

This is a line voltage single-stage electronic temperature control with single-pole, double-throw relay output and LED indication. It is designed with heating or cooling modes of operation, adjustable differential, and an interchangeable temperature sensor. The control couples electronic accuracy with remote sensing capability in a NEMA 1 high-impact plastic enclosure suitable for surface or DIN-rail mounting.

## 67428 Temperature Control with NEMA 1 Enclosure

[illegible]

Technical drawing of a phenolic bushing. The drawing shows a side view of the bushing with the following dimensions and labels:

- Phenolic Bushing**: Label on the left side of the bushing.
- 1/2 NPT**: Label pointing to the threaded section of the bushing.
- .25**: Dimension for the width of the bushing's base.
- 2.31**: Dimension for the length of the threaded section.
- 2.38**: Dimension for the length of the unthreaded section.
- .299**: Dimension for the inside diameter of the unthreaded section.
- Inside Diameter**: Label pointing to the .299 dimension.

|                                 |                                                                                                                               |                         |                         |                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|
| <b>Setpoint Range</b>           | -30°F to 212°F (-34°C to 100°C)                                                                                               |                         |                         |                         |
| <b>Differential Range</b>       | 1°F to 30°F (0.5°C to 17°C)                                                                                                   |                         |                         |                         |
| <b>Input Voltage</b>            | 120 or 208/240 VAC, 50/60 HZ (1 Phase only)                                                                                   |                         |                         |                         |
| <b>Current Draw</b>             | 1.8 VA                                                                                                                        |                         |                         |                         |
| <b>Relay Electrical Ratings</b> | <b>SPDT</b>                                                                                                                   | <b>120V<br/>NO (NC)</b> | <b>280V<br/>NO (NC)</b> | <b>240V<br/>NO (NC)</b> |
|                                 | Horsepower:                                                                                                                   | 1 (0.25) HP             | 1 (0.33) HP             | 1 (0.5) HP              |
|                                 | Full Load Amps:                                                                                                               | 16 (5.8) A              | 9.2 (4.0) A             | 8.0 (4.9) A             |
|                                 | Locked Rotor Amps:                                                                                                            | 96 (3) A                | 55 (24) A               | 48 (29) A               |
|                                 | Non-Inductive Amps:                                                                                                           | 15 (10) A               | 10 (10) A               | 10 (10) A               |
|                                 | Pilot Duty: 125 VA (NO) @ 24-240 VAC, 125 VA (NC) @ 120-240 VAC, 50 VA (NC) @ 24 VAC                                          |                         |                         |                         |
| <b>Sensor Type</b>              | Replaceable Thermistor with Reference Resistance of 2.25 K ohms at 77°F (25°C)                                                |                         |                         |                         |
| <b>Control Ambient</b>          | Operating: -30°F to 140°F (-34°C to 60°C)                                                                                     |                         |                         |                         |
| <b>Temperature</b>              | Shipping: -40°F to 185°F (-40°C to 85°C)                                                                                      |                         |                         |                         |
| <b>Ambient Humidity</b>         | 0 to 95% RH Non-Condensing, Maximum Dew Point: 85°F (29°C)                                                                    |                         |                         |                         |
| <b>Control Material</b>         | Case and Cover: NEMA 1 High Impact Lexan 950® Plastic.                                                                        |                         |                         |                         |
| <b>Agency Listings</b>          | UL Listed: File E27734, Guide XAPX (Temperature Indicating and Regulating Equipment)<br>CSA Approved File LR948 Class 4813-02 |                         |                         |                         |

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# Electronic Temperature Sensors

- Process connection: 1/4" NPT
- 2 switching outputs complementary hysteresis adjustable
- Measuring range of -13 - 284 °F (-25 - 140 °C)

## Function

The unit generates 2 output signals: 1 x NO + 1 x NC with separately adjustable switch points (SET 1) and (SET 2).

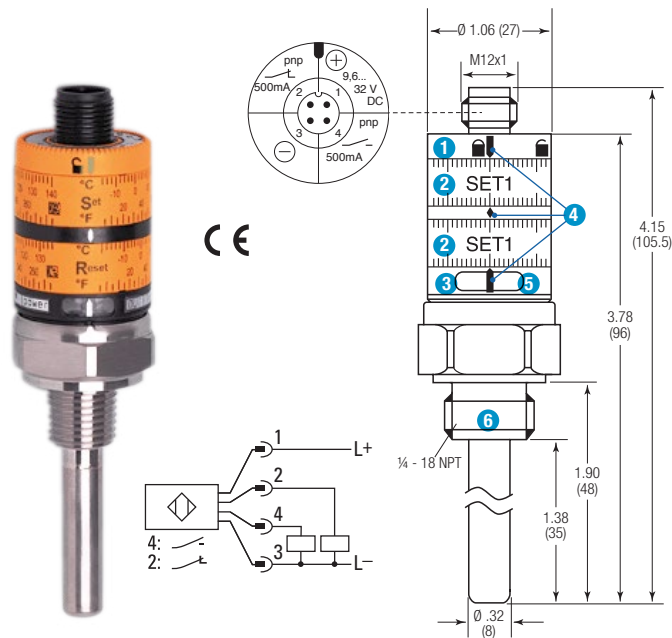
### OUT1

- With rising temperature OUT1 closes when the set value (SET1) is reached.
- With falling temperature OUT1 opens when the value (SET1) minus hysteresis is reached.

### OUT2

- With rising temperature OUT2 opens when the set value (SET2) is reached.
- With falling temperature OUT2 closes when the value (SET2) minus hysteresis is reached.

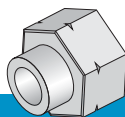
The hysteresis is fixed at 5 K.



- 1 locking ring
  - 2 setting rings (manually adjustable after unlocking)
  - 3 LED yellow: lights if OUT1 = ON, temperature > [SET1]
  - 4 setting marks
  - 5 LED yellow: lights if OUT2 = ON, temperature < [SET2]
  - 6 process connection 1/4" NPT
- Pin 4 = OUT1 / Pin2 = OUT2

To obtain the setting accuracy, set both rings to minimum values, and then set desired values.  
All dimensions in inches (millimeters), unless noted otherwise.

## Sensor Port Adapters



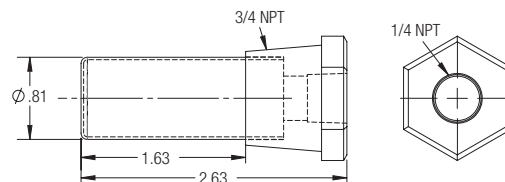
| Part Number | Description        |
|-------------|--------------------|
| 51627       | #8SAE TO 1/2" BSPP |
| 51653       | #8 SAE TO 1/4" NPT |
| 51654       | #8 SAE TO 1/2" NPT |

## Technical Data

| Application                    | Liquid and Gases                                                                                                                      |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Electrical Design              | DC PNP                                                                                                                                |
| Output                         | Normally open/closed complementary                                                                                                    |
| Operating voltage (V)          | 9.6 - 32*                                                                                                                             |
| Current rating (mA)            | 500                                                                                                                                   |
| Short-circuit protection       | Yes (non-latching)                                                                                                                    |
| Reverse polarity protection    | Yes                                                                                                                                   |
| Overload protection            | Yes                                                                                                                                   |
| Voltage drop                   | < 2                                                                                                                                   |
| Current consumption            | < 30                                                                                                                                  |
| Setting Range                  |                                                                                                                                       |
| Set point, SP                  | 3 - 284 / 37 - 543 °F (-16 - 140 / 3 - 284 °C)                                                                                        |
| Reset point, rP                | -4 - 277 / 25 - 531 °F (-20 - 136 / -4 - 277 °C)                                                                                      |
| Adjustment of the switch point | Shims                                                                                                                                 |
| Accuracy                       |                                                                                                                                       |
| Setting accuracy               | ± 3 K                                                                                                                                 |
| Repeatability                  | ± 0.1 K                                                                                                                               |
| Temperature drift              | 0.1 / 10 K                                                                                                                            |
| Power-on delay time            | 0.5 s                                                                                                                                 |
| Measuring element              | 1 x Pt 1000, to DIN EN 60751, class B                                                                                                 |
| Dynamic response T05 / T09     | 1/3 s**                                                                                                                               |
| Minimum installation depth     | .59 inches (15 mm)                                                                                                                    |
| Medium temperature             | -13 - 257 °F (-25 - 125 °C) 293 °F (145 °C) max. 1 h                                                                                  |
| Ambient temperature            | -13 - 158 °F (-25 - 70 °C)                                                                                                            |
| Storage temperature            | -40 - 257 °F (-40 - 212 °C)                                                                                                           |
| Protection                     | IP 67, III                                                                                                                            |
| Shock resistance               | DIN IEC 68-2-27:50 g (11 ms)                                                                                                          |
| Vibration resistance           | DIN EN 60068-2-6:20 g (10 - 2000 HZ)                                                                                                  |
| EMC                            | EN 61000-4-2 ESD: 4 kV CD / 8 kV AD<br>EN 61000-4-3 HF radiated: 10 V/m<br>EN 61000-4-4 Burst: 2 Kv<br>EN 61000-4-6 HF conducted: 10V |
| Housing materials              | Stainless steel 316L / 1.4404; PC (Makrolon);<br>PBT (Pocan); FPM (Viton)                                                             |
| Materials (wetted parts)       | Stainless steel 316L / 1.4404                                                                                                         |
| Display                        | Power: LED green; Switching status: LED yellow                                                                                        |
| Connection                     | M12 connector; gold-plated contacts                                                                                                   |
| Weight                         | 0.229 lbs (0.104 kg)                                                                                                                  |

\*Operating voltage "supply class 2" to cULus. \*\* According to DIN EN 60751  
The values for accuracy apply to flowing water.

## Optional Bulb Well



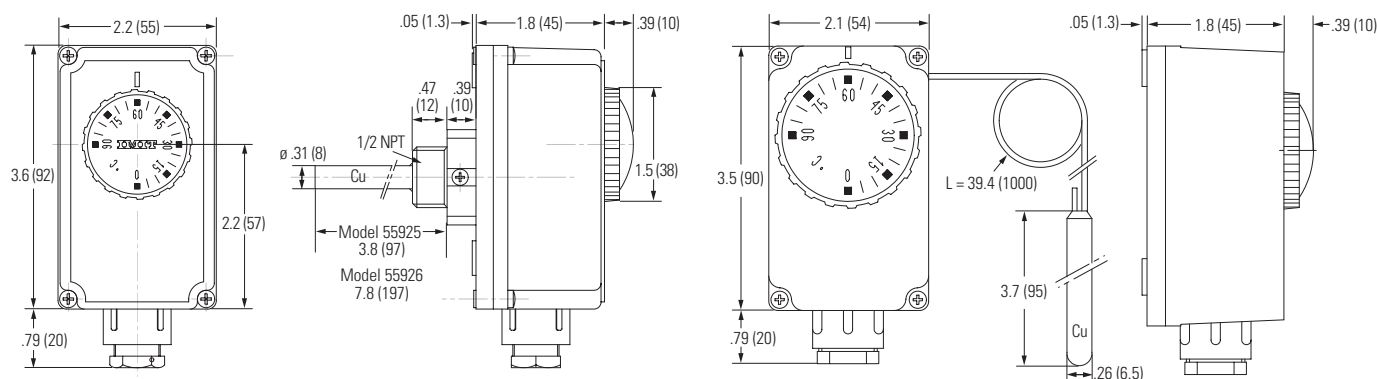
| Part Number      | Description                                    |
|------------------|------------------------------------------------|
| 55857            | Temperature Sensor, dual PNP outputs, 1/4" NPT |
| 55858            | Cover, Protective, PK                          |
| 55859            | 4-wire Micro DC cordset, straight connector    |
| 51661 (Optional) | Bulb Well                                      |

# Electronic Temperature Sensors

## Low Cost, Simple Setup

Immersion thermostat, measuring temperature with a liquid filled sensing element. SPDT contacts, complete with waterproof protection pocket. Used to measure temperature on the primary heating pipe circuit, it is particularly suitable for automatic adjustment pumps.

- Contacts rating: 10(2,5)A/250V~
- Contacts: switching or closing contact for temperature increase
- Maximum head temperature: 176°F (80°C)
- Maximum bulb temperature: 257°F (125°C)
- Temperature rate of change: 1° K/min
- Protection degree: IP40

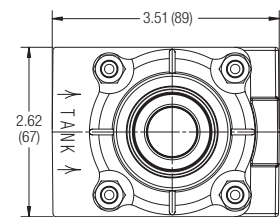
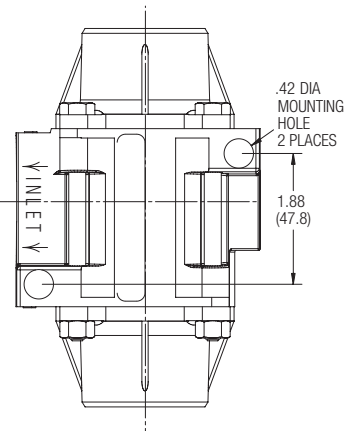
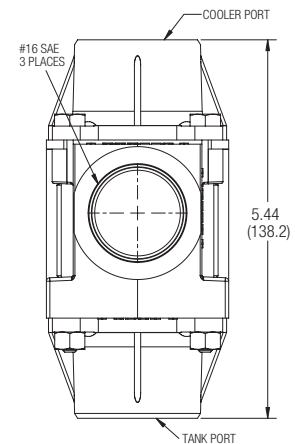


All dimensions in inches (millimeters), unless noted otherwise.

| Part Number | Temperature Range  | Differential          | Maximum Bulb Temperature | Capillary Length | Protection Pocket 1/2" NPT  | Copper Bulb              |
|-------------|--------------------|-----------------------|--------------------------|------------------|-----------------------------|--------------------------|
| 55925       | 0°/194°F (0°/90°C) | $\Delta t = 4 \pm 1K$ | 266°F (130°C)            | NA               | .27x.31x4" (7 x 8 x 100 mm) | NA                       |
| 55926       | 0°/194°F (0°/90°C) | $\Delta t = 4 \pm 1K$ | 266°F (130°C)            | NA               | .27x.31x8" (7 x 8 x 200 mm) | NA                       |
| 55927       | 0°/194°F (0°/90°C) | $\Delta t = 4 \pm 1K$ | 266°F (130°C)            | 39" (1000 mm)    | NA                          | Ø .26x3.7" (6.5 x 95 mm) |

# Thermal Bypass Assembly

This thermal bypass valve is ideally suited for hydrostatic drive circuits which require fast warm-up, controlled fluid temperature, and low return line back pressure. When installed in the return line of a hydraulic circuit that employs an oil cooler, this device will modulate fluid temperature by either shifting return line flow through the cooler, or bypassing directly to the reservoir. In addition, a built-in pressure relief function automatically relieves excess pressure to the reservoir should the cooler become restricted and resultant pressure drop become too high for the cooler circuit.



## Standard Shift Temperatures

100°F (38°C) 120°F (49°C) 140°F (60°C) 160°F (71°C)

## Full Shift (Cooler Port Open) Temperatures

Shift temperature plus 25°F (14°C)

**Relief Valve Setting** 65 PSI (4.5 BAR) *Consult factory for other pressure settings.*

**Maximum Operating Pressure** 250 PSI (17 BAR)

**Proof Pressure** 300 PSI (21 BAR)

## Minimum Burst Pressure

Up to the full shift temperature: 325 PSI (22 BAR).

Above the full shift temperature: 600 PSI (41 BAR).

**Minimum Operating Temperature** -30°F (-34°C)

**Maximum Operating Temperature** Shift temperature plus 75°F (24°C)

**Maximum Flow Rating** 60 GPM (227 l/m)

## Leakage @ 250 PSI (17 BAR) and 60 GPM (227 l/m) Inlet Flow

Cooler Port:

- 0.5 GPM (2 l/m) maximum up to 5°F (3°C) before shift temp.
- 1.0 GPM (4 l/m) maximum from 5°F (3°C) before shift to shift.

Tank Port: 0.10 GPM (0.4 l/m) maximum

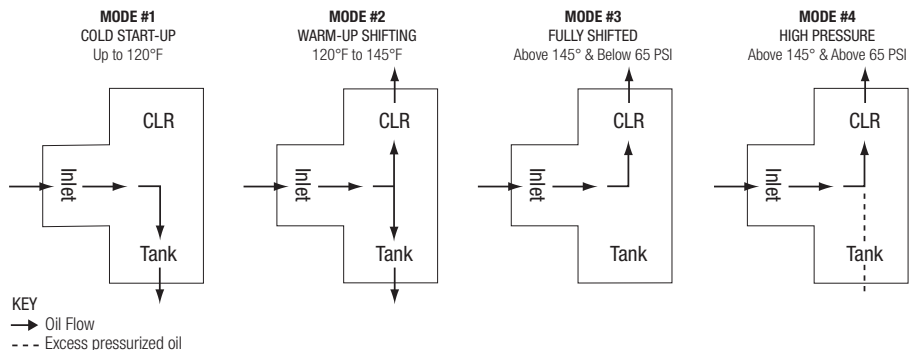
**Operating Fluid** Mineral base hydraulic fluids

**Construction** Aluminum die-cast housing

## Operating Characteristics

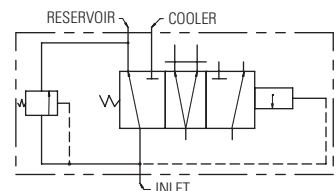
- Mode 1: At temperatures below the shift temperature oil flows from inlet to tank port.
- Mode 2: At temperatures between the start of shift and full shift the flow from the inlet port is divided between the cooler and tank ports.
- Mode 3: At temperatures above the full shift temperature inlet flow is through the cooler port.
- Mode 4: At temperatures above the full shift temperature the excess pressure is relieved through the tank port.

## For 120°F Shift Temperature



NOTE: If the temperature drops below 145°F the valve will shift back to modes 2 or 1.

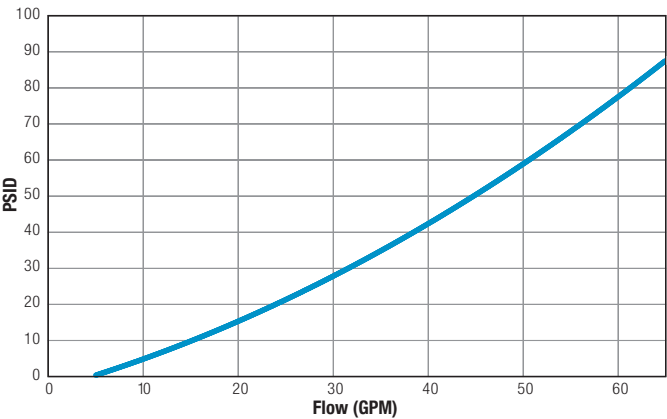
## Graphic Symbol



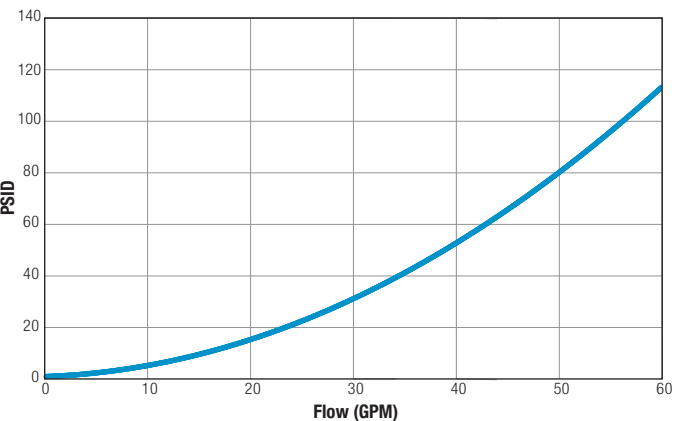
# Thermal Bypass Assembly

## Pressure Drop (Mobile DTE 26 OIL)

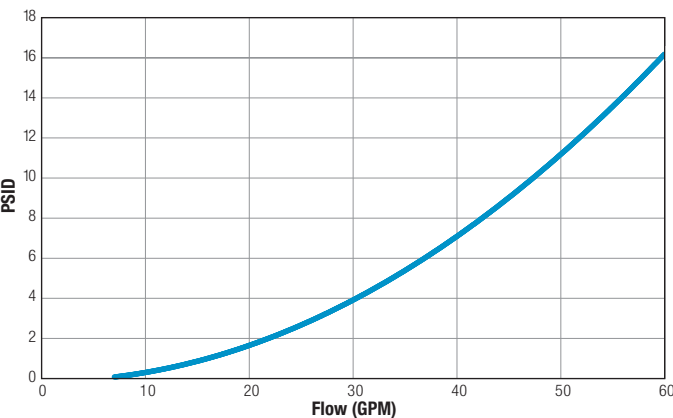
**Inlet Port Thru Tank Port**  
@ 100°F (38°C) (300 SUS)



**Inlet Port Over Integral Relief Valve**  
@ 170°F (77°C) (78 SUS)



**Inlet Port Thru Cooler Port**  
@ 145°F (63°C) (110 SUS)



NOTE: Pressure drop shown is added to relief valve crack pressure for total pressure drop.

| Part Number | Shift Temperature |
|-------------|-------------------|
| 65654       | 100°F (38°C)      |
| 65655       | 120°F (49°C)      |
| 65656       | 140°F (60°C)      |
| 65657       | 160°F (71°C)      |

## How to Order Consult factory for pricing and lead time

Part Number

-

Pressure Setting

65 = Standard, 65 PSI

Optional pressure settings

available in 5 PSI increments,

up to 85 PSI.

-

Thermal Bypass Assembly

# Three-Way Thermostatic Valves

0916

## 1/2", 3/4", 1", 1 1/2" & 2" NPT Ports\*

- Self-contained
- Wide range of temperatures
- Rugged construction
- Non-adjustable
- Heavy duty
- Operate in any position
- Tamper-proof
- Replaceable element
- Compact



## Materials

**Housing** Grey iron (steel or bronze optional)  
125 PSI maximum operating pressure

**O-Ring Seals** Viton (Buna N optional)

*\*3", 4" and 6" Flange Models also available.*

## Operation

TTP thermostatic valves use the principle of expanding wax. A self-contained power element activates a stainless steel sliding valve that provides a positive three-way valve action. All temperature settings are factory set. Elements are field replaceable to obtain the same, or a new bypass temperature setting.

On starting, total flow is in the bypass mode. As the fluid temperature rises, some fluid is diverted to the cooling system. As fluid temperature continues to rise, more flow is diverted until the valve is fully stroked. At this point, all the flow is diverted to the cooler. With respect to temperature ranges, the "nominal" temperature represents the "operating temperature."

Valves are acceptable for oil or water service.

## Applications

Three Way Thermostatic Valves may be installed for either mixing or diverting modes of operation at the preference of the user. They may be mounted in any plane.

When installed as a mixing valve, it is on the cold side of the application, and mixes hot liquid with cooled liquid to discharge the proper temperature fluid to the process.

When installed as a diverting valve, it is on the hot side of the application, and bypasses the cold liquid allowing the system to warm up, then directs the hot liquid to the cooler.

Temperature settings are nominal. 110°F and 140°F are standard. Other settings are available upon request. The valves begin to "shift" (open) about 10°F below the nominal temperature setting and are fully shifted about 10°F above.

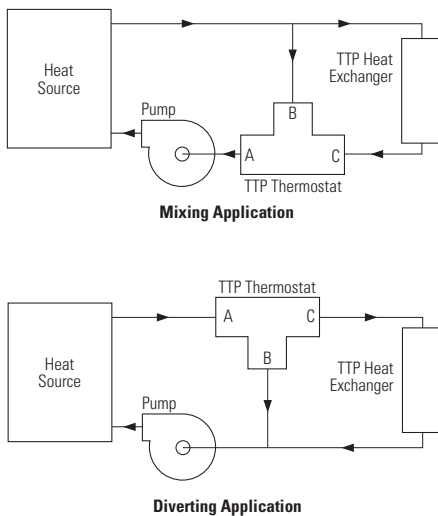
## Typical Installation

**Hydraulic Power Units** Diverting mode 110°F

**Air Compressors** Mixing mode 140°F

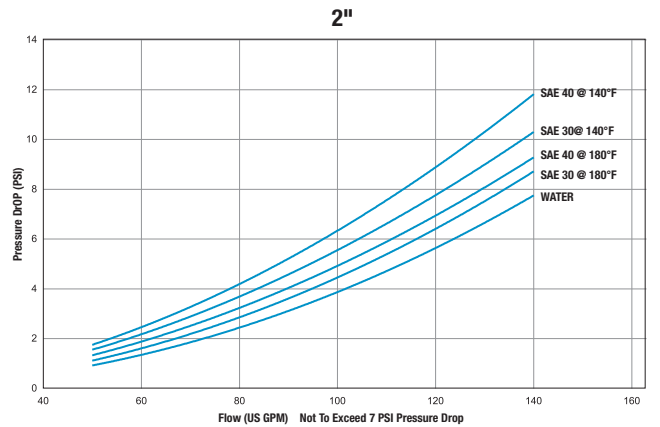
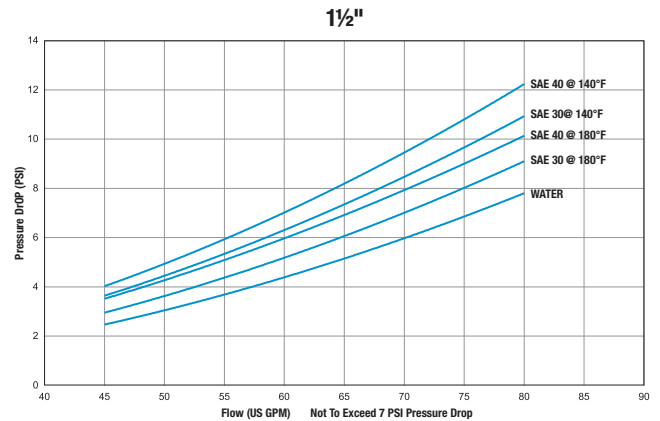
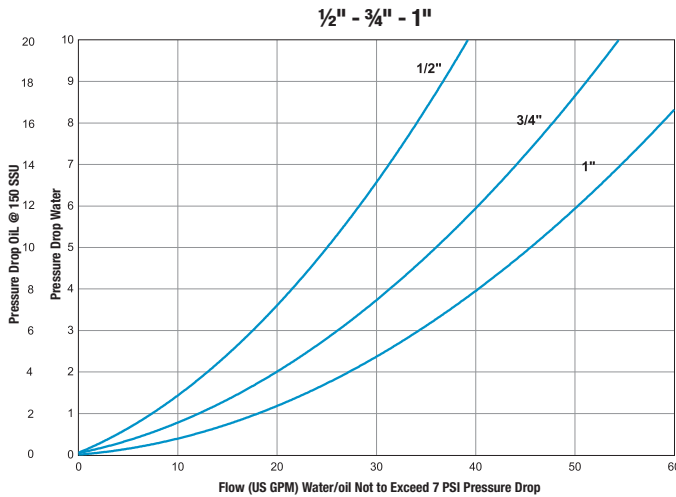
**Mobile Oil Coolers** Diverting mode 110°F

**Radiators** Diverting mode 190°F

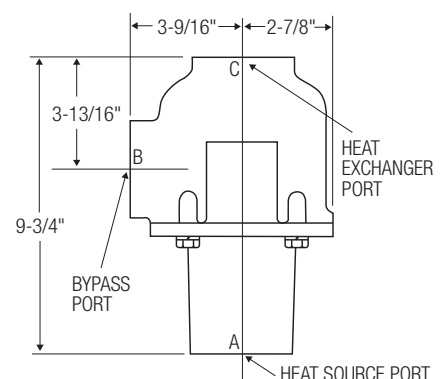
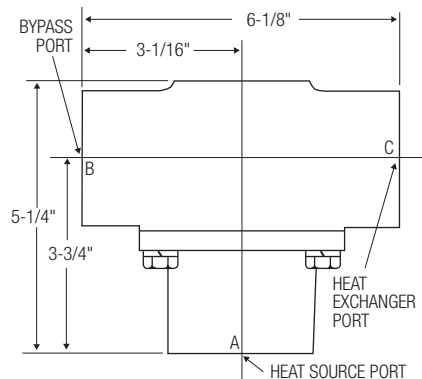
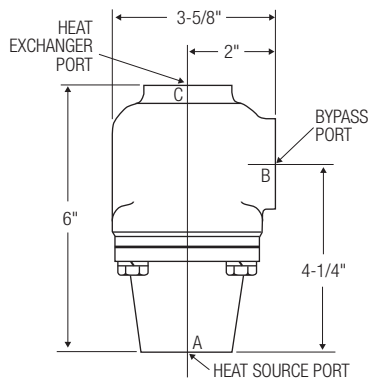


# Three-Way Thermostatic Valves

## Pressure Drop Curves



## Dimensions and Part Numbers



| Port Size | Part Number |
|-----------|-------------|
| 1/2" NPT  | 66037-110°F |
| 1/2" NPT  | 66037-140°F |
| 3/4" NPT  | 66038-110°F |
| 3/4" NPT  | 66038-140°F |
| 1" NPT    | 66039-110°F |
| 1" NPT    | 66039-140°F |
| #16 SAE   | 67365-110°F |
| #16 SAE   | 67365-140°F |

| Port Size  | Part Number |
|------------|-------------|
| 1 1/2" NPT | 66040-110°F |
| 1 1/2" NPT | 66040-140°F |
| #24 SAE    | 67760-110°F |

| Port Size | Part Number |
|-----------|-------------|
| 2" NPT    | 66041-105°F |
| 2" NPT    | 66041-140°F |

NOTE: All three ports on any one valve have the same thread size.

# Three-Way Thermostatic Valves

## Special Temperature Ranges

| ½" - ¾" - 1" NPT<br>Part Numbers | 1½" NPT<br>Part Numbers | 2" NPT<br>Part Numbers |
|----------------------------------|-------------------------|------------------------|
| 65974                            | 65977                   | 65978                  |
| 65975                            | 66040                   | 66041                  |
| 65976                            | 67760                   |                        |
| 66037                            | (#24 SAE)               |                        |
| 66038                            |                         |                        |
| 66039                            |                         |                        |
| 67365                            |                         |                        |
| (#16 SAE)                        |                         |                        |

| ½" - ¾" - 1" NPT |                        | 1½" NPT |                        | 2" NPT  |                        |
|------------------|------------------------|---------|------------------------|---------|------------------------|
| Nominal          | Temperature Range (°F) | Nominal | Temperature Range (°F) | Nominal | Temperature Range (°F) |
| 80               | 77-88                  | 80      | 70-88                  | 75      | 70-85                  |
| 90               | 80-100                 | 90      | 80-100                 | 90      | 85-105                 |
| 110              | 100-120                | 110     | 100-120                | 105     | 100-116                |
| 120              | 110-130                | 120     | 110-130                | 120     | 110-130                |
| 130              | 120-140                | 130     | 120-140                | 130     | 124-140                |
| 140              | 130-150                | 140     | 130-150                | 140     | 135-150                |
| 150              | 140-160                | 150     | 140-160                | 150     | 145-160                |
| 160              | 150-170                | 160     | 150-170                | 155     | 150-165                |
| 170              | 163-180                | 170     | 163-180                | 160     | 155-172                |
| 185              | 175-190                | 175     | 170-185                | 165     | 160-175                |
| 195              | 185-200                | 180     | 175-190                | 170     | 165-180                |
| 200              | 190-210                | 190     | 185-200                | 180     | 175-190                |
|                  |                        | 200     | 190-210                | 195     | 188-208                |
|                  |                        |         |                        | 210     | 200-215                |

EXAMPLE: 1" NPT, Part Number 66039-90 indicates the 1" NPT valve with a nominal shift temperature of 90°F. The actual operating temperature range in this example is 80-100°F. The valve begins to open at 80°F, and is fully open at 100°F.

## How to Order Consult factory for pricing and lead time

-

°F

Valve Part Number

Nominal Temperature Setting