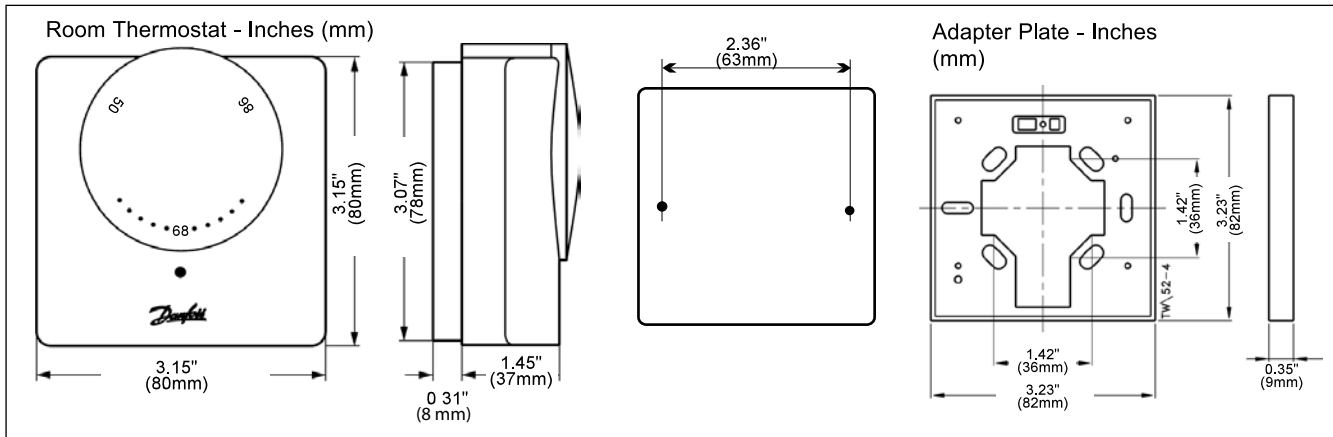


## FHV-R & FHV-A THERMOSTAT DIMENSIONS

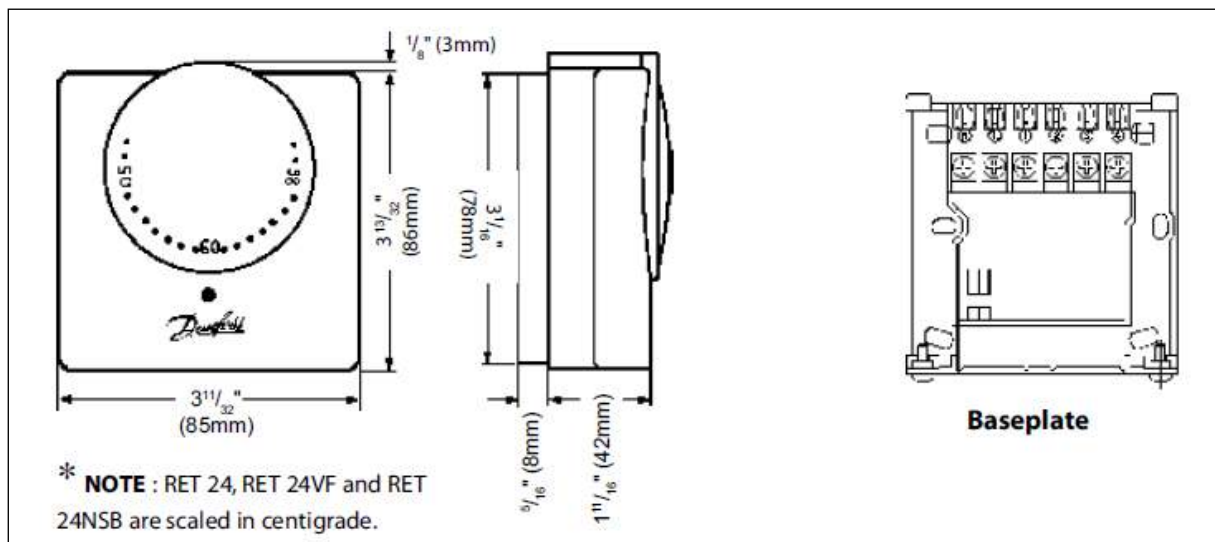


# Dimensions

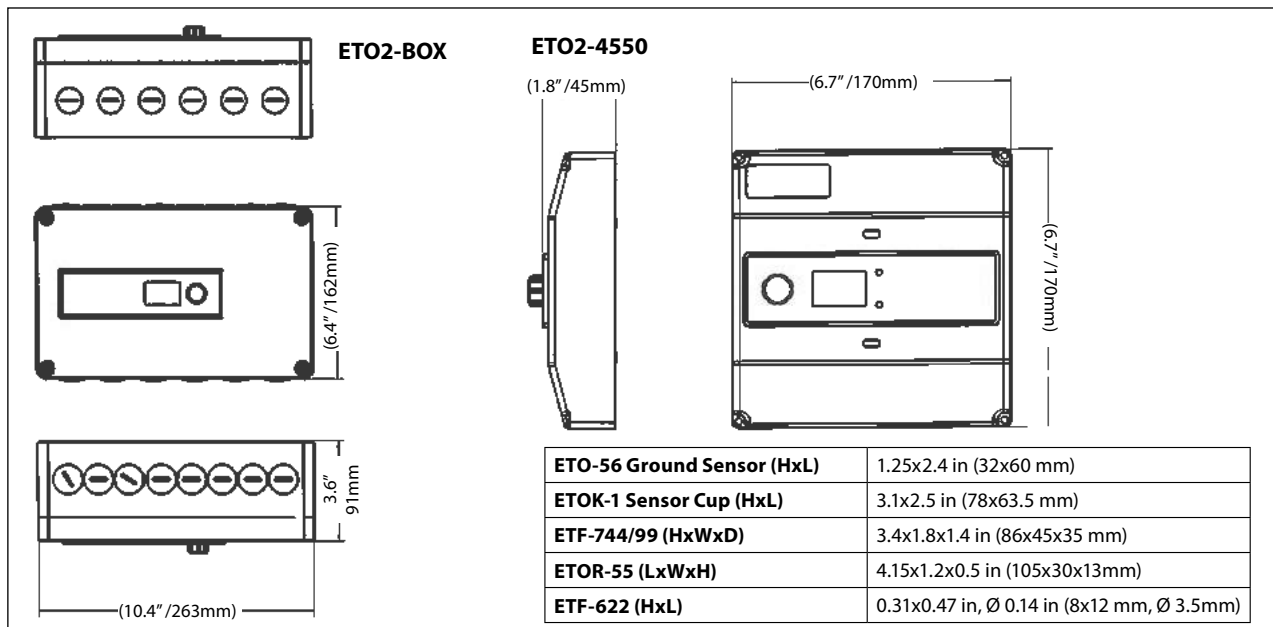
## RMT THERMOSTAT DIMENSIONS



## RET THERMOSTAT DIMENSIONS

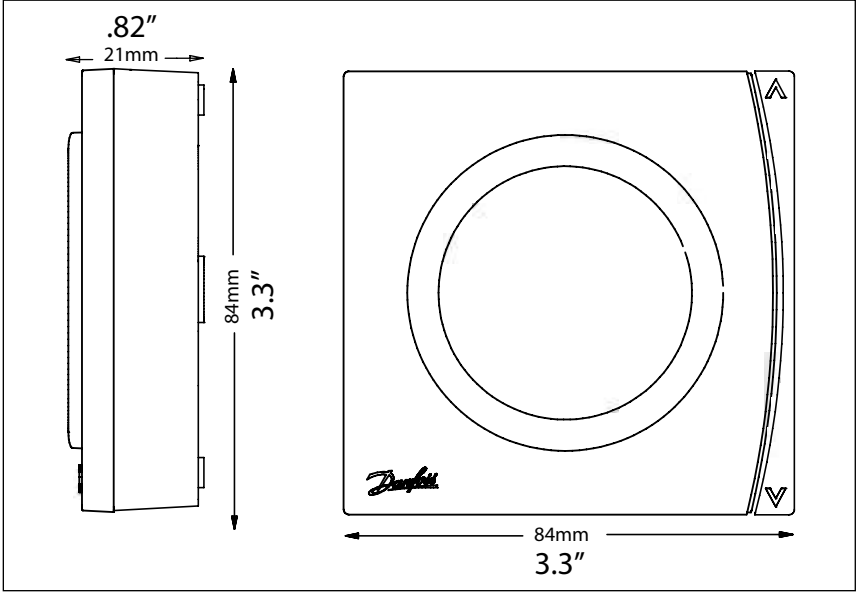


## ETO2 DIMENSIONS

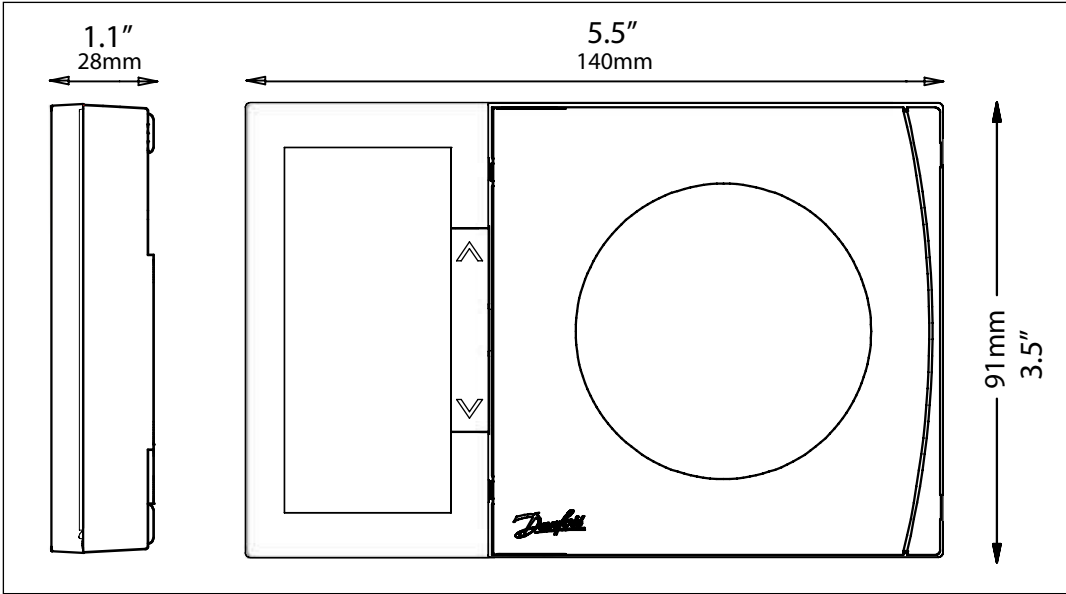


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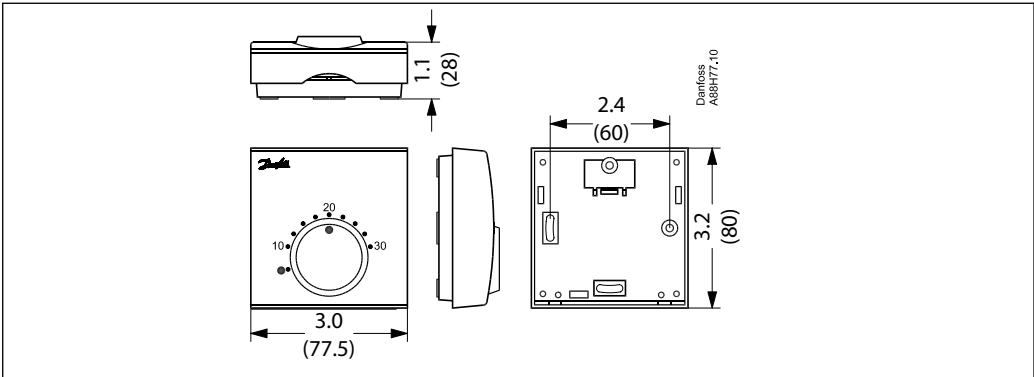
## RET2000B THERMOSTAT DIMENSIONS



## TP7001 THERMOSTAT DIMENSIONS



## FH THERMOSTAT DIMENSIONS

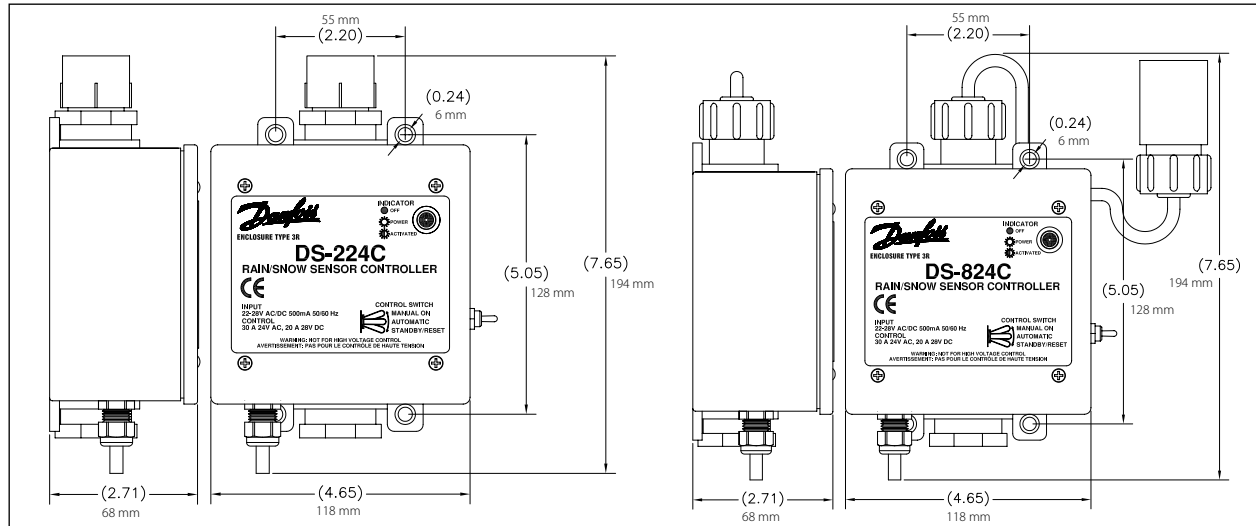


DIMENSIONS

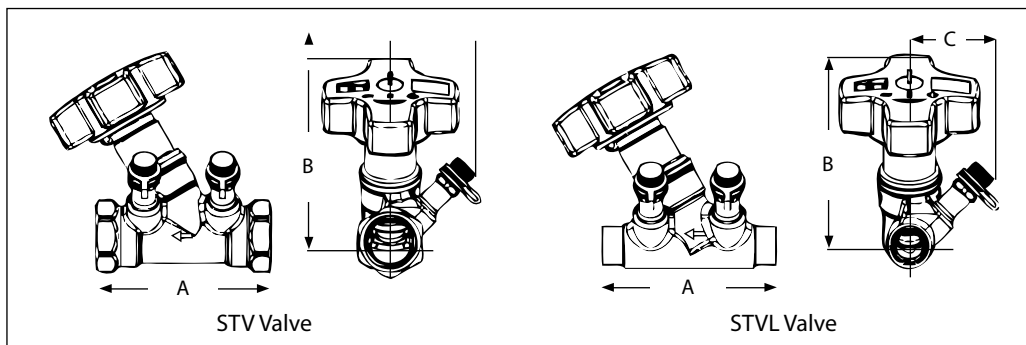


# Dimensions

## DS-224/DS-824 DIMENSIONS



## STV/STVL/STVA DIMENSIONS



STV / STVL <sup>(1)</sup> STVL F.Solder version, <sup>(2)</sup> P/T Tap offset			
Size	A in (mm)	B in (mm)	C <sup>(2)</sup> 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) <sup>(1)</sup>	4.4 (111.7)	2.1 (53.1)

<b>Body and parts in contact with liquid</b>	Dezincification resistant brass
<b>Gaskets:</b>	EPDM
<b>Seat Seal:</b>	EPDM
<b>Handwheel:</b>	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)



# 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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### **Electric Heating Solutions**

With over 70 years of manufacturing experience, Danfoss, offers comfort and safety solutions for both indoor and outdoor applications. And enjoy peace of mind with one of the best, most all-encompassing warranties in the industry - 20 years on LX Floor Heating, GX Snow Melting & TX Thermal Storage products.

**[www.LX.Danfoss.com](http://www.LX.Danfoss.com)**

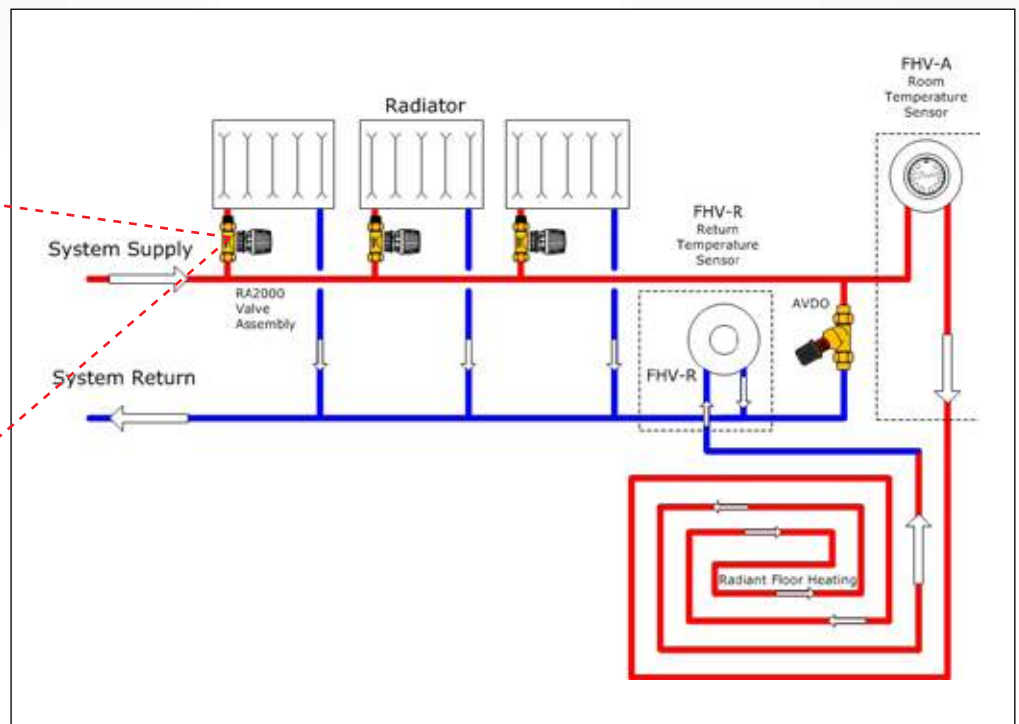
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- Radiant Cooling Controls
- Snow/Ice Melt Controls
- Heat Exchanger Controls
- Boiler Protection Controls
- 2, 3, & 4-Way Mixing Controls
- And more....

**Easy**  
Danfoss makes it easier than ever to find the energy efficient products you need!



To find out more about Danfoss please visit [www.heating.danfoss.us](http://www.heating.danfoss.us) or contact your local Danfoss representative today.