



Building Control Solutions LLC

Domestic Hot Water Package

This control package is an Electronic Tempering Valve System used to control domestic hot water temperature.

Approved and Listed
ASSE-1017

The system includes:

- (1) TC250D PI controller with LED display
- (1) STP120-70 Fast Immersion Sensor
- (1) M800 20 second Modulating Actuator
- (1) V43 Stainless Steel 3-way Valve
 Sizes: ¾" | 1" | 1 ¼" | 1 ½" | 2" | 2 ½"
- (1) M4202 Enclosure with back plate

The stainless-steel mixing valves conform to NSF/ANSI 372-2011 & California Lead Free Health & Safety Code Sec. 116875-116880

Features:

- Easy setup, default settings work in most systems
- PI control algorithm
- High temperature alarm function
- Fast sample rate of sensor input
- Low demand dead zone with adjustable activation point
- Several valves can be installed in parallel, wired to one controller

The control package should be used in systems incorporating a hot water recirculating line with a pump running continuously.

An optional solenoid valve can be added for high temperature shutdown.



Warning!

This control package is not a safety system. It is only an operating temperature control system

It is the installer's responsibility to make the field adjustments needed for the correct operation of this control system, according to these instructions.

Technical Data

Controller (page 2)	TC250D	Actuator (page 3)	M800
Power supply	24 V ac/dc	Power supply	24 Vac, 50 VA
Power consumption	75 mA	Control signal input	0/2 – 10 Vdc
Sensor (page 4)	STP120-70	Stem force	200 lb.
Sensor sample rate	10/sec.	Run time (¾" stroke)	20 seconds
Analog output	0-10 or 2-10 Vdc	Temperature Ranges	
Enclosure	5" (W), 5" (H), 3 ¼" (D)	Cold Inlet	40°F – 80°F
SS 3-way valve	Page 2	Hot Inlet	120°F – 205°F
		Outlet Temp	95°F – 140°F

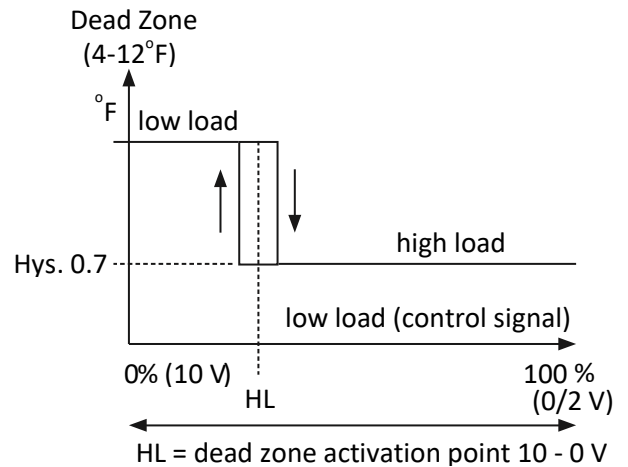
TC250D - Controller

The TC250D is a proportional integral (PI) controller with an adjustable dead zone feature. The proportional (P) action gives stability to the control loop but can cause some fluctuation around setpoint. The integral (I) action corrects the P error and brings the loop back to setpoint.

The adjustable dead zone (4-12°F) allows for very stable control at low loads (high control signal). The activation point for the dead zone can be set between 0-10 Vdc (default = 9 Vdc)

At high load, there is a fixed dead zone (hysteresis) of 0.7°F

The use of a dead zone reduces the wear on the actuator in systems with large fluctuations in load and long periods at low load.



Mixing Valve

The stainless-steel mixing valves conform to NSF/ANSI 372-2011 and California Lead Free Health & Safety Code Sec. 116875-116880 for a maximum lead content of 0.25%



Maximum System Pressure:

Water 250psi

Steam 100psi

Max Temperature: 350°F

Characteristics: EQ% Modified

Connections: NPT

Stroke: ¼"

Materials:

Body Stainless Steel

Stem Stainless Steel

Trim Stainless Steel

Stem Packing: PTFE spring loaded

V-cups + Viton O-Rings

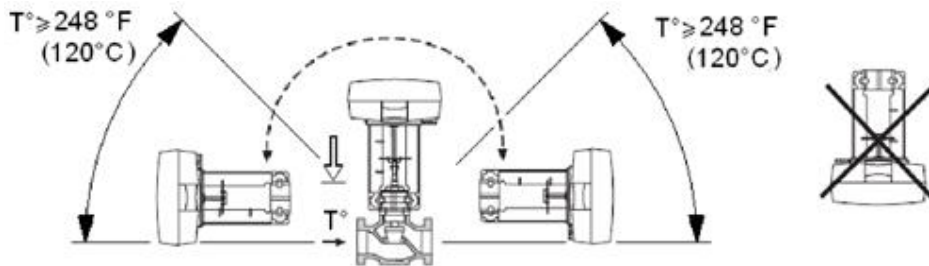
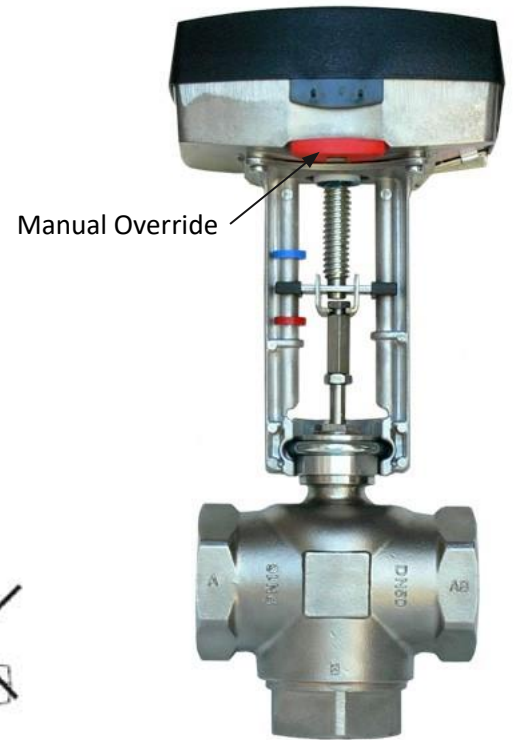
Size	Cv@1 psi	2 psi	3 psi	4 psi	5 psi	6 psi
¾"	7.3 gpm	10.8	13.2	15.3	17	18.7
1"	11.6	16.3	20	23.2	25.5	27.8
1 ¼"	18.5	26.5	32.2	36.8	41.4	44.8
1 ½"	29	40.2	49.4	57.5	64.4	70.2
2"	46.3	65.5	79.3	92	102	112
2 ½"	65	91	112	129	145	158

Manual operation

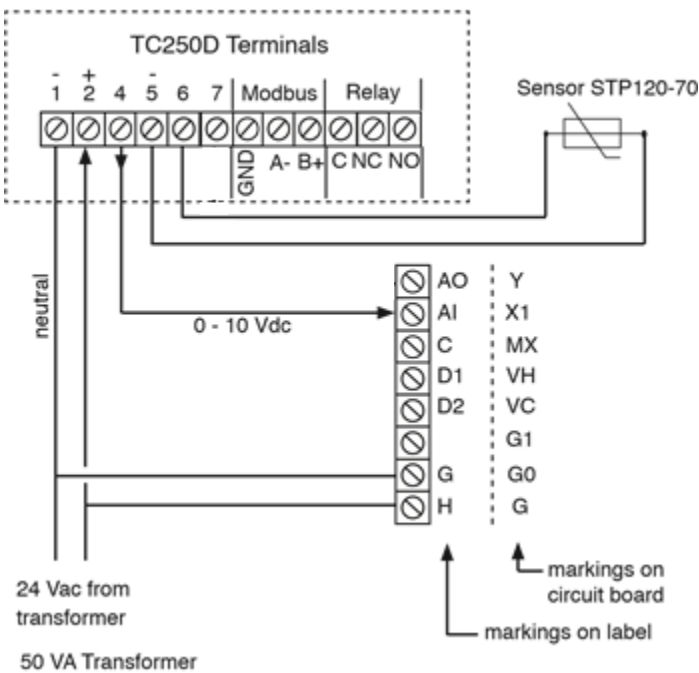
There is a red manual operation handle on the actuator. When it is lowered, the motor stops. Then the actuator can be operated manually if the handle is turned.

Important

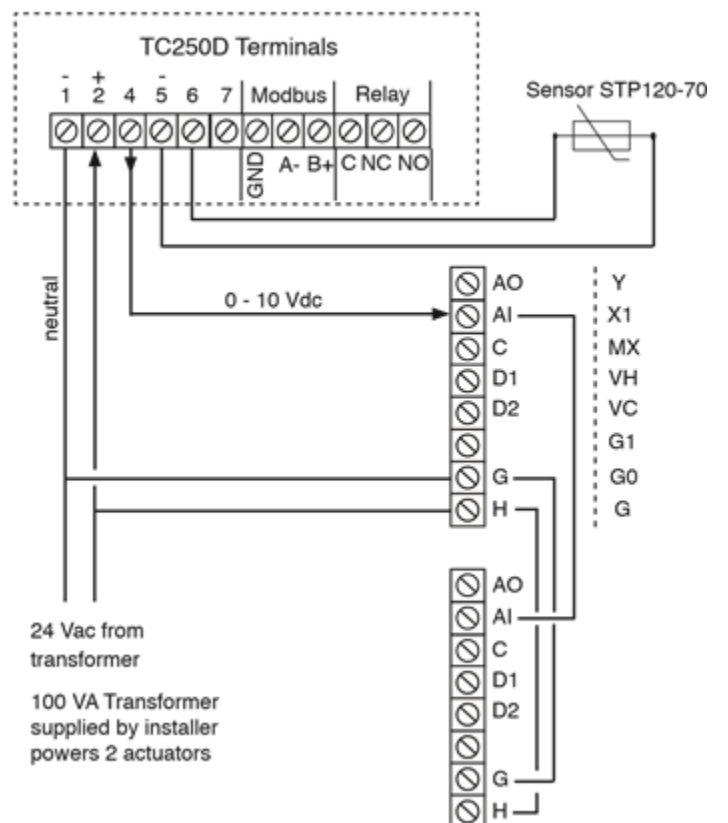
First, connect only the 24 Vac and let the actuator self-adjust to the stroke of the valve. The control signal should NOT be connected to AI during this process.



Wiring of one M800 Actuator



Wiring of two (2) M800 Actuators in parallel

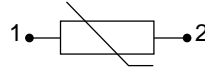


STP120-70 - Sensor

The STP120-70 water temperature sensor is designed for fast applications. The sensor should be mounted without a well. Includes NTC 1.8 K element and the insert probe is made of stainless steel.

Reaction time - 1.5 sec. Connection - 1/2"

WIRING




Ordering



Part Number	Valve Size		Flow Coefficient		Flow Range
			Cv	Kv	GPM*
TVS43-020	3/4"	DN20	7.3	6.3	7 - 19
TVS43-025	1"	DN25	11.6	10.0	12 - 28
TVS43-032	1 1/4"	DN32	18.5	16.0	18 - 45
TVS43-040	1 1/2"	DN40	29.0	25.0	29 - 70
TVS43-050	2"	DN50	46.3	40.0	46 - 112
TVS43-065	2 1/2"	DN65	65.0	55.5	65 - 158




* Suggested flow range for a given size to achieve good control authority


Operator Interface


The simple 3 key operator interface performs all the functions needed to adjust and set the operating parameters for the control loop.

Press and hold the  enter key for 3 seconds to place the interface in adjust mode.

Use the   keys to move between functions.

Select a function with  and then make changes with  

When finished, confirm the change with  then select the next function with the up or down arrow key and make that adjustment.

When all changes have been made, hold down  for 3 seconds to exit adjust mode.



Display	Functions & Adjustments	Default
FC	Temperature scale °F or °C	°F
125F	Setpoint 40 - 205°F (5 - 96°C)	100 °F
P 50	P-band 9 – 360°F	50°F
12	I-Time OFF or 1 – 480 seconds	12s
HL 9	Dead zone activation point 0 – 10 Vdc	9 Vdc
d2.5	Dead zone 4 – 12°F (2 – 9°C)	5°F
Ro	Analog output 0–10 or 2–10 Vdc	0–10 Vdc
dA	Direct acting output	Dir. Acting
t 30	Actuator run time 15, 30, 60, 120, 180	30 sec
L OFF	Limit OFF or 15 – 40°F over setpoint	OFF
d 10	Limit time delay 3 – 300 seconds	10 sec
HL A	High temperature limit alarm (blinking)	
SE	Sensor Error (open or shorted sensor)	
DEF	Reset to default values Yes or No	

High Limit Alarm Function (Works in D. A. mode only). Function is OFF by default (LOFF in Display)

This is a high limit function that is activated if the temperature goes above setpoint by an adjustable number of degrees, for a certain length of time. This is set with **L** (temperature) and **Lt** (time). **L** is the number of degrees over setpoint and **Lt** is the delay in minutes before the function is activated.

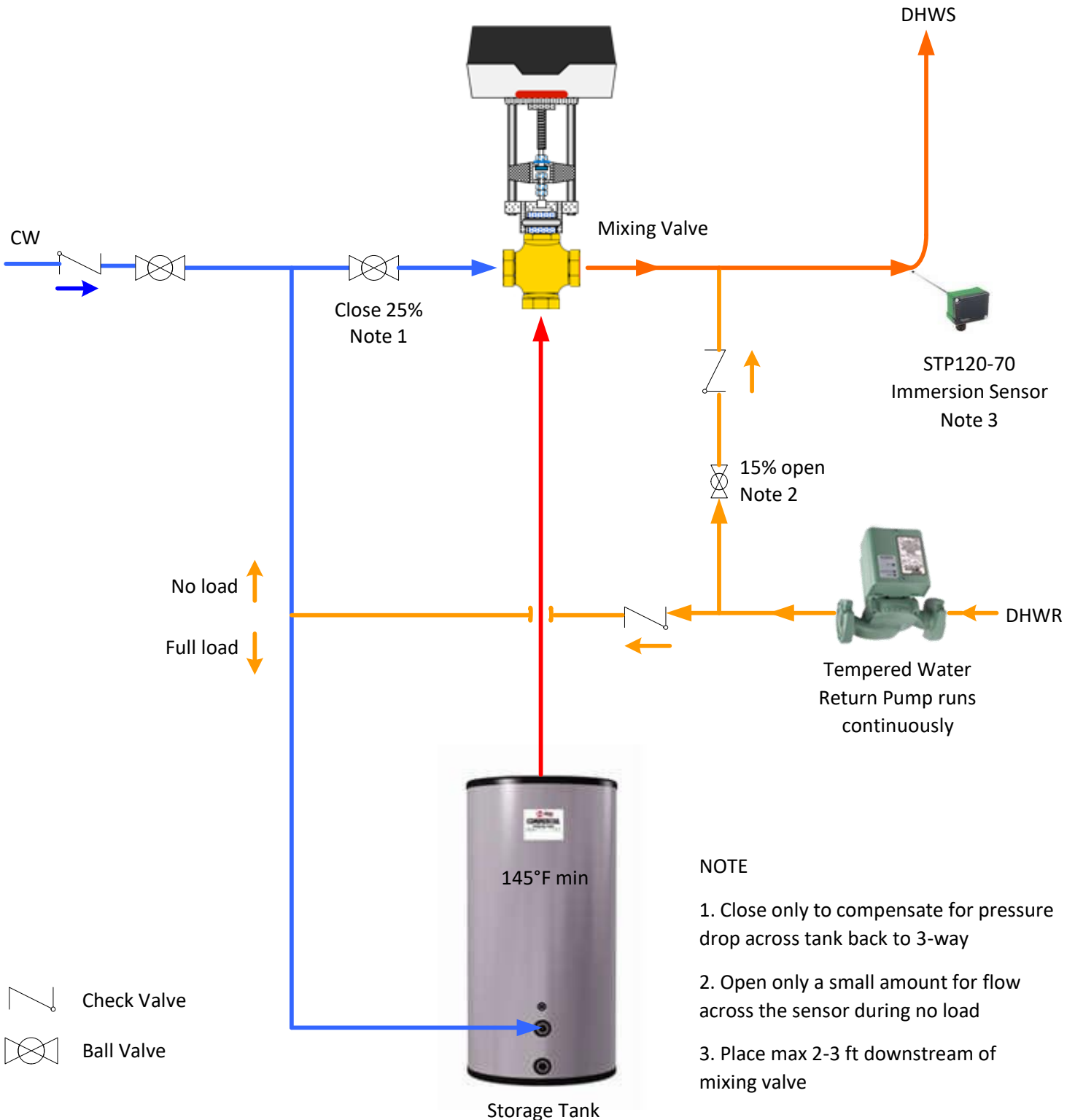
Example: Setpoint = 125°F, L = 15°F, d = 10 seconds. The alarm is triggered at 140°F after 10 seconds.

The output for this function is a SPDT relay that can be wired to a N.C. solenoid valve and/or a remote alarm unit.

Alarm Reset: Press down both   keys for one second to reset a high temperature alarm.

Note: To turn off the alarm function, increase the limit temperature (**L**) one step beyond maximum, to **OFF**.

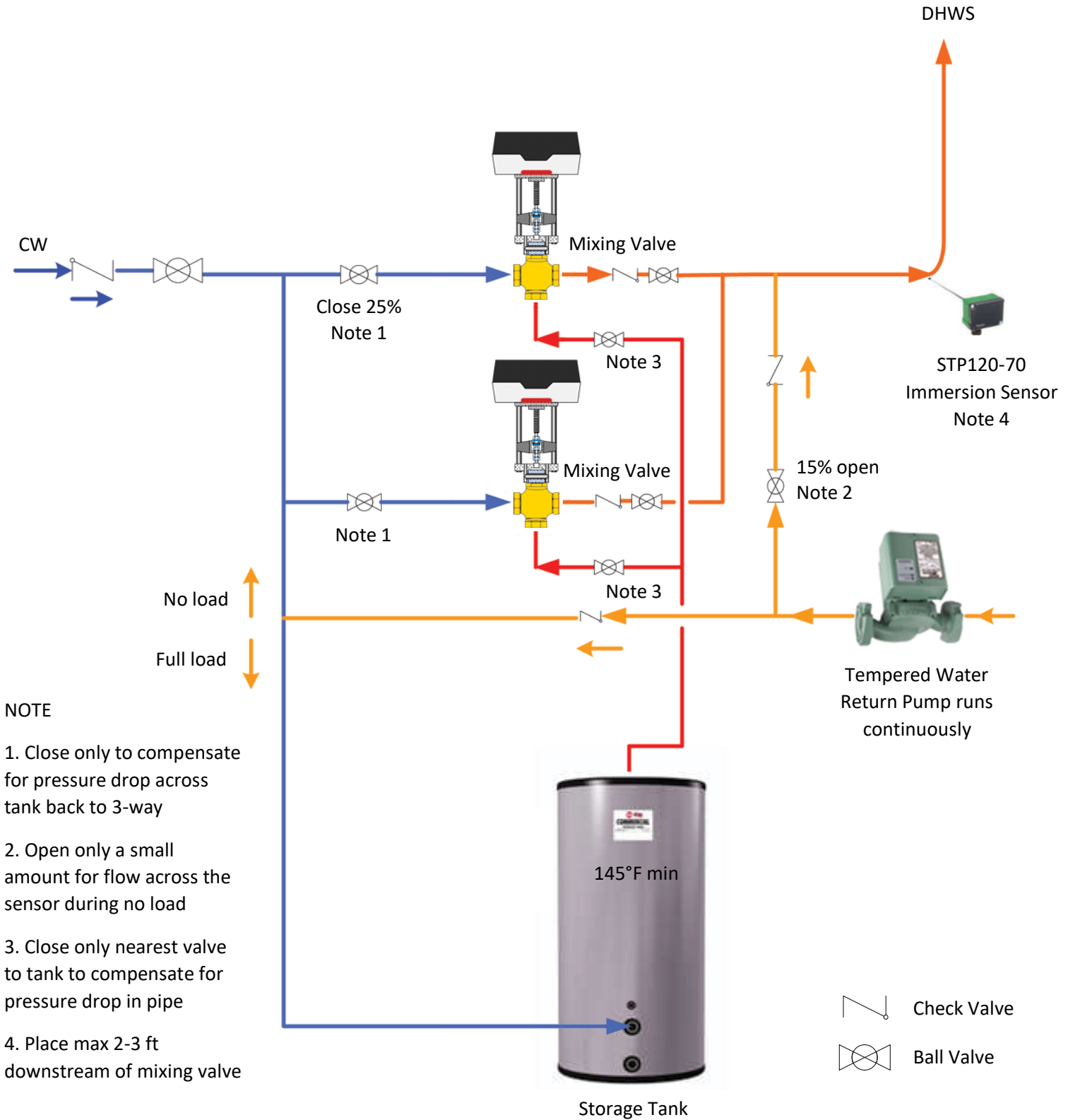
Piping – 1 Mixing Valve



ATTENTION

The installer must follow all applicable codes and provide and install check valves to prevent cross-flow between hot and cold inlets and in the recirculation line before the connection to the cold-water line.

Piping – 2 Mixing Valves



ATTENTION

The installer must follow all applicable codes and provide and install check valves to prevent cross-flow between hot and cold inlets and in the recirculation line before the connection to the cold-water line.