
# CATALOG

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# 20 and 25 Series Temperature Swichgage®

T-94031B
Revised 06-06
Catalog Section 10


20T Series shown

## 2 and 2-1/2 in. (51 and 64 mm) Dial

- Combination Indicating Gage and Limit Switch
- Critical/High Temperature Limit Switch Is Visible and Adjustable (Most Models)
- Switch Can Activate Alarms and/or Shut Down Equipment
- Contact Grounds Through Case

CE**

## Description

The 20 Series (2 inch/51 mm dial) and the 25 Series (2-1/2 inch/64 mm dial) Swichgage models are diaphragm-actuated, temperature-indicating gages, with built-in electrical switches for tripping alarms and/or shutdown devices.

Ranges are available from 32-120°F (0-45°C) thru 300-440°F (160-220°C).

The gage mechanism is enclosed in a steel case coated to resist corrosion. A polycarbonate, break-resistant lens and a polished, stainless steel bezel help protect this rugged, built-to-last instrument.

These vapor actuated gages feature a sealed capillary tube and a sensing bulb. When subjected to heat, the liquid in the sensing bulb changes to vapor creating pressure against the diaphragm mechanism. The diaphragm translates this vapor pressure into a mechanical gage reading.

For series 20T and 25T, the gage pointer acts as a temperature indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contact(s) are grounded through the Swichgage case. They have self-cleaning motion to enhance electrical continuity.

Models 20TE and 25TE have internal snap-acting SPDT switches.
Gage-only models, without contacts (Murphygage® instrument) are also available.

## Applications

Industrial engines and equipment in Oil Field, Marine, Irrigation, Construction and Trucking industries. Monitoring Engine Coolant, Crankcase Oil, Transmission Oil.

## Specifications

**Dial:** White on black; U.S.A. standard scale is dual scale °F/°C; others available (see How to Order).

**Case:** Plated steel; mounting clamp included (except for direct mounting models).

**Bezel:** Polished stainless steel, standard; others are available (see How to Order).

**Pointer:** Tempered nickel silver.

**Lens:** Polycarbonate, high-impact.

**Sensing Element:** Beryllium copper diaphragm.

**Capillary:** PVC armored copper; 4 ft. (1.2 m)* Stainless steel armor optional.

**Sensing Bulb:** Copper*

**Gage Accuracy:** See accuracy chart, on page 2.

**Maximum Temperature:** See Temperature Ranges and Factory Settings table on page 2.

**Adjustable Limit Contact (20T and 25T):**
SPST contact; pilot duty only, 2 A @ 30 VAC/ VDC; Ground path through encasement. Normally Closed (NC) when the high limit is met. Normally Open (NO) when pointer is in normal operating range. Contacts are gold flashed silver.
Limit Contact Adjustment: *by a 1/16 in. hex wrench thru 100% of the scale.*
Limit Contact Wire Leads: *18 AWG (1.0 mm²) x 12 in. (305 mm).*

**Snap-Switch Rating (20TE and 25TE):**
SPDT, 3 A @ 30 VDC inductive; *4 A @ 125 VAC inductive.*
Snap-Switch Wire Leads: *20 AWG (0.75 mm²) x 12 in. (305 mm).*

**Unit Weight:** 20 Series: *12.7 oz. (0.39 kg).* 25 Series Models: *13.8 oz. (0.43 kg).*

**Unit Dimensions:** 20 Series: *4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm).* 25 Series Models: *4-3/4 x 4-3/4 x 3 in. (121 x 121 x 76 mm).*

## Base Models

### Coolant or Oil Temperature

#### *20T and 25T Series Swichgage*

For these models the gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

#### *20TL and 25TL Swichgage instrument*

For use on Ford Worldwide engines. Supplied with special sensing bulb.

#### *20TO Swichgage instrument*

Same as 20T with a special dial for Oil Temperature.

#### *20TE and 25TE Swichgage instrument*

**20TE** (*was 20ESR*) and **25TE** (*was 25ESR*). Models with internal SPDT snap-switches, instead of the single pole/pointer contact(s). When the switch closes on rising temperature, it becomes Set. As temperature decreases the switch Resets.

#### *20TABS and 25TABS Swichgage instrument*

Same as 20/25T with internal SPDT snap-switch for pre-alarm.

### Cylinder Head Temperature

#### *20TH and 25TH Swichgage instrument*

**20TH** (*was 20TL8133*) and **25TH** (*was 25TL8133*). For use on Air Cooled engines.

### Direct Mount Models

#### *20TD Swichgage instrument*

Same as 20T. Available ranges: 220°F (104°C ) or 250°F (121°C). Includes 1/4 x 4 in. (6 x 102 mm) sensing bulb.

#### *20SD Swichgage instrument*

Same as 20T. Available ranges: 220°F (104°C ) or 250°F (121°C). Includes 11/32 x 1-1/2 in. (9 x 38 mm) sensing bulb.

### Gage-Only Models

#### *20TG and 25TG Murphygage*

Gages without contact(s).

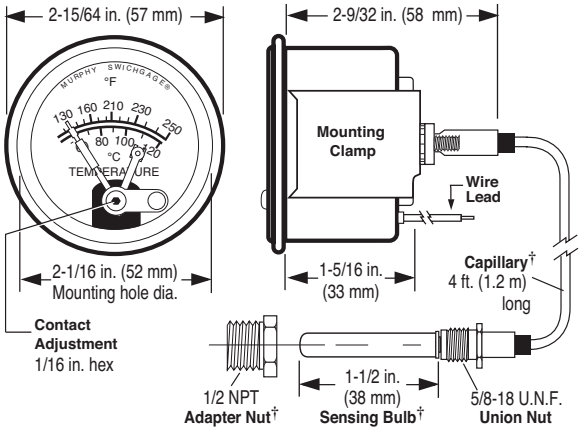
* For optional capillary lengths, engine adaptors, sensing bulbs and range combinations, see Murphy bulletin T-8428B.

** Products cover by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility as noted.

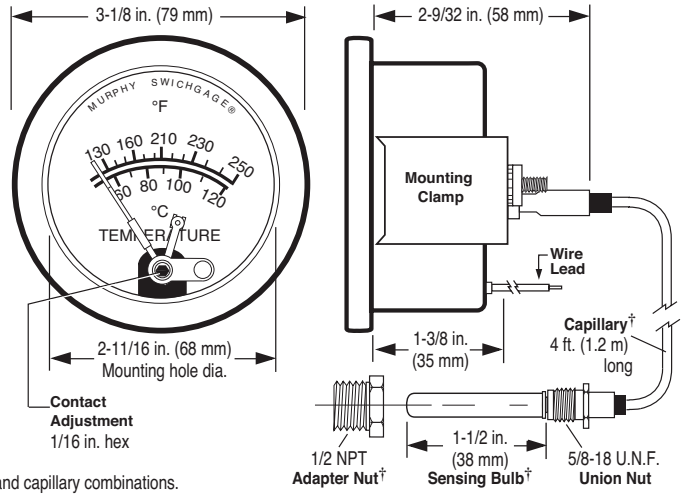
MURPHY®

## Dimensions

### 20 Series Models (typical)




### 25 Series Models (typical)




†Standard combinations. See Murphy bulletin T-8428B for optional sensing bulb, engine adaptors and capillary combinations.

## Temperature Ranges and Factory Settings

**NOTES**

**1.** Values in ( ) are mathematical conversions from °F to °C–they do not reflect actual second scale range. U.S.A. standard scale is °F/°C.

**2.** For models 20TE and 25TE; the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential.

**3.** For adjustable switch models, the trip point is adjustable **only** over the upper half of the scale.

| Ranges Available *Dual Scale Dial* °Fahrenheit (°Celsius) | *Single Scale* °Celsius only | Max. Temp. | Std. Settings* | | Hi/Lo Settings Low | Hi/Lo Settings High | 20TABS and 25TABS Settings Alarm** | | 20TABS and 25TABS Settings Shutdown | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | °F (°C) | °F (°C) | °C only | °F (°C) | °F (°C) | °F (°C) | °C only | °F (°C) | °C only |
| 32 – 120 (0 – 49) | — | 185 (85) | 110 (43) | — | 32 (0) | 110 (43) | 100 (38) | — | 110 (43) | — |
| 32 – 160 (0 – 71) | 0 – 70 | 215 (102) | 150 (66) | 66 | 32 (0) | 150 (66) | 140 (60) | 60 | 150 (66) | 66 |
| 130 – 220 (54 – 104) | 45 – 100 | 260 (127) | 210 (99) | 85 | 160 (71) | 210 (99) | 200 (93) | 80 | 210 (99) | 85 |
| 130 – 250 (54 – 121) | 50 – 120 | 310 (154) | 210 (99) | 97 | 160 (71) | 210 (99) | 200 (93) | 95 | 210 (99) | 100 |
| 140 – 300 (60 – 149) | 60 – 140 | 340 (172) | 275 (135) | 130 | 200 (93) | 275 (135) | 265 (129) | 125 | 275 (135) | 130 |
| 160 – 320 (71 – 160) | 70 – 160 | 370 (192) | 300 (149) | 150 | 200 (93) | 300 (149) | 290 (143) | 145 | 300 (149) | 150 |
| 180 – 350 (82 – 177) | — | 400 (209) | 330 (166) | — | 240 (116) | 330 (166) | 320 (160) | — | 330 (166) | — |
| 300 – 440 (149 – 227) | — | 500 (260) | 400 (204) | — | 300 (149) | 400 (204) | 390 (199) | — | 400 (204) | — |

* Standard setting for 20T, 25T, 20TE and 25TE models.

** SPDT snap-switch is the alarm switch.

## Temperature Accuracy Chart

| Temperature Range | Lower 1/3 of Scale | Middle 1/3 of Scale | Upper 1/3 of Scale |
|---|---|---|---|
| 32 to 120°F (0 to 49°C) | ± 12°F (± 6°C) | ± 5°F (± 2.4°C) | ± 6°F (± 3°C) |
| 32 to 160°F (0 to 71°C) | ± 20°F (± 10°C) | ± 8°F (± 4.4°C) | ± 7°F (± 4°C) |
| 130 to 220°F (54 to 104°C) | ± 6°F (± 3°C) | ± 3°F (± 1.6°C) | ± 4°F (± 2°C) |
| 130 to 250°F (54 to 121°C) | ± 9°F (± 5°C) | ± 5°F (± 2.4°C) | ± 4°F (± 2°C) |
| 140 to 300°F (60 to 149°C) | ± 10°F (± 5.2°C) | ± 6°F (± 3°C) | ± 5°F (± 2.4°C) |
| 160 to 320°F (71 to 160°C) | ± 10°F (± 5.2°C) | ± 5°F (± 2.4°C) | ± 5°F (± 2.4°C) |
| 180 to 350°F (82 to 177°C) | ± 12°F (± 6°C) | ± 5°F (± 2.4°C) | ± 5°F (± 2.4°C) |
| 300 to 440°F (149 to 227°C) | ± 9°F (± 5°C) | ± 5°F (± 2.4°C) | ± 4°F (± 2°C) |

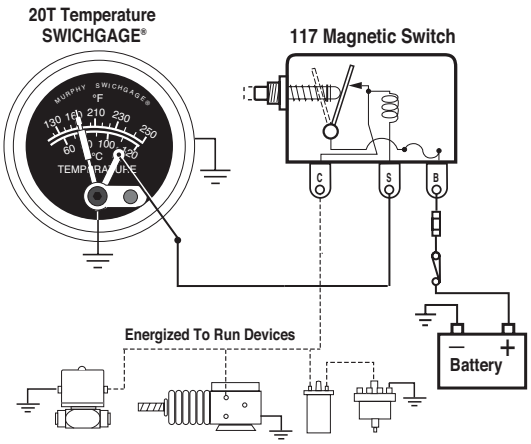
## Maximum Temperature

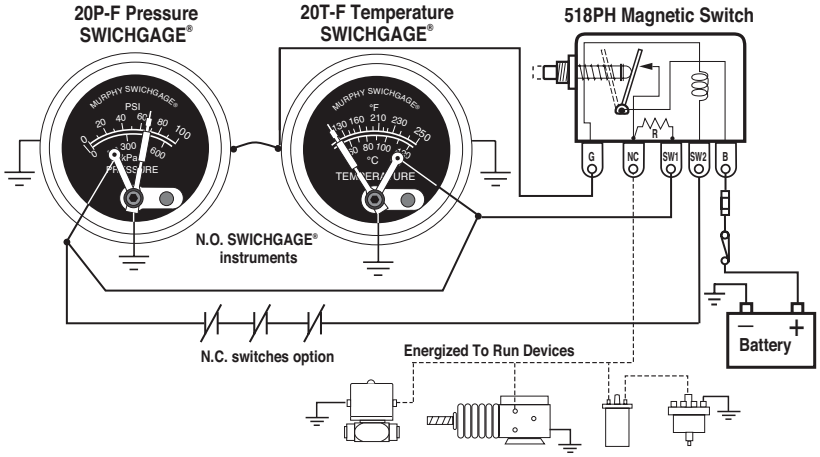
**MAXIMUM AMBIENT TEMPERATURE:** -40° (-40°) thru 150° (66°)

| RANGE | MAXIMUM PROCESS TEMPERATURE |
|---|---|
| ≤250° (120°) | 120% OF FULL SCALE |
| 300° (140°) | 350° (198°) |
| ≥320° (160°) | 120% OF FULL SCALE |

## Magnetic Switch

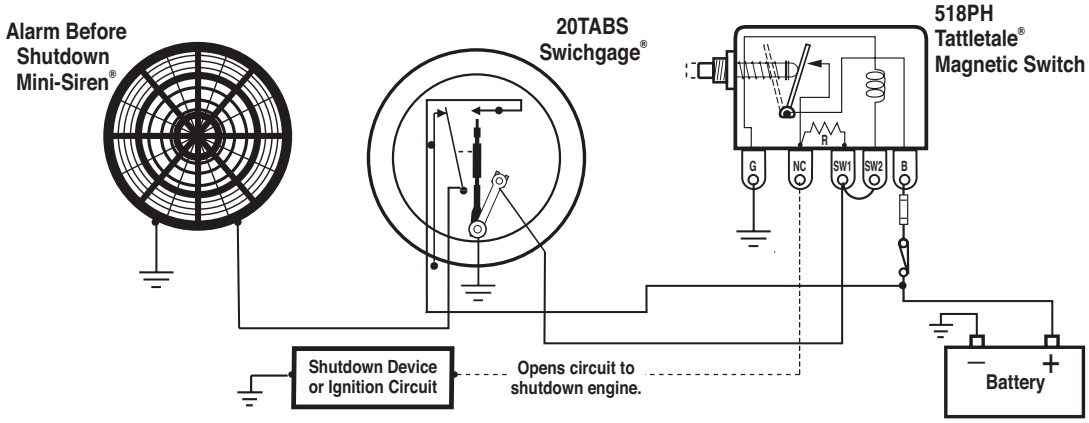
**INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH.** The Swichgage contacts are for light-duty electrical switching to operate alarms or control devices. Murphy manufactures the Magnetic Switch for protection of the light-duty Swichgage limit contacts. Tattletale® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown below.




## Pre-Alarm Using 20/25TABS

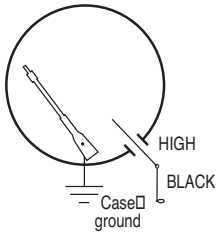
The 20TABS and 25TABS feature a standard limit contact for high temperature equipment shutdown. It also has an internal SPDT snap-switch to signal an alarm before shutting down. When the low side of the snap-switch trips (preset point), on rising temperature, the switch completes a circuit to activate an alarm. If the temperature continues to increase, the face-adjustable pointer contact will make and the shutdown circuit will be completed (see the typical diagram below for reference). The front contact shutdown limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to "Temperature Ranges and Factory Settings" table on opposite page for settings. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.



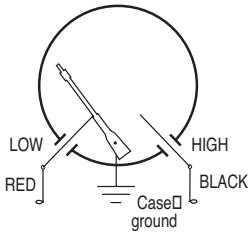

## Typical Internal Wiring Diagrams

Pointer shown in the shelf position. Pointer type contact rating: pilot duty 2 A @ 30 VAC/VDC.
Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.

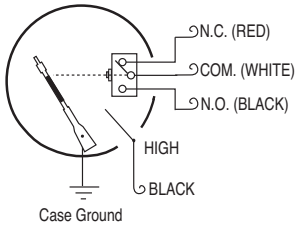
### Pointer Type Contact



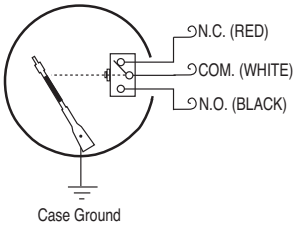

### "HL" Hi-Lo Option




### ABS Models




### TE Models



## How to Order

To order, use the diagram below. List options in ascending alphabetical order (A-Z). Example: **20T-IP1-250-4.**

____ – ____ – ____ – ____ – ____

### *Base Model*

| | | |
|---|---|---|
| **20T** | **20TH** | **25TL** |
| **20TL** | **20TD** | **25TE** |
| **20TO** | **20SD** | **25TABS** |
| **20TE** | **20TG** | **25TH** |
| **20TABS** | **25T** | **25TG** |
| **20TB** | | |

### *Options*†

**A** = AGF (Argon filled)
**B1** = Black bezel
**B2** = Bezel 05051857 (was "HP")
**B3** = Bezel 05051836 (was "HBB")
**EX** = EX proof (explosion proofed)
**EL** = EX less case (explosion proofed less case)
**F** = "FS" contact (includes "ES" as appropriate)
**HL** = High and low contacts
**I** = Illumination (for options, see chart below)
**IP1** = Light pipe illumination, 12 VDC
**IP2** = Light pipe illumination, 24 VDC
**K** = Knob adjusting face contact
**OS** = Oil sealed (Silicone Oil)
**UA** = Temperature bulb style A (10050166)*
**UB** = Temperature bulb style B (10010061)*
**UC** = Temperature bulb style C (10010060)*
**UD** = Temperature bulb style D (10000286)*
**UE** = Temperature bulb style E (10010084)*
**UF** = Temperature bulb style F (10000577)*
**UG** = Temperature bulb style G (10000578)*
**UH** = Temperature bulb style H (10002466)*
**UK** = Temperature bulb style K (10054886)*

† Options not available on all models or configurations.
* Specify optional bulb ONLY when not included as standard for temperature ***Base Model,*** scale/range or capillary length.

### *Illumination Options*

| | IP1 / IP2 | I |
|---|---|---|
| 20 Series | x | x[1] |
| 25 Series | N/A | N/A |

[1]Can be used with standard Clamp Lite Assembly (12 V= 05702176; 24 V= 05702177).

### *Adapter Nuts*†††

| | |
|---|---|
| **1/8** = 1/8-27 NPT | **Metric** |
| **1/4** = 1/4-18 NPT | **M10** = 10 mm x 1.5 |
| **3/8** = 3/8-18 NPT | **M12** = 12 mm x 1.5 |
| **3/8B** = 3/8-19 BSPT | **M14** = 14 mm x 1.5 |
| **3/8K** = 3/8 NPSF | **M16** = 16 mm x 1.5 |
| **-** = 1/2-14 NPT†††† | **M18** = 18 mm x 1.5 |
| **1/2B** = 1/2-BSPT | **M20** = 20 mm x 1.5 |
| **1/2K** = 1/2 NPSF | **M22** = 22 mm x 1.5 |
| **5/8** = 5/8-18 UNF | **M24** = 24 mm x 1.5 |
| **3/4** = 3/4-14 NPT | |
| **3/4U** = 3/4-16 UNF | |
| **7/8** = 7/8-9 UNC | |

†††Specific adapter nut must match the sensing bulb.
††††Standard.

### *Temperature Capillary Armor Type and Length*

***Capillary Armor Type***
**Blank** = PVC armor, copper capillary
**S** = Stainless steel armor, copper capillary

***Capillary Length (specify after capillary type; example: "S4")***
**4** = 4 ft. (1.2 m)
**Specify other length** = Available in 2 ft. increments thru 20 ft.; 5 ft. increments above 20 ft. (0.5 metres increments from 1.5–10 metres; 2 metre increments thru 34 metres. **Specify "M" following length, i.e. 1.5M.**)

### *Range*††

| Dual scale (°F/°C) | | | Single scale (°C) | |
|---|---|---|---|---|
| | *°F* | *°C* | | |
| **120** = | 32-120 | 0-49 | **70C** = | 0-70°C |
| **160** = | 32-160 | 0-71 | **100C** = | 45-100°C |
| **220** = | 130-220 | 54-104 | **120C** = | 50-120°C |
| **250** = | 130-250 | 60-121 | **140C** = | 60-140°C |
| **300** = | 140-300 | 60-149 | **160C** = | 70-160°C |
| **320** = | 160-320 | 71-160 | | |
| **350** = | 180-350 | 82-177 | | |
| **440** = | 300-440 | 149-227 | | |

††Consult factory for availability of dials other than °F/°C. Select scale so your normal operating temperature is in the upper half of the scale.

## Warranty

A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm

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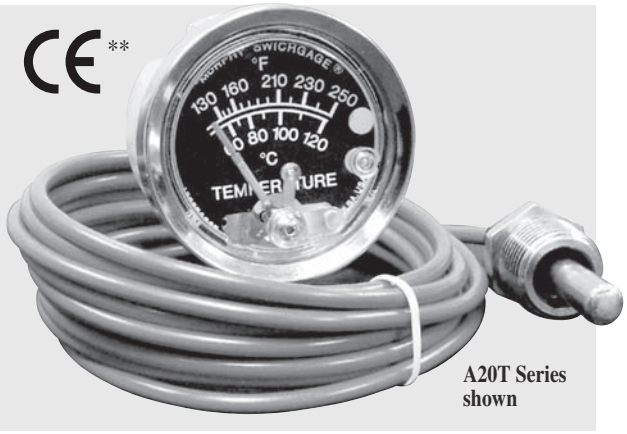
# A20 and A25 Series Temperature SWICHGAGE®

AT-95026B
Revised 08-05
Catalog Section 10




A20T Series shown

## 2 and 2-1/2 in. (51 and 64 mm) Dial

- Corrosion Resistant Polycarbonate Case
- Indicating Gage and Limit Switch
- Switch Can Activate Alarms and/or Shut Down Equipment
- Critical/High Temperature Limit Switch Is Visible and Adjustable (Most Models)
- Contact(s) Isolated From Ground

## Description

The A20 Series (2 inch/51 mm dial) and the A25 Series (2-1/2 inch/64 mm dial) SWICHGAGE® models are diaphragm-actuated, temperature-indicating gages, with built-in electrical switches for tripping alarms and/or shutdown devices.

Ranges are available from 32-120°F (0-45°C) thru 300-440°F (160-220°C).

All models of these rugged, built-to-last instruments are fully sealed from the environment by the unique combination of a polycarbonate case and lens, a polished stainless steel bezel, and O-ring seals.

These vapor/pressure actuated gages feature a sealed capillary tube and a sensing bulb. When subjected to heat, the liquid in the sensing bulb changes to vapor creating pressure against a diaphragm mechanism. The diaphragm translates this vapor pressure into a mechanical gage reading.

For series A20T and A25T, the gage pointer acts as a temperature indicator and as one switch pole which completes a circuit when it touches the adjustable limit contact. Contact(s) are isolated from ground. They have self-cleaning motion to enhance electrical continuity.

Models A20TE and A25TE have internal snap-acting SPDT switches.

Gage-only models, without contacts (MURPHYGAGE®) are also available.

## Applications

Applications for A20 and A25 Series temperature SWICHGAGE® instruments include: engines and equipment in Oil Field, Marine, Irrigation, Construction and Trucking industries. Monitoring Engine Coolant temperature, Crankcase Oil, Transmission Oil.

## Specifications

**Dial:** White on black; U.S.A. standard scale is dual scale °F/°C; others available.

**Case:** Glass filled/Polycarbonate, corrosion-resistant; steel mounting clamp included. **Bezel:** Polished stainless steel, standard; others are available.

**Pointer:** Tempered nickel silver; red tip.

**Lens:** Polycarbonate, high-impact.

**Sensing Element:** Beryllium copper diaphragm.

**Capillary:** PVC armored copper; 4 ft. (1.2 m)* Stainless steel armor optional.

**Sensing Bulb:** Copper*

**Gage Accuracy:** See accuracy chart, on page 2.

**Maximum Temperature:** See Temperature Ranges and Factory Settings table on page 2.

**Adjustable Limit Contact (A20T and A25T):** SPST contact; pilot-duty only, 2 A @ 30 VAC/VDC; isolated from case ground. Normally Closed when the high limit is met. Normally Open when pointer is in normal operating range. Contacts are gold flashed silver.
Limit Contact Adjustment: *by a 1/16 in. hex wrench thru 100% of the scale.*
Wiring: *A20T: Number 4 screw terminals; A25T: Number 6 screw terminals.*

**Snap-Switch Rating (A20TE and A25TE):** SPDT, 3 A@ 30 VDC inductive; 4 A @ 125 VAC inductive.
Wiring: *A20TE: Number 4 screw terminals; A25TE: Number 6 screw terminals.*

**Unit Weight:** A20 Series: *11.9 oz. (0.370 kg).* A25 Series Models: *13.3 oz. (0.413 kg).*

**Unit Dimensions:** A20 Series: *4-3/4 x 4-3/4 x 3 in. (121 x 121 x 76 mm).* A25 Series Models: *4-3/4 x 4-3/4 x 2-3/4 in. (121 x 121 x 70 mm).*

## Base Models

### Coolant or Oil Temperature

#### *A20T and A25T Series SWICHGAGE®*

For these models the gage pointer makes with an adjustable contact to complete a pilot-duty circuit.

#### *A20TL and A25TL SWICHGAGE®*

For use on Ford Worldwide engines. Supplied with special sensing bulb.

#### *A20TE and A25TE SWICHGAGE®*

**A20TE (*was A20ESR)* and A25TE (*was A25ESR).*** Models with internal SPDT snap-switches, instead of the single pole/pointer contact(s). When the switch closes on rising temperature, it becomes Set. As temperature decreases the switch Resets. Model A25TE is CSA listed for non-hazardous areas. Model A25TE-EX is CSA listed for Class I, Division 1, Groups C & D hazardous areas.

#### *A20TABS and A25TABS SWICHGAGE®*

Same as 20 and 25T with internal SPDT snap-switch for pre-alarm.

### Cylinder Head Temperature

#### *A20TH and A25TH SWICHGAGE®*

**A20TH (*was A20TL8133)* and A25TH (*was A25TL8133).*** For use on Air Cooled engines.

### Gage–Only Models

#### *A20TG and A25TG MURPHYGAGE®*

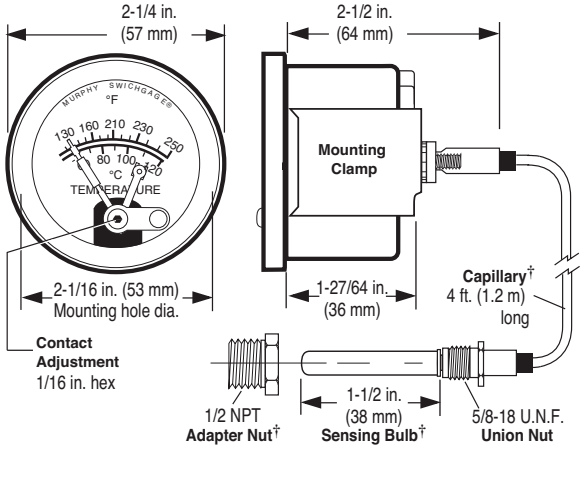
Gage without contact(s).

* For optional capillary lengths, engine adapters, sensing bulbs and range combinations, see Murphy bulletin T-8428B.

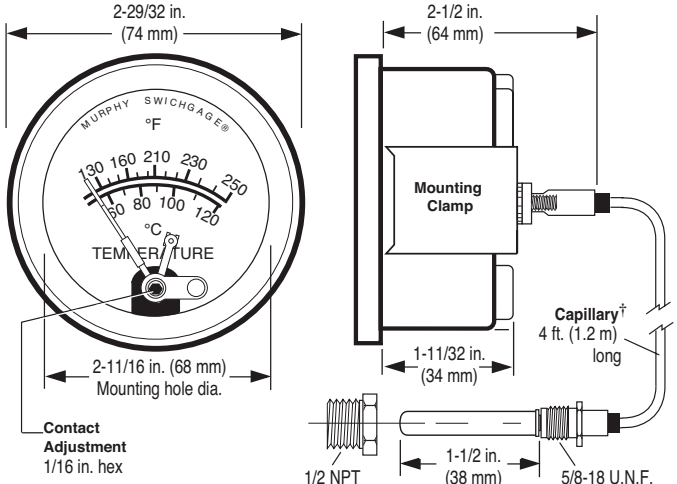
** Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

## Dimensions

### A20 Series Models (typical)




### A25 Series Models (typical)




†Standard combinations. See Murphy bulletin T-8428B for optional sensing bulb, engine adaptors and capillary combinations.

## Temperature Ranges and Factory Settings

**NOTES**

**1.** Values in ( ) are mathematical conversions from °F to °C–they do not reflect actual second scale range. U.S.A. standard scale is °F/°C.

**2.** For models A20TE and A25TE; the switch trip point cannot be set at either the low or high extreme of the scale. The trip point must allow for the reset differential.

**3.** For adjustable switch models, the trip point is adjustable **only** over the upper half of the scale.

| Ranges Available *Dual Scale Dial* °Fahrenheit (°Celsius) | *Single Scale* °Celsius only | Max. Temp. | Std. Settings* | | Hi/Lo Settings Low | High | 20TABS and 25TABS Settings Alarm** | | Shutdown | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | °F (°C) | °F (°C) | °C only | °F (°C) | °F (°C) | °F (°C) | °C only | °F (°C) | °C only |
| 32 – 120 (0 – 49) | — | 185 (85) | 110 (43) | — | 32 (0) | 110 (43) | 100 (38) | — | 110 (43) | — |
| 32 – 160 (0 – 71) | 0 – 70 | 215 (102) | 150 (66) | 66 | 32 (0) | 150 (66) | 140 (60) | 60 | 150 (66) | 66 |
| 130 – 220 (54 – 104) | 45 – 100 | 260 (127) | 210 (99) | 85 | 160 (71) | 210 (99) | 200 (93) | 80 | 210 (99) | 85 |
| 130 – 250 (54 – 121) | 50 – 120 | 310 (154) | 210 (99) | 97 | 160 (71) | 210 (99) | 200 (93) | 95 | 210 (99) | 100 |
| 140 – 300 (60 – 149) | 60 – 140 | 340 (173) | 275 (135) | 130 | 200 (93) | 275 (135) | 265 (129) | 125 | 275 (135) | 130 |
| 160 – 320 (71 – 160) | 70 – 160 | 370 (192) | 300 (149) | 150 | 200 (93) | 300 (149) | 290 (143) | 145 | 300 (149) | 150 |
| 180 – 350 (82 – 177) | — | 400 (209) | 330 (166) | — | 240 (116) | 330 (166) | 320 (160) | — | 330 (166) | — |
| 300 – 440 (149 – 227) | — | 500 (260) | 400 (204) | — | 300 (149) | 400 (204) | 390 (199) | — | 400 (204) | — |

* Standard setting for A20T, A25T, A20TE and A25TE models.

** SPDT snap-switch is the alarm switch.

## Temperature Accuracy Chart

| Temperature Range | Lower 1/3 of Scale | Middle 1/3 of Scale | Upper 1/3 of Scale |
|---|---|---|---|
| 32 to 120°F (0 to 49°C) | ± 12°F (± 6°C) | ± 5°F (± 2.4°C) | ± 6°F (± 3°C) |
| 32 to 160°F (0 to 71°C) | ± 20°F (± 10°C) | ± 8°F (± 4.4°C) | ± 7°F (± 4°C) |
| 130 to 220°F (54 to 104°C) | ± 6°F (± 3°C) | ± 3°F (± 1.6°C) | ± 4°F (± 2°C) |
| 130 to 250°F (54 to 121°C) | ± 9°F (± 5°C) | ± 5°F (± 2.4°C) | ± 4°F (± 2°C) |
| 140 to 300°F (60 to 149°C) | ± 10°F (± 5.2°C) | ± 6°F (± 3°C) | ± 5°F (± 2.4°C) |
| 160 to 320°F (71 to 160°C) | ± 10°F (± 5.2°C) | ± 5°F (± 2.4°C) | ± 5°F (± 2.4°C) |
| 180 to 350°F (82 to 177°C) | ± 12°F (± 6°C) | ± 5°F (± 2.4°C) | ± 5°F (± 2.4°C) |
| 300 to 440°F (149 to 227°C) | ± 9°F (± 5°C) | ± 5°F (± 2.4°C) | ± 4°F (± 2°C) |

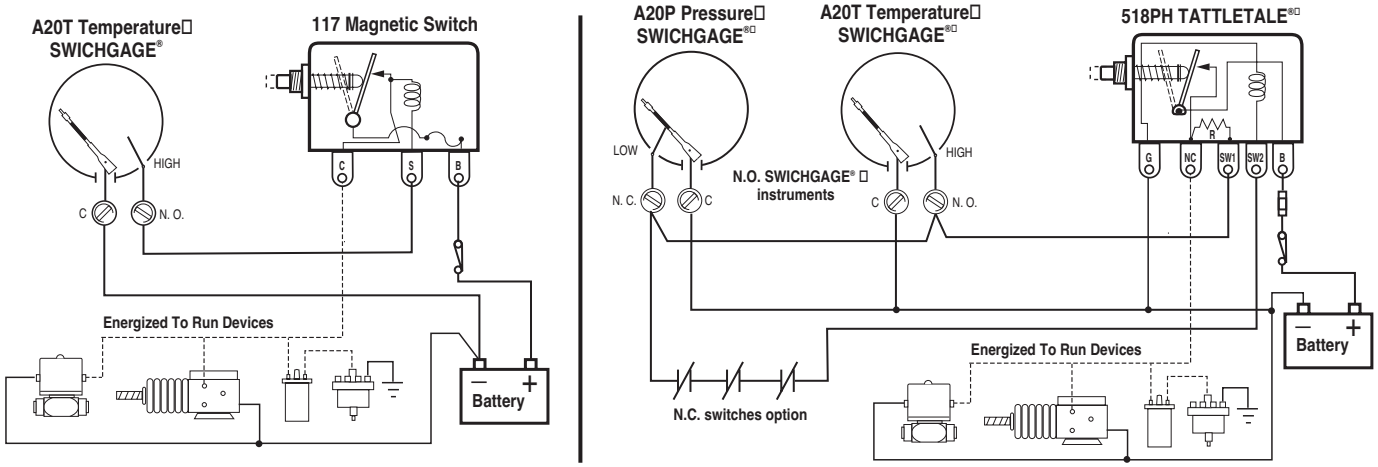
## Maximum Temperature

**MAXIMUM AMBIENT TEMPERATURE:** -40° (-40°) thru 150° (66°)

| RANGE | MAXIMUM PROCESS TEMPERATURE |
|---|---|
| ≤250° (120°) | 120% OF FULL SCALE |
| 300° (140°) | 350° (198°) |
| ≥320° (160°) | 120% OF FULL SCALE |

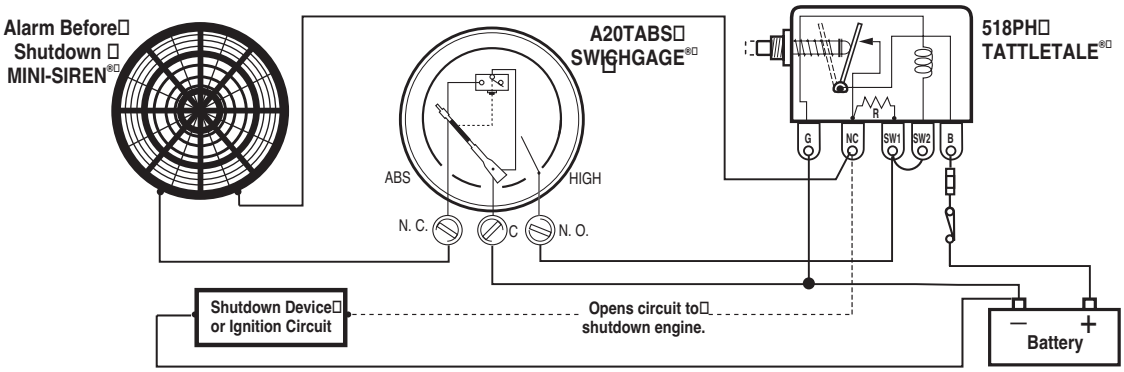
## Magnetic Switch

**INDUCTIVE AND HIGH CURRENT LOADS REQUIRE THE USE OF A MAGNETIC SWITCH.** The SWICHGAGE® contacts are for light-duty electrical switching to operate alarms or control devices. Murphy manufactures the Magnetic Switch for protection of the pilot-duty SWICHGAGE® limit contacts. TATTLETALE® Magnetic Switches show the cause of shutdown for applications that include: capacitor discharge or magneto ignitions, battery systems and electric motor driven equipment. Typical wiring diagrams are shown below.



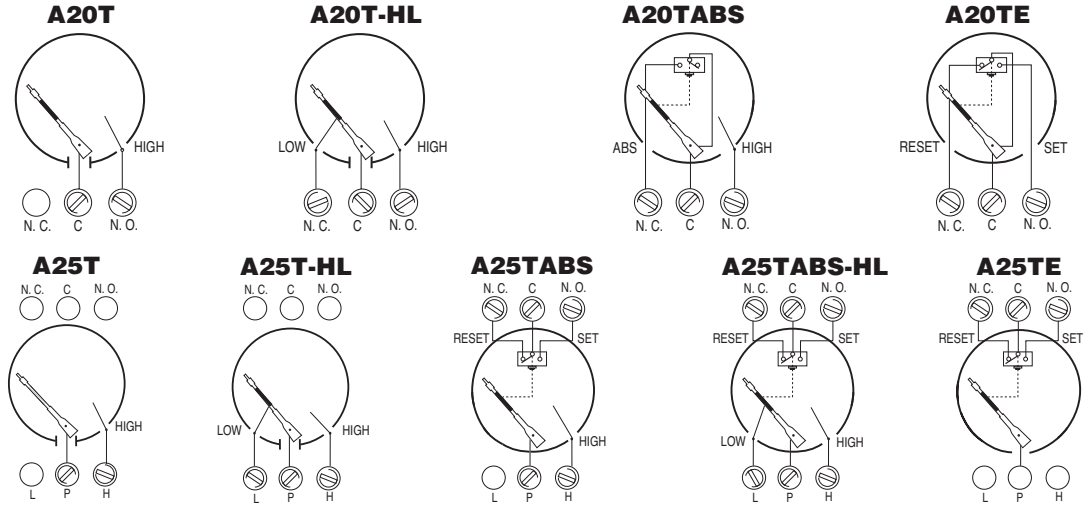

## Pre-Alarm Using A20/A25TABS

The A20TABS and A25TABS features a standard limit contact for equipment shutdown on high temperature. It also has an internal SPDT snap-switch to signal an alarm before shutting down. When the snap-switch trips (preset point), on rising temperature, the switch completes a circuit to activate an alarm. If the temperature continues to increase, the face-adjustable pointer contact will make and the shutdown circuit will be completed (see the typical diagram below for reference). The front contact shutdown limit setting (which is adjustable) and the snap-switch are preset at the factory. Refer to "Temperature Ranges and Factory Settings" table on opposite page for settings. For alternative alarm before shutdown, see Magnetic Switch model 760A or 761APH.




## Typical Internal Wiring Diagrams

Pointer shown in the shelf position. Pointer type contact rating: pilot-duty 2 A @ 30 VAC/VDC resistive.
Snap-acting switch rating: 3 A @ 30 VDC inductive. 4 A @ 125 VAC inductive.



## How to Order

To order, use the diagram below. List options in ascending alphabetical order (A-Z). Example: **A20T-B1-250-4.**

____ – ____ – ____ – ____ – ____

### *Base Model*

| | |
|---|---|
| **A20T** | **A20TG** |
| **A20TL** | **A25T** |
| **A20TO** | **A25TL** |
| **A20TE** | **A25TE** |
| **A20TABS** | **A25TABS** |
| **A20TB** | **A25TH** |
| **A20TH** | **A25TG** |

### *Options*†

**B1** = Black bezel
**EX** = Explosion-proof (CSA Listed for Class I, Div. 1, Groups C & D)*
**EL** = Explosion-proof less case
**HL** = High and low contacts
**K** = Knob adjusting face contact
**OS** = Oil sealed (Silicone Oil)
**UA** = Temperature bulb style "A" (10-05-0166)
**UB** = Temperature bulb style "B" (10-01-0061)
**UC** = Temperature bulb style "C" (10-01-0060)
**UD** = Temperature bulb style "D" (10-00-0286)
**UE** = Temperature bulb style "E" (10-01-0084)
**UF** = Temperature bulb style "F" (10-00-0577)
**UG** = Temperature bulb style "G" (10-00-0578)
**UH** = Temperature bulb style "H" (10-00-2466)
**UJ** = Temperature bulb style J (10051153)
**UK** = Temperature bulb style K (10054886)

†Options not available on all models or configurations.
*A25TE-EX only is CSA listed for hazardous locations.
**This option is not covered by the CE mark.

### *Adapter Nuts*†††

| | |
|---|---|
| **1/8** = 1/8-27 NPT | **Metric** |
| **1/4** = 1/4-18 NPT | **M10** = 10 mm x 1.5 |
| **3/8** = 3/8-18 NPT | **M12** = 12 mm x 1.5 |
| **3/8B** = 3/8-19 BSPT | **M14** = 14 mm x 1.5 |
| **3/8K** = 3/8 NPSF | **M16** = 16 mm x 1.5 |
| **–** = 1/2-14 NPT†††† | **M18** = 18 mm x 1.5 |
| **1/2B** = 1/2-BSPT | **M20** = 20 mm x 1.5 |
| **1/2K** = 1/2 NPSF | **M22** = 22 mm x 1.5 |
| **5/8** = 5/8-18 UNF | **M24** = 24 mm x 1.5 |
| **3/4** = 3/4-14 NPT | |
| **3/4U** = 3/4-16 UNF | |
| **7/8** = 7/8-9 UNC | |

†††Specific adapter nut must match the sensing bulb.
††††Standard.

### *Temperature Capillary Armor Type and Length*

***Capillary Armor Type***
**Blank** = PVC armor, copper capillary
**S** = Stainless steel armor, copper capillary

***Capillary Length (specify after capillary type; example: "S4")***
**4** = 4 ft. (1.2 m)
**Specify other length =** Available in 2 ft. increments thru 20 ft.; 5 ft. increments above 20 ft. (0.5 m. increments from 1.5–10 m.; 2 m. increments thru 34 m. **Specify "M" following length, i.e. 1.5M.**)

### *Range*††

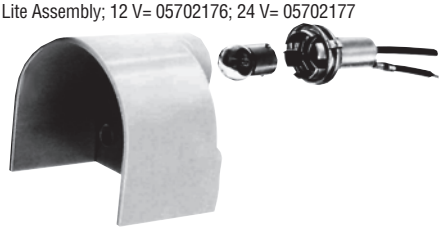
| Dual scale (°F/°C) | | | Single scale (°C) |
|---|---|---|---|
| | *°F* | *°C* | |
| **120** = | 32-120 | 0-49 | **70C** = 0-70°C |
| **160** = | 32-160 | 0-71 | **100C** = 45-100°C |
| **220** = | 130-220 | 54-104 | **120C** = 50-120°C |
| **250** = | 130-250 | 60-121 | **140C** = 60-140°C |
| **300** = | 140-300 | 60-149 | **160C** = 70-160°C |
| **320** = | 160-320 | 71-160 | |
| **350** = | 180-350 | 82-177 | |
| **440** = | 300-440 | 149-227 | |

††Consult factory for availability of dials other than °F/°C. Select scale so your normal operating temperature is in the upper half of the scale.

### *Illumination – Order Separately*

***A20 Series:*** Clamp Lite Assembly; 12 V= 05702176; 24 V= 05702177

***A25 Series:*** N/A.



## Warranty

A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm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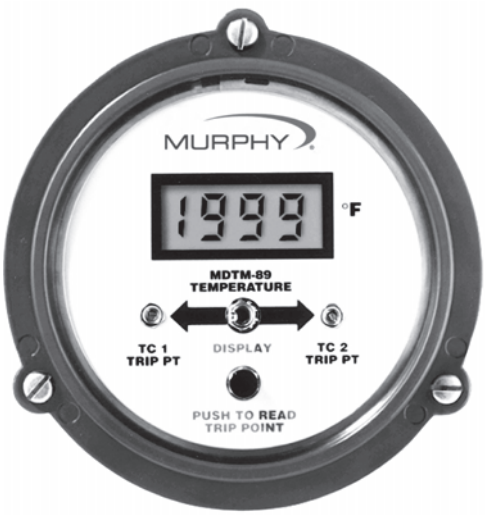
# Dual Temperature SWICHGAGE® Model Series MDTM89




## Features

- Monitor inputs from two thermocouples
- Adjustable switch trip point for each input
- FET or SCR output
- Power from CD ignition or 120 VAC or 12/24 VDC
- Types“J”or“K”ungrounded thermocouples
- Digital readings in Fahrenheit or Celsius

**Approved***

**Approved†**

* When used with approved ignition or 12-24 VDC. Contact Murphy for details.
† Approved for CD ignition, 80–250 VDC.

Murphy's model MDTM89 is an electronic, dual-temperature monitor. It monitors two thermocouples, displays the temperature of the thermocouple selected, and has adjustable trip points for each input. A toggle switch provides for selection of the thermocouple to be displayed and/or the temperature trip point to be checked/adjusted. If either trip point is reached, the associated output “turns on” and can be used as a control signal, or to initiate alarms and/or shutdown.

**A “Push to Read” button,** located below the selector switch, allows the operator to check the trip point and to see its value as adjustments are made. Two potentiometers, one on each side of the thermocouple selector switch, are provided for field-adjustment of the trip points.

**There are four basic models.** Two of the models are powered by capacitor discharge ignition, and have either an FET or an SCR output. One model operates from 12 or 24 VDC and has an FET output. One model operates from 120 VAC by use of an isolation module and has an FET output. Standard display is in degrees Fahrenheit; degrees Celsius is optional.

## Applications

Applications include the following:

- Compressor suction/discharge temperature
- Engine/compressor jacket water temperature
- Engine exhaust temperature
- Compressor cylinder temperature
- After cooler temperature
- Bearing temperature

## Thermocouple Type

Either “J” or “K” type **UNGROUNDED THERMOCOUPLE** is accepted. Specify type in part number for each MDTM89 unit (see How to Order information on back page).

Order thermocouples as a separate item.

## Automatic Cold Junction Reference

Cold junction reference point compensation is an integral feature of the monitor. The compensator circuit monitors case temperature and automatically compensates for changes in ambient temperatures. Compensation will allow maximum of 2 degrees change in the temperature reading from 32 to 122°F (0 to 50°C).

## Open Thermocouple Input

An open thermocouple input forces the monitor into upscale overrange. The monitor indicates an overrange by displaying the numeral 1 (one) in the left most digit of the display. An overrange will turn on the high trip point output.

## Trip Point Operation

Monitored trip points are independent of the thermocouple selector switch. Both set points are always active.

When the thermocouple temperature reaches the trip point temperature, the MDTM89 is triggered. After approximately 0.5 seconds the trip point output “turns on”.

Trip points are set by depressing the “Push to Read” push button while rotating a trip point potentiometer until the desired trip point temperature is displayed.

## Continuous & Trip Point Display

The selector switch is used to select the thermocouple or trip point temperature to be displayed. The selected temperature is continuously displayed during normal operation. Depressing the “Push to Read” push button displays the trip point temperature of the selected thermocouple.

## Specifications

**Power Requirements (Operating Voltages):**

**MDTM89-A:** 100 to 350* VDC, CD ignition, negative ground (FET outputs).

**MDTM89-E:** 100 to 350*, CD ignition, negative ground (FET outputs).

**MDTM89-B:** 100 to 350* VDC, CD ignition, negative or positive ground (SCR outputs).

**MDTM89-C:** 12 to 24† VDC, negative ground, 15 milliwatts (FET outputs).

**MDTM89-D:** 120 VAC (MDTM89-C with 120 V isolation module #IT-1) (FET outputs.) Model NOT approved by CSA or Factory Mutual.

**Power Consumption:** CD ignition: 350 µa @ 100V; 120 VAC: 0.6 watts; 24 VDC: 0.5 watts.

**Outputs**: Model B: output turns on above trip point; output turns off when power is switched off; two (2) isolated SCR outputs, 0.5 amp @ 250 VDC.
Models A, C and D: output turns on above trip point; output turns off below trip point; two (2) isolated FET outputs, 0.5 amp @ 250 VDC.

Model E: output one turns on above trip point, output turns off below trip point: output 2 turns on below trip point, output turns off above trip point: two (2) isoloated FET outputs, 0.5 amp @ 250 VDC.

* Approved for CD ignition, 80–250 VDC.

† When used with approved ignitions or 12-24 VDC. Contact Murphy for details.

**Ambient Cold Junction Compensation Range:** 32 to 122°F (1°C from 0 to 50°C).

**Operating Temperature:** -4 to 158°F (-20 to 70°C).

**Storage Temperature:** -40 to 300°F (-40 to 150°C).

**Case:** Die cast aluminum.

**Reset Differential:** FET models: Decreases 3 Degrees (°F or °C).
SCR model: turn input power off to reset.

**Measurement Range:** Monitor Range 0-1999°F or °C (specify "F" or "C" in part number).

**Accuracy:** With J-type thermocouple: from 150-1200°F (66-649°C) ±1.5% of reading. With K-type thermocouple: from 400-2000°F (204-1076°C) ±1.5% of reading. At calibration temperature.

**Laboratory Approvals:** CSA† and Factory Mutual* approved for Class I, Division 2, Group D, hazardous locations).

**Thermocouple Lead Length:** 150 ohm lead resistance affects monitor accuracy less than 1°.

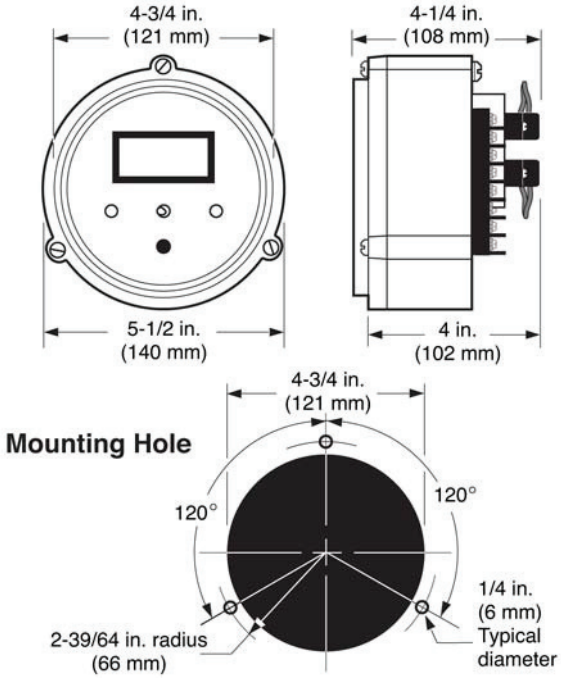
**Trip Point Accuracy:** ±3°F (±2°C) of reading.

**Trip Point Adjustment Range:** 0-1999 Degrees.

**Shipping Weight:** 48 ozs (1.4 kg).

**Shipping Dimensions:** 10 x 9-1/2 x 6 in. (254 x 241 x 152 mm)

## Dimensions




## How to Order

**MDTM89- F - A - K**

***Calibration***
**F**: Fahrenheit
**C**: Celsius

*Type of **ungrounded** thermocouple to be used;* "**J**" or "**K**".

***Powered by and type output:***
**A**: CD ignition, 100–350 VDC, output by FET (Field Effect Transistor, 0.5 A @ 250 VDC maximum).
**E:** CD ignition, 100-350 VDC, output by FET (Field Effect Transistor, 0.5 A @ 250 VDC maximum).
**B**: CD ignition, 100–350 VDC, output by SCR (Silicon Controller Rectifier, 0.5 A @ 250 VDC maximum).
**C**: 12 to 24 VDC, 15 mw, output by FET
**D**: 120 VAC, output by FET (same as "C" with a 120 VAC–24 VDC power supply [#IT-1])

### MDTM89 Interface Capabilities

| *Model* | *Power Source* | *Rating* |
|---|---|---|
| **LCDT** | CD Ign., 120 VAC, 12/24 VDC | Cl.I, Div.1, Gr.D, Haz. areas* |
| **S1501** | 120 VAC or 12/24 VDC | Cl.I, Div.1, Gr.D, Haz. areas* |
| **TTD** | CD Ign., 12/24 VDC | Cl.I, Div.2, Gr.D, Haz. areas** |
| **TATTLETALE®** | CD Ign., 120 VAC, 12/24 VDC | Non-Hazardous areas |

**PLC s, various non-Murphy annunciators–**contact factory.

*An isolation barrier is needed between the **MDTM89** and an **Annunciator** rated for Class I, Division 1, Group D, Hazardous Areas.

**When used with approved ignition. Contact Murphy for details.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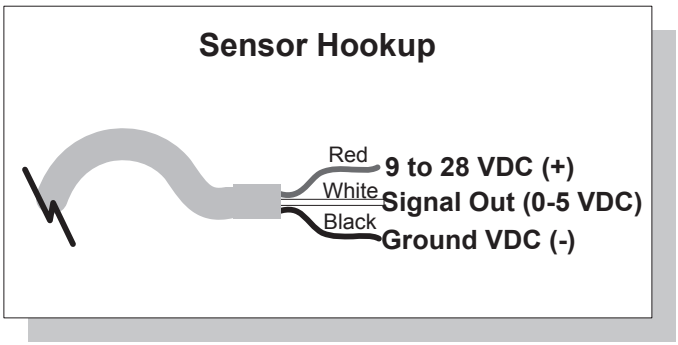
# Air Temperature Sensor - Model 12

The Model 12 Air Temperature Sensor is intended for use in applications that monitor slowly changing temperatures. The unit gives approximately .5 °F (.25 °C) resolution when used with an 8-bit analog input.

Applications for the probe include the following:

- Monitor ambient temperature and signal wind machines to start.
- Monitor and maintain cargo temperatures.




**Temperature Sensing Range**

| VDC Out | °C | °F |
|---|---|---|
| 0.00 | -18 | 0 |
| 0.25 | -14.5 | 5.8 |
| 0.50 | -11.4 | 11.5 |
| 0.75 | -8.2 | 17.3 |
| 1.00 | -5 | 23.0 |
| 1.25 | -1.8 | 28.8 |
| 1.50 | 1.4 | 34.5 |
| 1.75 | 4.6 | 40.3 |
| 2.00 | 7.8 | 46.0 |
| 2.25 | 11 | 51.8 |
| 2.50 | 14.2 | 57.5 |
| 2.75 | 17.4 | 63.3 |
| 3.00 | 20.6 | 69.0 |
| 3.25 | 23.8 | 74.8 |
| 3.50 | 27 | 80.5 |
| 3.75 | 30.2 | 86.3 |
| 4.00 | 33.3 | 92.0 |
| 4.25 | 36.6 | 97.8 |

## Specifications

**Temperature Capability**
**Useful Operating Temperature Range:** 0°F to 115°F (-18°C to 46°C)
**Component Temperature Range:** -85°F to 300°F (-65°C to 150°C)

**Accuracy:** 2% of full scale with software offset correction..

**Voltage**
**Power Input Voltage:** 9 to 28 VDC

**Current Draw:** 1 mA

**Cable:** 2 foot length, 22 AWG, stranded

**Clamp:** ½" ID, provided (P/N 00-03-0392)

## How to Order

Air Temperature Sensor – Model 12 – P/N 10-70-7483

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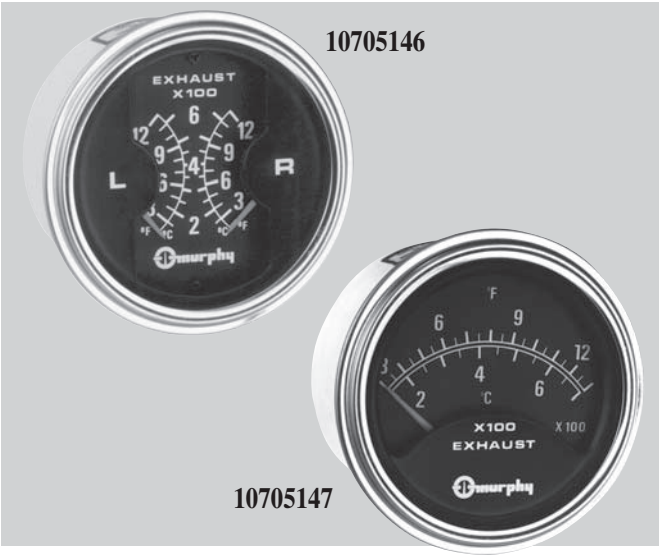
**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm.

# Exhaust Pyrometers




## Models 10705146 (00000819) and 10705147 (00000956)

- Single or Dual Port Reading
- 2% Accuracy
- Sealed Construction
- Temperature Compensation
- Easy to Read Scales

### Description

The Single 10705147 (00000956) and Dual 10705146 (00000819) Port Pyrometers monitor exhaust temperatures in all types of engines. The Dual Port Pyrometer can monitor each bank of a V-type engine, allowing you to compare readings at all times. Both pyrometers feature an easy-to-read illuminated dial with scales in both Fahrenheit and Celsius. They require no outside power (except for dial lighting). Spring loaded jewels and alloy pivots increase durability. Murphy offers pyrometer accessories such as thermocouples and wire lead assembly.

### Application

Excessive exhaust temperature is a major damaging factor to all engines. The best way to monitor this temperature is with the use of a pyrometer. Excessive exhaust temperature is caused by an upset fuel/air ratio or more fuel in the engine than there is air to support it. This condition can occur as a result of over throttling, a dirty air cleaner, different fuels, a malfunctioning fuel system, change of altitude, an out of tune engine and many other causes. But whatever the cause, a pyrometer indicates this condition before serious damage occurs.

Suitable for stationary or mobile engines, power units, agricultural and construction equipment, as well as marine and trucking.

### Features

- Large sweep scales for maximum legibility.
- Internal illumination for night use.
- Accuracy: 2% full scale.
- Sealed housing.
- Ambient temperature compensation.
- Calibrated permanently at 2/3 scale.
- Flush type mounting on any plane.

### Benefits of Using a Pyrometer

- Longer engine life
- Better fuel economy
- Less lubrication oil dilution
- Lubrication oil stays clean much longer
- Exhaust emissions drop to a minimum
- Malfunctions indicated before excessive damage occurs

### Specifications

**Dial Scale**

Single: *300 to 1300°F (150 to 700°C)**

Dual: *300 to 1200°F (150 to 649°C)**

*Celsius only dials available.

**Dial Sweep (both models):** 100°.

**Accuracy:** Full scale 2%.

**Illumination**

Internal 12 or 24 VDC.

**Bezel:** Polished stainless steel†

†Black bezel available. Special order.

**Case:** PVC.

**Pointer(s):** Fire Orange.

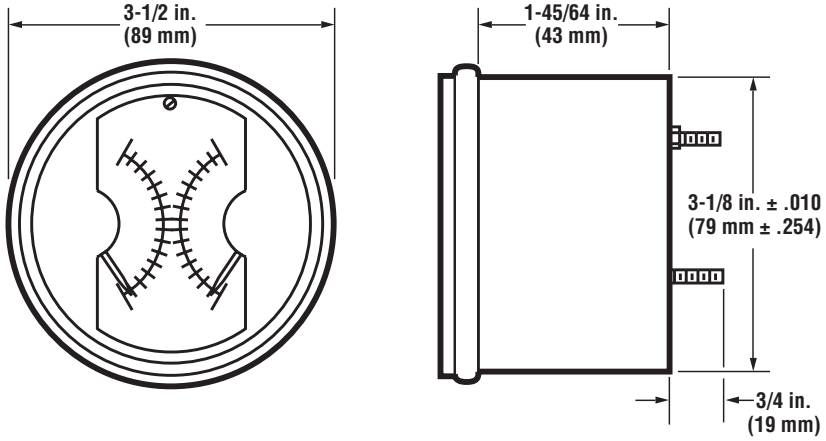
### Warranty

A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm

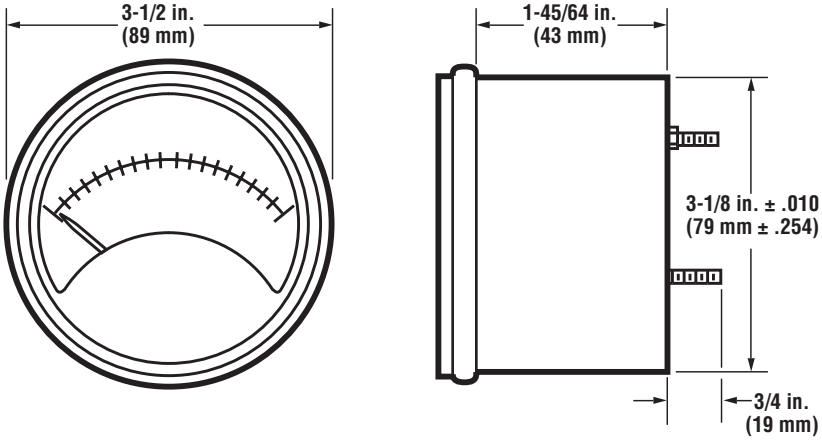
MURPHY

## Dimensions

**10705146 (00000819)**




**10705147 (00000956)**



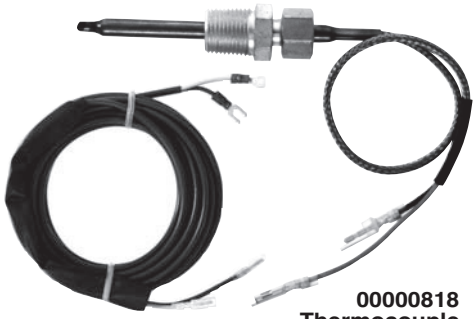

## How to Order

Specify part number. Example: **10705146 (00000819)**

*Pyrometer*
**10705146** = Dual
**10705147** = Single

*Accessories (order separately)*
**00000817** 14 ft. (4.27 m) Wire Lead Assembly.
**00000818** Thermocouple, grounded, Type K, 3/8 NPT*
**00003488** Thermocouple, ungrounded, Type K, 1/4 NPT*
*1/8 NPT, 1/4 NPT and 1/2 NPT adaptors available.

## Accessories



**00000818**
**Thermocouple**

**00000817**
**Wire Lead Assembly**

**Thermocouples** 00000818 and 00003488 can mount in the engine manifold or in 2 to 3-1/2 in. (51 to 89 mm) diameter exhaust ports. In turbo-charged engines, a thermocouple mounts between the engine and the turbo. Thermocouple 00000818 is a grounded, type K (Chromel Alumel). Thermocouple 00003488 is ungrounded type K (Chromel Alumel).

**Thermocouple Specifications**

Element "K": *type (NiCr/Ni) solid wire*.
Hot Junction: *fusion welded*.
Protecting Tube: *inconel for no carbon absorption, end closed by heliarc melt down*.
Wire Insulation: *Q-glass with stainless steel overbraid*.
Adaptors:
- *3/8 NPT (00003578) standard*
- *1/8 NPT (00003577)*
- *1/4 NPT (00003450)*
- *1/2 NPT (00003579)*

**Wire Lead Assembly** 00000817 is a 14 ft. (4.27 m) extension with mating plug connections for the 00000818 and 00003488 thermocouples. The wire is PVC covered, non-shielded, 18 AWG (1.0 mm$^2$), with heat shrinkable sleeve provided for insulating terminals after installation. Extension up to 100 ft. (30.48 m) can be made with 18 AWG (1.0 mm$^2$) or larger copper wire at the gage head.


MURPHY

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USA–ISO 9001:2000 FM 28221
UK–ISO 9001:2000 FM 29422

ISO 9001 REGISTERED

Printed in U.S.A. 0990058M

# Direct-Mount Temperature Swichgage® Instrument SDB Series


**Features**

- Easy to Read Dial
- Bi-Metallic Sensor
- Two Ranges:
  100 to 500°F (40 to 260°C)
  200 to 1000°F (100 to 500°C)
- Dials Scaled in Degrees Fahrenheit/Celsius
- CSA Listed Explosion-proof Model Available

* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

The SDB Series are direct-mounting temperature Swichgage devices. They provide an accurate direct-reading gauge with an adjustable limit switch to activate alarms and/or shutdown. A knob on front of the Swichgage instrument allows you to adjust the limit switch trip point. Pointer movement is actuated by a bi-metallic sensing element.

Models SDB500, SDB501 and SDB500EX have a temperature range of 100 to 500°F (40 to 260°C). SDB500EX enclosure is explosion-proof and CSA listed for Class I, Group C and D hazardous locations.

The SDB1000 has a temperature range of 200 to 1000°F (100 to 500°C).

## Basic Operation

SDB500, SDB501 and SDB1000: When the indicating pointer on the SDB touches the adjustable contact, a one-wire-to-ground circuit is completed to shut down the equipment and/or actuate audible or visual alarms. Proper relays or Tattle-tale® annunciators (magnetic switches) must be incorporated into the system.

SDB500EX: When the temperature rises to the preset trip point, the pointer engages an internal SPDT snap-switch to close/open circuits.

## Applications

The most common use of the SDB Series is to monitor gas compressor temperatures. Engine exhaust temperature can also be monitored to indicate overloading or lean fuel mixtures; or use the SDB to help coordinate loads on twin-engine installations.

## Specifications

**Temperature Ranges:**
SDB500, SDB500EX, and SDB501: 100 to 500°F (40 to 260°C).
SDB1000: 200 to 1000°F (100 to 500°C).

**Sensing Bulb Material and Size:** 304 stainless steel; 1/2 in. dia. x 4 in. (13 x 102 mm) insertion depth.

**Maximum Bulb Pressure:** 285 psi (1.97 MPa) [19.7 bar] at 625°F (329°C).
**NOTE:** use of a thermowell is recommended.

**Process Connection:** 1/2 NPTF. 3/4 NPT adapter available.

**Sensing Element:** High torque bi-metal element in heliarc welded stainless steel bulb.

**Contact Rating:**
SDB500, SDB501 and SDB1000: 2 A @ 30 VAC
SDB500EX: 2 A @ 120 VAC

**Limit Contact Adjustment:** By knob through full range.

**Maximum Unit Temperature:**
SDB500, SDB500EX, SDB501: 625°F(329°C).
SDB1000: 1250°F (677°C).

**Case Material:** SDB501: Die-cast aluminum.
SDB500, SDB1000, SDB500EX: Sand-cast aluminum.

**SWICHGAGE® Accuracy:** ± 3% of full scale.
**NOTE:** All models are calibrated for use with a thermowell. Specify when a thermowell is **NOT** to be used, (see How to Order on back page).

**Wire:** 18 AWG (1.0 mm2). See Dimensions for lengths, reverse side.

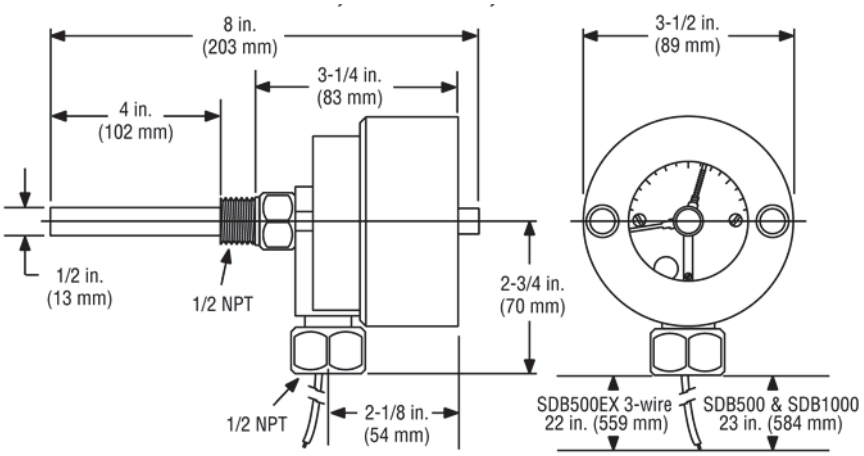
**Dial:** Black print on stainless steel. Dials are scaled in degrees Fahrenheit and Celsius.

**Shipping Weight:**
SDB501: 1 lb. 4 oz. (0.57 kg).
SDB500 and SDB1000: 2 lb. (1.0 kg).
SDB500EX: 2 lb. 5 oz. (1.05 kg).

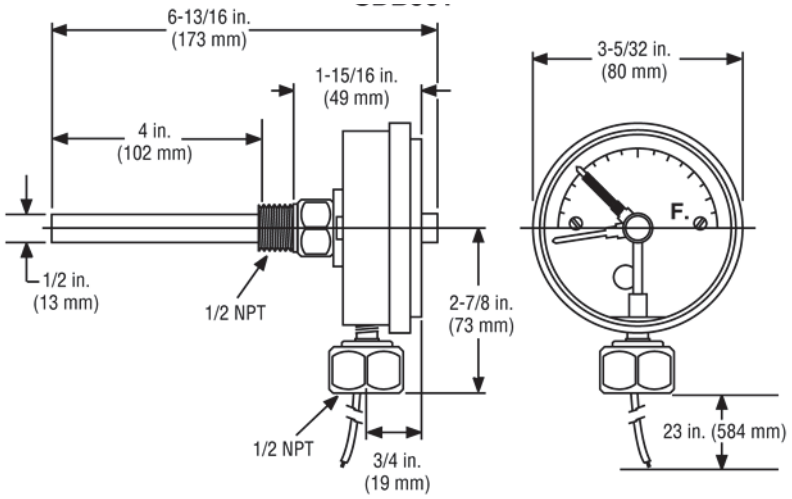
**Shipping Dimensions:**
SDB501: 8-1/4 x 4-1/4 x 4-1/2 in. (210 x 108 x 114 mm).
SDB500 and SDB1000: 8-1/4 x 4-1/4 x 4-1/2 in. (210 x 108 x 114 mm).
SDB500EX: 9 x 5-1/2 x 6 in. (229 x 140 x 152 mm).

## Dimensions

**SDB500, SDB500EX, and SDB1000**

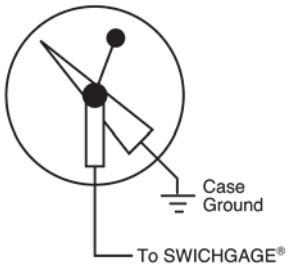



**SDB501**



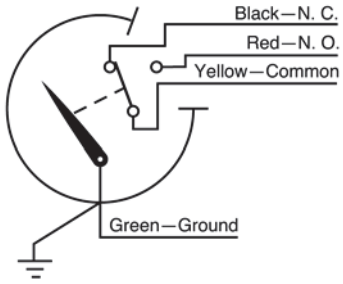

## Wiring Diagrams

**SDB500, SDB501, and SDB1000**




**Contact Rating:** 2 A @ 30 VAC

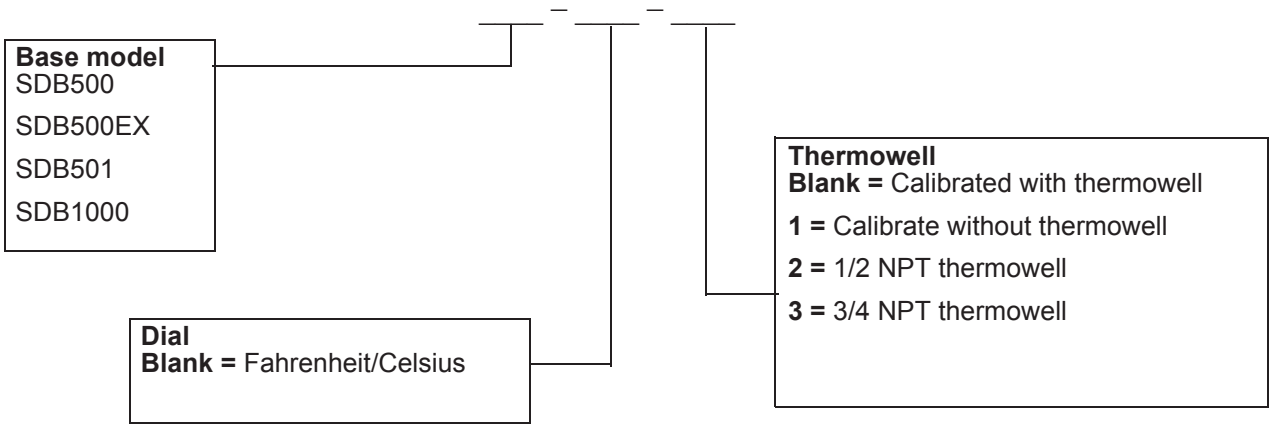
**SDB500EX**




**Contact Rating:** 2 A @ 120 VAC

## How to Order

To order the SDB use the model number diagram below. Model number example: **SDB500EX-3**.




## Optional Thermowells

Murphy offers thermowells (separable sockets) to facilitate maintenance of a temperature Swichgage instrument and to protect the temperature sensing bulb from extreme amounts of system pressure. For system pressures exceeding 285 psi (1.97 MPa) [19.7 bar] at 625°F (329°C) an optional thermowell is recommended for use with the SDB series. The thermowell protects the SDB bulb from system pressures up to 3000 psi (20.68 MPa) [206.8 bar] at 300°F (149°C). Two thermowell options are available: 1/2 NPT and 3/4 NPT. Thermowells can be ordered with the SDB Series Swichgage instrument or ordered separately. See “How to Order” on back page.

To order thermowell separately:

Specify part number **10050025** for 1/2 NPT.
Specify part number **10050311** for 3/4 NPT.

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12/02/09

# 4.5 in. (114 mm) Dial Temperature SWICHGAGE® SPL and 45TE Series


45TE Model

## Features

- Combination Indicating Gage and Critical Temperature Limit Switches
- High and Low Temperature Limit Contacts Are Visible and Adjustable
- SPDT Snap-Acting Models
- Panel and Wall Mount Versions
- Latching Control Relay Versions Available

CE * SA C US †

* Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.
† Selected configurations are third party listed. Call Murphy for details.

The 4-1/2 in. (114 mm) dial size SWICHGAGE® is a mechanical gage for temperature indication. It includes adjustable, electrical contacts that can be used for start and stop, to trip alarms and to shut down equipment.
Ranges are available from 15° to 250°F (9° to 121°C) thru 260° to 450°F (127° to 232°C).

## Basic Operation

This vapor actuated gage features a sealed capillary tube and sensing bulb. When subjected to heat, the liquid in the sensing bulb expands to vapor creating pressure against a bourdon tube mechanism. The bourdon tube translates this vapor pressure into a mechanical gage reading.
For models SPLC and SPLFC, the gage pointer acts as a pressure indicator and as one switch pole which completes a circuit when it touches the adjustable limit contacts. Contacts have self-cleaning motion to ensure electrical continuity. A toggle switch is provided on SPLC models to override the low contact for equipment start-up.
Models 45TE and 45TEF have internal snap-acting SPDT switches.

## Applications

Typical applications include:

- Gas Compressors
- Engine Coolant Temperature
- Process Temperature
- Heaters and Coolers
- Water Pump Temperature

## Specifications

**Dial:** White on black, dual scale, °F and °C standard, 4-1/2 in. (114 mm) diameter.
**Case:** Die cast aluminum, surface or panel mount.
**Capillary:** PVC armored copper tube, 5 ft. long (1.5 m.) standard–see options next page.
**Sensing Bulb:** Copper bulb: 1/2 in. (13 mm) OD; Length: 7 in. (178 mm).
Minimum bulb insertion– see corresponding chart, on page 2.
Pressure Rating: 600 psi (4.1 MPa) [41 bar]. Connection: 1/2 NPT compression fitting.
**Overrange:** Do not exceed 10% above full range.
**Limit Contacts (SPLC and SPLFC):** 1-SPDT, Center off; pilot-duty; 2 A @ 30 V; 1 A @ 125 VAC. Contacts are gold plated silver.
**Snap-Acting Switches (45TE and 45TEF):** 2-SPDT; 2 A @ 250 VAC.
**Dry Relay Contact ("BP" Models):** 10 A @ 28 VDC or 10 A @ 120 VAC.
**Wire Connections:** Surface mount models: 1/2 NPT conduit and terminal block.
Panel mount models: Wire leads, 18 AWG (1.0 mm2) x 9 in. (229 mm) long.
"OS" models: 1/2 NPT conduit and wire leads, 18 AWG (1.0 mm2) x 9 in. (229 mm) long.
**Item Weight:** 8 lb. (3.6 kg) approximately. Explosion-proof models: 22 lb. (10 kg) approx.
**Item Dimensions:** 16 x 11 x 5-1/2 in. (406 x 279 x 140 mm).
Explosion-proof models: 12 x 12 x 9 in. (305 x 305 x 229 mm).

## Basic Models

**SPLC Series SWICHGAGE®**
Surface mount version of the SWICHGAGE®. For these models the gage pointer makes with two adjustable contacts to complete a pilot duty circuit.

**SPLFC Series SWICHGAGE®**
Panel-mounting (round case) version of the SPLC.

**SPLBP Latching Control Relay SWICHGAGE®**
This version of the SPLC Series is designed to start and to stop electric motor driven equipment. The pilot duty contacts of the SPLBP are connected to a latching control relay for automatic ON/ OFF control, either directly or through a motor starter.

**45TE Series Snap-Acting SWICHGAGE®**
Surface mount version of the SWICHGAGE®. These models offer internal snap-acting SPDT switches, instead of the single pole contacts.

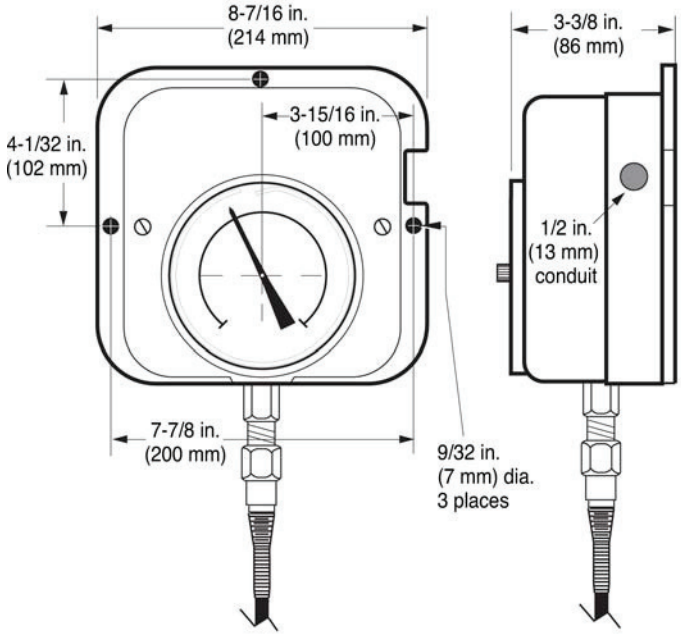
**45TEF Series SWICHGAGE®**
This is the panel mounting (round case) version of the 45TE series.

**45TEBP Snap-Acting and Latching Control Relay SWICHGAGE®**
Same as 45TE–includes an internal latching control relay for automatic ON/OFF control either directly or through a motor starter.

Murphy offers square case configurations altered to fit round panel openings, see "Dimensions", next page.

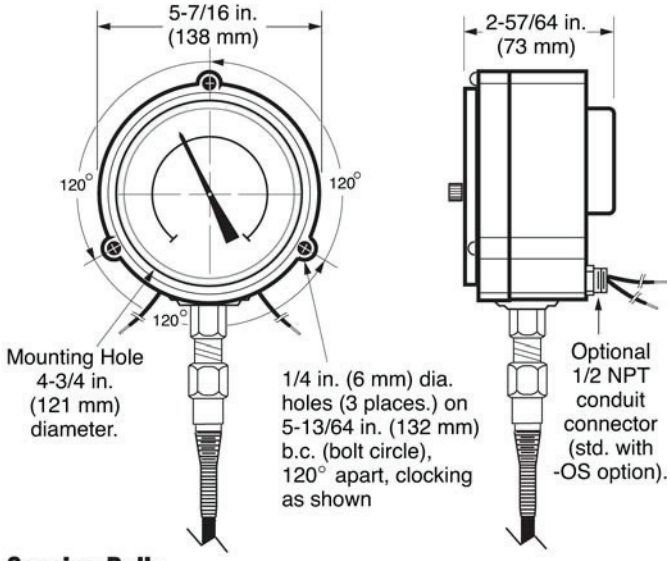
## Dimensions

### Surface Mount Models

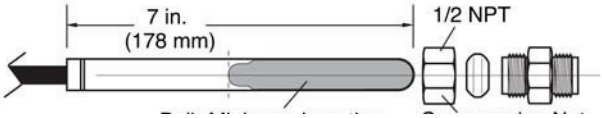



* **SPLCE, SPLBPE, 45TEE and 45TEBPE** versions feature square case, but altered to fit standard round panel mounting–not pictured.

### Panel Mount Models




### Sensing Bulb

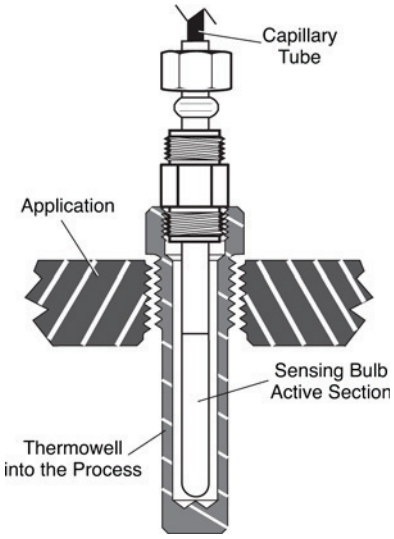



## Ranges and Accuracy — Sensing Bulb Insertion

| Temperature Ranges Available (dual scale dials) | | Accuracy (SPL and 45 Series Models) | | | Minimum Sensing Bulb |
|---|---|---|---|---|---|
| Fahrenheit | Celsius | Lower 1/4 | Middle 1/2 | Upper 1/4 | Insertion into Process |
| 15° to 250°F | 9° to 121°C | ±8°F/±4°C | ±2°F/±1°C | ±2°F/±1°C | 5 in. (127 mm) |
| 130° to 350°F | 60° to 180°C | ±8°F/±4°C | ±2°F/±1°C | ±3°F/±1.5°C | 2-1/2 in. (64 mm) |
| 260° to 450°F | 127° to 232°C | ±8°F/±4°C | ±2°F/±1°C | ±3°F/±1.5°C | 2-1/2 in. (64 mm) |

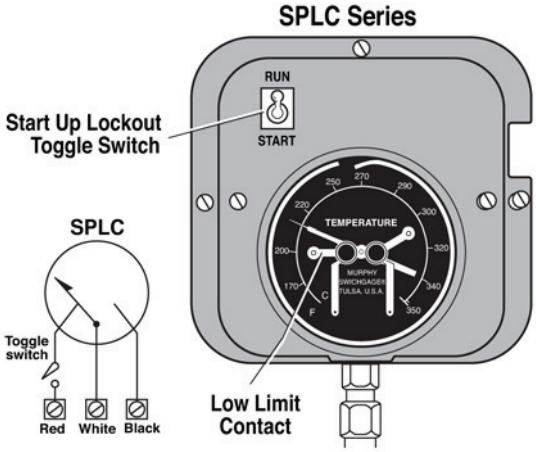
## Using a Thermowell

Installing a thermowell is recommended for high pressure applications or corrosive environments. It also allows sensing bulbs to be changed or adjusted without opening the connection to process. Murphy offer thermowells for a variety of applications. For details see Murphy bulletin T-9003B.




## Start-Up Lockout

The SPLC SWICHGAGE® low limit contact can be bypassed for equipment start up. A toggle switch is provided for this purpose. The toggle switch must be manually reset when temperature rises above the low limit.



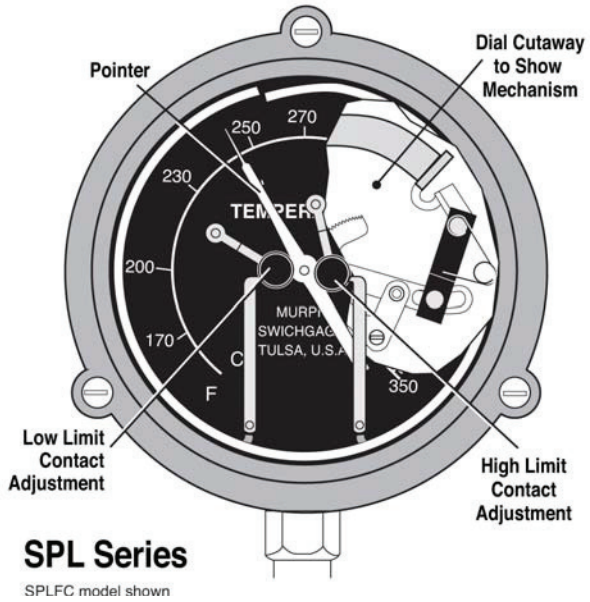

**Warranty** - A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to http://www.fwmurphy.com/warranty

## How the SPL Works

SPLC and SPLFC SWICHGAGE® temperature indicator gages include 2 pilot duty, pointer-type limit contacts (one for high and one for low) that can be used for alarm and/or shutdown. The SPLC and SPLFC models will complete a circuit when the gage pointer and either limit contact meet. This provides an electrical signal to alert the operator of critical temperature conditions or, when required, to shut-down the equipment.

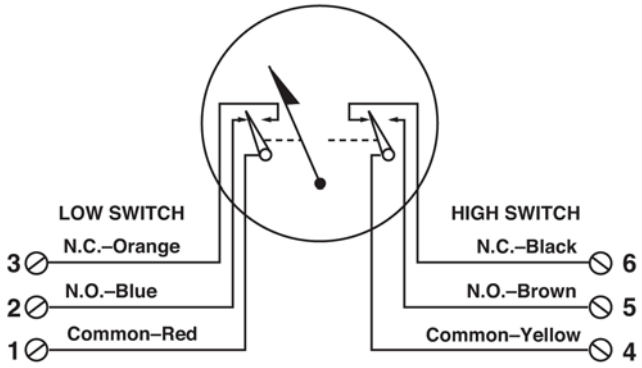
Both limit contacts (high and low) are field adjustable by simply turning the fingertip type knob to the desired point on the scale dial.

The graphic below shows details of a typical SPLFC SWICHGAGE® model.



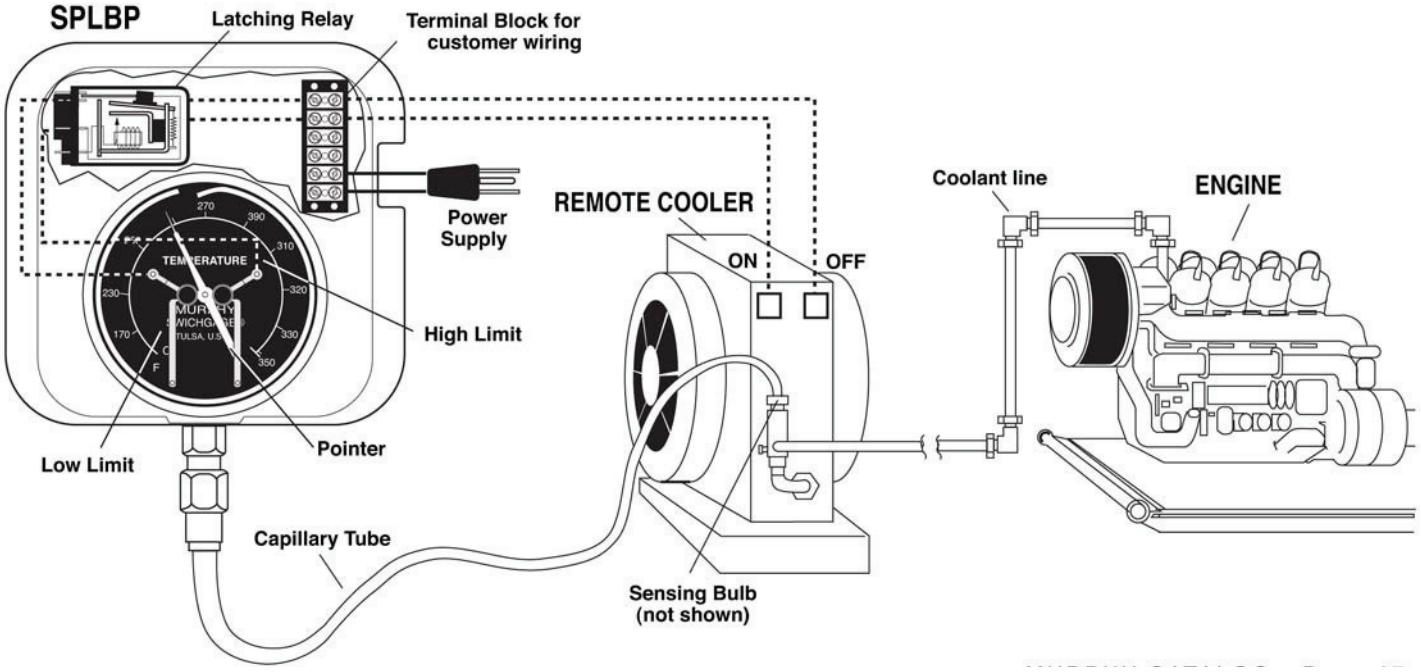

## How the 45TE Works

The 45TE series SWICHGAGE® incorporates 2 SPDT snap-switches instead of the pointer-type contacts of the SPL. Unlike the SPL that completes an electrical circuit as soon as the pointer touches the contact, the 45TE trip point indicators will stop the pointer movement slightly before the switches operate. As temperature continues to increase (reaching high set point) or to decrease (reaching low set point), the electrical circuit is then made. It provides the ability to set the trip point exactly with the indicator needle—no guessing or equipment calibration is needed as on blind switches. The 45TE trip points (high and low) can be easily set using its stacked knob adjustment. See the schematic below for details.




## (BP) Latch Relay Contact Models

Primarily designed to maintain a specific temperature range by turning ON or OFF heaters or coolers having 125 VAC circuitry, the SPLBP and 45TEBP SWICHGAGE® models are applicable to a variety of situations where temperatures are variable and controlling factors. As the pointer touches a preset high or low limit contact/snap-switch, the magnetic latching relay sets or resets to latch a heater or cooler ON or OFF. The relay unlatches, (resets) when the opposite contact operates. Pictured below is a typical application. **For applications with higher voltages, a Murphy TR assembly can be used in conjunction with any 4-1/2 in. (114 mm) dial SWICHGAGE®.**



## How to Order

Specify model number. **NOTE:** No designator is required for **Standard** configurations.
Also, list options in alphabetical order (A to Z). Place a dash (–) between each option. See example below.

**SPLBP – 4 – 350 G 10 – EX**

*Base Model*

| | |
|---|---|
| SPLC | 45TE |
| SPLCE | 45TEE |
| SPLFC | 45TEF |
| SPLBP* | 45TEBP* |
| SPLBPE* | 45TEBPE* |

* This version not covered by CE mark.

*Latching Control Relay Voltage (applies to "BP" models only)*

**Blank =** 120 VAC
**2 =** 12 VDC
**4 =** 24 VDC

*Range*

**250 =** 15 to 250°F
**350 =** 130 to 350°F
**450 =** 260 to 450°F

*Armor / Capillary / Bulb*

**P =** PVC / Copper / Copper
**S =** Stainless steel / Stainless steel / Stainless steel

*Capillary Length*

| *Specify in feet:* | *Specify in metres:* |
|---|---|
| **05 =** 5 feet | **1.5M =** 1-1/2 metres |
| **10 =** 10 feet | **2M =** 2 metres |
| **Etc.** | **Etc.** |

*5 ft. increments available to 30 ft., thereafter 10 ft. increments only. Some ranges are not available over 50 ft.*

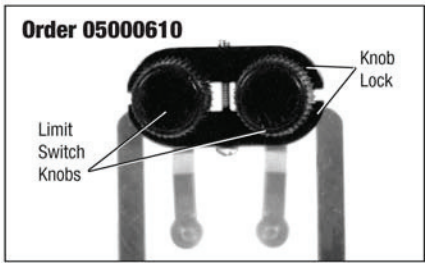
*Options*

**NOTE:** Verify option availability. Not all options can be provided for every model.

**BC =** Capillary tubing exits from back of case
**ES =** Environmentally sealed for isolation from the elements
**EX =** Explosion-proof; SWICHGAGE® enclosed within explosion proof case; Class I, Division 1, Groups C & D
**EL =** (EXLC) Explosion-proof less case; internal gage mechanism only–without case
**LC =** Less case; SWICHGAGE® mechanism and hardware connections–without case
**OS =** Liquid filled case for resistance against corrosion, environment, vibration and electrical arc
**TA =** (TCA) Tickler contact; includes 1 auxiliary contact (tickler) and 2 limit contacts (all-face-adjustable-SPL series)

### Tamperproof Contact Accessory

**Order 05000610**



# Temperature Scanner/Pyrometer SWICHGAGE® – Model TDX6

Approved*

Approved†

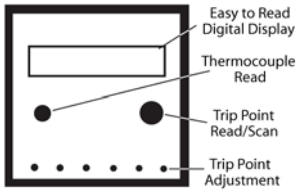

## Features

- Scans 6 Channels
- Rated for Class I, Division 2, Group D Hazardous Areas
- Start-up Time Delay
- Easy to Read Digital Display
- Accepts Type “J” or “K” Thermocouples Grounded‡ or Ungrounded
- Field Adjustable Trip Points
- LCD Display in Either °F or °C (Specify)
- One Thermocouple Maybe Selected for Continuous Display
- CD Ignition, 24 VDC, or 120 VAC Powered
- No Special Training or Programming Required
- Scans All 6 Sensors in 30 Seconds

* When used with approved ignition. Contact Murphy for details.
† When used with power requirements described below.
‡ Using grounded thermocouples introduces the risk of odd currents or voltages being imposed on the thermocouple signal which can affect the accuracy of the reading. This is an inherent problem of grounded thermocouples, the reason why we prefer ungrounded thermocouples.

## Description

The TDX6 is an advanced design 6-point temperature scanner and pyrometer. It continually scans up to six thermocouples and sequentially displays the thermocouple number and its reading. Each sensor input has a field settable trip point for alarm, shutdown or control. A read/scan selector allows the operator to set and view each trip point. With the selector in the scan mode, a “thermocouple read” push button provides a means to manually toggle through the six channels and to lock in on a specific channel. Normal scanning will resume approximately three seconds after releasing the push button. All trip points are continually armed and active during the scanning process.




Type “J” or “K”, grounded‡ or ungrounded thermocouples are accommodated. Other types are available upon request.

The TDX6 can interface with other Murphy SELECTRONIC® TATTLETALE® annunciators and Micro-controllers. It is rated for Class I, Division 2, Group D, hazardous areas* and is available for operation from CD ignition, 120 VAC, or 24 VDC.

## Applications

- Gas Compressor Suction/Discharge Temp.
- Engine/Compressor Jacket Water Temperature
- Process Temperatures
- Generators
- Pumps
- Engine Exhaust Temperature

## Specifications

**Power Requirements (Operating Voltages):** 120 VAC or 80-250 VDC, CD ignition or 24 VDC.

**Outputs:**

Models TDX6-A and TDX6-C: Six (6) isolated Silicon Controlled Rectifier (S.C.R.) outputs; 0.5 A @ 250 VDC; switches on (applies ground) above trip point and switches off (removes ground) when power is switched off.

Models TDX6-B and TDX6-D: Six (6) isolated Field-Effect Transistor (F.E.T.) outputs; 0.1 A @ 250 VDC; switches on (applies ground) above trip point and switches off (removes ground) below trip point.

**Operating Temperature:** -4 to 158°F (-20 to 70°C).

**Storage Temperature:** -40 to 300°F (-40 to 150°C).

**Case:** ABS 1/4 DIN (90 x 90 mm).

**Scanning Speed:** Complete scan in 30 seconds.

**Reset Differential:** F.E.T. models: Decreases 3 Degrees (°F or °C). S.C.R. models: Turn input power off to reset.

**Display Update Time:** Updates temperature every 0.3 seconds.

**Start-up Time Delay:** Unit is locked out for 10 seconds after ignition voltage is sensed.

**Ambient Cold Junction Compensation Range:** 2°F from 32°F to 122°F (1°C from 0°C to 50°C).

**Measurement Range:** Monitor Range 0-1999°F or °C (specify °F or °C in part number).

**Accuracy:**

With J-type thermocouple: from 50-150°F (10-66°C) +3°F(+2°C), from 150-1200°F (66-649°C) ±1.0% of reading.

With K-type thermocouple: from 400-2000°F (204-1076°C) ±1.0% of reading.

**Trip Point Accuracy:** ±3°F (±2°C) of reading.

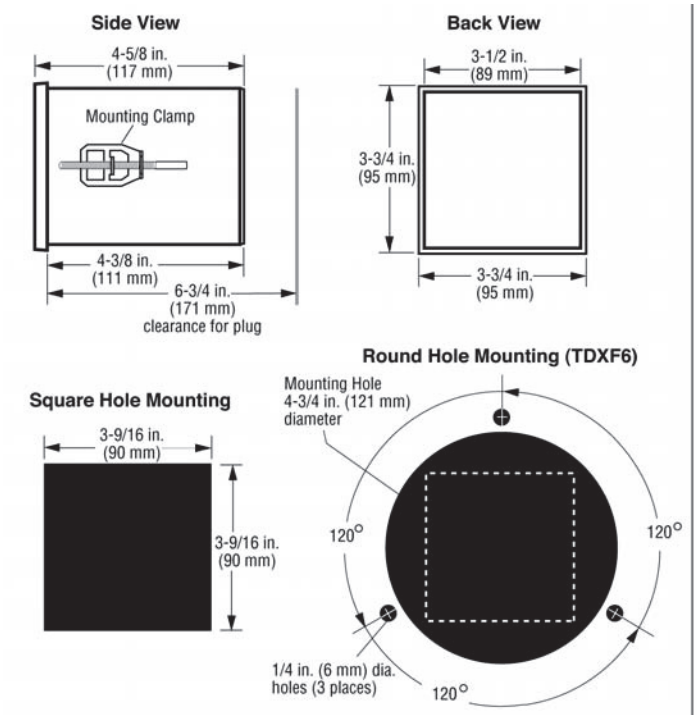
**Trip Point Adjustment Range:** 0-1999 Degrees.

**Open Thermocouple Input:** A number 1 appears in the display to the right of the channel number and the trip point operates.

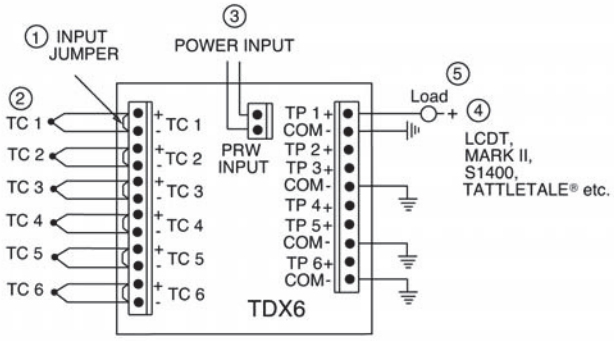
**Shipping Weight:** 2 lb. (0.91 kg).

**Shipping Dimensions:** 5-1/2 x 9 x 6 in. (140 x 229 x 152 mm).

## Dimensions




## Typical Wiring Diagram




**NOTES:**

① Remove input jumper when the thermocouple is connected to input.

② Thermocouple Input

③ Power input 120 VAC, 80-250 VDC, CD ignition or 24 VDC, positive or negative ground.

④ Interfaced components must meet area classification requirements.

⑤ When using the TDX6 with inductive loads, we recommend installing a suppression diode across all coils.

## TDX6 Interface Capabilities

| Model | Power Source | Rating |
|---|---|---|
| LCDT | CD Ign., 120 VAC, 12/24 VDC | Cl.I, Div.1, Gr.D, Haz. areas* |
| S1501 | 120 VAC or 12/24 VDC | Cl.I, Div.1, Gr.D, Haz. areas* |
| MARK II | CD Ignition, pos. or neg. grnd | Cl.I, Div.2, Gr.D, Haz. areas† |
| TATTLETALE® | CD Ign., 120 VAC, 12/24 VDC | Non-Hazardous areas |

* **Note:** An isolation barrier is needed between the TDX6 and an Annunciator rated for Class I, Division 1, Group D, Hazardous Areas.

† **Note:** When used with approved ignition. Contact Murphy for details.

**PLC's, various non-Murphy annunciators–**contact factory.

## How to Order

To order the TDX6 use the part number designation diagram below.

**TDX6 – A – F – J**

**Models**
**TDX6 =** Square hole mounting
**TDXF6 =** Round hole mounting

**Thermocouple Type**
**J =** Type J
**K =** Type K

**Display**
**F =** Fahrenheit
**C =** Celsius

**Power Supply/Output**
**A =** CD ignition, 80-250 VDC Positive or Negative Ground or 120 VAC 50-60 Hz Inputs—S.C.R. Outputs.†
**B =** CD ignition, 80-250 VDC Positive or Negative Ground or 120 VAC 50-60 Hz Inputs—F.E.T. Pulsed Outputs.††
**C =** 24 VDC Inputs—S.C.R. Outputs.†
**D =** 24 VDC Inputs—F.E.T. Pulsed Outputs.††

†For use with electromechanical **TATTLETALE®** annunciators.
††For use with **SELECTRONIC®** or similar **solid-state annunciators.**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06/09

TDXM-00064B
Revised 06-06
Catalog Section 10

# Temperature Scanner/Pyrometer


## TDXM Model

- Scans Up To 24 Channels
- Three (3) Adjustable Trip Points Per Channel
- Accepts Any Combination of "J" or "K" Type Grounded or Ungrounded Thermocouples
- 2 Separate Groups with Deviation Trip Functions Selectable
- Powered By 10 to 32 VDC Systems
- RS485 Serial Communications Port
- Uses MConfig™ Configuration and Monitoring Software
- CSA Certified for Use in Class I, Division 2, Groups "C & D" Hazardous Locations

## Description

The innovative new TDXM now gives you a unique configurable temperature scanner/pyrometer with a built-in power supply. A new design features a 7-character, 7-segment Liquid Crystal Display window with 1/2 inch (13 mm), easy-to-read characters. Also located on the faceplate are membrane keys for easy configuring.

Highly reliable and versatile, the TDXM accepts up to 24 type "J" or "K" grounded or ungrounded* thermocouples. Each channel has three (3) adjustable setpoints SP1, SP2 and SP3. The SP1, SP2 and SP3 Setpoints correspond to the SP1, SP2 and SP3 outputs. Additionally it has the selectable feature to monitor and alarm or shutdown on deviation from an average from up to two groups of temperatures (GRP/DEV; deviation from average). One group could be exhaust temperatures and another group could be bearing temperatures.

The TDXM is capable of communicating with controllers, PLC's, computers or SCADA (Supervisory Control & Data Acquisition) systems by a built-in RS485 serial communications port.

The TDXM-DC is available for 10 - 32 VDC systems.

## User Interface (Faceplate)

The User Interface includes a numeric LCD display and a 5-button membrane keypad for readout and channel configuration. Thermocouple types can be selected and setpoints entered through a series of setup menus, see "Setup Menus" section.

## Thermocouple Types

Each of the 24 channels on the TDXM can be configured as either "J" or "K" type thermocouples and temperature units can be selected as °F or °C readout for each channel. Unused channels can be set to "Ignore" and will not be seen in the display and will not cause fault trips.

## Control Options

Each TDXM model features three outputs: 2 Field Effect Transistor (FET) outputs and 1 Form-C Relay output. Each channel has 3 setpoints, one for each of the outputs. This allows for greater system flexibility by grouping sets of channels through one output.

## Setpoint History

The TDXM stores the last setpoint trip for each output in non-volatile memory. For instance, if SP1of channel 1 was the last SP1 tripped, the LCD display will read: SP1 1 when the Setpoint History is accessed for SP1.

## Sensor Inputs and Terminals

The TDXM accepts up to 24, either "J" or "K" type grounded or ungrounded* thermocouples using 24 pairs of screw type connections. Each pair has a jumper from the factory. Any tripped setpoint is detected within 2 seconds after the set point is exceeded.

## RS485 Serial Port

The RS485 serial port (MODBUS®† RTU slave) on the back of the module is provided for communicating with micro-controllers, PC's, PLC's and SCADA systems (see "Typical Wiring Diagrams"). It is recommended that a termination resistor (customer supplied) be used when the TDXM is the last device connected in a daisy-chain configuration. The Baud rate, number of stop bits, and slave node number can be set using the keypad. Communication is half-duplex. Modbus® RTU function codes 3 and 6 are supported.

## Specifications

**Power Input (Operating Voltages):** 10- 32VDC, 750 mW max.

**Sensor Inputs:** Up to 24 type "J" or "K" grounded or ungrounded* thermocouples.

**Outputs:** Two (2) Outputs 0.5 A, 350 VDC, FET-sink to ground to trip.
One (1) Form "C" Solid State Relay Output 0.125 A, 350 VDC/240 VAC.
***NOTE:*** *The form "C" relay output is de-energized for a trip condition. The NC terminal is closed and the NO terminal is open for trip.*

**Communications:** RS485 Serial Port, MODBUS® RTU slave.

**Operating, Storage, and Display Temperature:** -40 to 85°C (-40 to 185F).

**Sensor Scan Rate:** Scans all channels in 2 seconds.

**Range:** Type K: 0 - 1999°F (0 - 1093°C); Type J: 0 - 1538°F (0 - 837°C).

**Display Type:** Custom 7-segment, 7-character, back-lit type with temperature units indication and set-point trip indication.

**Accuracy:** Cold junction: Better than ±0.5°C (1.0°F). Type "J" or "K": ±1°C (2°F); 38 - 1093°C (100 - 1999°F).

Cold Junction Compensation: -40 to 85°C (-40 to 185F).

**Open Thermocouple Detection:** Drives channel reading high.

**We recommend the use of ungrounded thermocouples. Errors in readings with grounded thermocouples can be the result of differences in grounding between different devices.*

† *MODBUS® is a registered trademark of AEG Schneider Automation Inc.*

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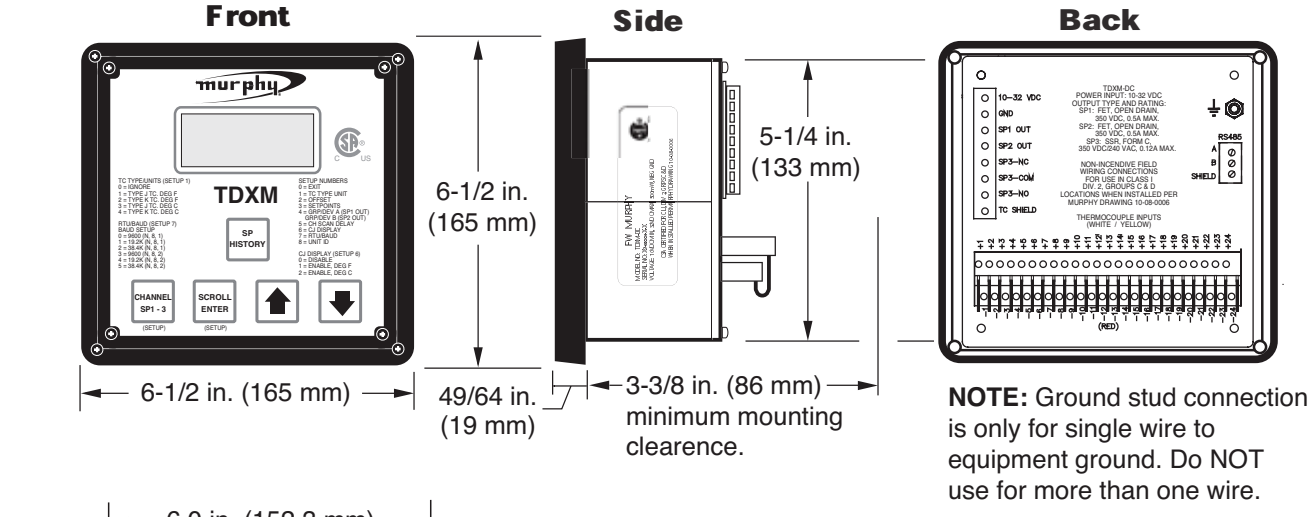
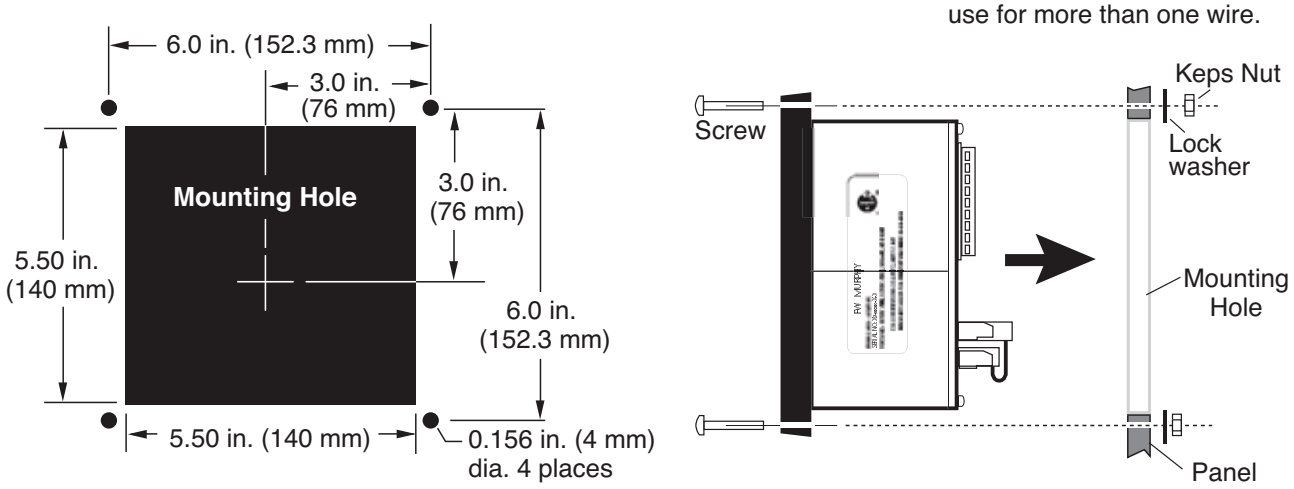
## TDXM Module Dimensions




**NOTE:** Ground stud connection is only for single wire to equipment ground. Do NOT use for more than one wire.




**For Outdoor Use, the TDXM should be mounted in a weatherproof enclosure**

## How to Order Your TDXM

*Specify the following part number:*

### Head/Module

**TDXM-DC**: 24-channel model, 10-32 VDC powered.

**TDXM-DC W/SP3 Latch**: Same as TDXM-DC but with SP3 latch feature.

### Configuration Software

**MConfig**: TDXM configuration software available.

### Replacement Parts

**Plug, kit, TDXM**: Terminal Plug replacement kit-P/N 10-00-7848.

### Shipping Weights and Dimensions

**Shipping Weight (all Models):** 3 lb. (1.36 kg) approximately.

**Shipping Dimensions (all Models):** 5-1/2 x 9 x 9-1/2 in. (140 x 229 x 241 mm) approximately.

### Warranty

A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm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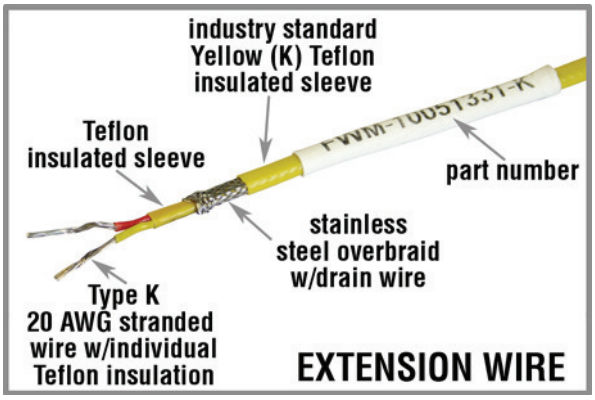
# Thermocouple, 1/4″ Diameter Stainless Steel Tube Type

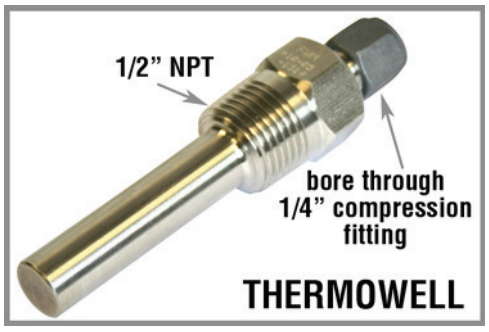
**Features**

- ¼″ diameter 316 stainless steel tubing sheath
- Type K, 6" and 10" probes
- Can be used with 2", 4.5" and 7.5" insertion thermowells
- Can be bent anywhere along its length to a 90° angle
- Tip sensitive to minimize temperature influence from surrounding environment

Due to the increase in controller and telemetry applications, this thermocouple product line has been added to the line up of Murphy temperature monitoring end devices. They are designed to fit as many applications as possible with the fewest possible parts and the fewest possible installation caused faults.




Most of the thermocouple failures occur in how the thermocouples extension wire is installed and connected. This new line incorporates Type K, 20 AWG stranded extension wire encased in a rugged cable to meet demanding environments The extension wire lengths are available in 5′, 15′, 30′, 50′, and 100′ lengths. This will enable a run from the point of measurement to the nearest conduit entry or to be installed in a cable tray. The industry standard yellow Teflon allows easy identification of K type thermocouple wires so they can be separated from high voltage wires following good installation practices.




Thermowells are available in 2″, 4-1/2″, or 7-1/2″ lengths for insertion depth and have a ½″ NPT process connection. They are supplied with a standard stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth. In low pressure applications the thermocouple can be inserted directly into the process through a standard ¼″ SS tubing compression fitting.

## Product Overview

The thermocouples are encased in a ¼″ diameter 316 stainless steel tubing sheath with stainless steel Bell Spring for strain relief. The initial offerings are K type thermocouples with 6″ and 10” long ¼″ diameter probes. The thermocouples are shipped straight, but can be bent with standard tubing benders anywhere along its length to a 90° angle to minimize clearance required and help prevent damage due to personnel working on the unit. The thermocouple is tip sensitive to minimize ambient temperature influence and should be inserted between 25% and 75% of the piping inside diameter or enough to minimize any skin temperature affect on the tip of the probe when installed in vessels.

## Additional features

- Stainless steel transition sealing gland with a stainless steel Bell Spring for strain relief.
- Standard bore through stainless steel compression fitting for securing the thermocouple in the thermowell at the appropriate depth.
- Can be inserted directly into a low-pressure application process through a standard ¼″ SS bore through tubing compression fitting.
- Enables a run from the point of measurement to the nearest conduit entry, junction box, or all the way to the panel housing the readout and monitoring instrument. Can also be installed in a cable tray.
- The thermowelll assembly comes with a stainless steel bore through compression fitting and ferrel saving installation time and money.

## How to Order

| Item Number | Product Name | Description |
|---|---|---|
| 10051331 | Thermocouple, Type K, 1/4Dia. Tube x 6″L | w/5′ Thermocouple Extension Wire |
| 10051325 | Thermocouple, Type K, 1/4Dia. Tube x 6″L | w/15′ Thermocouple Extension Wire |
| 10051326 | Thermocouple, Type K, 1/4Dia. Tube x 6″L | w/30′ Thermocouple Extension Wire |
| 10051327 | Thermocouple, Type K, 1/4Dia. Tube x 6″L | w/50′ Thermocouple Extension Wire |
| 10051328 | Thermocouple, Type K, 1/4Dia. Tube x 6″L | w/100′ Thermocouple Extension Wire |
| 10051332 | Thermocouple, Type K, 1/4Dia. Tube x 10″L | w/5′ Thermocouple Extension Wire |
| 10051323 | Thermocouple, Type K, 1/4Dia. Tube x 10″L | w/15′ Thermocouple Extension Wire |
| 10051317 | Thermocouple, Type K, 1/4Dia. Tube x 10″L | w/30′ Thermocouple Extension Wire |
| 10051322 | Thermocouple, Type K, 1/4Dia. Tube x 10″L | w/50′ Thermocouple Extension Wire |
| 10051321 | Thermocouple, Type K, 1/4Dia. Tube x 10″L | w/100′ Thermocouple Extension Wire |
| 10707436 | Thermowell, ½″NPT, ¼″ T, 2.0″L | Assembly 304SS |
| 10707437 | Thermowell, ½″NPT, ¼″ T, 4.5″L | Assembly 304SS |
| 10707438 | Thermowell, ½″NPT, ¼″ T, 7.5″L | Assembly 304SS |

TSB-9137B
Revised 04-06
Catalog Section 10
(00-02-0051)

# Direct Mount Temperature Switch


## Model TSB

- Limit Switch for Critical Temperature
- Operate Alarms or Shutdown Equipment
- SPDT Snap-Acting Switch
- Fits Most Engine Applications

## Description

The TSB switch is a direct mount switch for temperature sensing. It has one limit contact that can be used to activate an alarm, actuate indicator lights or shut down equipment.

The construction of this instrument is the same as our time-proven Swichgage®. A precision machined brass mounting plate and port captures a high quality stamped beryllium copper diaphragm. The single-pole, double-throw (SPDT) snap switch is operated directly from the diaphragm, for quick acting and positive switching. Trip point is factory preset according to your specifications.

Housing is weather sealed to prevent entry of moisture, dust, etc. A glass-filled nylon terminal block with quick-screw terminal connections gives the TSB switch a real advantage in industrial engine applications. The TSB is ideal when reading is not desired, but temperature is critical to operational efficiency.

Intended for use in general purpose non-classified areas.

## Applications

- Engine Coolant
- Irrigation Systems
- Compressors
- Oil Field Systems
- Engine Lubrication
- Construction equipment
- Mobile Equipment
- Marine Engines
- Generators
- Electric Motors

## Features

- Fits most engine applications
- SPDT snap-switch
- Activates indicator lights, alarms or shut down equipment
- Time-proven Swichgage construction
- Easy wiring terminal block
- Steel housing specially coated to resist corrosion
- Trip point is factory preset to your specifications (minimum quantities apply)

## Specifications

**Housing:** Plated steel.

**Connections:** Popular NPT and metric (specify).

**Diaphragm:** Formed beryllium copper (heat treated).

**Sensing Bulb:** Copper.

**Terminal Block:** Three # 4-40 screws.

**Accuracy:** See chart on page 2.

**Contact Rating:** SPDT 3 A @ 30 VDC inductive.

**Maximum Temperature:** 325°F (163°C).

**Factory Trip Point Setting:** 210°F (99°C) Rising.

**Contact:** Operates on rising temperature only.

**Shipping Weight:** 10 oz (0.31 kg).

**Shipping Dimensions:** 4-3/4 x 4-3/4 x 2-5/8 in. (121 x 121 x 67 mm).

**NOTE:** No customer replacement parts.

**Products covered by this bulletin comply with EMC Council directive 89/336/EEC regarding electromagnetic compatibility except as noted.

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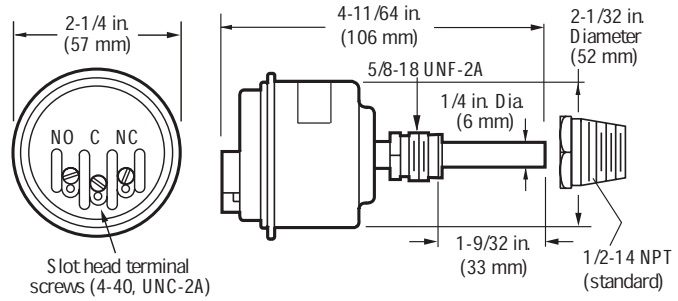
## Dimensions




## How to Order

To order the TSB model use the diagram below.

**TSB – R230 – 3/8**

***Standard Switch Trip Point***

Specify trip point value. Example: TSB-**R200**

| Standard Switch Trip Point Values (rising)* | Accuracy |
|---|---|
| **R165** = 165°F (74°C) | |
| **R180** = 180°F (82°C) | 165– 210°F ±5°F (±2.7°C) |
| **R200** = 200°F (93°C) | Water/glycol 10% used for |
| **R205** = 205°F (96°C) | setpoint |
| **R210** = 210°F (99°C) | |
| **R220** = 220°F (104°C) | |
| **R225** = 225°F (107°C) | 215– 230°F ±7°F (±3.8°C) |
| **R230** = 230°F (110°C) | 240– 250°F ±10°F (±6.5°C) |
| **R240** = 240°F (116°C) | Heat transfer fluid used for |
| **R250** = 250°F (121°C) | setpoint (276 viscosity @ 100°F) |

* Non standard trip points require a minimum quantity order. Trip point must be in 5°F increments between 165– 250°F (74–121°C).

| | |
|---|---|
| ***Switch Reset Differential*** | ±15°F (±8.3°C) |
| ***Switch Repeatability*** | ±3°F (1.7°C) |

***Connection Size***

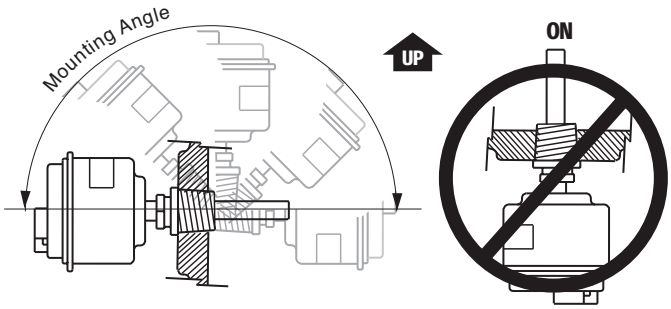
| | | |
|---|---|---|
| **Blank** = | 1/2-14 NPT** | 10-05-0131** |
| **1/4** = | 1/4-18 NPT | 10-05-0167 |
| **3/8** = | 3/8-18 NPT | 10-05-0069 |
| **5/8** = | 5/8-18 UNF | 10-05-0068 |
| **3/4** = | 3/4-14 NPT | 10-05-0105 |
| **7/8** = | 7/8-9 UNC | 10-05-0093 |
| **3/8B** = | 3/8-19 BSPT | 10-05-0284 |
| **1/2B** = | 1/2 BSPT | 10-05-0330 |
| **M14** = | 14 mm x 1.5 † | 10-05-0104 † |
| **M16** = | 16 mm x 1.5 † | 10-05-0514 † |
| **M18** = | 18 mm x 1.5 † | 10-05-0399 † |
| **M20** = | 20 mm x 1.5 † | 10-05-0670 † |
| **M22** = | 22 mm x 1.5 † | 10-05-0606 † |
| **M24** = | 24 mm x 1.5 † | 10-05-0907 † |

** Standard connection.
† Includes copper seal.

# Installation Instructions

## Mounting

**1.** The TSB can be mounted in horizontal or vertical angles (**do not mount the switch facing down**).




**2.** Install the TSB switch in the engine water jacket location recommended by the engine manufacturer.

**3.** Install the appropriate adapter nut into the engine water jacket. Use thread sealant such as Teflon® tape as necessary.

**4.** Insert the sensing bulb through the adapter nut. The sensing bulb must be fully immersed in coolant/liquid flow so liquid flows across the sensing bulb.

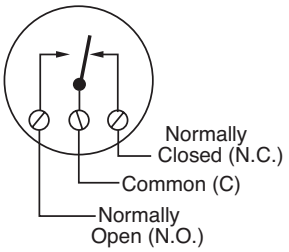
**5.** Tighten the 5/8-18 UNF-2A compression nut to complete a liquid tight seal.

## Wiring

**CAUTION:** DISCONNECT Electrical Power before wiring.

**1.** See wiring schematic below. Switch contacts are shown with no temperature applied to the TSB switch.

**2.** A spade (forked) terminal is recommended for all TSB switch connections.




**3.** Complete the wiring operation making sure the voltage and current requirements are within the TSB switch electrical rating.

Teflon is a trademark of Dupont.

## Warranty

A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm

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