SECTION 15120

HYDRONIC HEATING PIPING SPECIALTIES

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\*\* NOTE TO SPECIFIER \*\* Caleffi North America, Inc.; hydronic heating piping specialties and component products.
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This section is based on the products of Caleffi North America, Inc., which is located at:
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Milwaukee, WI 53208
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Email: [request info (sales@caleffi.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Caleffi+North+America,+Inc.&coid=46802&rep=&fax=414-238-2366&message=RE:%20Spec%20Question%20(15120cal):%20%20&mf=)
Web: [www.caleffi.us/caleffi/en\_US/index.sdo](http://www.caleffi.us/caleffi/en_US/index.sdo)
 [ [Click Here](http://www.arcat.com/arcatcos/cos46/arc46802.html) ] for additional information.
Caleffi North America, Inc. is a leader in the production of Italian-made components for domestic and industrial heating, air conditioning and plumbing systems, and an expert supplier of state-of-the-art system solutions, has celebrated its fiftieth year of activity in 2011. This Italian company is at the heart of an international group which employs more than 1,000 people in its various sales offices and representative branches throughout Europe, America, China, Japan and Australia.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Hydraulic separation devices.
		2. Air and dirt separation and venting devices.
		3. Thermostatic radiator valves and accessories.
		4. Zone valves and relays.
		5. Temperature mixing stations, distribution manifolds and accessories.
		6. Thermostatic mixing valves for hydronic and domestic water systems.
		7. Automatic filling units and backflow preventers.
		8. Boiler trim kits.
		9. Balancing valves.
		10. Storage tanks.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 15105 - Facility Water Distribution Piping.
		2. Section 15140 - Domestic Water Piping.
		3. Section 15480 - Domestic Water Heat Exchangers.
		4. Section 16150 - Common Work Results for Electrical: Wiring Connections.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
		2. CSA B51 4.3 - Boiler, pressure vessel, and pressure piping code.
		3. CSA B64.3 - Backflow Preventers and Vacuum Breakers.
		4. CSA B125.3 - Plumbing fittings.
		5. CSA C309 - Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.
		6. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent.
		7. ANSI B16.5 - Pipe Flanges and Flanged Fittings.
		8. ANSI/NSF 372-2011 - Drinking Water System Components-Lead Content.
		9. ASTM F 1281 Standard Specification for Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Pressure Pipe.
		10. ASTM F 876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing.
		11. UL 873 - Temperature-Indicating and -Regulating Equipment
		12. UL Listed - Underwriters' Laboratories
		13. cUL Listed - Underwriters' Laboratories of Canada
		14. cUPC Listed - IAPMO R&T listing for United States and Canada
		15. UL 1995 - Heating and Cooling Equipment.
		16. ASSE 1017 - Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems.
		17. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices.
		18. IAPMO R&T - Lead Plumbing Law Certified.
		19. UNI EN 215 - (KEYMARK), Thermostatic Radiator Valves. Requirements and Test Methods.
	1. SUBMITTALS
		1. Submit under provisions of Section 01300.
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Preparation instructions and recommendations.
			2. Storage and handling requirements and recommendations.
			3. Installation methods.
		3. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
		4. Closeout Submittals: Submit instructions for operating instructions, assembly views, servicing requirements, and replacement parts list.
	2. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
		2. Installer Qualifications: Company specializing in performing Work of this section with documented experience and approved by manufacturer.
	3. DELIVERY, STORAGE, AND HANDLING
		1. Store products in manufacturer's unopened packaging until ready for installation.
		2. Store and protect products in accordance with manufacturer's recommendations.
		3. Protect pipe openings and piping from debris and other foreign matter by using caps on piping connections.
	4. PROJECT CONDITIONS
		1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
	5. WARRANTY
		1. Provide the manufacturer 2 year limited warranty that hydronic components are free from defects in material and workmanship, or other malfunction or failure to perform, under normal use and services.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Caleffi North America, Inc., which is located at: 3883 W. Milwaukee Rd. ; Milwaukee, WI 53208; Tel: 414-238-2360; Fax: 414-238-2366; Email: [request info (sales@caleffi.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Caleffi+North+America,+Inc.&coid=46802&rep=&fax=414-238-2366&message=RE:%20Spec%20Question%20(15120cal):%20%20&mf=); Web: [www.caleffi.us/caleffi/en\_US/index.sdo](http://www.caleffi.us/caleffi/en_US/index.sdo)

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01600.

\*\* NOTE TO SPECIFIER \*\* Select the hydronic flow control devices required from the following paragraphs as required and delete those not required. Equipment meeting ASME Boiler Pressure Code and CRC CSA B51 are noted.

* 1. HYDRAULIC SEPARATION DEVICES
		1. HydroCal Combination Air, Hydraulic and Dirt Separators: Provided with an epoxy resin painted steel body, 300 series stainless steel internal coalescing mesh, and a brass blow down drain valve on the bottom of the separator with particle separation capacity to 5 microns. All models provided with air vent isolated manually using a shut off ball valve.

\*\* NOTE TO SPECIFIER \*\* Select the device(s) required from the following paragraphs and delete those not required.

* + - 1. Code 549 series ANSI B16.5 Class 150 RF flanged, 2 inches to 4 inches with pre-formed insulation, rigid closed cell expanded polyurethane foam.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Vessel working temperature range w/ insulation: 32 degrees F to 220 degrees F (0 degrees C to 105 degrees C).
				3. Vessel working temperature range w/o insulation: 32 degrees F to 270 degrees F (0 degrees C to 132 degrees C).
				4. Suitable fluids: water or 50 percent maximum glycol solution.
				5. Flow rates: 37.3 gallons per minute to 149 gallons per minute (2.3 liters per second to 9.4 liters per second).
			2. Code NA549 series designed, fabricated and stamped per ASME Section VIII Division 1 and CRN Registered ANSI B16.5 Class 150 RF flanged, 2 inches to 4 inches with pre-formed insulation, rigid closed cell expanded polyurethane foam.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Vessel working temperature range w/ insulation: 32 degrees F to 220 degrees F (0 degrees C to 105 degrees C).
				3. Vessel working temperature range w/o insulation: 32 degrees F to 270 degrees F (0 degrees C to 132 degrees C).
				4. Suitable fluids: water or 50 percent maximum glycol solution.
				5. Flow rates: 37.3 gallons per minute to 149 gallons per minute (2.3 liters per second to 9.4 liters per second).
			3. Code NA549 series designed, fabricated and stamped per ASME Section VIII Division 1 and CRN Registered ANSI B16.5 Class 150 RF flanged, 6 inches to 12 inches. Thermowell pocket, 8-12 inch sizes only, 3/4 inch NPT female front center, 1/2 inch NPT female inlet/outlet flanges.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Vessel working temperature range: 32 degrees F to 270 degrees F (0 degrees C to 132 degrees C).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Flow rate: 380 gallons per minute to 1650 gallons per minute (24 liters per second to 117 liters per second).
		1. Hydraulic Separators: Provided with an epoxy resin painted steel body, a brass blow down drain valve on the bottom of the separator, and automatic brass air vent on the top. Flanged hydro separators, provided with air vent isolated manually using a shut off ball valve. Union sweat or threaded hydro separators provided with brass air vent body automatically isolated by a check valve that closes when air vent body is removed.

\*\* NOTE TO SPECIFIER \*\* Select the device(s) required from the following paragraphs and delete those not required.

* + - 1. Code 548 series NPT and sweat union, 1 inch to 2 inches with a 300 series stainless steel internal baffle, preformed insulation, double density closed cell expanded PE-X, and a 1/2 inch NPT thermometer pocket well front center.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Working temperature range w/ insulation: 32 degrees F to 210 degrees F (0 degrees C to 100 degrees C).
				3. Working temperature range w/o insulation: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).
				4. Suitable fluids: water or 50 percent maximum glycol solution.
				5. Flow rates: 11 gallons per minute to 37 gallons per minute (0.7 liters per second to 2.3 liters per second).
			2. Code 548 series ANSI B16.5 Class 150 RF flanged, 2 inches to 4 inches with 300 series stainless steel internal baffle, pre-formed insulation, double density closed cell expanded polyurethane foam.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Vessel working temperature range w/ insulation: 32 degrees F to 210 degrees F (0 degrees C to 100 degrees C).
				3. Vessel working temperature range w/o insulation: 32 degrees F to 270 degrees F (0 degrees C to 132 degrees C).
				4. Suitable fluids: water or 50 percent maximum glycol solution.
				5. Flow rates: 40 gallons per minute to 247 gallons per minute (2.5 liters per second to 16 liter per second).
			3. Code NA548 series designed, fabricated and stamped per ASME Section VIII Division 1 and CRN Registered ANSI B16.5 Class 150 RF flanged, 2 inches to 4 inches with a 300 Series stainless steel internal baffle, pre-formed insulation, and rigid closed cell expanded polyurethane foam.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Vessel working temperature range w/ insulation: 32 degrees F to 210 degrees F (0 degrees C to 100 degrees C).
				3. Vessel working temperature range w/o insulation: 32 degrees F to 270 degrees F (0 degrees C to 132 degrees C).
				4. Suitable fluids: water or 50 percent maximum glycol solution.
				5. Flow rates: 40 gallons per minute to 247 gallons per minute (2.5 liters per second to 16 liter per second).
			4. Code NA548 series designed, fabricated and stamped per ASME Section VIII Division 1 and CRN Registered ANSI B16.5 Class 150 RF flanged, 5 inches to 6 inches, with a 300 series stainless steel internal baffle.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Vessel working temperature range: 32 degrees F to 270 degrees F (0 degrees C to 132 degrees C).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Flow rates: 300 gallons per minute to 484 gallons per minute (19 liters per second to 31 liters per second).
			5. Code NA548 series designed, fabricated and stamped per ASME Section VIII Division 1 and CRN Registered ANSI B16.5 Class 150 RF flanged, 8 inches to 12 inches, with a 300 series stainless steel internal baffle, and a 3/4 inch NPT female thermometer pocket well on front center and 1/2 inch NPT female on inlet/outlet flanges.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Vessel working temperature range: 32 degrees F to 270 degrees F (0 degrees C to 132 degrees C).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Flow rates: 792 gallons per minute to 1,850 gallons per minute (50 liters per second to 117 liters per second).
		1. SEP4 Combination Hydraulic, Air, Dirt and Magnetic Separators: Provided with an epoxy resin painted steel body, HDPE internal coalescing elements- removable for cleaning, a brass blow down drain valve on the bottom of the separator with hose connection, and automatic brass air vent on the top, brass air vent body with EPDM hydraulic seal, polypropylene air vent float, stainless steel float linkages and stainless steel float guide pin, an external removable magnet belt, neodymium rare-earth. Particle separating capacity to 5 microns (0.2 mil). Magnetic particle (ferrous oxide) separation rating: up to 95 percent removal.
			1. Code 5495 series NPT and sweat union, 1 inch to 2 inches with preformed insulation, double density, closed cell, expanded PE-X, and a 1/2 inch straight female thermometer pocket well, front center.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Working temperature range w/ insulation: 32 degrees F to 210 degrees F (0 degrees C to 100 degrees C).
				3. Working temperature range w/o insulation: 32 degrees F to 230 degrees F (0 degrees C to 110 degrees C).
				4. Suitable fluids: water or 50 percent maximum glycol solution.
				5. Flow rates: 11 gallons per minute to 37 gallons per minute (0.7liters per second to 2.3 liters per second).
		2. Hydraulic Separator Plus Manifold:
			1. HydroLink hydraulic separator plus distribution manifold headers with either built-in wall mounting or provided with angle mounting brackets. Steel body with pre-formed insulation. Provided with air vent and drain valve.

\*\* NOTE TO SPECIFIER \*\* Select the device(s) required from the following paragraphs and delete those not required.

* + - * 1. Code 559920A: 1 inch NPT female primary connection. Connections to secondary, 1 inch NPT male two below (or above).

Maximum working pressure: 100 psi.

Working temperature range: 32 degrees F to 230 degrees F (0 degrees C to 110 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rate: 9 gallons per minute (0.5 liters per second) primary, 22 gallons per minute (1.5 liters per second) secondary (total all branches).

Built-in wall mounting.

Secondary branch outlet center distance: 125 mm (4-15/16 inch).

Primary connection outlet center distance: 60 mm (2-3/8 inch).

* + - * 1. Code 559921A: 1 inch NPT female primary connection. Connections to secondary, 1 inch NPT male two below and 1 inch NPT male one side:

Maximum working pressure: 100 psi.

Working temperature range: 32 degrees F to 230 degrees F (0 degrees C to 110 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rate: 9 gallons per minute (0.5 liters per second) primary, 22 gallons per minute (1.5 liters per second) secondary (total all branches).

Built-in wall mounting.

Secondary branch outlet center distance: 125 mm (4-15/16 inch).

Primary connection outlet center distance: 60 mm (2-3/8 inch).

* + - * 1. Code 559922A: 1-1/4 inch NPT female primary connection. Connections to secondary, 1 inch NPT male two top and 1 inch NPT male two below:

Maximum working pressure: 100 psi.

Working temperature range: 32 degrees F to 230 degrees F (0 degrees C to 110 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rate: 11 gallons per minute (0.7 liters per second) primary, 26 gallons per minute (1.7 liters per second) secondary (total all branches).

Provided with angle mounting brackets for front-to-back positioning.

Secondary branch outlet center distance: 125 mm (4-15/16 inch).

Primary connection outlet center distance: 80 mm (3-1/8 inch).

* + - * 1. Code 559931A: 1-1/4 inch NPT female primary connection. Connections to secondary, 1 inch NPT male three top and 1 inch NPT male one below.

Maximum working pressure: 100 psi.

Working temperature range: 32 degrees F to 230 degrees F (0 degrees C to 110 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rate: 11 gallons per minute (0.7 liters per second) primary, 26 gallons per minute (1.7 liters per second) secondary (total all branches).

Provided with angle mounting brackets for front-to-back positioning.

Secondary branch outlet center distance: 125 mm (4-15/16 inch).

Primary connection outlet center distance: 80 mm (3-1/8 inch).

\*\* NOTE TO SPECIFIER \*\* Select the air separators, dirt separators and air vents required from the following paragraphs as required and delete those not required.

* + 1. Hydraulic Separator Accessories:
			1. High Capacity Automatic Air Vents:
				1. Code 501502A Extra High Capacity Air Vent, Provided with 3/4 inch NPT brass body and cover, stainless steel internal components.

Maximum working pressure: 230 psi (15 bar).

Maximum discharge pressure: 90 psi (6 bar).

Maximum working temperature: 250 degrees F (120 degrees C).

* + - * 1. Code 5022/3 series - High capacity automatic air vent available with or without automatic check valve. 1/2 inch NPT brass body.

Maximum working pressure: 150 psi (10 bar).

Maximum discharge pressure: 60 psi (4 bar).

Maximum working temperature: 250 degrees F (120 degrees C).

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 502243A: Air vent.

Code 502343A: Air vent with service check valve.

* + - 1. Code 694045 Temperature pocket well for 1 inch to 1-1/2 inch Hydraulic Separator.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

* + - * 1. 1/2 inch straight thread.
				2. 1-3/4 inch pocket length.
		1. Miscellaneous System Components:
			1. Differential Pressure By-Pass Valve
				1. Code 519 series with threaded or sweat union inlet and outlet connections, brass body and valve plug, EPDM valve plug gasket and O-ring seals, asbestos free NBR union seals.

Differential pressure adjustable from 2 psi to 10 psi (1 m w.g. to 6 m w.g.).

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 230 degrees F (0 degrees C to 110 degrees C).

Suitable fluids: water or 30 percent maximum glycol solution.

3/4 inch flow up to 9 gallons per minute (2 m3 per hour).

1 inch flow up to 40 gallons per minute (9 m3 per hour).

1-1/4 inch flow up to 45 gallons per minute (10 m3 per hour).

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 519502A: 3/4 inch NPT inlet by 3/4 inch NPT outlet.

Code 519566A: 3/4 inch press inlet by 3/4 inch press outlet.

Code 519599A: 3/4 inch sweat inlet by 3/4 inch sweat outlet

Code 519600A: 1 inch NPT inlet by 1 inch NPT outlet.

Code 519609A: 1 inch NPT inlet by 1 inch sweat outlet.

Code 519700A: 1-1/4 inch NPT inlet by 1-1/4 inch NPT outlet.

Code 519709A: 1-1/4 inch NPT inlet by 1-1/4 inch sweat outlet.

* + - 1. Universal Flow switch
				1. Code 626600A suitable for 1 inch to 8 inch pipe with 1 inch NPT male pipe connection and 1/2 inch NPT female conduit connection, brass body, self-extinguishing polycarbonate cover and micro switch protection casing, stainless steel bellows and bellows rod, stainless steel paddles for pipes and stainless steel micro switch spring, EPDM O-ring seals.

Adjustable flow rate settings for switch open and switch close.

Normally open or normally closed operation.

Maximum working pressure: 150 PSI (10 bar).

Working temperature range: minus 20 degrees F to 250 degrees F (minus 30 degrees C to 120 degrees C).

Suitable fluids: water or 30 percent maximum glycol solution.

Maximum ambient temperature: 130 degrees F (55 degrees C).

Power supply: 250 VAC.

Switch contact rating: Resistive/Inductive 15 A at 240 VAC Maximum. Motor Load 5 A, 1/4 hp at 125 VAC (Normally Closed), 1.5 A, 1/8 hp at 125 VAC (Normally Open).

Certifications: CE, cULus, NEMA Type 5, IP54.

Minimum switch trip flow: 5.7 gallons per minute (1.3 m3 per hour), maximum switch trip flow 334 gallons per minute (75 m3 per hour).

* + - 1. Boiler Drain valve
				1. Code 538 series Drain Valve, brass body with 3/4 inch garden hose thread connector and cap. 1/4 inch or 1/2 inch NPT connection.

Maximum working pressure: 150 PSI (10 bar).

Maximum working temperature: 250 degrees F (120 degrees C).

Suitable fluids: water or 30 percent maximum glycol solution.

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 538202 FD: 1/4 inch NPT male by 3/4 inch garden hose thread.

Code 538402 FD: 1/2 inch NPT male by 3/4 inch garden hose thread.

* 1. AIR AND DIRT SEPARATION AND VENTING DEVICES
		1. Automatic Air Vents:
			1. High Discharge Capacity Float-type Automatic Air Vents:
				1. Code 501502A Extra High Discharge Capacity Automatic Air Vent. Provided with 3/4 inch NPT female brass body and cover. Stainless steel internal components. Thin mesh filter strainer. Viton mechanism seal. EPDM hydraulic seals.

Maximum working pressure: 230 psi (15 bar).

Maximum discharge pressure: 90 psi (6 bar).

Air discharge capacity: greater than 8 scfm.

Working temperature range: minus 4 degrees F to 250 degrees F (minus 20 degrees C to 120 degrees C).

Suitable fluids: water or 30 percent maximum glycol solution.

* + - * 1. Code 551004A DISCALAIR High Discharge Capacity Automatic Air Vent. Provided with 1/2 inch NPT female brass body. Polypropylene float guided by centering pin. Brass float guide. Stainless steel float lever and spring. Brass air release valve stem. EPDM hydraulic seals.

Maximum working pressure: 150 psi (10 bar).

Maximum discharge pressure: 150 psi (10 bar).

Air discharge capacity: greater than 4 scfm.

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

* + - * 1. Code 5022/3 series - High capacity automatic air vent available with or without automatic check valve. 1/2 inch NPT male brass body. Polypropylene float. Brass float linkage. EPDM hydraulic seals.

Maximum working pressure: 150 psi (10 bar).

Maximum discharge pressure: 60 psi (4 bar).

Air discharge capacity: greater than 2 scfm.

Maximum working temperature: 250 degrees F (120 degrees C).

Suitable fluids: water or 30 percent maximum glycol solution.

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 502243A: Air vent.

Code 502343A: Air vent with service check valve.

* + - 1. Standard Discharge Capacity Float-Type Automatic Air Vents:
				1. MINICAL Automatic Air Vent: Provided with 1/2 inch NPT male brass body and cover, polypropylene float, brass valve stem, stainless steel vent wire lever and spring, EPDM O-Rings, and available with or without automatic check valve.

Maximum working pressure: 150 psi (10 bar).

Maximum venting discharge pressure: 40 psi (2.5 bar).

Maximum working temperature: 250 degrees F (120 degrees C).

Air discharge capacity: to 1.6 scfm.

Suitable fluids: water or 30 percent maximum glycol solution.

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 502015A: Air vent.

Code 502115A: Air vent with service check valve.

* + - * 1. Code 5026/7 series Automatic air vent available with or without automatic check valve. 1/2 inch brass body with 1/8 inch or 1/4 inch NPT male connection. Polypropylene float. Silicone rubber mechanism seal. EPDM hydraulic seals.

Maximum working pressure: 150 psi (10 bar).

Maximum discharge pressure: 90 psi (6 bar).

Maximum working temperature: 240 degrees F (115 degrees C).

Air discharge capacity: greater than 1.75 scfm.

Suitable fluids: water or 30 percent maximum glycol solution.

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 502610A: Air vent with 1/8 inch NPT male connection.

Code 502620A: Air vent with 1/4 inch NPT male connection.

Code 502710A: Air vent with 1/8 inch NPT male connection and service check valve.

Code 502720A: Air vent with 1/4 inch NPT male connection and service check valve.

* + - 1. Hygroscopic Type Automatic Air Vent:
				1. Code 508013A - Manual operation by rotating knob counterclockwise, chrome-plated brass body with 1/8 inch NPT male connection. Integral check valve. White POM heat resistance knob. Replaceable hygroscopic cartridge.

Maximum working pressure: 150 psi (10 bar).

Maximum working temperature: 212 degrees F (100 degrees C).

Hydronic and low pressure steam (15 psi rated).

* + 1. Manual air vents
			1. Manual Air Vents:
				1. Code 337221A - Manual Air Vent with metal seal and adjustable outlet with 1/4 inch NPT male brass body with PTFE seal on thread

Maximum working pressure: 150 psi (10 bar).

Maximum working temperature: 212 degrees F (100 degrees C).

* + 1. Dirt Separators for Small Applications:
			1. DIRTCAL Brass Dirt Separators: Provided with brass body, a brass blow down drain valve on the bottom of the separator. Particle separating capacity to 5 microns (0.2 mil).
				1. Code 5462 series NPT and sweat connections for horizontal piping, 3/4 inch to 2 inches and a glass reinforced nylon PA66G30 internal mesh element.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rates: 6 gallons per minute to 36 gallons per minute (0.4 liters per second to 2.3 liters per second).

\*\* NOTE TO SPECIFIER \*\* Select the following optional paragraph if required and delete if not required.

Provide with optional Code CBN5462 series pre-formed insulation shell for field installation.

* + - * 1. Code NA5469 series sweat connection for vertical piping, 3/4 inch to 1 inch and a 304 stainless steel internal mesh element.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rate: 9.0 gallons per minute (0.6 liters per second).

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code NA546995: 3/4 inch sweat.

Code NA546996: 1 inch sweat.

* + - 1. DIRTMAG Brass Dirt Separator with Magnet: Provided with brass body, a brass blowdown drain valve on the bottom of the separator. Particle separating capacity to 5 microns (0.2 mils). Magnetic particle (ferrous oxide) separation rating: up to 95 percent removal.
				1. Code 5463 series NPT and sweat connections for horizontal piping, 1 inch to 2 inches and a glass reinforced nylon PA66G30 internal mesh element with an external removable magnet belt, neodymium rare-earth.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rates: 6 gallons per minute to 36 gallons per minute (0.4 liters per second to 2.3 liters per section).

\*\* NOTE TO SPECIFIER \*\* Select the following optional paragraph if required and delete if not required.

Provide with optional code CBN5462 series pre-formed insulation shell for field installation.

* + - 1. DIRTMAG Dirt Separator with Magnet: Provided with engineered polymer PA66G30 (composite) body, a brass blowdown drain valve on the bottom of the separator with hose connection and brass tee pipe fitting, EPDM hydraulic seals. Magnetic particle (ferrous oxide) separation rating: up to 95 percent removal.
				1. Code NA5453 series NPT male sweat and press connections, adjustable for either vertical or horizontal piping, 3/4 inch and 1 inch and a HDPE internal element removable for cleaning. Includes an external removable magnet collar, neodymium rare-earth.

Maximum working pressure: 45 psi (3 bar).

Working temperature range: 32 degrees F to 195 degrees F (0 degrees C to 90 degrees C).

Suitable fluids: water or 30 percent maximum glycol solution.

Flow rates: 12 to 12.2 Cv.

* + 1. Dirt separators for commercial applications:
			1. DIRTCAL Steel Dirt Separators: Provided with epoxy resin coated steel body, a 304 stainless steel internal mesh element, a brass blow down drain valve on the bottom of the separator and a top connection 3/4 inch NPT with plug, with particle separating capacity to 5 microns (0.2 mil).
				1. Code 5465 series ANSI B16.5 Class 150 RF flanged, 2 inches to 4 inches.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rates: 37.3 gallons per minute to 149 gallons per minute (2.35 liters per second to 9.4 liters per second).

* + - * 1. Code NA5465 series designed, fabricated and stamped per ASME Section VIII Division 1 and CRN Registered ANSI B16.5 Class 150 RF flanged, 2 inches to 6 inches.

Maximum working pressure; 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rates: 37.3 gallons per minute to 380 gallons per minute (2.35 liters per second to 24 liters per second).

* + 1. Air separators for small applications:
			1. DISCAL Brass Air Separators: Provided with brass body, stainless steel float linkages, stainless steel float guide pin and 1/2 inch NPT drain port for optional service check valve (except NA5519 series).
				1. Code 551003A 3/4 inch NPT and 551022A 3/4 inch sweat connections for horizontal piping, compact size with 304 stainless steel internal coalescing mesh element removable for cleaning.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 14.3 gallons per minute (0.9 liters per second).

* + - * 1. Code 551 series NPT and sweat connections for horizontal piping, 3/4 inch to 2 inches, with glass reinforced nylon internal coalescing mesh element removable for cleaning.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High Velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 19 gallons per minute to 86 gallons per minute (1.2 liters per second to 5.4 liters per second).

\*\* NOTE TO SPECIFIER \*\* Select the following optional paragraph if required and delete if not required.

Provide with optional Code CBN551 series pre-formed insulation shell for field installation.

* + - * 1. Code NA5519 series sweat connection for vertical piping, 3/4 inch to 1 inch with 304 stainless steel internal coalescing mesh element.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 20 gallons per minute (1.26 liters per second).

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code NA551995: 3/4 inch sweat.

Code NA551996: 1 inch sweat.

* + 1. Air separators for commercial applications:
			1. DISCAL steel air separators: Provided with epoxy resin coated steel body, stainless steel float linkages, stainless steel float guide pin, a 1 inch NPT drain pipe on the bottom of the separator, and flush valve side tap with 304 stainless steel internal coalescing mesh element.
				1. Code 551 series ANSI B16.5 Class 150 RF flanged, 2 inches to 6 inches.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 88.8 gallons per minute to 903.6 gallons per minute (5.6 liters per second to 57 liters per second).

* + - * 1. Code NA551series designed, fabricated and stamped per ASME Section VIII Div. 1 and CRN Registered ANSI B16.5 Class 150 RF flanged, 2 inches to 6 inches.

Maximum working pressure; 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 88.8 gallons per minute to 903.6 gallons per minute (5.6 liters per second to 57 liters per second).

* + 1. Air and dirt separators for small applications:
			1. DISCALDIRT Brass Air and Dirt Separators: Provided with brass body, glass reinforced nylon internal coalescing mesh element removable for cleaning, stainless steel float linkages, stainless steel float guide pin, and a brass blow down drain valve with hose connection on the bottom of the separator with particle separating capacity to 5 microns (0.2 mil). Provide with optional Code CBN546002 pre-formed insulation shell for field installation.
				1. Code 5460 series NPT and sweat, 3/4 inch to 1-1/4 inches.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rated at maximum 4 feet per second (1.2 meters per second) fluid velocity: 8 gallons per minute to 10 gallons per minute (0.5 liters per second to 0.6 liters per second).

* + - 1. DISCALDIRTMAG Brass Air and Dirt Separator with Magnet: Provided with brass body, glass reinforced nylon internal coalescing mesh element removable for cleaning, stainless steel float linkages, stainless steel float guide pin, and a brass blow down drain valve with hose connection on the bottom of the separator with particle separating capacity to 5 microns (0.2 mil). Magnetic particle (ferrous oxide) separation rating: up to 95 percent removal. Provide with optional Code CBN546002 pre-formed insulation shell for field installation.
				1. Code 5461 series NPT male and sweat connections, 3/4 inch to 1-1/4 inches. Includes an external removable magnet collar, neodymium rare-earth.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

Flow rated at maximum 4 feet per second (1.2 meters per second) fluid velocity: 8 gallons per minute to 10 gallons per minute (0.5 liters per second to 0.6 liters per second).

* + 1. Air and dirt separators for commercial applications:
			1. DISCALDIRT Steel Air and Dirt Separators: Provided with epoxy resin coated steel body, 304 stainless steel internal coalescing mesh element, stainless steel float linkages, stainless steel float guide with particle separating capacity to 5 microns (0.2 mil).
				1. Code 546 series ANSI B16.5 Class 150 RF flanged, 2 inches to 6 inches, with a 1 inch NPT drain pipe on the bottom of the separator. Provide with 1 inch drain ball valve code NA39753.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High Velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 88.8 gallons per minute to 903.6 gallons per minute (5.6 liters per second to 57 liters per second).

* + - * 1. Code NA546 series designed, fabricated and stamped per ASME Section VIII Div. 1 and CRN Registered, ANSI B16.5 Class 150 RF flanged, 2 inches to 12 inches, with a 1 inch (2-6 inch) or 2 inch (8-12 inch) male NPT drain pipe on the bottom of the separator. Provide with 1 inch drain ball valve code NA39753 for 2-6 inch separators; 2 inch drain ball valve code NA59600 for 8-12 inch separators.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High Velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 88.8 gallons per minute to 3530 gallons per minute (5.6 liters per second to 222 liters per second).

* + - * 1. Code NA546 series designed, fabricated and stamped per ASME Section VIII Div. 1 and CRN Registered, NPT male threaded, 2 inches to 2-1/2 inches, with a 1 inch male NPT drain pipe on the bottom of the separator. Provide with 1 inch drain ball valve code NA39753.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: 32 degrees F to 250 degrees F (0 degrees C to 120 degrees C).

Suitable fluids: water or 50 percent maximum glycol solution.

High Velocity flow rate at maximum 10 feet per second (3 meters per second) fluid velocity: 88.8 gallons per minute to 150.1 gallons per minute (5.6 liters per second to 9.5 liters per second).

\*\* NOTE TO SPECIFIER \*\* Select the radiator components required from the following paragraphs as required and delete those not required.

* 1. THERMOSTATIC RADIATOR VALVES AND ACCESSORIES

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

* + 1. Thermostatic Control Heads:
			1. Thermostatic control head for radiator valves, Code 200000: Provided with built-in sensor with liquid-filled element and temperature adjustment settings of 45 degrees F to 82 degrees F (7 degrees C to 28 degrees C). Adjustable maximum temperature setting range. Temperature lock feature. Freeze protection feature. Provide with optional accessory code 209000 tamper-proof cap for public installations, and code 209001 hex key. Combined with Caleffi 220 and 221 series thermostatic valves are certified to UNI EN215.
			2. Thermostatic control head for radiator valves, Code 201000: Provided with remote sensor with liquid-filled element and temperature adjustment settings of 45 degrees F to 82 degrees F (7 degrees C to 28 degrees C). Capillary length 78 inches (2 meters). Adjustable maximum temperature setting range. Temperature lock feature. Freeze protection feature. Provide with optional accessory code 209000 tamper-proof cap for public installations, and code 209001 hex key. Combined with Caleffi 220 and 221 series thermostatic valves are certified to UNI EN215.
			3. Thermostatic control head for radiator valves, Code 203502: Provided with remote sensor probe with liquid-filled element, capillary length 78 inches (2 meters) and adjustable temperature range of 68 degrees F to 122 degrees F (20 degrees C to 50 degrees C). Adjustable maximum temperature setting range. Temperature lock feature. Freeze protection feature.
			4. Thermostatic control head with remote adjusting knob, Code 472000: Provided with remote wall sensor with liquid-filled element, capillary length 78 inches (2 meters). and temperature adjustment range of 43 degrees F to 82 degrees F (6 degrees C to 28 degrees C). Provide with optional accessory pocket well code NA475002, length 7-3/8 inches (187 mm), 3/4 inch NPT male.
		2. NPT Thermostatic radiator valve bodies
			1. Thermostatic valve, Code 220 series, for radiators suitable for thermo-electric and thermostatic control heads. Provided with angled connections 1/2 inch and 3/4 inch NPT, brass chrome-plated body, and manual control cap in ABS white RAL 9010, double seal on control stem with EPDM O-Rings. Combined with Caleffi 200 and 201 series thermostatic control heads certified to UNI EN215.
				1. Temperature range: 40 degrees F to 212 degrees F (5 degrees C to 100 degrees C).
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 30 percent maximum glycol solution.

\*\* NOTE TO SPECIFIER \*\* Select the following optional paragraph if required and delete if not required.

* + - * 1. Provide with optional code 200000, 201000, 203502, or 472000 thermostatic control head, or 449010 manual temperature adjustment knob.
			1. Thermostatic valve, Code 221 series, for radiators suitable for thermo-electric and thermostatic control heads. Provided with straight-through connections 1/2 inch and 3/4 inch NPT, brass chrome-plated body, and manual control cap in ABS white RAL 9010, double seal on stainless steel control stem with EPDM O-Rings. Combined with Caleffi 200 and 201 series thermostatic control heads certified to UNI EN215.
				1. Temperature range: 40 degrees F to 212 degrees F (5 degrees C to 100 degrees C).
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 30 percent maximum glycol solution.

\*\* NOTE TO SPECIFIER \*\* Select the following optional paragraph if required and delete if not required.

* + - * 1. Provide with optional code 200000, 201000, 203502, or 472000 thermostatic control head, or 449010 manual temperature adjustment knob.
		1. Metric Thermostatic Radiator Valve Bodies:
			1. Convertible radiator valve, Code 338452, for thermo-electric or thermostatic control heads. Provided with angled brass chrome-plated body for copper, single and multilayer PE-X pipes, control knob in ABS white RAL 9010, double seal on stainless steel control stem with EPDM O-rings. Radiator connection 1/2 inch straight male thread with tailpiece complete with EPDM seal pipe connection 3/4 inch conical. Temperature adjustment manually or thermostatically.
				1. Temperature range: 40 degrees F to 212 degrees F (5 degrees C to 100 degrees C).
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
			2. Convertible radiator valve, Code 339452, for thermo-electric or thermostatic control heads. Provided with straight-through brass chrome-plated body for copper, single and multilayer PE-X pipes, control knob in ABS white RAL 9010, double seal on stainless steel control stem with EPDM O-rings. Radiator connection 1/2 inch straight male thread with tailpiece complete with EPDM seal pipe connection 3/4 inch conical. Temperature adjustment manually or thermostatically.
				1. Temperature range: 40 degrees F to 212 degrees F (5 degrees C to 100 degrees C).
				2. Maximum working pressure: 150 psi.
				3. Suitable fluids: water or 30 percent maximum glycol solution.
			3. Isolation and balancing valve, Code 342452. Provided with angled brass chrome-plated body for copper, single and multilayer PE-X pipes, control knob in ABS white RAL 9010, double seal on stainless steel control stem with EPDM O-rings. Radiator connection 1/2 inch straight male thread with tailpiece complete with EPDM seal pipe connection 3/4 inch conical.
				1. Temperature range: 40 degrees F to 212 degrees F (5 degrees C to 100 degrees C).
				2. Maximum working pressure: 150 psi
				3. Suitable fluids: water or 30 percent maximum glycol solution.
			4. Isolation and balancing valve, Code 343452. Provided with straight-through brass chrome plated body for copper, single and multilayer PE-X pipes, control knob in ABS white RAL9010, double seal on stainless steel control stem with EPDM O-rings. Radiator connection 1/2 inch straight male thread with tailpiece complete with EPDM seal pipe connection 3/4 inch conical.
				1. Temperature range: 40 degrees F to 212 degrees F (5 degrees C to 100 degrees C).
				2. Maximum working pressure: 150 psi
				3. Suitable fluids: water or 30 percent maximum glycol solution.
		2. Valves for panel style radiators
			1. Panel radiator valve, Code 301040, for panel radiators with built-in thermostatic valve units. Two-pipe straight version with floor connections and two ball shut-off valves. Provided with brass chrome-plated body for copper, single and multilayer PE-X pipes, radiator connection 1/2 inch straight male thread and pipe connection 3/4 inch conical.
				1. Maximum working temperature: 212 degrees F (100 degrees C).
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Provide with optional connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 681524, Universal PE-X fitting.

Code 682540A, Universal PE-X-AL-PE-X fitting.

Code NA10262, Sweat connection fitting, 1/2 inch.

Code 437516, Compression fitting for 1/2 inch hard copper.

* + - * 1. Provide with optional wall covering plate code 449740, white ABS.
			1. Panel radiator valve, Code 301140, for panel radiators with built-in thermostatic valve units. Two-pipe angled version with wall connections and two ball shut-off valves. Provided with brass chrome-plated body for copper, single and multilayer PE-X pipes, radiator connection 1/2 inch straight male thread and pipe connection 3/4 inch conical.
				1. Maximum working temperature: 212 degrees F (100 degrees C).
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Provide with optional connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 681524, Universal PE-X fitting.

Code 682540A, Universal PE-X-AL-PE-X fitting.

Code NA10262, Sweat connection fitting, 1/2 inch.

Code 437516, Compression fitting for 1/2 inch hard copper.

* + - * 1. Provide with optional wall covering plate code 449740, white
			1. Panel radiator valve, Code 301240, for panel radiators with built-in thermostatic valve units. One-pipe straight version with floor connections and two ball shut-off valves with adjustable by-pass, 30-50 percent of flow to radiator and PPO thermal break (non-return device) in return side. Provided with brass chrome-plated body for copper, single and multilayer PE-X pipes, radiator connection 1/2 inch straight male thread and pipe connection 3/4 inch conical.
				1. Maximum working temperature: 212 degrees F (100 degrees C).
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Provide with optional connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 681524, Universal PE-X fitting.

Code 682540A, Universal PE-X-AL-PE-X fitting.

Code NA10262, Sweat connection fitting, 1/2 inch.

Code 437516, Compression fitting for 1/2 inch hard copper.

* + - * 1. Provide with optional wall covering plate code 449740, white ABS.
			1. Panel radiator valve, Code 301340, for panel radiators with built-in thermostatic valve units. One-pipe angled version with wall connections and two ball shut-off valves and two ball shut-off valves with adjustable by-pass, 30-50 percent of flow to radiator and PPO thermal break (non-return device) in return side. Provided with brass chrome-plated body for copper, single and multilayer PE-X pipes, radiator connection 1/2 inch straight male thread and pipe connection 3/4 inch conical.
				1. Maximum working temperature: 212 degrees F (100 degrees C).
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Provide with optional connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 681524, Universal PE-X fitting.

Code 682540A, Universal PE-X-AL-PE-X fitting.

Code NA10262, Sweat connection fitting, 1/2 inch.

Code 437516, Compression fitting for 1/2 inch hard copper.

* + - * 1. Provide with optional wall covering plate code 449740, white ABS.
		1. Pipe Fittings:

\*\* NOTE TO SPECIFIER \*\* Select the fittings required from the following paragraphs as required and delete those not required.

* + - 1. Code 681524 Universal PE-X fitting, chrome-plated, compatible with any ASTM F876 single layer PE-X pipe.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Working temperature range: minus 41 degrees to 180 degrees F (minus 40 degrees C to 80 degrees C).
				3. 1/2 inch nominal PE-X.
			2. Code 682540A Universal PE-X-AL-PE-X fitting, compatible with any ASTM F 1281 multi-layer PE-X-AL-PE-X pipe.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Working temperature range: minus 41 degrees to 167 degrees F (minus 40 degrees C to 75 degrees C) with tubing rated 200 degrees F (90 degrees C).
				3. 1/2 inch nominal PE-X-AL-PE-X.
			3. Code NA10262 Sweat connection fitting, 1/2 inch.
			4. Code 437516 Compression fitting for 1/2 inch hard copper, chrome-plated with O-ring seal.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Working temperature range: minus 13 degrees to 250 degrees F (minus 25 degrees C to 120 degrees C).
				3. 1/2 inch compression.
			5. Code 449740 Decorative Wall covering plate, white ABS.

\*\* NOTE TO SPECIFIER \*\* Select the zone valves and relays required from the following paragraphs as required and delete those not required.

* 1. ZONE VALVES AND RELAYS
		1. Motorized Zone Valves:
			1. Z-one series motorized two-position spring-return type zone valve. Provided with 100% bubble-tight seat close-off leakage, Z200 series two-way 1/2 inch - 1-1/4 inch forged brass (optional lead-free) body, inverted or SAE flare, sweat or NPT female connections, brass trim, stainless steel stem, EPDM seals and seat. Removable Z100 series actuator, normally closed or normally open, with or without auxiliary micro-switch. Full stroke operating time less than 60 seconds powered, 6 seconds spring return. Wire leads 18 inch or terminal block connection (Z151000). Actuator cUL listed, CE, and approved for UL873, including air plenums and ducts rating per UL1995 section 18. Agency approval for optional low-lead brass body: Reduction of Lead in Drinking Water Act Compliant: 0.25% Max. weighted average lead content. Reduction of Lead in Drinking Water Act Certified by IAPMO R&T. Meets requirements of ANSI/NSF 372-2011.
				1. Power supply: 24, 120, 208, 230, 277 VAC.
				2. Power consumption; 5.0 W, 7 VA.
				3. Lost motion transmission disengagement actuation mechanism.
				4. Quick-connect actuator-to-valve body assembly (no fastener).
				5. Working temperature range: 32 degrees to 240 degrees F (0 degrees C to 115 degrees C).
				6. Auxiliary micro-switch rating:

24 V: 0.0A minimum, 0.4A max, 24 V.

120-277 V: 0.25A min., 5.0A max, 250 V.

Code Z111000 HCS: 0.25 A min, 5 A max, 250 V.

* + - * 1. Maximum static pressure 300 psi (20 bar).
				2. Flow ratings, Cv: 1.0, 2.5, 3.5, 5.0, 7.5.
				3. Maximum close off pressures, psi: 75, 50, 30, 25, 20 (kPa: 517, 345, 207, 172, 138).
				4. Rated for high temperature water, glycol solutions to maximum 50 percent, chilled water, open systems, closed systems and low pressure (15 psi) steam.
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Z200 series two-way 1/2 inch - 1-1/4 inch (optional lead-free, code Z207433, Z207533, Z207537 bodies).

Z300 series three-way diverting (optional lead-free, code Z307433, Z307537) bodies.

* + 1. Thermo-Electric Zone Valves:
			1. Thermo-electric two-way zone valve. Provided with 676 series two-way straight-through style brass body. Connections: 1/2 inch, 3/4 inch and 1 inch sweat with unions, 3/4 inch press with unions. Brass trim, stainless steel stem and spring, and EPDM seals. Maximum body pressure 150 psi (10 bar), Cv 4.0. Maximum differential pressure 20 psi (1.2 bar). Water and glycol solutions to maximum 50 percent. Provide with 656 series thermo-electric actuator, power open/spring-return closed (normally closed), with auxiliary micro-switch (contacts rated 5 A, 24 V), power supply 24 VAC or VDC, power consumption 3 W running, maximum temperature 200 degrees F (95 degrees C), maximum 20 psi (1.2 bar) close off pressure, 31.5 inch (80 cm) wire leads.
				1. TwisTop Thermo-electric actuator. Provided with manual open/close knob with automatic reset, visual pop-up position indicator when activated, self-extinguishing polycarbonate protective shell, protection class IP 40 installed in vertical position. Fabricated with double insulation in accordance with CE standards.

Initial current draw: 800 mA.

Holding current: 140 mA.

Inrush power consumption: 19 VA.

Operating time: 120 to 180 seconds full stroke opening, 120 to 180 seconds full stroke closing.

Maximum operating temperature, valve plus actuator: 120 degrees F (50 degrees C).

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 656304, RAL 9010 white color.

Code 656314, with micro switch, RAL 9002 gray color.

* + - * 1. Thermo-electric actuator, Code 6564 series. Provided with visual pop-up position indicator when activated, self-extinguishing polycarbonate protective shell, protection class NEMA 5 (IP 54) installed in all positions. Fabricated with double insulation in accordance with CE standards

Initial current draw: < 250 mA.

Holding current: 125 mA.

Inrush power consumption: 6 VA.

Operating time: 600 seconds full stroke opening, 240 seconds full stroke closing.

Maximum operating temperature, valve plus actuator: 170 degrees F (75 degrees C).

Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 656404, RAL 9010 white color.

Code 656414, with micro switch, RAL 9002 gray color.

* + 1. Motorized zone valves, high-flow, high-close off:
			1. Motorized ball zone valve with three-wire power open/power closed control. Provided with brass full-port ball valve, with chrome plated brass ball, PTFE ball seal with EPDM O-ring, two EPDM stem seals, union seals with EPDM O-ring and automatic compensation of mechanical slack from shaft wear. Valve body working temperature 20 degrees F to 230 degrees F (minus 5 degrees C to 110 degrees C), maximum working pressure 150 psi (10 bar), maximum 150 psi (10 bar) close off pressure. Self-extinguishing polycarbonate actuator; gray RAL 9002; synchronous three-wire motor with auxiliary micro-switch (contacts rated 5 A, 24 V), power supply 24 VAC, power consumption 4 VA, starting (inrush) current 170 mA, holding current 0 mA, dynamic starting torque 70 in lb (8 N m), operating time 40 seconds (angle of rotation 90 degrees), working temperature range 32 degrees to 130 degrees F (0 degrees C to 55 degrees C), water and glycol solutions to maximum 50 percent, 36 inch (100 cm) wire leads.

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

* + - * 1. Code 6442 series 2-way straight-through body style NPT male threaded or sweat with unions, 1/2 inch to 1 inch; 3/4 inch press with unions.
				2. Code 6443\_3BY series 3-way by-pass body style NPT male threaded or sweat with unions, 1/2 inch to 1 inch; 3/4" press with unions.
				3. Code 6443 series 3-way diverting style NPT male threaded or sweat with unions, 1/2 inch to 1 inch; 3/4 inch press with unions.
		1. Single zone switching relay:
			1. Z-one Relay code ZSR101 single zone switching relay. Incorporates Power in, Relay 1 and Relay 2 connection terminals. Compatible with 2, 3 and 4-wire thermostats or low voltage controllers with switching action. Power supply 120 VAC, 50/60 Hz. Heavy duty, sealed, DPDT, fuse protected relay with spare fuse, Two relay outputs for operating 120 VAC pump with boiler enable, or two devices without boiler enable. 5 Amp capacity each relay, 10 total Amps. R,W,C and T,T,COM dual labeling at thermostat terminals. Rear knock-outs for mounting onto 4 inch by 4 inch junction box. High capacity 6 VA transformer. Automatic resettable fuse on 24 V circuit. Pre-installed jumper, large screw terminals, on-board ground terminals. Front panel LED indicator light for functional status. ETL certified to CSA C22-2 No. 24, conforms to UL873.
				1. Capabilities:

Transformer voltage: 24 VAC.

Maximum transformer load: 12 VA.

Temperature limits for shipping, storage and operating: 110 degrees F (43 degrees C).

Maximum humidity: 90 percent non-condensing.

Electrical switch rating: 10A maximum combined.

* + 1. Multi-zone switching relay: Z-one Relay multi-zone switching relay. Compatible with 2, 3 and 4-wire thermostats or low voltage controllers with switching action. Power supply 120 VAC, 50/60 Hz. Zone priority selectable with 1 hour time-out feature. R,W,C and T,T,COM dual labeling at thermostat terminals. DHW (ZR/ZC) dry contacts rated for switching line voltage. Automatic resettable fuse on 24 V circuit. Expandable to unlimited number of zones using 3-wire connection between controls. Large screw terminals. Front panel LED indicator light for functional status. ETL certified to CSA C22-2 No. 24, conforms to UL873.
			1. Code ZVR series Multi-zone valve and boiler operating control:
				1. Heavy duty, sealed relays.
				2. 3 pump outputs (120 VAC/5 A) and 3 to 6 (model dependent) zone valve outputs (24 V).
				3. System pump status (on/off) during priority selectable.
				4. Replaceable, snap-fit 40 VA transformer on 3 and 4 zone models, expandable to 80 VA with second transformer.
				5. Two replaceable, snap-fit 40 VA transformers (80 VA) on 6 zone models.
				6. On-board ground terminals.
				7. Transformer voltage: 24 VAC
				8. Temperature limits for shipping, storage and operating: 110 degrees F (43 degrees C)
				9. Maximum humidity: 90% non-condensing
				10. Electrical switch rating: 20A maximum combined.
				11. Electrical switch rating ZR/ZC, DHW, XX: 120 VAC, 2A each.
				12. Electrical switch rating pumps: 120 VAC, 5A each.
				13. Models:

Code ZVR103, three-zone, 40 VA maximum transformer load.

Code ZVR104, four-zone, 40 VA maximum transformer load.

Code ZVR106, six-zone, 80 VA maximum transformer load.

* + - 1. Code ZSR series Multi-zone pump and boiler operating control
				1. Heavy duty, sealed, fuse protected relay with spare fuse.
				2. 1 primary pump output and 3 to 6 (model dependent) zone pump outputs (120 VAC/5 A each)
				3. High capacity 12 VA or 20 VA transformer (model dependent).
				4. Selectable post purge.
				5. Selectable pump exercising.
				6. 3 pump ground terminals.
				7. Transformer voltage: 24 VAC.
				8. Temperature limits for shipping, storage and operating: 110 degrees F (43 degrees C).
				9. Maximum humidity: 90 percent non-condensing
				10. Electrical switch rating: 20A maximum combined.
				11. Electrical switch rating pump output: 120 VAC, 5A each.
				12. Dry contact rating: ZR/ZC, DHW, XX: 120 VAC max, 2A each.
				13. Replaceable fuses: Type 2AG, 5A slow blow.
				14. Models:

Code ZSR103, three-zone, 12 VA maximum transformer load.

Code ZSR104, four-zone, 12 VA maximum transformer load.

Code ZSR106, six-zone, 20 VA maximum transformer load.

\*\* NOTE TO SPECIFIER \*\* Select the radiant and distribution manifolds, thermostatic mixing units required from the following paragraphs as required and delete those not required.

* 1. TEMPERATURE MIXING STATIONS AND DISTRIBUTION MANIFOLDS
		1. Thermostatic Fixed Point Mixing Unit for HydroLink:
			1. HydroMixer Thermostatic fixed point temperature mixing unit. Compatible with HydroLink 559 series hydraulic separator-manifold. Includes Grundfos UPS 15-58 series three speed pump, adjustable differential pressure by-pass valve, temperature gauges and shutoff ball valves.
				1. 1 inch NPT female union inlet fittings.
				2. 1 inch NPT female outlet connections.
				3. Pre-formed insulation shell.
				4. Differential pressure by-pass adjustable from 1.5psi to 8.5 psi (10 kPa to 58 kPa).
				5. Maximum working pressure: 145 psi (10 bar).
				6. Setting temperature range: 80 degrees F to 130 degrees F (25 degrees C to 55 degrees C).
				7. Suitable fluids: water or 30 percent maximum glycol solution.
				8. Power supply: 115 V, 50/60 Hz.
				9. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 163600A, 1 inch NPT outlet for right side flow.

Code 163610A, 1 inch NPT outlet for left side flow.

* + 1. Direct distribution unit for heating systems:
			1. HydroMixer Direct distribution unit for high temperature heating systems, factory pre-assembled configurations selectable either with upward flow and discharge (pump mounting) on right or left side, and field reversible. Compatible with HydroLink code 5599 series hydraulic separator-manifold. Union connections to the secondary supply and return header (bottom connections) 1-1/2 inch male straight threads. Union connections to the system supply and return circuit (top connections) 1-1/4 inch male straight threads. Center distance 5 inch (125 mm) between connections. Dual-scale temperature gauges for supply and return 32 degrees F to 176 degrees F (0 degrees C to 80 degrees C), brass secondary circuit shut-off ball valves, connection pipe in steel. Check valve with brass body and PPAG40 shutter. Pre-formed insulation shell in EPP. Includes Grundfos UPS 15-58 series three-speed pump or variable-speed pump Alpha 25-55U. Provide with 1 inch sweat or NPT union inlet and outlet fittings code NA16 series, adjustable differential pressure by-pass valve (DPBV), code 519006 (0.3 psi to 4.3 psi (2 kPa to 30 kPa), stainless steel mounting bracket code 165001.
				1. Maximum working pressure: 145 psi (10 bar).
				2. Maximum working temperature: 212 degrees F (100 degrees C).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Power supply: 115 V 50/60 Hz
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 165600A, HydroMixer with Grundfos UPS 15-58 on right side.

Code 165610A, HydroMixer with Grundfos UPS 15-58 on left side.

Code 165602A, HydroMixer with Grundfos Alpha 25-55U on right side.

Code 165612A, HydroMixer with Grundfos Alpha 25-55U on left side.

* + 1. Thermostatic Fixed Point Mixing Unit:
			1. HydroMixer thermostatic fixed temperature mixing unit for low temperature heating systems, factory pre-assembled configurations selectable either with upward flow and discharge (pump mounting) on right or left side, and field reversible. Union connections to the secondary supply and return header (bottom connections) 1-1/2 inch male straight threads. Compatible with HydroLink code 5599 series hydraulic separator-manifold. Union connections to the system supply and return circuit (top connections) 1-1/4 inch male straight threads. Center distance 5 inch (125 mm) between connections. Dual-scale temperature gauges for supply and return 32 degrees F to 176 degrees F (0 degrees C to 80 degrees C), brass secondary circuit shut-off ball valves, connection pipe in steel. Check valve with brass body and PPAG40 shutter. Pre-formed insulation shell in EPP. Includes Grundfos UPS 15-58 series three-speed pump or variable-speed pump Alpha 25-55U. Provide with 1 inch sweat or NPT union inlet and outlet fittings code NA16 series, adjustable differential pressure by-pass valve (DPBV), code 519006 (0.3 psi to 4.3 psi (2 kPa to 30 kPa), stainless steel mounting bracket code 165001.
				1. Maximum working pressure: 145 psi (10 bar).
				2. Adjustable temperature range: 80 degrees F to 125 degrees F (25 degrees C to 50 degrees C).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Power supply: 115 V 50/60 Hz
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 165600A, HydroMixer with Grundfos UPS 15-58 on right side.

Code 165610A, HydroMixer with Grundfos UPS 15-58 on left side.

Code 165602A, HydroMixer with Grundfos Alpha 25-55U on right side.

Code 165612A, HydroMixer with Grundfos Alpha 25-55U on left side.

* + 1. Thermostatic Fixed Point Mixing Unit:
			1. HydroMixer motorized temperature mixing unit with modulating 24 VAC three-point floating type non-spring return actuator for use with outdoor rest controller. Factory pre-assembled configurations selectable either with upward flow and discharge (pump mounting) on right or left side. Compatible with HydroLink code 5599 series hydraulic separator-manifold. Union connections to the secondary supply and return header (bottom connections) 1-1/2 inch male straight threads. Union connections to the system supply and return circuit (top connections) 1-1/4 inch male straight threads. Center distance 5 inch (125 mm) between connections. Dual-scale temperature gauges for supply and return 32 degrees F to 176 degrees F (0 degrees C to 80 degrees C), brass secondary circuit shut-off ball valves, connection pipe in steel. Check valve with brass body and PPAG40 shutter. Pre-formed insulation shell in EPP. Includes Complete with motorized 3-way mixing valve, brass body, brass valve plug. Three-point floating type non-spring return actuator, power supply 24 VAC. Grundfos UPS 15-58 series three-speed pump or variable-speed pump Alpha 25-55U. Provide with 1 inch sweat or NPT union inlet and outlet fittings code NA16 series, adjustable differential pressure by-pass valve (DPBV), code 519006 (0.3 psi to 4.3 psi (2 kPa to 30 kPa), stainless steel mounting bracket code 165001.
				1. Maximum working pressure: 145 psi (10 bar).
				2. Primary input temperature range: 40 degrees F to 212 degrees F (5 degrees C to 100 degrees C).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Power supply: 115 V 50/60 Hz for pump, 24 VAC for actuator
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 167600A, HydroMixer with Grundfos UPS 15-58 on right side.

Code 167610A, HydroMixer with Grundfos UPS 15-58 on left side.

Code 167602A, HydroMixer with Grundfos Alpha 25-55U on right side.

Code 167612A, HydroMixer with Grundfos Alpha 25-55U on left side.

* + 1. Fixed Point Temperature Mixing Station:
			1. Pre-assembled 172 series manifold mixing station including a built-in thermostatic sensor for adjustable fixed point temperature mixing with tamper protection. Includes Grundfos UPS 15-58 series three-speed pump, removable primary circuit hydraulic separator, temperature gauges and shutoff ball valves. Provided with brass body, bonnet and fittings, PSU shutter and EPDM seals, integral 1-1/4 inch distribution manifold, available in models ranging from 3 to 13 outlets 3/4 inch male, 3/4 inch NPT male primary circuit connections, 3/4 inch male supply and return connections. Supply manifold equipped with built-in sight flow meters, with 0.25 gallons per minute to 2 gallons per minute ( 1 liter per minute to 8 liters per minute) scale, and adjustable balancing valves. Return manifold equipped with shut-off valves suitable for thermo-electric actuators. Compatible with HydroLink 559 series hydraulic separator-manifold.
				1. Primary inlet temperature: 195 degrees F (90 degrees C).
				2. Suitable fluids: water or 30 percent maximum glycol solution.
				3. Control temperature range: 80 degrees F to 130 degrees F (25 degrees C to 55 degrees C).
				4. Accuracy: plus or minus 4 degrees F (2 degrees C).
				5. Maximum working pressure 150 psi (10 bar).
				6. Flow ratings, loop Cv: 1.23 (combined supply and return ports).
				7. Outlet center distance: 2 inches (50 mm).
				8. Provide with optional circuit connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 680 series, universal PEX fitting.

Code 682 series, universal PEX-AL-PEX fitting.

Code NA10262, sweat connection fitting, 1/2 inch.

* + - * 1. Provide with optional Thermo-electric actuators:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Thermo-electric actuators and select the actuators required from the following paragraphs as required and delete those not required.

TwisTop Code 6563 series, Thermo-electric actuator.

Code 6564 series, Thermo-electric actuator.

* + 1. Brass distribution manifolds:
			1. TwistFlow Code 668S1A series, pre-assembled radiant manifold. Provided with brass body, brass end fittings, and EPDM seals, available in models ranging from 3 to 13 outlets 3/4 inch male, and integral brass automatic air vent and brass drain valve Supply manifold equipped with built-in sight flow meters, with 0.25 gallons per minute to 2 gallons per minute (1 liter per minute to 8 liters per minute) scale, and adjustable balancing valves. Return manifold equipped with shut-off valves suitable for thermo-electric actuators.
				1. Brass inlet ball valves, 1 inch or 1-1/4 inch NPT.
				2. Working temperature range: 32 degrees F to 180 degrees F (0 degrees C to 80 degrees C).
				3. Suitable fluids: water or 30 percent maximum glycol solution.
				4. Maximum working pressure 150 psi (10 bar).
				5. Flow ratings, loop Cv: 1.23 (combined supply and return ports).
				6. Outlet center distance: 2 inches (50 mm).
				7. Provide with optional Manifold housing box, Code 659 series.
				8. Provide with optional circuit connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 680 series, universal PEX fitting.

Code 682 series, universal PEX-AL-PEX fitting.

Code NA10262, sweat connection fitting, 1/2 inch.

* + - * 1. Provide with optional Thermo-electric actuators:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Thermo-electric actuators and select the actuators required from the following paragraphs as required and delete those not required.

TwisTop Code 6563 series, Thermo-electric actuator.

Code 6564 series, Thermo-electric actuator.

* + 1. High Temperature/High Flow Distribution Manifold Assemblies:
			1. High Temperature / High Flow Distribution Manifold Assemblies, Code 592 series: Pre-assembled distribution manifold consisting of return distribution manifold and supply distribution manifold consisting of return distribution manifold and supply distribution manifold. Provided with brass body, EPDM seals and available in models ranging from 2 to 8 outlets 3/4 inch male.
				1. 1-1/4 inch NPT inlet ball valves.
				2. Maximum working pressure: 150 psi (10 bar).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Maximum working temperature: 210 degrees F (99 degrees C).
				5. Loop Cv: 5.0.
				6. Outlet center distance: 2-3/8 inches (60 mm).
				7. Provide with optional circuit connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 680 series, universal PEX fitting.

Code 682 series, universal PEX-AL-PEX fitting.

Code NA10262, sweat connection fitting, 1/2 inch.

* + - * 1. Provide with optional Thermo-electric actuators:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Thermo-electric actuators and select the actuators required from the following paragraphs as required and delete those not required.

TwisTop Code 6563 series, Thermo-electric actuator.

Code 6564 series, Thermo-electric actuator.

* + - 1. High Temperature / High Flow Manifold Assemblies, Code 663 series: Pre-assembled distribution manifold consisting of return distribution manifold complete with built-in shut-off valves suitable for thermo-electric actuator and supply distribution manifold complete with manually adjustable balancing valves. Provided with brass body, EPDM seals and available in models ranging from 3 to 13 outlets 3/4 inch male.
				1. 1 inch or 1-1/4 inch NPT inlet ball valves.
				2. Loop Cv: 2.3 combined supply and return ports.
				3. Maximum working pressure: 150 psi (10 bar).
				4. Maximum temperature: 210 degrees F (99 degrees C).
				5. Suitable fluids: water or 50 percent maximum glycol solution.
				6. Outlet center distance: 2 inches (50 mm).
				7. Provide with optional Manifold housing box, Code 659 series.
				8. Provide with optional circuit connection pipe fittings:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Pipe Fittings and select the fittings required from the following paragraphs as required and delete those not required.

Code 680 series, universal PEX fitting.

Code 682 series, universal PEX-AL-PEX fitting.

Code NA10262, sweat connection fitting, 1/2 inch.

* + - * 1. Provide with optional Thermo-electric actuators:

\*\* NOTE TO SPECIFIER \*\* Coordinate with Paragraph Distribution Manifold, Thermo-electric actuators and select the actuators required from the following paragraphs as required and delete those not required.

TwisTop Code 6563 series, Thermo-electric actuator.

Code 6564 series, Thermo-electric actuator.

* + 1. Distribution Manifold Accessories:
			1. Manifold Housing Boxes, Code 659 series: Housing wall box for manifold systems. For use with Caleffi Series 663 and 668S1 manifolds.
				1. Adjustable depth from 4-3/8 inch to 5-1/2 inches.
				2. All models 20 inch height, ranging from 16, 24, 32, 40 or 48 inch widths corresponding to manifold outlets of 3, 6, 10, 13 or 17.
				3. Painted 18 gauge sheet steel.
				4. Push-fit clamp.
			2. Pipe Fittings:

\*\* NOTE TO SPECIFIER \*\* Select the fittings required from the following paragraphs as required and delete those not required.

* + - * 1. Code 680 series universal PEX fitting, compatible with any ASTM F 876 single layer PEX pipe.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: minus 41 degrees F to 180 degrees F (5 degrees C to 82 degrees C).

Nominal PEX connection sizes range from 5/16, 3/8, 1/2, 5/8, or 3/4 inch.

* + - * 1. Code 682 series universal PEX-AL-PEX fitting, compatible with any ASTM F 1281 multi-layer PEX-AL-PEX pipe.

Maximum working pressure: 150 psi (10 bar).

Working temperature range: minus 41 degrees F to 167 degrees F (5 degrees C to 75 degrees C) with tubing rated 200 degrees F (93 degrees C).

Nominal PEX-AL-PEX connection sizes range from 3/8, 1/2, 5/8, or 3/4 inch.

* + - * 1. Code NA10262 sweat connection fitting, 1/2 inch.

\*\* NOTE TO SPECIFIER \*\* Select one of the following actuator paragraphs as required and delete those not required.

* + - 1. Thermo-electric actuators:
				1. TwisTop Thermo-electric actuator. Provided with manual open/close knob with automatic reset, visual pop-up position indicator when activated, self-extinguishing polycarbonate protective shell, protection class IP 40 installed in vertical position. Fabricated with double insulation in accordance with CE standards.

Initial current draw: 800mA.

Maximum ambient temperature: 120 degrees F (50 degrees C).

Model:

Code 656304, RAL 9010 white color.

Code 656314, with micro switch, RAL 9002 gray color.

* + - * 1. Thermo-electric actuator, Code 6564 series. Provided with visual pop-up position indicator when activated, self-extinguishing polycarbonate protective shell, protection class NEMA 5 (IP 54) installed in all positions. Fabricated with double insulation in accordance with CE standards.

Initial current draw: < 250 mA.

Maximum medium working temperature: 40 degrees F to 170 degrees F (5 degrees C to 75 degrees C).

Maximum ambient temperature while operating: 120 degrees F (50 degrees C).

Quick coupling, snap-in-place, mounting to valve or manifold.

Model:

Code 656404, RAL 9010 white color.

Code 656414, with micro switch, RAL 9002 gray color.

\*\* NOTE TO SPECIFIER \*\* Select the plumbing and solar heating components required from the following paragraphs as required and delete those not required.

* 1. MIXING VALVES FOR DOMESTIC WATER AND HYDRONICS SYSTEMS
		1. Thermostatic Mixing Valves For Point of Distribution:
			1. MixCal Code 521 series Low-lead three-way adjustable thermostatic and pressure balanced mixing valve cUPC listed to ASSE 1017/CSA B125.3, approved for point of distribution domestic water systems and radiant hydronic heating systems. Provided with low-lead brass body (< 0.25 percent lead content) certified by IAPMO R&T, with internal anti-scale materials with locking set point knob. Meets requirements of ANSI/NSF 372-2011.
				1. Maximum working pressure: 200 psi (14 bar).
				2. Maximum inlet temperature: 200 degrees F (93 degrees C).
				3. Adjustable range: 85 degrees F to 150 degrees F (30 degrees C to 65 degrees C).
				4. Suitable fluids: water or 30 percent maximum glycol solution.
				5. ASSE 1017 approved.
				6. Agency approval for low-lead brass body: Lead plumbing law compliance (0.25 percent maximum weighted average lead content). Lead plumbing law certified by IAPMO R&T.
				7. Sizes 1/2, 3/4 and 1 inch, NPT male and sweat with union tailpieces.
				8. Models available with inlet port check valves.
				9. Models available with mixed outlet temperature gauge, 30 - 210 degrees F scale, 2 inch diameter.
				10. Flow rating: Cv 3.0.
			2. Code 5231 series Low-lead high-flow adjustable three-way thermostatic mixing valve cUPC listed to ASSE 1017/CSA B125.3, approved for radiant hydronic heating systems and domestic water systems. Provided with low-lead brass body (< 0.25 percent lead content) certified by IAPMO R&T, with internal anti-scale materials: PPSG40 shutter, stainless steel springs, and EPDM seals and tamper proof temperature locking. Meets requirements of ANSI/NSF 372-2011.
				1. Maximum working pressure (static): 200 psi (14 bar).
				2. Maximum operating differential pressure: 70 psi (5 bar).
				3. Maximum inlet temperature: 195 degrees F (91 degrees C).
				4. Hot water inlet temperature range: 120 degrees F to 195 degrees F (49 degrees C to 91 degrees C).
				5. Cold water inlet temperature range: 39 degrees F to 80 degrees F (3.7 degrees C to 26.6 degrees C).
				6. Mixed temperature setting range: 95 degrees F to 150 degrees F (35 degrees C to 66 degrees C).
				7. Suitable fluids: water or 30 percent maximum glycol solution.
				8. Model available with mixed outlet temperature gauge, 30 to 210 degrees F scale, 2 inch diameter.
				9. ASSE 1017 approved.
				10. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs s required and delete those not required.

Code #523160A, 1 inch NPT male, flow 7.0 Cv.

Code #523168A, 1 inch sweat , flow 7.0 Cv.

Code #523170A, 1-1/4 inch NPT male, flow 7.6 Cv.

Code #523177A, 1-1/4 inch sweat, flow 7.6 Cv.

Code #523178A, 1-1/4 inch sweat with outlet temperature gauge, flow 7.6 Cv.

Code #523180A, 1-1/2 inch NPT male, flow 13.0 Cv.

Code #523188A, 1-1/2 inch sweat, flow 13.0 Cv.

Code #523190A, 2 inch NPT male, flow 14.2 Cv.

Code #523198A, 2 inch sweat, flow 14.2 Cv.

* + 1. Thermostatic Mixing Valves For Point of Use:
			1. Code 5213 series scald protection three-way adjustable thermostatic and pressure balanced mixing valve ASSE 1070 approved for point of use where the user must be protected from the danger of scalding caused by hot water with locking set point. Provided with low-lead brass body (< 0.25 percent lead content) certified by IAPMO R&T. Provided with check valves on both hot and cold inlets and low-lead brass body.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Maximum inlet temperature: 185 degrees F (85 degrees C).
				3. Adjustable range: 85 degrees F to 120 degrees F (29 degrees C to 49 degrees C).
				4. Temperature control: Plus or minus 3 degrees F (2 degrees C).
				5. Minimum flow for optimum performance: 0.5 gpm.
				6. ASSE 1070 approved.
				7. cUPC listed to ASSE 1017/CSA B125.3
				8. Sizes 1/2, 3/4 and 1 inch, NPT male and sweat.
		2. Thermostatic Mixing Valves For Heating Systems:
			1. Code NA16469 - Motorized three-way thermostatic mixing valve with modulating 24 VAC three-point floating type actuator for use with outdoor reset controller for hydronic systems or radiant panel heating systems. Provided with brass body, stainless steel internal shutter cartridge, EPDM seals, reversible cold inlet port and straight-through flow direction from hot inlet to mixed outlet.
				1. Actuator Power supply: 24 VAC.
				2. Actuator Power consumption: 8 VA.
				3. Actuator Current draw; 0.335 A.
				4. Auxiliary micro-switch rating: 0.8 A, 24.
				5. Maximum working pressure: 200 psi (14 bar).
				6. Maximum inlet temperature: 185 degrees F (85 degrees C).
				7. Control temperature range: 80 to 130 degrees F (25 degrees C to 55 degrees C).
				8. Suitable fluids: water or 30 percent maximum glycol solution.
				9. 1 inch sweat connections.
				10. Flow rating: Cv 7.7.
			2. ThermoMix 280 series boiler protection high-flow thermostatic valve with exchangeable thermostatic sensor cartridge. Provided with brass body and plug, polysulfone shutter, stainless steel spring, wax thermostatic sensor and EPDM seals.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Working temperature range: 40 to 212 degrees F (5 degrees C to 100 degrees C).
				3. Thermostatic sensor cartridge, fixed temperatures: 130 degrees F standard (55 degrees C).
				4. Field changeable thermostatic sensor cartridges: 115 degrees F (45 degrees C), 140 degrees F (60 degrees C), 160 degrees F (70 degrees C).
				5. Sensor cartridge accuracy plus or minus 4 degrees F (plus or minus 2 degrees C)
				6. Hot inlet from boiler complete closed temperature Tset plus18 degrees F (10 degrees C)
				7. Suitable fluids: water or 50 percent maximum glycol solution.
				8. End connections: 1 inch and 1-1/4 inch NPT or sweat.
				9. Flow rating: Cv 10 (1 inch), 14 (1-1/4 inch).

\*\* NOTE TO SPECIFIER \*\* Select the automatic filling and backflow prevention devices required from the following paragraphs as required and delete those not required.

* 1. AUTOMATIC FILLING UNITS AND BACKFLOW PREVENTERS
		1. Automatic Filling Valves:
			1. AutoFill Code 553 series Pre-adjustable automatic filling valve, anti-scale, visual system pressure setting indicator. Provided with brass body, Nylon plastic cover, sliding surfaces in anti-scale plastic. Diaphragm and seals in NBR. Cartridge removable for maintenance operations. Manual shutoff valve, strainer and check valve.
				1. Maximum inlet pressure: 230 psi (16 bar).
				2. Maximum working temperature: 150 degrees F (65 degrees C).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Setting pressure range: 3 psi to 60 psi (0.2 Bar to 4 bar).
				5. Preset outlet pressure: 15 psi (1.035 bar).
				6. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs s required and delete those not required.

Code 553542A, 1/2 inch NPT male inlet by 1/2 inch NPT female outlet.

Code 553549A, 1/2 inch sweat inlet by 1/2 inch NPT female outlet.

* + - 1. Backflow preventer and AutoFill combination: Pre-adjustable automatic filling unit with backflow preventer. Filling unit provided with brass body, Nylon plastic cover, sliding surfaces in anti-stick plastic. Diaphragm and seals in NBR. Cartridge removable for maintenance operations. Manual shutoff valve, strainer and check valve. Dual check continuous pressure backflow preventer with atmospheric vent provided with brass body, stainless steel filter, EPDM seals and is ASSE 1012 listed and CSA B64.3 certified.
				1. Maximum inlet pressure: 175 psi (12 bar).
				2. Maximum working temperature: 150 degrees F (65 degrees C).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Setting pressure range: 3 to 60 psi (0.2 Bar to 4 bar).
				5. Preset outlet pressure: 15 psi (1.035 bar).
				6. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs s required and delete those not required.

Code 573002A, 1/2 inch NPT female inlet plus 1/2 inch NPT female outlet.

Code 573009A, 1/2 inch sweat inlet plus 1/2 inch NPT female outlet.

* + - 1. AutoFill Code 5350 series automatic filling unit for commercial systems. Provided with brass body, Glass fiber reinforced nylon PA66G30 cover, Diaphragm and seals in NBR. Cartridge removable for maintenance operations. Pressure setting adjustment knob and integral downstream pressure gauge.
				1. Maximum working pressure: 365 psi (25 bar).
				2. Maximum working temperature: 140 degrees F (60 degrees C).
				3. Setting pressure range: 6 psi to 90 psi (0.5 bar to 6 bar).
				4. Preset outlet pressure: 15 psi (1.035 bar).
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs s required and delete those not required.

Code 535051A, 3/4 inch NPT male inlet.

Code 535056A, 3/4 inch press.

Code 535059A, 3/4 inch sweat.

* + 1. Backflow Preventer:
			1. Code 573 series Dual check continuous pressure backflow preventer with atmospheric vent. Provided with brass body, stainless steel filter, and EPDM seals.
				1. Female union connections.
				2. Maximum working pressure: 175 psi (12 bar).
				3. Maximum working temperature: 210 degrees F (99 degrees C).
				4. ASSE 1012 listed and CSA B64.3 certified.
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs s required and delete those not required.

Code 573403A, 1/2 inch NPT female inlet/outlet.

Code 573409A, 1/2 inch sweat inlet/outlet.

Code 573493A, 1/2 inch sweat inlet/NPT female outlet.

Code 573503A, 3/4 inch NPT female inlet/outlet.

* 1. BOILER TRIM KITS
		1. Boiler Trim Kits with Backflow Preventer
			1. NA553 - Boiler Trim Kit with Backflow Preventer: Kit matches the necessary components for boiler installations into a simple package. The kit includes:
				1. (1) Caleffi DISCAL Air Separator.
				2. (1) AutoFill Boiler Feed Valve.
				3. (1) Expansion Tank Check Valve.
				4. (2) Brass Nipples.
				5. (1) Brass Tee.
				6. (1) Expansion Tank.
				7. (1) Backflow Preventer.
			2. Models:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs s required and delete those not required.

* + - * 1. Code NA553252, Boiler Trim Kit 3/4 inch NPT, expansion tank 2.2 gallons (8.3 liters).
				2. Code NA553259, Boiler Trim Kit 3/4 inch Sweat, expansion tank 2.2 gallons (8.3 liters)..
				3. Code NA553362, Boiler Trim Kit 1 inch NPT, expansion tank 4.4 gallons (16.6 liters).
				4. Code NA553369, Boiler Trim Kit 1 inch Sweat, expansion tank 4.4 gallons (16.6 liters).
				5. Code NA553372, Boiler Trim Kit 1-1/4 inch NPT, expansion tank 4.4 gallons (16.6 liters).
				6. Code NA553379, Boiler Trim Kit 1-1/4 inch Sweat, expansion tank 4.4 gallons (16.6 liters).
				7. Code NA553662, Boiler Trim Kit 1 inch NPT, expansion tank 7.6 gallons (28.8 liters).
				8. Code NA553669, Boiler Trim Kit 1 inch Sweat, expansion tank 7.6 gallons (28.8 liters).
				9. Code NA553672, Boiler Trim Kit 1-1/4 inch NPT, expansion tank 7.6 gallons (28.8 liters).
				10. Code NA553679, Boiler Trim Kit 1-1/4 inch Sweat, expansion tank 7.6 gallons (28.8 liters).
		1. Boiler Trim Kits without Backflow Preventer
			1. NA553-B - Boiler Trim Kits without Backflow Preventer matches the necessary components for boiler installations into a simple package. The kit includes:
				1. Kit matches the necessary components for boiler installations into a simple package. The kit includes:

(1) Caleffi DISCAL Air Separator.

(1) AutoFill Boiler Feed Valve.

(1) Expansion Tank Check Valve.

(2) Brass Nipples.

(1) Brass Tee.

(1) Expansion Tank.

* + - * 1. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs s required and delete those not required.

Code NA553259-B, Boiler Trim Kit 3/4 inch Sweat, expansion tank 2.2 gallons (8.3 liters)..

Code NA553369-B, Boiler Trim Kit 1 inch Sweat, expansion tank 4.4 gallons (16.6 liters).

Code NA553379-B, Boiler Trim Kit 1-1/4 inch Sweat, expansion tank 4.4 gallons (16.6 liters).

Code NA553669-B, Boiler Trim Kit 1 inch Sweat, expansion tank 7.6 gallons (28.8 liters).

Code NA553679-B, Boiler Trim Kit 1-1/4 inch Sweat, expansion tank 7.6 gallons (28.8 liters).

\*\* NOTE TO SPECIFIER \*\* Select the balancing valves required from the following paragraphs as required and delete those not required.

* 1. BALANCING VALVES
		1. Low-lead Balancing Valve with Fixed Orifice:
			1. Code 130 series Balancing valve with fixed (venturi) orifice. Provided with low-lead brass body certified by IAPMO R&T, bonnet and control stem (< 0.25% lead content) certified by IAPMO R&T, stainless steel valve plug, PTFE stem guide bearing, brass seal seat, EPDM hydraulic seals, PA6G30 adjusting knob with memory stop, pressure test ports with low-lead brass body and EPDM seal elements. Number of adjustment turns: 6. Accuracy plus or minus 10 percent. Provide with optional pre-formed insulation shells available for field installation.
				1. Maximum working pressure: 232 psi (16 bar).
				2. Suitable fluids: water or 50 percent maximum glycol solution.
				3. Working temperature range: -4 degrees F to 250 degrees F (minus 20 degrees C to 120 degrees C).
				4. Agency approval for low-lead brass body: Reduction of Lead in Drinking Water Compliant- 0.25% Max. Weighted average lead content. Reduction of Lead in Drinking Water Act Certified by IAPMO R&T.
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 130400A, 1/2 inch NPT female threaded, 3.7 maximum valve Cv.

Code 130500A, 3/4 inch NPT female threaded, 5.1 maximum valve Cv.

Code 130600A, 1 inch NPT female threaded, 8.8 maximum valve Cv.

Code 130700A, 1-1/4 inch NPT female threaded, 14.0 maximum valve Cv.

Code 130800A, 1-1/2 inch NPT female threaded, 19.7 maximum valve Cv.

Code 130900A, 2 inch NPT female threaded, 30.5 maximum valve Cv.

* + 1. Balancing Valve with Flow Meter:
			1. QuickSetter Code 132 series Manual Balancing Valve with Magnetic Movement Flow Indicator. Direct reading of flow rate through graduated no-clouding sight gauge. Provided with brass valve body, flow meter and ball, chrome-plated brass ball control stem and bypass valve stem, stainless steel springs, PTFE ball seal seat, EPDM seals and pre-formed shell insulation in expanded closed cell PE-X. Adjustable ball valve for accurately regulating the medium flow rate.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Suitable fluids: water or 50 percent maximum glycol solution.
				3. Working temperature range: 14 degrees F to 230 degrees F (minus 10 degrees C to 11 degrees C).
				4. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 132432A, 1/2 inch NPT, flow rate 0.5 - 1.75 gallons per minute.

Code 132552A, 3/4 inch NPT, flow rate 2 - 7 gallons per minute.

Code 132662A, 1 inch NPT, flow rate 3 - 10 gallons per minute.

Code 132772A, 1-1/4 inch NPT, flow rate 5 - 19 gallons per minute.

Code 132882A, 1-1/2 inch NPT, flow rate 8 - 32 gallons per minute.

Code 132992A, 2 inch NPT, flow rate 12 - 50 gallons per minute.

* + - 1. QuickSetter+ Code 132 series Manual Balancing Valve with Magnetic Movement Flow Indicator. Direct reading of flow rate through graduated no-clouding sight gauge. Provided with low-lead brass valve body and flow meter, stainless steel ball, chrome-plated brass ball control stem, PSU control stem guide, stainless steel flow meter bypass valve stem, stainless steel flow meter springs, PSU flow meter float and indicator cover, PTFE ball seal seat, EPDM seals, and inlet flow check valve. Adjustable ball valve for accurately regulating the medium flow rate. Provide with optional (model dependent) mixed outlet temperature gauge, 30 to 210 degrees F scale, 2 inch diameter.
				1. Maximum working pressure: 150 psi (10 bar).
				2. Suitable fluids: water or 50 percent maximum glycol solution.
				3. Working temperature range: 14 degrees F to 230 degrees F (minus 10 degrees C to 11 degrees C).
				4. Agency approval for low-lead brass body: Reduction of Lead in Drinking Water Compliant- 0.25% Max. Weighted average lead content. Reduction of Lead in Drinking Water Act Certified by IAPMO R&T.
				5. Model:

\*\* NOTE TO SPECIFIER \*\* Select one of the following paragraphs as required and delete those not required.

Code 132439AFC, 1/2 inch union sweat, flow rate 0.5 - 1.75 gallons per minute.

Code 132539AFC, 3/4 inch union sweat, flow rate 0.5 - 1.75 gallons per minute.

Code 132639AFC, 1 inch union sweat, flow rate 0.5 - 1.75 gallons per minute.

Code 132459AFC, 1/2 inch union sweat, flow rate 2.0 - 7.0 gallons per minute.

Code 132559AFC, 3/4 inch union sweat, flow rate 2.0 - 7.0 gallons per minute.

Code 132659AFC, 1 inch union sweat, flow rate 2.0 - 7.0 gallons per minute.

Code 132438AFC, 1/2 inch union sweat with temperature gauge, flow rate 0.5 - 1.75 gallons per minute.

Code 132538AFC, 3/4 inch union sweat with temperature gauge, flow rate 0.5 - 1.75 gallons per minute.

Code 132638AFC, 1 inch union sweat with temperature gauge, flow rate 0.5 - 1.75 gallons per minute.

Code 132458AFC, 1/2 inch union sweat with temperature gauge, flow rate 2.0 - 7.0 gallons per minute.

Code 132558AFC, 3/4 inch union sweat with temperature gauge, flow rate 2.0 - 7.0 gallons per minute.

Code 132658AFC, 1 inch union sweat with temperature gauge, flow rate 2.0 - 7.0 gallons per minute.

* + 1. Pressure Independent Automatic Balancing Valves with Low-Lead Brass:
			1. Compact FlowCal Code 127 series Automatic Flow Balancing Valves Provided with low-lead brass body, high abrasion resistant, anti-scale, low noise, interchangeable polymer flow cartridge, stainless steel spring and EPDM seals.
				1. Maximum working pressure: 232 psi (16 bar).
				2. Working temperature range: 32 degrees F to 212 degrees F (0 degrees C to 100 degrees C).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Differential pressure control ranges: 2 to 14 psid (0.5 to 0.75 gallons per minute); 2 to 32 psid (1 to 5 gallons per minute); 4 to 34 psid (6 to 8 gallons per minute); 5 to 35 psid (9 to 10 gallons per minute).
				5. Agency approval for low-lead brass body: Lead plumbing law compliance (0.25 percent maximum weighted average lead content). Lead plumbing law certified by IAPMO R&T.
				6. Sizes 1/2, 3/4 and 1 inch, NPT male and sweat
				7. Flow: 16 fixed flow rate settings ranging from 1/2, 3/4, 1, 1-1/2, 2, 2-1/2, 3, 3-1/2, 4, 4-1/2, 5, 6, 7, 8, 9, or 10 gallons per minute for all connection sizes.
				8. Flow accuracy: Plus or minus 10 percent.
		2. Pressure Independent Automatic Balancing Valves with Integral Ball Valve:
			1. FlowCal Code 121 series Automatic Flow Balancing Valves with Integral Ball Valve. Provided with brass body and drain plug (in blowdown port connection), high abrasion resistant, anti-scale, low-noise, interchangeable polymer cartridge, stainless steel spring, EPDM seals (flow valve body), PTFE ball seat and stem seal (integral ball valve), chrome-plated brass ball, brass pressure/temperature test port caps, and zinc-coated steel lever with vinyl grip.
				1. Maximum working pressure: 400 psi (400 WOG).
				2. Working temperature range: 32 degrees F to 212 degrees F (0 degrees C to 100 degrees C).
				3. Suitable fluids: water or 50 percent maximum glycol solution.
				4. Differential pressure control ranges: 2 to 14 psid (0.5 to 0.75 gallons per minute); 2 to 32 psid (1 to 5 gallons per minute); 4 to 34 psid (6 - 8 gallons per minute); 5 to 35 psid (9 to 10 gallons per minute), 3 to 32 psid (11 to 13 gallons per minute); 4 to 35 psid (14 to 21 gallons per minute).
				5. Sizes 1/2, 3/4, 1, and 1-1/4 inch, NPT female threaded and sweat
				6. Flow: 27 fixed flow rate settings ranging from 1/2, 3/4, 1, 1-1/2, 2, 2-1/2, 3, 3-1/2, 4, 4-1/2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, or 21 gallons per minute.
				7. Flow accuracy: Plus or minus 10 percent.
				8. Identification: metal plate with ball chain stating AP range and fixed flow rate.
				9. Provide with optional factory-installed, or field installed pressure and temperature test ports and drain valves.
		3. Y-Strainer with Integral Ball Valve:
			1. Code 120 series Y-Strainer with Integral Ball Valve: Provided with brass body and drain plug (in blowdown port connection), stainless steel mesh strainer cartridge. PTFE ball seat and stem seal (integral ball valve), chrome-plated brass ball, brass pressure/temperature test port caps, and zinc-coated steel lever with vinyl grip.
				1. Maximum working pressure: 400 psi (400 WOG).
				2. Working temperature range: 32 degrees F to 212 degrees F (0 degrees C to 100 degrees C).
				3. Strainer mesh diameter: 0.87 mm (20 mesh).
				4. Sizes 1/2, 3/4, 1, and 1-1/4 inch, NPT female and sweat.
				5. Flow: Cv 8.0 (1/2 inch), 8.4 (3/4 inch), 19.0 (1 inch), 20 (1-1/4 inch).
				6. Provide with optional factory-installed, or field installed pressure and temperature test ports and drain valves.
	1. STORAGE TANKS
		1. ThermoCon Buffer Storage Tank: Vertical insulated water tank, four pipe connections, porcelain lined steel internal walls, powder-coated steel, 20-24 gauge external cover and 2 inch thick non-CFC foam insulation (minimum R16) on sides, top and bottom.
			1. Maximum working pressure: 150 psi (10 bar).
			2. Testing pressure: 300 psi (20 bar).
			3. Maximum tank temperature: 180 degrees F (80 degrees C).
			4. Recommended maximum delivery hot water temperature: 120 degrees F (50 degrees C)
			5. Meets and exceeds CSA C309.
			6. Model:
				1. NAS20025, 25 gallon. 3 top connections: 1-1/2 inch NPT male with dip tube to draw cooler water from tank bottom, 1-1/2 inch NPT female, 3/4 inch NPT female. 5 side connections: (4) 1-1/2 inch NPT female, (1) 3/4 inch NPT female.
				2. NAS20050, 50 gallon. 3 top connections: 3/4 inch NPT female. 7 side connections: 2 inch NPT female.
				3. NAS20080, 80 gallon. 3 top connections: 3/4 inch NPT female. 7 side connections: 2 inch NPT female.
				4. NAS20120, 120 gallon. 3 top connections: 3/4 inch NPT female. 7 side connections: 2 inch NPT female.
1. EXECUTION
	1. EXAMINATION
		1. Do not begin installation until substrates have been properly prepared.
		2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
	2. PREPARATION
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
	3. INSTALLATION
		1. Install in accordance with manufacturer's instructions.
		2. Locate test plugs as indicated on Drawings.
		3. Where large air quantities accumulate, provide enlarged air collection standpipes.
		4. Install manual air vents at system high points.
		5. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain.
		6. Provide air separator on suction side of system circulation pump and connect to expansion tank.
		7. Provide drain and hose connection with valve on strainer blow down connection.
		8. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.
		9. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.
		10. Support pump fittings with floor mounted pipe and flange supports.
		11. Provide radiator valves on water inlet for the following terminal heating unit types: radiation, unit heaters, and fan coil units.
		12. Provide radiator-balancing valves on water outlet for the following terminal heating unit types: radiation, unit heaters, and fan coil units.
		13. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.
		14. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
		15. Pipe relief valve outlet to nearest floor drain.
		16. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
		17. Feed heat transfer fluid solution to system through make-up line with pressure regulator, venting system high points.
	4. FIELD QUALITY CONTROL
		1. Protect installed products until completion of project.
		2. Test for strength of heat transfer fluid and submit written test results.
	5. PROTECTION CLEANING
		1. Protect installed products until completion of project.
		2. Clean and flush system before adding heat transfer fluid solution.
	6. PROTECTION
		1. Protect installed products until completion of project.
		2. Do not install hydronic pressure gauges until after systems are pressure tested.
	7. SCHEDULES

\*\* NOTE TO SPECIFIER \*\* Retain Paragraph below if required to suit project requirements. Identify products by name on the Drawings or use this paragraph to define the location of each type of material to be used. The following are some examples of schedule references. Edit as required to suit project or delete and identify products on the Drawings.

* + 1. :
		2. :

END OF SECTION