

Failsafe Control Unit

The Emech Failsafe Control Unit is designed for use with Emech G1 electronic actuated control valves, and electrically switched isolation valves.

The unit is primarily designed to minimize the possibility of out of specification water temperature being supplied to hose wash-down stations, and critical fluid temperature processes.

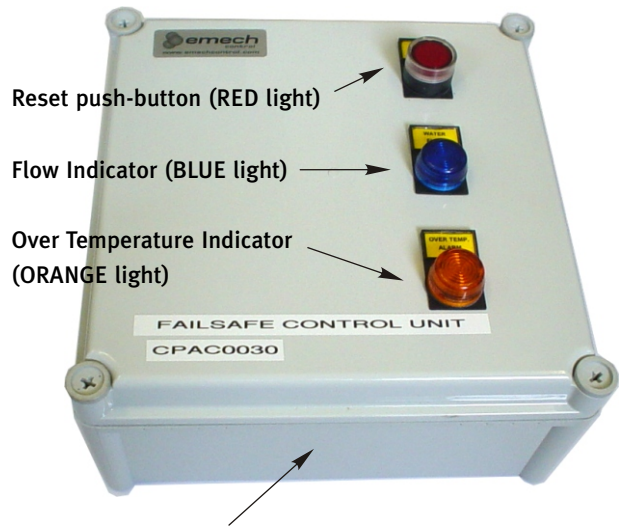
Using dependable relay logic switching components, the Failsafe Control Unit can be connected to temperature and flow switches. This creates enhanced safety for operators of hot water wash-down hoses and processes. Steam and/or hot water isolation valves are tripped to close (FAILSAFE) when over-temperature conditions are detected.

Also included is a 5 amp switch-mode power supply, suitable for powering an Emech G1 Actuator. The unit comes in a water resistant enclosure suitable for industrial installation.

Features

- Automatically trips actuated isolation valving for steam and hot water at 'low-flow' or 'over-temperature' conditions.
- Can be connected to 'emergency shut-down' (ESD) switches to also trip actuated isolation valving in the event of hose failures or other emergencies.
- A 'Reset' push-button on the front panel indicates the Failsafe Control Unit is powered and operating. This light is OFF only when there has been an over-temperature condition, or the main power supply is OFF. Pushing the 'Reset' button enables the safety system to be reset after the over-temperature condition has been resolved.

Enables the setting of Valve System Failsafe conditions for Fluid Temperature control.
(Includes a 24Vdc Regulated Power Supply)



Recommended position of cable entry points.
(to be drilled and fitted with Cable Glands by Customer)

Figure 1: Emech Failsafe Control Unit

- A flow switch is set to close the actuated hot water or steam isolation valving when the water demand is BELOW the recommended minimum temperature-controllable flow of the Emech valve.
- 3 high visibility indicator lights for showing the status of the controller: System Active ('Reset' button lit); Adequate flow; Over-temperature.
- Includes a regulated power supply (230/110 VAC to 24VDC). Provides up to 5 A , 24 V DC supply for the Emech G1 Actuator and powered accessories.
- Enclosure ingress protection to IP65/NEMA 4 (with the use of appropriate cable glands - customer supply).

Environmental / Standards

Ambient Temperature	-10°C to +50°C (14°F to 122°F)
Ingress Protection Standard	Designed to meet IP65 (equivalent to NEMA 4)

Electrical Data

Input Voltage (mains supply)	110V 60 Hz AC or 230V AC 50 Hz (switchable)
Input Current	Nominal <2.6A @ 110 V, <1.4 A @ 230 V
Output Voltage (actuator supply)	24V DC +5% -1%
Output Current	5 A

Cable Access

At Failsafe Control Unit:
 Input Voltage; 24V DC Output; Thermal Switch Input; Flow Switch Input; Steam Isolation valve; Emergency Stop Switches; Flow Switch Output.
 Customer to drill holes and fit appropriate cable glands to suit site standards.

At Emech G1 Actuator Connection:

Power Supply	2 x M16 cable gland
Port 1- Temperature Sensor Assembly Input	M8 Female 3 Pin (Sensor and Fitting supplied, part CPAC0021)
Port 2- Flow Switch Input	M8 Male 3 Pin (Cable and Fitting supplied, part CPEL0018)
Port 3- Serial Connection	M8 Female 4 Pin (Cable and Fitting supplied, part CPEL0091)

Emech G1 Actuator Assembly and Electrical Connection Ports

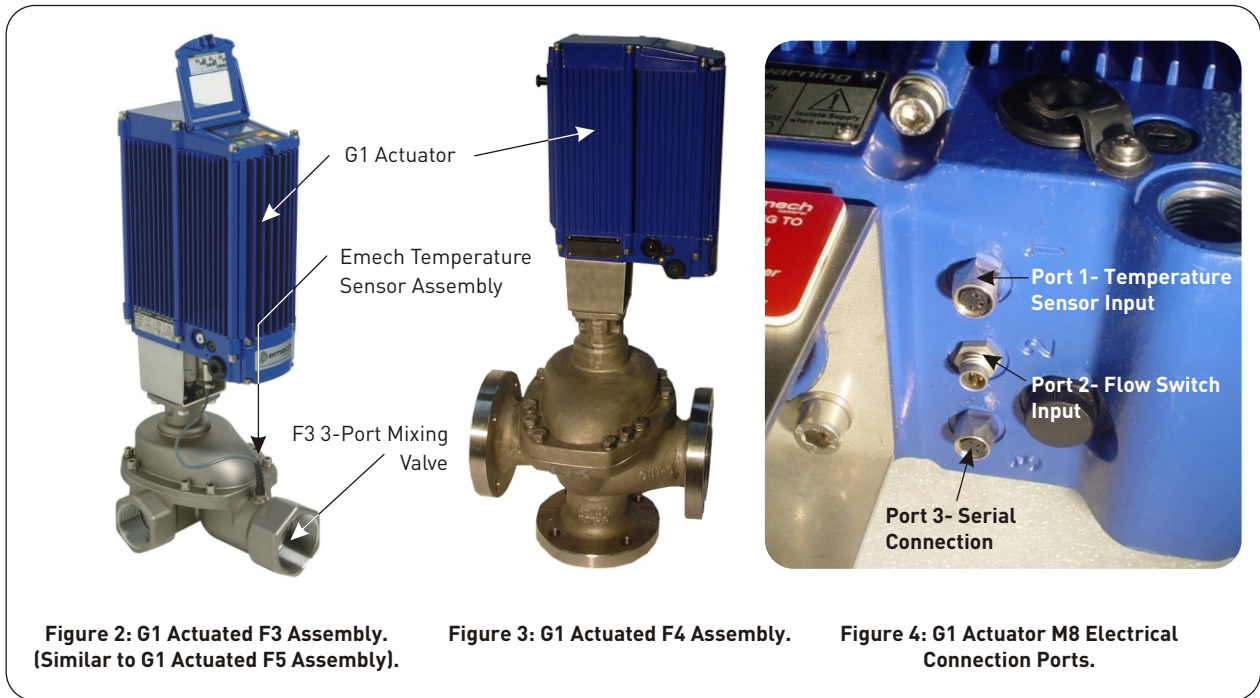


Figure 2: G1 Actuated F3 Assembly. (Similar to G1 Actuated F5 Assembly).

Figure 3: G1 Actuated F4 Assembly.

Figure 4: G1 Actuator M8 Electrical Connection Ports.

Installation Instructions

This Failsafe System is designed for or use with Emech G1 Actuated F3, F4, or F5 Mixing Valves:

- 1.0 Ensure the individual 'Installation, Operation and Maintenance' (IOM) Manual for the appropriate valve has been thoroughly read prior to installation.
- 2.0 Ensure the IOM Manual for the G1 actuator has been thoroughly read prior to installation.
- 2.1 NOTE that for the G1 to be used with the Failsafe Control Unit, it must be a unit with the 'Flow Switch Input' M8 connection in Port 2. (See Figure 4, page 2).
- 2.2 Emech supply a connection cable with an M8 plug to run between the G1 Port 2 and the Failsafe Control Unit (Part CPEL0018). See the electrical wiring diagram shown on page 5.

CAUTION!

- 3.0 A hydraulic circuit needs to be designed to ensure the appropriate safety and performance is achieved for each customer application. Emech has Application Notes that show typical circuits, but these can only be used as a guide for the system designer. (See <http://www.emechcontrol.com/applications.html>). A typical hose station circuit is shown on page 7.

Thermal Switch Installation:

- 4.0 The Thermal Switch should to be installed within 1m of the valve outlet. The probe housing ought to be immersed in the pipe flow to ensure rapid and effective heat transfer (see Figure 4. page 6). Installation through a socket welded to a swept bend in the pipework is one way to achieve this.
- 4.1 The Thermal Switch is to be screwed into a 1/2" BSPP socket welded in the pipe-work. Emech Thermal Switches are available with other types of pipe connections. Note that the 1/2" BSPT sensor will screw securely into a 1/2" NPT or NPSM fitting as the thread dimensions are an adequate match.
- 4.2 The set-point for the tripping of the hot water (or steam) isolation valve can be set by adjusting the dial knob in the enclosure (see Figure 5. page 6).
- 4.3 It is usual to set the Thermal Switch 9-18°F (5-10°C) above the normal operating temperature to minimize tripping that may occur through short period temperature variations.
- 4.3 Connect the thermal switch with appropriate cabling to the Failsafe Control Unit as per the electrical wiring diagram shown on page 5.

Flow Switch Installation:

- 5.0 The Flow Switch ought to be installed about 2-4m from the mixing-valve outlet, and **BEFORE** any draw off points.
- 5.1 The Flow Switch has been factory set by Emech to switch at the minimum temperature-controllable flow of the specific Emech control valve used in the system. See Table 1. below for the nominal minimum temperature-controllable flows per valve size. Contact Emech for solutions at other flows.
- 5.2 Connect the flow switch with appropriate cabling to the Failsafe Control Unit as per the electrical wiring diagram shown on pg 5.

Table 1: Emech Valve Size and Specifications

		3-Port Mixing Valves									
Valve Figure Number		F3	F3	F3	F3	F4	F5	F5	F5		
Nominal Valve Size	U.S. (Inch) Metric (mm)	3/4"	1"	1 1/2"	2"	3"	1"	1 1/2"	2"		
		20mm	25mm	40mm	50mm	80mm	25mm	40mm	50mm		
		Flanged Valve									
Inlet/Outlet Size	U.S. (Inch) Metric (mm)	3/4"x1" 20x25	1"x1-1/4" 25x32	1-1/2"x1-1/2" 40x40	2"x2-1/2" 50x65	3"x3" 80x80	1"x1-1/4" 25x32	1-1/2"x1-1/2" 40x40	2"x2-1/2" 50x65		
Pressure Rating	U.S. (psi @ 212F) Metric (bar @ 100C)	145 10	145 10	145 10	145 10	110 7.6	(psi @ 482F) (bar @ 250C)	145 10	145 10	145 10	
Flow Co-efficient - Mixing	Cv Kv	8.1 7	12.5 10.9	19.6 17	47.5 41.3	144 125	8 6.8	13.3 11.9	26.6 23		
Flow at given pressure drop (dP) across the valve	USgpm @ 29 psi dP Lpm @ 2 bar dP	44 165	68 257	106 401	257 973	778 2946	42 160	74 280	143 542		
Nominal Minimum Mixing Flow for temperature control. (contact Emech for low flow applications)	USgpm Lpm	0.9 4	4 18	6 26	20 70	53 200	4 18	6 26	20 70		
Weight Valve Only	lbs kg	4 2	5.5 2.5	11 5	22 10	100 45.5	5.5 2.5	11 5	22 10		
Weight Valve + G1* Actuator	lbs kg	23 10.5	24.5 11	30 13.6	49 22.2	117 43	24.5 11	30 13.6	49 22.2		
*Recommended Emech Actuator		G1.2	G1.2	G1.2	G1.3	G1.3	G1.2	G1.2	G1.3		

Commissioning

CAUTION!

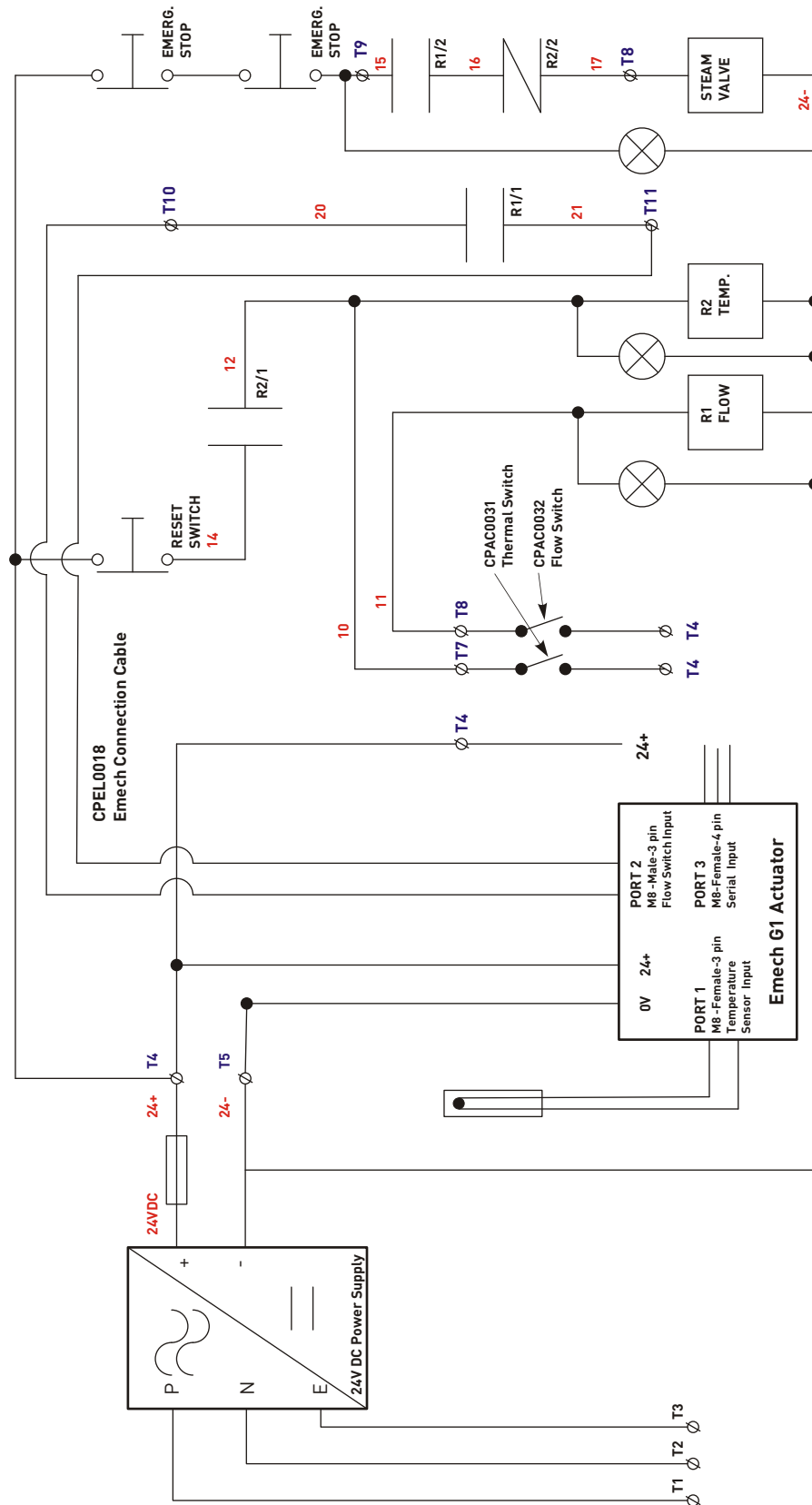
As customer systems are designed by others, the commissioning notes below are a general guide only. A commissioning strategy ought to be designed, and implemented for each system type by the system designer.

- 1.0 The mixing valve and actuator assembly is usually factory set specifically for applications with the Failsafe Control Unit. The assembly usually will be supplied with the valve in the closed position, and this ought to be confirmed prior to commissioning.
- 1.1 When used with the Failsafe Control Unit the G1 actuator software settings are standard except for two 'Controller' property values. These settings are accessible using the 'Emech Config' software program:
Controller > 'FlowGainThreshold' is set to 0.
Controller > 'FlowGainFactor' is set to 0.
- 1.2 For tuning of the operating control gains on the G1 actuator, consult the G1 IOM, or contact Emech Control.
- 2.0 With the hot water or steam supply manually isolated, but the cold water supply available, switch on the power supply to the Failsafe Control Unit 'ON'.
 - 2.1 The G1 actuator will begin to control to the temperature set point as soon as the flow switch closes, which indicates there is a demand for flow above the 'minimum temperature-controllable flow'.
 - 2.2 The actuated hot water or steam isolation valve ought to open at the same time as the flow switch activates.
 - 2.3 Start and stop the demand flow to check that the flow switch is switching at or above the correct 'minimum temperature-controllable flow', and the actuated hot water or steam isolation valve closes when the flow switch deactivates.
- 3.0 Check the setting on the thermal switch is correct (9-18°F (5-10°C) above the highest required set-point).
- 4.0 Ease open the hot water or steam supply at the manual isolation valve, while there is a typical demand flow (e.g. 1 hose in a multi-hose station set-up).
- 5.0 The G1 actuator will be controlling to the desired temperature set-point. Check the output temperature is stable and accurate.
- 6.0 To check the thermal switch is working correctly, lower the set-point at the switch until the switch trips, and the actuated hot water or steam isolation valve will close. Simultaneously the orange 'Over Temperature' indicator lamp on the front panel of the Failsafe Control Unit will be lit, and the red 'Reset' push button will become un-lit.
 - 6.1 The 'Reset' push-button on the front panel indicates the Failsafe Control Unit is powered and operating. This light is OFF only when there has been an over-temperature condition, or the main power supply is OFF. Pushing the 'Reset' button enables the safety system to be reset after the over-temperature condition has been resolved.
 - 6.2 Return the thermal switch set-point to the desired setting.
- 7.0 Operate the system over the expected flow range (low to high flow) to ensure stable and accurate temperature control is attained.
 - 7.1 Particularly trial the operation at the highest expected demand flows, stop the flow, then after a 5 second delay operate at the lowest expected demand flow. The water temperature ought to stabilize and be accurate within a short time period. If there is significant inaccuracy, or instability, the G1 actuator control gains may need to be modified.
- 8.0 If ESD's (emergency shut-down devices, e.g. switches) are used, trial the effectiveness of these to close the actuated hot water or steam isolation valve.

CAUTION!

- 9.0 Consider other normal operating or UPSET conditions that may occur for the particular system (e.g. sudden loss of water pressure, or power failure), and test that the system fails safely under these conditions.

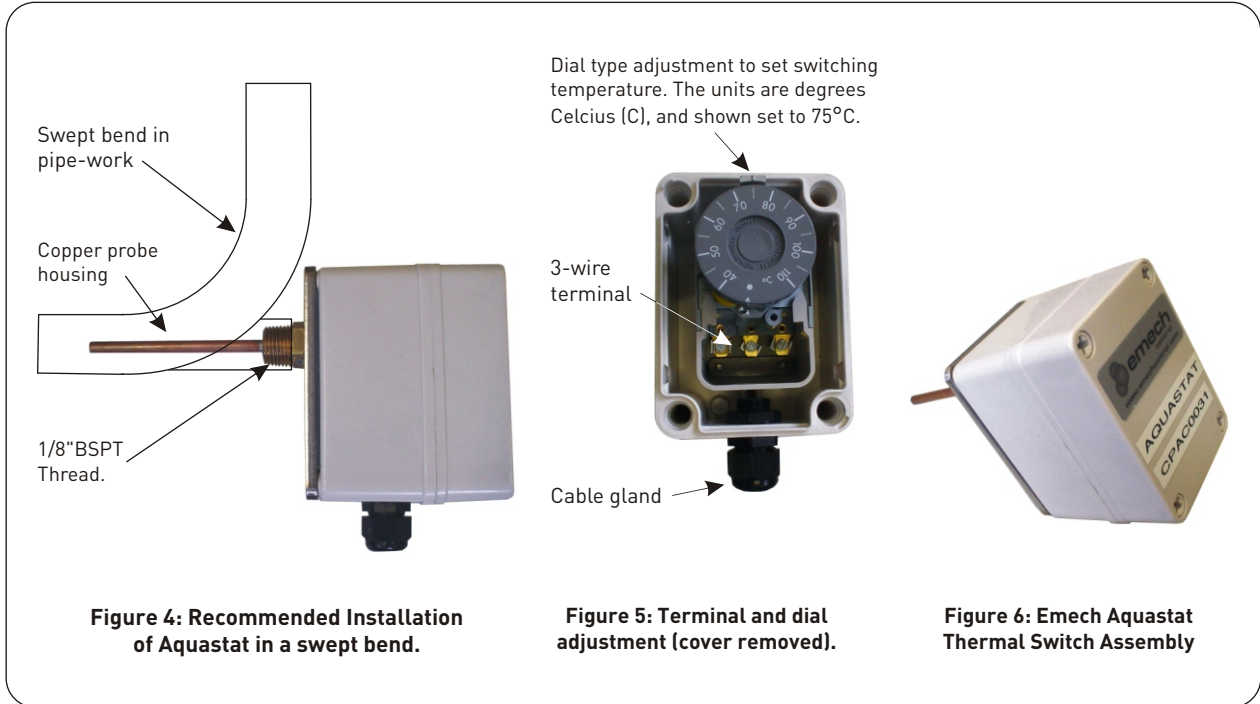
Fail-safe Control Unit - STEAM/WATER MIXING SYSTEM Wiring Diagram



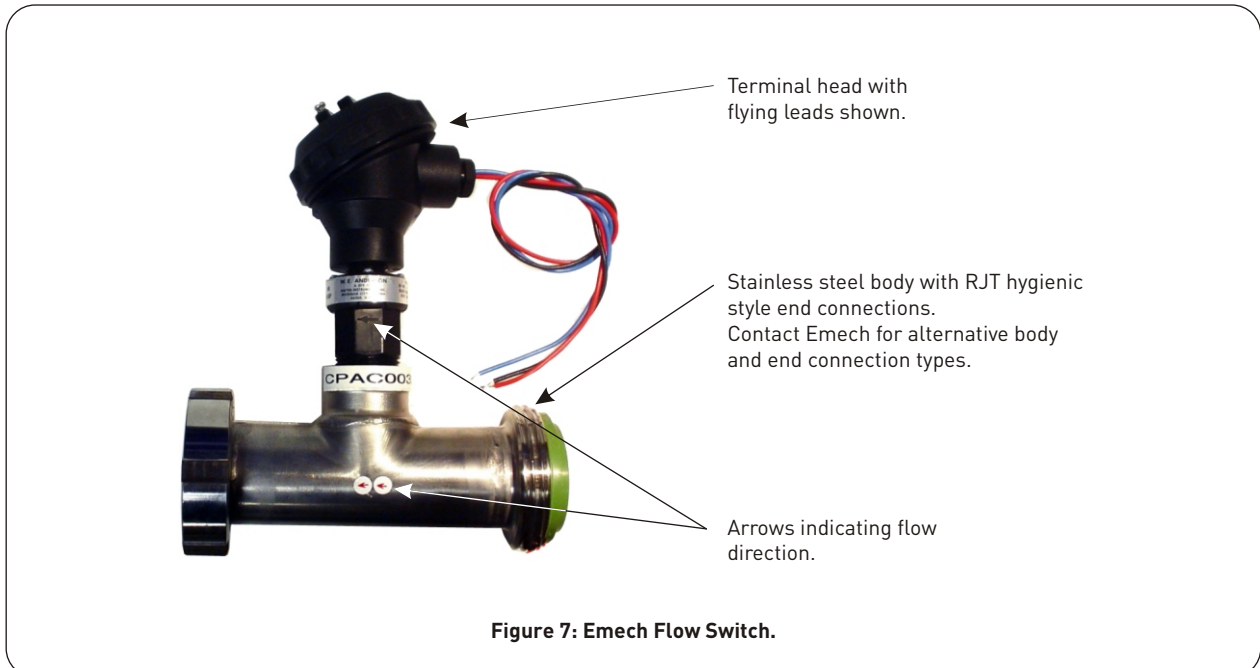
Disclaimer: This diagram is for general discussion purposes only. It is NOT intended as a design document. The actual operation and equipment selection is the responsibility of the plant owner. The information is solely intended to provide a general understanding of the subject matter and to assist Emech's customers and potential customers to assess whether they require further information. Emech does not guarantee or warrant the accuracy, completeness or currency of any information provided.

Switch Accessories

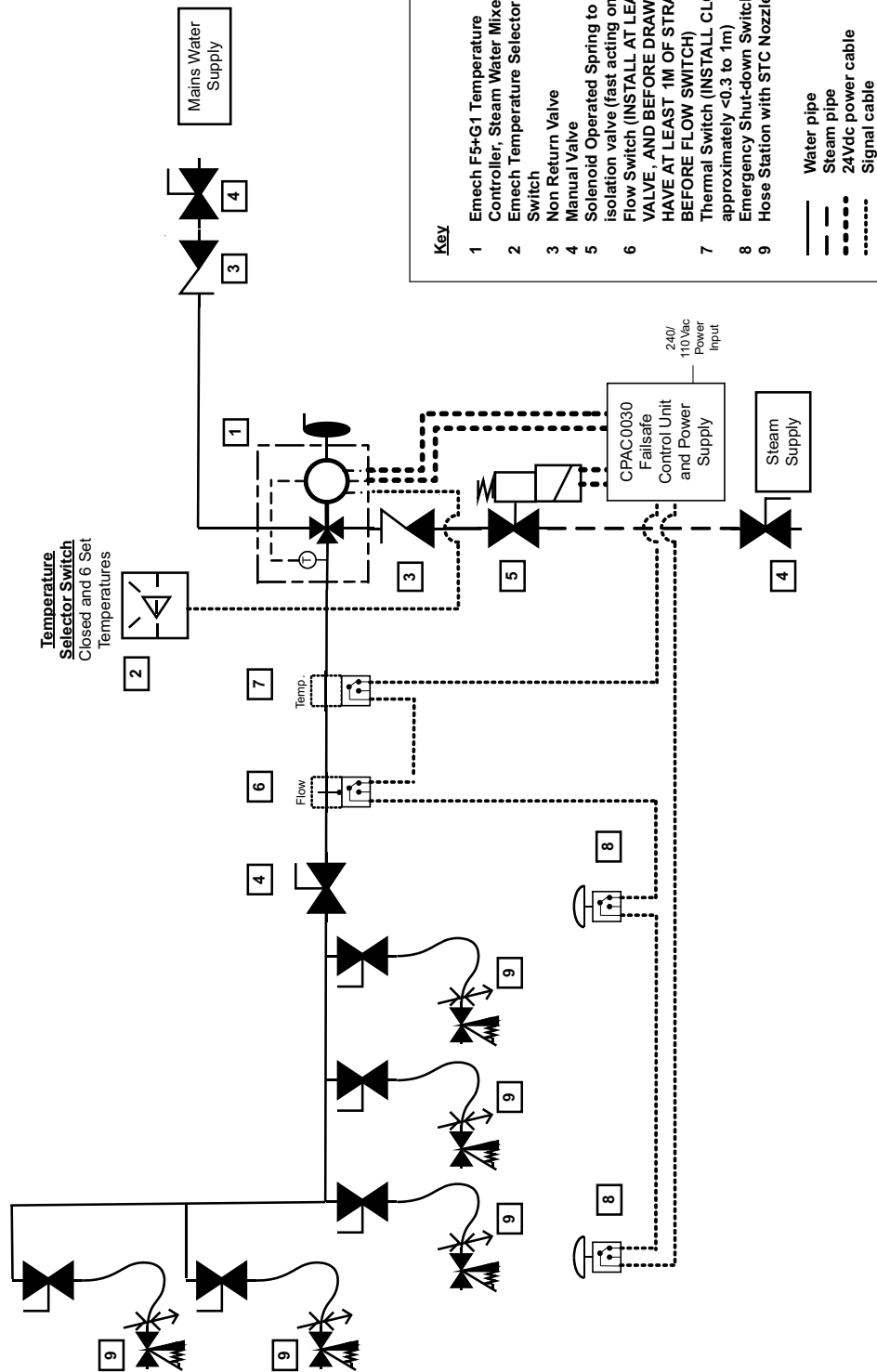
Part CPAC0031 Emech Aquastat Thermal Switch



Part CPAC0032 Emech Flow Switch (paddle type)



Typical Application Circuit Steam - Water Mixer Hose Station



- Key**
- 1 Emech F5+G1 Temperature Controller, Steam Water Mixer.
 - 2 Emech Temperature Selector Switch
 - 3 Non Return Valve
 - 4 Manual Valve
 - 5 Solenoid Operated Spring to Close (STC) steam isolation valve (fast acting on 'close' only)
 - 6 Flow Switch (INSTALL AT LEAST 2M FROM VALVE, AND BEFORE DRAW OFF POINTS. HAVE AT LEAST 1M OF STRAIGHT PIPE BEFORE FLOW SWITCH)
 - 7 Thermal Switch (INSTALL CLOSE TO VALVE, approximately <math><0.3\text{ to }1\text{m}</math>)
 - 8 Emergency Shut-down Switch (ESD)
 - 9 Hose Station with STC Nozzle, and Restrictor
- Water pipe
 - - - Steam pipe
 - - - 24Vdc power cable
 Signal cable

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