

ThermoSetter™ Recirculation thermal balancing valve

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116 Series

Function

The ThermoSetter™ adjustable thermal balancing valve is used for automatic balancing of recirculation loops in domestic hot water systems, to speed hot water delivery, reduce water waste and save energy. The internal thermostatic balancing cartridge automatically modulates flow to ensure a constant temperature in the recirculation piping system. The 116 Series has an adjustment knob with connection size specific temperature scale indication. An integral dry-well holds a slide-in temperature gauge for local indication, or a sensor for remote temperature sensing. An integral check valve to prevent circuit thermo-syphoning is standard on sizes 1/2" and 3/4" and is an optional accessory on 1" and 1-1/4" sizes.



NSF/ANSI/CAN 61
NSF/ANSI/CAN 372



The 1162xx and 1166xx Series are available with a disinfection bypass cartridge, for use in systems which are designed to perform thermal disinfection for control of Legionella. When the disinfection cartridge senses 160 °F (70 °C) -1162xx, or 140 °F (60 °C) -1166xx, water (2 available disinfection bypass temperature options), indicating disinfection control mode, it automatically opens a bypass flow path to allow sufficient flow for disinfection to occur. When the temperature drops back to normal range, the disinfection bypass cartridge closes to return flow control to the balancing cartridge.

The 1163xx Series is also available with a disinfection bypass valve that is controlled by a 24V spring return normally-closed thermo-electric actuator, rather than thermostatically, thus allowing thermal disinfection mode to be controlled remotely by an automation system.

The 116 series ThermoSetter, sizes 1" and 1-1/4", is also available pre-assembled with the Caleffi NA108 series low-lead brass full-port ball valve for isolation. This can be ordered complete with two of these ball valves plus low-lead close nipples by adding a suffix "001" to the order code number. For sizes 1/2" and 3/4", add suffix codes listed on page 2 depending on end connection style.

The valve complies with standards NSF/ANSI/CAN 61 (180 °F/82 °C Commercial Hot), NSF/ANSI/CAN 372 and with codes IPC, IRC, UPC and NPC as certified by ICC-ES.

Product range, sizes and connections listed below

1161 series	ThermoSetter w/o disinfection function
1162 series	ThermoSetter w/ disinfection function bypass cartridge (160°F (70°C))
1163 series	ThermoSetter w/ actuator disinfection function
1166 series*	ThermoSetter w/ disinfection function bypass cartridge (140°F (60°C))

Sizes ½" & ¾" with NPT female, sweat, press, PEX crimp, PEX expansion union connections

Sizes 1" and 1¼" with integral NPT female connections

*Maximum temperature setting must be less than 140°F for 1" & 1 ¼" sizes when using the 140°F disinfection temperature bypass cartridge.



SAFETY INSTRUCTION

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety alert symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.**



WARNING: This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.



CAUTION: All work must be performed by qualified personnel trained in the proper application, installation, and maintenance of systems in accordance with all applicable codes and ordinances.



CAUTION: Over-tightening and breakage can occur with the use of Teflon® pipe joint compounds. Teflon® provides lubricity so that care must be exercised not to over-tighten joints. Failure to follow these instructions could result in property damage and /or personal injury.



WARNING: System fluids are under pressure or temperature can be hazardous. Be sure the pressure has been reduced to zero and the system temperature is below 100 °F (38 °C). Failure to follow these instructions could result in property damage and/or personal injury.



CAUTION: If the series ThermoSetter balancing valve is not installed, commissioned and maintained properly, according to the instructions contained in this manual, it may not operate correctly and may endanger the user.



WARNING: The outer surface of the device, especially in polymer type components, must not come into contact with any chemical substance, either on purpose or accidentally. The system fluid and any chemical additives used within the water piping system – whether for washing or as protection – must be compatible with the materials used to make the device and with the function it performs.



CAUTION: Make sure that all the connecting pipework is water tight.

Caleffi shall not be liable for damages resulting from stress corrosion, misapplication or misuse of its products.

LEAVE THIS MANUAL FOR THE USER.



CONSIGNE DE SÉCURITÉ

Ce symbole d'avertissement servira dans ce manuel à attirer l'attention sur la sécurité concernant instructions. Lorsqu'il est utilisé, ce symbole signifie. **ATTENTION! DEVEZ-VOUS ÊTRE ALERTES ! VOTRE SÉCURITÉ EST EN JEU ! NE PAS SUIVRE CES INSTRUCTIONS PEUT PROVOQUER UN**



AVERTISSEMENT: Ce produit peut vous exposer à des produits chimiques comme le plomb, qui est connu dans l'État de Californie pour causer le cancer, dommages à la naissance ou autre. Pour plus d'informations rendez-vous www.P65Warnings.ca.gov.



ATTENTION: Tous les travaux doivent être effectués par du personnel qualifié formé à la bonne application, installation et maintenance des systèmes conformément aux codes et règlements locaux.



ATTENTION: Un serrage excessif et la rupture peut se produire avec l'utilisation de composés à joint de tuyau en Téflon®. Pouvoir lubrifiant Teflon® permet de sorte qu'il faut prendre soin de ne pas trop serrer les articulations. Le non-respect de ces instructions peut entraîner des dommages matériels et/ou des blessures.



AVERTISSEMENT: Les liquides du système sont sous pression ou de la température peuvent être dangereux. Être sûr que la pression a été réduite à zéro et la température du système est inférieure à 100 °F (38 °C). Le non-respect de ces instructions peut entraîner des dommages matériels et/ou des blessures. Le non-respect de ces instructions peut entraîner des dommages matériels et/ou des blessures.



ATTENTION: Si la vanne d'équilibrage, Série ThermoSetter, n'est pas installé, mis en service et entretenu correctement, selon les instructions contenues dans ce manuel, il peut ne pas fonctionner correctement et peut mettre en danger l'utilisateur.



AVERTISSEMENT: La surface extérieure de l'appareil, en particulier les composants de type polymère, ne doit pas entrer en contact avec des substances chimiques, que ce soit volontairement ou accidentellement. Le produit et les additifs chimiques utilisés dans les canalisations d'eau - que ce soit pour le lavage ou la protection - doivent être compatibles avec les matériaux utilisés pour la fabrication de l'appareil et avec la fonction qu'il remplit.



ATTENTION: S'assurer que tous les raccords sont étanches.

Caleffi ne pourra être tenue responsable des dommages résultant de la corrosion, d'une mauvaise utilisation ou une mauvaise utilisation des produits.

LAISSEZ CE MANUEL AVEC L'UTILISATEUR

Technical specifications

Materials

Body:	DZR low-lead* brass EN 12165 CW724R
Adjustable cartridge:	PSU
Springs:	Stainless steel EN 10270-3 (AISI 302)
Hydraulic seals:	peroxide-cured EPDM
Check valve:	EPDM, POM color black
Adjustment knob:	ABS

* Meets the "lead free" requirement of Section 1417 of the Safe Drinking Water Act (SDWA). This product has a weighted average lead content of less than 0.25% for its wetted surfaces contacted with consumable water.

Performance

Suitable fluid:	water
Max. working pressure:	230 psi (16 bar)
Max. differential pressure:	15 psi (1 bar)
Adjustable temperature range:	sizes ½" & ¾" : 95 – 140 °F (35 – 60 °C) sizes 1" & 1¼": 95 – 150 °F (35 – 65 °C)
Factory setting:	130 °F (55 °C)
Disinfection temperature:	1162xx series-160 °F (70 °C) 1166xx series-140 °F (60 °C)*

*Maximum temperature setting must be less than 140 °F for 1" & 1 ¼" sizes when using the 140 °F disinfection temperature bypass cartridge.

Closing temperature:	1162xx series-170 °F (75 °C) 1166xx series-150 °F (65 °C)										
Max. inlet temperature:	195 °F (90 °C)										
	<table><tr><th>½" & ¾"</th><th>1" & 1¼"</th></tr><tr><td>Cv (Kv) max:</td><td>2.1 (1.8) 4.4 (3.8)</td></tr><tr><td>Cv (Kv) dis:</td><td>1.2 (1.0) 2.3 (2.0)</td></tr><tr><td>Cv (Kv) min:</td><td>0.23 (0.2) 1.0 (0.9)</td></tr><tr><td>Cv (Kv) design:</td><td>0.52 (0.45) 1.9 (1.6)</td></tr></table>	½" & ¾"	1" & 1¼"	Cv (Kv) max:	2.1 (1.8) 4.4 (3.8)	Cv (Kv) dis:	1.2 (1.0) 2.3 (2.0)	Cv (Kv) min:	0.23 (0.2) 1.0 (0.9)	Cv (Kv) design:	0.52 (0.45) 1.9 (1.6)
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Cv (Kv) design:	0.52 (0.45) 1.9 (1.6)										

Certifications

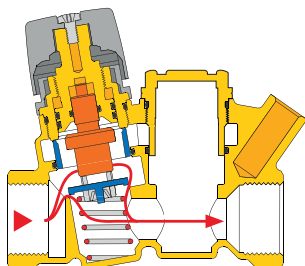
The valve complies with standards NSF/ANSI/CAN 61 (180 °F/82 °C Commercial Hot), NSF/ANSI/CAN 372 and with codes IPC, IRC, UPC and NPC as certified by ICC-ES, file PMG-1360.

Connections

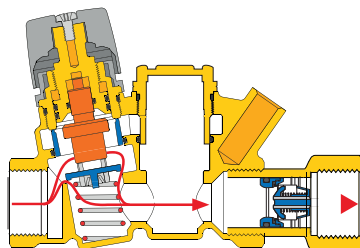
Main connections:	½" & ¾" with npt female, sweat, press, PEX crimp and PEX expansion union connections
Temperature gauge/probe pocket:	1" & 1¼" integral NPT female Ø 10 mm metric

Temperature gauge code 116010

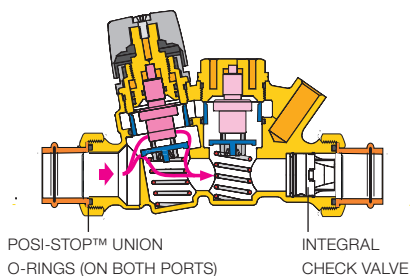
Scale:	32 – 180 °F (0 – 80 °C)
Diameter:	1½" (40 mm)



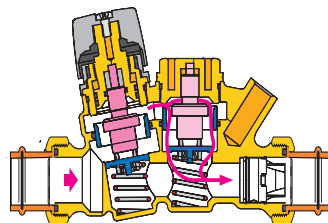
Thermostatic control,
1161xxA series, size 1" & 1¼"



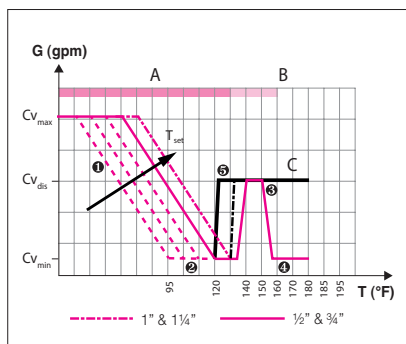
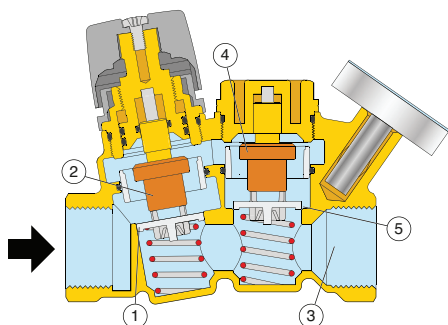
Thermostatic control with check valve,
1161xxAC series, size 1" & 1¼"



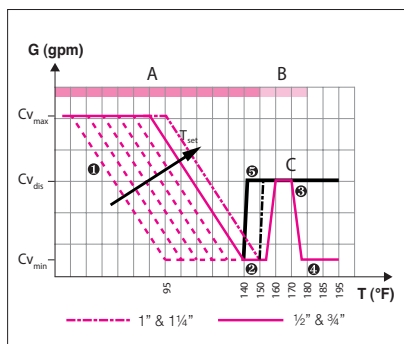
Thermostatic control,
1161x0AC 006 series,
size ½" or ¾" press union



Disinfection control,
1161x0AC 004 series,
size ½" or ¾" sweat union



For 1166xx series with 140 °F bypass temperature
and 150 °F closing temperature.

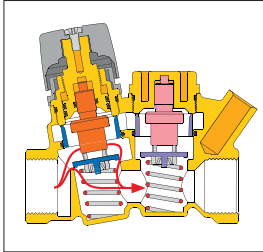


For 1162xx series with 160 °F bypass temperature and
170 °F closing temperature.

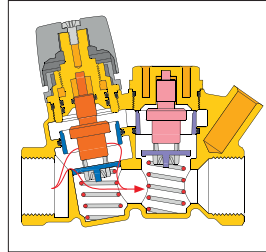
	½" & ¾"	1" & 1¼"
	Cv (Kv)	Cv (Kv)
Cv (Kv) max:	2.1 (1.8)	4.4 (3.8)
Cv (Kv) dis:	1.2 (1.0)	2.3 (2.0)
Cv (Kv) min:	0.23 (0.2)	1.0 (0.9)

Function A - Temperature control

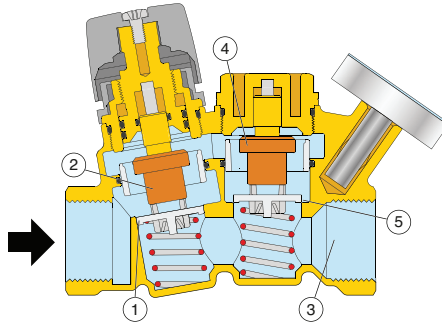
At the set temperature, the valve plug (1), controlled by the thermostatic balancing cartridge (2), gradually closes the outlet (3) to the minimum. The outlet never fully closes to always allow a minimum flow for temperature sensing and to prevent recirculation pump dead-heading. If the temperature decreases, the outlet increases, causing flow and thus temperature to increase back to the set temperature as shown in curve 1. If temperature exceeds the set-point, the plug stays in the minimum closed position as shown in curve 2. The balancing cartridge has a throttling range of 60°F, from full open to minimum position.



❶ Thermostatic control

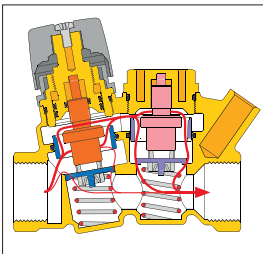


❷ Minimum flow rate

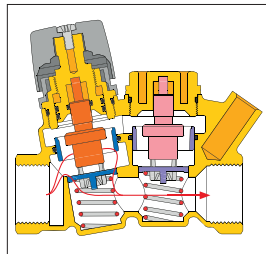


Function B - Automatic thermostatic disinfection

The 1162xx and 1166xx series operating characteristic curves for operating mode B are curves 1, 2, 3 and 4. When a temperature higher than about 155 °F (68 °C) is reached, a bypass passage begins to open to activate the second thermostatic cartridge (4) which controls the thermal disinfection process, allowing flow independent of the operation of the thermostatic balancing cartridge. This allows water flow through a special bypass port, opening the flow path up until the bypass temperature is attained shown in curve 3. If the temperature continues rising beyond this point, the flow is reduced through the bypass port to allow thermal balancing even during the disinfection process. When temperature reaches closing temperature, the disinfection bypass port (5) closes to protect the system fixtures from the effects of excessive temperatures, as shown in curve 4.



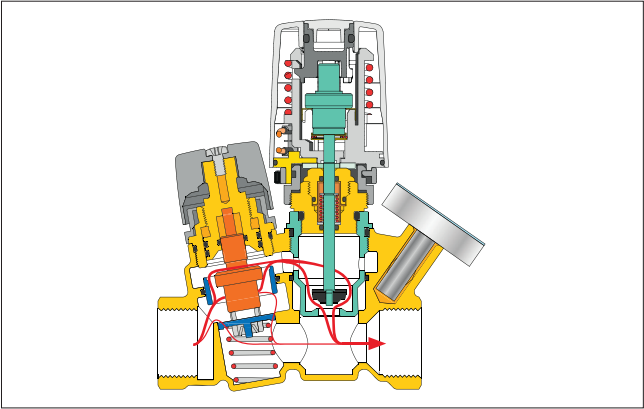
❸ Thermostatic disinfection



❹ Thermal shut-off

Function C - Actuator-controlled disinfection

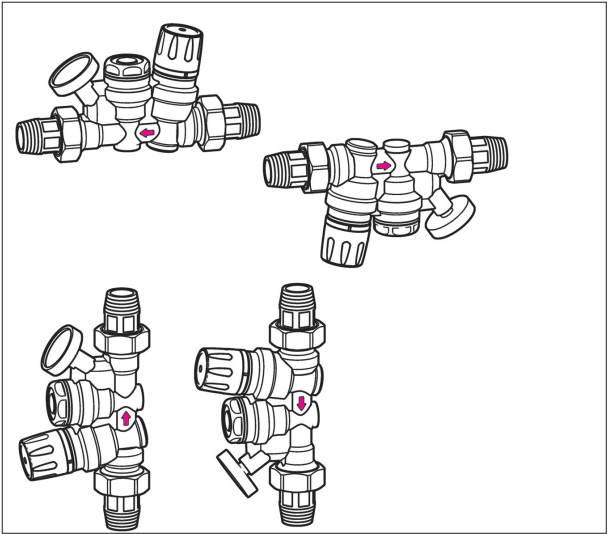
The 1163xx series operating characteristic curves for operating mode C are curves 1, 2 and 5. When the disinfection operating temperature setting of the electronic disinfection system is reached, the thermo-electric actuator 656 series (which is controlled by a dedicated electronic control system), is energized to operate the bypass valve to control the disinfection process, allowing flow independent of the operation of the thermostatic balancing cartridge shown in curve 5. In this case, the minimum head loss is produced during this thermal disinfection process.



⑤ Electrically controlled disinfection

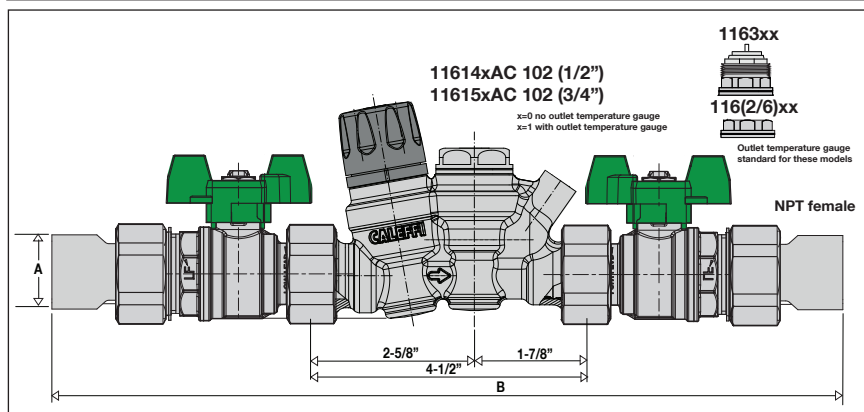
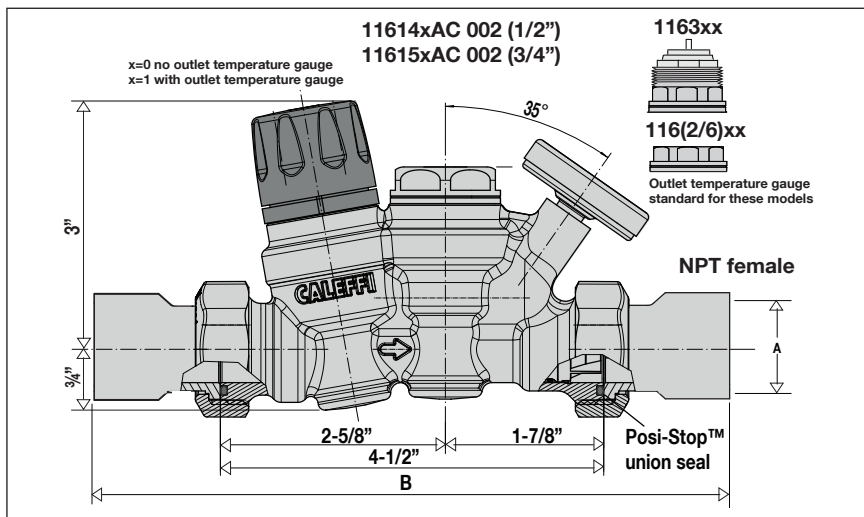
Installation

Before installing the ThermoSetter, flush the pipes to make sure that impurities in system will not interfere with valve performance. Strainers of sufficient capacity at the inlet from the water main are highly recommended. The ThermoSetter can be installed in any position, vertical or horizontal, following the flow direction indicated by the arrow on the valve body. The ThermoSetter must be installed according to the diagrams given in this manual. It must be installed to allow free access to for checking on operation and maintenance procedures.



Dimensions

ThermoSetter 116 series 1/2" & 3/4" union connections with standard outlet check valve



Base Code	A	B					Weight w/o ball valves w/ ball valves (lb/kg) (NPT;SwT;Prs;exp;crmp)
		NPTF 002 102	Sweat 009 109	Press** 006 106	PEX expansion 008 108	PEX crimp 007 107	
116n40AC XXX with ball valves	1/2"	6 11/16" 12 1/4"	6 1/32" 11 9/16"	6 11/16" 12 3/16"	5 15/16" 11 7/16"	5 7/8" 11 3/8"	3.0;2.6;2.4;2.4;2.4 5.0;4.6;4.4;4.4;4.4
*116n41AC XXX with ball valves		6 11/16" 12 1/4"	6 1/32" 11 9/16"	6 11/16" 12 3/16"	5 15/16" 11 7/16"	5 7/8" 11 3/8"	3.0;2.6;2.4;2.4;2.4 5.0;4.6;4.4;4.4;4.4
116n50AC XXX with ball valves	3/4"	7 7/32" 12 11/16"	6 1/2" 12"	6 3/4" 12 1/4"	8 7/8" 14 3/8"	7 7/8" 13 7/16"	3.0;2.8;2.4;2.4;2.4 5.0;4.8;4.4;4.4;4.4
*116n51AC XXX with ball valves		7 7/32" 12 11/16"	6 1/2" 12"	6 3/4" 12 1/4"	8 7/8" 14 3/8"	7 7/8" 13 7/16"	3.0;2.8;2.4;2.4;2.4 5.0;4.8;4.4;4.4;4.4

*with integral outlet temperature gauge (digits 5 and 6=41 and 51 only for 1161 models, and not used for A=2,6,3)

**Lay Length: size 1/2": 5"; size 3/4": 4-3/16".

n: =1 for models without disinfection function, integral outlet temperature gauge optional.

=2 for models with 160 °F (70 °C) disinfection temperature, includes integral outlet temperature gauge.

=6 for models with 140 °F (60 °C) disinfection temperature, includes integral outlet temperature gauge.

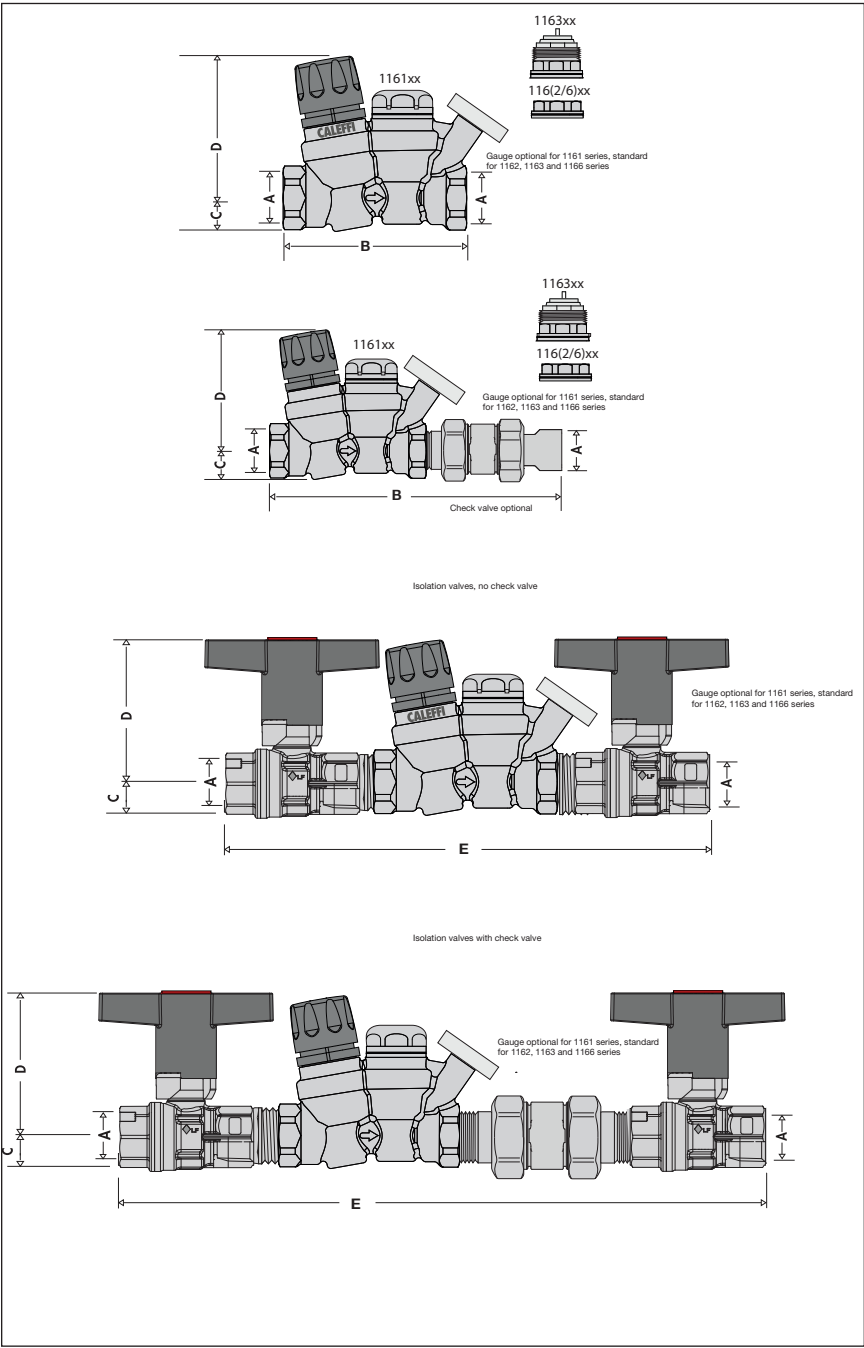
=3 for models with actuator disinfection function, includes integral outlet temperature gauge.

XXX: suffix identifies end connection style with and without isolation ball valves on inlet and outlet.

All 1/2" and 3/4" models have outlet check valve pressed into outlet before installing tailpiece and union nut, standard.

Dimensions

ThermoSetter 116 series 1" & 1¼" with & without outlet check valve



ThermoSetter 116 series 1" & 1¼" without outlet check valve

Code (1)	Code (2)	A	B	C	D	E	Wt w/o ball valves (lb/kg)	Wt with ball valves (lb/kg)
116160A	116D60A	1" NPT F	4½"	1"	4 ⅜"	--	2.1 / (0.95)	--
116160A 001	116D60A 001	1" NPT F	--	1"	4 ⅜"	12"	--	4.1 (1.8)
116161A*	--	1" NPT F	4½"	1"	4 ⅜"	--	2.2 / (1.00)	--
116161A 001*	--	1" NPT F	--	1"	4 ⅜"	12"	--	4.2 (1.9)
116170A	116D70A	1¼" NPT F	4½"	1"	4 ⅜"	--	2.1 / (0.95)	--
116170A 001	116D70A 001	1¼" NPT F	--	1"	4 ⅜"	13 7/8"	--	5.6 (2.5)
116171A*	--	1¼" NPT F	4½"	1"	4 ⅜"	--	2.2 / (1.00)	--
116171A 001*	--	1¼" NPT F	--	1"	4 ⅜"	13 7/8"	--	5.7 (2.6)

ThermoSetter 116 series 1" & 1¼" with outlet check valve (AC)

Code (1)	Code (2)	A	B	C	D	E	Wt w/o ball valves (lb/kg)	Wt with ball valves (lb/kg)
116160AC	116D60AC	1" NPT F	9 ½"	1"	4 ⅜"	--	2.3 / (1.0)	--
116160AC 001	116D60AC 001	1" NPT F	--	1"	4 ⅜"	15 ¾"	--	4.3 (1.9)
116161AC*	--	1" NPT F	9 ½"	1"	4 ⅜"	--	2.4 / (1.1)	--
116161AC 001*	--	1" NPT F	--	1"	4 ⅜"	15 ¾"	--	4.4 (2.0)
116170AC	116D70AC	1¼" NPT F	9 ¾"	1"	4 ⅜"	--	2.3 / (1.0)	--
116170AC 001	116D70AC 001	1¼" NPT F	--	1"	4 ⅜"	17 ⅜"	--	4.1 (1.8)
116171AC*	--	1¼" NPT F	9 ¾"	1"	4 ⅜"	--	2.4 / (1.1)	--
116171AC 001*	--	1¼" NPT F	--	1"	4 ⅜"	17 ⅜"	--	4.2 (1.9)

Codes with suffix '001' come assembled with NA108 ball valves on the inlet and outlet.

(1) Models without disinfection function

* with integral outlet temperature gauge.

(2) Models with disinfection function

D=2 for models with 160 °F (70 °C) disinfection temperature.

D=6 for models with 140 °F (60 °C) disinfection temperature.

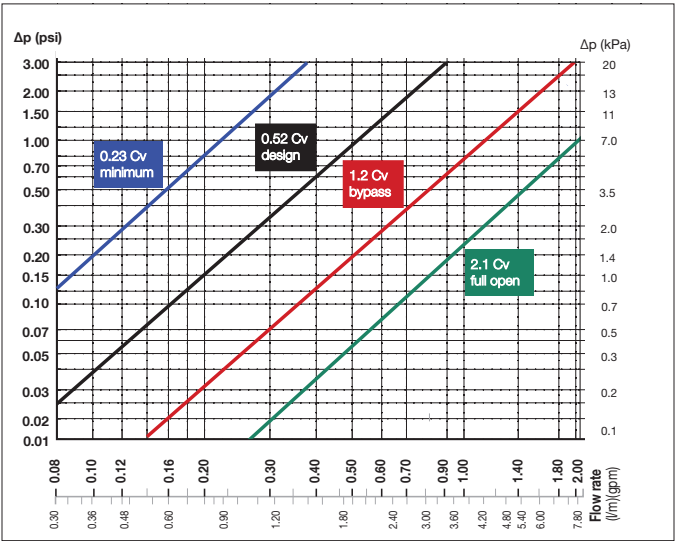
D=3 for models with actuator disinfection function.

NOTE: All models, in this column come complete with integral outlet temperature gauge.

Flow characteristics

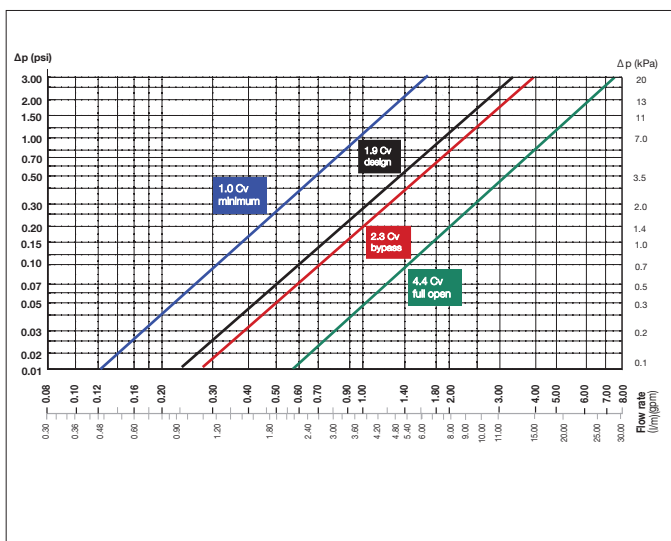
The ThermoSetter thermostatic balancing valve is designed to balance individual branches of domestic hot water recirculation systems, based on the temperature at the valve. It automatically modulates flow to maintain hot water availability to all fixtures in the branch circuit. The valve is at minimum flow (Cv = 0.23 for ½" & ¾"; 1.0 for 1" & 1¼") when the incoming water temperature is equal to the set-point position of the adjustment dial. The valve opens as incoming water temperature drops.

For pressure loss calculations in the recirculation system, follow traditional pipe sizing and head loss practices. For pressure loss calculations across the ThermoSetter valve, use the design curve shown in the graphs below. This line represents a typical valve position under normal working conditions (ΔT= 10 °F). Determine the pressure drop across the valve by selecting the branch design gpm on the graph X-axis, draw a vertical line up to the "design" curve, then go across to the Y-axis to find the design pressure drop. Include that pressure drop in your head loss calculations for the circuit.



Sizes ½" and ¾"

The "bypass mode" curve in the chart above shows the head loss of the valve when it is in bypass thermal disinfection mode for Legionella control.

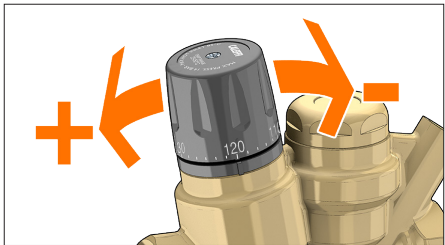


Sizes 1" and 1¼"

The "bypass mode" curve in the chart above shows the head loss of the valve when it is in bypass thermal disinfection mode for Legionella control.

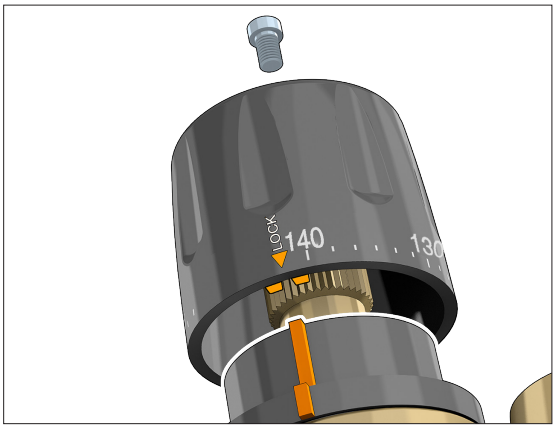
Temperature adjustment

Set the desired recirculation system temperature by turning the adjustment knob. The graduated scale shows the temperatures at which the indicator can be set. A valve temperature setting at about 10 °F (5 °C) higher than the water temperature at the valve inlet is recommended, accounting for heat losses along the line, to limit the head required at the recirculation pump. Be sure this is the minimum flow rate at the mixing valves in the central heating system.

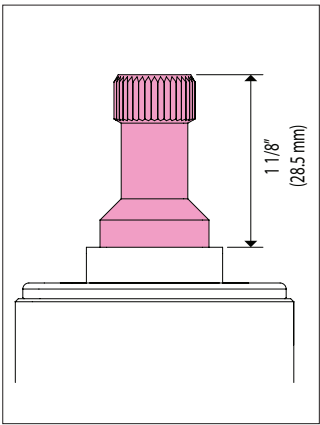


Adjustment locking

After adjusting the temperature, the setting can be locked at the desired value using the adjustment knob. Unscrew the locking screw at the top of the adjustment knob (A), remove the knob and then put it back on so that the internal groove couples with the protrusion on the knob holder nut. When this block is used, the reference of the indication of the temperature values on the knob is lost. To restore it, completely unscrew the regulating screw (B). NOTE: for 1" and 1¼" sizes only stop at 1 1/8" as shown. Replace the knob and reposition it to the maximum value (140 °F ½" & ¾"), (150 °F 1" & 1¼") . Tighten the locking screw.



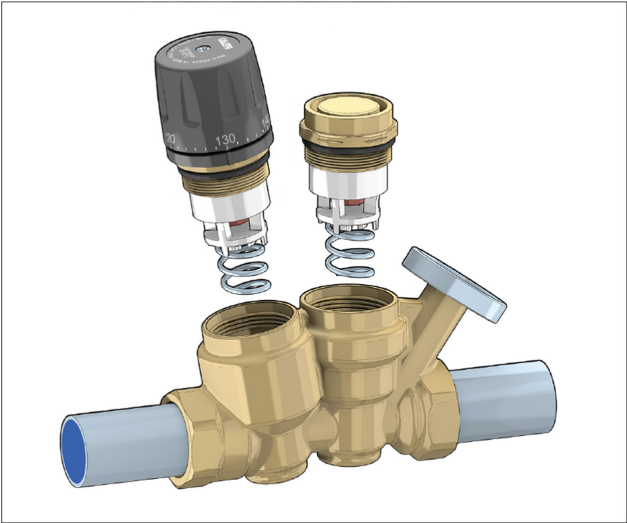
A



B

Maintenance

Both the balancing adjustment cartridge and the disinfection control cartridge can be removed from the valve body for periodic inspection, cleaning or replacement.



Insulation shell

The ThermoSetter insulation shell, code CBN116140 (sizes ½" & ¾"), CBN116160 (sizes 1" & 1¼") can be purchased separately to minimize heat loss.



Replacement parts



Actuator disinfection cartridge for use with 656 actuator.

Code	Description	Lbs
116000	Replacement actuator bypass cartridge	0.1



Temperature gauge fits 116 ThermoSetter. Working temperature range: 32 °F – 180 °F.

Code	Description	Lbs
116010	1½" dial temperature gauge	0.1



Replacement thermal disinfection cartridge.

Code	Description	Lbs
F0001286	140 °F Thermal disinfection cartridge	0.1
F0000580	160 °F Thermal disinfection cartridge	0.1



Check valve fits 1" and 1¼" 116 ThermoSetter.
Max. working pressure: 150 psi.
Max. working temperature: 250 °F.
Stainless steel body.

Code	Description	Lbs
NA51361	1" MNPT in x 1" FNPT out	1.1
NA51371	1¼" MNPT in x 1¼" FNPT out	1.3



Replacement main balancing cartridges

Code	Description	Lbs
F0001516	½", ¾" balancing cartridge	0.1

Isolation ball valves

The NA108 series low-lead brass full-port ball valves are designed for isolating ThermoSetter 116 series thermal balancing valves with 1" and 1-1/4" NPT connections. The isolation valve comes factory-installed on the inlet and outlet sides of the valve body using a low-lead close nipple. Some products are available pre-assembled with the NA108 series isolation valve. For example, the Caleffi 116A series ThermoSetter can be ordered complete with two of these ball valves plus low-lead close nipples by adding a suffix "001" to the order code number, see page 9 through 11.



The NA108 series have an extended stem which allows operation if the valve body gets insulated. The valve features a blowout proof stem, PTFE seats, double o-ring stem seals, lead free brass ball and stem, and polyamide thermal plastic T handle.

The following codes can be ordered separately for field installation if not ordered factory pre-assembled with the 116.

Code	Description
NA10826	1" NPT female ball valve low lead
NA10827	1¼" NPT female ball valve low lead
NA10836	1" NPT male close nipple low lead
NA10837	1¼" NPT male close nipple low lead



Caleffi code 290030 full-port ball valve is designed for isolating the 116 series ThermoSetter sizes ½" and ¾" which have 1" metric "G" thread union connections. The isolation valve installs in between the valve body and the tailpiece fitting assembly. Male x Female configuration and bi-directional full ball valve flow capacity provides flexibility for using one, two or three isolation valves for the primary functioning valve. The following codes can be ordered separately for field installation.

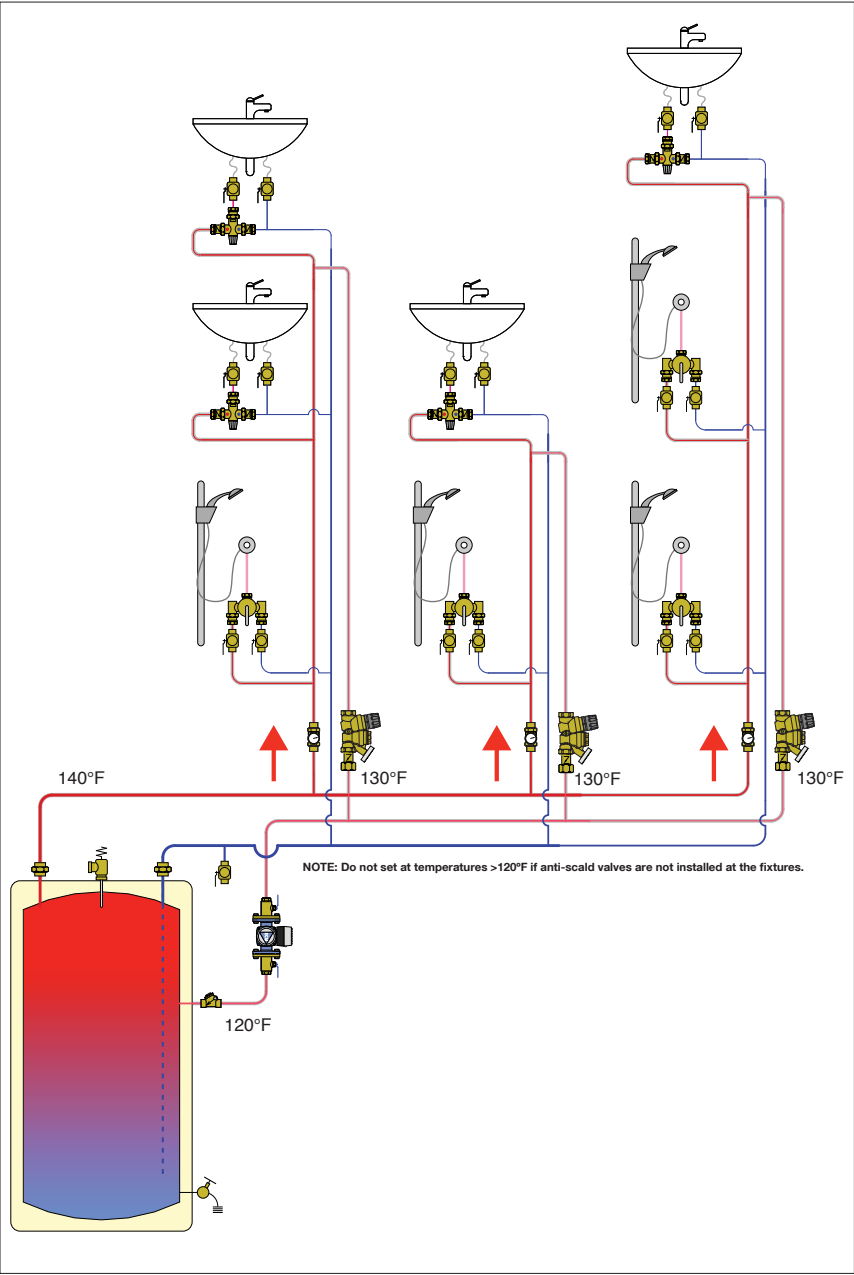


Code	Description
290030	Isolation ball valve low lead 1" M x 1" F union
290031	Isolation ball valve with extended stem low lead 1" M x 1" F union

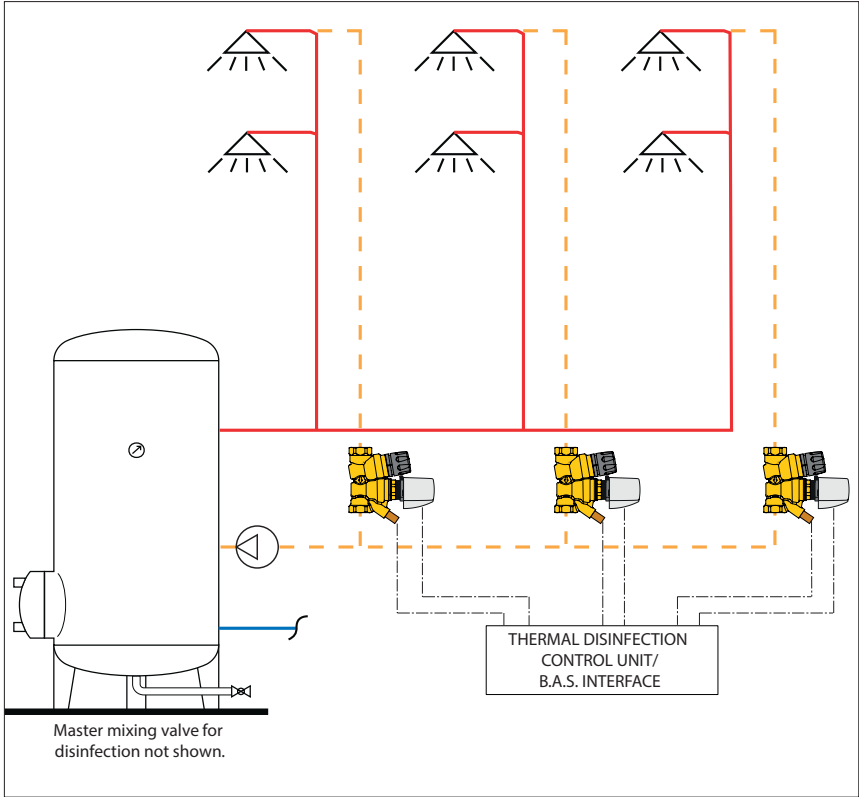


Application diagrams

Hot water recirculation with thermal balancing valves



Hot water recirculation with actuator controlled disinfection



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