

# 2008

CT-LC

## LOVE CONTROLS

LOW COST SOLUTIONS FOR TEMPERATURE & HUMIDITY

temperature controllers

panel meters

humidity

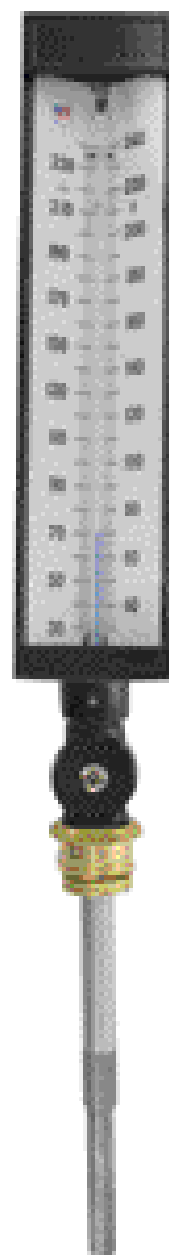
temperature sensors

handhelds

transmitters/alarms

data acquisition/recorders

thermometers



[www.love-controls.com](http://www.love-controls.com)

# HISTORY of LOVE CONTROLS

Since starting in a small warehouse in Wheeling, IL in 1970, Love Controls has been a leading innovative force in manufacturing temperature controllers. Starting with the Model 69, 49 and 449, Love Controls has consistently looked to push the edge of PID technology. In 1985, Love Controls launched the 300 Series, the company's first microprocessor-based controller using surface mount components. Following the success of the 300 Series, the 1600 Series, which was the first of Love Control's modern day controllers, launched the company into the future in 1991. After years of expanding the product offering with different size controllers from 1/16 DIN to 1/4 DIN, Love Controls launched the feature enhanced 16A and 2600 Series of controllers. As the demand for smaller controllers grew, the innovative engineers at Love developed in 1998 the world's first 1/32 DIN controller with two full-size displays for process and set point values. Two years later, they pushed the envelope further with the world's only dual zone 1/32 DIN controller. In 2006, Love Controls released a new low cost line of controllers that are the most competitively priced on the market. In 2007, the TSF Series FM approved Limit Control became the latest in the line of head turning temperature products from Love Controls.

Besides leading the way in innovation, Love Controls maintains a high standard of quality. Love Controls was acquired by Dwyer Instruments, Inc. in 1989 and Dwyer Instruments, Inc. invested in state of the art equipment to ensure years of quality manufactured products. Along with upgraded equipment, Dwyer Instruments, Inc. has improved the manufacturing process to produce short lead times. Now, Love Controls is able to offer products utilizing the latest technology, manufactured to the highest quality standards, while maintaining short lead times and the best prices.





## Customer Service

Fast, friendly customer service professionals are available to process and provide assistance with your order – whether it is by phone, fax, e-mail or through our website.



## Technical Support

Have an application question? Our technical support professionals are trained to provide you with the answers you need.



## Prompt Shipment

After you place your order, Dwyer's dedicated shipping staff packs and ships your order promptly and completely—within 24 hours on most in-stock items.



Love Controls website delivers the convenience you want. Go to [www.love-controls.com](http://www.love-controls.com) for the most complete ordering and product support information at your fingertips – anytime, day or night. Installation and operating manuals are available on products that are easily downloadable to your computer or printer.

Total customer service the way you need it.

# [www.love-controls.com](http://www.love-controls.com)



**Address:**  
Love Controls  
A Division of Dwyer Instruments, Inc  
P.O. Box 338  
Michigan City, IN 46361 U.S.A.



**e-mail:**  
[love@love-controls.com](mailto:love@love-controls.com)



**Telephone:**  
(800) 828-4588  
(219) 879-8000



**website:**  
<http://www.love-controls.com>  
<http://www.dwyer-inst.com>  
<http://proximitycontrols.com>



**Fax:**  
(219) 872-9057

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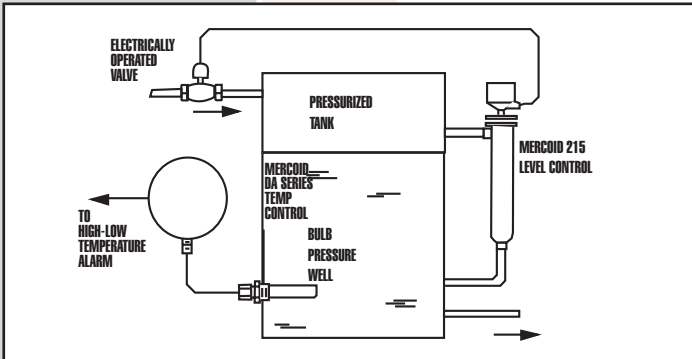
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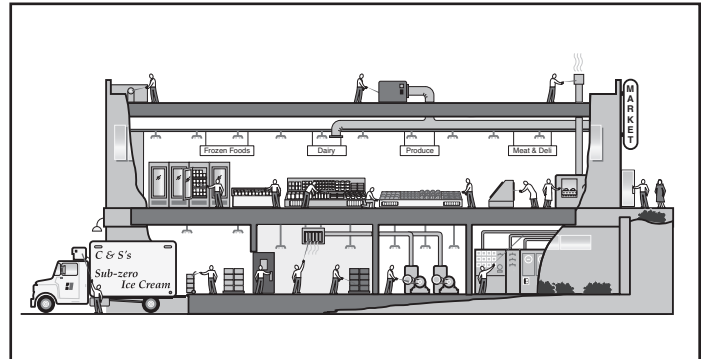
# Introduction to Temperature Controls

The temperature of an object is generally described by the relative "Hot" or "Cold" feeling of the item. Several reliable and reproducible methods exist to establish the relative "Hotness" or "Coldness" of an object and provide a quantitative indication of temperature. Our sensors provide a quantitative indication of temperature through a variety of methods including bulb and capillary, infrared, bimetal, thermocouple, thermistor and RTD. These technologies are represented on the following pages.



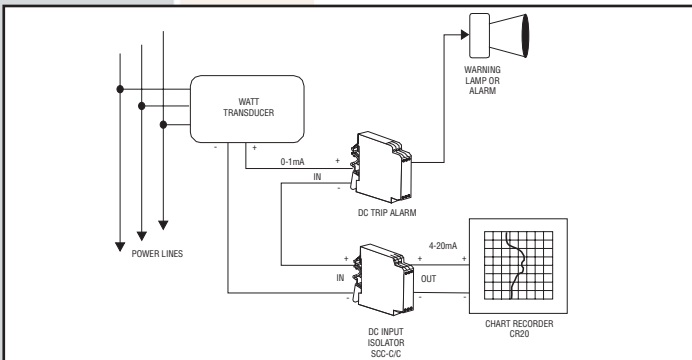
### Mercoid temperature and level controls find wide application in high pressure and high temperature processes.

The application above shows a Mercoid DA series bulb and capillary temperature control monitoring the temperature of media in a holding tank. This control can actuate an alarm when the media temperature exceeds the desired temperature limit. A well in the side of the tank protects the bulb from the system pressure and it allows removal of the bulb and control without disturbing the process. A Mercoid Model 215, also shown, can be used to control the level in the tank by turning on or off an electrically operated valve. This level control features an adjustable level setpoint from 1.5 to 24 inches and pressure/temperature ratings of 300 psi/500°F.



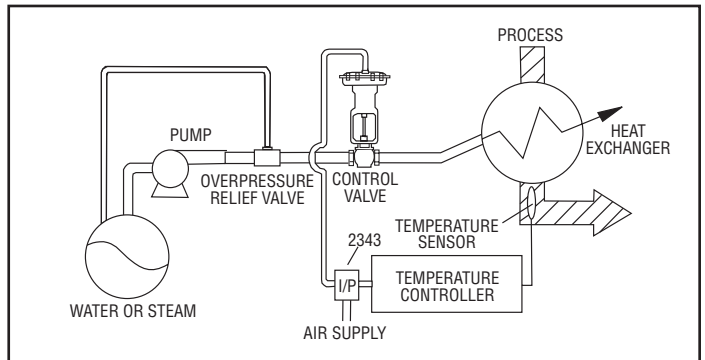
### Noncontact temperature measurement using infrared thermometers.

Use Infrared Thermometers for noncontact, non-contaminating temperature measurement of food items. Quickly verify uniform heating or cooling in food display and food storage areas to eliminate spoilage and product waste. Monitor the temperature of ovens, ranges, deep fryers, and heated serving areas while maintaining a safe distance from the heat source. Check refrigeration and heating lines, compressors, motors, HVAC units, electrical connections, and circuit breakers to verify proper operation and determine trouble spots early.



### Power consumption monitoring with Dwyer SCC signal conditioners, limit alarms and chart recorder.

Reduce operational costs by monitoring power consumption and alerting operators if power limits are exceeded. A Watt transducer provides a 0 to 1 mA output proportional to the AC power level. The DC input limit alarm is set to trip at the appropriate power level. The DPDT relay contacts control a visual or audible alarm. The model DC input signal conditioner converts the 0 to 1 mA signal into a 4 to 20 mA output signal for use with recording equipment and provides up to 1500 VDC isolation.



### Process temperature control using a Hi-Flow™ control valve, an I/P transducer and a Dwyer controller.

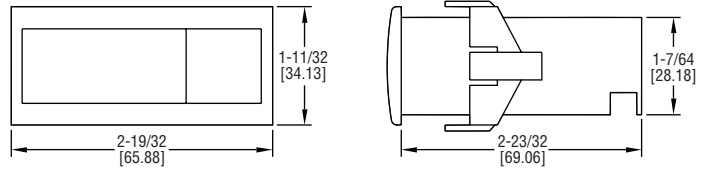
Pneumatic Hi-Flow™ control valves provide excellent control with high flow capacity, wide rangeability and tight shut-off capabilities. The application shown uses a Lin-E-Aire® pneumatic actuator operating from a standard 3-15 psi control air signal and a Hi-Flow™ linear control valve which apportions steam or water to the process. The valve regulates cooling water or steam flow depending on the process requirement resident in the temperature controller program. This package can be provided with a Precisor® positioner, 2343, a current to pressure transducer, Proximity position indicating transmitter and a Love 1600 temperature controller with thermocouple.

**Important Note:** The control hook-ups and sketches and other application information shown in this bulletin are generalized and abbreviated to present the basic application only. We believe this application information to be reliable but it is intended for use by persons, at their own discretion, having technical skill and knowledge of the business. Neither Dwyer Instruments, Inc., nor any of its divisions including the Mercoid, W.E. Anderson, Proximity or Love Divisions shall be liable for loss, damage or expense directly or indirectly arising from the use of any product described herein. In no event shall any of these companies be liable for direct, indirect, special or consequential damages.

Series  
TSF

# Thermocouple Limit Control

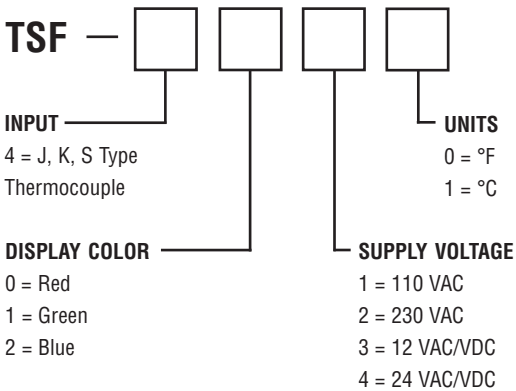
## FM Approved Boiler High Limit Switch



Panel Cutout 2-51/64 x 1-9/64 (71 x 29)

The Series TSF Thermocouple FM Approved Limit Control provides audible alarm status along with a robust 15 amp relay output. Unit allows the user to easily select automatic or manual reset along with 10 other parameters. The TSF series has a built in reset button on the front panel or can accept an external reset.

The ease of programming and low price make the TSF series the best value limit control on the market.



### SPECIFICATIONS

**Probe Range:** 0 to 700°C (32 to 999°F) for thermocouple J type. 0 to 999°C (32 to 999°F) for thermocouples K or S type.

**Input:** Type J, K or S thermocouple.

**Output:** 15 A SPDT relay @ 250 VAC resistive.

**Horsepower Rating (HP):** 3/4 HP.

**Control Type:** ON/OFF; manual/automatic reset.

**Power Requirements:** 110 VAC, 230 VAC, 12 VAC/VDC or 24 VAC/VDC (depending on model).

**Power Consumption:** 4 VA.

**Accuracy:** ±1% FS.

**Display:** 3-digit, red, 1/2" (12.7 mm) digits, plus sign.

**Resolution:** 1°.

**Memory Backup:** Nonvolatile memory.

**Ambient Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Storage Temperature:** -4 to 176°F (-20 to 80°C).

**Weight:** 2.3 oz (65 g).

**Front Panel Rating:** IP64.

**Agency Approvals:** CE, FM, UR, URc.

### ACCESSORIES

**TCS-J,** J type thermocouple, 4" probe, 48" extension

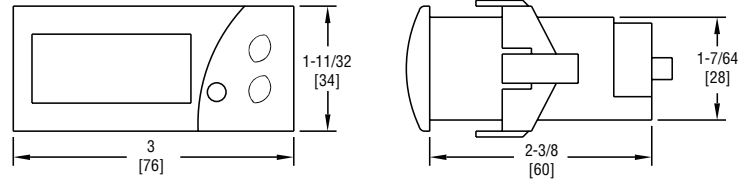
**TCS-K,** K type thermocouple, 4" probe, 48" extension

**TS2-K,** Configuration Key

Series TCS

# Thermocouple Temperature Switch

Heating and Cooling Control, 16 Amp Rating, Two Alarms



Panel Cutout 2-51/64" x 1-9/64" (71 x 29 mm)

**Monitor and control temperature** in heating and cooling applications with the Series TCS Thermocouple Switch. The Series TCS offers a wide temperature range, two selectable alarm sets, and an internal buzzer indicating alarm condition or error. The user can define set point, heating/cooling regulation, cycle time, alarm configuration, load status, and ambient probe adjustment. The thermocouple switch features password protection and error/alarm messaging. Temperature and output status is indicated on the bright red LED display. Use the configuration key (sold separately) to quickly program multiple units. The Series TCS includes a fitting clip for panel mounting, gasket, rear terminal cover and instruction manual.

## SPECIFICATIONS

**Probe Range:** 0 to 700°C (32 to 999°F) for thermocouple J .

0 to 999°C (32 to 999°F) for thermocouples K, S.

**Input:** Type J or K thermocouple.

**Output:** 15 A SPDT relay @ 250 VAC resistive.

**Horsepower Rating (HP):** 3/4 HP.

**Control Type:** ON/OFF.

**Power Requirements:** 110 VAC, 230 VAC, 12 VAC/VDC or 24 VAC/VDC (depending on model).

**Accuracy:** ±1% FS.

**Display:** 3-digit, red, 1/2" (12.7 mm) digits, plus sign.

**Resolution:** 1°.

**Memory Backup:** Nonvolatile memory.

**Ambient Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Storage Temperature:** -4 to 176°F (-20 to 80°C).

**Weight:** 2.3 oz (65 g).

**Front Panel Rating:** IP64.

**Agency Approvals:** CE, UR, URc.

## APPLICATIONS

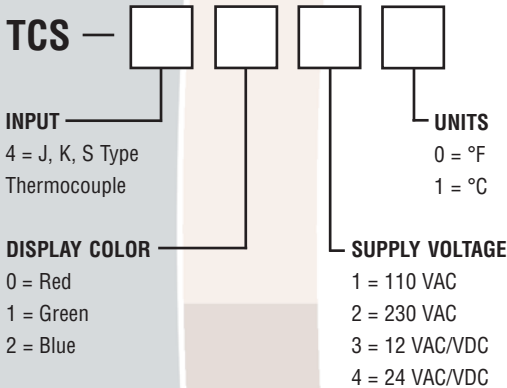
TS Digital Temperature Switches are suitable for industrial chillers, environmental chambers, walk-ins and freezers, heat sealers, sterilizers, beer and wine chillers, mug frosters, coolers, display cases and cabinets, warmers, meat and produce storage, floral preservation, refrigerated transportation, laboratories, food service equipment, ovens and dryers, tobacco preservation, hot melt glue stitchers for case erectors, cool rooms, burn-in rooms and chambers, and cold water citrus packing.

## ACCESSORIES

**TCS-J,** J Type Thermocouple, 4" probe, 48" extension

**TCS-K,** K Type Thermocouple, 4" probe, 48" extension

**TS2-K,** Configuration Key



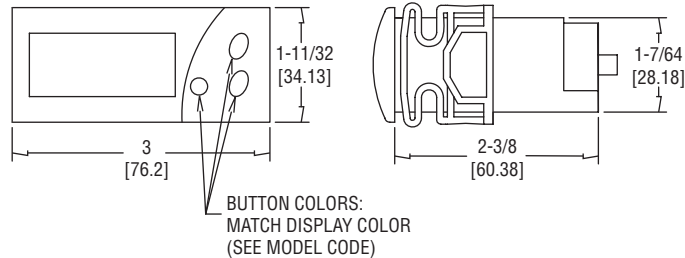
## PARAMETERS

	Description	Units	Range
<b>SP</b>	Set point	Degrees	r1 to r2
<b>r0</b>	Differential or hysteresis	Degrees	1 to 99°
<b>r1</b>	Lower Value Set Point	Degrees	0 to 999°
<b>r2</b>	Higher Value Set Point	Degrees	0 to 999°
<b>d0</b>	Heating or Cooling Control	Option	Ht/Co
<b>c0</b>	Min. stop time for Load	Minutes	0 to 59 min.
<b>c2</b>	Load Status During Probe Error	0/1	Off/On
<b>P1</b>	Ambient Probe Adjustment	Degrees	-10 to 10
<b>P5</b>	Ambient Probe Type	Option	J, K, or S
<b>H5</b>	Parameter Access code	Numeric	0 to 255 (Set at 0 from factory)
<b>A0</b>	Alarm 1 Hysteresis	Degrees	1 to 999°
<b>A1</b>	Alarm 1 Threshold	Degrees	0 to 999°
<b>A2</b>	Alarm 1 Exclusion Time	Seconds	0 to 999
<b>A3</b>	Alarm 1 Configuration	Option	Off, 1, or 2
<b>A4</b>	Alarm 2 Hysteresis	Degrees	1 to 999°
<b>A5</b>	Alarm 2 Threshold	Degrees	0 to 999°
<b>A6</b>	Alarm 2 Exclusion	Seconds	0 to 999
<b>A7</b>	Alarm 2 Configuration	Option	Off, 1, or 2



# Digital Temperature Switch

## Easy Multi-Unit Programming, 16A SPDT Relay Output



Panel Cutout 2-51/64" x 1-9/64" (71 x 29 mm)

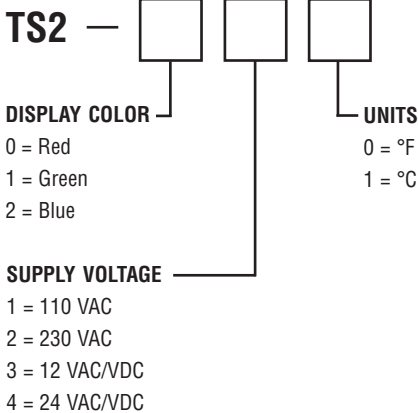
Monitor and control temperature for heating and cooling applications with the Series TS2 Digital Temperature Switch. The Series TS2 offers twelve programmable functions to customize the unit to fit application requirements. Use the 16 (5) Amp SPDT relay output to drive a motor, compressor, or fan. Designed with the OEM in mind, the TS2 offers the ability to configure multiple units with the touch of a button.

Programming multiple units is quick and easy. Simply program one switch with the desired parameter settings and connect the configuration key (sold separately) to the back of the unit. Press the button on the configuration key and download the parameter settings. Connect the key to the other switches to upload the stored settings with the push of a button.

The TS2 features set point adjustments, static defrost timing, compressor mean time, hysteresis, and ambient probe adjustment. Security protection is offered using a password code. The Series TS2 Digital Temperature Switches are designed to operate with PTC (1000Ω @ 25°C) probes sold separately.

### SPECIFICATIONS

- Probe Range:** -58 to 302°F (-50 to 150°C).
- Input:** PTC thermistor 1000Ω @ 25°C.
- Output:** 16A SPDT relay @ 250 VAC resistive, 5A inductive.
- Horsepower Rating (HP):** 3/4 HP.
- Control Type:** ON/OFF.
- Power Requirements:** 110 VAC, 230 VAC, 12 VAC/VDC or 24 VAC/VDC.
- Accuracy:** ±1% F.S.
- Display:** 3-Digit, red, 1/2" digits.
- Resolution:** 1°.
- Memory Backup:** Nonvolatile memory.
- Ambient Operating Temperature:** 14 to 131°F (-10 to 55°C).
- Storage Temperature:** -4 to 176°F (-20 to 80°C).
- Weight:** 2.3 oz (65 g).
- Front Panel Rating:** IP64.
- Agency Approvals:** CE, URc, UR.



### ACCESSORIES

- TS-1,** Probe Brass 5 ft (1.5 m) cable
- TS-11,** Probe Brass 10 ft (3 m) cable
- TS-2,** Probe SS 5 ft (1.5 m) cable
- TS-21,** Probe SS 10 ft (3 m) cable
- TS-5,** Probe PVC, 5 ft (1.5 m) cable
- TS-51,** Probe PVC, 10 ft (3 m) cable
- TS-6,** Probe metal, 5 ft (1.5 m) cable
- TS-61,** Probe metal, 10 ft (3 m) cable
- TS2-K,** Configuration Key

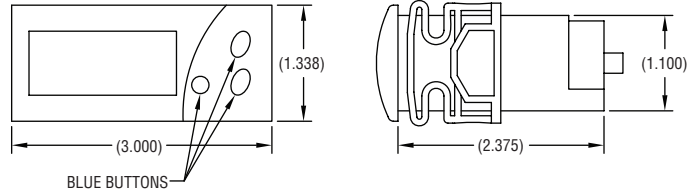
### PARAMETERS

	Description	Units	Range
<b>SP</b>	Set point	Degrees	r1 to r2
<b>r0</b>	Differential or hysteresis	Degrees	1 to 20
<b>r1</b>	Lower Value Set Point	Degrees	-50 to 150°C (-50 to 302°F)
<b>r2</b>	Higher Value Set Point	Degrees	-50 to 150°C (-50 to 302°F)
<b>d0</b>	Heating or Cooling Control	Option	Ht/Co
<b>d2</b>	Time for Defrosting	Minutes	0 to 59 min.
<b>d8</b>	Interval Time between Defrosting	Hours	1 to 24 hr.
<b>c0</b>	Minimum Stop Time for Compressor	Minutes	0 to 59 min.
<b>c1</b>	Continuous Cycle Time	Hours	0 to 24 hr.
<b>P1</b>	Ambient Probe Adjustment	Degrees	-10 to 10°
<b>H5</b>	Parameter Access code	Numeric	0 to 99
<b>t0</b>	Maximum Temperature on Display	Degrees	-50 to 150°C (-50 to 302°F)

Series TSX

# Digital Temperature Switch

Dual Input, Cooling Applications, Single or Dual Relay Output



Panel Cutout 2-51/64" x 1-9/64" (71 x 29 mm)

The microprocessor based Series TSX offers a low cost solution for cooling applications. Units are designed to accept up to two temperature probes selectable between PTC or NTC thermistor input. The probe temperature is displayed on the bright 3-digit LED.

The Series TSX offers 23 programming parameters for specific application requirements. To quickly program multiple units with the same settings, use the configuration key TS2-K (sold separately). The user can define set point, hysteresis, probe error performance, and defrosting. The defrosting mode can also be initiated or interrupted manually by pressing the up arrow button. Units include password protection to secure from unwanted setting changes except for set point adjustment. If required, the keypad can be locked out so no adjustments can be made.

Select from single output units with one 16A SPST relay dual output with one 16A SPST relay and one 8A SPDT relay for defrosting or three output models with one 16A SPST, 8A SPST and 5A SPDT. The temperature switch includes one NTC probe, gasket, mounting clips, and instruction manual.

## SPECIFICATIONS

### Probe Range:

PTC: -58 to 302°F (-50 to 150°C);

NTC: -58 to 230°F (-50 to 110°C).

**Input:** PTC/NTC thermistor 1000Ω @ 25°C.

**Output:** All models include 16A SPST relay @ 250 VAC resistive, 5A inductive; Dual output units also have one 8A SPDT relay @ 250 VAC resistive, 3A inductive, 3 output models also have 5A SPDT @ 250 VAC and 8A SPST @ VAC.

**Horsepower Rating (HP):** 16A: 1HP 240 VAC - 10FLA, 60LRA 250 VAC.

**Control Type:** ON/OFF.

**Power Requirements:** 110 VAC; 230 VAC; 24 VAC/DC; (depending on model).

**Accuracy:** ±1% F.S.

**Display:** 3-digit, red, 1/2" (12.7 mm) digits.

**Resolution:** 0.1° (<100°); 1° (≥100°).

**Memory Backup:** Nonvolatile memory.

**Ambient Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Storage Temperature:** -4 to 176°F (-20 to 80°C).

**Weight:** 2.3 oz (65 g).

**Front Panel Rating:** IP64.

**Agency Approvals:** UR pending.

## ACCESSORIES

**TS2-K,** Configuration Key

**TS-1,** Probe Brass 5 ft (1.5 m) cable

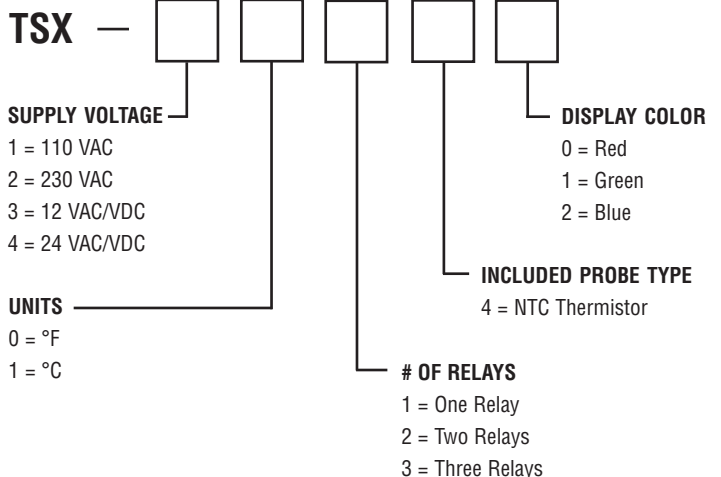
**TS-2,** Probe SS 5 ft (1.5 m) cable

**TS-5,** PVC Probe (PTC), 5 ft

**TS-6,** Metal Probe (PTC), 5 ft

**TS-7,** Plastic Probe (NTC), 3 ft

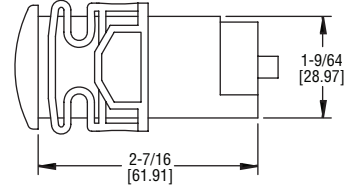
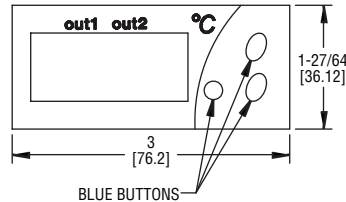
DUAL INPUT, SINGLE OUTPUT		
Model Number	Supply Voltage	Degrees
TSX-10140	110 VAC	°F
TSX-11140	110 VAC	°C
TSX-20140	230 VAC	°F
TSX-21140	230 VAC	°C
TSX-40140	24 VAC/DC	°F
TSX-41140	24 VAC/DC	°C
DUAL INPUT, DUAL OUTPUT		
Model Number	Supply Voltage	Degrees
TSX-10240	110 VAC	°F
TSX-11240	110 VAC	°C
TSX-20240	230 VAC	°F
TSX-21240	230 VAC	°C
TSX-40240	24 VAC/DC	°F
TSX-41240	24 VAC/DC	°C
DUAL INPUT, THREE OUTPUT		
Model Number	Supply Voltage	Degrees
TSX-10340	110 VAC	°F
TSX-11340	110 VAC	°C
TSX-20340	230 VAC	°F
TSX-21340	230 VAC	°C
TSX-40340	24 VAC/DC	°F
TSX-41340	24 VAC/DC	°C



Series  
TSS2

# Dual Stage Temperature Switch

## Two Independent Relay Outputs, Heating or Cooling Control



Panel Cutout 2-51/64 x 1-9/64 (71 x 29)

Regulate temperatures for heating or cooling control with the Series TSS2 Dual Stage Temperature Switch. The Series TSS2 is designed to accept two inputs with independent relays output for dual stage temperature control.

The Series TSS2 offers 34 programmable parameters to customize control functions. Access to all parameters, except setpoint, can be secured with a password code.

### APPLICATIONS

TSS2 Digital Temperature Switches are suitable for industrial chillers, environmental chambers, walk-ins and freezers, heat sealers, sterilizers, beer and wine chillers, mug frosters, coolers, display cases and cabinets, warmers, meat and produce storage, floral preservation, refrigerated transportation, laboratories, food service equipment, ovens and dryers, tobacco preservation, hot melt glue stitchers for case erectors, cool rooms, burn-in rooms and chambers, and cold water citrus packing.

### PARAMETERS

	Description	Units	Range
Set 1	Temperature Set Point 1	Degrees	r4 to r6
Set 2	Temperature Set Point 2	Degrees	r5 to r7
r0	Set1 and Set2 dependency	Range	Ind/dEP
r1	Differential for Set1	Degrees	0.1 to 20.0
r2	Differential for Set 2	Degrees	0.1 to 20.0
r3	Band differential	Degrees	0.1 to 20.0
r4	Minimum value for Set1	Degrees	-99.9 to r6
r5	Minimum value for Set2	Degrees	-99.9 to r7
r6	Maximum value for Set1	Degrees	r4 to 302
r7	Maximum value for Set2	Degrees	r5 to 302
r8	Operation mode	Range	On1/On2/nEU
A0	Alarm differentials	Degrees	0.1 to 20.0
A1	Maximum probe 1 alarm	Degrees	0.1 to 99.9
A2	Maximum probe 2 alarm	Degrees	0.1 to 99.9
A3	Minimum probe 1 alarm	Degrees	0.1 to 99.9
A4	Minimum probe 2 alarm	Degrees	0.1 to 99.9
A5	Alarm check time (*)	hh:m	0.0 to 18.0
c0	Minimum relay stop time	Minutes	0 to 240
c1	Operation output 1	Range	dir/inv
c2	Operation output 2	Range	dir/inv
c3	Default operation output 1	%ON	0 to 100
c4	Default operation output 2	%ON	0 to 100
P0	Temperature units	Range	°C/°F
P1	Temp. probe 1 adjustment	Degrees	-20.0 to 20.0
P2	Temp. probe 2 adjustment	Degrees	-20.0 to 20.0
P3	Decimal point	Option	no/yES
P4	Probe to be displayed	Option	sd1/sd2
P5	Number of temp. probes	Range	1/2
H0	Set default settings	Command	0
H1	Keypad protection	Option	no/yES
H2	Operation LED OUT	dir/inv	dir/inv
H3	Operation LED def	Option	dir/inv
H4	Communication setup	Numeric	0 to 999
H5	Access code to parameters	Numeric	0 to 999

\*Time Format: hh:m, where m are tenths of minutes.

### SPECIFICATIONS

**Probe Range:** -58 to 302°F (-50 to 150°C).

**Input:** PTC thermistor (1000Ω @ 25°C).

**Outputs:** One 16A SPST relay @ 250 VAC, resistive; One 8A SPST relay @ 250 VAC resistive.

**Horsepower Rating (HP):** 1/3 HP.

**Control Type:** On/Off.

**Power Requirements:** 12 VAC/DC, 24 VAC/DC, 115 VAC, 230 VAC depending on model.

**Accuracy:** 1% of full scale.

**Display:** 3-digit and sign, red LED.

**Resolution:** 0.1° (<100°); 1° (≥100°).

**Memory Backup:** Nonvolatile memory.

**Ambient Operating Temperature:** 32 to 158°F (0 to 70°C).

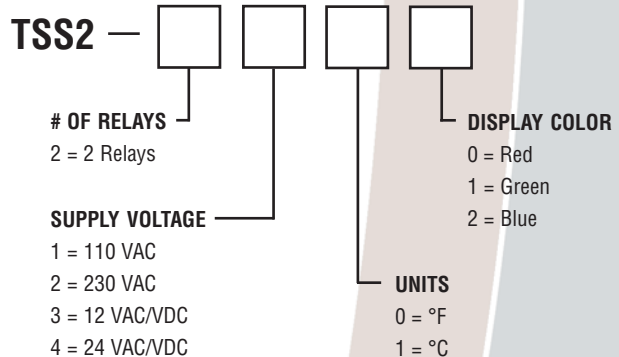
**Storage Temperature:** -4 to 176°F (-20 to 80°C).

**Dimensions:** 3 x 1-27/64 x 2-7/16 in.

**Front Panel Rating:** IP64.

**Weight:** 2.3 oz (65 g).

**Agency Approvals:** CE.



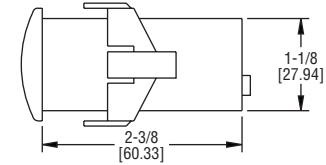
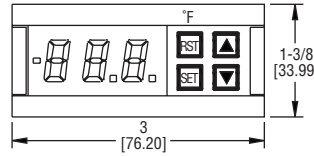
### ACCESSORIES

- TS-1, Probe Brass 5 ft (1.5 m) cable
- TS-2, Probe SS 5 ft (1.5 m) cable
- TS-5, Probe PVC, 5 ft (1.5 m) cable
- TS-51, Probe PVC, 10 ft (3 m) cable
- TS-6, Probe metal, 5 ft (1.5 m) cable
- TS-61, Probe metal, 10 ft (3 m) cable
- TS2-K, Configuration key

Series TS

# Digital Temperature Switch

3-Digit Display, Heating/Cooling Control, 8 or 16 Amp Relay

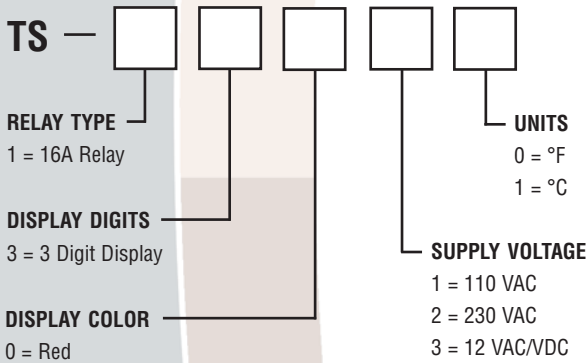


Panel Cutout 2-51/64 x 1-9/64 (71 x 29)

The TS Digital Temperature Switch is designed to regulate many heating and cooling applications. Easy programming via the tactile front keypad enables quick setup of the 12 parameters for simple, reliable operation. The user can define set point, heating/cooling regulation, hysteresis, cycle time, ambient probe adjustment and defrosting time. The unit features error or alarm messaging and password protection. View probe temperature on the bright red, 3-digit LED display. Select between 8 amp SPDT or 16 amp SPST relay outputs, temperature display in °F or °C, and 110 VAC, 230 VAC, or 12 VDC power supplies. The Series TS includes a thermistor with 5 ft (1.5 m) cable, fitting clips for panel mounting, gasket, rear terminal cover, and instruction manual.

### SPECIFICATIONS

- Probe range:** -58 to 302°F (-50 to 150°C).
- Input:** 1.5-inch (4 cm) thermistor (1000Ω @ 25°C) with 5 ft (1.5 m) cable.
- Output:** 8A SPDT or 16A SPST relay @ 250 VAC resistive (Depending on model).
- Horsepower Rating (HP):** 1/3 HP for 8A and 3/4 HP for 16A.
- Control Type:** ON/OFF.
- Power Requirements:** 110 VAC, 230 VAC or 12 VAC/VDC (Depending on model). 4VA (230V).
- Accuracy:** ±1°C.
- Display:** 3-Digit, red, 1/2" digits.
- Resolution:** 1°.
- Memory Backup:** Nonvolatile memory.
- Ambient Operating Temperature:** 14 to 158°F (-10 to 70°C).
- Storage Temperature:** -4 to 176°F (-20 to 80°C).
- Weight:** 2.3 oz (65 g).
- Front Panel Rating:** IP64.
- Agency Approvals:** CE, URc, UR



### APPLICATIONS

TS Digital Temperature Switches are suitable for industrial chillers, environmental chambers, walk-ins and freezers, heat sealers, sterilizers, beer and wine chillers, mug frosters, coolers, display cases and cabinets, warmers, meat and produce storage, floral preservation, refrigerated transportation, laboratories, food service equipment, ovens and dryers, tobacco preservation, hot melt glue stitchers for case erectors, cool rooms, burn-in rooms and chambers, and cold water citrus packing.

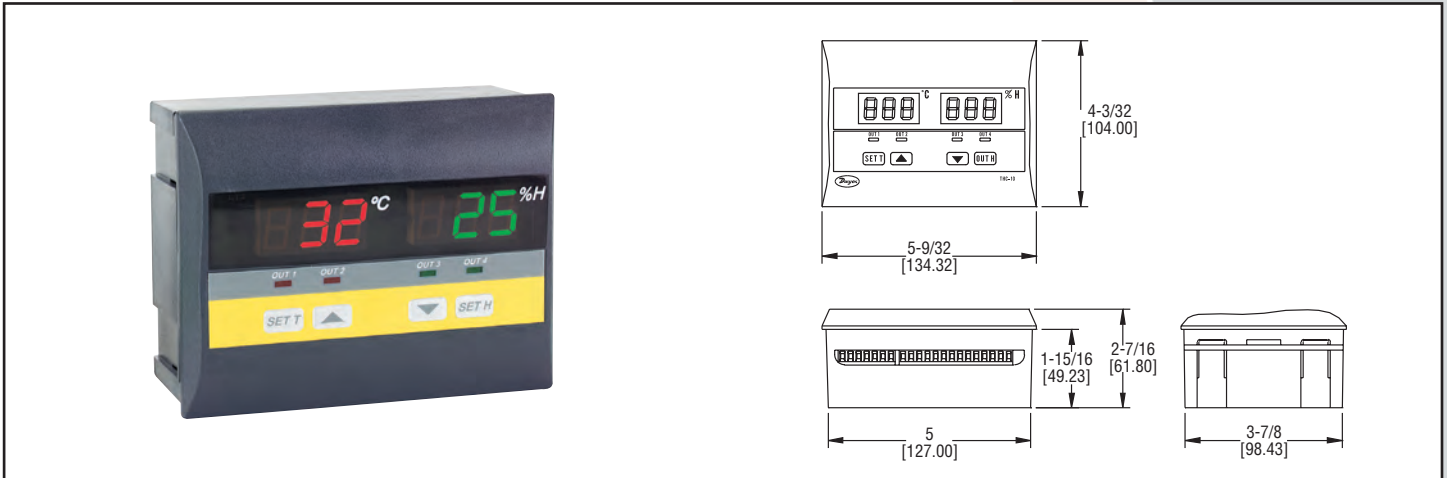
### PARAMETERS

	Description	Units	Range
<b>SP</b>	Set point	Degrees	r1 to r2
<b>r0</b>	Differential or hysteresis	Degrees	1 to 20
<b>r1</b>	Lower Value Set Point	Degrees	-50 to 150°
<b>r2</b>	Higher Value Set Point	Degrees	-50 to 302°F (-50 to 150°C)
<b>d0</b>	Heating or Cooling Control	Option	Ht/Co
<b>d2</b>	Time for Defrosting	Minutes	0 to 59 min.
<b>d8</b>	Interval Time between Defrosting	Hours	1 to 24 hr.
<b>c0</b>	Min. stop time for Load	Minutes	0 to 59 min.
<b>c1</b>	Continuous Cycle Time	Hours	0 to 24 hr.
<b>P1</b>	Ambient Probe Adjustment	Degrees	-10 to 10
<b>H5</b>	Parameter Access code	Numeric	0 to 99 (Set at -00 from factory)
<b>t0</b>	Max. Temp. on Display	Degrees	-50 to 302°F (-50 to 150°C)



# Temperature/Humidity Switch

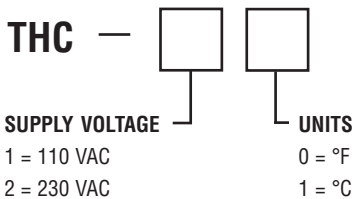
Independent Displays, 61 Programmable Parameters, 4 SPST Relays



**Simultaneously measure and control** temperature and humidity with the Series THC Temperature/Humidity Switch. The unit offers a 3-digit red display for temperature indication and a 3-digit green display indicating humidity. The Series THC is equipped with four independent relays, two for temperature control and two relays for humidity control.

The unit offers 61 programmable parameters for temperature and humidity control including set point, differential, direct/reverse acting, cycle time, alarm clock time, and decimal point adjustment. In the event of a probe error, the default operation of the relays can be set to open or close. The THC features error or alarm messaging and password protection.

The THC Temperature/Humidity Switch accepts up to two temperature probe inputs (sold separately) and a humidity sensor. A humidity sensor with 0-1V, 0-3V (sold separately), or 4-20 mA output can be used with the Series THC.



## SPECIFICATIONS

**Measurement Range:** Temperature: -58 to 302°F (-50 to 150°C); Humidity: 0 to 100% RH.

**Input:** Up to 2 thermistors and 1 humidity sensor.

**Output:** 4 SPST, 8A relays @ 250 VAC.

**Horsepower Rating (HP):** 1/3 HP.

**Control Type:** ON/OFF direction, direct or reverse acting, neutral.

**Power Requirements:** 110 or 230 VAC (depending on model).

**Accuracy:** Temperature ±0.5% of probe range; Humidity: ±3% of range.

**Display:** Two 3-digit displays. 1/2" digits.

**Resolution:** 0.1°.

**Memory Backup:** Nonvolatile memory.

**Ambient Operating Temperature:** 32 to 158°F (0 to 70°C).

**Storage Temperature:** -4 to 176°F (-20 to 80°C).

**Weight:** 1.17 lb (530 g).

**Panel Cutout:** 5.15" x 2.37" (131 x 111 mm).

**Front Panel Protection:** IP64.

**Agency Approvals:** CE.

## ACCESSORIES

**THC-P** Humidity probe with 3V output & 4 ft (1.2 m) cable

**TS-5** Temperature probe, PVC with 5 ft (1.5 m) cable

**TS-6** Temperature probe, metal with 5 ft (1.5 m) cable

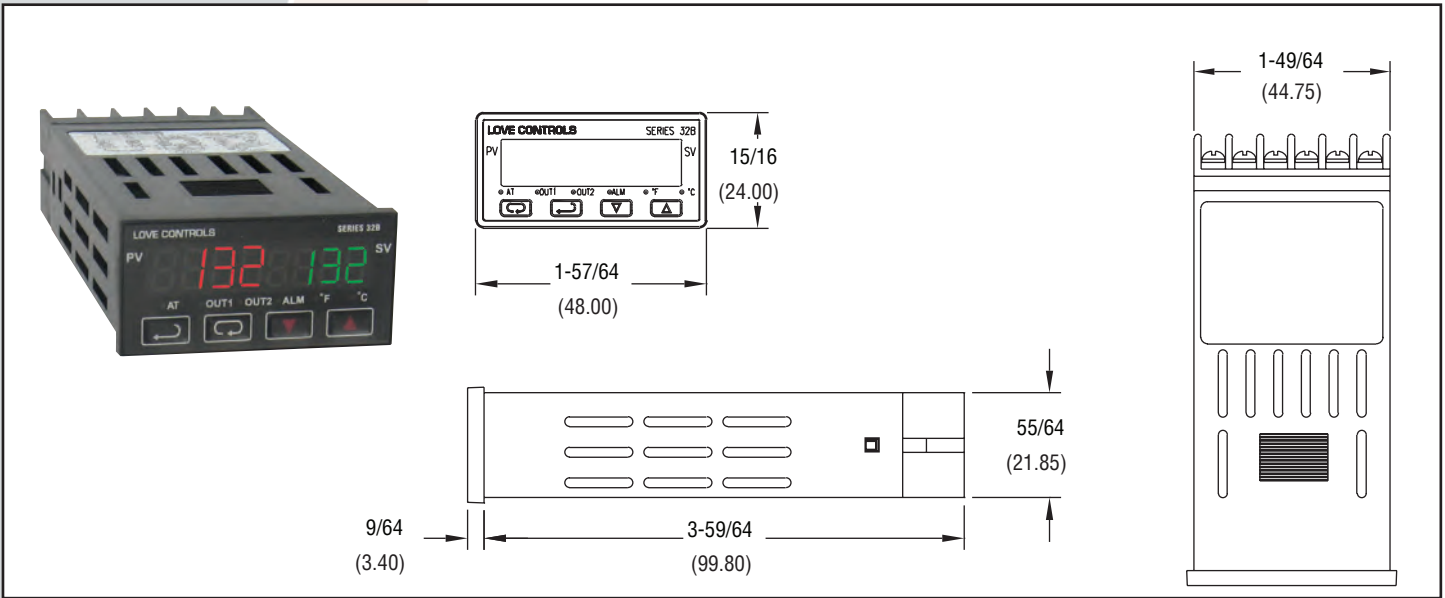
**TS-51** Temperature probe, PVC with 10 ft (3 m) cable

**TS-61** Temperature probe, metal with 10 ft (3 m) cable

Series 32B

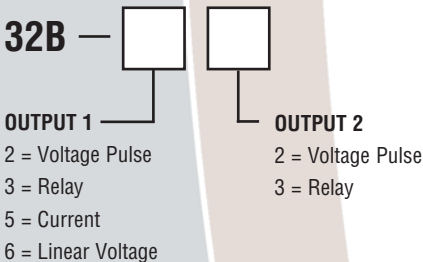
# 1/32 DIN Temperature/Process Controller

Universal Input, Dual Temperature Output Control, RS-485 Communication



The compact Series 32B Temperature/Process Controller offers advanced control features for the most demanding temperature or process applications. Enclosed in a 1/32 DIN housing, the Series 32B is designed with dual, 4-digit LED displays for local indication of process value and setpoint. Control methods include ON/OFF, PID, self-tune, and manual tune. PID control is supported with 64 temperature and time (ramp/soak) control actions. The dual loop output control allows simultaneous heating and cooling control. The second output can be configured as an alarm mode using one of the thirteen built-in alarm functions.

RS-485 communication is standard on the Series 32B. Up to 247 communication addresses are available with transmission speeds of 2400 to 38,400 bps. The controller also features universal input, selectable temperature units (°F/°C), selectable resolution, quick sampling rate and security protection.



**ACCESSORIES**

- MN-1**, RS485 to USB Signal Converter
- SCD-SW**, Configuration Software
- A-277**, 250 Ohm Precision Resistor

Modbus® is a registered trademark of Schriener Automation

**SPECIFICATIONS**

- Inputs:** Thermocouple, RTD, DC voltages or DC current.
- Display:** Two 4-digit, 7 segment .25" H (6.35 mm) LED's. PV: red; SV: green.
- Accuracy:** ±0.25% span, ±1 least significant digit.
- Supply Voltage:** 100 to 240 VAC, 50/60 Hz.
- Power Consumption:** 5 VA max.
- Operating Temperature:** 32 to 122°F (0 to 50°C).
- Memory Backup:** Nonvolatile memory.
- Control Output Ratings:**
  - Relay: SPST, 5A @ 250 VAC resistive.
  - Voltage pulse: 14V, 10% to -20% (max 40 mA).
  - Current: 4 to 20 mA.
- Communication:** RS-485 Modbus® A-5-11/RTU communication protocol.
- Weight:** 4 oz (114 g).
- Agency Approvals:** CE, UL, cUL.
- Front Panel Rating:** IP66

Input Types	Range
Type K T/C	-328 to 2372°F (-200 to 1300°C)
Type J T/C	-148 to 2192°F (-100 to 1200°C)
Type T T/C	-328 to 752°F (-200 to 400°C)
Type E T/C	32 to 1112°F (0 to 600°C)
Type W T/C	-328 to 2372°F (-200 to 1300°C)
Type R T/C	32 to 3092°F (0 to 1700°C)
Type S T/C	32 to 3092°F (0 to 1700°C)
Type B T/C	212 to 3272°F (100 to 1800°C)
Type L T/C	-328 to 1562°F (-200 to 850°C)
Type U T/C	-328 to 932°F (-200 to 500°C)
Pt 100 RTD	-328 to 1112°F (-200 to 600°C)
0-50 mV	-999 to 9999
0-5 V	-999 to 9999
0-10 V	-999 to 9999
0-20 mA*	-999 to 9999
4-20 mA*	-999 to 9999

\*Requires 250 Ohm Precision Resistor.

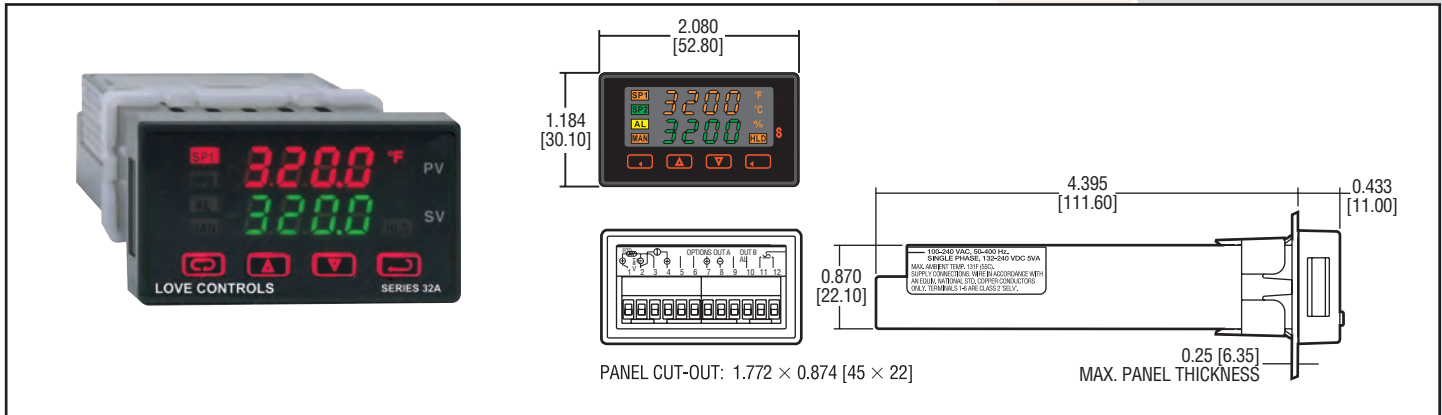
Series  
32A

# Temperature Controller/Process

1/32 DIN, Universal Input, Self-Tune, Fuzzy Logic



Temperature  
Controls



## STANDARD FEATURES

- Large Dual Display
- Self-Tune
- Fuzzy Logic
- 16 Segment Ramp/Soak Function
- Auto/Manual Station Function

The 32A Series temperature/process controllers set a new standard in 1/32 DIN power, flexibility and value. This group of controls offers the highest level of features in the most compact industry standard size. Ease of use is assured with the world's first dual display 1/32 DIN temperature/process controllers.

The Series 32A offers universal input (10 thermocouple types, 4 RTD types, voltage and current), single or dual set point, alarm (optional), Fuzzy Logic, Self-Tune, Peak/Valley indication, Percent Output indication and Heater Break protection. Auto/Manual capability and 16 Segment Ramp and Soak with adjustable time base are also offered. Process protection features include open sensor protection, shorted sensor protection, input rate of change protection and loop break protection.

## SPECIFICATIONS

**Selectable Inputs:** Thermocouple, RTD, DC Voltage or DC Current selectable.

**Display:** Two 4-digit, 7 segment, 0.259 high (6.35 mm) LEDs.

**Accuracy:**  $\pm 0.25\%$  of span,  $\pm 1$  least significant digit.

**Supply Voltage:** 100 to 240 VAC, nominal,  $+10 - 15\%$ , 50 to 400 Hz. single phase; 132 to 240 VDC, nominal,  $+10 - 20\%$ .

**Power Consumption:** 5 VA maximum.

**Operating Temperature:** 14 to 131°F ( $-10$  to 55°C).

**Memory Backup:** Nonvolatile memory. No batteries required.

### Control Output Ratings:

Relay: SPST, 3A @ 240 VAC resistive; 1.5A @ 240 VAC inductive; Pilot Duty Rating: 250 VA, 2A @ 120 VAC or 1A @ 240 VAC.

Switched Voltage (Non-isolated): 5 VDC @ 20 mA.

Proportional Current: 0 to 20 mADC sealable into 600 Ohms max.

**Weight:** 4 oz (114 g).

**Agency Approvals:** CE, UL E83725.

**Front Panel Rating:** Type 4X (IP66).

## ACCESSORY

**MN-1,** RS485 to USB Signal Converter



### ALARM PROGRAMMING‡

- 0 = No
- 1 = Yes

### OUTPUT A

- 1 = AC SSR†
- 2 = Switched 5 VDC
- 3 = Relay†
- 5 = Current
- 6 = DC SSR

### OUTPUT B‡

- 0 = None
- 1 = AC SSR†
- 2 = Switched 5 VDC
- 3 = Relay†
- 8 = DC SSR

### OPTIONS:

**992** RS-485 Serial Communications. Allows remote computer to read and write all control parameters.

**9502** 12 - 24 Vdc/Vac 50-400Hz power supply (control operates on low voltage equipment).

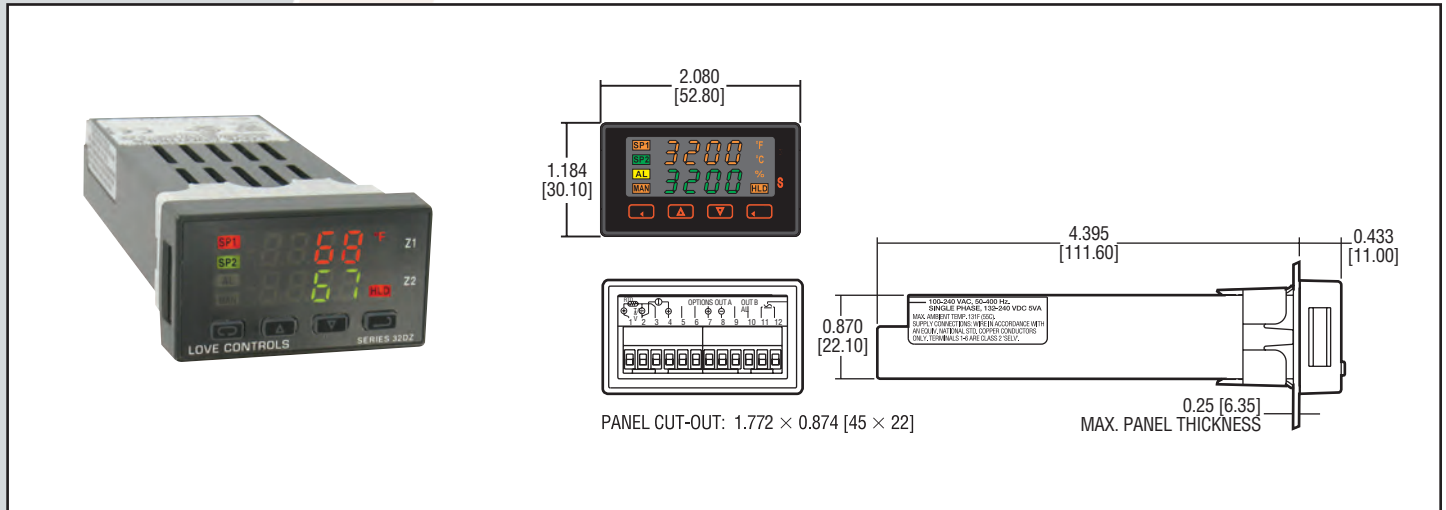
‡ Maximum of two outputs available. Order Output B with or without alarm programming.

† If using a SSR output to drive a relay or other coil driven device, make sure that the coil HOLDING current is greater than 100 mA. If the RELAY output is selected to drive a contractor or other coil driven device, then also order part number 541-0014, R/C snubber.

Series 32DZ

# Temperature/Process Controller

1/32 DIN, Dual Zone Control, Fuzzy Logic, Self-Tune PID



### STANDARD FEATURES

- Large Dual Display
- Independent Self-Tune for Each Zone
- Independent Fuzzy Logic for Each Zone

The Model 32DZ temperature/process controls set a new standard in 1/32 DIN power, flexibility, and value. Love Controls is proud to be the creator of the world's first dual zone control in the 1/32 DIN size. Ease of use is assured from the creators of the world's first dual display 1/32 DIN temperature /process control. The 32DZ offers 5 thermocouple type inputs. Each zone offers a single set point with mechanical relay. Standard features include independent Fuzzy Logic, Self-Tune, and Peak/Valley indication for each zone. Process protection is provided by open sensor protection, shorted sensor protection, input rate of change protection, and loop break protection. Options for the 32DZ include RS-485 Serial Communication. Designed and built in the USA, the 32DZ offers the highest levels of features, function, and quality available today.

### ACCESSORY

**MN-1**, RS485 to USB Signal Converter

### SPECIFICATIONS

**Inputs:** Thermocouple, Type J, K, E, L, and N.

**Display:** Two 4-digit, 7 segment, 0.259 high (6.35 mm) LEDs.

**Accuracy:** ±0.25% of span, ±1 least significant digit.

**Supply Voltage:** 100 to 240 VAC, nominal, +10 - 15%, 50 to 400 Hz. single phase; 132 to 240 VDC, nominal, +10 - 20%.

**Power Consumption:** 5 VA maximum.

**Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Memory Backup:** Nonvolatile memory. No batteries required.

### Control Output Ratings:

Relay: SPST, 3A @ 240 VAC resistive; 1.5A @ 240 VAC inductive; Pilot Duty Rating: 250 VA, 2A @ 120 VAC or 1A @ 240 VAC.

Proportional Current: 4 to 20 mA. SSR: 2.0 A at 240 VAC resistive at 77°F (25°C). De-rates to 1.0 A at 130°F (55°C). Minimum load of 100 mA.

Voltage: Switched 5 VDC.

**Weight:** 4 oz (114 g).

## MODEL 32DZ

### ZONE 1 INPUT

- 1 = Thermocouple J, K, E, L, N
- 2 = Thermocouple T, R, S, B, C
- 4 = 1000 Ohm RTD
- 5 = Current, 0 or 4 to 20 mA
- 6 = Voltage, 0 to 10 V or 2 to 10 V

### ZONE 2 INPUT

- 1 = Thermocouple J, K, E, L, N
- 2 = Thermocouple T, R, S, B, C
- 4 = 1000 Ohm RTD
- 5 = Current, 0 to 4 to 20 mA
- 6 = Voltage, 0 to 10 V or 2 to 10 V

### OUTPUT B

- 1 = SSR\*
- 2 = Switched 5 Vdc
- 3 = Relay\*
- 8 = DC SSR

### OUTPUT A

- 1 = SSR\*
- 2 = Switched 5 Vdc
- 3 = Relay\*
- 5 = Proportional Current
- 8 = DC SSR

### OPTIONS

#### OPTIONS:

- 992** RS-485 Serial Communications. Allows remote computer to read and write all control parameters.
- 9502** 12 - 24 Vdc/Vac 50-400Hz power supply (control operates on low voltage equipment).

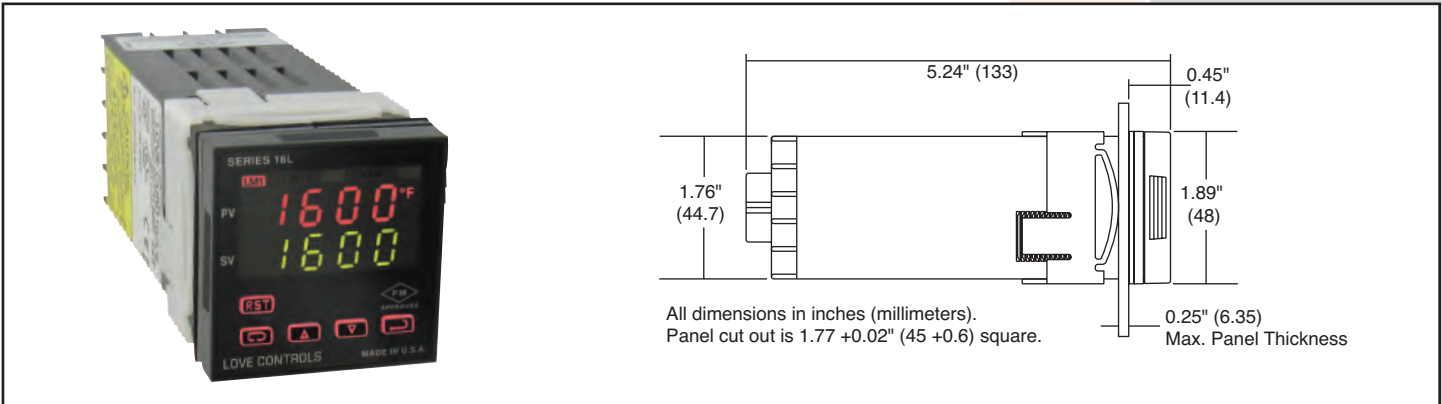
\* If using a SSR output to drive a relay or other coil driven device, make sure that the coil HOLDING current is greater than 100 mA. If the RELAY output is selected to drive a contractor or other coil driven device, then also order part number 541-0014, R/C snubber.



Series  
16L

# Limit Controls

FM Approved, Large Dual Display, Universal Input



## STANDARD FEATURES

- FM Approved Limit
- Large Dual Display
- Universal Input
- Dedicated, Illuminated Reset Key
- Remote Reset Capability Standard
- Four Password Protected Security Levels

The 16L Series Temperature/Process FM Approved Limit Controls set a new standard in 1/16 DIN Limit controls. The 16L offers universal input (10 thermocouple types, 4 RTD types, voltage, and current), single set point or dual set point. Standard features include Remote Reset capability, Peak/Valley indication, open sensor protection, input rate of change protection, and much more.

Unit offers 1500 VAC resolution, selectable high or low input, programmable sensor break protection and adjustable differential.

Outputs include normally open (form A) and normally closed (form B) relays. Form A and form B relays can be setup one for each set point output and logically linked to emulate a form C output.

Designed and built in the USA, the 16L family of controls offers the highest levels of features, function, and quality available today.

## ACCESSORY

**MN-1**, RS485 to USB Signal Converter

## SPECIFICATIONS

**Selectable Inputs:** 10 Thermocouple, 4 RTD, DC Voltage, or DC Current selectable.

**Display:** Two 4 digit, 7 segment 0.3" (7.62 mm) high LEDs.

**Accuracy:**  $\pm 0.25\%$  of span,  $\pm 1$  least significant digit.

**Supply Voltage:** 100 to 240 VAC, nominal,  $+10 -15\%$ , 50 to 400 Hz. single phase; 132 to 240 VDC, nominal,  $+10 -20\%$ .

**Power Consumption:** 5 VA maximum.

**Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Memory Backup:** Nonvolatile memory. No batteries required.

**Control Output Ratings:** Relay: SPST, 3A @ 240 VAC resistive; 1.5A @ 240 VAC inductive.

**Weight:** 8 oz (227 g).

**Agency Approvals:** UL, FM.



### OUTPUT A\*

- 1 = AC SSR
- 2 = 15 VDC
- 3 = Relay N/O
- 4 = Relay N/C
- 8 = DC SSR

### OUTPUT B\*

- 0 = None
- 1 = AC SSR
- 2 = 25 VDC
- 3 = Relay N/O
- 4 = Relay N/C

### OPTIONS:

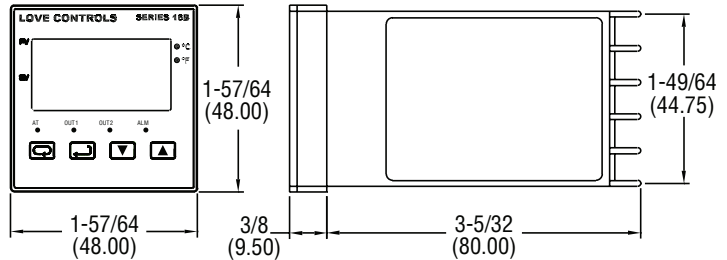
- 934** Analog Retransmission of Process Variable or Set Variable, 0 or 4 to 20 mADC, fully programmable and scalable.
- 936** Analog Retransmission of Process or Set Variable, 0 to 10 VDC, fully programmable and scalable.
- 992** RS-485 Serial Communications. Allows remote computer to read and write all control parameters.
- 993** RS-232 Serial Communications. Allows remote computer to read and write all control parameters.

\* When ordering a control to operate contractor or solenoid loads greater than 100 mA, it is suggested that the SSR output be selected rather than the RELAY. If the RELAY output is selected, then also order part number 541-0014, R/C Snubber.

Series 16B

# 1/16 DIN Temperature/Process Controller

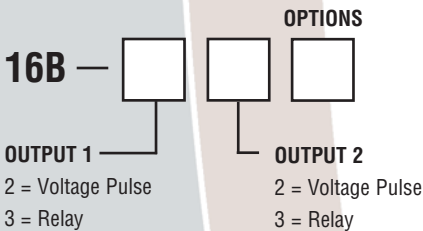
Dual Control Output, RS-485 Communication, Universal Inputs



**Monitor and control temperature or process applications** with precision using the Series 16B controllers. The units offer two separate outputs for dual loop control in direct or reverse acting. Select relay, voltage, or current output combined with a second relay output. The Series 16B provides dual LED displays for local indication of process value and setpoint value. Output status, engineering scale, auto tuning and alarm status is also indicated on the front panel. Control methods include ON/OFF, PID, self-tune and manual tune. PID control is supported with 64 ramp/soak control actions. Two additional alarm outputs are standard on the Series 16B. The alarm outputs can be quickly configured by using the thirteen built-in alarm functions. The controller easily communicates with other external devices such as PC's and PLC's for data search and system integration using the built-in RS-485 interface. Up to 247 communication addresses are available with transmission speeds of 2400 to 38,400 bps. The Series 16B also features universal input, selectable °F/°C, selectable resolution and security functions.

## SPECIFICATIONS

- Inputs:** Thermocouple, RTD, DC voltages or DC current.
- Display:** Two 4-digit, 7 segment .25" H (6.35 mm) LED's. PV: red; SV: green.
- Accuracy:** ±0.25% span, ±1 least significant digit.
- Supply Voltage:** 100 to 240 VAC, 50/60 Hz.
- Power Consumption:** 5 VA max.
- Operating Temperature:** 32 to 122°F (0 to 50°C).
- Memory Backup:** Nonvolatile memory.
- Control Output Ratings:**
  - Relay: SPST, 5A @ 250 VAC resistive.
  - Voltage pulse: 14V, 10% to -20% (max 40 mA).
  - Current: 4 to 20 mA.
- Communication:** RS-485 Modbus® A-5-11/RTU communication protocol.
- Weight:** 4 oz (114 g).
- Agency Approvals:** CE, UL, cUL.
- Front Panel Rating:** IP66.



### OPTIONS

- Blank = none
- 1 = Event input
- 2 = Current Transformer

### ACCESSORIES

- MN-1**, RS485 to USB Signal Converter
- SCD-SW**, Configuration Software
- A-277**, 250 Ohm Precision Resistor

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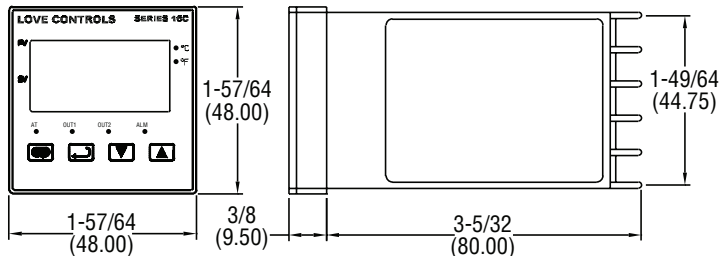
Input Types	Range
Type K T/C	-328 to 2372°F (-200 to 1300°C)
Type J T/C	-148 to 2192°F (-100 to 1200°C)
Type T T/C	-328 to 752°F (-200 to 400°C)
Type E T/C	32 to 1112°F (0 to 600°C)
Type W T/C	-328 to 2372°F (-200 to 1300°C)
Type R T/C	32 to 3092°F (0 to 1700°C)
Type S T/C	32 to 3092°F (0 to 1700°C)
Type B T/C	212 to 3272°F (100 to 1800°C)
Type L T/C	-328 to 1562°F (-200 to 850°C)
Type U T/C	-328 to 932°F (-200 to 500°C)
Pt 100 RTD	-328 to 1112°F (-200 to 600°C)
0-50 mV	-999 to 9999
0-5 V	-999 to 9999
0-10 V	-999 to 9999
0-20 mA*	-999 to 9999
4-20 mA*	-999 to 9999

\*Requires 250 Ohm Precision Resistor

Series 16C

# 1/16 DIN Temperature Controller

PID Control, Auto-Tuning, Dual Display, RS-485 Communication



The compact **Series 16C Temperature Controller** offers accurate temperature measurement and control in a 1/16 DIN package. Designed for direct or reverse acting (cooling or heating) control, the Series 16C can be programmed for simple ON/OFF or more complex PID control functions. PID control is supported with manual or auto-tuning. Select relay, voltage or current output for control methods. The Series 16C accepts a variety of thermocouple and RTD inputs. Process value and setpoint value are displayed simultaneously on the large dual LED. Auto-tuning, engineering units (°F or °C), and alarm status is also indicated on the faceplate. Two alarm outputs are included on the unit with 12 preprogrammed alarm functions.

## SPECIFICATIONS

- Inputs:** Thermocouple, RTD, see chart.
- Display:** Two 4-digit, 7 segment .25" H (6.35 mm) LED's. PV: red; SV: green.
- Accuracy:** ±0.25% span, ±1 least significant digit.
- Supply Voltage:** 100 to 240 VAC, 50/60 Hz.
- Power Consumption:** 5 VA max.
- Operating Temperature:** 32 to 122°F (0 to 50°C).
- Memory Backup:** Nonvolatile memory.
- Control Output Ratings:**
  - Relay: SPST, 5A @ 250 VAC resistive.
  - Voltage pulse: 14V, 10% to -20% (max 40 mA).
  - Current: 4 to 20 mA.
- Communication:** RS 485 Modbus® Communication Protocol.
- Weight:** 4 oz (114 g).
- Agency Approvals:** CE, UL, cUL.
- Front Panel Rating:** IP66.

Input Types	Range
Pt100Ω RTD	32 to 212°F (0 to 100°C) -4 to 932°F (-20 to 500°C)
T/C type B	-328 to 1112°F (-200 to 600°C)
T/C type S	212 to 3272°F (100 to 1800°C)
T/C type R	32 to 3092°F (0 to 1700°C)
T/C type N	32 to 3092°F (0 to 1700°C)
T/C type E	-328 to 2372°F (-200 to 1300°C)
T/C type T	32 to 1112°F (0 to 600°C)
T/C type J	-4 to 752°F (-20 to 400°C) -328 to 752°F (-200 to 400°C)
T/C type K	-4 to 752°F (-20 to 400°C) -148 to 1562°F (-100 to 850°C)
T/C type L	-328 to 2372°F (-200 to 1300°C)
T/C type U	-328 to 932°F (-200 to 500°C) -328 to 932°F (-200 to 500°C) -328 to 1472°F (-200 to 800°C)



- OUTPUTS**
- 2 = Voltage Pulse
  - 3 = Relay
  - 5 = Current

## ACCESSORIES

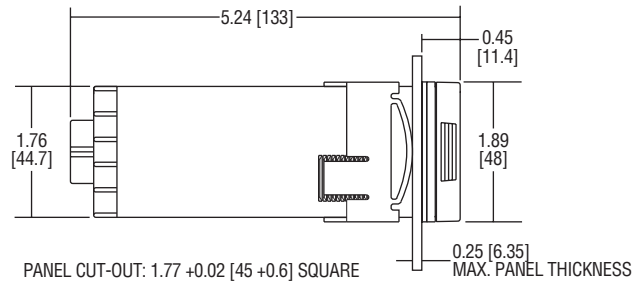
- MN-1**, RS485 to USB Signal Converter
- SCD-SW**, Configuration Software

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Series 16A

# Temperature Controller/Process

1/16 DIN, Universal Input, Fuzzy Logic, Self-Tune PID



Latest microprocessor based technology affords full programmability with complete array of features in compact ultra low cost unit. 16A Series Temperature/Process Controller features universal input, Self-Tune PID, Fuzzy Logic, and dual four-digit LED displays for process and set point value. Selectable inputs can be thermocouple, RTD, current or voltage. Available outputs are solid-state relay, relay, pulsed voltage, or proportional current. Programmable alarm (optional) can be reset automatically or manually. Front panel is waterproof and corrosion resistant (UL type 4-X), making it ideal for sanitary applications. Replace electronics without wiring changes (via removable front panel). Self diagnostics, nonvolatile memory and selectable control modes are all designed for greater productivity. Four security levels are password protected. On-off, P, PI or PID manual tune control functions can be selected or the controller will Self-Tune automatically for best PID control.

The 16A2 offers the best value in Standard Features in a Process and Temperature control. In addition to the features listed above, the 16A2 offers Peak/Valley indication, Percent Output indication, Digital Input Filter, and a host of others.

## SPECIFICATIONS

**Selectable Inputs:** Thermocouple, RTD, DC Voltage, or DC Current (See Input Ranges).

**Display:** Two four-digit LED displays, 0.3 in (7.62 mm) high.

**Display Resolution:** 1 degree or 0.1 degree (sensor dependent), or 1 count.

**Accuracy:**  $\pm 0.25\%$  of span  $\pm 1$  least significant digit.

**Supply Voltage:** 100 to 240 VAC nominal, +10% -15%, 50 to 400 Hz single phase; 132 to 240 VDC +10% -20%.

**Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Power Consumption:** 5 VA maximum.

### Control Output Ratings:

**SSR:** 2.0 A at 240 VAC resistive at 77°F (25°C). De-rates to 1.0 A at 130°F (55°C). Minimum load of 100 mA. **DC SSR:** 1.75 A at 32 VDC maximum. **Relay:** SPST, 3A at 240 VAC resistive, 1.5 A @ 240 VAC inductive. Pilot Duty rating: 250 VA, 2 A @ 120 VAC, 1 A @ 240 VAC.

**Alarm Relay:** SPST, 3 A @ 240 VAC resistive; 1.5 A @ 240 VAC inductive. Pilot Duty Rating: 240 VA, 2 A @ 120 VAC or 1 A @ 240 VAC. **Switched Voltage:** 15 VDC at 20 mA. **Proportional Current:** 0 to 20 mA DC, scalable, into 600 ohms maximum.

**Weight:** 8 oz (227g).

**Agency Approvals:** UL E83725, CE.

**Front Panel Rating:** Type 4X (IP66).

**Serial Communications (Optional):** RS-232 or RS-485 with either LoveLink™ Protocol or Modbus® RTU protocol.

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16A

### FEATURE SET

2 = Standard  
3 = Enhanced

### ALARM

0 = No  
1 = Yes

### OUTPUT A\*

1 = AC SSR  
2 = Switched 15 VDC  
3 = Relay, NO  
4 = Relay, NC  
5 = Current  
8 = DC SSR

### OUTPUT B\*

0 = None  
1 = AC SSR  
2 = Switched 15 VDC  
3 = Relay, NO  
4 = Relay, NC  
5 = Current

### OPTIONS

### OPTIONS:

- 934\*\* Analog Retransmission of Process or Set Variable, 4 to 20 mA.
- 936\*\* Analog Retransmission of Process or Set Variable, 0 to 10 VDC.
- 948\*\* 4-Stage Set Point. One of four pre-set set point values can be implemented via contact closure.
- 992\*\* RS-485 Serial Communications. Allows remote computer to read and write all control parameters.
- 993\*\* RS-232 Serial Communications. Allows remote computer to read and write all control parameters.
- 995\*\* RS-232 Modbus® Serial Communications. Allows remote computer to read and write all control parameters.
- 996\*\* RS-485 Modbus® Serial Communications. Allows remote computer to read and write all control parameters.
- 9152\*\* Remote Run/Hold for Ramp/Soak Feature.
- 9502 12 to 24 VDC / VAC 50 to 400 Hz control operation.

\* If using a SSR output to drive a relay or other coil driven device, make sure that the coil HOLDING current is greater than 100 mA.  
If the RELAY output is selected to drive a contractor or other coil driven device, then also order part number 541-0014, R/C Snubber.

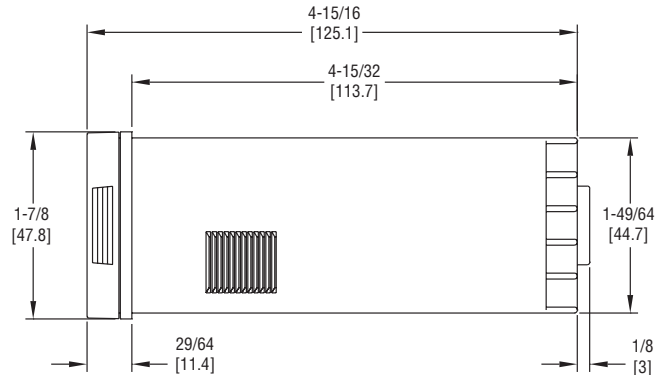
\*\* These options may not be combined with each other.



Series 1500

# Temperature Controller

1/16 DIN, Microprocessor Based, Self-Tune PID



The Love Series 1500 Temperature Controller is a reliable, accurate and fully programmable temperature control or alarm in an economical 1/16 DIN case. Microprocessor based, all control functions are easily programmed from the waterproof, corrosion resistant front panel. Models are available that accept field selectable J, K or T type thermocouples or RTD 100Ω DIN (.00385 ohms/ohm/°C) inputs and provide SSR, Relay or 5 VDC Logic outputs. All models are programmable for on-off, P, PI, manual PID or automatic Self-Tune PID control. Like the control output, optional alarm is field configurable direct acting (cooling) or reverse acting (heating) and is easily adjusted for either automatic or manual reset to provide independent high or low system protection. Four security levels are password protected.

## SPECIFICATIONS

**Inputs:** Thermocouple (J type stocked), field selectable K, T, E, or N type; RTD (100Ω DIN).

**Display:** 4 digit, 7 segment 0.3" high LED display; Set Point and Alarm status LED indicators; °F or °C LED indicators.

**Accuracy:** ±0.25% of span ±1 least significant digit.

**Supply Voltage:** 100 to 240 VAC, 50 – 400 Hz. single phase; 132 to 240 VDC (nom.) +10% – 20%. 5 VA maximum power consumption.

**Temperature Range:** Operating 14 to 131°F (-10 to 55°C); storage -40 to 176°F (-40 to 80°C).

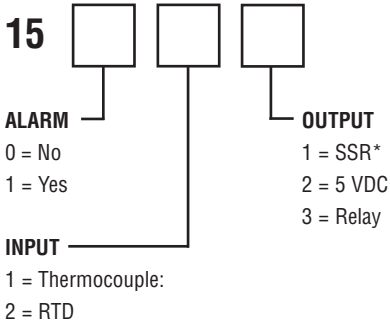
**Output Ratings:** SSR: 3.5A @ 240 VAC max. @ 77°F (25°C) typical. Relay (SPST): 3A res., 1.5A ind. @ 250 VAC; Pilot Duty = 250 VA, 2A @ 125 VAC or 1A @ 250 VAC.

**Alarm Rating (optional):** Relay (SPST): 3A res., 1.5A ind. @ 250 VAC. Isolation: Relay and SSR outputs are isolated.

**Sensor Break Protection:** De-energizes control output.

**Weight:** 8 oz (227 g).

**Front Panel Rating:** NEMA 4X (IP65).



\* When ordering a control to operate contractor or solenoid loads greater than 100 mA, it is suggested that the SSR output be selected rather than the RELAY. If the RELAY output is selected, then also order part number 541-0014, R/C Snubber.

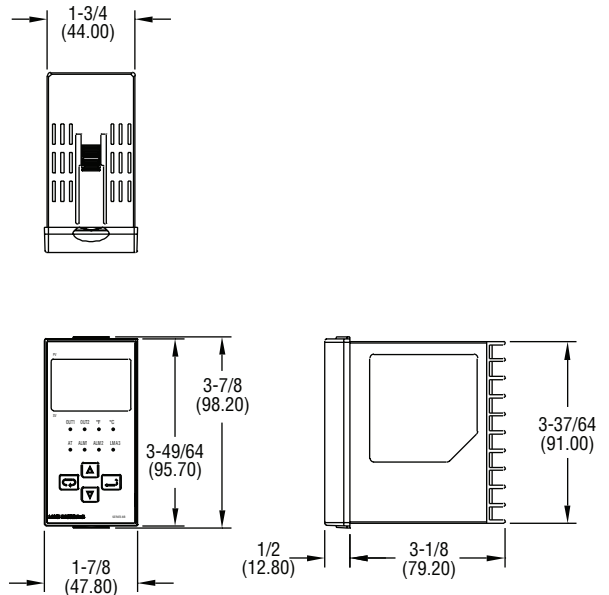
**R/C Snubber:** Recommended for solenoid or contactor loads. Order optional Part Number A-600.

**No. A-600, R/C Snubber** — For solenoid or contactor loads

Series 8B

# 1/8 DIN Temperature/Process Controller

Vertical Mount, Dual Control Output, RS-485 Communication



The Series 8B 1/8 DIN Temperature/Process Controller offers versatility and reliability for temperature and process monitoring applications. Designed as a vertical mount 1/8 DIN controller, the Series 8B features dual outputs, universal input, and up to three additional alarm outputs. The second output can be configured as a third alarm output. Select the alarm type from 13 different preprogrammed alarm functions. Control methods include ON/OFF, PID, auto-tune or manual tune. PID control is supported with 64 ramp/soak control actions. RS-485 communication is standard on the Series 8B with up to 247 available addresses.

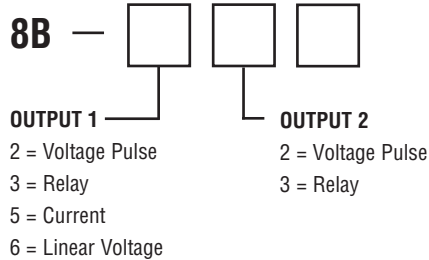
## SPECIFICATIONS

- Inputs:** Thermocouple, RTD, DC voltages or DC current.
- Display:** Two 4-digit, 7 segment .38" H (9.53 mm) LED's. PV: red; SV: green.
- Accuracy:**  $\pm 0.25\%$  span,  $\pm 1$  least significant digit.
- Supply Voltage:** 100 to 240 VAC, 50/60 Hz.
- Power Consumption:** 5 VA max.
- Operating Temperature:** 32 to 122°F (0 to 50°C).
- Memory Backup:** Nonvolatile memory.
- Control Output Ratings:**
  - Relay: SPST, 5A @ 250 VAC resistive.
  - Voltage pulse: 14V, 10% to -20% (max 40 mA).
  - Current: 4 to 20 mA.
  - Linear Voltage: 0-5V, 0-10V.
- Communication:** RS-485 Modbus® communication protocol.
- Weight:** 15 oz (425 g).
- Agency Approvals:** CE, UL, cUL.
- Front Panel Rating:** IP66.

Input Types	Range
Type K T/C	-328 to 2372°F (-200 to 1300°C)
Type J T/C	-148 to 2192°F (-100 to 1200°C)
Type T T/C	-328 to 752°F (-200 to 400°C)
Type E T/C	32 to 1112°F (0 to 600°C)
Type W T/C	-328 to 2372°F (-200 to 1300°C)
Type R T/C	32 to 3092°F (0 to 1700°C)
Type S T/C	32 to 3092°F (0 to 1700°C)
Type B T/C	212 to 3272°F (100 to 1800°C)
Type L T/C	-328 to 1562°F (-200 to 850°C)
Type U T/C	-328 to 932°F (-200 to 500°C)
Pt 100 RTD	-328 to 1112°F (-200 to 600°C)
0-50 mV	-999 to 9999
0-5 V	-999 to 9999
0-10 V	-999 to 9999
0-20 mA*	-999 to 9999
4-20 mA*	-999 to 9999

\*Requires 250 Ohm Precision Resistor.

## OPTIONS



## OPTIONS

- Blank = none
- 1 = Event input
- 2 = Current Transformer

## ACCESSORIES

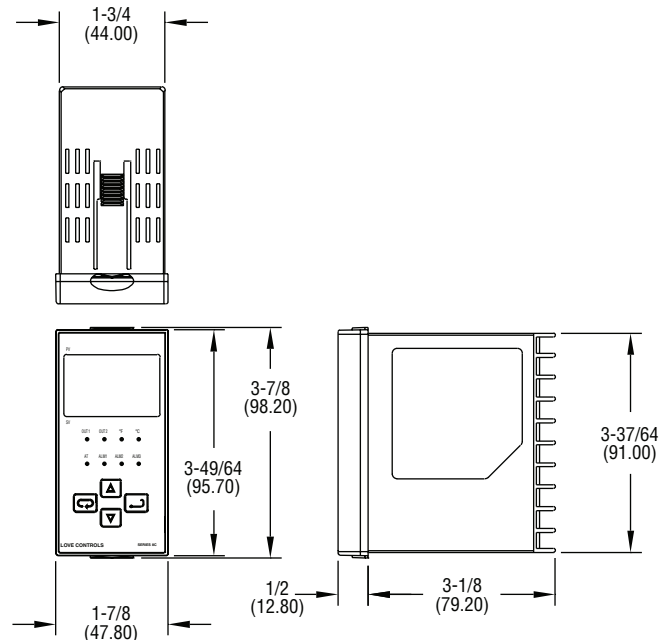
- MN-1**, RS485 to USB Signal Converter
- SCD-SW**, Configuration Software
- A-277**, 250 Ohm Precision Resistor

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Series 8C

# 1/8 DIN Temperature Controller

ON/OFF or PID Control, Auto-Tuning, RS 485 Communication



The Series 8C Temperature Controller offers easy-to-use programming menus designed for quick installation. The unit is designed for direct or reverse acting (cooling or heating) control. The Series 8C can be programmed for simple ON/OFF or more complex PID control functions. PID control is supported with manual or auto-tuning. Select relay, voltage pulse, or current output control methods. The controller also includes two additional alarm outputs. The alarm outputs can be configured from 12 different preprogrammed settings. The temperature controller accepts a variety of thermocouple and RTD inputs. The process value and setpoint value are displayed simultaneously on the large dual LED. Auto-tuning, engineering units (°F or °C) and alarm status is also indicated on the faceplate.

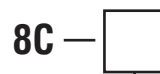
## SPECIFICATIONS

- Inputs:** Thermocouple & RTD (see chart).
- Display:** Two 4-digit, 7 segment .38" H (9.53 mm) LED's. PV: red; SV: green.
- Accuracy:** ±0.25% span, ±1 least significant digit.
- Supply Voltage:** 100 to 240 VAC, 50/60 Hz.
- Power Consumption:** 5 VA max.
- Operating Temperature:** 32 to 122°F (0 to 50°C).
- Memory Backup:** Nonvolatile memory.
- Control Output Ratings:**
  - Relay: SPDT, 5A @ 250 VAC resistive.
  - Voltage pulse: 14V, 10% to -20% (max 40 mA).
  - Current: 4 to 20 mA.
  - Communication: RS 485 Modbus® Communication Protocol.

- Weight:** 15 oz (425 g).
- Agency Approvals:** CE, UL, cUL.
- Front Panel Rating:** IP66.

## ACCESSORIES

- MN-1,** RS485 to USB Signal Converter
- SCD-SW,** Configuration Software



## OUTPUTS

- 2 = Voltage Pulse
- 3 = Relay
- 5 = Current

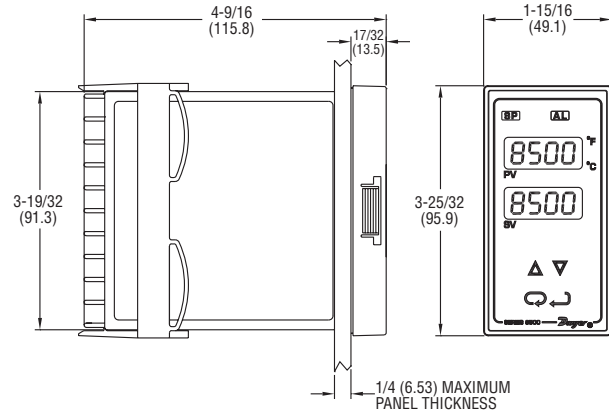
Input Types	Range
Pt100Ω RTD	32 to 212°F (0 to 100°C) -4 to 932°F (-20 to 500°C) -328 to 1112°F (-200 to 600°C)
T/C type B	212 to 3272°F (100 to 1800°C)
T/C type S	32 to 3092°F (0 to 1700°C)
T/C type R	32 to 3092°F (0 to 1700°C)
T/C type N	-328 to 2372°F (-200 to 1300°C)
T/C type E	32 to 1112°F (0 to 600°C)
T/C type T	-4 to 752°F (-20 to 400°C) -328 to 752°F (-200 to 400°C)
T/C type J	-4 to 752°F (-20 to 400°C) -148 to 1562°F (-100 to 850°C)
T/C type K	-328 to 2372°F (-200 to 1300°C) -328 to 932°F (-200 to 500°C)
T/C type L	-328 to 932°F (-200 to 500°C)
T/C type U	-328 to 1472°F (-200 to 800°C)

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Series 8500

# Temperature/Controller

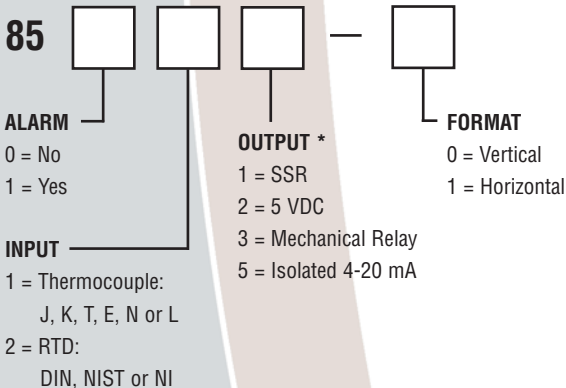
1/8 DIN, Fully Programmable, Self-Tune PID



Panel cutout 1.772" x 3.622" (45 x 92 mm).

The Love Series 8500 Temperature/Process Control provides an impressive selection of features in a compact, economical 1/8 DIN package. Features include on-off, time proportioning, proportional, PI, PD or full PID control – fully programmable from the front panel – or use Self-Tune PID. Inputs are selectable from a variety of thermocouple types including J, K, T, E, N or L; DIN NIST or Ni RTD's. Output choices include solid state relay, mechanical relay, 5 VDC – ideal for driving an external SSR – or isolated 4-20 mA proportional current. An optional programmable alarm provides a full array of alarm action configurations including high alarm, low alarm and high/low guardband alarm. Manual reset, power-up inhibit and power interrupt reset provide additional alarm flexibility.

A water and corrosion resistant front panel (NEMA 4X, IP65), input fault timer, digital input filter, Self-Tune ramp to setpoint, four password protected security levels and °F or °C display selection are all standard. Entire electronics package is easily field replaceable without wiring changes thanks to the removable front panel.



\* If using a SSR output to drive a relay or other coil driven device, make sure that the coil HOLDING current is greater than 100 mA. If the RELAY output is selected to drive a contractor or other coil driven device, then also order part number 541-0014, R/C Snubber.

## SPECIFICATIONS

**Inputs:** Thermocouple or RTD.

**Display:** Two 4 digit, 7 segment LED; models; 0.3" (7.62 mm) high.

**Resolution:** 1 degree or 0.1 degree.

**Accuracy:** ±0.25% of span, ±1 degree.

**Supply Voltage:** 100 to 240 VAC nominal, +10%-15%, 50-400 Hz, single phase; 132-240 VDC nominal, +10%-20%.

**Power Consumption:** 5 VA maximum.

**Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Memory Backup:** Non-volatile memory. No batteries required.

### Control Output Ratings:

**SSR:** 2.5A @ 240 VAC resistive at 77°F (25°C).

De-rate to 1.25A @ 130°F (55°C).

**Relay:** SPDT, 10A @ 240 VAC resistive.

**Alarm Relay:** SPST, 3A @ 240 VAC resistive.

**Switched Voltage (non-isolated):** 5 VDC @ 20 mA.

**Proportional Isolated Current:** 0-20 mA, selectable, into 600 ohms maximum.

**Control Action:** Selectable for Reverse (usually heating) or Direct (usually cooling).

**Ramp:** One ramp time adjustable from 0 to 100 hours.

**Isolation:** Relay and SSR outputs; 1500 VAC. 0-20 mA output; 500 VAC. 5 VDC output is not isolated.

**Weight:** 13 oz (369 g).

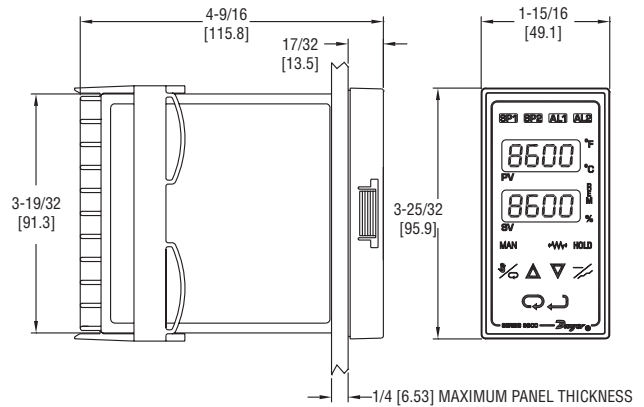
Series  
8600

# Temperature/Process Controller

1/8 DIN Self-Tune PID, Fuzzy Logic Software



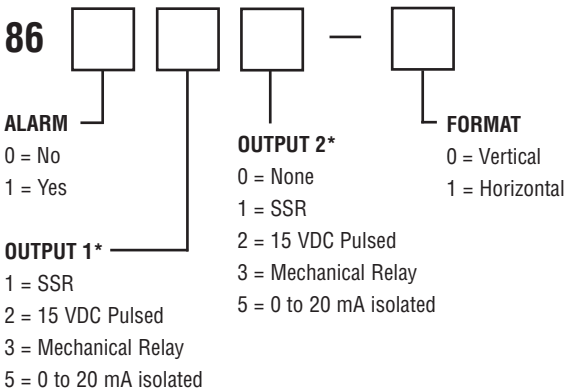
Temperature  
Controls



Panel cutout 1.772" x 3.622" (45 x 92 mm).

**Series 8600 Temperature/Process Controllers** set a new standard for quality, ease-of-use and value. While a high level of standard features are included, many function setup items appear in the control menu only when the function is selected, so you don't have to wade through unnecessary items. Units feature a universal input for thermocouple types J, K, E, T, L, N, B, C, S, & R; RTDs – 100Ω Plt. NIST, 100Ω Plt. DIN, 120Ω Ni Industrial, 1000Ω Plt. DIN; differential input (-10 to +10 mV DC) and process input (0 to 20 mA DC, 0 to 10 VDC). A standard 24 volt isolated, regulated power supply is included to operate most standard 4-20 mA transmitters.

Standard features include Self-Tune, Fuzzy Logic, fully adjustable PID, Auto/Manual control with bumpless transfer and front panel activation key, percent output indication, peak and valley indication, loop break protection and indication. For process inputs, the display is fully programmable from -1999 to +9999 with selectable decimal point location. Most thermocouple and RTD inputs can show whole or tenth degree displays. The Series 8600 is available with single or dual setpoint outputs and can be programmed for on-off, PID or heat/cool or latching alarm. All outputs are isolated from the inputs. Outputs include 10 amp relay, 2.5 amp SSR and 0-20 mA DC (scalable). 15 VDC SSR drive is standard.



## STANDARD FEATURES

- NEMA 4X (IP 65) Front Panel Resists Dust & Moisture
- Four Password Protected Security Levels
- Front Panel Programmability
- 16 Segments of Ramp/Soak with Program End Control
- Operates on 100-240 VAC, 132-240 VDC

## SPECIFICATIONS

**Selectable Inputs:** Thermocouple, RTD, DC voltage or DC current.

### Input Impedance:

- Thermocouple** — 3 megohms minimum.
- Voltage** — 5000 ohms.
- Current** — 10 ohms.
- RTD Current** — 200μA maximum.

**Display:** Two 4 digit, 7 segment LED; 0.4" (10 mm) high — horizontal models; 0.3" (7.62 mm) high — vertical models.

**Accuracy:** ±0.25% of span, ±1 least significant digit.

**Supply Voltage:** 100 to 240 VAC nominal, +10%-15%, 50 to 400 Hz, single phase; 132 to 240 VDC +10%-20%.

**Operating Temperature:** 14 to 131°F (-10 to 55°C).

### Control Output Ratings:

- SSR:** 2.5 A at 240 VAC resistive at 77°F (25°C). De-rate to 1.25 A at 130°F (55°C).
- Relay:** SPDT, 10 A at 240 VAC resistive, 1/2 hp at 120 VAC, 1/3 hp at 240 VAC.
- Alarm Relay:** SPST, 3 A at 240 VAC resistive.
- Switched Voltage:** 15 VDC at 20 mA.
- Proportional Current:** 0-20 mA DC, scalable into 600 ohms maximum.

**Weight:** 13 oz (369 g).

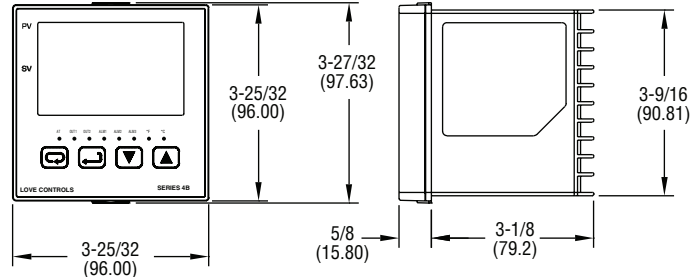
\* If using a SSR output to drive a relay or other coil driven device, make sure that the coil HOLDING current is greater than 100 mA. If the RELAY output is selected to drive a contractor or other coil driven device, then also order part number 541-0014, R/C Snubber.



Series 4B

# 1/4 DIN Temperature/Process Controller

Dual Control Output, RS-485 Communication, Auto-Tuning



The Series 4B 1/4 DIN Temperature/Process Controller is designed to accept thermocouple, RTD, current or voltage input and provide dual outputs for control. Available outputs include relay/relay, voltage pulse/relay, current/relay, or linear voltage/relay. The units can be programmed for ON/OFF, PID, auto-tuning, or manual tuning control methods. The PID control is supported by 64 ramp/soak actions. The Series 4B also includes two additional alarm outputs. The second relay output can be reconfigured as a third alarm output. The alarm type can be selected from 13 different preprogrammed alarm functions. The controller features dual LED displays for local indication of process and setpoint values.

### ACCESSORIES

- MN-1**, RS485 to USB Signal Converter
- SCD-SW**, Configuration Software
- A-277**, 250 Ohm Precision Resistor

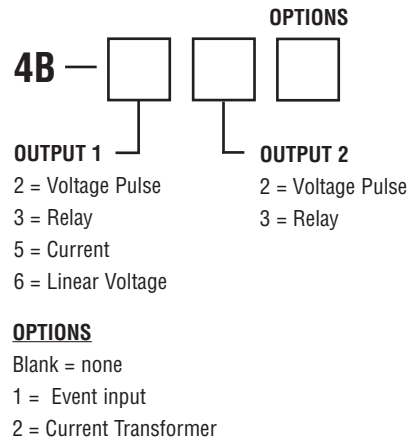
Input Types	Range
Type K T/C	-328 to 2372°F (-200 to 1300°C)
Type J T/C	-148 to 2192°F (-100 to 1200°C)
Type T T/C	-328 to 752°F (-200 to 400°C)
Type E T/C	32 to 1112°F (0 to 600°C)
Type W T/C	-328 to 2372°F (-200 to 1300°C)
Type R T/C	32 to 3092°F (0 to 1700°C)
Type S T/C	32 to 3092°F (0 to 1700°C)
Type B T/C	212 to 3272°F (100 to 1800°C)
Type L T/C	-328 to 1562°F (-200 to 850°C)
Type U T/C	-328 to 932°F (-200 to 500°C)
Pt 100 RTD	-328 to 1112°F (-200 to 600°C)
0-50 mV	-999 to 9999
0-5 V	-999 to 9999
0-10 V	-999 to 9999
0-20 mA*	-999 to 9999
4-20 mA*	-999 to 9999

\*Requires 250 Ohm Precision Resistor.

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### SPECIFICATIONS

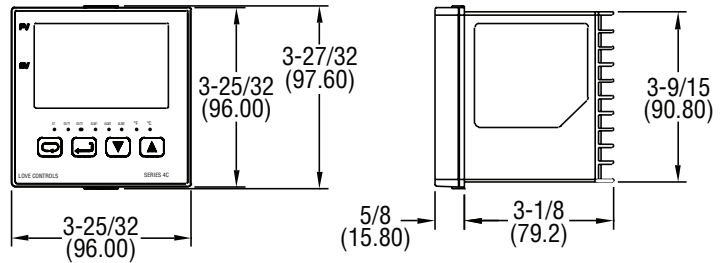
- Inputs:** Thermocouple, RTD, DC voltages or DC current.
- Display:** Two 4-digit, 7 segment. PV: 3/4" H (19 mm) red; SV: 1/2" H (12.7 mm) green.
- Accuracy:** ±0.25% span, ±1 least significant digit.
- Supply Voltage:** 100 to 240 VAC, 50/60 Hz.
- Power Consumption:** 5 VA max.
- Operating Temperature:** 32 to 122°F (0 to 50°C).
- Memory Backup:** Nonvolatile memory.
- Control Output Ratings:**
  - Relay: SPDT, 5A @ 250 VAC resistive.
  - Voltage pulse: 14V, 10% to -20% (max 40 mA).
  - Current: 4 to 20 mA.
  - Linear Voltage: 0-5V, 0-10V.
- Communication:** RS-485 Modbus® A-5-11/RTU communication protocol.
- Weight:** 15 oz (425 g).
- Agency Approvals:** CE, UL, cUL.
- Front Panel Rating:** IP66.



Series 4C

# 1/4 DIN Temperature Controller

PID Control, Auto-Tuning, Large Dual Display, RS 485 Communication



The Series 4C 1/4" DIN Temperature Controller offers easy-to-use programming menus designed for quick installation. Control functions include ON/OFF, PID, auto-tuning or manual tuning. The Series 4C is available with relay, voltage or current output with two additional alarm outputs. The alarm outputs can be configured from 12 different preprogrammed settings. The Series 4C accepts a variety of thermocouple and RTD inputs. Process value and setpoint value are simultaneously displayed with the process value in red and setpoint in green.

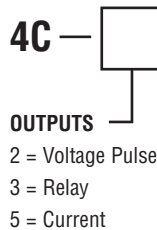
### ACCESSORIES

- MN-1, RS485 to USB Signal Converter
- SCD-SW, Configuration Software

Input Types	Range
Pt100Ω RTD	32 to 212°F (0 to 100°C) -4 to 932°F (-20 to 500°C) -328 to 1112°F (-200 to 600°C)
T/C type B	212 to 3272°F (100 to 1800°C)
T/C type S	32 to 3092°F (0 to 1700°C)
T/C type R	32 to 3092°F (0 to 1700°C)
T/C type N	-328 to 2372°F (-200 to 1300°C)
T/C type E	32 to 1112°F (0 to 600°C)
T/C type T	-4 to 752°F (-20 to 400°C) -328 to 752°F (-200 to 400°C)
T/C type J	-4 to 752°F (-20 to 400°C) -148 to 1562°F (-100 to 850°C)
T/C type K	-328 to 2372°F (-200 to 1300°C) -328 to 932°F (-200 to 500°C)
T/C type L	-328 to 932°F (-200 to 500°C)
T/C type U	-328 to 1472°F (-200 to 800°C)

### SPECIFICATIONS

- Inputs:** Thermocouple or RTD, see chart.
- Display:** Two 4-digit, 7 segment. LED's. PV: red .75" H (19 mm); SV: green .5" (12.7 mm).
- Accuracy:** ±0.25% span, ±1 least significant digit.
- Supply Voltage:** 100 to 240 VAC, 50/60 Hz.
- Power Consumption:** 5 VA max.
- Operating Temperature:** 32 to 122°F (0 to 50°C).
- Memory Backup:** Nonvolatile memory.
- Control Output Ratings:**
  - Relay: SPST, 5A @ 250 VAC resistive.
  - Voltage pulse: 14V, 10% to -20% (max 40 mA).
  - Current: 4 to 20 mA.
- Communication:** RS 485 Modbus® Communication Protocol.
- Weight:** 15 oz (472 g).
- Agency Approvals:** CE, UL, cUL.
- Front Panel Rating:** IP66.

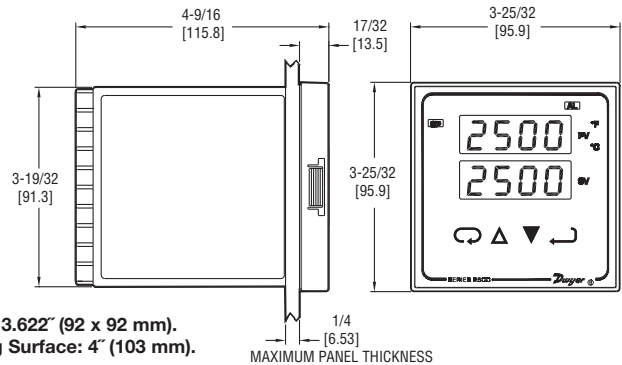


Modbus® is a registered trademark of Schneider Automation.

Series 2500

# Temperature/Controller

1/4 DIN Fully Programmable, Self-Tune PID



Panel cutout 3.622" x 3.622" (92 x 92 mm).  
Depth Behind Mounting Surface: 4" (103 mm).

The Love Series 2500 Temperature Control provides an impressive array of features in an economical 1/4 DIN package. Features include on-off, time proportioning, proportional, PI, PD, or full PID control, programmable from the front panel, or use Self-Tune PID. Input types are selectable from a variety of thermocouple types (J, K, T, E, N or L) or DIN, NIST or Ni RTD's. Outputs include solid state relay, mechanical relay, 5 VDC (ideal for driving an external SSR) or isolated 4-20 mA proportional current. Programmable alarm can act as high or low or high/low guardband alarm.

A water and corrosion resistant front panel (NEMA 4X; IP 65), input fault timer, digital input filter, Self-Tune ramp to setpoint, four password protected security levels and °F or °C display selection are all standard. Entire electronics package is field replaceable without wiring changes thanks to removable front panel.

## 25

### ALARM

- 0 = No
- 1 = Yes

### INPUT

- 1 = Thermocouple:  
J, K, T, E, N or L
- 2 = RTD:  
DIN, NIST or NI

### OUTPUT

- 1 = SSR\*
- 2 = 5 VDC
- 3 = Mechanical Relay
- 5 = Isolated 4-20 mA

\* If using a SSR output to drive a relay or other coil driven device, make sure that the coil HOLDING current is greater than 100 mA.  
If the RELAY output is selected to drive a contractor or other coil driven device, then also order part number 541-0014, R/C Snubber.

## SPECIFICATIONS

**Inputs:** Thermocouple or RTD.

**Input Impedance:** Thermocouple = 3 megohms minimum, RTD current = 200 µA maximum.

**Display:** Two-4 digit, 7 segment, 0.56" high LED.  
Resolution: 1 degree or 0.1 degree.

**Accuracy:** ±0.25% of span, ±1 degree.

**Supply Voltage:** 100-240 VAC nominal, ±10%, 50-400 Hz, single phase; 132-240 VDC nominal, ±10%.

**Power Consumption:** 5 VA maximum.

**Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Memory Backup:** Non-volatile memory. No batteries required.

### Control Output Ratings:

**SSR:** 2.5A @ 240 VAC resistive at 77°F (25°C). De-rates to 1.25A @ 130°F (55°C).

**Relay:** SPDT, 10 A @ 240 VAC resistive.

**Switched Voltage (non-isolated):** 5 VDC @ 20 mA.

**Proportional Isolated Current:** 0-20 mA, selectable, into 600 Ohms maximum.

**Control Action:** Selectable for reverse (usually heating) or direct (usually cooling).

**Ramp:** One ramp time adjustable from 0-100 hours.

**Isolation:** Relay and SSR outputs; 1500 VAC. 0-20 mA output; 500 VAC. 5 VDC output is not isolated.

**Weight:** 13 oz (369 g).

**Front Panel Rating:** NEMA 4X (IP65).

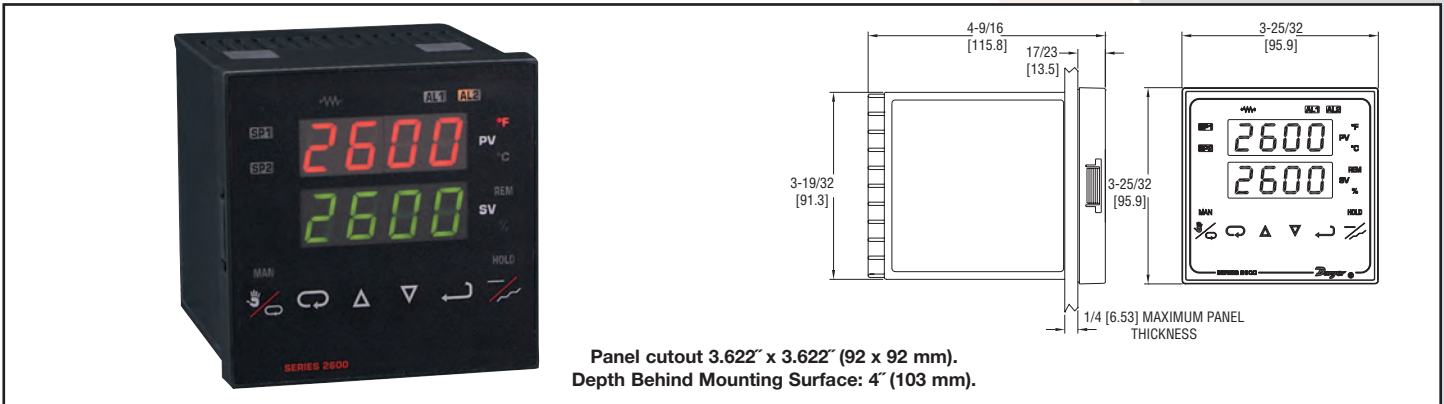
Series  
2600

# Temperature/Process Controller

1/4 DIN Self-Tune PID, Fuzzy Logic Software



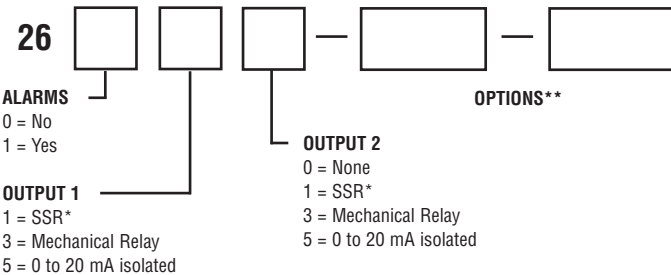
Temperature  
Controls



Panel cutout 3.622" x 3.622" (92 x 92 mm).  
Depth Behind Mounting Surface: 4" (103 mm).

**Series 2600 Temperature/Process Controllers** set a new standard for quality, versatility, ease-of-use and value. While they include a high level of standard features, many function setup items appear in the control menu only when the function is selected, so you don't have to wade through unnecessary items. Units feature a universal input for thermocouple types J,K,E,T,L,N,B,C,S & R; RTDs 100Ω Pt. NIST, 100Ω Pt. DIN, 120Ω Ni Industrial, 1000Ω Pt. DIN; differential input (-10 to +10 mV DC) and process input (0 to 20 mA DC, 0 to 10 VDC). A standard 24 Volt isolated, regulated power supply is included to operate most standard 4-20 mA transmitters.

Standard features include Self-Tune, Fuzzy Logic, fully adjustable PID, Auto/Manual control with bumpless transfer and front panel activation key, percent output indication, peak and valley indication, loop break protection and indication. For process inputs, the display is fully programmable from -1999 to +9999 with selectable decimal point location. Most thermocouple and RTD inputs can show whole or tenth degree displays. The Series 2600 is available with single or dual setpoint outputs and can be programmed for on-off, PID or heat/cool or latching alarm. All outputs are isolated from the inputs. Outputs include 10 Amp relay, and 0-20 mA DC (scalable).



**\*\*OPTIONS:**

- 924, 926, 928** Analog Remote Set Point. Allows remote setting of Set Point 1 through an external analog signal of 0 to 10 VDC (924), 0 to 20 mADC (926), or 0 to 10,000 ohms (928), field scalable. Set point reverts to internal value if signal is invalid.
- 934, 936** Process or Set Point Retransmission. Provides a 0 to 10 VDC (936) or 0 to 20 mADC (934) (field scalable) to follow the process variable or the set variable (field selectable) over a user specified range.
- 948** 4-Stage Set Point. Allows remote selection of up to 4 preset set point values via external switch closures.
- 986** Control provided in portable housing. See page 51.
- 992, 993** Serial Communications. Allows communication between control and remote host computer through a RS-485 (992) serial communication line with half duplex operation (2-wire) or through a RS-232 (993) serial communication line with full duplex operation (3-wire).
- 994** Serial Communications. RS-485 with SPI protocol.
- 995** Serial Communications. RS-232 with Modbus® protocol.
- 996** Serial Communications. RS-485 with Modbus® protocol.

\* If using a SSR output to drive a relay or other coil driven device, make sure that the coil HOLDING current is greater than 100 mA.  
If the RELAY output is selected to drive a contractor or other coil driven device, then also order part number 541-0014, R/C Snubber.

**STANDARD FEATURES**

- NEMA 4X (IP65) Front Panel Resists Dust & Moisture
- Four Password Protected Security Levels
- Front Panel Programmability
- 16 Segments of Ramp/Soak with Program End Control
- Operates on 100-240 VAC, 132-240 VDC

**SPECIFICATIONS**

**Selectable Inputs:** Thermocouple, RTD, DC voltage or DC current.

**Input Impedance:**

**Thermocouple** — 3 Megohms minimum.

**Voltage** — 5000 ohms.

**Current** — 10 ohms.

**RTD Current** — 200 μA maximum.

**Display:** Two 4 digit, 7 segment, 0.56" (14.2 mm) high LED.

**Accuracy:** ±0.25% of span, ±1 least significant digit.

**Supply Voltage:** 100 to 240 VAC nominal, +10%-15%, 50 to 400 Hz, single phase; 132 to 240 VDC +10% -20%.

**Operating Temperature:** 14 to 131°F (-10 to 55°C).

**Control Output Ratings:**

**Relay:** SPDT, 10A @ 240 VAC resistive, 1/2 hp @ 120 VAC, 1/3 hp @ 240 VAC.

**Alarm Relay:** SPST, 3A @ 240 VAC resistive.

**Proportional Current:** 0-20 mA DC, scalable into 600 ohms maximum.

**Weight:** 13 oz (369 g).

**Front Panel Rating:** NEMA 4X (IP65).

**ACCESSORIES**

**MN-1,** RS485 to USB Signal Converter

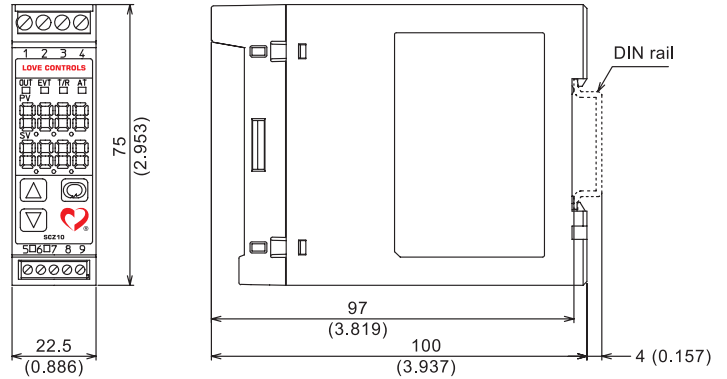
**541-0014,** R/C Snubber



Series SCZ10

# DIN Rail Mount Temperature/Process Control

Universal Input, Two-Color Dual Display



The Series SCZ10 has its own dual display and keypad, making process monitoring and programming a snap. The universal input allows field programming for a wide variety of sensors, making the SCZ10 one of the most flexible controls or transmitters available today. When used as a control, the SCZ10 is available with mechanical relay, switched (pulsed) DC for SSRs, or proportional current (4-20 mA) to drive motor actuators or proportional power units (SCRs). When used as a transmitter, the 4-20 mA output may be scaled virtually anywhere on the input scale, allowing for the greatest application flexibility.

**FEATURES**

- Dual display
- Control or Transmitter
- SelfTune and PID
- Directly Programmable from Self Contained Keypad
- Universal Input
- Compact DIN Rail Mount

**SCZ10**

**OUTPUT**

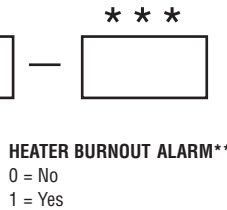
- 1 = Relay
- 2 = Switched Voltage
- 3 = Current (4-20mA)

**POWER**

- 0 = Line (120-240 VAC/VDC)
- 1 = Low (24 VAC/VDC)

**RS-485 COMMUNICATIONS\***

- 0 = No
- 1 = Modbus® RTU



**\*\*\* MAX. CURRENT**

- 00 = NA
- 05 = 5 Amps
- 10 = 10 Amps
- 20 = 20 Amps
- 50 = 50 Amps

**NOTES:**

- \* The RS-485 and Heater Burnout Alarm options are mutually exclusive.
- \*\* The Current Alarm is only available for outputs 1 and 2.

INPUT TYPE	RANGE °F	RANGE °C
Type J Thermocouple	-320 to 1800	-200 to 1000 <sup>1</sup>
Type K Thermocouple	-320 to 2500 <sup>1</sup>	-200 to 1370 <sup>1</sup>
Type T Thermocouple	-200 to 750 <sup>1</sup>	-200 to 400 <sup>1</sup>
Type E Thermocouple	-320 to 1500	-200 to 800
Type R Thermocouple	0 to 3200	-17 to 1760
Type S Thermocouple	0 to 3200	-17 to 1760
Type B Thermocouple	0 to 3300	0 to 1820
Type C Thermocouple	0 to 4200	0 to 2315
Type PL-II Thermocouple	0 to 2500	0 to 1390
Type N Thermocouple	-320 to 1500	-200 to 800
100Ω PIt. 0.00385 DIN RTD	-300 to 1500 <sup>1</sup>	-200 to 850 <sup>1</sup>
100Ω PIt. 0.003916 JIS1 RTD	-300 to 900 <sup>1</sup>	-200 to 500 <sup>1</sup>

Current/Voltage/Δ Voltage<sup>2</sup> Scalable Units from -1999 to +9999

<sup>1</sup> These input ranges can be set for 0.1° display. Range may be limited to no greater than 999.9° or less than -199.9°.

<sup>2</sup> The 0 to 20 mADC, 4 to 20 mADC, 0 to 5 VDC, 1 to 5 VDC, and 0 to 10 VDC inputs are fully scalable from a minimum of 100 counts span placed anywhere within the range of -1999 to +9999. Decimal point position is adjustable from the zero place (9999), tenths (999.9) place, or hundredths (99.99) place.

**SPECIFICATIONS**

**Input:**

- Thermocouple:** K, J, R, S, E, T, N, PL-II, C (W/Re5-26).
- External Resistance:** 100Ω or less.
- B Thermocouple:** External resistance: 40Ω or less.
- RTD:** Pt100, JPt100 3-wire system. Allowable input wire resistance (10Ω or less per wire).
- DC Current:** 0 to 20 mAdc, 4 to 20 mA input impedance 50Ω (50Ω shunt resistor sold separately).
- DC Voltage:** 0 to 1 VDC.
- Input Impedance:** 1MΩ or greater.

**Output Ratings**

- Relay Contact:** 3A @ 250 VAC, Resistive; 1A @ 250 VAC Inductive (CØS =0.4), Electric life 100,000 cycles.
- Switched Voltage (for SSR drive):** 12 VDC @ 40 mA Max. (Short-circuit protected)
- DC Current:** 4 to 20 mAdc, Load resistance: Max. 550Ω Output accuracy: ±0.3% of output span. Resolution : 12,000 counts.

**Control Type:** P, PI, PD, PID, Self Tune, On-Off, Process Retransmission.

**Proportional Band:** 0.0 to 110.0% (ON/OFF when set to 0.0).

**Integral Time:** 0 to 1000 seconds (Off when set to 0).

**Derivative Time:** 0 to 300 seconds (Off when set to 0).

**Proportional Cycle:** 1 to 120 seconds.

**Manual Reset:** Proportional band converted value.

**Output Limit:** 0 to 100% (DC current output type: -5 to 105%).

**Hysteresis:** Thermocouple and RTD Input: 0.1 to 100.0 degrees

DC Voltage and Current Input: 1 to 1000 (Decimal point place follows the selection).

**Power Requirements:** 120-240 VAC, 50-60 Hz, 24 VAC 50-60 Hz optional.

**Power Consumption:** Approximately 6VA.

**Accuracy:** Thermocouple Input: ±0.2% of input span, ±1 digit or 4°F (2°C), whichever is greater. R, S input 0 to 400°F (0 to 200°C): ±6°C (12°F). B input 0 to 600°F (0 to 300°C): Accuracy is not guaranteed.

K, J, E, N input less than 32°F (0°C): ±0.4% of input span ±1 digit.

RTD Input: ±0.1% of input span ±1 digit or ±2°F (1°C), whichever is greater. DC Voltage Input: ±0.2% of input span ±1 digit. DC Current Input: ±0.2% of input span ±1 digit.

**Input Sampling Period:** 0.25 seconds, 4 Hz.

**PV Display:** Red LED 4-digit character size: 7.5 x 4.1 mm (H x W).

**SV Display:** Green LED 4-digit character size 7.5 x 4.1 mm (H x W).

**Display Resolution:** 1 count, 1 degree, or 0.1 degree, depending on selected range.

**Memory Backup:** Nonvolatile memory, no battery used.

**Ambient Temperature:** 32 to 131°F (0 to 50°C).

**Ambient Humidity:** 35 to 85%RH (Non-condensing).

**Weight:** Approx. 5.3 oz (150 g).

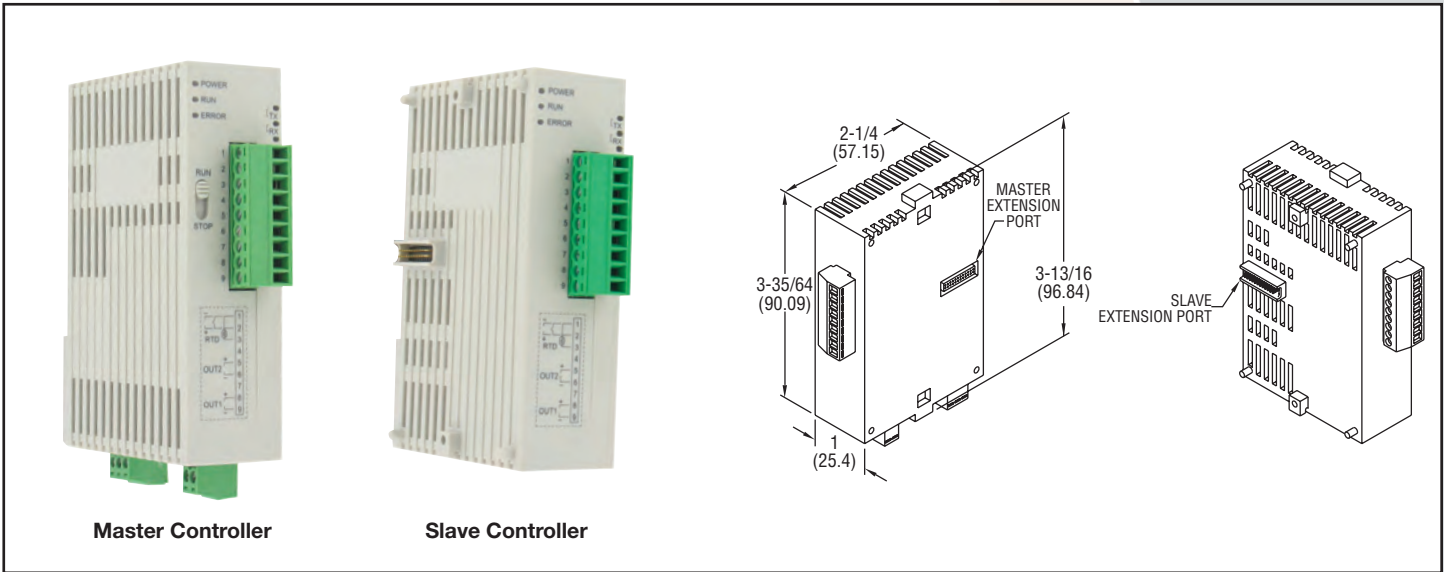
**Agency Approvals:** CE.



Series  
SCD

# DIN Rail Temperature/ Process Controller

Universal Inputs, Up to 8 PID Loops, Modbus® Communications



Master Controller

Slave Controller

The DIN Rail Mount Series SCD offers multiple PID loops in a compact size. Each SCD1000 master controller can be combined with up to seven SCD2000 slave controllers without any wires. Each controller has one universal input, one relay output and one user selected output. The outputs can be used for a dual loop to control heating and cooling or a single loop with an alarm. These controllers support up to 64 ramp/soak actions. The SCD series controllers are programmed using an user-friendly software program via the RS-485 Modbus® communications.

## SPECIFICATIONS

**Inputs:** Thermocouple, RTD, DC linear voltage, and DC currents.

**Supply Voltage:** 24 VDC.

**Power Consumption:** 3 W.

**Operating Temperature:** 32 to 122°F (0 to 50°C).

**Memory Backup:** Non-volatile.

**Control Output Ratings:**

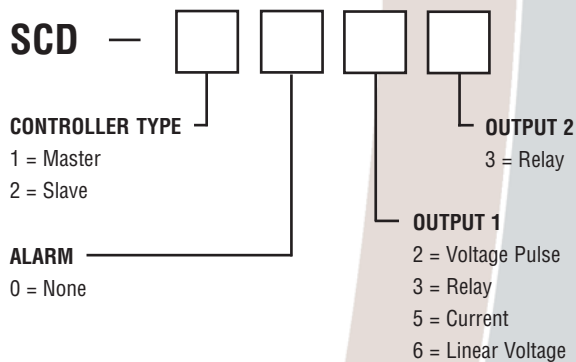
Relay: Resistive load @ 250 VAC 3 A; Voltage Pulse: 12 VDC, max. output current: 40 mA; Current: 20 mA output; Linear Voltage: 0 - 10 VDC.

**Communication:** RS-485 Modbus® A-5-11/RTU communication protocol.

**Weight:** 2.7 oz (76.5 g).

**Agency Approvals:** CE, UL.

Input Types	Ranges
Type K T/C	-328 to 2372°F (-200 to 1300°C)
Type J T/C	-148 to 2192°F (-100 to 1200°C)
Type T T/C	-328 to 752°F (-200 to 400°C)
Type E T/C	32 to 1112°F (0 to 600°C)
Type W T/C	-328 to 2372°F (-200 to 1300°C)
Type R T/C	32 to 3092°F (0 to 1700°C)
Type S T/C	32 to 3092°F (0 to 1700°C)
Type B T/C	212 to 3272°F (100 to 1800°C)
Type L T/C	-328 to 3272°F (-200 to 850°C)
Type U T/C	-328 to 932°F (-200 to 500°C)
Pt 100 RTD	-328 to 1112°F (-200 to 600°C)
0-50 mV	-999 to 9999
0-10 V	-999 to 9999
0-20 mA*	-999 to 9999
4-20 mA*	-999 to 9999



## ACCESSORIES

**MN-1**, RS485 to USB Signal Converter

**SCD-PS**, 24 VDC Power Supply

**SCD-SW**, Configuration Software

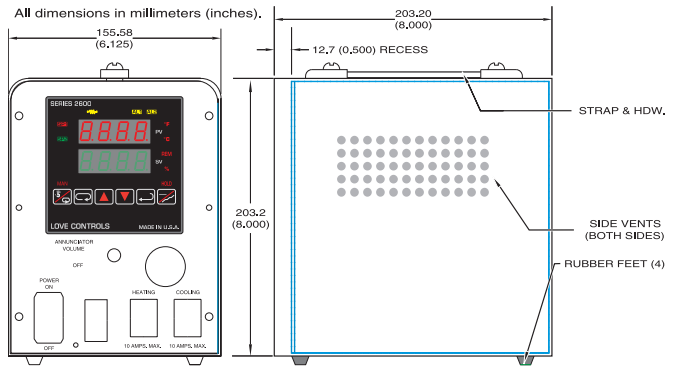
**A-277**, 250 Ohm Precision Resistor

Modbus® is a registered trademark of Schneider Automation.

Series 986

# Portable Housing Option

## For 2500 and 2600 Series Controls



The option 986 portable housing allows use of either of these popular and powerful 1/4 DIN controls as a portable or bench top control. Designed for rugged use, the 986 option allows operation on any standard US 3-prong outlet.

### FEATURES

- 10 Amp 120 VAC Outlet on Front Panel
- On-off Switch with Pilot Lamp
- Combination Jack for Standard or Mini Size Thermocouple Plugs
- Self Storing 4 Foot Power Cord
- Optional Alarm has Audible Signal with Volume Control

Model	Controller Used	Input	Description
25013-986/J	25013	Type J T/C	Single Set Point
25013-986/K	25013	Type K T/C	Single Set Point
26130-986/J	26130	Type J T/C	Single Set Point with Alarm

### SPECIFICATIONS

**Control Output Ratings:** Relay, 10A @ 120 VAC resistive.

**Dimensions:** 6.125 x 8.0 x 8.0" (155.6 x 203.2 x 203.2 mm).

**Outlets:** US Standard, three prong grounded. Single Set Point units have outlets for both normally open and normally closed contacts.

**Alarm:** Units equipped with alarm include an aural alarm with front mounted volume control.

**Supply Voltage:** 120 VAC. Connects with US standard grounded three prong plug. Outlet must be rated for minimum 10A service.

**Environmental:** Designed for indoor bench top use. Cabinet is open to air and is not dust or splash resistant.

For Specifications on control unit see the Series 2600 and the Series 2500.

# Introduction to Panel Meters

FEATURES	TID	TI	LC1132	LC1108 (J)	LC1308	LC1408	LC1508	LC1608	1000	DPMA	DPML	DPMW	DPMP	BPI	LPI
<b>INPUTS</b>															
4-20 mA	●		●	●	●	●	●	●	●	●	●	●	●		●
0-10 V			●	●	●	●	●	●	●	●	●	●	●		
0-1 V									●						
0-100 mV									●						
Type J T/C														●	
Type K T/C														●	
Thermister	●	●													
DIN RTD															
Universal Temperature (T/C, RTD)			●	●	●	●									●
Universal Process				●	●	●	●	●							
AC Volts				●											
AC Current				●											
Frequency/Tachometer				●	●		●	●							
Counter/Chronometer				●											
Strain Gauge				●	●	●	●	●							
Pressure															
Potentiometer (Resistance)						●	●	●							
<b>EXCITATION POWER SUPPLY</b>															
12 Volt										●	●	●	●		
15 Volt															
24 Volt				●	●	●	●	●		●	●	●	●		●
<b>DISPLAY</b>															
2-Digits		●													
3-1/2 Digits	●		●	●					●	●			●		
4 Digits								●						●	●
4-1/2 Digits											●	●			
4-3/4 Digits					●										
5 Digits						●	●								
6 Digits															
<b>OUTPUTS</b>															
Relay				●	●	●	●	●	●						
Process Retransmission				●	●	●	●	●							
Computer Communications				●	●	●	●	●							
<b>PACKAGE</b>															
Special	●	●												●	●
1/8 DIN				●	●	●	●	●		●	●	●	●		
1/16 DIN							●		●						
3/64 DIN															
1/32 DIN			●												
Handheld															

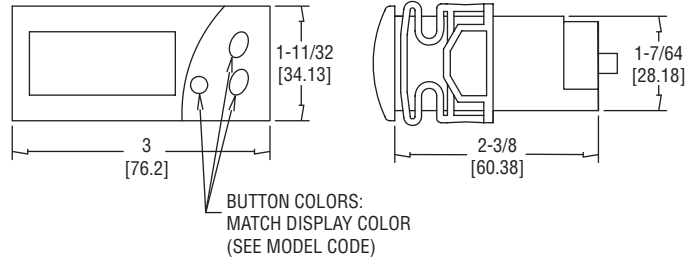
Series  
TID

# Temperature/Process Indicator

Low Cost, 3-Digit Display, 1% Accuracy



Panel Meters



The affordable **Series TID** allows user to monitor temperature or a process value. Temperature ranges are available from -58 to 302°F using one of our PTC or NTC thermistors. Process values can be displayed from -999 to 999 counts using a 4 to 20 mA from one of our various transmitters. The process indicator has an adjustable span and zero.

## SPECIFICATIONS

**Inputs:** PTC/NTC thermistor or 4 to 20 mA.

**Display:** 3-digits; red, green or blue display.

**Range:** -58 to 302°F (thermistor); -999 to 999 counts (4 to 20 mA).

**Power Requirements:** 110 VAC, 230 VAC, 24 VAC/DC.

**Accuracy:** Better than 1%.

**Resolution:** 1° or 0.1 count.

**Front Panel Rating:** IP64.

**Agency Approvals:** CE.

Model Number	Units	Input	Supply Power
TID-1110	°F	PTC thermistor	110 VAC
TID-1120	°C	PTC thermistor	110 VAC
TID-1210	°F	PTC thermistor	230 VAC
TID-1220	°C	PTC thermistor	230 VAC
TID-1410	°F	PTC thermistor	24 VAC/DC
TID-1420	°C	PTC thermistor	24 VAC/DC
TID-3100	None	4 to 20 mA	110 VAC
TID-3200	None	4 to 20 mA	230 VAC
TID-3400	None	4 to 20 mA	24 VAC/DC

## ACCESSORIES

**TS-1,** Probe Brass 5 ft (1.5 m) cable

**TS-11,** Probe Brass 10 ft (3 m) cable

**TS-2,** Probe SS 5 ft (1.5 m) cable

**TS-21,** Probe SS 10 ft (3 m) cable

**TS-5,** PTC thermistor probe PVC (5 ft cable)

**TS-51,** PTC thermistor probe PVC (10 ft cable)

**TS-6,** PTC thermistor probe metal (5 ft cable)

**TS-61,** PTC thermistor probe metal (10 ft cable)

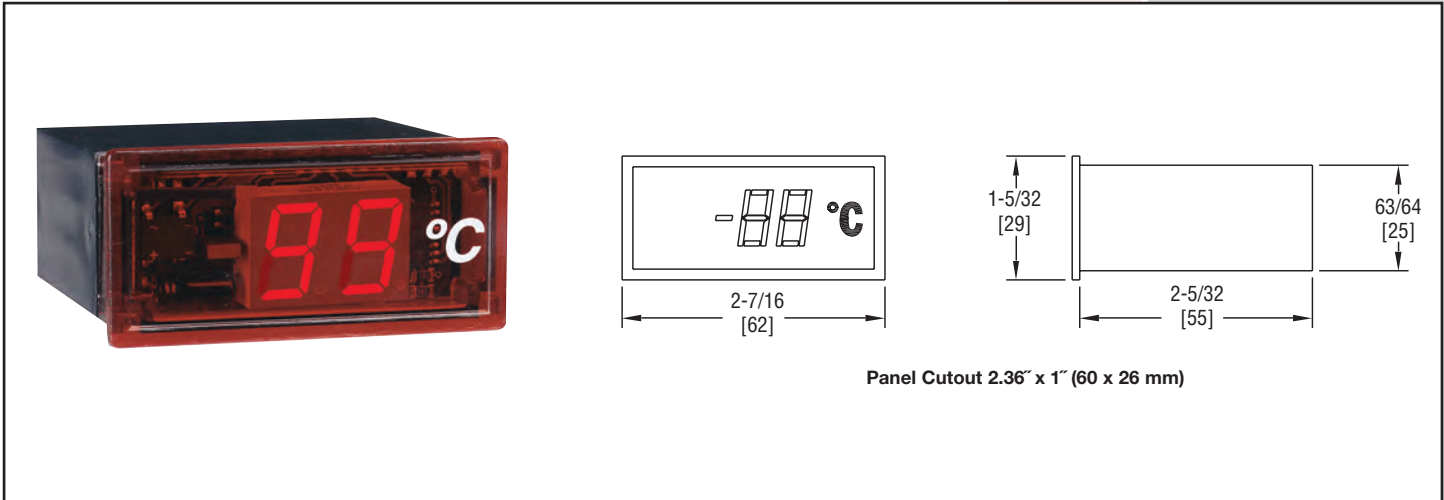
Series  
TI

# Temperature Indicator

Low Cost, Two-Digit Display,  $\pm 1\%$  Accuracy



Panel Meters



**Monitor temperature** with the Series TI Temperature Indicator. Units offer a temperature range of -58 to 99°F (-50 to 99°C) with an accuracy of  $\pm 1\%$ . Quickly view temperatures on the bright red, double-digit LED. Models TI-106 & TI-216 feature an external potentiometer for probe temperature adjustment. The compact design of the Series TI makes it ideal for any refrigeration application.

## SPECIFICATIONS

**Probe Range:** -58 to 99°F (-50 to 99°C).

**Input:** PTC thermistor (1000 $\Omega$  @ 25°C), not included.

**Power Requirements:** 110 VAC or 230 VAC (depending on model).

**Accuracy:**  $\pm 1\%$  FS.

**Display:** 2-digit plus sign, red, 1/2" H digits.

**Resolution:** 1°.

**Front Panel Rating:** NEMA 4X (IP65).

**Weight:** 2.3 oz (65 g).

**Agency Approvals:** UR, CE

Model Number	Power Supply	Display	Adjustable
TI-10	110 VAC	°F	No
TI-21	230 VAC	°C	No
TI-106	110 VAC	°F	Yes
TI-216	230 VAC	°C	Yes

## ACCESSORIES

- TS-1**, Probe Brass 5 ft (1.5 m) cable
- TS-11**, Probe Brass 10 ft (3 m) cable
- TS-2**, Probe SS 5 ft (1.5 m) cable
- TS-21**, Probe SS 10 ft (3 m) cable
- TS-5**, PTC thermistor probe PVC (5 ft cable)
- TS-6**, PTC thermistor probe metal (5 ft cable)

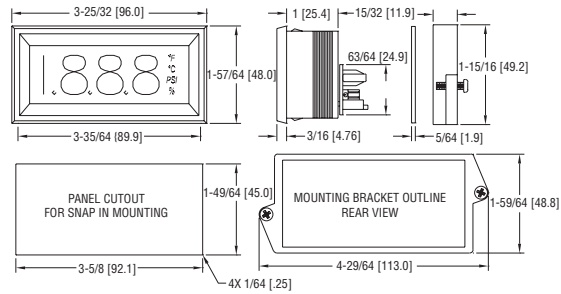


Series  
DPMA

# Adjustable LCD Digital Panel Meters

1/8 DIN, Loop Powered, Large 3-1/2 Digit Display

Panel Meters



**Series DPMA Adjustable LCD Digital Panel Meter** offers a 3-1/2 digit display for easy viewing in a standard 1/8 DIN package. Unit accepts 4-20 mA, 0 to 5 VDC, or 0 to 10 VDC inputs with a wide bipolar zero and span adjustment. Standard features include field selectable engineering units and decimal point positions. Choose from red, amber, or green segments for easy viewing at a distance. A separate 24 VDC power supply is required for the operation of the backlight.

Model Number	Input	Backlighting
DPMA-401	Current	Amber Segments
DPMA-402	Current	Red Segments
DPMA-404	Current	Green Segments
DPMA-501	Voltage	Amber Segments
DPMA-502	Voltage	Red Segments
DPMA-504	Voltage	Green Segments

## SPECIFICATIONS

**Input:** 4-20 mA, 0-5 VDC, or 0-10 VDC.  
**Input Impedance:** 300Ω nominal.  
**Accuracy:** ±0.05% FS + 1 count.  
**Power Supply:** 24 VDC or 12 VDC (DPMA-5XX).  
**Current Consumption:** 35 mA DC. 10 mA DC. backlight: 35 mA.  
**Span and Zero:** Adjustable. (±1999 counts).  
**Display:** 3-1/2 digits, 7 segments, 1" (25.4 mm) H.

**Decimal Points:** 3-position, user selectable.

**Engineering Units:** °F, °C, %, psi.

**Polarity:** Automatic, "-" displayed.

**Operating Temperature:** 14 to 122°F (-10 to 50°C).

**Storage Temperature:** -40 to 167°F (-40 to 75°C).

**Mounting:** Snap-in panel mount or clamp (gasket included).

**Connection:** Screw terminals.

**Weight:** 4 oz (113.4 g).

## APPLICATION

- Used to display process values from pressure, humidity or temperature transmitters

## Accessories

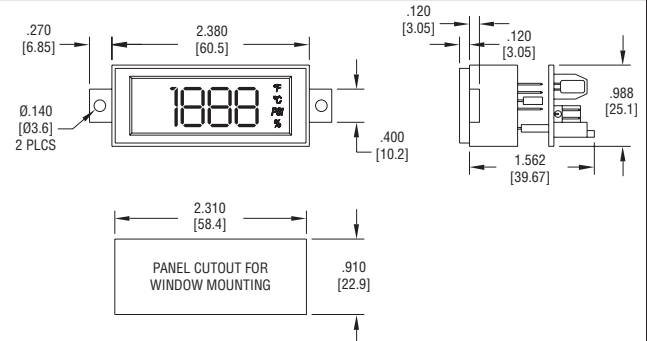
**DPM-12P,** Regulated 120 VAC to 12 VDC Power Supply

**DPM-24P,** Regulated 120 VAC to 24 VDC Power Supply

Series  
DPMW

# LCD Digital Panel Meters

4-1/2 Digits, Window Mount



The **Series DPMW LCD Digital Panel Meter** is designed with a 4-1/2 digit, high contrast LCD display. The colored segments are available in red, amber, or green - ideal for viewing at a distance. The Series DPMW features user selectable engineering units, selectable decimal point position and adjustable zero and span. The meter accepts a 4 to 20 mA input signal for pressure, level, flow, and temperature transmitter. A separate 24 VDC power supply is required to illuminate the colored segments. The Series DPMW can be quickly installed in a window cutout.

Model Number	Backlighting
DPMW-401	Amber Segments
DPMW-402	Green Segments
DPMW-403	Red Segments

## Accessories

**DPM-24P,** Regulated 120 VAC to 24 VDC Power Supply

## SPECIFICATIONS

**Inputs:** 4-20 mA DC.

**Input Impedance:** 300Ω nominal.

**Accuracy:** ±0.1% FS + 2 count.

**Power Supply:** 24 VDC.

**Current Consumption:** 20 mA.

**Span and Zero:** Adjustable. (± 1999).

**Display:** 4-1/2 digits, 7 segments, 0.45" (11.4 mm) H.

**Decimal Points:** 3-position, user selectable.

**Annunciator:** °F, °C, %, psi.

**Polarity:** Automatic, "-" displayed.

**Operating Temperature:** 32 to 122°F (0 to 50°C).

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

**Mounting:** Window mount.

**Connection:** Screw terminals.

**Weight:** 2 oz (56.7 g).

**Conversion Rate:** 3 per second.

**Warm-Up:** 10 minutes typical.

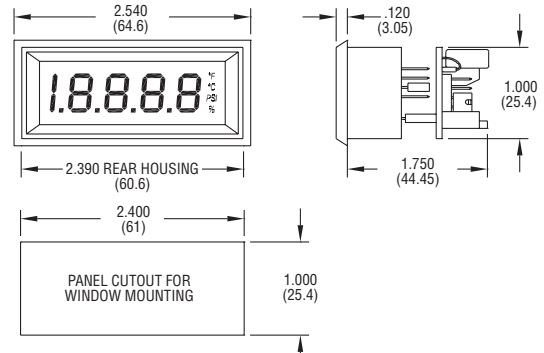
Series  
DPML

# LCD Digital Panel Meters

## 4-1/2 Digit LCD, Selectable Engineering Units



DPML-401



The Series DPML LCD Digital Panel Meter offers a large 4-1/2 digit LCD display with a choice of red, amber or green segments for easy viewing at a distance. The meter accepts loop powered 4-20 mA DC input, 0 to 5 VDC, or 0 to 10 VDC voltage input. Standard features include field selectable engineering units and decimal point positions. A separate 24 VDC power supply is required for the operation of the back light.

Model Number	Input	Backlighting
DPML-401	Current	Amber Segments
DPML-402	Current	Green Segments
DPML-403	Current	Red Segments
DPML-501	Voltage	Amber Segments
DPML-502	Voltage	Green Segments
DPML-503	Voltage	Red Segments

### Accessories

DPM-12P, Regulated 120 VAC to 12 VDC Power Supply

DPM-24P, Regulated 120 VAC to 24 VDC Power Supply

### SPECIFICATIONS

**Inputs:** 4-20 mA DC, 0-5 VDC, 0-10 VDC.

**Input Impedance:** 300Ω nominal.

**Accuracy:** ±0.1% FS + 2 count.

**Power Supply:** 24 VDC or 12 VDC (DPML-5XX).

**Current Consumption:** 35mA DC.

**Span and Zero:** Adjustable (±19999 counts).

**Display:** 4-1/2 digits, 7 segments, 0.45" (11.4 mm) H.

**Decimal Points:** 4-position, user selectable.

**Annunciator:** °F, °C, %, psi.

**Polarity:** Automatic, "-" displayed.

**Operating Temperature:** 32 to 122°F (0 to 50°C).

**Mounting:** Snap-in bezel mount.

**Connection:** Screw terminals.

**Weight:** 2 oz (56.7 g).

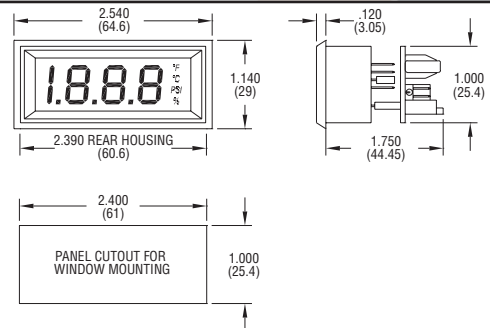
### APPLICATION

- Used to display process values from pressure, humidity or temperature transmitters

Series  
DPMP

# LCD Digital Process Meters

## 3-1/2 Digit, User Selectable Engineering Units, Panel Mount



The Series DPMP LCD Digital Process Meter provides easy viewing on the 3-1/2 digit LCD display. The display segments are available in a choice of amber, red or green. The meter features user-selectable engineering units, adjustable zero and span and field-selectable decimal point position. The snap-in bezel mount eliminates mounting hardware for quick installation. A separate 24 VDC power supply is required for the operation of the backlight.

Model Number	Input	Backlighting
DPMP-401	Current	Amber Segments
DPMP-402	Current	Green Segments
DPMP-403	Current	Red Segments
DPMP-501	Voltage	Amber Segments
DPMP-502	Voltage	Green Segments
DPMP-503	Voltage	Red Segments

### Accessories

DPM-12P, Regulated 120 VAC to 12 VDC Power Supply

DPM-24P, Regulated 120 VAC to 24 VDC Power Supply

### SPECIFICATIONS

**Inputs:** 4-20 mA DC, 0-5 VDC or 0-10 VDC.

**Input Impedance:** 300Ω nominal.

**Accuracy:** ±0.1% FS + 2 count.

**Power Supply:** 24 VDC or 12 VDC (DPMP-5XX).

**Current Consumption:** 35 mA DC.

**Span and Zero:** Adjustable. (±1999 Counts).

**Display:** 3-1/2 digits, 7 segments, 0.45" (11.4 mm) H.

**Decimal Points:** 3-position, user selectable.

**Annunciator:** °F, °C, %, psi.

**Polarity:** Automatic, "-" displayed.

**Operating Temperature:** 32 to 122°F (0 to 50°C).

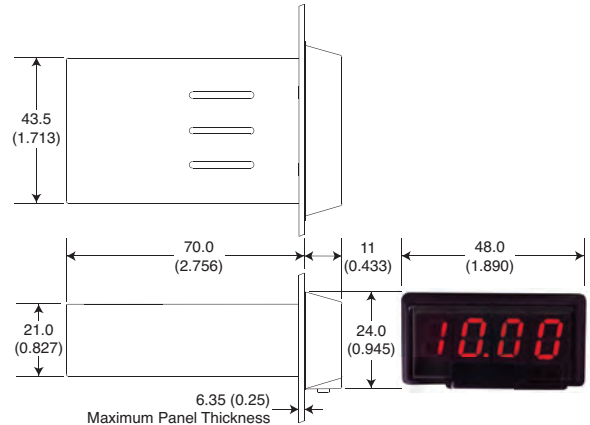
**Mounting:** Snap-in bezel mount.

**Connection:** Screw terminals.

**Weight:** 2 oz (56.7 g).

# Process Indicator

1/32 DIN, Fully Programmable



The LCI132 Series process indicators offer flexibility, and value in a low cost, compact 1/32 DIN package. This family of indicators offers input availability for most types of process measurement.

The LCI132 has a 7.62mm (0.3 inch) high display. The shallow depth of these full size panel meters allows installation in panels only 70mm (2.76 inches) deep with room to spare.

Inputs are available for Process (0 to 10V, 4 to 20 mA), AC Volts, AC Amps, DC Volts, and DC Amps.

## FEATURES

- Large display
- Easy to Program
- Inputs for most processes
- IP65 (NEMA 4X) Front

Model Number	Input	Supply Voltage
LCI132-00	± 100 VDC; ±20 VDC	120/240 VAC
LCI132-01	±10 VDC; ±200 VDC; ±20 mA DC	24/48 VAC
LCI132-10	±100 VAC; 600 VAC; 5A (DC) 1A (AC) -199.9 to +600 VDC;	120/240 VAC
LCI132-11	±100 VDC -1.999 to 5A (DC) ± 1A (DC)	24/48 VAC



## SPECIFICATIONS

	INPUT	VOLTS (DC)	AMPERES	INPUT IMPEDANCE
LCI132-0x	Range: ±200V ±20V ±10V Resolution: 0.1V 0.01V 1mV		±100mV ±20mA 0.1mV 0.01mA	Volts 1 Mohms mV: 100 Mohms mA: 12.1 ohms
LCI132-1x	Range AC: 600.0 100.0 Range DC: -199.9 +600.0 ±100.0 Resolution 0.1V		5.000 1.000 -1.999 +5.000 ±1.000 1 mA	Volts: 3 Mohms (106) Amp: 12 Mohms (10-3)

## INPUT IMPEDANCE

Volts: 3 Mohms (106).

Amp: 12 mohms (10-3).

## ALL ACCURACY at 23°C ±5°C

100/600 VDC 1/5 A DC; 600V/5A AC: ±(0.2% reading + 3 digits).

100 V / 1 A AC: ±(0.4% reading + 4 digits).

Temperature Coefficient: 100 ppm/°C.

Warm Up: 5 minutes.

## POWER SUPPLY AND FUSES (DIN 41661) (Not supplied):

### LCI132-x0:

85-265 VAC 50/60 Hz and 100-300 VDC: Fuse: 0.1A/ 250V.

### LCI132-x1:

21-53 VAC 50/60Hz and 10.5-70 VDC: Fuse 0.5A/ 250V.

Power Consumption: 1.8W Max.

## DISPLAY

Range: -1999 to 9999 (DC) 0 to 9999 (AC).

Type: 4 red digits 10 mm.

Reading Rate: 4/s.

Overflow Indication: OVR.

## ENVIRONMENTAL

Operating Temperature: -10 to 60°C.

Storage Temperature: -25 TO85°C.

Relative Humidity (non condensed): <95% @ 40°C.

Panel Sealing: NEMA 4X (IP65).

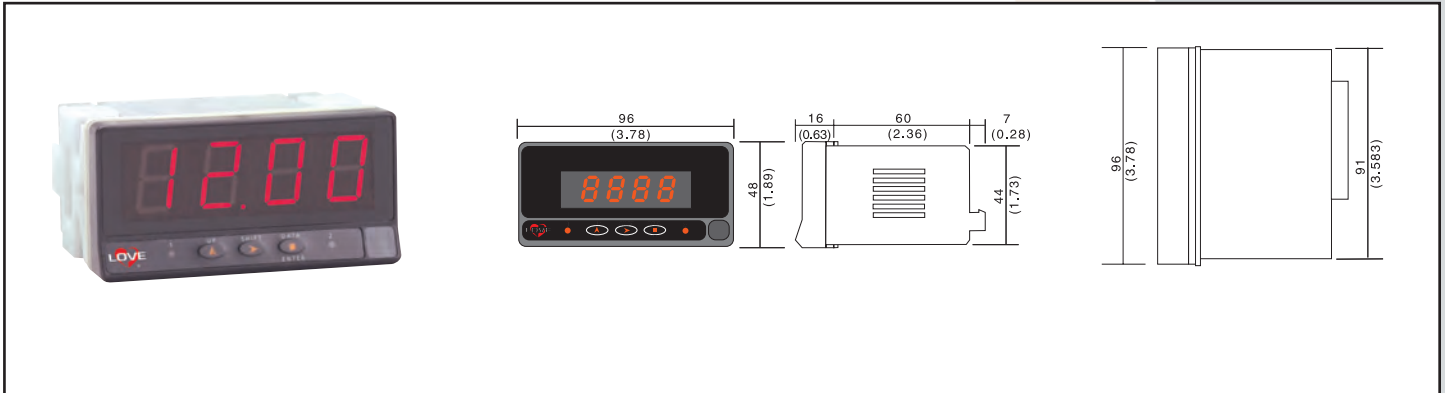
Series  
LCI108  
&  
LCI108J

# 3-1/2 Digit Panel Meter

## 3-1/2 Digit Display, Self-Tune/Fuzzy Logic



Panel Meters



The LCI108 & LCI108J Series 3-1/2 digit panel meter offer flexibility, and value in a low cost, compact 1/8 DIN package. This family of indicators offers input availability for virtually all types of process measurement. The LCI108 & LCI108J are identical except for the size of the display. The LCI108 has a 0.56 inch (14 mm) high display. The LCI108J (jumbo) has a 0.80 inch (20 mm) display for viewing from longer distances. Inputs are available for Process (0 to 10V, 4 to 20 mA), AC Volts, AC Amps, DC Volts, DC Amps, Temperature (RTD), Temperature (Thermocouple), and Frequency. The process and frequency inputs have appropriate transducer excitation power supplies, giving you everything you need in a compact package.

Model No.	Input	Display
LCI108-00	Process	.56" (14 mm) H
LCI108-10	T/C (J, K, T)	.56" (14 mm) H
LCI108-20	RTD	.56" (14 mm) H
LCI108J-10	T/C (J, K, T)	.80" (20 mm) H
LCI108J-20	RTD	.80" (20 mm) H

### ACCESSORY

LCIA-01, Dual Relay Output Option Card

### SPECIFICATIONS

**Inputs:** Process, Thermocouple, RTD, VAC, VDC, A AC, A DC, Frequency.

**Input Impedance:**

Process: Voltage, 1 M $\Omega$ ; Current, 12.1 $\Omega$ .

AC & DC Current: 0.012 $\Omega$  for 5 A, 0.06 $\Omega$  for 1 A.

AC & DC Voltage: 3 M $\Omega$  for 600 V, 300 k $\Omega$  for 200 V, 30 k $\Omega$  for 20 V.

**Display:** 4 digit, 14 mm red for LCI108; 4 digit, 20 mm red for LCI108J; Programmable decimal point with 2 LEDs for output status indication on all units.

**Accuracy:**  $\pm 0.1\%$  of reading (except T/C & RTD);  $\pm 0.4\%$  of reading for T/C;  $\pm 0.1\%$  for RTD.

**Supply Voltage:** 120/240 VAC, 50/60 Hz  $\pm 10\%$ .

**Power Consumption:** 3 W max.

**Operating Temperature:** 14 to 140 $^{\circ}$ F (-10 to 60 $^{\circ}$ C) / <95% @ 104 $^{\circ}$ F (40 $^{\circ}$ C) non-condensing.

**Front Panel Rating:** NEMA 4X (IP65).

**Agency Approvals:** CE.

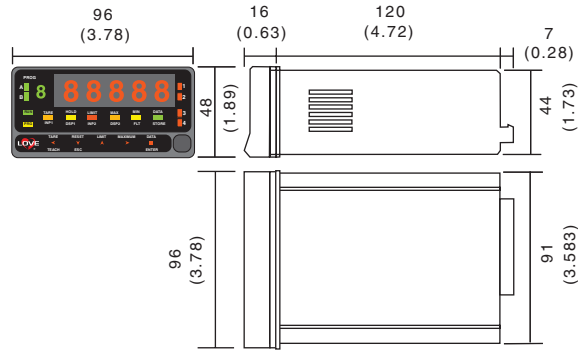
Series  
LCI308  
&  
LCI408

# Panel Meter Indicators

1/8 DIN, High Accuracy, Peak & Valley Display



Panel Meters



The Series LCI308 and LCI408 panel meter indicators offer flexibility and value in a standard 1/8 DIN package. This family of indicators offers input availability for virtually all types of process measurement.

The LCI308 offers a 4-3/4 digit display scalable to  $\pm 32,000$  counts. This flexible indicator is available for Process Inputs (0-10VDC, 4-20 mA, etc. and potentiometer inputs).

The LCI408 has a universal input that accepts the Process, Temperature, and Load Cell inputs of the LCI308, plus a Potentiometer input. The full 5-digit display can be scaled between  $\pm 99999$  counts. The dual display allows simultaneous display of the measured value plus other values such as peak or valley.

Options include relay and transistor set point outputs, BCD Parallel output, RS-232/RS-485 computer communications, and 4 to 20 mA analog retransmission.

## SPECIFICATIONS

**Inputs:** Process, temperature (T/C & RTO), frequency/counter, load cell (dependent on model number).

### Input Impedance:

Process: Voltage, 1 M $\Omega$ ; current, 12.1 $\Omega$ .

Load Cell: 100 M $\Omega$  for 300 mV, 1 MW for 30 mV.

**Display:** 5 digit, 7 segment, 14 mm red with a fixed decimal point. 14 LEDs (programming & control).

**Accuracy:**  $\pm 0.1\%$  of reading (+2 count).

Thermocouples:  $\pm 0.4\%$  of reading for types J, K, T, & E;  $\pm 0.05\%$  of reading for types R & S.

RTD:  $\pm 0.2\%$  of reading.

**Supply Voltage:** 115/230 VAC 50/60 Hz  $\pm 10\%$ .

**Power Consumption:** 3W max.

**Weight:** 8 oz (250 g).

**Front Panel Rating:** NEMA 4X (IP65).

**Agency Approvals:** CE.

Part Number	Description
LCI308-00	1/8 DIN Indicator, $\pm 10$ VDC, $\pm 20$ mADC, Potentiometer
LCI408-00	1/8 DIN Indicator, Universal Input

Consult Factory for add-in option cards.

## INPUT RANGES

INPUT TYPE	RANGE °F	RANGE °C
Type J Thermocouple	-58.0 to +1472.0	-50.0 to +800.0
Type K Thermocouple	-58.0 to +2282.0	-50.0 to +1250.0
Type T Thermocouple	-328.0 to +752.0	-200.0 to +400.0
Type R Thermocouple	+32.0 to +3182.0	0.0 to 1750.0
-Type S Thermocouple	-58.0 to +3182.0	-50.0 to +1750.0
Type E Thermocouple	-58.0 to +1832.0	-50 to +1000.0
100 Ohm Plt. 0.00385 DIN RTD	-328 to 1472.0	-200.0 to +800.0
100 Ohm Plt. 0.00392 NIST RTD	-328 to 1607	-200 to +875
Process (Includes excitation power supply)		
$\pm 10$ V	Scalable Units from -32000 to +32000 (LCI308); -99999 to +99999 (LCI408)	
$\pm 20$ mV	Scalable Units from -1999 to +1999	
Digital - Frequency/Counter (Includes excitation power supply)		
0.1 to 25,000 Hz	Count up/down 10,000 Hz (LCI308)	
Potentiometer	Resolution to 0.001% (LCI408)	
Load Cell (includes excitation power supply)	$\pm 30$ mVDC	

## ACCESSORIES

**LCIA-01,** Dual Relay Card. Two SPDT relays, 8A @ 240 VAC

**LCIA-02,** Quad Relay Card. Four SPST relays, 0.2A @ 240 VAC

**LCIA-03,** Quad Transistor Output Card. Four NPN optically coupled transistors, 50 mA @ 50 VDC max.

**LCIA-04,** Quad Transistor Output Card. Four PNP optically coupled transistors, 50 mA @ 50 VDC max.

**LCIA-05,** Analog Retransmission, 4 to 20 mADC or 0 to 10 VDC, selectable.

**LCIA-07,** BCD Output Card.

**LCIA-08,** RS-232 Serial Communication (Modbus<sup>®</sup> Protocol).

**LCIA-09,** RS-485 Serial Communication (Modbus<sup>®</sup> Protocol).

**MN-1,** RS485 to USB Signal Converter

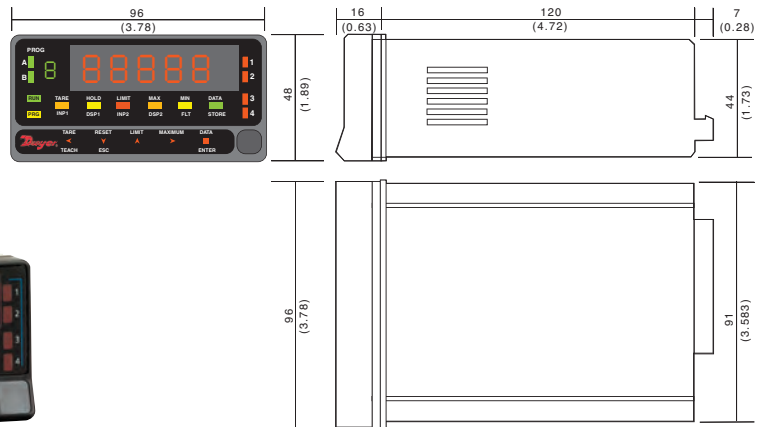
Modbus<sup>®</sup> is a registered trademark of Schneider Automation.



Series  
LCI508  
&  
LCI608

# Digital Panel Meters

## 1/8 DIN, Process, Load Cell & Potentiometer Input



Panel Meters

The Series LCI508/608 Digital Panel Meters offer high performance and a multitude of features for displaying and manipulating input variables. The unit accepts analog process input, load cell and potentiometer inputs. Standard features include data hold, peak and valley display, store function, tare function and reset. Both models offer a built-in excitation power supply. The Series LCI508/608 can be fitted with optional output modules for control capabilities.

The Model LCI508 is designed with 31 programmable functions and a high conversion rate of 555 reads per second. Up to 30 points can be set using the multipoint scaling function for non linear applications.

The Model LCI608 is designed for measuring and integrating analog signals containing two sets of information simultaneously (for example Flow and Totalization). The units can be configured to accept and display two analog input signals and allowing interaction between them. The model LCI608 offers 26 logical programmable functions.

**Model LCI508-00**, Panel Meter

**Model LCI608-00**, Panel Meter/Totalizer

### ACCESSORIES

**LCIA-01**, Dual Relay Card. Two SPDT relays, 8A @ 240 VAC

**LCIA-02**, Quad Relay Card. Four SPST relays, 0.2A @ 240 VAC

**LCIA-03**, Quad Transistor Output Card. Four NPN optically coupled transistors, 50 mA @ 50 VDC max.

**LCIA-04**, Quad Transistor Output Card. Four PNP optically coupled transistors, 50 mA @ 50 VDC max.

**LCIA-05**, Analog Retransmission, 4 to 20 mA DC or 0 to 10 VDC, selectable.

**LCIA-07**, BCD Output Card.

**LCIA-08**, RS-232 Serial Communication (Modbus® Protocol)

**LCIA-09**, RS-485 Serial Communication (Modbus® Protocol)

Modbus® is a registered trademark of Schneider Automation.

### SPECIFICATIONS

**Input:** Voltage Process:  $\pm 5$  and  $\pm 10$  V (Input Impedance:  $1\text{M}\Omega$ ); Voltage:  $\pm 0-1\text{V}$  (Input Impedance:  $100\text{M}\Omega$ ); Current Input:  $\pm 0-20$  mA (Input Impedance:  $11.8\Omega$ ).

#### Load-Cell:

Voltage Input:  $\pm 30$ ,  $\pm 60$ ,  $\pm 120$ ,  $\pm 300$ ,  $\pm 500$  mV (Input Impedance:  $100\text{M}\Omega$ ); 4-wires, unipolar or bipolar.

#### Potentiometer Input:

Minimum Resistance:  $120\Omega$  (Input Impedance:  $>10\text{M}\Omega$ ). Excitation Voltage: 2.2 V.

#### Excitation:

2.2 V @ 30 mA not adjustable.

24 V @ 30 mA not regulated.

5 V  $\pm 100$  mV @ 120 mA with fine adjust (50ppm/°C).

10 V  $\pm 10$  mV @ 120 mA with fine adjust (50ppm/°C).

#### Display Range:

Main Display: -9999/9999, 5 red digits, 7 Segments.

Aux. Display: -9999999 / 9999999, 8 green digits 8 mm (LCI608 only). Decimal Point: Programmable (both displays).

**Sampling Rate:** LCI508: 555/s; LCI608: 100/s.

#### Accuracy:

Error max:  $\pm 0.1\%$  reading +2 digits.

Temperature coefficient: 50 ppm/°C.

Warm up time: 10 minutes.

**Power Requirements:** 115/230VAC 50/60Hz.

Consumption (without options): 5W.

**Ambient Operating Temperature:** 14 to 140°F (-10 to 60°C).

**Storage Temperature Range:** -13 to 185°F (-25 to 85°C).

**Panel Cutout:** 3.6 x 1.8" (92 x 45 mm).

**Weight:** 21 oz (600 g).

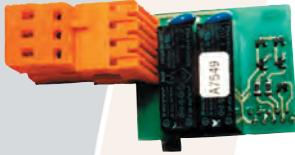
**Case Material:** s/UL 94 V-0 Polycarbonate.

**Front Panel Orientation:** NEMA 4X (IP65).

# Accessories for Series LCI Panel Meters

## LCIA-01 Dual Relay Output Option Card

for LCI108, LCI108J, LCI308, LCI408, LCI, 508, and 608 1/8 DIN panel meters



The **LCIA-01 Dual Relay Output Option Card** plugs in most of the LCI108 and LCI108J Series, and all of the LCI208, LCI308, and LCI408 Series panel meter indicators and controls. This handy card adds two 8 Amp single pole double pole outputs to a panel meter.

### SPECIFICATIONS

**Relay Output:** 2 SPDT relays rated at 8 A @ 250 VAC resistive.

**Maximum Power:** 2000 VA, 192 W.

**Maximum Voltage:** 250 VAC, 150 VDC.

**Contact Resistance:** 3mΩ maximum.

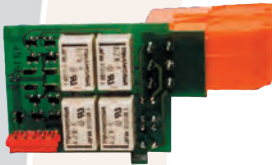
**Output Response Time:** 10 ms maximum.

### HOW TO ORDER

To order, specify part number LCIA-01.

## LCIA-02 Quad Relay Output Option Card

for LCI308, LCI, 508, 608 and LCI408 1/8 DIN panel meters



The **LCIA-02 Quad Relay Output Option Card** plugs in the LCI208, LCI308, and LCI408 Series panel meter indicators and controls. This handy card adds four 0.2 Amp single pole single pole outputs to a panel meter.

### SPECIFICATIONS

**Relay Output:** 4 SPDT relays rated at 0.2 A @ 250 VAC resistive.

**Maximum Power:** 25 VA, 192 W.

**Maximum Voltage:** 250 VAC, 10 VDC.

**Contact Resistance:** 200mΩ maximum.

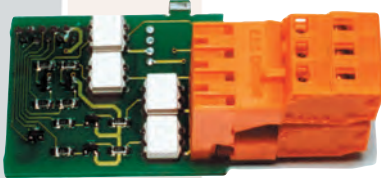
**Output Response Time:** 6 ms maximum.

### HOW TO ORDER

To order, specify part number LCIA-02.

## LCIA-03 Quad Transistor Output Option Card

for LCI308, LCI, 508, 608 and LCI408 1/8 DIN panel meters



The **LCIA-03 Quad Transistor Output Option Card** plugs in the LCI208, LCI308, and LCI408 Series panel meter indicators and controls. This handy card adds four NPN transistor outputs to a panel meter.

### SPECIFICATIONS

**Relay Output:** 4 NPN Transistors rated at 50 mA @ 50 VDC max.

**Leakage Current:** 100μA max.

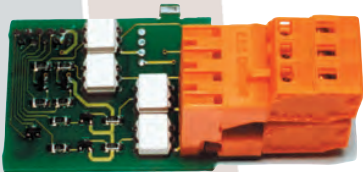
**Output Response Time:** 1 ms maximum.

### HOW TO ORDER

To order, specify part number LCIA-03.

## LCIA-04 Quad Transistor Output Option Card

for LCI308, LCI, 508, 608 and LCI408 1/8 DIN panel meters



The **LCIA-04 Quad Transistor Output Option Card** plugs in the LCI208, LCI308, and LCI408 Series panel meter indicators and controls. This handy card adds four PNP transistor outputs to a panel meter.

### SPECIFICATIONS

**Relay Output:** 4 PNP Transistors rated at 50 mA @ 50 VDC max.

**Leakage Current:** 100μA max.

**Output Response Time:** 1 ms maximum.

### HOW TO ORDER

To order, specify part number LCIA-04.

## LCIA-05 Isolated Analog Retransmission

for LCI308, LCI, 508, 608 and LCI408 1/8 DIN panel meters



The **LCIA-05 Isolated Analog Retransmission Option Card** plugs in the LCI308, and LCI408 Series panel meter indicators and controls. This handy card adds an analog retransmission output to a panel meter. The output may be selected as either 0 to 10 VDC or 4 to 20 mADC.

### SPECIFICATIONS

**Output:** Selectable 0 to 10 VDC into 500 ohms minimum, 4 to 20 mADC into 800 ohms maximum.

**Resolution:** 12 bits.

**Accuracy:** 0.1% of full scale ±1 bit.

**Response Time:** 60 ms maximum.

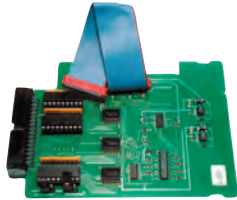
**Thermal Drift:** 0.2 mV/°C; 0.5μA/°C.

### HOW TO ORDER

To order, specify part number LCIA-05.

# Accessories for Series LCI Panel Meters

**LCIA-07 BCD Output Option Card** for LCI, 508, 608, LCI308 and LCI408 1/8 DIN panel meters.



The **LCIA-07 BCD Output Option Card** plugs in the LCI308 and LCI408 Series panel meter indicators and controls. This handy card adds a BCD output to a panel meter.

#### **SPECIFICATIONS**

**Output:** 5-1/2 digits Tri-state logic for 5V TTL or 24 VDC signals.

**Data Transfer Time:** 2 ms.

#### **HOW TO ORDER**

To order, specify part number LCIA-07.

**LCIA-08 RS-232 Serial Communications Option Card** for LCI, 508, 608, LCI308 and LCI408 1/8 DIN panel meters.



The **LCIA-08 RS-232 Serial Communications Option Card** plugs in the LCI308 and LCI408 Series panel meter indicators and controls. This handy card adds RS-232 Serial Communications to a panel meter.

#### **SPECIFICATIONS**

**Output:** RS-232-C, full duplex, 4 wire, via RJ-11 connector.

**Protocol:** Selectable ISO1745 (ASCII) or Modbus® RTU Protocol.

**Baud Rates:** 1200 or 19200 baud, selectable.

**Address Range:** 0 to 99.

#### **HOW TO ORDER**

To order, specify part number LCIA-08.

**LCIA-09 RS-485 Serial Communications Option Card** for LCI, 508, 608, LCI308 and LCI408 1/8 DIN panel meters.



The **LCIA-09 RS-485 Serial Communications Option Card** plugs in the LCI308 and LCI408 Series panel meter indicators and controls. This handy card adds RS-485 Serial Communications to a panel meter.

#### **SPECIFICATIONS**

**Output:** RS-485, half duplex, 3 wire, via RJ-11 connector.

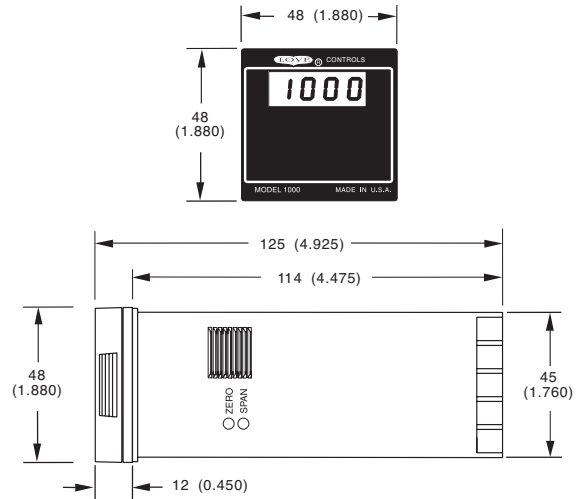
**Protocol:** Selectable ISO1745 (ASCII) or Modbus® RTU Protocol.

**Baud Rates:** 1200 or 19200 baud, selectable.

**Address Range:** 0 to 99.

#### **HOW TO ORDER**

To order, specify part number LCIA-09.

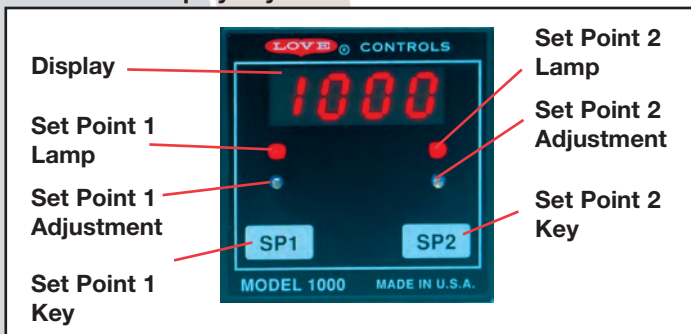


The Love 1000 Series offers an economical line of 1/16 DIN digital indicating analog based monitors. Four current or voltage input ranges are available and can be configured as either reverse or direct acting by simply setting a jumper. The reverse acting input is useful in filter applications where efficiency is related to the pressure differential across the filter. When the differential is low (filter is good, transmitter output is low) the display can read maximum percentage of efficiency. As the filter gets clogged, the pressure differential goes up (transmitter output goes up) and the display of percent efficiency goes down. When used on a Model 1010, the contacts can be set up to close to remind the operator that service is necessary and even shut down the system if you wish. Two optional alarms activating SPST contact relays can be set separately as either reverse or direct acting. The display ranges from 0 to 100.0 with a programmable decimal point position. A 15 V at 30 mA excitation output is a standard feature available to power a two wire transmitter.

## FEATURES

- Ultra Low Cost
- Current or Voltage Input Selections
- Full 3-1/2 Digit Display
- Direct or Reverse Input Action
- Dual Alarms Available
- Programmable Alarms
- Field Selectable Decimal Point
- Built-in Transmitter Power Supply
- Made in U.S.A.

## Model 1010 Display Layout



## SPECIFICATIONS

**Accuracy:**  $\pm 0.25\%$  of span  $\pm 1$  count.

**Resolution:** 1 count.

**Conversion Rate:** 3 readings per second.

**Selectable Input Ranges:** Factory setting: 4-20 mA  
Field adjustable: 0-100 mV, 0~1 V, or 0-10 V.

**Input Impedance:** Current =  $62\Omega$ ; Voltage =  $1\text{ M}\Omega$ .

**Alarm Relay Ratings: (Model 1010 Only)**

2 Relays, SPST contact, 3 A @ 250 VAC resistive, 1.5 A @ 250 VAC inductive, Pilot duty rating: 250 VA, 2 A @ 125 VAC or 1 A @ 250 VAC.

**Power Consumption:** 5 VA.

**Supply Voltage:** 100-240 VAC  $+10\%$ - $15\%$ , 50-400 Hz single phase, 132-240 VDC  $+10\%$ - $20\%$ .

**Transmitter Power Supply:** 15 V @ 30 mA max., regulated, isolated.

**Zero Adjust Range:** 0-250 counts.

**Span Adjust Range:** 500-1999 counts.

**Operating Temperature Range:** 32 to 122°F (0 to 50°C).

**Storage Temperature Range:** -40 to 176°F (-40 to 80°C).

**Display:** Red 3-1/2 digit 7 segment LED, 0.3" (7.62 mm) high.

**Weight:** 6.5 oz (185 g).

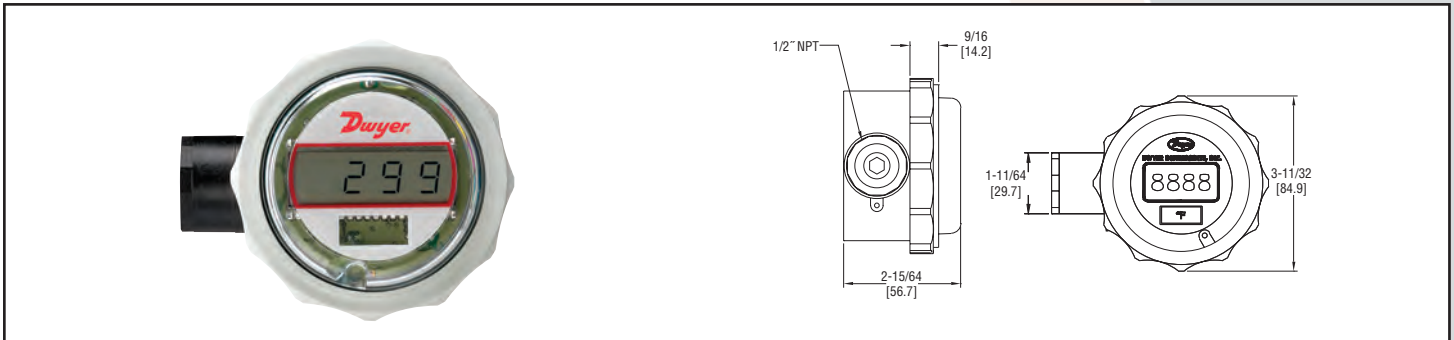
**Model 1000,** Process Indicator

**Model 1010,** Process Indicator with Alarm



# Series BPI Battery Powered Temperature Indicator

RTD or T/C Input, 4-Digit Display, Selectable °F or °C



The Series BPI Battery Powered Indicator accepts RTD or Thermocouple input and provides local or remote display of temperature measurements. Quickly navigate the menu system to customize for each application. Three push buttons allow the user to select input type, engineering units (°F or °C), offset temperature, decimal point position, and password protection. The indicator is housed in a polycarbonate NEMA 4X (IP65) enclosure for additional protection from the environment.

Model No.	Input
BPI - 101	3-wire Pt100 or Ni120
BPI - 102	K, J, T, N, R, S, E, or F thermocouples

## Measuring Ranges

Sensor	Range °F (°C)	Sensor	Range °F (°C)
K	-328 to 2498°F (-200 to 1370°C)	S	14 to 3200°F (-10 to 1760°C)
J	-148 to 2192°F (-100 to 1200°C)	E	-328 to 1832°F (-200 to 1000°C)
T	-346 to 752°F (-210 to 400°C)	F	-148 to 1112°F (-100 to 600°C)
N	-292 to 2372°F (-180 to 1300°C)	Pt100Ω	-148 to 1472°F (-100 to 800°C)
R	14 to 3200°F (-10 to 1760°C)	Ni120	-148 to 1472°F (-100 to 800°C)

## SPECIFICATIONS

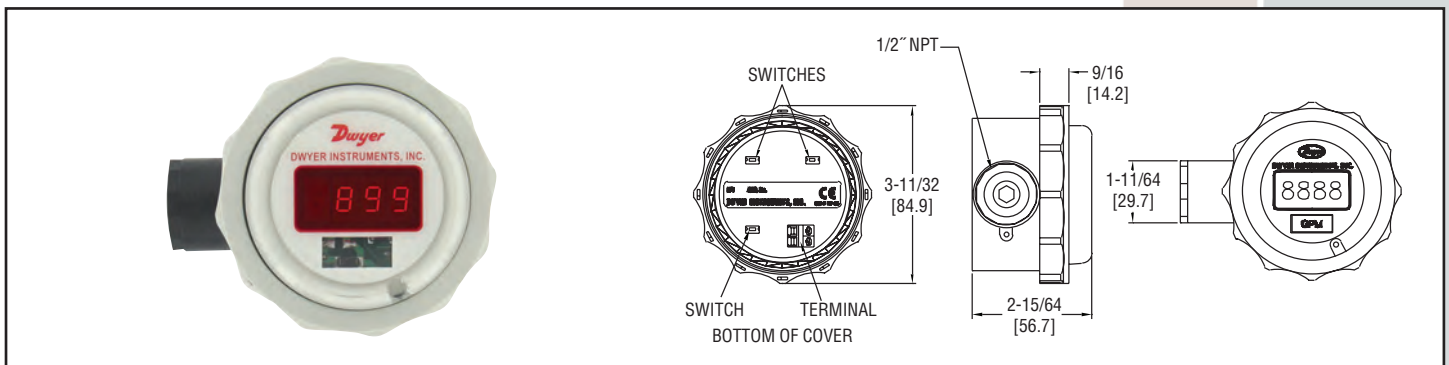
**Inputs:** Thermocouple or RTD depending on model.  
**Accuracy:** Thermocouple Input: ±0.1% of FS, ±0.5°C (plus sensor); RTD: ±0.2°C ±0.1% of reading (plus sensor error).  
**Power Requirements:** 3.6 V Lithium battery.  
**Battery Life:** >2 years.  
**Display:** 4-digit LCD.

**Resolution:** 0.1°C.  
**Ambient Operating Temperature:** 14 to 158°F (-10 to 70°C).  
**Storage Temperature:** -4 to 185°F (-20 to 85°C).  
**Weight:** 6.0 oz (170 g).  
**Front Panel Protection:** NEMA 4X (IP65).  
**Agency Approvals:** CE.

Panel Meters

# Series LPI Loop Powered Indicators

Square Root Function and User Defined Curves 4-Digit LED



The micropressure based Series LPI Loop Powered Indicator accepts a 4-20 mA input signal and displays the associated process variable such as pressure, level, flow, temperature or relative humidity. Local or remote indication of process variable can be viewed on the bright red four-digit LED. The user can quickly modify the instrument configuration via three push buttons. Program input/output scaling, engineering units, offset, decimal point position, and password protection. The Series LPI contains several linearizations which can be applied to the display including straight linear, square root, x 3/2, x 5/2, or a user defined 19 segment linearization curve. The indicator is housed in a NEMA 4X (IP65) polycarbonate enclosure with a 1/2" female NPT side port.

**Model LPI-111,** Loop Powered Indicator with plastic enclosure

## SPECIFICATIONS @ 68°F (20°C)

**Input:** 4 to 20 mA.  
**Maximum Input Current:** 100 mA for 1 minute.  
**Accuracy:** ±0.02% of full scale.  
**Stability:** Zero: 0.002%/°C; Span: 100 ppm/°C.  
**Power Requirements:** 2-wire 4-20 mA loop powered.  
**Display:** 4-digit, 7.6 mm (high) red LED.  
**Maximum Display Range:** -1999 to 9999.  
**Ambient Operating Temperature:** -4 to 167°F (-20 to 75°C).  
**Storage Temperatures:** -58 to 185°F (-50 to 85°C).  
**Weight:** 6.0 oz (170 g).  
**Front Panel Protection:** NEMA 4X (IP65).  
**Agency Approvals:** CE.



# Introduction to Humidity Controls

## What is relative humidity?

Relative humidity (RH) is the amount of water vapor given volume of air compared to the amount of water vapor the same volume of air will hold at saturation (100% RH) at a given temperature. The moisture holding capacity of air increases with increasing temperatures.

## Why is RH important?

Air is a vital component of our everyday lives. The amount of water vapor in the air effects our comfort levels and productivity. A direct relationship exists between the psychological well being of employees and the environment in which they work. When the indoor relative humidity drops below 40%, the incidence of absenteeism and respiratory illness increase. Humidity conditions also effect equipment, manufacturing process, and finished goods. Too much water vapor produces condensation problems, product instabilities, inefficiencies, increased bacteria growth and adverse health conditions. Too little water vapor produces static electricity, product instabilities, inefficiencies, ozone production, virus propagation, and adverse health conditions.

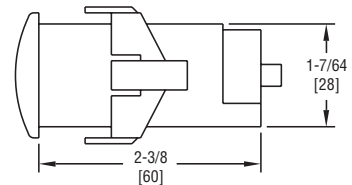
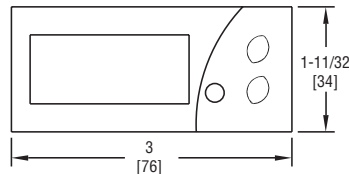
Product	Page
Series HS Humidity Switch . . . . .	45
Series THC Temperature/Humidity Switch. . . . .	46
Series HT RH/Temperature Transmitter. . . . .	47
Series RH-R Humidity/Temperature Transmitter . . . . .	47
Series RH/RHL Humidity/Temperature Transmitter . . . . .	48-49



Series  
HS

# Humidity Switch

Programmable, 8 Amp Relay, 3-Digit Display



Panel Cutout 2-51/64" x 1-9/64" (71 x 29 mm)

The microprocessor based Series HS Humidity Switch provides control for humidifying or dehumidifying. Relative humidity, output status, and error messaging can be viewed on the bright green LED. The switch features 9 user defined parameters including setpoint, hysteresis, control type, cycle time, and probe adjustment. Access to programming parameters can be locked for security purposes using the password protection feature. The Series HS includes a fitting clip for panel mounting, gasket, rear terminal cover, and instruction manual. Monitors humidity in ducts.

## SPECIFICATIONS

- Relative Humidity Range:** 0 to 100% RH.
- Input:** 0 to 3V, 0 to 1V or 4-20 mA (depending on model) humidity probe not included.
- Accuracy:**  $\pm 1\%$  RH.
- Display:** 3-digit, green, 1/2" (12.7 mm) digits.
- Resolution:** 1 digit.
- Temperature Limits:** 32 to 158°F (0 to 70°C).
- Storage Temperature:** -4 to 176°F (-20 to 80°C).
- Output:** 8 A SPDT relay @ 250 VAC resistive.
- Horsepower Rating (HP):** 1/3 HP.
- Control Type:** ON/OFF.
- Power Requirements:** 110 VAC or 230 VAC (Depending on model).
- Memory Backup:** Nonvolatile memory.
- Weight:** 2.3 oz (65 g).
- Front Panel Rating:** IP64.
- Agency Approvals:** CE, UR, URc.

Model Number	Input Sensor	Supply Voltage
HS-311	0 to 3 V	110 VAC
HS-312	0 to 3 V	230 VAC
HS-111	0 to 1 V	110 VAC
HS-112	0 to 1 V	230 VAC
HS-411	4 to 20 mA	110 VAC
HS-412	4 to 20 mA	230 VAC

## ACCESSORY

**THC-P Humidity Probe**, 0 to 3 output, 4 ft (1.5m) cable

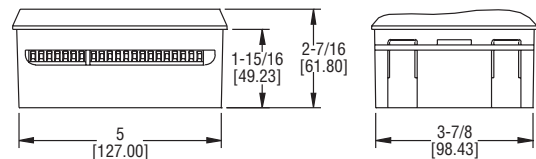
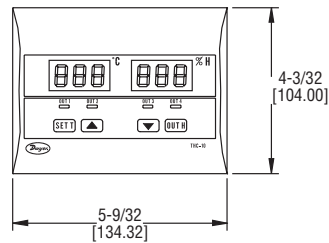
## APPLICATIONS

HS Digital Humidity Switches are suitable for industrial chillers, environmental chambers, walk-ins and freezers, heat sealers, beer and wine chillers, mug frosters, coolers, display cases and cabinets, meat and produce storage, floral preservation, refrigerated transportation, laboratories, food service equipment, ovens and dryers, green houses, museums, and tobacco preservation. Monitors humidity in ducts.

Series  
THC

# Temperature/Humidity Switch

Independent Displays, 61 Programmable Parameters, 4 SPST Relays

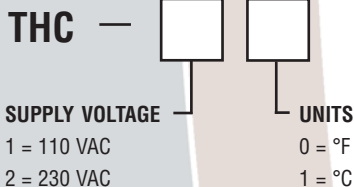


Humidity

**Simultaneously measure and control** temperature and humidity with the Series THC Temperature/Humidity Switch. The unit offers a 3-digit red display for temperature indication and a 3-digit green display indicating humidity. The Series THC is equipped with four independent relays, two for temperature control and two relays for humidity control.

The unit offers 61 programmable parameters for temperature and humidity control including set point, differential, direct/reverse acting, cycle time, alarm clock time, and decimal point adjustment. In the event of a probe error, the default operation of the relays can be set to open or close. The THC features error or alarm messaging and password protection.

The THC Temperature/Humidity Switch accepts up to two temperature probe inputs (sold separately) and a humidity sensor. A humidity sensor with 0-1V, 0-3V (sold separately), or 4-20 mA output can be used with the Series THC.



## SPECIFICATIONS

**Measurement Range:** Temperature: -58 to 302°F (-50 to 150°C); Humidity: 0 to 100% RH.

**Input:** Up to 2 thermistors and 1 humidity sensor.

**Output:** 4 SPST, 8A relays @ 250 VAC.

**Horsepower Rating (HP):** 1/3 HP.

**Control Type:** ON/OFF direction, direct or reverse acting, neutral.

**Power Requirements:** 110 or 230 VAC (depending on model).

**Accuracy:** Temperature ±0.5% of probe range; Humidity: ±3% of range.

**Display:** Two 3-digit displays. 1/2" digits.

**Resolution:** 0.1°.

**Memory Backup:** Nonvolatile memory.

**Ambient Operating Temperature:** 32 to 158°F (0 to 70°C).

**Storage Temperature:** -4 to 176°F (-20 to 80°C).

**Weight:** 1.17 lb (530 g).

**Panel Cutout:** 5.15" x 2.37" (131 x 111 mm).

**Front Panel Protection:** IP64.

**Agency Approvals:** CE.

## ACCESSORIES

**THC-P** Humidity probe with 3V output & 4 ft (1.2 m) cable

**TS-5** Temperature probe, PVC with 5 ft (1.5 m) cable

**TS-6** Temperature probe, metal with 5 ft (1.5 m) cable

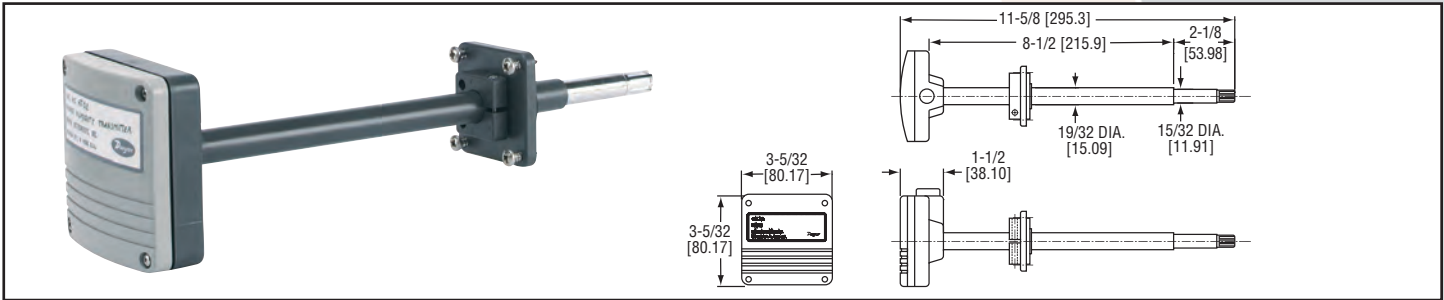
**TS-51** Temperature probe, PVC with 10 ft (3 m) cable

**TS-61** Temperature probe, metal with 10 ft (3 m) cable

Series  
HT

# RH/Temperature Transmitter

Calibration-Free, 2-Wire Design, Duct or Wall Mount



**Monitor and control** relative humidity and temperature in building energy management systems with the Series HT Humidity/Temperature Transmitter. Designed for demanding HVAC/EMCS applications, the Series HT provides  $\pm 3\%$  RH accuracy and  $\pm 1\%$  stability per year. Routine calibration is not required with the fully interchangeable sensor. Two wire connections allow easy installation directly into air ducts or within a controlled area.

Model Number	Description
HT00*	Humidity Transmitter, wall mount
HT01	Humidity Transmitter, duct mount
HT10*	Humidity/Temp Transmitter, wall mount
HT11	Humidity/Temp Transmitter, duct mount

\*Wall mount not shown

**ACCESSORY**

No. HT5, Replacement sensor

**SPECIFICATIONS**

**Relative Humidity Range:** 10 to 90% RH.  
**Temperature Range:** Duct mount: -40 to 140°F (-40 to 60°C), wall mount: 23 to 131°F (-5 to 55°C).  
**Accuracy:**  $\pm 3\%$  RH @ 25°C;  $\pm 0.3^\circ\text{C}$  @ 25°C.  
**Temperature Limits:** Duct mount: 14 to 140°F (-10 to 60°C), wall mount: 23 to 131°F (-5 to 55°C).  
**Storage Temperature:** -40 to 140°F (-40 to 60°C).  
**Operating Humidity Range:** Duct mount: 0 to 100% RH, wall mount: 0 to 90% RH.  
**Power Requirements:** 10 to 28 VDC.  
**Output Signal:** 4 to 20 mA.

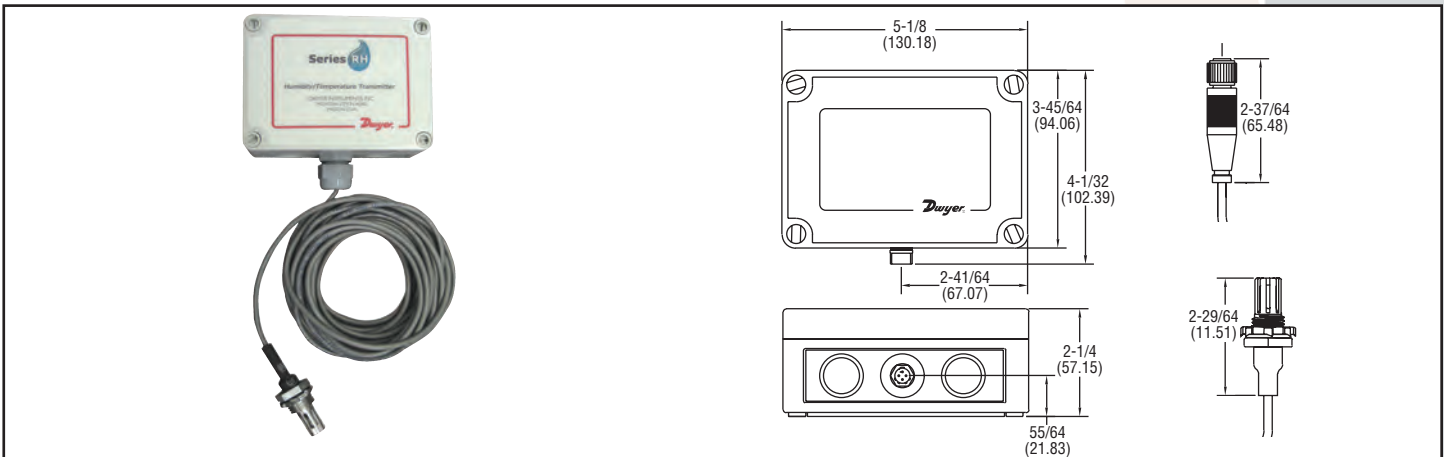
**Response Time:** 15 seconds.  
**Current Consumption:** 4 mA minimum.  
**Conduit Connection:** 1/2" NPT.  
**Mounting Connection:** 3/4" NPT.  
**Drift:**  $\pm 2\%$  RH over 2 years.  
**Temperature Sensor:** Pt 1000Ω RTD.  
**RH Temperature Dependence:**  $< \pm 1.5\%$  RH from 14 to 140°F (-10 to 60°C).  
**Temperature Dependence:** 0.01°C/°C.  
**Housing Material:** ABS plastic.  
**Enclosure Rating:** Duct mount only/IP65.  
**Weight:** 0.6 lb (0.3 kg).  
**Agency Approvals:** CE.

Humidity

Series  
RH-R

# Humidity/Temperature Transmitter

Remote Mount, Field Replaceable Sensor, Up to 16' Cable



The Series RH-R Humidity Transmitter is the ideal transmitter for those applications where space is limited. The compact sensor is protected by a removable filter. It can be mounted up to 16 feet away from the weatherproof base. The Series RH-R is ideal for environmental chambers, rubber bladder burst detection and air handler applications.

Model Number	Cable Length	Description
RHU-R06	6'	Humidity
RHU-R16	16'	Humidity
RHT-R06	6'	Humidity/Temperature
RHT-R16	16'	Humidity/Temperature

**SPECIFICATIONS**

**Relative Humidity Range:** 0 to 100% RH.  
**Temperature Range:** -40 to 140°F (-40 to 60°C).  
**Accuracy:**  $\pm 2\%$  @ 10-90%.  
**Temperature Limits:** -40 to 140°F (-40 to 60°C).  
**Storage Temperature:** -40 to 176°F (-40 to 80°C).  
**Compensated Temperature Range:** -4 to 140°F (-20 to 60°C).  
**Power Requirements:** 10-35 VDC.

**Output Signal:** 4-20 mA loop powered.  
**Response Time:** Less than 15 seconds.  
**Electrical Connections:** Removable terminal block.  
**Conduit Connection:** 1/2" NPT.  
**Drift:** Less than 1%/year.  
**RH Sensor:** Capacitance polymer  
**Cable Length:** 6 ft and 16 ft.  
**Housing Material:** Polycarbonate, aluminum enclosure.  
**Enclosure Rating:** NEMA 4X (IP65).  
**Agency Approvals:** CE.

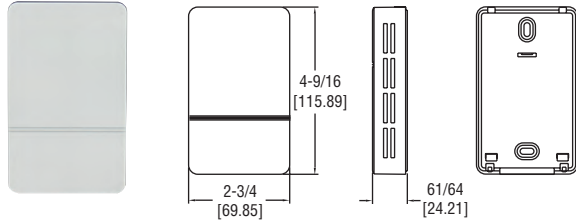
Series  
RH/RHL

# Humidity/Temperature Transmitter

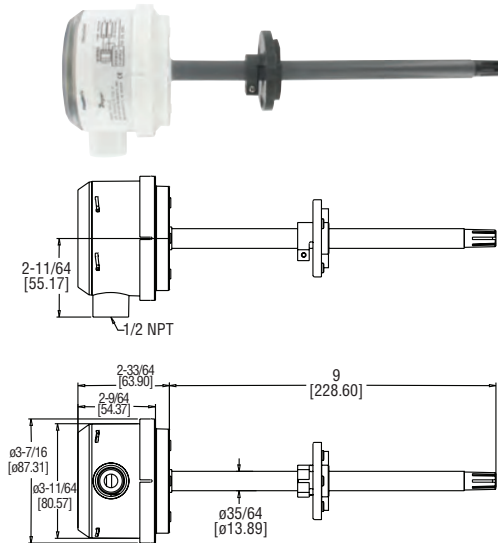
Calibration-Free, 2% Or 3% Accuracy, Optional Display



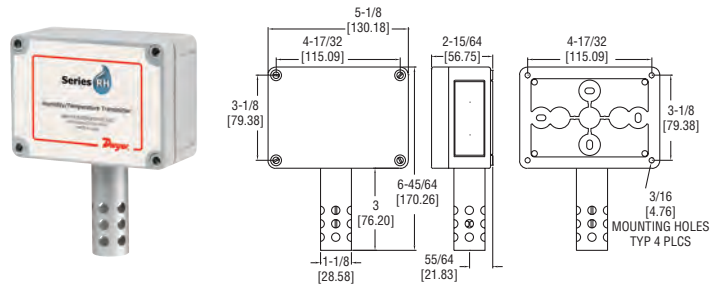
## Wall Mount



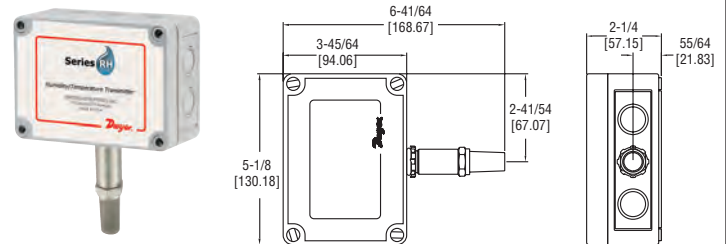
## Duct Mount



## OSA (Outside Air)



## Sintered Filter Version



**Demanding humidity/temperature applications require the Series RH/RHL Transmitter** which offers high accuracy, long term stability, and reliable operation. The Series RH/RHL is designed for monitoring and controlling humidity or both humidity and temperature in building energy management systems, HVAC, commercial, residential, clean rooms, museums, climate chambers, and other space monitoring applications.

The Series RH/RHL is a two-wire transmitter with a 4-20 mA loop powered output or 0 to 10 VDC output. The state of the art sensor recovers from 100% saturation and is calibration-free. A variety of mounting configurations are available including wall mount, duct mount, and OSA (outside air) models. Select humidity monitoring or humidity and temperature models.

The combined humidity/temperature version (RHT) provides dual 4-20 mA or 0 to 10 VDC output signals to control both humidity and temperature with one sensor which reduces installation costs. The duct mount version is also available with an optional alpha-numeric LCD to provide local indication of humidity and temperature simultaneously. The displayed temperature is field selectable for °F or °C. Monitor humidity in ducts, rooms, and outside air.

## APPLICATIONS

- Room temperature/humidity monitoring
- Supply air temperature/humidity monitoring
- Exhaust air temperature/humidity monitoring
- Outside air temperature/humidity monitoring

## SPECIFICATIONS

**Relative Humidity Range:** 0 to 100% RH.

**Temperature Range:** -40 to 140°F (-40 to 60°C).

**Accuracy:** (RH): ±2% @ 10 - 90% RH; (RHL): ± 3% @ 20-80% RH; ±0.9°F @ 72°F (±0.3°C @ 25°C).

**Temperature Limits:** -40 to 140°F (-40 to 60°C).

**Storage Temperature:** -40 to 176°F (-40 to 80°C).

**Compensated Temperature Range:** -4 to 140°F (-20 to 60°C).

**Power Requirements:** 10-35 VDC.

**Output Signal:** 4-20 mA or 0-10 VDC, 2 channels for humidity/temperature models (loop powered on RH current models).

**Response Time:** 5-15 seconds.

**Electrical Connections:** Screw terminal block.

**Conduit Connection:** Duct mount: 1/2" NPS; OSA: 1/2" (22.3 mm).

**Drift:** <1% RH/year.

**RH Sensor:** Capacitance polymer.

**Temperature Sensor:** Solid state band gap.

**Housing Material:** Wall Mount: ABS; Duct Mount: PBT; OSA: Polycarbonate.

**Enclosure Rating:** NEMA 4X (IP65) for OSA mount only.

**Display:** Optional 2-line alpha-numeric, 8 characters/line for duct mount only.

**Display Resolution:** RH: 0.1%; 0.1°F (0.1°C).

**Weight:** Wall Mount: 0.5 lb (0.25 kg); Duct Mount: 0.6 lb (0.3 kg); OSA: 1 lb (0.45 kg).

**Agency Approvals:** CE.



# Designed for Demanding Humidity/Temperature Applications

## FEATURES

- Long term stability
- Selectable temperature units
- Designer wall, duct or outside air models
- $\pm 2\%$  or  $\pm 3\%$  accuracy for RH
- Dual 4-20 mA or 0-10 VDC outputs on humidity/temperature models
- Two-line alpha-numeric display for local indication
- Completely recovers from 100% saturation

## DESIGNER WALL MODELS

Model Number	Accuracy	Output
RHUL-W	3%	4 to 20 mA
RHTL-W	3%	4 to 20 mA
RHUL-W1	3%	0 to 10 VDC
RHTL-W1	3%	0 to 10 VDC
RHU-W	2%	4 to 20 mA
RHT-W	2%	4 to 20 mA
RHU-W1	2%	0 to 10 VDC
RHT-W1	2%	0 to 10 VDC

## OUTSIDE AIR MODELS

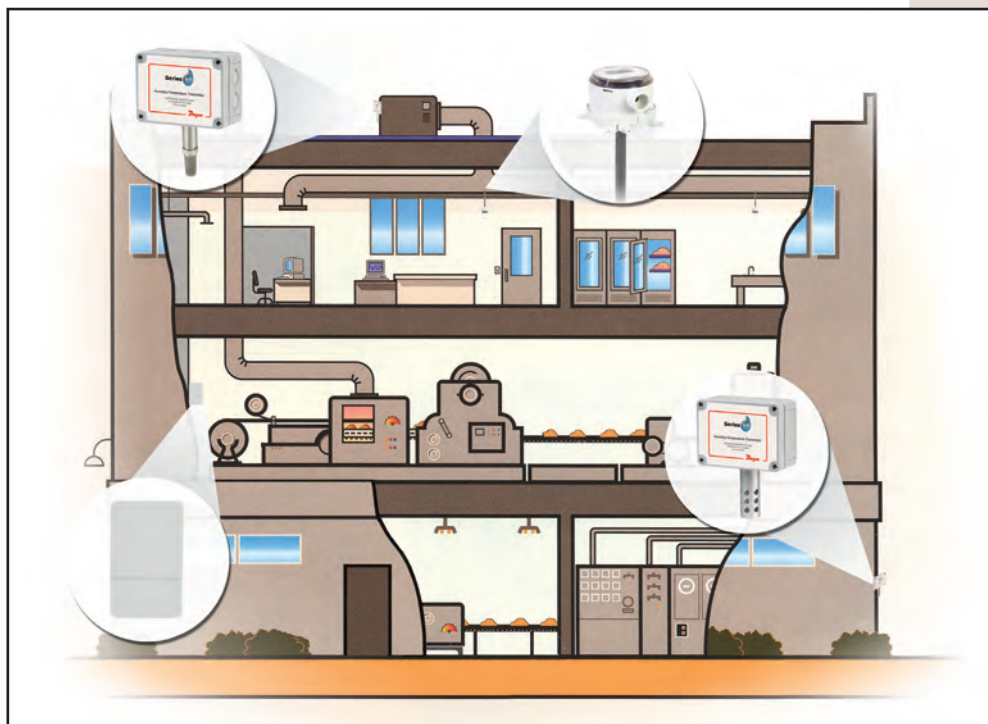
Model Number	Accuracy	Output
RHUL-O	3%	4 to 20 mA
RHTL-O	3%	4 to 20 mA
RHUL-O1	3%	0 to 10 VDC
RHTL-O1	3%	0 to 10 VDC
RHU-O	2%	4 to 20 mA
RHT-O	2%	4 to 20 mA
RHU-O1	2%	0 to 10 VDC
RHT-O1	2%	0 to 10 VDC

## DUCT MOUNT MODELS

Model Number	Accuracy	Output
RHUL-D	3%	4 to 20 mA
RHTL-D	3%	4 to 20 mA
RHUL-D1	3%	0 to 10 VDC
RHTL-D1	3%	0 to 10 VDC
RHU-D	2%	4 to 20 mA
RHT-D	2%	4 to 20 mA
RHU-D1	2%	0 to 10 VDC
RHT-D1	2%	0 to 10 VDC
RHT-D-LCD	2%	4 to 20 mA
RHT-D1-LCD	2%	0 to 10 VDC
RHTL-D-LCD	3%	4 to 20 mA
RHTL-D1-LCD	3%	0 to 10 VDC

## SINTERED FILTER MODELS

Model Number	Accuracy	Output
RHUL-S	3%	4 to 20 mA
RHTL-S	3%	4 to 20 mA
RHUL-S1	3%	0 to 10 VDC
RHTL-S1	3%	0 to 10 VDC
RHU-S	2%	4 to 20 mA
RHT-S	2%	4 to 20 mA
RHU-S1	2%	0 to 10 VDC
RHT-S1	2%	0 to 10 VDC



Humidity

# Temperature Sensors

## INTRODUCTION

Sensors measure temperature and pass that information to a control or monitor. Love offers three types of sensors: thermocouples, resistance temperature detectors (RTDs), and thermistors.

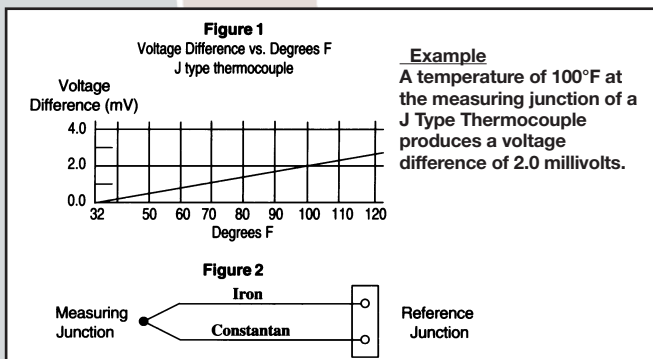
## THERMOCOUPLES

Thermocouples are made of two dissimilar metal wires joined at their measuring end forming the “measuring junction” also known as the “hot junction”. A small voltage, known as the Seebeck voltage, is created at a junction of dissimilar metal alloys. This voltage changes as a function of temperature. See Figure 1. The control or monitor measures this small voltage and converts it to a temperature signal. Modern instrumentation also measures the temperature where the thermocouple is connected to the instrument. This is the reference junction. See Figure 2. Any temperature effects near the instrument can be cancelled out leaving an accurate reading of the process to be measured.

A thermocouple may be directly connected to a control or monitor. Extension wires, if used, must be of the same materials as the thermocouple wires.

Thermocouples designed with their measuring junctions in contact with new surfaces are known as grounded junction thermocouples. These are the most common, generally have the fastest response times, and are the most economical. Ungrounded junction thermocouples offer the advantage of electrical isolation. Love manufactures both types of thermocouples. Thermocouples are generally more rugged and less expensive than other sensor types. All Love thermocouples are manufactured using industry standard alloys and meet stringent ANSI standards. This assures interchangeability with other standard thermocouples without special instrument recalibration.

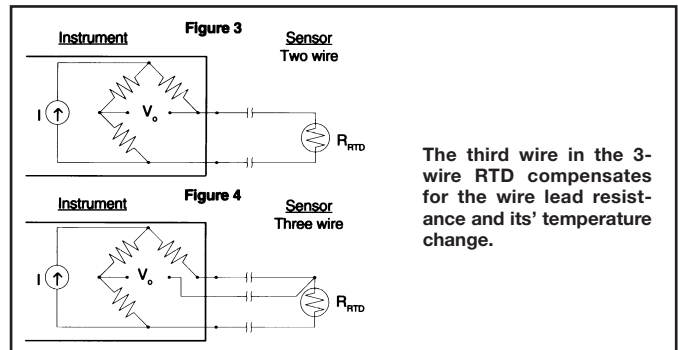
Love thermocouples are used in all types of applications, can measure wide temperature ranges, and are offered in a large variety of standard configurations.



## RTDs

RTDs are usually platinum wire wound on a glass or ceramic bobbin and sealed with a coating of ceramic or glass. They can also be made by depositing platinum as a film on a substrate and then encapsulating it. The electrical resistance of the RTD changes as a function of temperature. Circuitry similar to a Wheatstone bridge is built into controls designed for use with RTDs. Constant current into the bridge produces an output voltage that varies with temperature. Lead wire resistance can significantly affect the RTD measurement. This is typically corrected using a third (compensating) lead wire. See Figures 3 and 4.

Extension wires used with RTDs may be plain copper wire. RTDs are generally more accurate and more stable over time than thermocouples. Love RTDs are built to rigorous DIN (most common) or NIST standards and are offered in a wide variety of standard configurations.



## THERMISTORS

Thermistors have a semiconductor material which changes its electrical resistance as a function of temperature. Extension wires used with thermistors can be plain copper wire.

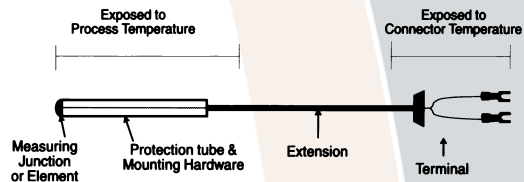
Thermistors offer accuracy similar to RTDs within narrow temperature ranges near ambient temperature. They also generally offer faster response times. Since thermistor standards vary, care must be taken to match the instrumentation to the sensor.

# Temperature Sensors

## ORDERING SENSORS:

Sensors are constructed with various types of protection/mounting hardware, extensions, and wire terminations. The sensor types and their temperature ranges are shown in the table below. See "Temperature Limits" below for maximum service temperatures applicable to the protection tube, mounting hardware, wire extensions, etc.

This section shows only a limited selection of the available sensors. The sensors are organized by hardware type. Most hardware can house any type thermocouple, RTD, or thermistor. Terminations are usually either lug type or standard plugs, but many other types are available. Various 'head enclosures' are also available. Dimensions can be custom designed to meet your specifications. The selections listed are the most popular configurations. Please ask your sales representative about other possible selections.



Thermocouple Types	Wire Type	Temperature Range (°F)	Temperature Range (°C)
J	Iron/Constantan	32 to 1400	0 to 760
K	Chromel/Alumel	32 to 2300	0 to 1200
E	Chromel/Constantan	-300 to 1600	-184 to 871
T	Copper/Constantan	-300 to 700	-184 to 371
R	Plat. 13% /Rhod. Plat.	32 to 2700	0 to 1482
S	Plat. 10% Rhod./Plat.	32 to 2700	0 to 1482
B	Plat. 6% Rhod./Plat. 30% Rhod.	1600 to 3100	871 to 1704
<b>Thermistor Types</b>			
Cal. 100	2K @ 25°C	-60 to 150	-51 to 66
Cal. 101	5K @ 25°C	50 to 250	10 to 121
Cal. 109	100K @ 25°C	300 to 600	140 to 315
<b>RTD Types</b>			
DIN (100Ω @ 0°C a = .00385 Ω/Ω/°C)		-420 to 1500	-200 to 875
NIST (100Ω @ 0°C a = .00392 Ω/Ω/°C)		-420 to 1500	-200 to 875
Nickel (120Ω @ 0°C a = .00672 Ω/Ω/°C)		-150 to 600	-101 to 315

## TEMPERATURE LIMITS:

Sensor selection depends on two separate temperatures: process temperature and connector temperature. Make sure the local temperature at each component does not exceed the maximum rated service temperature for that component. Note that extension wire must withstand the process temperature. All Love thermocouple and RTD assemblies (including extension wire) shown in this section are designed for process temperatures to at least 900°F. Please consult factory if higher service temperatures are needed.

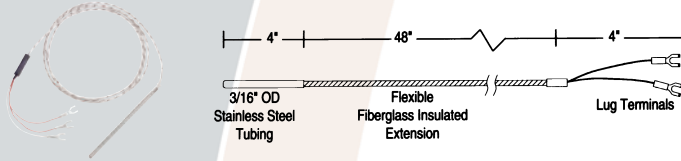
## SERVICE TEMPERATURES

Stainless Steel Tubing / Protection /	
Mounting Hardware .....	1500°F
Stainless Steel Springs .....	1500°F
Inconel® Springs (Dwyer Standard) .....	2100°F
Fiberglass Insulated Extension Wire (Love Standard) ..	900°F
Junction Box (BX) Connector .....	400°F
Plug .....	300°F
J Type Thermocouple Junction .....	1600°F
K Type Thermocouple Junction .....	2500°F
E Type Thermocouple Junction .....	1800°F
DIN or NIST RTD.....	1607°F

# Thermocouples & RTD's

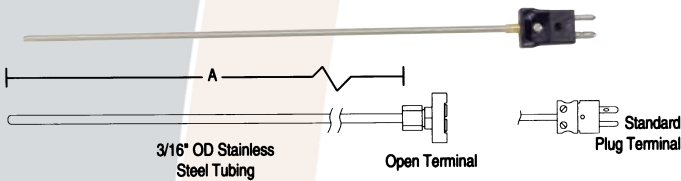
## GENERAL PURPOSE

### Basic Model



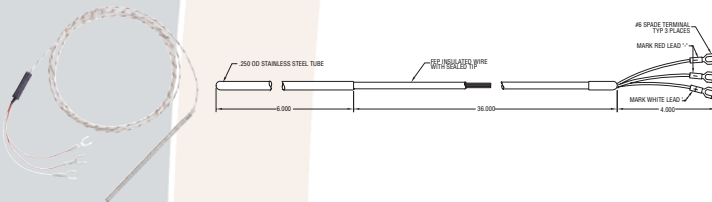
MODEL	SENSOR TYPE	TERMINAL
122095-84	J	Lug
122095-01	K	Lug
122095-04	(3-wire) 100Ω RTD	Lug

### Rigid Extension Model



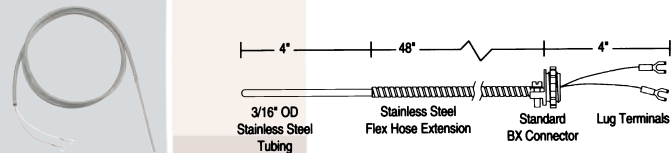
MODEL	SENSOR TYPE	A LENGTH	TERMINAL
122095-96	J	12	Open
122095-07	J	18	Open
122095-08	J	24	Open
122095-14	100Ω RTD	24	Open
122095-00	J	12	Plug
122095-10	J	18	Plug

### FEP Insulation Extension



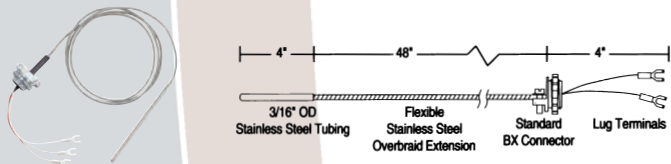
MODEL	SENSOR TYPE	A LENGTH	TERMINAL
122087-00	100Ω RTD	6"	Lug
122087-01	100Ω RTD	12"	Lug
122087-02	100Ω RTD	18"	Lug

### Flex Hose Extension Model



MODEL	SENSOR TYPE	BEND	TERMINAL
122095-06	J	0°	Lug
122095-15	J	0°	Plug
122095-17	100Ω RTD	0°	Lug
122095-16	J	90°	Lug
122095-20	100Ω RTD	90°	Lug

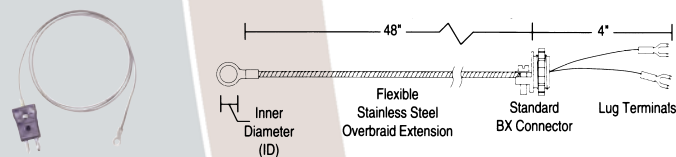
### Stainless Steel Overbraid Extension Model



MODEL	SENSOR TYPE	BEND	TERMINAL
122095-19	J	0°	Lug
122095-21	J	0°	Plug
122095-22	J	90°	Lug
122095-25	100Ω RTD	0°	Lug

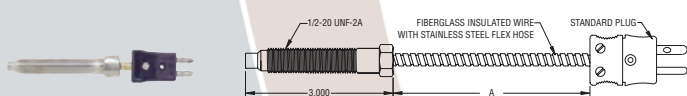
## SPECIAL PURPOSE

### Surface Thermocouple (900°F Max.)



MODEL	SENSOR TYPE	WASHER SIZE	TERMINAL
122095-24	J	13/32" ID	Lug
122095-31	J	13/32" ID	Plug
122095-32	J	13/64" ID (#10 Washer)	Lug

### Bolt Style

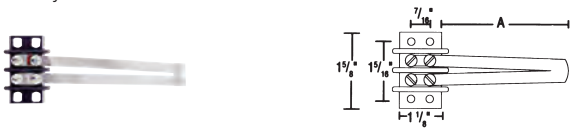


MODEL	SENSOR TYPE	TIP	A LENGTH	TERMINAL
122095-58	J	Flush	0	Plug
122095-57	J	Flush	4"	Plug
122095-60	J	1/8"	0	Plug
122095-59	J	1/8"	4"	Plug

# Thermocouples & RTD's

## SPECIAL PURPOSE

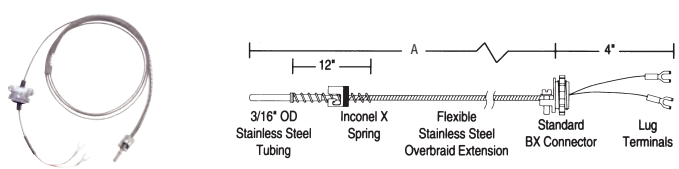
Web Style



MODEL	A LENGTH	TERMINAL
122095-35	4"	No
122095-86	2.75"	No
122095-34	4"	Yes
122095-85	2.75"	Yes

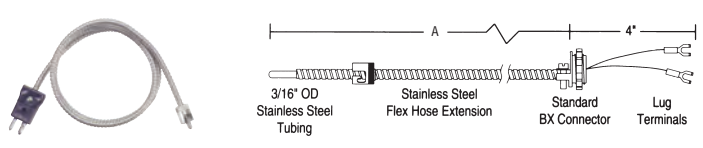
## BAYONET MOUNT

Adjustable Length Spring Type



MODEL	SENSOR TYPE	A LENGTH	TERMINAL
122095-75	J	36	Lug
122095-26	J	48	Lug
122095-77	J	60	Lug
122095-76	J	36	Plug
122095-27	J	48	Plug
122095-78	J	60	Plug

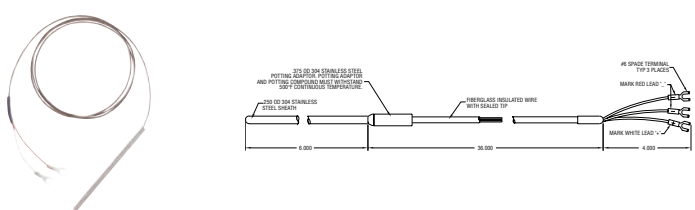
Adjustable Length Flex Hose Type



MODEL	SENSOR TYPE	A LENGTH	TERMINAL
122095-79	J	36	Lug
122095-81	J	48	Lug
122095-82	J	60	Lug
122095-80	J	36	Plug
122095-29	J	48	Plug
122095-83	J	60	Plug

## MINERAL INSULATED

Mineral Insulated



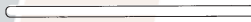
MODEL	SENSOR TYPE	A LENGTH	DIAMETER	TERMINAL
122088-00	100Ω RTD	6"	1/4	Lug
122088-01	100Ω RTD	12"	1/4	Lug
122086-00	100Ω RTD	6"	1/8	Lug

Temperature Sensors



# Term Descriptions

## HARDWARE TYPE



Plain Sheath



Bayonet Mount, Adjustable (min. A = 0.5")  
(when made with Flex Hose)



Bayonet Mount, Adjustable  
(when made with SS Overbraid Wire)



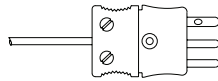
Bayonet Mount, Fixed (min. A = 1.8")

Temperature  
Sensors

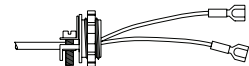
## TERMINALS



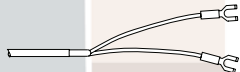
Stripped-Ends-Type 0



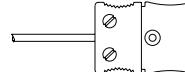
RTD Standard Plug - Type 3



Fast Tabs w/ BX  
Connector - Type A



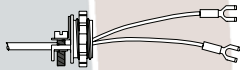
Lugs - Type 1



RTD Standard Jack - Type 4



Screw Cover Head -  
Type E, F



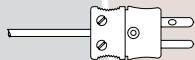
Lugs w/BX Connector -  
Type 2



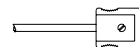
T/C Mini Plug - Type 6



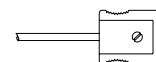
RTD Mini Plug - Type 6



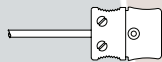
T/C Standard Plug - Type 3



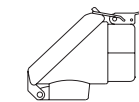
T/C Mini Jack - Type 7



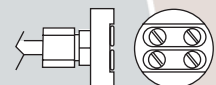
RTD Mini Jack - Type 7



T/C Standard Jack - Type 4



Snap Cover Head -  
Type 8, B



Open Terminals - Type 5

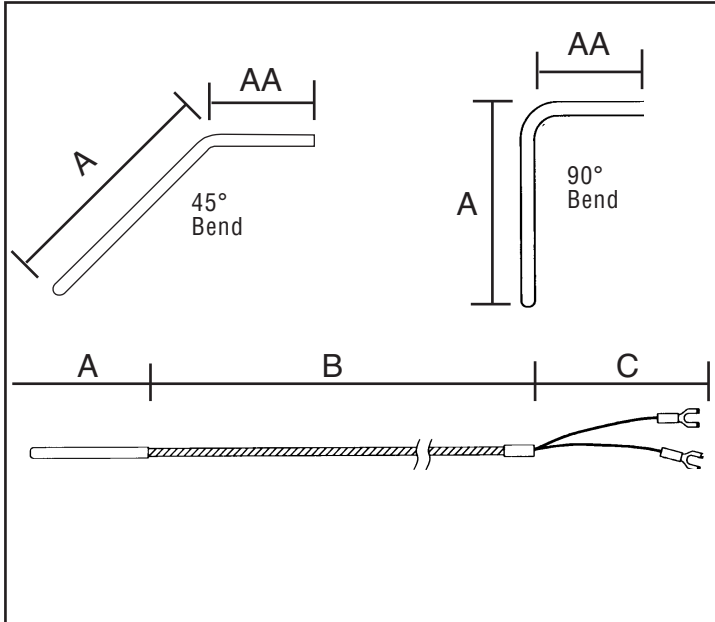


Fast Tabs - Type 9

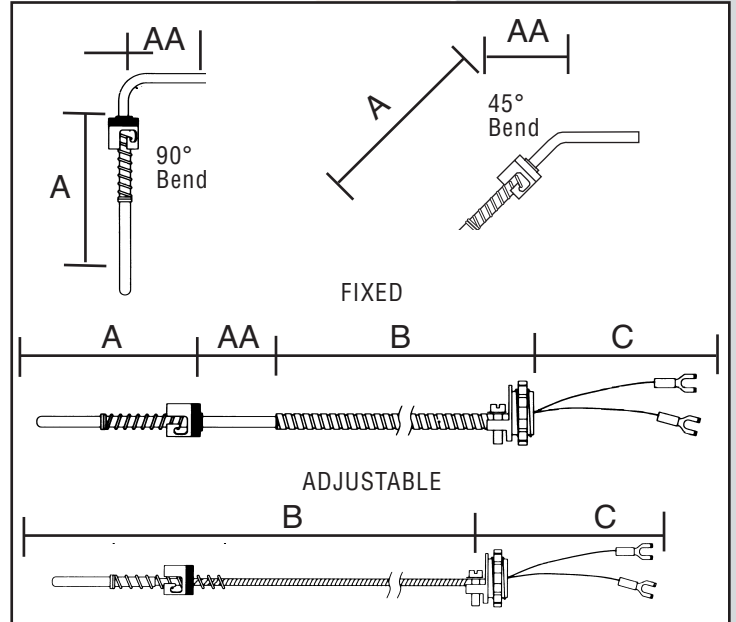
# General Purpose and Bayonet Type Thermocouples & RTD's

General Purpose Type Thermocouples and RTD's have a plain sheath with no permanently attached fittings. They are usually mounted with the use of a compression fitting which is supplied separately. Tip temperatures can be as high as 480°C (900°F) for fiberglass insulated wire, 250°C (500°F) for FEP insulated wire. Models specified with a head cover include a 1/2" hex nipple. For higher temperatures see the section on Mineral Insulated Probes.

## General Purpose



## Bayonet



## Model Coding For General Purpose & Bayonet Styles

Fill in the appropriate numbers or letters to specify the probe of your choice. Fill in all boxes. If an item or dimension does not apply, fill those boxes with zeros '0'.

A
AA
B
C  
 in 1/10 inch    in 1/10 inch    in inches    in inches

**5**     -     -    -    -    -

<p><b>SENSOR TYPE</b></p> <ul style="list-style-type: none"> <li>J (T/C)</li> <li>K (T/C)</li> <li>E (T/C)</li> <li>T (T/C)</li> <li>6 (RTD DIN)</li> <li>4 (RTD NIST)</li> <li>Z (RTD DIN 1K)</li> <li>5 (RTD DIN 2-Wire)</li> <li>7 (RTD DIN 1K 2-Wire)</li> </ul> <p><b>HARDWARE TYPE</b></p> <ul style="list-style-type: none"> <li>0 - None</li> <li>1 - Plain Sheath</li> <li>4 - Type 1 with FEP</li> <li>6 - Bayonet Mount - Adjustable, SS</li> <li>7 - Bayonet Mount - Fixed Length, SS</li> </ul>	<p><b>EXTENSION TYPE</b></p> <ul style="list-style-type: none"> <li>0 - No extension</li> <li>1 - Fiberglass Insulation</li> <li>3 - Stainless Steel Overbraid</li> <li>4 - FEP Insulation</li> <li>5 - Stainless Steel Flex Hose</li> <li>6 - FEP over SS Flex Hose</li> </ul>	<p><b>SENSOR TERMINALS</b></p> <ul style="list-style-type: none"> <li>0 - Stripped Ends</li> <li>1 - Lugs</li> <li>2 - Lugs with BX</li> <li>3 - Standard Plug</li> <li>4 - Standard Jack</li> <li>5 - Open Terminals</li> <li>6 - Mini Plug</li> <li>7 - Mini Jack</li> <li>8 - Snap Cover Head, AI</li> <li>9 - Fastabs</li> <li>A - Fastabs with BX</li> <li>B - Snap Cover Head, Plastic</li> <li>E - Screw Cover Head, AI w/ 3/4 NPT Conduit</li> <li>F - Screw Cover Head, Plastic w/ 3/4 NPT Conduit</li> <li>G - Screw Cover Head, SS Weather Proof Head w/ 1/2 NPT Conduit</li> </ul>	<p><b>ELEMENTS</b></p> <ul style="list-style-type: none"> <li>1 - Single</li> <li>2 - Dual</li> </ul>	<p><b>JUNCTION TYPE</b></p> <ul style="list-style-type: none"> <li>1 - Grounded</li> <li>2 - Ungrounded</li> <li>3 - Exposed Tip</li> </ul>	<p><b>SENSOR O.D.</b></p> <ul style="list-style-type: none"> <li>0 - None</li> <li>2 - 1/8"</li> <li>3 - 3/16"</li> <li>4 - 1/4"</li> </ul>	<p><b>BEND</b></p> <ul style="list-style-type: none"> <li>1 - Straight</li> <li>2 - 45°</li> <li>3 - 90°</li> </ul>
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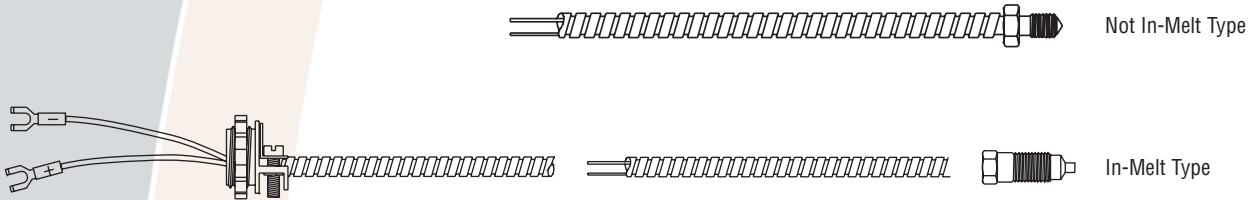
Temperature Sensors

# Sensors for Extruders and Plastic Machines

## INJECTION MOLDING NOZZLE TYPE

In-Melt type thermocouples and RTD's are designed to bolt into the injector nozzle and sense the temperature of the melt directly, and is rated to 450°C (900°F). The standard 3/8" hex head stainless steel body has 3/8-24 NPT threads. The sensor tip extends 1/8" beyond the end of the bolt assembly. Specify your requirements from the Order Chart below.

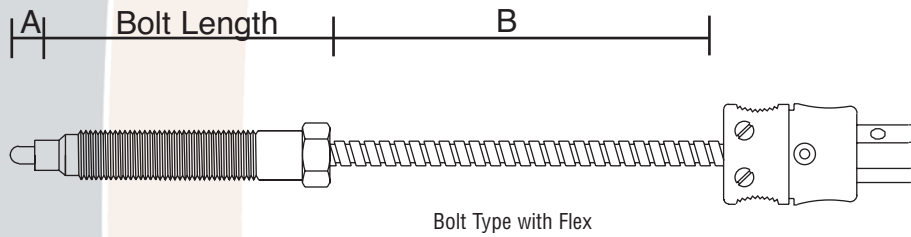
Not In-Melt type thermocouples and RTD's are designed to screw into a blind hole in the nozzle, and is rated to 450°C (900°F). The standard 1/4 NPT thread fits most standard nozzles. Specify your requirements from the Order Chart below.



Temperature Sensors

## EXTRUDER BOLT TYPE

Designed for direct mounting into extruder barrels, the Bolt Type thermocouples and RTD's offer easy interchangeability. Standard configuration has a 1/4 inch penetration into the barrel, and industry standard 1/2-20 NF thread. Order options allow barrel penetrations of 0 inches (flush) to 1 inch in 1/100th inch increments (specify as A dimension) and flex extension in 1 inch increments (specify as B dimension). See Special Order Chart below for more details.



## Model Coding

Fill in the appropriate numbers or letters to specify the probe of your choice. Fill in all boxes. If an item or dimension does not apply, fill those boxes with zeros '0'.

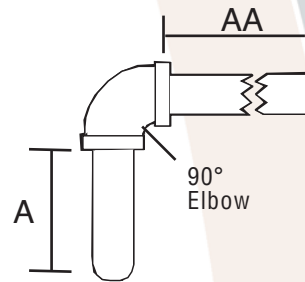
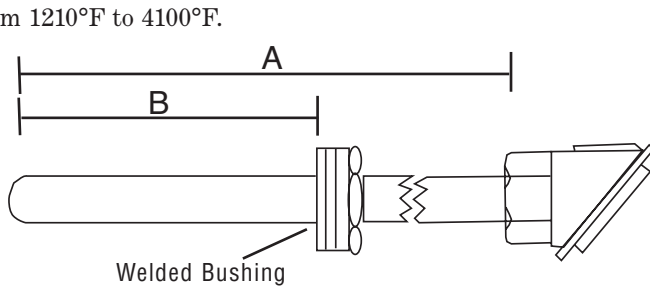
<p><b>6</b></p> <p><b>SENSOR TYPE</b></p> <ul style="list-style-type: none"> <li>J (T/C)</li> <li>K (T/C)</li> <li>6 (RTD DIN)</li> <li>4 (RTD NIST)</li> <li>Z (RTD DIN 1K)</li> <li>5 (RTD DIN 2-Wire)</li> <li>7 (RTD DIN 1K 2-Wire)</li> </ul> <p><b>HARDWARE TYPE</b></p> <ul style="list-style-type: none"> <li>1 - Not In-Melt</li> <li>2 - In-Melt</li> <li>3 - Bolt - 3" long</li> <li>4 - Bolt - 4" long</li> <li>6 - Bolt - 6" long</li> </ul>	<p><b>EXTENSION TYPE</b></p> <ul style="list-style-type: none"> <li>0 - No extension</li> <li>1 - Fiberglass Insulation</li> <li>3 - Stainless Steel Overbraid</li> <li>5 - Stainless Steel Flex Hose</li> </ul>	<p><b>SENSOR TERMINALS</b></p> <ul style="list-style-type: none"> <li>0 - Stripped Ends</li> <li>1 - Lugs</li> <li>2 - Lugs with BX</li> <li>3 - Standard Plug</li> <li>4 - Standard Jack</li> <li>6 - Mini Plug</li> <li>7 - Mini Jack</li> <li>9 - Fastabs</li> <li>A - Fastabs with BX</li> </ul>	<p><b>ELEMENTS</b></p> <ul style="list-style-type: none"> <li>1 - Single</li> <li>2 - Dual</li> </ul>	<p><b>JUNCTION TYPE</b></p> <ul style="list-style-type: none"> <li>1 - Grounded</li> <li>2 - Ungrounded</li> </ul>
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A	B	C
in 1/100 inch	in inches	in inches
<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>

# Protection Tube Assemblies and Replacement Thermocouple Elements

Protection tube assembly type thermocouples are designed for high temperature applications such as ovens, kilns, or other processes. Metal protection tubes can be used in applications ranging from 1200°F to 2100°F. Ceramic tubes can be used in applications from 1210°F to 4100°F.



## REPLACEMENT SENSOR ELEMENTS

Replacement sensor elements are available as separate parts. All rules regarding lengths and fittings apply. Use the standard Order Code, using a '0' for the tube type, '0' for mounting, '0' for sensor terminals, and '0' for protection tube. See example below.



To order use Order Chart below. Specify "0" for Tube Type. (e.g. - Type K 8 ga. insulated element 12" long is 7K000-110-121-12-02-00).



To order use Order Chart below. Specify "0" for Tube Type. (e.g. - Type K 14 ga. bare element 12" long is 7K000-110-311-12-02-00).

## Model Coding

Fill in the appropriate numbers or letters to specify the probe of your choice. Fill in all boxes. If an item or dimension does not apply, fill those boxes with zeros '0'.

<b>7</b>	□	□	□	□	-	□	□	□	-	*	**	<b>1</b>	-	□	□	□	-	□	□	□	-	□	□
	A inches					AA inches								B inches									
<b>SENSOR TYPE</b>			<b>MOUNTING TYPE</b>										<b>SENSOR TERMINALS</b>		<b>ELEMENTS</b>		<b>BEND</b>		<b>PROTECTION TUBE</b>				
J (T/C) K (T/C)			0 - No mounting 1 - Sleeve and Flange 2 - Bushing 3/4 NPT 3 - Bushing 1 NPT 4 - Bushing 1-1/4 NPT 5 - SS Bushing 3/4 NPT 6 - SS Bushing 1 NPT 7 - SS Bushing 1-1/4 NPT										0 - None 1 - Snap Cover, Aluminum Head 2 - Weatherproof Screw Cover Aluminum Head.		1 - Single 2 - Dual		1 - Straight 2 - 45° 3 - 90°		Metal/Ceramic 0 - None/None 1 - 1/4" pipe/None 2 - None/0.375" OD 3 - None/0.687" OD 4 - 1/2" pipe/None 5 - 3/4" pipe/0.750" OD 6 - None/1.125" OD 7 - 1" pipe/None				
<b>HARDWARE TYPE</b>													<b>*Wire Gauge</b>		<b>** Insulators</b>								
0 - None 1 - 304 SS 2 - 316 SS 4 - Inconel® 601 5 - Mullite+ 6 - Alumina+ B - Carbon Steel													0 - None 1 - 8 3 - 14 5 - 20 6 - 24 7 - 30		1 - None 2 - Oval (14 ga wire or larger) 3 - Round (18 ga wire or smaller)								
															+ Length in 6" increments								

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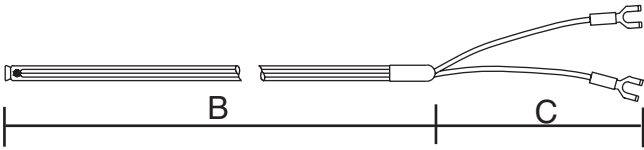




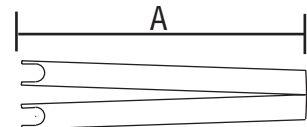
# Special Application Thermocouples and RTD's

Special Application Thermocouples and RTD's cover a wide variety of types and configurations. This section covers FEP covered thermocouples and RTD's in rigid and flexible types, ring type thermocouples and RTD's for surface measurement, web type thermocouples for surface measurement of moving objects such as rollers, and penetration thermocouples and RTD's with sharp tips for measurement of viscous liquids and semisolids such as tar and heavy oil, and other material such as frozen food and meat.

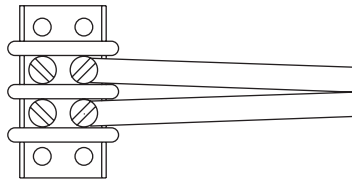
## Flexible FEP Covered Bead Junction



## Web Type Surface Thermocouples



Web Type Surface Thermocouple Replacement Element



Web Type Surface Thermocouple Assembly

## Model Coding

Fill in the appropriate numbers or letters to specify the probe of your choice. Fill in all boxes. If an item or dimension does not apply, fill those boxes with zeros '0'.

9     -    -    -    -    -    -

in 1/10 inch      in 1/10 inch      in inches      in inches

### SENSOR TYPE

- J (T/C)
- K (T/C)
- E (T/C)
- T (T/C)
- 6 (RTD DIN)
- 4 (RTD NIST)
- Z (RTD DIN 1K)

### HARDWARE TYPE

- 5 - FEP Covered Bead Junction
- 6 - Ring #10 (0.187 od)
- 7 - Ring #8 (0.156 od)
- 8 - Ring 13/32"
- 9 - Web
- A - Penetration Probe
- B - Penetration Probe with "D" Handle

### EXTENSION TYPE

- 0 - No extension
- 1 - Fiberglass Insulation
- 3 - Stainless Steel Overbraid
- 4 - FEP Insulation
- 5 - Stainless Steel Flex Hose
- 6 - FEP over SS Flex Hose

### SENSOR TERMINALS

- 0 - None
- 1 - Lugs
- 2 - Lugs with BX
- 3 - Standard Plug
- 4 - Standard Jack
- 5 - Open Terminals
- 6 - Mini Plug
- 7 - Mini Jack
- 9 - Fastabs
- A - Fastabs with BX

### ELEMENTS

- 1 - Single
- 2 - Dual

### JUNCTION TYPE

- 1 - Grounded
- 2 - Ungrounded
- 3 - Exposed

### SENSOR O.D.

- 0 - N/A
- 2 - 1/8"
- 3 - 3/16"
- 4 - 1/4"

## Penetration Type Thermocouples and RTD's

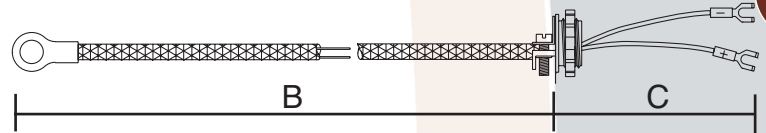


Standard Style with Transition Fitting



"D" Handle Style

## Ring Type Surface Thermocouples and RTD's



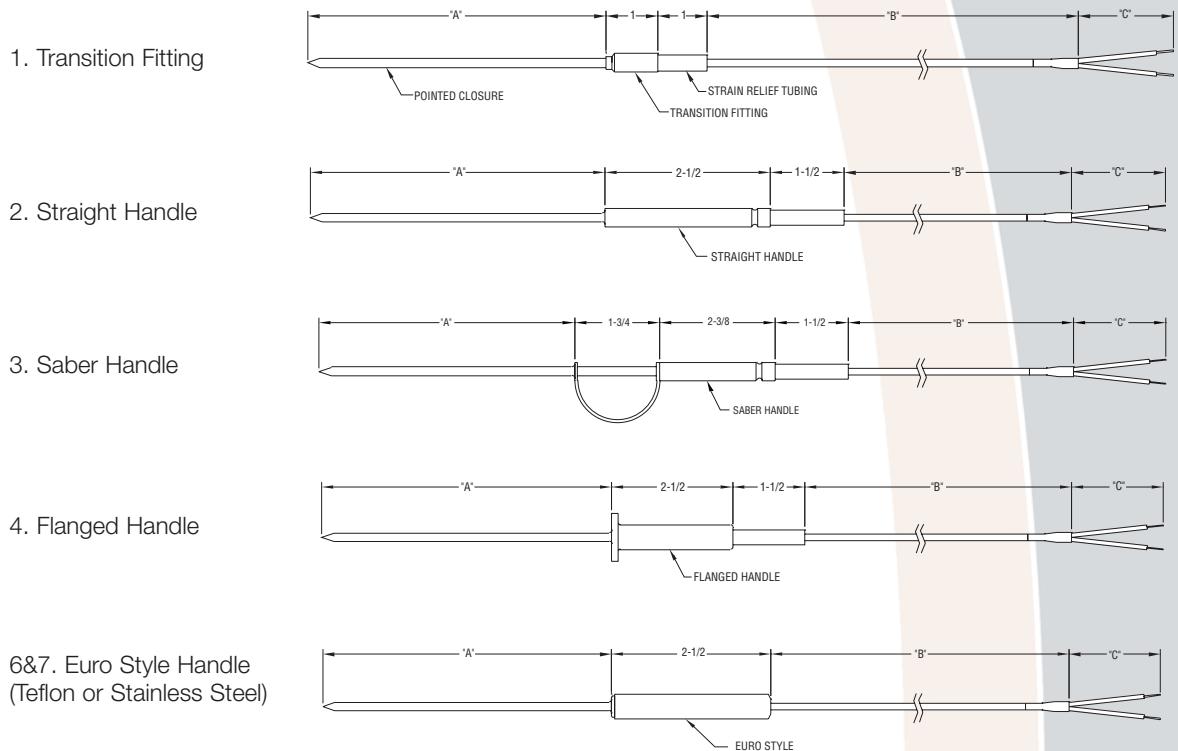
Temperature Sensors



# Series P Penetration Probes

Monitor internal temperature of poultry, meat, fish, dough, and other fresh or slightly frozen food products. The Series P probes can also be used to penetrate soft process materials such as plastic compounds and rubber. The probes are constructed entirely of FDA compliant materials for use in sanitary applications.

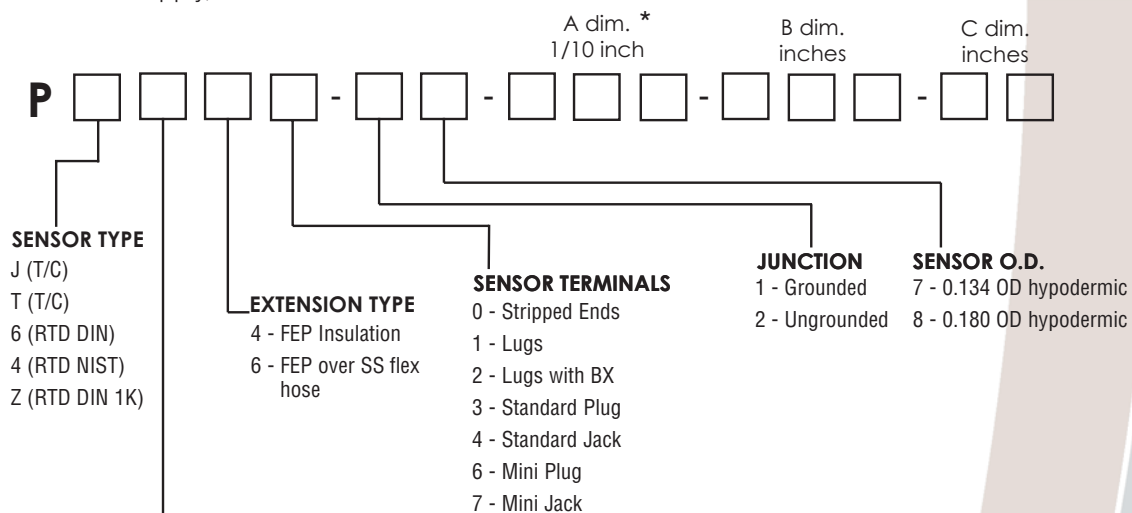
## Probe Styles



Temperature Sensors

## Model Coding - Series P Penetration Probes

Fill in the appropriate numbers or letters to specify the probe of your choice. Fill in all boxes. If an item or dimension does not apply, fill those boxes with zeros '0'.



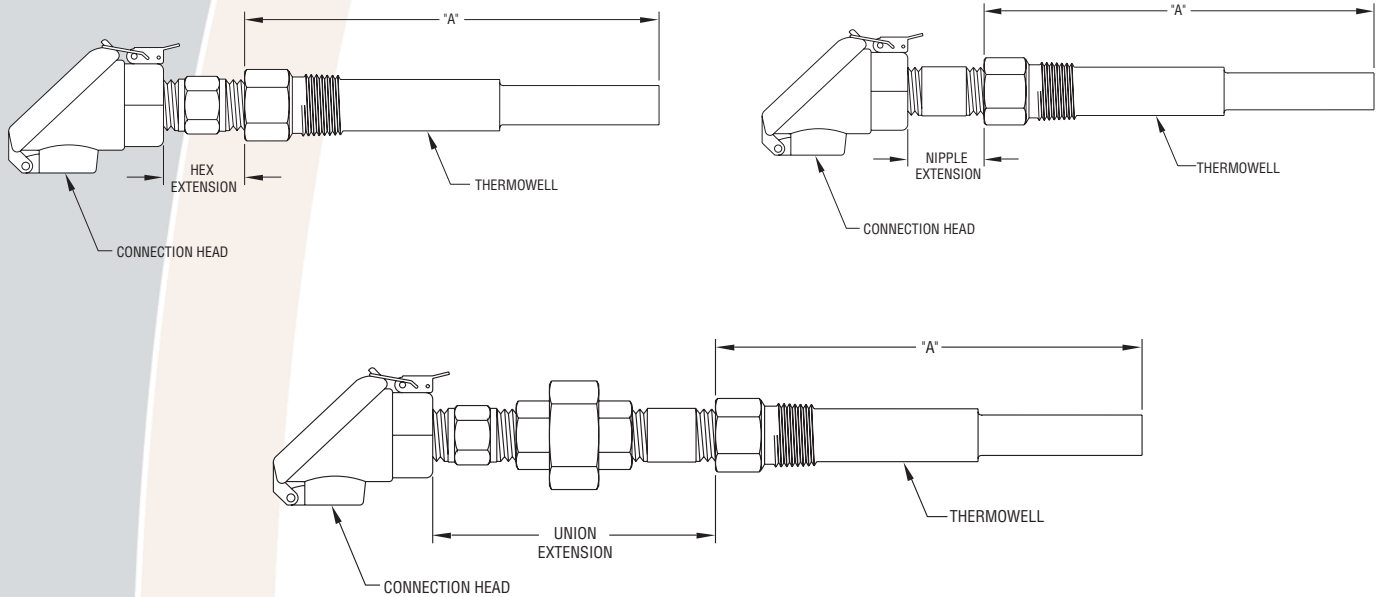
### PROBE STYLE

- 1 - Standard transition fitting, SS
- 2 - Straight handle, SS
- 3 - Saber handle, SS
- 4 - Flanged handle, SS
- 6 - Euro Style, FEP
- 7 - Euro Style, SS

\* "A" dimension maximum length is 12" (30 cm).

# Temperature Sensor Assemblies with Thermowells

Series T Sensor Assemblies are available in a variety of head styles and thermowell materials. All elements are spring loaded to ensure positive contact in the thermowell. Thermowells are non-lagging. The sensor sheath material is constructed of 316 stainless steel regardless of the well material specified.



Temperature Sensors

## Model Coding - Sensor Assemblies with Thermowells

Fill in the appropriate numbers or letters to specify the probe of your choice. Fill in all boxes. If an item or dimension does not apply, fill those boxes with zeros '0'.

A  
in inches

**T**     -    -

<p><b>SENSOR TYPE</b></p> <p>J (T/C) K (T/C) E (T/C) T (T/C) 6 (RTD DIN) 4 (RTD NIIST) Z (RTD DIN 1K)</p> <p><b>WELL MATERIAL</b></p> <p>1 - 304 SS 2 - 316 SS 3 - Brass</p>	<p><b>TAPER AND BORE</b></p> <p>1 - Step/0.260 2 - Straight/0.390 3 - Taper/0.260 4 - Taper/0.390 5 - Straight/0.260</p>	<p><b>EXTENSION</b></p> <p>1 - Steel 1/2 NPT 1 in hex 4 - Steel 1/2 NPT 4 in nipple 7 - Steel 1/2 NPT 4 in union A - 304 SS 1/2 NPT 1 in hex D - 304 SS 1/2 NPT 4 in nipple G - 304 SS 1/2 NPT 4 in union K - 316 SS 1/2 NPT 1 in hex N - 316 SS 1/2 NPT 4 in nipple S - 316 SS 1/2 NPT 4 in union</p>	<p><b>ELEMENTS</b></p> <p>1 - Single 2 - Dual</p>	<p><b>HEAD</b></p> <p>0 - Aluminum Screw Cover 1 - Cast Aluminum Snap Cover 2 - Polypropylene Snap Cover 3 - Polypropylene Screw Cover 4 - Explosion Proof+ 5 - 304 SS Weather Proof</p>	<p><b>SHEATH O.D. Nominal/Reduced</b></p> <p>1 - 5/8" / 1/2" 4 - 3/4" / 1/2" 6 - 7/8" / 1/2" 7 - 7/8" / 5/8" 8 - 1-1/16" / 5/8" 9 - 7/8" / 49/64" A - 1-1/16" / 49/64" B - 1/2" straight C - 49/64" straight D - 7/8" straight E - 3/4" straight</p>
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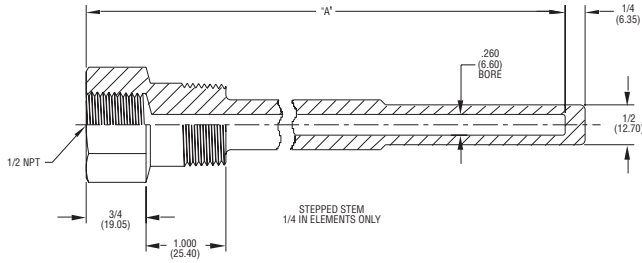
+Explosion-proof head meets the following:  
Class I, Groups C & D  
Class II, Groups E, F & L  
Class III, Div 1 & 2  
NEMA 7, Groups C & D  
NEMA 9, Groups E, F, & L

A dimension is available in lengths of 4, 6, 9, 12, 15, 18, and 24 inches only.

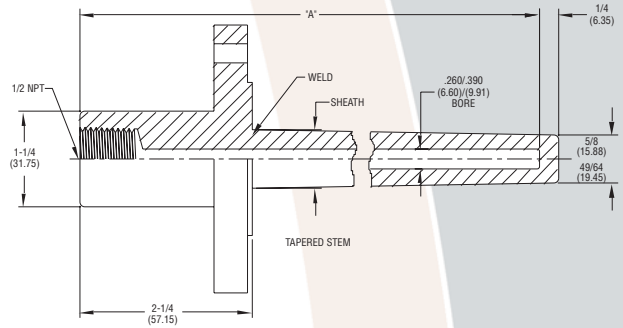
# Thermowells

Select bore as 0.260 for 1/4" diameter elements and 0.390 for 3/8" diameter elements. Specify heavy duty mounting for tapered sheaths.

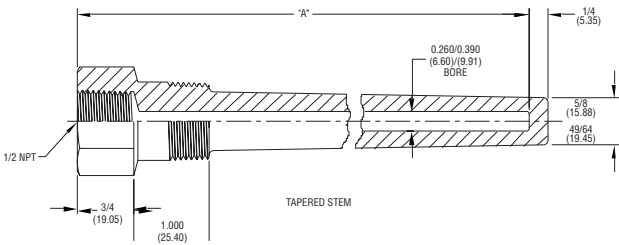
## STRAIGHT STEM



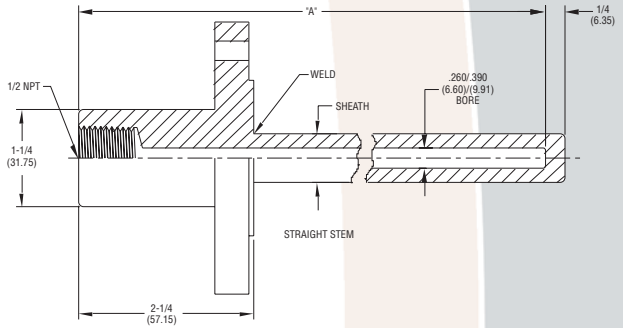
## TAPERED FLANGED



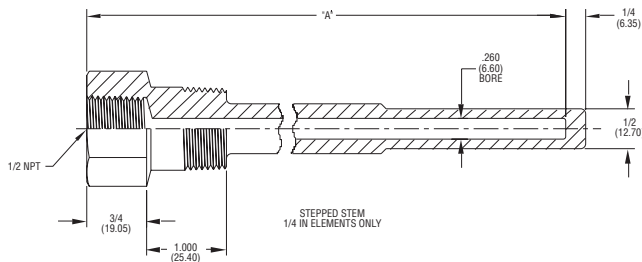
## TAPERED STEM



## STRAIGHT FLANGED



## STEPPED STEM



## Model Coding - Thermowells

Fill in the appropriate numbers or letters to specify the thermowell of your choice. Fill in all boxes. If an item or dimension does not apply, fill those boxes with zeros '0'.

**W**     -    -

A Dimension Specify in 4, 6, 9, 12, 15, 18, Or 24"

<p><b>HARDWARE TYPE</b></p> <ul style="list-style-type: none"> <li>1 - 304 SS Sheath</li> <li>2 - 316 SS Sheath</li> <li>3 - Brass</li> <li>4 - Carbon Steel</li> </ul>	<p><b>INSIDE THREAD</b></p> <ul style="list-style-type: none"> <li>1 - 1/2" female NPT</li> </ul> <p><b>TAPER AND BORE</b></p> <ul style="list-style-type: none"> <li>0 - Straight / 0.260</li> <li>1 - Step / 0.260</li> <li>2 - Straight / 0.390</li> <li>3 - Taper / 0.260</li> <li>4 - Taper / 0.390</li> </ul>	<p><b>PROCESS CONNECTION</b></p> <ul style="list-style-type: none"> <li>1 - 1/2 NPT</li> <li>2 - 3/4 NPT</li> <li>3 - 1 NPT</li> <li>4 - 1" 150# Flange</li> <li>5 - 1-1/2" 150# Flange</li> <li>6 - 2" 150# Flange</li> <li>7 - 1" 300# Flange</li> <li>8 - 1-1/2" 300# Flange</li> <li>9 - 2" 300# Flange</li> <li>A - 1" 600# Flange</li> <li>B - 1-1/2" 600# Flange</li> <li>C - 2" 600# Flange</li> </ul>	<p><b>MOUNTING</b></p> <ul style="list-style-type: none"> <li>1 - Threaded</li> <li>2 - Heavy Duty Threaded</li> <li>3 - Heavy Duty Flanged</li> <li>4 - Flanged</li> </ul>	<p><b>LAG</b></p> <ul style="list-style-type: none"> <li>0 - None</li> <li>2 - 2"</li> <li>3 - 3"</li> </ul>	<p><b>SHEATH O.D. Base/Taper</b></p> <ul style="list-style-type: none"> <li>1 - 5/8" / 1/2"</li> <li>4 - 3/4" / 1/2"</li> <li>6 - 7/8" / 1/2"</li> <li>7 - 7/8" / 5/8"</li> <li>8 - 1-1/16" / 5/8"</li> <li>9 - 7/8" / 49/64"</li> <li>A - 1-1/16" / 49/64"</li> <li>B - 1/2" straight</li> <li>C - 49/64" straight</li> <li>D - 7/8" straight</li> <li>E - 3/4" straight</li> </ul>
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# Hand Held Thermocouples

## Description

**Master Probe Handle** - Probes plug into the master probe handle. The handle has a mini-jack at one end and a coiled cable with mini-plug on the other. Individual probes may be connected to allow easy reach to your process.

**Immersion Probe** - This general purpose probe can be used in liquids and gases. Includes mini plug.

**Penetration Probe** - Used for penetrating meat, plastic, rubber, asphalt, or other semi-soft materials. Includes mini plug.

**Surface Probe** - For flat or semi-flat surfaces of metal, paper or plastic. Small gauge spring contoured tip allows fast response. Includes mini plug.

**Air Duct Probe** - Measures temperature in ducts for air or compatible gases, environmental chambers, ovens, rooms, etc. Perforated shield has good air flow and prevents heating by radiation. Includes mini plug.

**Exposed Junction Probe** - Small gauge tip allows high sensitivity and quick response. The thermocouple junction is exposed for readings in air or compatible gases. Includes mini plug.

**Needle Probe** - Small diameter penetrating probe gives fast response in soft materials and liquids. Made with mineral insulated sheath for extra durability. Includes mini plug.

**Bare Tip Probe** - This probe consists of 10 feet of 24 gauge wire with fiber-glass braided cable and a bare wired junction. Shipped with a spool for easy storage. Includes mini plug.

**Integral Handle Probes** - Featuring fixed handles and coiled cords, these rugged hand-held probes will plug into any device with a mini-jack.

**General Purpose Probe** - Featuring a built-in handle with coiled cord and mini-plug, this general purpose probe can be used in liquids and air compatible gases. For use to 800°F.

**High Temperature General Purpose Probe** - Featuring a built-in handle with coiled cord and mini-plug, this general purpose probe can be used in liquids and air compatible gases. For use to 1600°F.

**Penetration Probe** - Featuring a built-in handle with coiled cord and mini-plug, this probe is used for penetrating meat, plastic, rubber, asphalt, or other semi-soft materials.

**Straight Surface Probe** - Featuring a built-in handle with coiled cord and mini-plug, this probe is used for flat or semi-flat surfaces of metal, paper or plastic. Small gauge spring contoured tip allows fast response.

**Angled Surface Probe** - Featuring a built-in handle with coiled cord and mini-plug, this probe is used for flat or semi-flat surfaces of metal, paper or plastic. Small gauge spring contoured tip allows fast response.

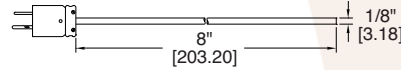
**Round Surface Probe** - Featuring a built-in handle with coiled cord and mini-plug, this probe measures temperature in ducts for rollers, convex surfaces. Spring stainless steel replaceable band stretched across C-shaped bow.

**Air Duct Probe** - Featuring a built-in handle with coiled cord and mini-plug, this probe measures temperature in ducts for air or compatible gases, environmental chambers, ovens, rooms, etc. Perforated shield allows good air flow and prevents heating by radiation.

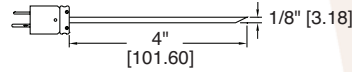
T/C  
Type Model



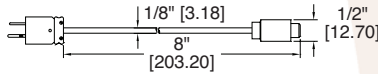
J 1718-0076  
K 1718-0077



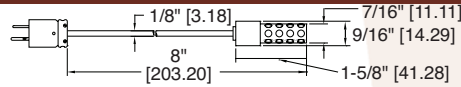
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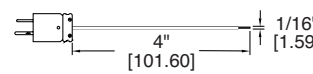
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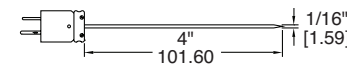
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K 1818-0082



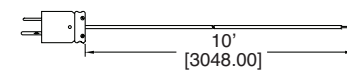
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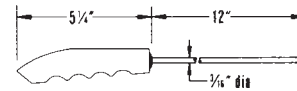
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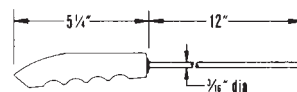
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K 1818-0093



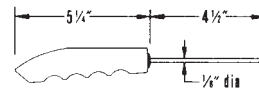
J 1558-0030  
K 1558-0013



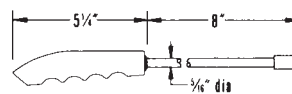
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K 1718-0002



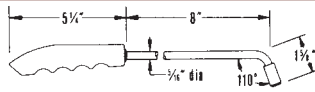
J 1718-0005  
K 1718-0006



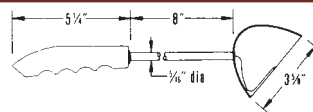
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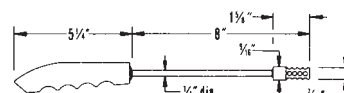
J 1718-0008  
K 1718-0009



J 1718-0011  
K 1718-0012



J 1718-0022  
K 1718-0023

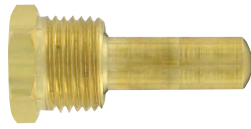
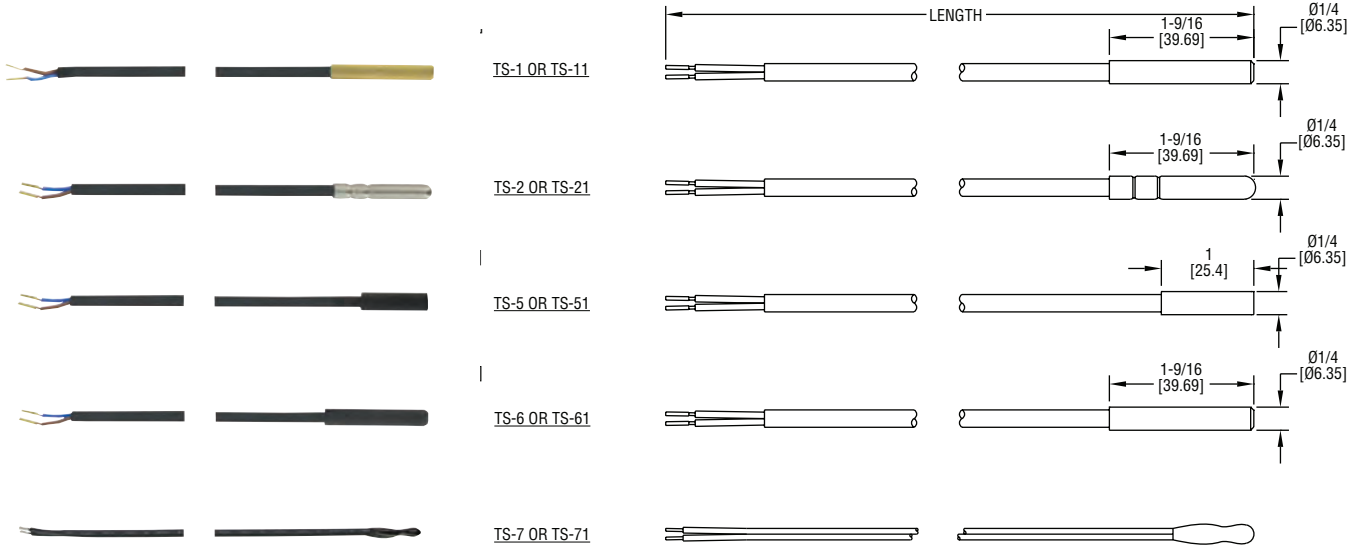


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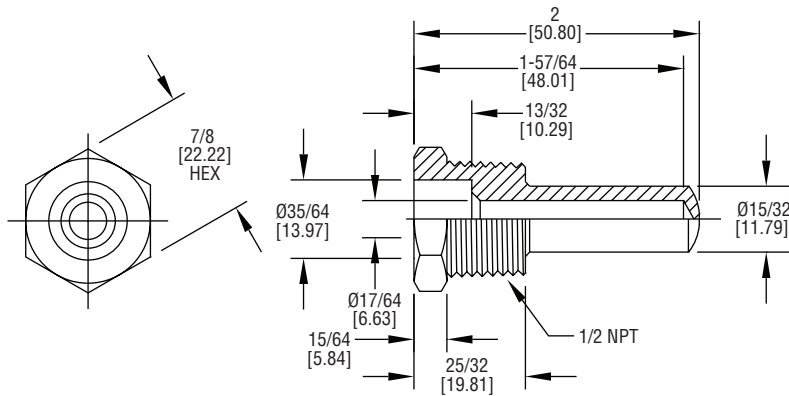
# Digital Temperature Switch Probes

Probes to Be Used With TS, TS2, TSX, TSS2, and TSWB

Temperature Sensors



TS-W



Model Number	Sensor	Cap Material	Length ft (m)
TS-1	PTC	Brass	5 (1.5)
TS-11	PTC	Brass	10 (3)
TS-2	PTC	Stainless Steel	5 (1.5)
TS-21	PTC	Stainless Steel	10 (3)
TS-5	PTC	PVC	5 (1.5)
TS-51	PTC	PVC	10 (3)
TS-6	PTC	Polyamide Resin Coated Brass	5 (1.5)
TS-61	PTC	Polyamide Resin Coated Brass	10 (3)
TS-7	NTC	None	5 (1.5)
TS-71	NTC	None	10 (3)

## SPECIFICATIONS

**Sensor:** PTC or NTC (depending on model).

**Operating Temperature:**

TS-1, TS-2, TS-6: -58 to 302°F (-50 to 150°C)

TS-5, TS-7: -58 to 221°F (-50 to 105°C).

**Accuracy:** ±2°C at 25°C.

**Response Time:** 15 seconds (in air).

**Cable:** PVC or silicone (depending on model).

**Protection:** IP67.

## ACCESSORIES

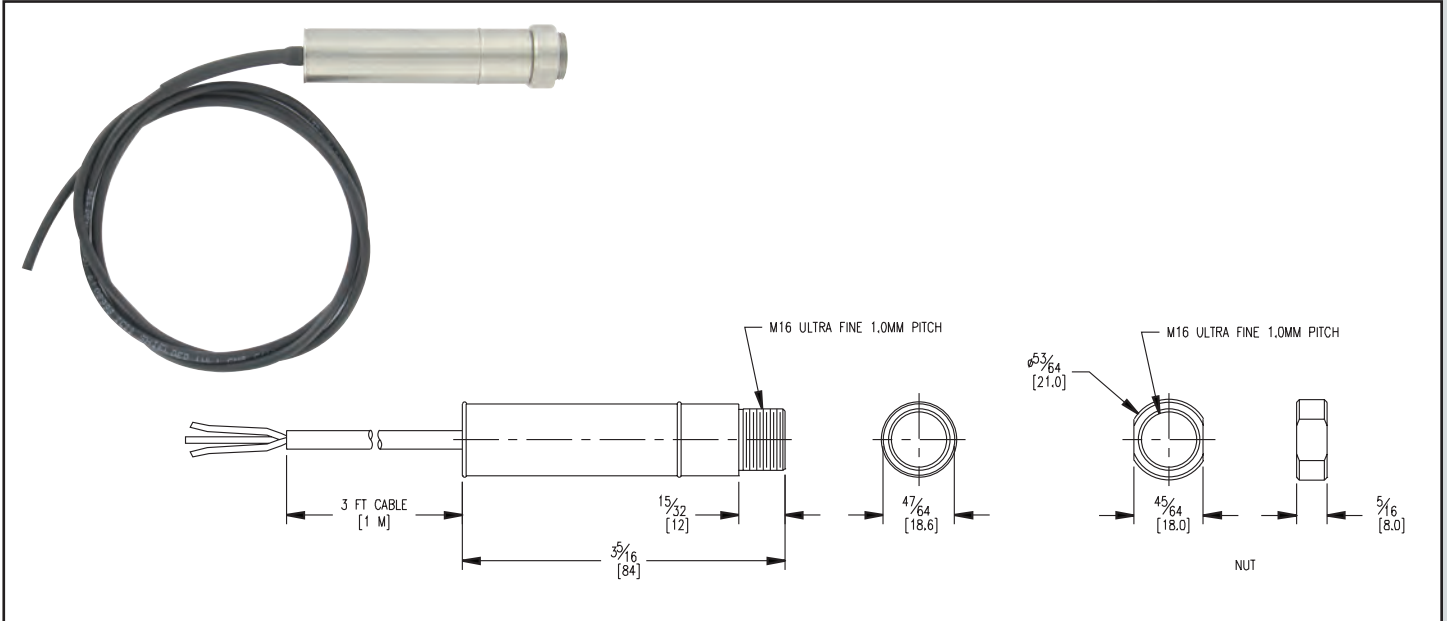
TS-W, Brass Thermowell

Series  
ILA

# In-Line IR Sensor

10:1 Distance to Target Ratio, 32 to 932°F

CE



Temperature  
Sensors

The Series ILA Non-Contact Sensors, measure temperatures from 32 to 932°F (0 to 500°C) and provide a linear 4 to 20 mA, 0 to 5 VDC or thermocouple output. The 2-wire signal is compatible with almost any indicator, controller, recorder, data logger, etc., without the need for special interfacing or signal conditioning. They are suitable for most materials such as food, paper, textiles, plastics, leather, tobacco, pharmaceuticals, chemicals, rubber, coal, and asphalt.

Models	Output
ILA 10	J Thermocouple
ILA 20	4-20 mA
ILA 30	0-5 V

## SPECIFICATIONS

**Temperature Range:** 32 to 932°F (0 to 500°C).

**Accuracy:** 1% of reading or 1°C whichever is greater.

**Emissivity:** 0.95 (Fixed).

**Distance to Target Size Ratio:** 10:1.

**Response Time:** 250 ms.

**Ambient Operating Temperature:** 32 to 122°F (to 50°C).

**Power Requirement:** 24 VDC.

**Repeatability:** 0.5% of reading or 0.5°C whichever is greater.

**Outputs:** 4 to 20 mA, 0 to 5 V, J type thermocouple.

**Cable Length:** 3.3 ft (1 m).

**Spectral Response:** 8 to 14 microns.

**Housing:** Stainless Steel.

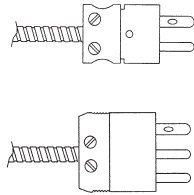
**Weight:** 3.17 oz (90 g).

**Agency Approval:** CE.

# Plugs and Jacks

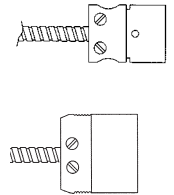
## Standard Size Single Plugs (male)

Type	Part Number
J	481-0001
K	481-0002
T	481-0003
Cu11 (2-Wire)	481-0004
E	481-0015
Cu (2-Wire)	481-0022
Cu (3-Wire)	481-0134



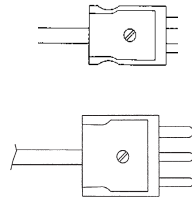
## Standard Size Single Jacks (female)

Type	Part Number
J	481-0006
K	481-0007
T	481-0008
Cu11 (2-Wire)	481-0009
E	481-0016
Cu (2-Wire)	481-0023
Cu (3-Wire)	481-0135



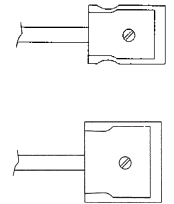
## Miniature Size Single Plugs (male)

Type	Part Number
J	481-0093
K	481-0095
T	481-0094
R	481-0098
S	481-0097
E	481-0096
Cu (2-Wire)	481-0099
Cu (3-Wire)	481-0175



## Miniature Size Single Jacks (female)

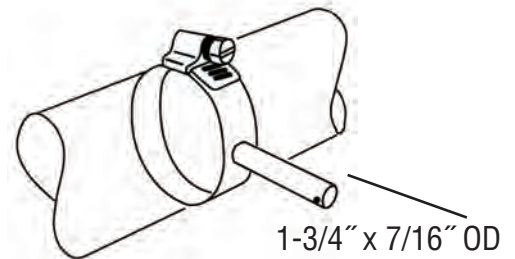
Type	Part Number
J	481-0100
K	481-0102
T	481-0101
R	481-0105
S	481-0104
E	481-0103
Cu (2-Wire)	481-0106
Cu (3-Wire)	481-0174



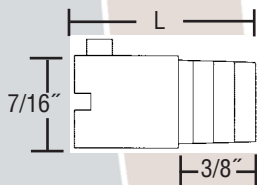
Temperature Sensors

# Pipe Adapters

Part Number	Fits Pipe Diameters	Part Number	Fits Pipe Diameters
1568-0007	1/2" to 7/8"	1568-0022	9-3/4" to 10-1/4"
1568-0008	7/8" to 1-1/2"	1568-0023	11-3/4" to 12-1/4"
1568-0009	1-5/16" to 2-1/4"	1568-0024	15-3/4" to 16-1/4"
1568-0011	2-1/4" to 3-5/16"	1568-0025	17-3/4" to 18-1/4"
1568-0012	3-5/8" to 4-1/4"	1568-0027	19-3/4" to 20-1/4"
1568-0013	4-5/16" to 5-1/4"	1568-0028	23-3/4" to 24-1/4"
1568-0020	6-1/4" to 6-3/4"	1568-0029	29-3/4" to 30-1/4"
1568-0021	7-3/4" to 8-1/4"		



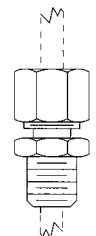
# Bayonet Adapters



L	Thread Size	Part Number
7/8"	1/8-27 NPT	1568-0001
7/8"	3/8-24 NPT	1568-0002
1-3/8"	1/8-27 NPT	1568-0003
1-3/8"	3/8-24 NPT	1568-0004
2-1/2"	1/8-27 NPT	1568-0005
2-1/2"	3/8-24 NPT	1568-0006
2-1/2"	10 x 1.5 mm	1568-0016

# Compression Fittings

Type OD	Thread Size	Material	Part Number
1/8"	1/8-27 NPT	Brass	144-0012
1/8"	1/8-27 NPT	Stainless Steel	144-0020
3/16"	1/8-27 NPT	Brass	144-0009
3/16"	1/8-27 NPT	Stainless Steel	144-0022
1/4"	1/4-18 NPT	Brass	144-0014
1/4"	1/8-27 NPT	Stainless Steel	144-0024
.260 - .275"	1/4-18 NPT	FEP	144-0037



# Transition Adapter

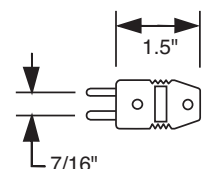
These adapters convert the miniature plug on the end of the coiled cable on the Master Probe Handle to a standard lug. Simply plug the cord into the adapter.

### Catalog Number

**Type K**  
481-127

**Type J**  
481-126

**Type T**  
481-128





# Introduction to Handhelds

Love Controls offers handheld instrumentation designed to measure temperature, current, voltage or pressure. All the handheld instrumentation is microprocessor based for precise measurement and ease-of-use.

Product	Page
<b>Series HM28</b> Handheld Digital Manometer . . . . .	70-71
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Handhelds

Series  
HM28

# Handheld Digital Manometer

High Accuracy (0.2%, 0.1% or 0.05%), Differential, Gage or Absolute



## SPECIFICATIONS

**Pressure Connection:** Hose; 4/6 mm or 1/8" NPT.

**Accuracy** (includes linearity, hysteresis, and repeatability): per order code.

±0.20% full scale ±1 digit

±0.10% full scale ±1 digit

±0.05% full scale ±1 digit

**Measuring Media:** Instrument Air or Inert Gases. For HM28G3XXXXX, Any material compatible with 18/8 stainless steel.

**Temperature Limits:** 23 to 122°F (-5 to 50°C).

**Storage Temperature:** -4 to 140°F (-20 to 60°C).

**Humidity:** 30 to 95% rH, non-condensing.

**Display:** 2 line, 16 character, dot matrix LCD, with switchable display sizes.

**Battery:** 9V alkaline (included). Can operate from external power supply of 7 to 14 VDC.

**Current Consumption:** <9 mA.

**Memory:** 964 measured values. Recording intervals adjustable from manual, 1, 5, 10, 20, 30 seconds, 1, 2, 3, 5, 10, 30, 60 minutes.

**Case Protection:** IP54.

**Case Dimensions:** 6 x 3.27 x 1.34 in (152 x 83 x 34 mm).

**Weight:** 9.5 oz (270 g).

**Maximum Measurement Rates:** Stand alone: 2-1/2 readings/sec (0.1% and 0.05% ratings), 5 readings/sec (0.2% rating). Output to RS-232: 20 measurements/sec (0.2% rating), 10 measurements/sec (0.1% and 0.05% ratings).

**RS-232 Baud Rate:** Adjustable, 1200, 2400, 4800, or 9600 baud.

**Agency Approvals:** CE.

The Love Controls Series HM28 Digital Hand-Held Manometer is a precision instrument designed to measure a wide range of pressures to a very high accuracy. The unit incorporates a variety of features in an easy to use format that makes it useful in a wide variety of applications. Features include: measurement in all common pressure ranges, display resolution to 0.001, differential or relative measurement, two line liquid crystal display, and adjustable auto power off to conserve battery.

We are so proud of the accuracy of the HM28 that we provide a certificate of calibration with the unit at no additional cost. Depending on your application, the HM28 can be used as a secondary calibration standard for your other pressure instrumentation.

## FEATURES

- Microprocessor based
- Differential, Gage, or Absolute
- High Accuracy, 0.2%, 0.1%, or 0.05% with Calibration Certificate
- Selectable Scales
- Resolution to 0.000 of Selected Unit
- Peak and Valley Indication
- Hold Function
- Programmable Display
- Memory for up to 964 Readings
- Output for Optional Printer or Computer Interface

## INPUT RANGES

RANGE (US)	RANGE (METRIC)	OVERPRESSURE
Gauge, underpressure and differential pressure		
0-10 in H <sub>2</sub> O	0-2.5 kPa	12.5 kPa (50 in H <sub>2</sub> O)
0-28 in H <sub>2</sub> O	0-7 kPa	35.0 kPa (140 in H <sub>2</sub> O)
0-80 in H <sub>2</sub> O	0-20 kPa	150 kPa (600 in H <sub>2</sub> O)
0-120 in H <sub>2</sub> O	0-30 kPa	150 kPa (600 in H <sub>2</sub> O)
0-200 in H <sub>2</sub> O	0-50 kPa	400 kPa (1600 in H <sub>2</sub> O)
0-14.5 psi	0-100 kPa	400 kPa (58 psi)
0-29 psi	0-200 kPa	700 kPa (100 psi)
0-100 psi	0-700 kPa	1700 kPa (246 psi)
0-145 psi	0-1000 kPa	2700 kPa (390 psi)
0-245 psi	0-1700 kPa	2700 kPa (390 psi)
for Gauge, media compatible with 18/8 SS (DIN 1.4305)		
0-14.5 psi	0-100 kPa	200 kPa (29 psi)
0-29 psi	0-200 kPa	400 kPa (58 psi)
0-100 psi	0-700 kPa	1400 kPa (203 psi)
0-145 psi	0-1000 kPa	3400 kPa (493 psi)
0-245 psi	0-1700 kPa	3400 kPa (493 psi)
0-435 psi	0-3000 kPa	7000 kPa (1015 psi)
0-1000 psi	0-7000 kPa	14000 kPa (2030 psi)

Series  
HM28

# Handheld Digital Manometer

High Accuracy (0.2%, 0.1% or 0.05%), Differential, Gage or Absolute

## How to Order

Specify by part number.

### Error limit 0.2% F.S. for gage, underpressure and differential pressure

Part Number	Features
HM28D3B10000	0-10 in H <sub>2</sub> O (2.5 kPa)
HM28D3C10000	0-28 in H <sub>2</sub> O (7 kPa)
HM28D3E10000	0-80 in H <sub>2</sub> O (20 kPa)
HM28D3F10000	0-120 in H <sub>2</sub> O (30 kPa)
HM28D3G10000	0-200 in H <sub>2</sub> O (50 kPa)
HM28D3H10000	0-14.5 psi (100 kPa)
HM28D3J10000	0-29 psi (200 kPa)
HM28D3K10000	0-100 psi (700 kPa)
HM28D3L11000	0-145 psi (1000 kPa)
HM28D3M11000	0-245 psi (1700 kPa)

### For gage, media compatible with 18/8 (DIN 1.4305)

Part Number	Features
HM28G3T11000	0-14.5 psi (100 kPa)
HM28G3U11000	0-29 psi (200 kPa)
HM28G3V11000	0-100 psi (700 kPa)
HM28G3P11000	0-145 psi (1000 kPa)
HM28G3W11000	0-245 psi (1700 kPa)
HM28G3N11000	0-435 psi (3000 kPa)
HM28G3R11000	0-1000 psi (7000 kPa)

Order Code for error limit 0.1% F.S. HM28XXX2XXXX  
(Replace eighth character "1" with "2")

## ACCESSORIES

**HM28-0** 1/8" NPT Adapter 1 piece

**HM28-1** Communication Software & Cable

**HM28-2** Universal Power Adapter

### Error limit 0.5% F.S. for gage, underpressure and differential pressure

Part Number	Features
HM28D3C30000	0-28 in H <sub>2</sub> O (7 kPa)
HM28D3F30000	0-120 in H <sub>2</sub> O (30 kPa)
HM28D3H30000	0-14.5 psi (100 kPa)
HM28D3J30000	0-29 psi (200 kPa)
HM28D3K30000	0-100 psi (700 kPa)
HM28D3M31000	0-245 psi (1700 kPa)

### For absolute pressure

Part Number	Features
HM28A3I10000	0-15.9 psia 0.2% F.S. (110 kPa abs)
HM28A3I20000	0-15.9 psia 0.1% F.S. (110 kPa abs)
HM28A3J10000	0-29 psia 0.2% F.S. (200 kPa abs)
HM28A3J20000	0-29 psia 0.1% F.S. (200 kPa abs)
HM28A3J30000	0-29 psia 0.05% F.S. (200 kPa abs)
HM28A3K10000	0-100 psia 0.2% F.S. (700 kPa abs)
HM28A3K20000	0-100 psia 0.1% F.S. (700 kPa abs)

Model  
CA10

# Thermocouple Calibrator

Accepts Type K Thermocouples, High/Low Alarm, Selectable Resolution



**Dual function CA10 Thermocouple Calibrator** can be used to source Type K thermocouple output values or measure Type K thermocouples. Quickly select output value using the rotary switch with coarse and fine adjustments. Model CA10 accepts up to two Type K thermocouples and features data hold and max functions. Measurements are displayed on a 3-1/2 digit backlit display. Units include a 4" (100 m) Type K bead wire temperature probe, calibration cable, 9V battery and instruction manual.

**Model CA10** Thermocouple Calibrator

## SPECIFICATIONS

**Measurement Range:** -40 to 1400°F (-40 to 760°C), selectable.  
**Thermocouple Input:** Type K.  
**Input Protection:** 24 VDC or 24 VAC rms max input voltage on any combination of input pins.  
**Accuracy:** ±0.1% rdg. +2°F on -40 to 1400°F; ±0.1% rdg. +1°C on -40 to 760°C, over operating temperature of 64 to 82°F (18 to 28°C).  
**Output Range:** -328 to 2192°F (-210 to 1200°C).  
**Display:** 0.8" (20 mm) height, 3-1/2-digit LCD with switchable back light.  
**Resolution:** Selectable 1° or 0.1°.  
**Reading Rate:** 2.5 times/second.

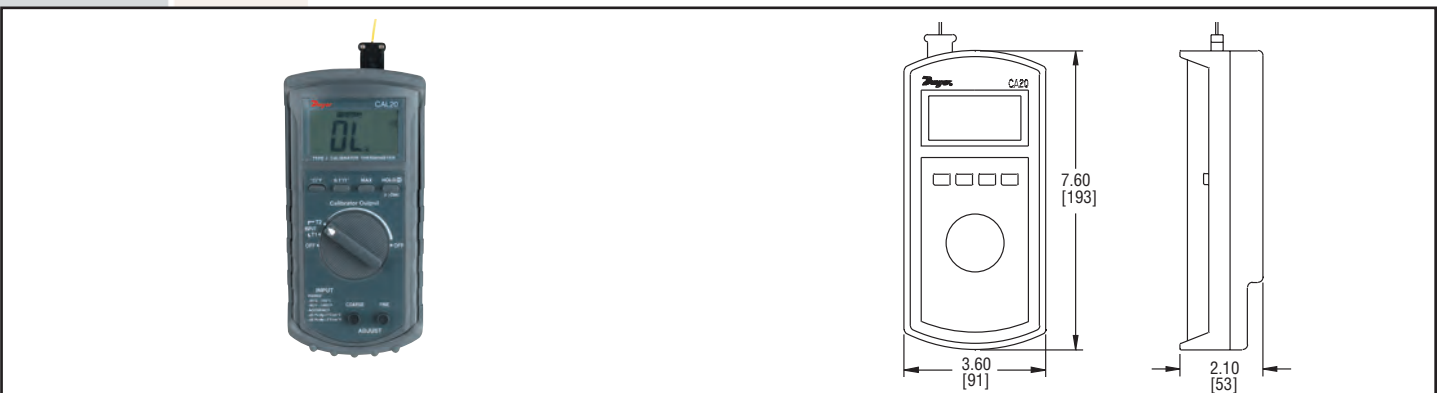
**Ambient Operating Temperature:** 32 to 122°F (0 to 50°C) max 80% RH.  
**Storage Temperature:** -4 to 140°F (-20 to 60°C) max 70% RH.  
**Thermocouple Connection:** Standard female mini-connector.  
**Power Requirements:** 9V Alkaline (included).  
**Battery Life:** 200 hours typical.  
**Temperature Coefficient:** 0.1 times the applicable accuracy specification per °F from 32 to 64°F and 82 to 122°F (0 to 18°C and 28 to 50°C).  
**Housing Material:** ABS plastic.  
**Weight:** 15.5 oz (440 g).  
**Agency Approvals:** CE.

Handhelds

Model  
CA20

# Thermocouple Calibrator

Accepts Type J Thermocouples, High/Low Alarm, Selectable Resolution



**Dual function CA20 Thermocouple Calibrator** can be used to source Type J thermocouple output values or measure Type J thermocouples. Quickly select output value using the rotary switch with coarse and fine adjustments. Model CA20 accepts up to two Type J thermocouples and features data hold and max functions. Measurements are displayed on a 3-1/2 digit backlit display. Units include a 4" (100 m) Type J bead wire temperature probe, calibration cable, 9V battery and instruction manual.

**Model CA20** Thermocouple Calibrator

## SPECIFICATIONS

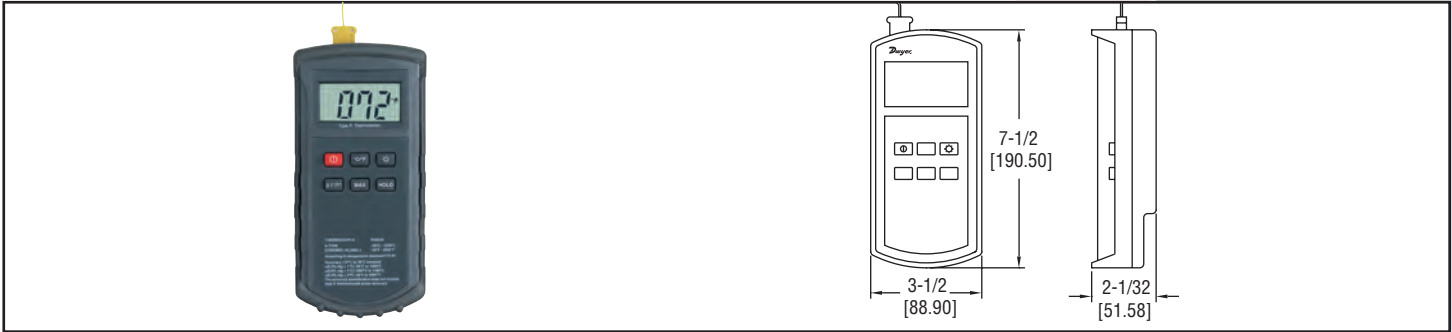
**Measurement Range:** -40 to 1400°F (-40 to 760°C), selectable.  
**Thermocouple Input:** Type J.  
**Input Protection:** 24 VDC or 24 VAC rms max input voltage on any combination of input pins.  
**Accuracy:** ±0.1% rdg. +2°F on -40 to 1400°F; ±0.1% rdg. +1°C on -40 to 760°C, over operating temperature of 64 to 82°F (18 to 28°C).  
**Output Range:** -328 to 2192°F (-210 to 1200°C).  
**Display:** 0.8" (20 mm) height, 3-1/2 digit LCD with switchable back light.  
**Resolution:** Selectable 1° or 0.1°.  
**Reading Rate:** 2.5 times/second.

**Ambient Operating Temperature:** 32 to 122°F (0 to 50°C) max 80% RH.  
**Storage Temperature:** -4 to 140°F (-20 to 60°C) max 70% RH.  
**Thermocouple Connection:** Standard female mini-connector.  
**Power Requirements:** 9V Alkaline (Included).  
**Battery Life:** 200 hours typical.  
**Temperature Coefficient:** 0.1 times the applicable accuracy specification per °F from 32 to 64°F and 82 to 122°F (0 to 18°C and 28 to 50°C).  
**Housing Material:** ABS plastic.  
**Weight:** 15.5 oz (440 g).  
**Agency Approvals:** CE.

Model  
TC10

# Digital Thermocouple Thermometer

Type K Thermocouple, Large 3 1/2 Digit Display, ±0.3% Accuracy



**Quickly and accurately measure temperature** with the Model TC10 Digital Thermocouple Thermometer. The TC10 accepts any type K thermocouple and connects via a standard mini-connection. View temperature readings in °F or °C (field selectable) on the large 3-1/2 digit LCD. The 0.8" (20 mm) display is backlit for dark or low light conditions. Choose either 0.1° or 1° resolution each with the basic accuracy of 0.3%. Thermometers respond quickly to environmental changes by updating the readings 2.5 times every second. Rugged, water resistant design comes with a protective holster and stand—ideal for field use. Additional features include low battery indication, MAX and HOLD functions. Units include protective holster, Type K thermocouple bead wire temperature probe, 9V battery and instruction manual.

**Model TC10** Digital Thermocouple Thermometer  
**Model TC10-N** includes NIST certification

## SPECIFICATIONS

**Input:** Type K (4' type K thermocouple bead probe included).

**Temperature Range:** -58 to 2000°F (-50 to 1300°C).

**Accuracy:** -58 to 2000°F: ±(0.3% of reading + 2°F); -50 to 1000°C: ±(0.3% of reading + 1°C); 1000 to 1300°C: ±(0.5% of reading + 1°C).

**Display:** 0.8" (20 mm) height, 3 1/2 digit LCD with switchable back light.

**Resolution:** Selectable 1° or 0.1°.

**Response Time:** 1 second.

## Temperature Limits:

32 to 122°F (0 to 50°C) max 80% RH.

**Storage Temperature:** -4 to 140°F (-20 to 60°C) max 70% RH.

## Power Requirements:

Standard 9V battery (included).

**Battery Life:** 200 hours typical.

**Input Protection:** 24V rms.

**Thermocouple Connection:**

Standard (F) mini-connector.

**Housing:** ABS plastic.

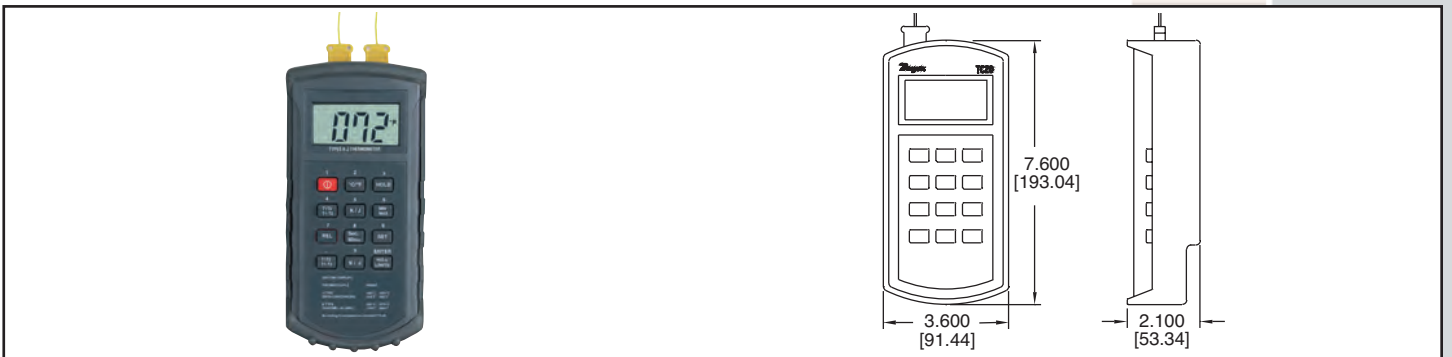
**Weight:** 12.9 oz (365 g).

**Agency Approvals:** CE.

Model  
TC20

# Dual Input Thermocouple Thermometer

Accepts Type J or K, High/Low Alarm, Selectable Resolution



**Quickly measure differential temperatures** with Model TC20 Dual Input Thermocouple Thermometer. Model TC20 accepts type J or K thermocouples and simultaneously displays T1, T2, or T1-T2 and elapsed time on a large, multi-function LCD. The unit features programmable high/low audible alarms, max/min, average readings, display hold and relative mode. The relative mode permits the user to store the current temperature value and compare it to subsequent temperature readings. Model TC20 thermometer includes two type K bead wire probes, rubber holster, 9V battery and instruction manual.

**Model TC20** Dual Input Thermocouple Thermometer  
**Model TC20-N** Includes NIST Certification

## SPECIFICATIONS

**Input:** Type J or K [Two 4 ft (100 m) type K thermocouple bead probes included].

**Temperature Range:** -328 to 1922°F (-200 to 1050°C) for type J; -328 to 2498°F (-200 to 1370°C) for type K.

**Accuracy:** -58 to 2498°F (-50 to 1370°C): ±0.05% of reading + 0.6°F (0.3°C) -328 to -58°F (-200 to -50°C): ±0.05% of reading + 1.4°F (0.7°C).

**Display:** 0.8" (20 mm) height, 5-digit LCD with switchable back light.

**Resolution:** Selectable 1° or 0.1°.  
**Response Time:** 1 second.

**Temperature Limits:** 32 to 122°F (0 to 50°C) max 80% RH.

**Storage Temperature:** -4 to 140°F (-20 to 60°C) max 70% RH.

**Power Requirements:** 9V Alkaline (included).

**Battery Life:** 200 hours typical.

**Thermocouple Connection:**

Standard female mini-connector.

**Housing:** ABS Plastic.

**Weight:** 13 oz (365 g).

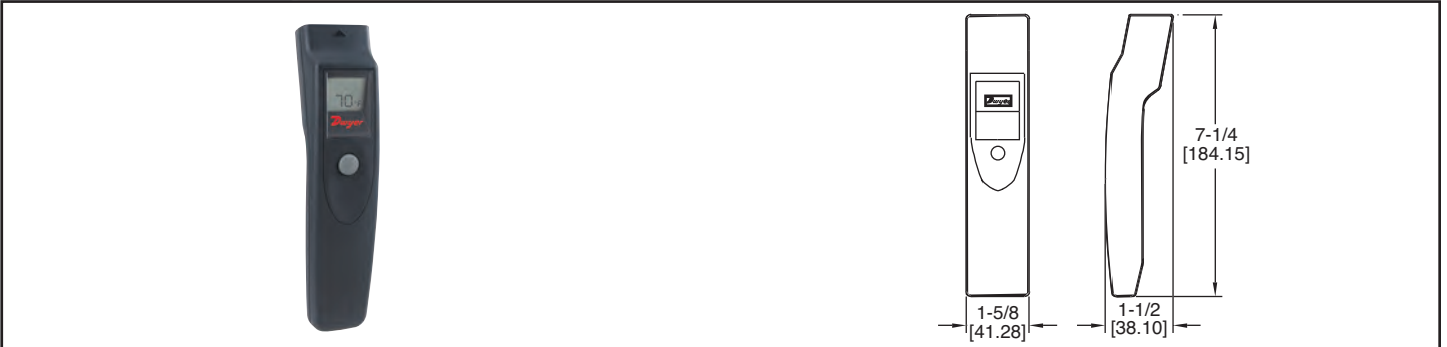
**Agency Approvals:** CE.



Model  
IRM20

# Noncontact Infrared Thermometer

6:1 Distance-to-Target Size Ratio, Selectable °F or °C, Laser Sighting



The economical, handheld Model IRM20 Noncontact Infrared Thermometer is compact, rugged and easy to use—just aim, push the button, and read current surface temperatures in less than a second. Hot, hazardous, or hard-to-reach objects are safely measured without contact. The unit has a wide temperature range from 0 to 500°F (-18 to 260°C) and a distance-to-spot size ratio of 6:1. The LCD shows temperatures in switchable °F or °C, holds the reading for 7 seconds after the button is released and indicates when the battery is low. The IRM20 is ideal for industrial, electrical, heating and air conditioning, automotive and food safety.

### SPECIFICATIONS

- Temperature Range:** 0 to 500°F (-18 to 260°C).
- Accuracy:** ±2% of reading or ±3.5°F (±2°C) whichever is greater for targets at 30 to 500°F (-1 to 260°C); ±5°F (±3°C) for targets at 0 to 30°F (-18 to -1°C).
- Emissivity:** Fixed 0.95.
- Distance-to-Target Size Ratio:** 6:1.
- Laser Classification:** Single point.
- Display:** 4-digit.
- Resolution:** 1°F/°C.
- Response Time:** 500 ms, 95% response.
- Ambient Operating Temperature:** 32 to 120°F (0 to 50°C).
- Power Requirement:** One 9V battery (included).
- Battery Life:** 12 hours.
- Repeatability:** ±2% of reading or ±3°F (±2°C).
- Storage Temperature:** -4 to 150°F (-20 to 65°C) without battery.
- Relative Humidity:** 10-95% RH noncondensing up to 86°F (35°C).
- Spectral Response:** 7-18 μm.
- Weight:** 0.5 lb (227 g).
- Agency Approvals:** CE.

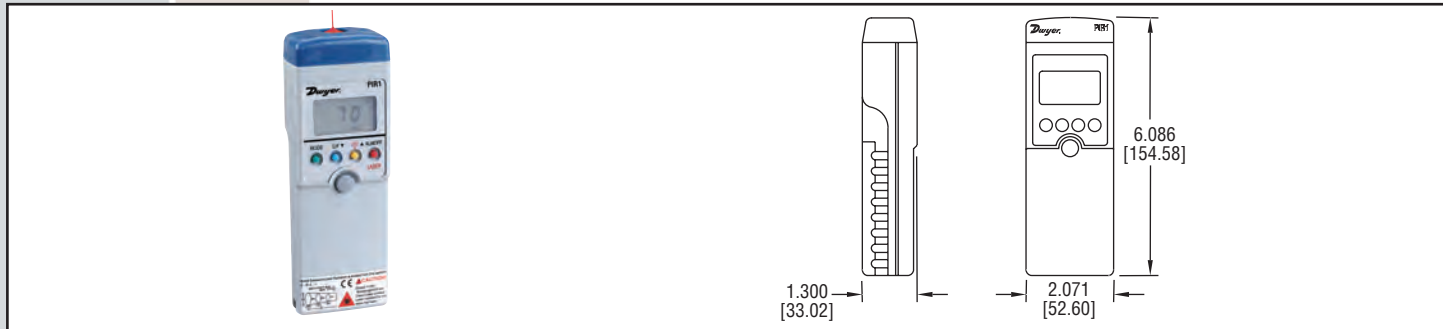
Model IRM20 Noncontact Infrared Thermometer

Handhelds

Model  
PIR1

# Pocket-Size Infrared Thermometer

Adjustable Emissivity, Laser Targeting, Selectable °F or °C



The PIR1 Pocket-Size Infrared Thermometer allows for temperature measurement of processes not suited for conventional “contact” measurements. Model PIR1 will display real time, maximum, minimum, differential or average temperature readings with a push of a button. The large, 3-digit LCD is backlit to allow for use in low light areas. Additional features include an audible high/low alarm, laser targeting, adjustable emissivity and selectable °F/°C measurements. Vinyl carrying case, lanyard, 9V battery and instructions are included.

### SPECIFICATIONS

- Temperature Range:** 0 to 600°F (-20 to 315°C).
- Accuracy:** ±2% of reading or ±4°F (±2°C) whichever is greater.
- Emissivity:** Adjustable 0.3-1.0.
- Distance-to-Target Size Ratio:** 6:1, nominal.
- Laser Classification Single Point:** Class II (Output <1mW).
- Display:** 3-Digit, 1/4" height. Automatically shuts off 7 seconds after hold button is released.
- Resolution:** 1°C/°F.
- Response Time:** 500 ms.
- Ambient Operating Temperature:** 32 to 122°F (0 to 50°C), 80% RH max.
- Power Requirements:** One 9V alkaline battery (included).
- Sample Rate:** 0.5 seconds minimum.
- Weight:** 6.3 oz (180 g).
- Agency Approvals:** CE.

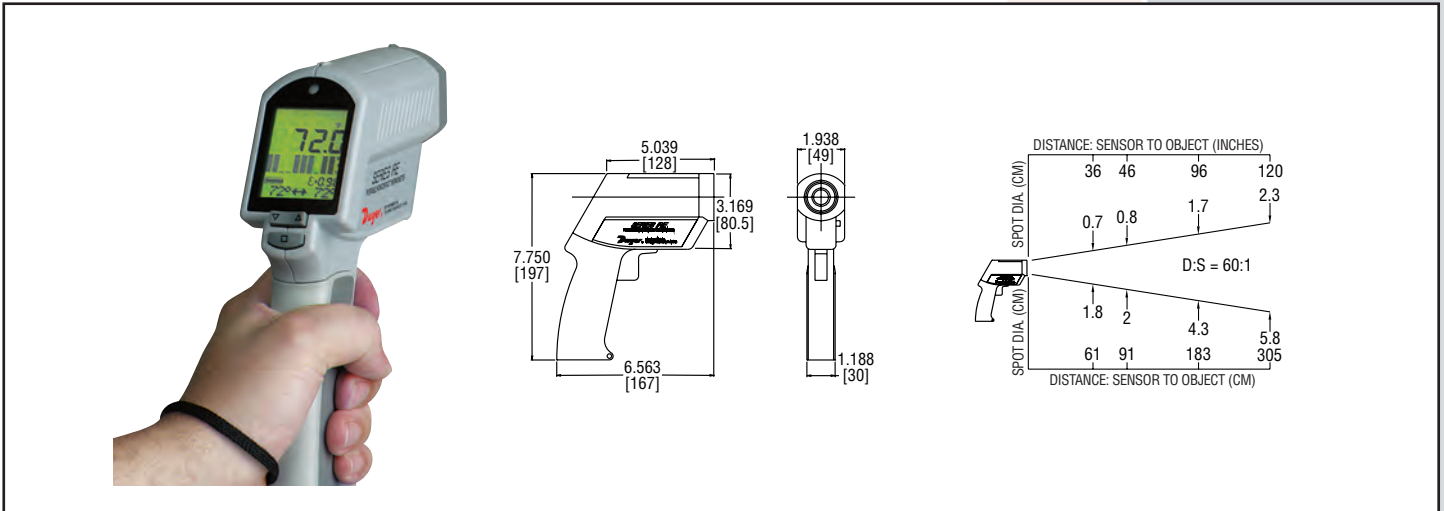
Model PIR1 Pocket Size Infrared Thermometer

Series  
IRE

# Infrared Thermometer Expanded

Laser Sighting,  $\pm 1\%$  Accuracy, Numeric and Graphical Display

CE



**Series IRE Infrared noncontact thermometer** features a unique 3-point laser sighting with center aiming point that defines the area being measured. All models have a selectable °F or °C, adjustable emissivity, MIN and MAX temperature, audible and visible high alarm, and a bar graph display indicating the last ten measurements. Model IRE61-1 and IRE90 also features average and differential temperatures, thermocouple input, RS232 output, low alarm, and on-board emissivity tables for 30 preset materials. Use the data management software included with model IRE-61-1/IRE90 for graphing and analysis of temperature measurements. Model IRE90 also features an integral digital camera to simultaneously measure temperature and digitally photograph the measured area. Units include hard carrying case and instruction manual.

## SPECIFICATIONS

- Temperature Range:** -25 to 1600°F (-32 to 900°C), selectable.
- Accuracy:**  $\pm 1\%$  of reading or  $\pm 1.5^\circ\text{F}$  ( $\pm 1^\circ\text{C}$ ), whichever is greater.
- Emissivity:** Adjustable from 0.1 to 1.0.
- Distance-to-Target Size Ratio:** 60:1, nominal.
- Laser Classification:** 1 mW, meets FDA Class II requirements.
- Display:** 4-digit.
- Resolution:** 0.1°F or °C.
- Response Time:** 250 msec.
- Power Requirements:** Two AA alkaline batteries (included).
- Repeatability:**  $\pm 0.5\%$  of reading or  $\pm 1^\circ\text{F}$  ( $\pm 1^\circ\text{C}$ ), whichever is greater.
- Thermocouple Input:** Type K or J (model IRE61-1 & IRE90 only).
- Output:** RS232 (model IRE61-1 & IRE90 only).
- Computer Requirements:** (For models IRE61-1 & IRE90 only): This product works with Windows® 98, Windows® 2000 or Windows® XP and one USB port.
- Weight:** 1.6 lb (480 g).
- Agency Approvals:** CE.

## ACCESSORY

**No. IRE7**, padded pouch and belt clip

Model Number	Description
IRE50-1*	Adjustable emissivity, MIN, MAX, Hi alarm, and bar graph
IRE61-1*	Adjustable emissivity, MIN, MAX, DIF, AVG, Hi/Lo alarm, t/c input, RS232, graph and tables (includes software, cables, Type K probe)
IRE90	Same as IRE61 and Integral Digital Photography Function

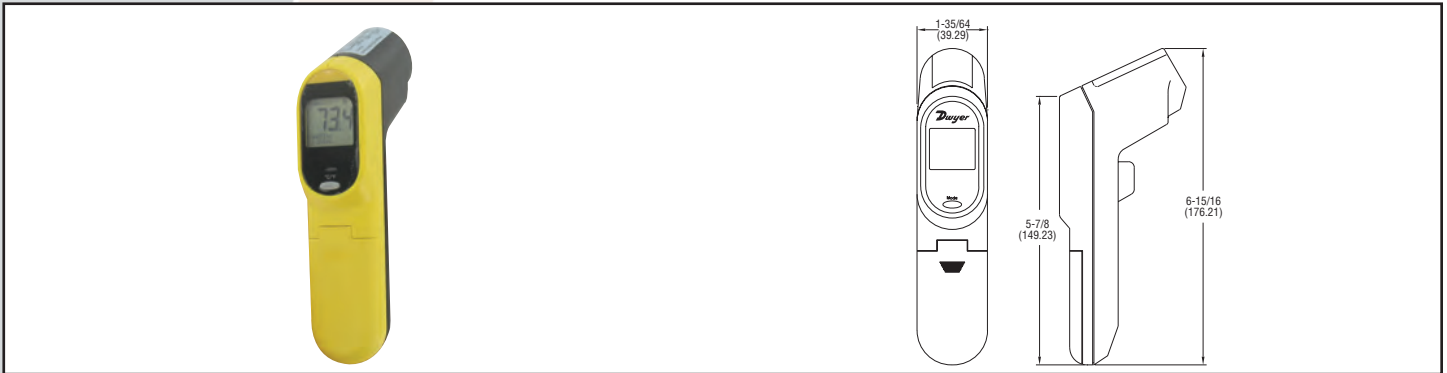
\*For a NIST certified unit add suffix N to model number.

Handhelds

Model  
IR2

# Infrared Non-Contact Thermometer

9:1 Distance-to-Target Size, Laser Sighting



The Series IR2 Infrared Temperature Thermometer allows users to economically take accurate measurements in hard to reach areas. Measurements can be taken at a safe distance with a 9:1 Distance to Target Ratio. The IR2 easily takes measurements within 2% accuracy using a built-in laser sighting. The fixed emissivity of 0.95 is perfect for measuring surface temperatures of concrete, asphalt, rubber or oxidized metals. Besides reading the process temperature, the back lit display also reads the maximum temperature seen. Excellent for monitoring surface temperatures of air ducts, boilers, engines or light fixtures.

Model IR2, Infrared Temperature Thermometer

## SPECIFICATIONS

**Measurement Range:** -58 to 750°F (-50 to 400°C).

**Operating Range:** 32 to 122°F (0 to 50°C).

**Accuracy:** 2% of reading or 4°F (2°C), whichever is greater.

**Resolution:** 0.1°F/0.1°C.

**Response Time:** 1 second.

**Distance to Target:** 9:1.

**Emissivity:** 0.95 fixed.

**Battery:** 2 AAA, 180 hours continuous use (auto power off after 15 seconds).

**Dimensions:** 6.90 x 1.54 x 2.83 in (175.2 x 39.0 x 71.9 mm).

**Units:** User select °F or °C.

**Weight:** 3.61 oz (102 g).

**Agency Approvals:** CE.

Handhelds

Model  
IR3

# Infrared Temperature Thermometer

12:1 Distance-to-Target Size Ratio, Laser Sighting, Thermocouple Input



The Model IR3 Infrared Thermometer utilizes infrared technology for precise, non-contact temperature measurement. This model features a 12:1 distance to spot ratio and single point laser sighting for accurate temperature measurements. The IR3 offers an adjustable emissivity, selectable temperature units, MAX, MIN, DIF and AVG functions and locking mode for continuous measurement and backlight display. A K-type thermocouple can be used to take dual contact and IR temperature measurements simultaneously. The IR3 offers high and low audible alarms for safety checks.

Model IR3, Infrared Temperature Thermometer

## SPECIFICATIONS

**Temperature Range:** -76 to 932°F (-60 to 500°C).

**Accuracy:** ±2% of reading or 4°F (2°C), whichever is greater.

**Emissivity:** 0.95 fixed; 0.1-1.0, step 0.1.

**Distance to Target:** 12:1.

**Laser Classification:** Class II.

**Display:** 3 digits.

**Resolution:** 0.1°F/0.1°C.

**Response Time:** 1 second.

**Ambient Operating Temperature:** 32 to 122°F (0 to 50°C).

**Power Requirements:** 2 AAA, 1.5 V alkaline batteries.

**Average Battery Life:** 180 hours (without laser or LCD backlight).

**Thermocouple Input:** Type K.

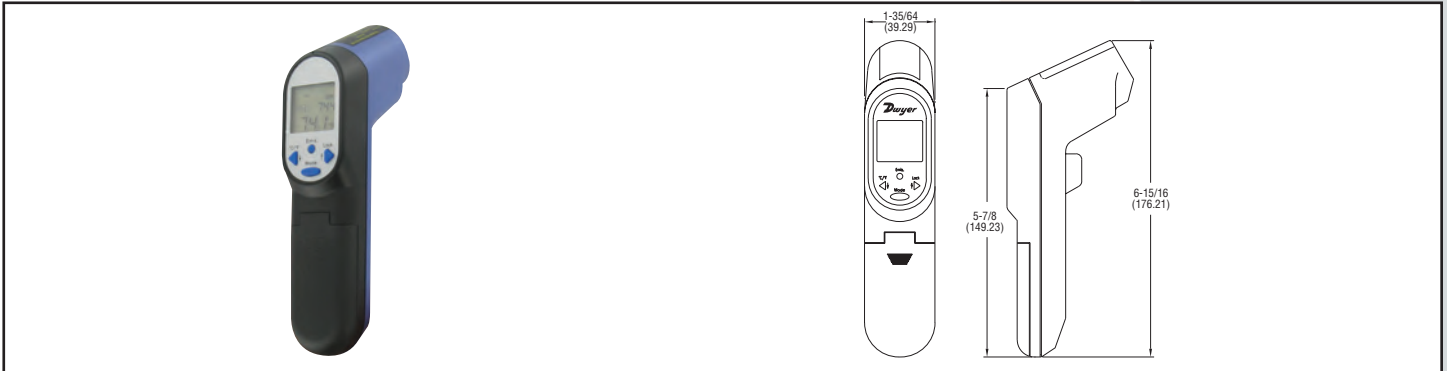
**Weight:** 6.3 oz (179 g) with batteries.

**Agency Approvals:** CE.

Model  
IR4

# Infrared Non-Contact Thermometer

20:1 Distance-to-Target Ratio, Thermocouple Input, Laser Sighting



For those long range applications, the IR4 Non Contact Infrared Thermometer is the perfect instrument. It has a distance to spot ratio of 20:1 and laser sighting to accurately measure within 1% of reading. The adjustable emissivity allows this thermometer to measure the temperature of virtually any surface. There is no guessing when the battery is low as the IR4 has a battery indicator on its back lit display. This useful hand held has programmable low and high audible alarms built in. The IR4 accepts any K-type thermocouple to display both a IR and a contact reading simultaneously. MAX, MIN, DIF, and AVG can be displayed with a push of a button.

## SPECIFICATIONS

**Measurement Range:** -76 to 1400°F (-70 to 760°C).

**Operating Range:** 32 to 122°F (0 to 50°C).

**Accuracy:** 1% of reading or 1.8°F (1°C) whichever is greater.

**Resolution:** 0.1°F/0.1°C.

**Response Time:** 1 second.

**Distance to Spot:** 20:1 optics ratio.

**Emissivity Range:** 0.95 default – adjustable 0.05 to 1.00 emissivity.

**Additional Input:** K-type thermocouple.

**Battery Life:** 2 AAA typical, 180 hours continuous use (auto power off after 15 seconds).

**Dimensions:** 6.9 x 1.54 x 2.83 in (175.2 x 39.0 x 71.9 mm).

**Weight:** 6.31 oz (179 g).

**Agency Approvals:** CE.

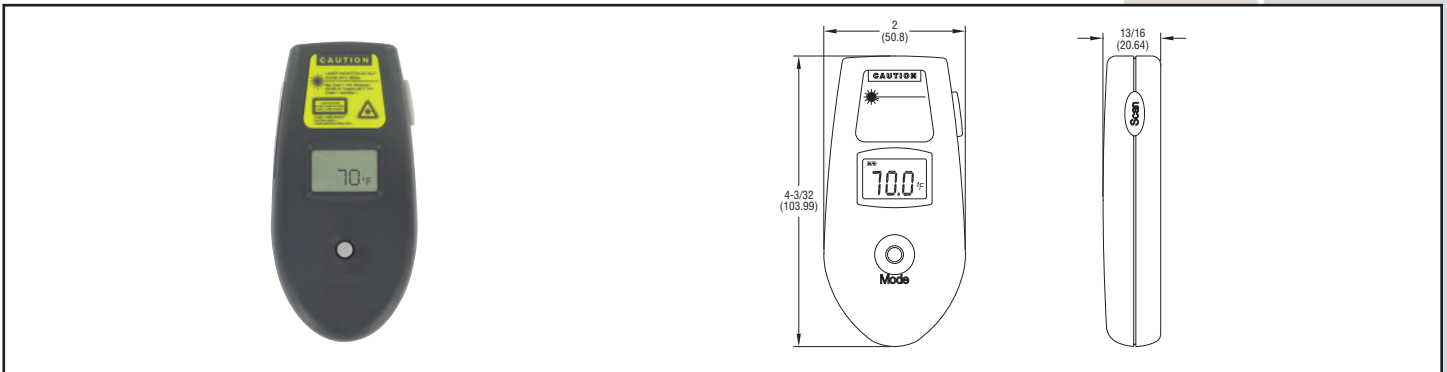
Model IR4, Non Contact Thermometer

Handhelds

Model  
MIT

# Miniature Infrared Non-Contact Thermometer

6:1 Distance-to-Target Ratio with Laser Sighting



The Model MIT Miniature Infrared Temperature Thermometer is the ultimate portable infrared solution. This unit has features such as MIN and MAX temperature, adjustable emissivity, battery life indicator, and laser sighting. This affordable thermometer also has a 6 to 1 distance to spot ratio in key chain size housing.

## SPECIFICATIONS

**Measurement Range:** -67 to 482°F (-55 to 250°C).

**Operating Range:** 32 to 122°F (0 to 50°C).

**Accuracy:** 2% of reading or 4°F (2°C), whichever is greater.

**Resolution:** 0.1°F/0.1°C (switchable).

**Response Time:** 1 second.

**Distance To Spot:** 6:1 optics ratio.

**Emissivity Range:** 0.95 default – adjustable 0.05 to 1.00 emissivity.

**Battery Life:** Typical 40 hours of continuous use (auto power off after 15 seconds). (2) CR2032 batteries included.

**Dimensions:** .89 x 1.97 x 4.06 in (175.2 x 39.0 x 71.9 mm).

**Weight:** 2.29 oz (65 g) including batteries.

**Agency Approvals:** CE.

Model MIT, Miniature Infrared Non-Contact Thermometer

# Introduction to Transmitters/Alarms

Love Controls offers a variety of transmitters and signal conditioners for process monitoring and control. Mounting variations include in-head, panel, octal, and DIN rail.

Transmitters/  
Alarms

FEATURES	659	SC4130	SC4151	SC1290	SC1490	SC4380	SC1090/SCL1090	4130/4151	1290/1490	4380	1090	MSC	MSP
<b>INPUTS</b>													
4-20 mA							•						
0-20 mA							•						•
0-10 V							•						•
10-50 mA							•						
0-1 V													
1-5 V													
0-100 mV													
0-5 V							•						
J, K, T T/C	•	•						•					
100Ω RTD	•												
Thermistor	•												
Universal T/C				•				•				•	•
Universal RTD			•		•			•	•			•	•
Universal Process						•				•	•	•	
AC Volts													
AC Current													
Frequency													•
Strain Gage													
Potentiometer												•	•
<b>OUTPUT</b>													
0-10 V		•	•					•					
4-20 mA	•	•	•					•					
Open Collector													
Current						•			•			•	•
Voltage						•			•			•	•
Relay				•	•		•	•		•			
Thermocouple													•
RTD													•
Potentiometer													•
<b>FEATURES</b>													
1500 VAC Isolation		•	•	•	•	•	•	•	•	•	•	•	•
1800 VAC Isolation													
<b>MOUNTING</b>													
In Head	•												
Panel													
Octal								•	•	•	•		
DIN		•	•	•	•	•	•						•

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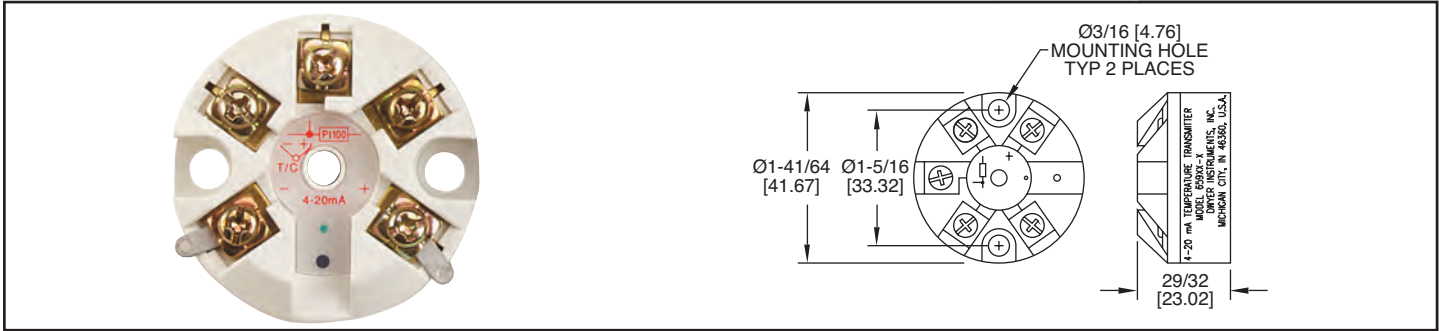




Series  
659

# Push-Button Temperature Transmitter

Programmable, RTD, Thermistor or Thermocouple Input, In-Head Mounting



**Series 659 Push-Button Temperature Transmitters** accept thermocouple (J, K, T), RTD (Pt100Ω) or thermistor input and provide a linearized 4 to 20 mA output. The transmitter is quickly ranged and calibrated by using a single on-board switch. An LED provides visual indication of sensor fault and programming mode. Models feature reverse polarity protection. Thermocouple models are also galvanically isolated and cold junction compensated.

The compact transmitter can be mounted directly within any standard thermal head for connection to the sensor. The Series 659 Transmitters are ideal for temperature measurement in boilers, burners, ducts, furnaces, refrigeration systems, food processing, tanks, chemical processing, steam generators or any other process application.

Model Number	Input
659TC-1	Thermocouple (Type J, K, T)
659RTD-1	3-wire RTD (Pt100)
659TH-1	Thermistor (2252)

## SPECIFICATIONS

**Input Range:** Type J T/C: -328 to 2192°F (-200 to 1200°C); Type K T/C: -328 to 2498°F (-200 to 1370°C); Type T T/C: -328 to 752°F (-200 to 400°C); Pt100Ω RTD: -328 to 1562°F (-200 to 850°C); Thermistor: -13 to 257°F.

**Accuracy:** T/C models: ±0.04% F.S., ±0.04% of reading or ±0.5°C whichever is greater; RTD: ±0.2°C ±0.1% of rdg; Thermistor: ±0.25°F (±0.1°C).

**Output:** Linearized 4 to 20 mA, 2-wire loop powered.

**Sample Rate:** 500 ms.

**Loop Resistance:** T/C: 700Ω @ 24 VDC; RTD: 800Ω @ 24 VDC; Thermistor: 24 VDC.

**Output Thermal Drift:** Zero: 0.2µA/°C; Span: 0.5µA/°C.

**Ambient Operating Temperature:** -4 to 158°F (-20 to 70°C), 80% RH max.

**Ambient Storage Temperature:** -40 to 158°F (-40 to 70°C), 95% RH max.

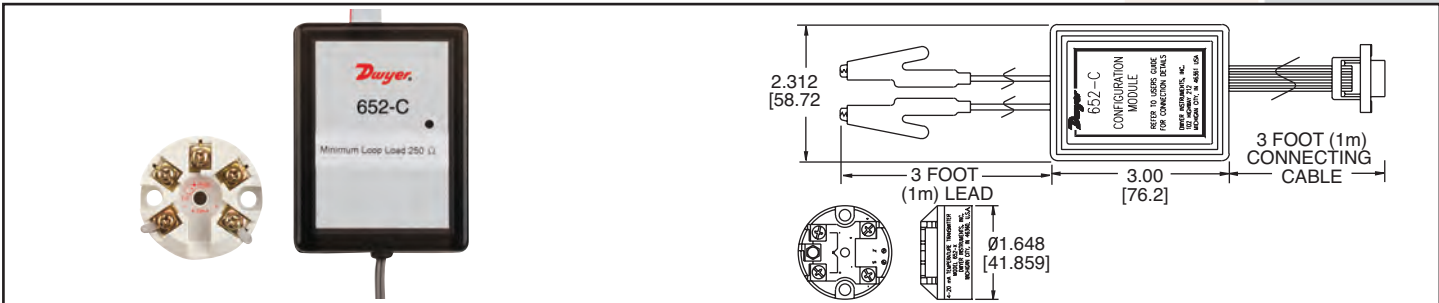
**Burnout:** Upscale 22 mA.

**Weight:** 0.92 oz (26 g).

Model  
652-0

# Programmable Transmitter

RTD, Thermocouple, Voltage or Potentiometer Input, Galvanically Isolated



**Model 652-0 Programmable Transmitter** accepts any commonly used temperature sensor, slidewire transducer or millivolt signal and produces a 4 to 20 mA output signal. Input type and range are easily programmed using a PC and the simple Windows® based software program model 652-C sold separately. The user can completely reconfigure units of measure, high/low range, filtering factor, offset, and transmitter reference details. The model 652-0 features 500V input to output isolation to remove ground loop effects and four filter settings to remove incoming signal noise. Outstanding versatility and compact size make this unit ideal for any temperature application.

**Model 652-0 Programmable Transmitter**

## ACCESSORY

**Model 652-C Configuration Kit** (includes power adapter, configuration module, software and carrying case).

## SPECIFICATIONS

**Input/Output Isolation:** 500 VAC RMS.

**Thermocouple Input Range:** J: -328 to 2192°F (-200 to 1200°C); K: -328 to 2498°F (-200 to 1370°C); T: -328 to 752°F (-200 to 400°C); R and S: -14 to 3200°F (-10 to 1760°C); E: -328 to 1832°F (-200 to 1000°C); F: -148 to 1112°F (-100 to 600°C); N: -292 to 2372°F (-180 to 1300°C).

**RTD Input Range:** (Pt100Ω): -328 to 1562°F (-200 to 850°C).

**Output:** Linearized 4 to 20 mA.

**Output Impedance:** 700Ω @ 24 VDC.

**Power Requirements:** 10 to 35V.

**Accuracy:** T/C: ±0.04% full range input, ±0.04% rdg.; RTD: ±0.01 full range input, ±0.05% of rdg.; Voltage: 10µV, ±0.07% rdg.; Potentiometer: 0.1% full range input.

**Thermal Drift:** Zero: 0.1µV/°C (RTD zero drift is 0.008°F/°F); Span: 100ppm/°C.

**Ambient Operating Temp.:** -40 to 185°F (-40 to 85°C).

**Response Time:** <1 second.

**Update Time:** 250 msec max.

**Filtering:** Off; 2 seconds, 10 seconds, or adaptive.

**Cold Junction Error:** ±29°F (±0.5°C).

**Computer Interface:** RS232 via configurator 652-C, IBM compatible 386 or above with 4MB RAM and serial port.

**Housing:** PPE & PS.

**Weight:** 0.92 oz (26 g).

**Max. Output Load:** 700Ω @ 24 VDC.

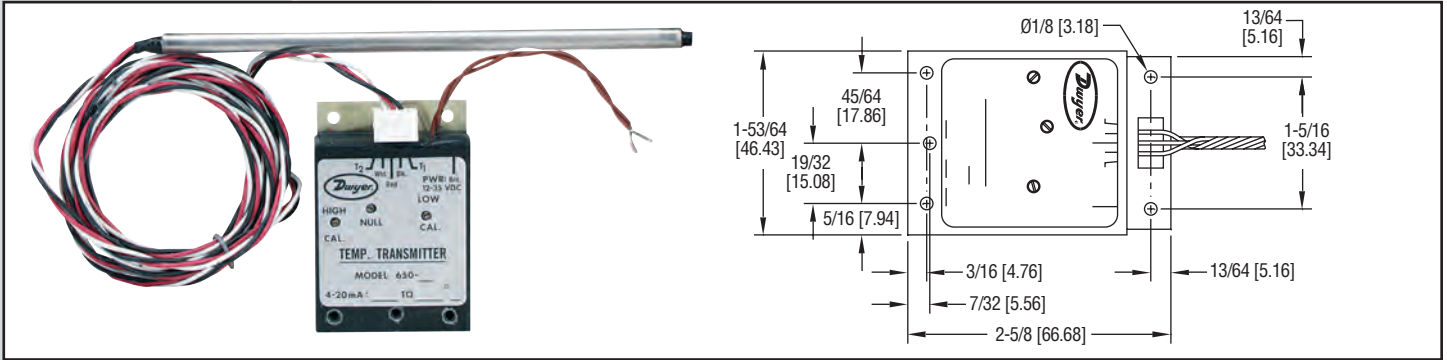
**Agency Approvals:** CE.

Transmitters/  
Alarms

Series  
650

# Temperature Transmitter

4-20 mA Signal, Two Wire Operation, Temperatures from -55 to 180°C



The Series 650 Temperature Transmitter combines low cost with small size making it ideal for a wide variety of HVAC, industrial and commercial multi-point temperature monitoring applications. Non-polarized terminals simplify connection to any 12-35 VDC power supply. Capable of operation with long cable runs, Series 650 Transmitters are well suited for monitoring air or water temperatures at remote locations. Three models are stocked in popular ranges factory calibrated within 0.3% of span. All are linear within 0.25% of span and may be recalibrated within low range and span limits shown in chart. Low Range is temperature corresponding to 4 mA output. Span is temperature difference between Low and High Ranges corresponding to 4-20 mA output signal.

### SPECIFICATIONS

**Input:** Silicone-junction transistor.  
**Output Signal:** 4-20 mA DC.  
**Power Requirements:** 12-35 volts DC.  
**Accuracy:** ±0.3% F.S. @ 20°C (68°F).  
**Linearity:** Within 0.25% of span.  
**Thermal Drift:** Less than 0.5% of span over ambient temperature range of 0 to 50°C (32 to 122°F).

**Probe Construction:** 6" long, 0.25" O.D. Type 304 SS.

**Ambient Operating Temperature:** 0 to 70°C (32 to 158°F).

**Temperature Limits: (Probe):** 204°C (400°F).

**Probe Cable Length:** 7 ft (2.1 m).

**Voltage Stability:** Output error less than 0.01% of span over the specified supply voltage range.

Model Number	Range As Stocked	Low Range Limits		Span Limits	
		Min.	Max.	Min.	Max.
650-1	-23° to +10°C	-32°C	-14°C	24°C	48°C
650-2	-7° to +49°C				
650-3	0° to +100°C	-12°C	+6°C	37°C	150°C

Consult factory for special ranges calibrated within the limits of -55°C and +180°C

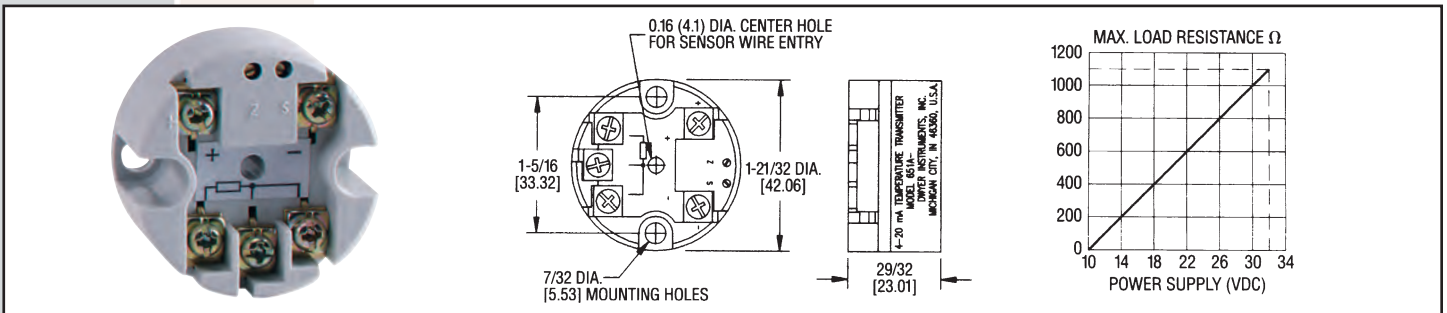
All Series 650 models listed

A-325 Duct Mounting Kit with flange, fitting and hardware

Series  
651

# Temperature Transmitter

RTD or Thermocouple Input, Zero and Span Adjust, Linearized 4-20 mA Signal



**Linearized output** for precise temperature monitoring or control is combined with small size and quick, easy mounting. Rugged Series 651 transmitters are designed for use with 2 or 3 wire Pt100 RTDs (to DIN standard 43760 or BS1904) or ungrounded Type K thermocouples. Thermocouple models 651TC are cold junction compensated, automatic 32 to 160°F (0 to 70°C) with upscale burnout. These economical devices provide the accuracy and reliability you need at the lowest possible cost.

### SPECIFICATIONS

**Input:** 2 or 3 -wire Pt100 RTD (models 651A), or ungrounded Type K thermocouple (models 651TC).

**Output:** 4-20 mA DC, linearized. **Transmitter Type:** 2-wire.

**Output Impedance:** 700Ω @ 24 VDC.

**Power Requirements:** 10-32 VDC, reverse connection protected.

**Accuracy:** ±0.2°C plus 0.2% reading (models 651A), ±0.1% FS plus cold junction errors (models 651TC).

**Temperature Drift:** ZERO drift typical 0.02%/°C (0.09°F), SPAN typical 0.005%/°C (0.0036°F).

**Ambient Operating Temperature:** 32 to 122°F (0 to 50°C).

**Maximum Storage Temperature:** 160°F (70°C).

**Response Time:** 10-90% in 200 ms (models 651A), 70% in 2 ms (models 651TC).

**Agency Approvals:** CE.

### ACCESSORY

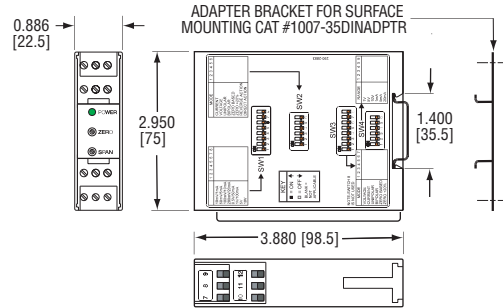
**A-709,** Optional enclosure for Series 651 Transmitters. NEMA 1 protective housing is 3" x 2 1/8" (76 x 54 mm). Supplied with mounting hardware, strain relief fitting and assembly instructions

Model No.	Input Type	Range, °F (°C)
651A-10	Pt100 RTD	32-212 (0-100)
651A-20	Pt100 RTD	32-392 (0-200)
651A-40	Pt100 RTD	32-752 (0-400)
651TC-01	Type K Thermocouple	32-212 (0-100)
651TC-02	Type K Thermocouple	32-392 (0-200)
651TC-04	Type K Thermocouple	32-752 (0-400)
651TC-06	Type K Thermocouple	32-1112 (0-600)

Series  
SC4130  
SC4151

# Iso Verter® II Signal Conditioning Modules

Accepts Virtually All Standard Process Signals



Linearized and isolated RTD and Thermocouple transmitters are part of the Series SC4000 Iso Verter® II Signal Conditioning Modules. These modules completely isolate the input from the output and from ground. Compatible with industry standard 35 mm DIN Rail mount transmitters and isolators, these modules are easily applied in new or existing installations.

The **SC4151 RTD Transmitters** each offer a fixed scale range input (selected when ordered) and a linearized, isolated, field selectable 4 to 20 mA or 0 to 10 VDC output. Output is selected by simple switch settings. Low Voltage units (SCL) are also available.

The **SC4130 Thermocouple Transmitter** offers a fixed scale range input (selected when ordered) and a linearized, isolated, field selectable 4 to 20 mA or 0 to 10 VDC output. Output is selected by simple switch settings.

Low Voltage units (SCL) are also available.

## SPECIFICATIONS

**Isolation:** 1500 VAC RMS.

**Linearity:** 0.1% of full scale.

**Drift:** ±0.02%/°C typical, ±0.05%/°C maximum.

**Power Supply:** SC: 85 to 265 VDC/VAC 50 to 400 Hz;

SCL: 12 to 24 VDC/VAC 50 to 400 Hz.

**Output Loads:** Current: 600 ohms maximum Voltage: 500 ohms minimum (20 mA maximum).

**Input Characteristics:** SC4151: RTD Search current < 500 µA; SC4130: 3 megohms impedance.

**Case Size:** 0.866" W (22.5 mm) x 2.950" H (75.0 mm) x 3.880" D (98.5 mm).

**Mounting:** Mounts on industry standard 35 mm DIN Rail (DIN EN50022-35).

## To Order Use Range Code as Suffix:

### SC4130 & SCL4130 Thermocouple Transmitter

Model SC4130 Range Codes	Model SCL4130 Range Codes
A = J, -100 to 200°C	A = J, -100 to 200°C
C = J, 0 to 100°C	C = J, 0 to 100°C
D = J, 0 to 500°F	D = J, 0 to 500°F
E = J, 0 to 250°C	E = J, 0 to 250°C
F = J, 0 to 750°C	F = J, 0 to 750°C
G = J, 0 to 1000°F	G = J, 0 to 1000°F
H = K, -150 to 350°F	H = K, -150 to 350°F
J = K, -100 to 200°C	J = K, -100 to 200°C
K = K, 0 to 500°F	K = K, 0 to 500°F
L = K, 0 to 250°C	L = K, 0 to 250°C
M = K, 0 to 1000°F	M = K, 0 to 1000°F
N = K, 0 to 500°C	N = K, 0 to 500°C
P = K, 0 to 2000°F	P = K, 0 to 2000°F
R = K, 0 to 1000°C	R = K, 0 to 1000°C
S = T, -300 to 250°F	S = T, -300 to 250°F
T = T, -200 to 200°C	T = T, -200 to 200°C

### SC4151 & SCL4151 RTD Transmitters

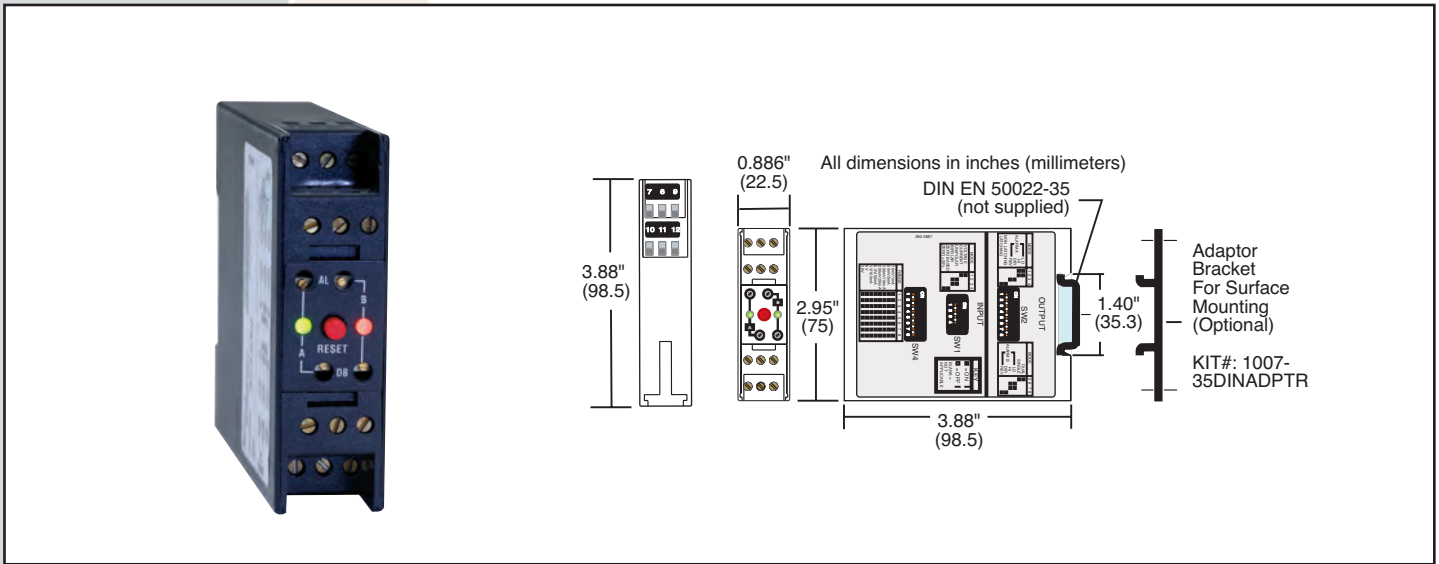
Model SC4151 Range Codes	Model SCL4151 Range Codes
A = DIN, -100 to 200°C	A = DIN, -100 to 200°C
B = DIN, 0 to 100°C	B = DIN, 0 to 100°C
C = DIN, 0 to 150°C	C = DIN, 0 to 150°C
D = DIN, 0 to 200°F	D = DIN, 0 to 200°F
E = DIN, 0 to 200°C	E = DIN, 0 to 200°C
F = DIN, 0 to 400°F	F = DIN, 0 to 400°F
G = DIN, 0 to 250°C	G = DIN, 0 to 250°C
H = DIN, 0 to 500°F	H = DIN, 0 to 500°F
J = DIN, 0 to 500°C	J = DIN, 0 to 500°C
K = DIN, 0 to 1000°F	K = DIN, 0 to 1000°F

Transmitters/  
Alarms

Series  
SC1290  
SC1490

# Thermocouple & RTD Limit/Alarm Switch Module

Two Form C (SPDT) Switches, Small Size, Mounts Easily on 35 mm DIN Rail



The Series SC1290 & SC1490 Thermocouple Limit/Alarm Switch Modules are on-off or limit switches with selectable, thermocouple, or RTD inputs. Input type, scale range, output action, and output type are all selectable by the user in the field. All selections are made through easily accessible switches without the need to open the product. Each unit has two form C (SPDT) relays which can operate independently, or be logically connected to operate as a DPDT output. A two color LED indicator indicates the status of each output relay. These units mount easily on a standard 35mm DIN rail. Low Voltage (SCL XXXX) units are also available.

## SPECIFICATIONS

**Input:** SC1290: Thermocouple Type J, K, R, S, T, E; SC1490: RTD Pt1000, Ni100, Ni120, Cu10, Ni-Fe1000, Ni-Fe2000.

**Power Supply:** (SC units) 85 to 265 VDC/VAC 50 to 400 Hz (12-24 VDC, VAC 50-400 Hz for Low Voltage Option, SCL units).

**Isolation:** 1500 V rms between outputs, input, and power.

**Set Points:** Adjustable 0 to 100% of span.

**Deadband:** Adjustable 0.25% to 100% of span.

**Drift:**  $\pm 0.02\%/^{\circ}\text{C}$  typical  $\pm 0.05\%/^{\circ}\text{C}$  maximum.

### Ambient Temperature Range:

(operating) 32 to 131°F (0 to 55°C).

(storage) -40 to +176°F (-40 to +80°C).

**Excitation Current:** (SC1490) Cu10Ω = 5mA; Pt 100Ω, Ni 100Ω, Ni 120Ω = 500μA; Pt 500Ω, NiFe 1000Ω = 100 μA; Pt 1000Ω = 50 μA.

### Lead Compensation Error:

(SC1490)  $\approx 0.02\%/\Omega$ .

### Open Lead Protection:

(SC 1490) Upscale only.

**Input Impedance:** (1290) 3 megohms.

**Sensor Burnout Protection:** Selectable, upscale or downscale on 1290.

**Relay Output:** Form C, SPDT, one per set point, 5A @ 250 VAC, resistive.

**Latch Circuit Reset:** Automatic at power up. Manual with reset switch on front of module.

**Indicators:** one dual color LED per set point. Red = relay on, green = relay off.

**Wiring Terminals:** Screw driven compression type.

Transmitters/  
Alarms

Model Number	Description
SC1290	T/C Input
SC1490	RTD Input
SCL1290*	T/C Input
SCL1490*	RTD Input

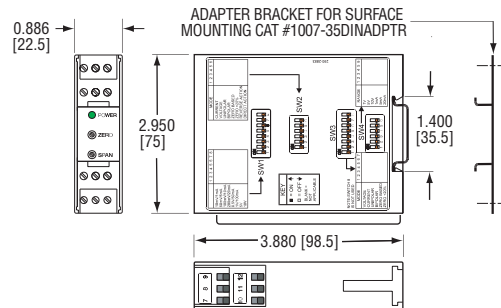
\* Low Voltage Supply



Series  
SC4380

# Iso Verter® II Signal Conditioning Modules

Accepts Virtually All Standard Process Signals



**Linearized and isolated RTD and Thermocouple** transmitters are part of the Series SC4000 Iso Verter® II Signal Conditioning Modules. These modules completely isolate the input from the output and from ground. Compatible with industry standard 35 mm DIN Rail mount transmitters and isolators, these modules are easily applied in new or existing installations.

The **SC4380 Process Signal Converter/Isolator** accepts virtually all standard process signals as an input, and isolates and retransmits the signal in either the same units or virtually any other standard process signal. The SC4380 can be field programmed for reverse or direct action and can receive and transmit single sided or bipolar\* signals. Low Voltage units (SCL) are also available.

Low Voltage units (SCL) are also available.

\*Note: The term "bipolar" refers to an input or output that crosses zero volts. Certain devices have ranges that run from minus to plus voltages (eg. -1 to +5 VDC, -10 to +10 VDC, etc.). The SC4380 Iso Verter® II can be set up to accept a bipolar signal input or provide a bipolar output.

## SPECIFICATIONS

**Isolation:** 1500 VAC RMS.

**Linearity:** 0.1% of full scale.

**Drift:** ±0.02%/°C typical, ±0.05%/°C maximum.

**Power Supply:** SC: 85 to 265 VDC/VAC 50 to 400 Hz;  
SCL: 12 to 24 VDC/VAC 50 to 400 Hz.

**Output Loads:** Current: 600 ohms maximum Voltage: 500 ohms minimum (20 mA maximum).

**Input Characteristics:** Voltage: 1 megohms impedance, Current: 10 ohms.

**Case Size:** 0.866" W (22.5 mm) x 2.950" H (75.0 mm)  
3 3.880" D (98.5 mm).

**Mounting:** Mounts on industry standard 35 mm DIN Rail (DIN EN50022-35).

## SC4380 & SCL4380 OPERATING RANGES

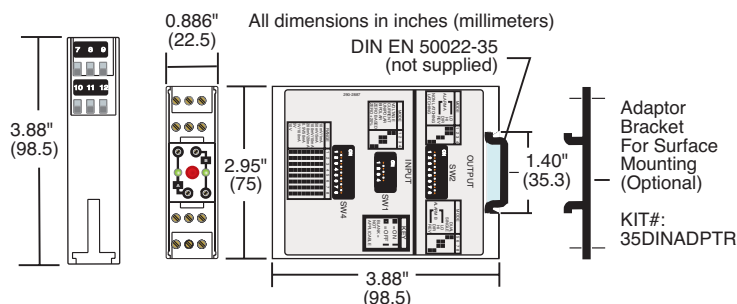
Inputs		Outputs	
Current	Voltage	Current	Voltage
0 to 5 mA	0 to 100 mV	0 to 1 mA	0 to 1 V
0 to 10 mA	0 to 200 mV	0 to 5 mA	0 to 5 V
0 to 10 mA	0 to 500 mV	0 to 20 mA	0 to 10 V
0 to 20 mA	0 to 1 V	1 to 5 mA	1 to 5 V
0 to 50 mA	0 to 5 V	4 to 20 mA	2 to 10 V
0 to 100 mA	0 to 10 V		
1 to 5 mA	1 to 5 V		
4 to 20 mA	2 to 10 V		
10 to 50 mA			



Series  
SC1090  
&  
SCL1090

# Process/Alarm Switch Module

Two Form C (SPDT) Switches, Small Size, Mounts Easily on 35 mm DIN Rail



The Series SC1090 Thermocouple Limit/Alarm Switch Modules are on-off or limit switches with selectable process signal. Input type, scale range, output action, and output type are all selectable by the user in the field. All selections are made through easily accessible switches without the need to open the product. Each unit has two form C (SPDT) relays which can operate independently, or be logically connected to operate as a DPDT output. A two color LED indicator indicates the status of each output relay.

These units mount easily on a standard 35 mm DIN rail. Low Voltage (SCL XXXX) units are also available.

## SPECIFICATIONS

**Input:** 4 to 20 mA, 10 to 50 mA, 0 to 20 mA, 0 to 10 V, -10 to 10 mV.

**Power Supply:** (SC units) 85 to 265 VDC/VAC 50 to 400 Hz (12-24 VDC, VAC 50-400 Hz for Low Voltage Option, SCL units).

**Isolation:** 1500V rms between outputs, input, and power.

**Set Points:** Adjustable 0 to 100% of span.

**Deadband:** Adjustable 0.25% to 100% of span.

**Drift:**  $\pm 0.02\%/^{\circ}\text{C}$  typical  $\pm 0.05\%/^{\circ}\text{C}$  maximum.

**Ambient Temperature Range:**

(operating) 32 to 131°F (0 to 55°C).

(storage) -40 to 176°F (-40 to 80°C).

**Input Impedance:** (1090) Voltage input = 1 megohms, Current input = 10 ohms.

**Sensor Burnout Protection:** Selectable.

**Relay Output:** Form C, SPDT, one per set point, 5A @ 250 VAC, resistive.

**Latch Circuit Reset:** Automatic at power up. Manual with reset switch on front of module.

**Indicators:** One dual color LED per set point. Red = relay on, green = relay off.

**Wiring Terminals:** Screw driven compression type.

Model Number	Power Supply
SC1090	85 to 265 VDC/VAC
SCL1090*	12 to 24 VDC/VAC

\* Low Voltage Supply

Series  
1090

# Loop Alarms™ Process/Alarm Switch

Accepts Inputs from Voltage and Current



**Loop Alarms™ Process/Alarm Switch** accept inputs from process devices. SPDT relay outputs can be set for latching or non-latching, direct or reverse action and high or low function. Output behavior is easily programmable via switches. Mount in standard 11-pin sockets.

**Dimensions:** Including socket pins, 2-3/8" W x 3-7/16" H x 1-3/4" D (60.3 W x 87.3 H x 44.4 D mm)

## SPECIFICATIONS

**Isolation:** 1500 Volts RMS. between input, outputs and power.

**Power Supply:** 85-265 VDC/VAC, 50-400 Hz.

**Setpoints:** Adjustable from 0-100% of span.

**Deadband:** Adjustable from 0.25-100% of span.

**Drift:** ±0.02% /°C typical, ±0.05% /°C maximum.

## Ambient Operating

**Temperature:** 32 to 131°F (0 to 55°C) non-condensing.

**Input Impedance:** Voltage input=1 megohm, Current input=10 ohms.

**Relay Output:** SPDT, one set per setpoint, 5A @ 250 VAC resistive.

## Latch Circuit Reset:

Automatic at power up. Manual with reset switch.

**Indicators:** One dual color LED per setpoint; red = On, green = Off.

Model 1090 Input Type and Ranges			
Voltage Inputs		Current Inputs	
0 to 10 mV	0 to 500 mV	0 to 1 mA	0 to 20 mA
0 to 50 mV	0 to 1V	0 to 5 mA	0 to 50 mA
0 to 100 mV	0 to 5V	0 to 10 mA	0 to 100 mA
0 to 200 mV	0 to 10V		

**Model 1090** Current & Voltage Loop Alarm™ Switches

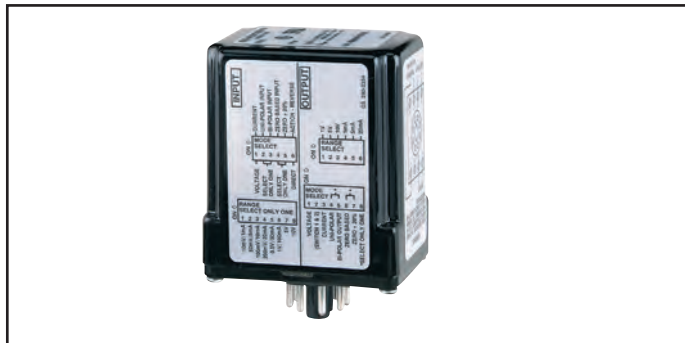
## ACCESSORY

**Model 481-0164** DIN Rail Socket Adapter

Model  
4380

# Process Signal Converter/Isolator

Converts Process Signal, Isolates to 1500 V RMS



**The Iso Verter® II** Isolator/Converter protects electronic circuits by completely isolating the input and output signals from each other and from ground. Both input and output ranges are fully field selectable with easy to adjust switches. With bipolar input selection and zero suppression, nearly any standard input/output range combination is possible. Zero and span adjustments are easily accessible on top of housing. Units plug into universally available octal sockets for quick, easy installation. Industry standard "pin-out" wiring configuration allows direct replacement of most competitive models. Order optional 481-0159 socket for new installations.

## RANGES AVAILABLE (Field Selectable)

Inputs				Outputs	
Current		Voltage		Current	Voltage
0-5 mA	0-100 mA	0-100 mV	0-5 V	0-1 mA	0-1 V
0-10 mA	1-5 mA	0-200 mV	0-10 V	0-5 mA	0-5 V
0-20 mA	4-20 mA	0-500 mV	1-5 V	0-20 mA	0-10 V
0-50 mA	10-50 mA	0-1 V	2-10 V	1-5 mA	1-5 V
				4-20 mA	2-10 V

## SPECIFICATIONS

**Isolation:** 1500 VAC.

**Linearity:** 0.1% of full span.

**Drift:** ±0.02%/°C typical; ±0.05%/°C maximum.

**Ambient Operating Temperature:** 32 to 131°F (0 to 55°C).

**Output Loads:** Current: 600 ohms maximum.

Voltage: 500 ohms minimum (20 mA maximum).

**Input Impedance:** Current: 10 ohms, Voltage: 1 megohm.

**Power Supply:** 85-265 VDC/VAC, 50-400 Hz.

**Case Size:** (Including socket pins)

2-3/8" W x 3-7/16" H x 1-3/4" D

60.3 mm W x 87.3 mm H x 44.4 mm D

Height is 2-7/8" (73 mm) above socket.

**Mounting:** Industry standard octal socket.

**Model 4380** Process Signal Converter/Isolator

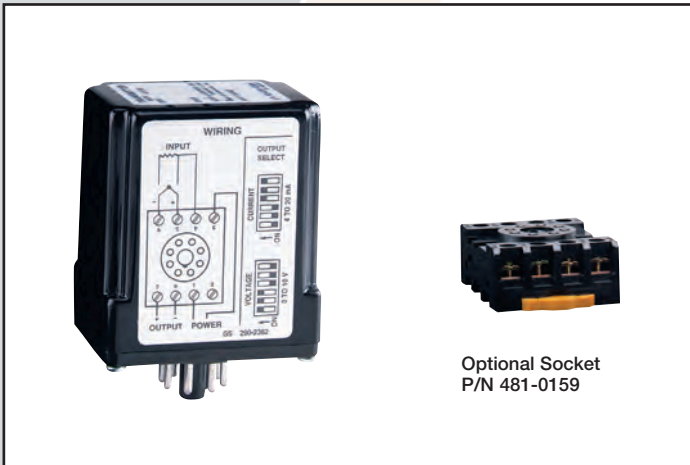
## ACCESSORY

**Model 481-0159** DIN Rail Socket Adapter

Series  
4130  
4151

# Temperature Transmitters

Linearized, Isolated 4-20 mA or 0-10 VDC Outputs, Thermocouple or RTD Inputs



Optional Socket  
P/N 481-0159

Iso Verter® II Transmitters accept thermocouple (4130) or RTD (4151) inputs, completely isolating them from the output signal and ground. Output is selectable for your choice of a linearized 4-20 mA or 0-10 VDC signal. These compact modules are compatible with industry standard octal bases for complete interchangeability.

## 4151 (RTD TRANSMITTERS)

Model	Type, Range	Model	Type, Range
4151A	DIN, -100 to 200°C	4151F	DIN, 0 to 400°F
4151B	DIN, 0 to 100°C	4151G	DIN, 0 to 250°C
4151D	DIN, 0 to 200°F	4151H	DIN, 0 to 500°F
4151E	DIN, 0 to 200°C	4151J	DIN, 0 to 500°C

## SPECIFICATIONS

**Isolation:** 1500 VAC RMS.

**Linearity:** 0.1% of full scale.

**Drift:** ±0.02% per °C typical, ±0.05% per °C maximum.

**Ambient Operating Temperature:** 32 to 131°F (0 to 55°C).

**Power Supply:** 85-265 VDC/VAC, 50-400 Hz.

**Output Loads:** Current: 600 ohms maximum.

Voltage: 500 ohms minimum, 20 mA maximum.

## Input Characteristics:

4130 (Thermocouple): 3 megohms impedance.

4151 (RTD): Search current <500 µA.

**Case Size Including Socket Pins:** 2-3/8" W x 3-7/16" H x 1-3/4" D (60.3 mm W x 87.3 mm H x 44.4 mm D). Height is 2-7/8" (73 mm) above socket.

## Model 4130 or 4151 Temperature Transmitter

## ACCESSORY

No. 481-0159 DIN Rail Socket Adapter

## 4130 (THERMOCOUPLE TRANSMITTERS)

Model	Type, Range	Model	T/C Type, Range
4130A	J, -100 to 200°C	4130L	K, 0 to 250°C
4130D	J, 0 to 500°F	4130N	K, 0 to 500°C
4130E	J, 0 to 250°C	4130P	K, 0 to 2000°F
4130F	J, 0 to 750°C	4130R	K, 0 to 1000°C
4130G	J, 0 to 1000°F	4130S	T, -300 to 250°F
4130K	K, 0 to 500°F	4130T	T, -200 to 200°C
		4130U	T, 0-500°F
		4130W	T, 0-250°C

Series  
1290  
1490

# Loop Alarms™ Process/Alarm Switch

Accepts Inputs from Thermocouples, RTDs



Loop Alarms™ Process Alarm Switch accept inputs from thermocouples (1290), RTDs (1490). SPDT relay outputs can be set for latching or non-latching, direct or reverse action and high or low function. Output behavior is easily programmable via switches. Mount in standard 11-pin sockets.

**Dimensions:** Including socket pins, 2 3/16" W x 3 7/16" H x 1 3/4" D (60.3 W x 87.3 H x 44.4 D mm).

**Search Current (1490):** Cu 10Ω = 5 mA. Pt 100Ω, Ni100Ω, Ni120Ω = 500µA. Pt 500Ω, NiFe 1000Ω, NiFe 2000Ω = 100 µA. Pt 1000Ω = 50µA.

**Relay Output:** SPDT, one set per setpoint, 5A @ 250 VAC resistive.

**Latch Circuit Reset:** Automatic at power up. Manual with reset switch.

**Lead Compensation Error (1490):** 0.02%/Ω.

**Indicators:** One dual color LED per setpoint; red = On, green = Off.

**Open Thermocouple Protection (1290):** Selectable upscale or downscale.

## SPECIFICATIONS

**Isolation:** 1500 Volts RMS between input, outputs and power.

**Power Supply:** 85-265 VDC/VAC, 50-400 Hz.

**Setpoints:** Adjustable from 0-100% of span.

**Deadband:** Adjustable from 0.25-100% of span.

**Drift:** ±0.02% /°C typical, ±0.05% /°C maximum.

**Ambient Operating Temperature:** 32 to 131°F (0 to 55°C) non-condensing.

**Input Impedance:** (1290) 3 megohms, Current input=10 ohms.

## Model 1290 Input Type and Ranges

**Type E Thermocouple**  
-454 to +302°F (-270 to +150°C)  
-454 to +554°F (-270 to +290°C)

32 to +302°F (0 to +150°C)  
32 to +554°F (0 to +290°C)

32 to +1220°F (0 to +660°C)  
32 to +1832°F (0 to +1000°C)

**Type S Thermocouple**  
32 to 1922°F (0 to +1050°C)  
32 to 3200°F (0 to +1760°C)

**Type T Thermocouple**  
-454 to +410°F (-270 to +210°C)  
-454 to +734°F (-270 to +390°C)

32 to 410°F (0 to 210°C)  
32 to 734°F (0 to 390°C)

**Type J Thermocouple**  
-346 to +374°F (-210 to 190°C)  
-346 to +680°F (-210 to 360°C)

32 to +374°F (0 to 190°C)  
32 to +680°F (0 to 360°C)

32 to +1400°F (0 to 760°C)

**Type K Thermocouple**  
-454 to +482°F (-270 to +250°C)  
-454 to +896°F (-270 to +480°C)

32 to 482°F (0 to 250°C)  
32 to 896°F (0 to 480°C)

32 to 2501°F (0 to 1372°C)

**Type R Thermocouple**  
32 to 1778°F (0 to 970°C)  
32 to 3200°F (0 to 1760°C)

## Model 1490 Input Type and Ranges

**Pt 100, 500, 1000 RTDs**

32 to 212°F (0 to 100°C)

32 to 572°F (0 to 300°C)

32 to 932°F (0 to 500°C)

**Ni100 RTDs**

-58 to +302°F (-50 to +150°C)

**Ni120 RTDs**

-58 to +482°F (-50 to +250°C)

**Cu10 RTDs**

32 to 482°F (0 to 250°C)

32 to 2501°F (0 to 1372°C)

**NiFe 1000, 2000 RTDs**

-58 to +392°F (-50 to +200°C)

Model 1490 RTD Loop Alarm™ Switches

Model 1290 T/C Loop Alarm™ Switches

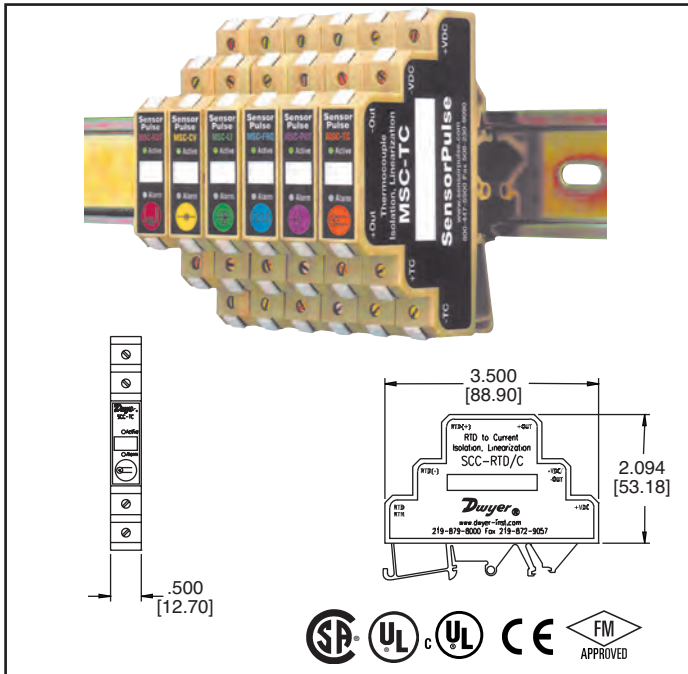
## ACCESSORY

No. 481-016 DIN Rail Socket Adapter

Series  
MSC

# Signal Conditioners

±0.05% Accuracy, 1500 VAC Isolation, 3-Way



The Series MSC Signal Conditioners provide maximum accuracy with minimal cost. Built-in microprocessor digitally scales, amplifies, linearizes and isolates thermocouple, RTD, current, voltage, frequency or potentiometer analog input signals. Units offer 16-bit input resolution with 0.05% full scale accuracy. Eliminate ground loops with 1500 VAC isolation. Two LEDs, one red and one green, located on the front face of the enclosure provide visual indication of operation. Additional features include short circuit, reverse power protection, digital calibration and cold junction compensation. Installation is a snap with the DIN rail mountable enclosure. Units are factory set to support a specific analog input and output, however, can be easily reconfigured to suit your application with the user-friendly Windows® Configuration software and cable (sold separately).

Also available is the SCC-4W DIN Rail Mount power supply and SCC-L1 Loop Isolator. Model SCC-4W is designed specifically to provide 24 VDC power for the SCC modules. Model SCC-L1 accepts a 4 to 20 mA signal and provides an isolated 4 to 20 mA signal output.

## SPECIFICATIONS

**Isolation:** 1500 VAC. 3-way: C, V, TC; 2-way: RTD, POT, FRQ, LI.

**Input Protection:** 220 VAC continuous.

**Input Impedance:** 1GΩ (mV/TC); >55KΩ (Voltage); 82Ω (Current).

**Excitation:** 150μA (RTD), 1.25V (POT).

**Output Impedance:** >10MΩ (Current); ~ 0Ω (Voltage).

**Output Load:** ≤ 600Ω (Current); ≥ 4KΩ (±10 Volts); ≥ 2KΩ (± 5 Volts).

**Power Requirements:** 15-32 VDC @ 25-45 mA.

**Over Voltage:** 240 Vrms continuous.

**Accuracy:** 0.05% Full Scale (includes linearity, repeatability and calibration errors).

**Cold Junction Compensation:** ±0.2°C (-15 to 55 °C) for all T/C.

**Resolution:** 16-bit (input); 13-bit (output).

**Drift:** 0.01% full scale per °C.

**Ambient Operating Temperature:** Operating: -40 to 167°F (-40 to 75°C).

**Storage Temperature:** -49 to 185°F (-45 to 85°C); 0-95% RH, non-condensing.

**Mounting:** DIN rail (32 mm-G and 35 mm-H).

**Connections:** Socketed screw terminals for 14-22 AWG.

**Response Time:** 150 ms @ 60 Hz, typical.

**Housing Material:** Polyamide.

**Weight:** 1.4 oz (40 g).

**Agency Approvals:** CE, CSA, FM, cUL, UL.

**All Series MSC Single Channel Conditioners**

## ACCESSORIES

**SCC-L1** Loop Isolator 4 to 20 mA input and output

**SCC-4W** Power Supply 85 - 265 VAC @ 50/60 Hz

**SCC-CC-A1** Windows® Software and Cable

\* Units can be reconfigured from their factory (default) settings with the SCC-CC-A1 Windows® Software (sold separately).

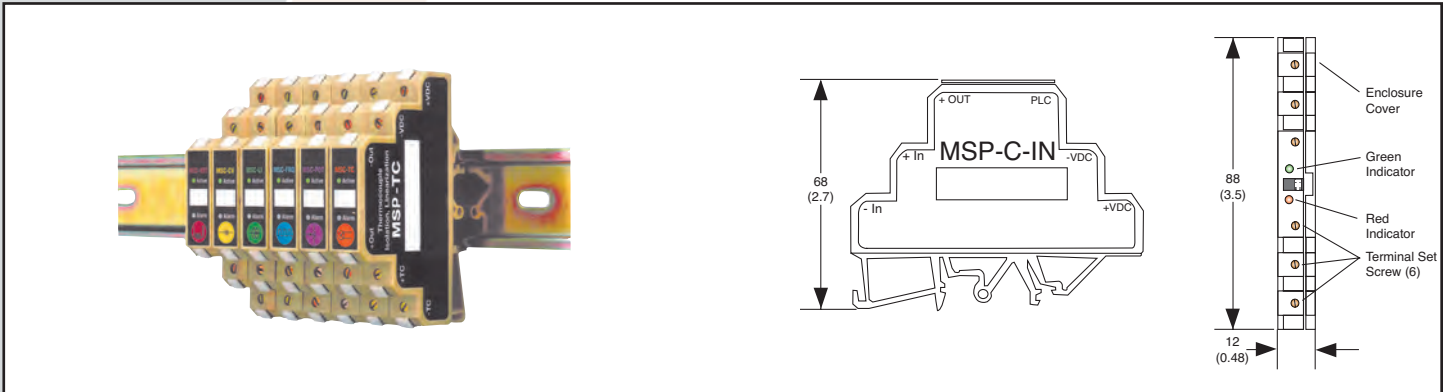
Windows® is a registered trademark of Microsoft Corporation.

Model Number	Input Types and Ranges	Default	Output Types and Ranges Input Range	Default Output Range
<b>MSC-C-C</b>	0 to 10 mA, 0 to 20 mA, 4 to 20 mA, ±10 mA, ±20 mA	4-20 mA	0 to 20 mA or 4 to 20 mA	4 to 20 mA
<b>MSC-C-V</b>			0 to 5 V, 0 to 10 V, ±5 V or ±10V	0 to 10V
<b>MSC-V-C</b>	0 to 5V, 1 to 5V, ±5V, ±1.5V, 0 to 1.5V, 0 to 1.25V, ±1.25V, ±300mV, 0 to 300 mV, ±10mV,	0-10V	0 to 20 mA or 4 to 20 mA	4 to 20 mA
<b>MSC-V-V</b>	0 to 10 mV, 0 to 50 mV, and ±50mV		0 to 5V, 1 to 5V, 0 to 10V, 2 to 10V	0 to 10V
<b>MSC-TC-C</b>	-148 to 1832°F, -328 to 32°F (Type E T/C), 32 to 1400°F, -328 to 32°F (Type J T/C), -328 to 32°, 32 to 2372°F (Type N T/C), 32 to 2498°F, -328 to 32°F (Type K T/C), -256 to 752°F, 32 to 752°F (Type T T/C)	Type J -32 to 1400°F	0 to 20 mA or 4 to 20 mA	4 to 20 mA
<b>MSC-TC-V</b>			0 to 5V or 0 to 10V	0 to 10V
<b>MSC-RTD-C</b>	-328 to 1562°F (Pt100Ω), -148 to 500°F (Ni120Ω),	Pt100 -328 to 1562°F	0 to 20 mA or 4 to 20 mA	4 to 20 mA
<b>MSC-RTD-V</b>	-148 to 500°F (Cu10Ω) 0 to 500Ω		0 to 5V or 0 to 10V	0 to 10V
<b>MSC-POT-C</b>	0 to 500Ω (min.) or 0 to 100KΩ (max.)	0 to 10KΩ	0 to 20 mA or 4 to 20 mA	4 to 20 mA
<b>MSC-POT-V</b>			±5V, ±10V, 0 to 5V or 0 to 10V, 1 to 5V	0 to 10V
<b>MSC-FRQ-C</b>	0 to 100 kHz at a magnitude of 0 to 50 mV, 0 to 500 mV, 0 to 5V,	0-10KHz (24 VDC)	0 to 20 mA or 4 to 20 mA	4 to 20 mA
<b>MSC-FRQ-V</b>	0 to 50 V or 0 to 250 V		0 to 5V or 0 to 10V	0 to 10V



# Isolating Transmitters

Adds Single Channel Analog In or Out to a PLC



The MSP family of analog I/O blocks offers the freedom to use any analog sensor with many models of PLC. Each MSP block provides a single analog input (or output) interface between the PLC and the analog world. Communications between the MSP unit and the PLC is through a patented protocol that provides truly "open" architecture for analog signals to be processed digitally.

The MSP is factory preconfigured to support specific analog input or output signals, depending on the model. Optionally, the MSP signal range can be reconfigured in the field using the windows based configuration software model SCC-CC-A1 (sold separately). Signal Conditioners used in panels for isolation and converting signals for Boilers and Controls Systems.

### Input Analog Signal

The analog input signal is isolated, filtered, amplified, scaled and/or linearized by the MSP micro-processor and converted to a 16-bit, binary weighted, digital word which is transmitted serially (one bit at a time) at 24VDC signal levels to the PLC's discrete I/O port. At the PLC, each binary-weighted bit sent to the discrete input is temporarily stored until all 16 bits have been received. The digital word is then reassembled and its value (proportional to the analog signal) is placed in a working register of choice for decision making by the PLC program.

### Output Analog Signal

The numerical value representing a desired analog output signal is placed into a PLC working register of choice. This value is transmitted serially (one bit at a time) at 24VDC signal levels to the MSP through the PLC's discrete I/O port. The MSP scales, linearizes and proportionally converts the digital signal to the voltage or current output signal. The signal is then sent to the isolated output channel for use by a analog actuator connected at the output channel.

Part Number	Parameter	Signal Direction
MSP-TC-IN	Thermocouple	To PLC
MSP-RTD-IN	RTD	To PLC
MSP-V-IN	Voltage	To PLC
MSP-V-OUT	Voltage	From PLC
MSP-C-IN	Current	To PLC
MSP-C-OUT	Current	From PLC
MSP-POT-IN	Potentiometer	To PLC

### SPECIFICATIONS

- Isolation:** 1500 VAC continuous (3-way, 2-way for excitation).
- Inputs:** See Range Chart.
- Input Impedance:** 1G ohm (mV/TC), 55K ohm (V), 82 ohm (C).
- Output Impedance:** >10M ohm (C), -0 ohm (V).
- Power Requirements:** 15-32 VDC @ 25 mA - 45 mA.
- Accuracy:** 0.05% F.S.
- CJC Accuracy:** 0.2°C over 15 to 55°C (ambient); 1.0°C over -40 to 14°C; .3°C over 56 to 75°C.
- Drift:** 0.01% F.S. per °C (offset + gain).
- Dimensions:** 88 mm (H) x 68 mm (D) x 12 mm.
- Ambient Operating Temperature:** -40 to 167°F (-40 to 75°C).
- Storage Temperature:** -49 to 185°F (-45 to 85°C).
- Humidity Conditions:** 95% non-condensing.
- Mounting:** DIN rail (32 mm-G and 35 mm-H).
- Connections:** Screw terminals for 14-22 AWG.
- Weight:** 1.4 oz (40 g).
- Agency Approvals:** UL, cUL, CSA, CE.

### APPLICATION

- Signal conditioners used in panels for isolation and converting signals for boilers and controls systems

### Accessories

- SCC-4W** Power Supply 85 - 265 VAC @ 50/60 Hz
- SCC-CC-A1** Windows® Software and Cable

### INPUT/OUTPUT RANGES

INPUT TYPE	RANGE °F	RANGE °C
Type J Thermocouple	-328 to 32° & 32 to 1400°	-200 to 0° & 0 to 760°
Type K Thermocouple	-328 to 32° & 32 to 2498°	-200 to 0° & 0 to 1370°
Type T Thermocouple	-328 to 32° & -256 to 752°	-200 to 0 & -160 to 400°
Type E Thermocouple	-328 to 32° & -148 to 1832	-200 to 0 & -160 to 400°
Type R Thermocouple	32 to 3214°	0 to 1768
Type S Thermocouple	32 to 3214°	0 to 1768
Type B Thermocouple	32 to 3322°	0 to 1832
Type N Thermocouple	-328 to 32° & 32 to 2373°	-200 to 0° & 0 to 1300°
100 Ohm Plt. 0.00385 DIN RTD	-328 to 1562°	-200 to +850°
120 Ohm Nickel 0.00628 US RTD	-112 to +392°	-80 to +200
1000 Ohm Plt. 0.00385 DIN RTD	-328 to +1562	-200 to +850
Potentiometer	0 to 500Ω min.; 0 to 100K max.	
Current/Voltage	0-20 mADC/ 0 to 10 VDC	

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# Power Supplies

## for MSC and MSP Series Isolating Transmitters

These fine SensorPulse Power Supplies are available in sizes to fit your application.

To order, select one of the following, specifying the part number.

### SPS-4W

4 Watts

24 Volts

150 mAmps

Same Terminal Block Shape and Dimensions as MSC/ MSP families



### SPS-12W

12 Watts

24 Volts

1.0 Amps



### SPS-24W

24 Watts

24 Volts

2.0 Amps



### SPS-55W

55 Watts

24 Volts

2.3 Amps



### SPS-120W

120 Watts

24 Volts

5.0 Amps



### SPECIFICATIONS

**Input Voltage:** 85 - 265 VAC 50/60 Hz.

**Input Current & Voltage:**

SPS-4W: 150 mA @ 115 VAC.

SPS-12W: 260 mA @ 115 VAC.

SPS-24W: 460 mA @ 115 VAC.

SPS-50W: 1.2 A @ 115 VAC.

SPS-120W: 2.4 A @ 115 VAC.

**Output Voltage and Current:**

SPS-4W: 24 VDC @ 0.150 A.

SPS-12W: 24 VDC @ 0.5 A.

SPS-24W: 24 VDC @ 1.0 A.

SPS-50 W: 24 VDC @ 2.1 A.

SPS-120W: 24 VDC @ 5.0 A.

**Switching Frequency:** 100 KHz PWM.

**Efficiency:** 80%.

**Ripple:** 0.1% RMS MAX.

**Regulation:** 0.6% (10-100% load).

**Protection:** Overcurrent Shutdown plus thermal shutdown.

**Load Capacitance:** <8000mF.

**Operation Temperature:** 32 to 122°F (0 to 50°C) full rated load.

**Storage Temperature:** -40 to 185°F (-40 to 85°C).

**Isolation:** 1 KV input to output, 500 V output to ground.

**Dimensions:**

SPS-4W: 88(H) x 12(W) x 68 mm(D) (3.5 x 0.48 x 2.7 in)

SPS-12W: 90(H) x 18(W) x 102 mm(D), (3.543 x 0.709 x 4.016 in)

SPS-24W: 75(H) x 45(W) x 106 mm(D), (2.952 x 1.772 x 4.173 in)

SPS-50W: 145(H) x 109(W) x 91 mm(D), (5.709 x 4.291 x 3.583 in)

SPS-120W: 200(H) x 225(W) x 125 mm(D), (8.189 x 8.859 x 4.921 in)

**Approvals:** UL, CSA, VDE, IEC950, EN55022 Class B, IEC 801-2,3,4,5 level 3, CE.

# Introduction to Data Acquisition/Recorders

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Series MTL10 Mini Temperature Data Logger	99
Series PD Pro-Data Programmable Data Logger	100

FEATURES	LCR	1200	DL8	DLA	DL6	DL7	DL001	MDL	MTL10	PD
<b>INPUTS</b>										
Type K T/C		●								
Internal			●	●	●	●		●	●	
Universal T/C	●									
Thermistor		●					●			●
100Ω RTD	●									
0-100 mV		●								
0-1 V		●								
0-5 V	●		●							●
0-300 V		●								
4-20 mA	●	●	●							
Pressure					●	●				●
<b>TYPE</b>										
Circular	●									
Strip Chart		●								
# of Pens										
1	●	●								
2		●								
<b>ROTATION</b>										
Clockwise	●									
Counter-clockwise	●									
<b>OUTPUT</b>										
None		●								
Relay	●			●						
Serial			●	●	●	●	●	●	●	●

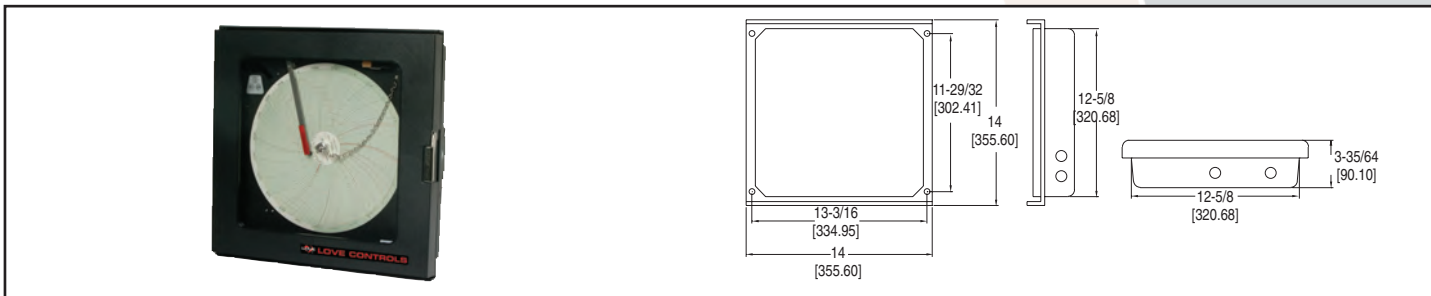
Data Acq.  
/Recorders



Series  
LCR10

# Circular Chart Recorder

Single Pen, Clockwise or Counter-clockwise Rotation



The Series LCR10 Circular Chart Recorder offers a wide range of features in an easy to use package. The large 10 in (254 mm) Circular chart allows easy reading of your data. Available in clockwise and counter clockwise rotation, the LCR10 is compatible with Honeywell and Partlow circular charts. The LCR10 can be easily programmed for any of six different thermocouple types, 100 ohm platinum DIN RTD's, or process inputs (0 to 5 VDC or 4 to 20 mA). Inputs may be scaled to a minimum of 100 units (or degrees) to a maximum of the sensor scale or -1999 to +9999.

## SPECIFICATIONS

**Ranges:** Thermocouple: Type J, K, T, R, S, B. RTD: 100 Ohm Platinum DIN Curve (0.00385 Ohms per ohm per degree C). Process: 0 to 5 VDC, 250 Ohms impedance, 4 to 20 mA across 250 Ohms.

**Chart Size:** 10" (254 mm).

**Accuracy:** ±0.5% of span (100 division span).

**Output Relay:** Form C (DPDT), 1A @ 240 VAC resistive.

**Chart Speed:** Programmable 4, 8, 12, 24, 48, 72, 168 hour rotation (168 hours=7 days).

## Ambient Operating

**Temperature/RH:** 32 to 140°F (0 to 60°C); 0-90% RH (non-condensing).

**Power Requirements:** 110/220 VAC ±10%; Battery Backup: 9 V alkaline.

**Power Consumption:** 15 VA maximum.

**Housing Material:** Fire retardant Polyphenylene Ether and Polystyrene PPE & PS w/ acrylic window.

**Mounting:** ±20 degrees of vertical, ±10 degrees of horizontal.

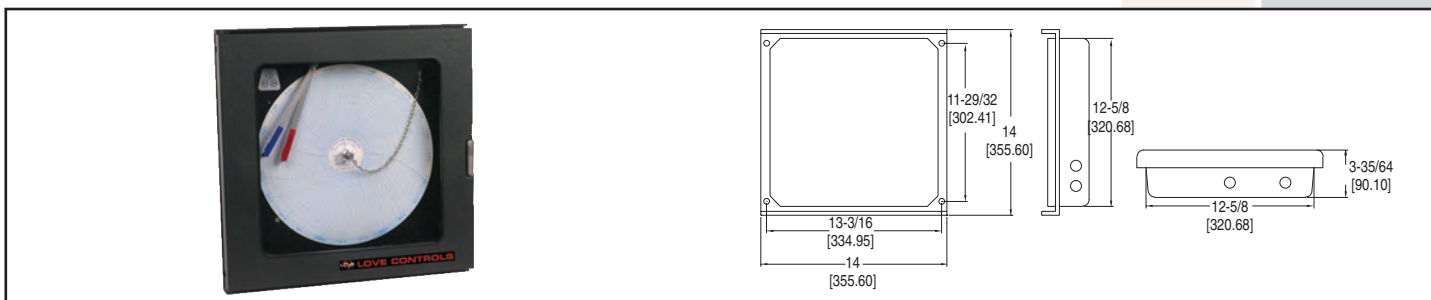
**Weight:** 7 lb (3.2 kg).

Model Number	Rotation	Output
LCR10-101	Counter Clockwise	No
LCR10-111	Counter Clockwise	Yes
LCR10-201	Clockwise	No
LCR10-211	Clockwise	Yes

Series  
LCR20

# Dual Pen Circular Chart Recorder

Dual Pen, Adjustable Rotation Speeds, Selectable Recording Times



The LCR20 Dual Pen Circular Chart Recorder offers a wide range of features in an easy to use package. The large 10 in (254 mm) circular chart allows easy reading of your data. Available in clockwise and counter-clockwise rotation, the LCR20 is compatible with Honeywell and Partlow circular charts. The LCR20 has one pen input that can be easily programmed for any of six different thermocouple types, 100 ohm platinum DIN RTD's, or process inputs (0 to 5 VDC or 4 to 20 mA). Inputs may be scaled to a minimum of 100 units (or degrees) to a maximum of the sensor scale or -1999 to +9999.

## SPECIFICATIONS

**Ranges Input 1:** Thermocouple: Type J, K, T, R, S, B. RTD: 100 Ohm Platinum DIN Curve (0.00385 ohms per ohm per degree C). Process: 0 to 5 VDC, 250 Ohms impedance, 4 to 20 mA across 250 Ohms.

**Ranges Input 2:** Thermocouple: Type J, K, T, R, S, B. RTD: 100 Ohm Platinum DIN Curve (0.00385 ohms per ohm per degree C). Process: 0 to 5 VDC, 250 Ohms impedance, 4 to 20 mA across 250 Ohms.

**Chart Size:** 10" (254 mm).

**Accuracy:** ±0.5% of span (100 division span).

**Output Relay:** Form C (DPDT), 1A @ 240 VAC resistive.

**Chart Speed:** Programmable 4, 8, 12, 24, 48, 72, 168 hour rotation (168 hours=7 days).

**Ambient Operating Temperature/RH:** 32 to 140°F (0 to 60°C); 0-90% RH (non-condensing).

**Power Requirements:** 110/220 VAC ±10%; Battery Backup: 9 V alkaline.

**Power Consumption:** 15 VA maximum.

**Housing Material:** Fire retardant Polyphenylene Ether and Polystyrene PPE & PS w/ acrylic window.

**Mounting:** ±20 degrees of vertical, ±10 degrees of horizontal.

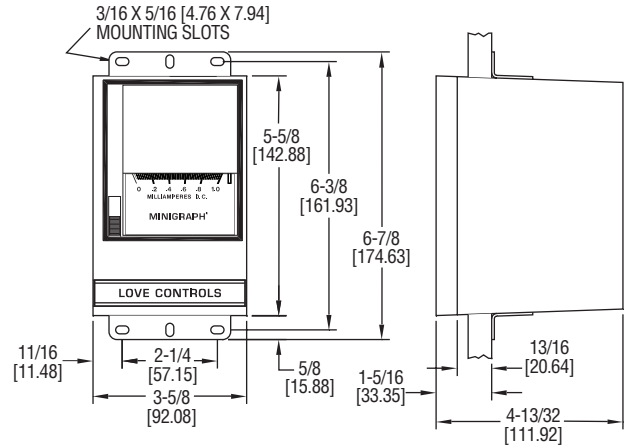
**Weight:** 7 lb (3.2 kg).

Model Number	Rotation	Output
LCR20-101	Counter Clockwise	No
LCR20-111	Counter Clockwise	Yes
LCR20-201	Clockwise	No
LCR20-211	Clockwise	Yes

Series  
1200

# Minigraph Recorders

## Temperature and Process Inputs



**Minigraph Recorders** combine compact size, durability, accuracy and low cost for an exceptional value. Units are widely used in applications ranging from commercial, industrial, and process to laboratory, field, marine, aerospace and more.

Series 1200 Minigraph Recorders use a unique stylus which records on special pressure sensitive paper. No messy ink pens, reservoirs or ink cartridges are used, eliminating maintenance problems and data loss caused by dry pens.

Stock temperature recorders come complete with 6" long x 3/16" dia. K type thermocouple protected by a 304 SS sheath with 8 ft. fiberglass insulated cable. They will record a full 31 days of information on a single 62 ft. x 2-9/16" wide paper roll. Stock units operate from a 120 VAC power source; special units are available for 240 VAC or 12 VDC.

### SPECIFICATIONS

**Pen Response Speed:** 1 second full scale. Stylus strikes chart once in two seconds. Dot density depends on chart speed.

**Temperature Limits:** 32 to 122°F (0 to 50°C).

**Accuracy:** ±2% of span for DC and temperature inputs; ±3% of span for AC inputs.

**Power Supply:** Standard: 120 VAC, 60 Hz, 3W nominal. Optional: 240 VAC, 60 Hz, 3W nominal or 12 VDC, 20 mA nominal.

**Chart Size:** 2-9/16 in. wide x 62 ft. long, 2-1/8 in. active width (65 mm wide x 19 m long, 54 mm active width).

**Housing Size:** 3-5/8 in. W x 5-5/8 in. H x 4-5/8 in. D. (92 mm W x 143 mm H x 111 mm D).

**Weight:** 3-1/2 lb (1.6 kg).

### CHARTS (Packed 6 per box)

Parts No.	Major/Minor Division
MG651-691630	8/40
MG651-691760	10/50
MG651-691770	15/75
MG651-691950	10/47
MG651-691650	12/60
MG651-220920	14/70

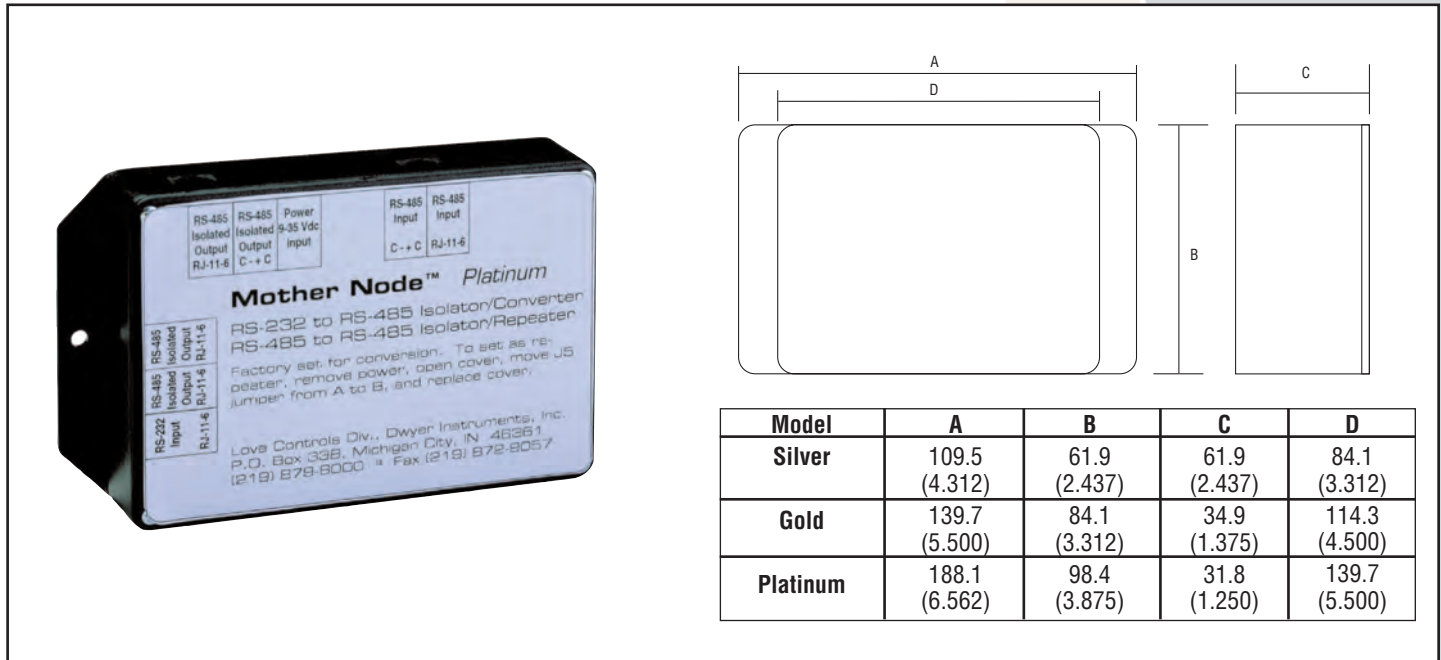
Model Number	Range	Input Type
1201-11-09-04	0-100 mV	DC Voltage
1201-12-09-04	0-1V	DC Voltage
1201-20-09-04	4-20 mA	DC Current
1201-21-09-04	4-20 mA	0-14 PH
1202-05-09-04	0-200°F	Type K T/C
1202-12-09-04	0-1000°F	Type K T/C
1203-01-09-04	-20 to 130°F	Thermistor
1204-05-09-04	0-300 V	AC Voltage

Data Acq.  
/Recorders

Series  
350

# Mother Node™ Communication Signal Converter

Converts RS-232 to RS-485, Isolates & Repeats



Model	A	B	C	D
<b>Silver</b>	109.5 (4.312)	61.9 (2.437)	61.9 (2.437)	84.1 (3.312)
<b>Gold</b>	139.7 (5.500)	84.1 (3.312)	34.9 (1.375)	114.3 (4.500)
<b>Platinum</b>	188.1 (6.562)	98.4 (3.875)	31.8 (1.250)	139.7 (5.500)

The Mother Node™ Communication Signal Converter line of RS-232 to RS-485 converters offers an easy way to use virtually any PC to communicate with half duplex RS-485 devices. Complicated handshaking issues are eliminated with these easy to use converters. The Mother Node™ converters come in three levels of sophistication to offer the exact combination of features you need. The Mother Node™ Silver Converter is a low cost device that converts signals at baud rates to 19.2 Kbaud. Installation is simple, just connect the two RS-485 wires, the quick connect RS-232 cable, and the power transformer. No additional connections or settings are required. The Mother Node™ Gold Converter adds optical isolation and an additional quick connect (RJ-11) RS-485 output. The Mother Node™ Platinum Converter adds the ability to operate as either a converter or a RS-485 repeater. In repeater mode the RS-485 standard of 32 devices and 1800m (6000 ft.) of cable run can be increased. In place of the 32nd device on the line, the Mother Node™ Platinum Converter reforms and repeats the wave forms to add an additional 32 devices and 1800m (6000 ft.) of cable. When used with Love Controls products with Option 992, you can address up to 1020 devices on a single port.

## FEATURES

- Converts RS-232 Signals to RS-485
- Connects Half-duplex Devices to Full Duplex Hosts
- Transmission Speeds to 19.2 Kbaud
- Available with 1500V Optical Isolation
- Operates on 12 VDC
- Available with 120 VAC Adaptor
- Available Repeater Allows Expansion of RS-485 Beyond Standard 32 Devices and 1800 m (6000 ft)

Model Number	Description	Repeater	Isolator	Power Transformer	Connector
<b>351-9</b>	Mother Node™ Silver RS-232 to RS-485 Converter			•	DB9F
<b>351-9N</b>	Mother Node™ Silver RS-232 to RS-485 Converter			•	DB9F
<b>352-9</b>	Mother Node™ Gold RS-232 to RS-485 Converter		•	•	DB9F
<b>352-9N</b>	Mother Node™ Gold RS-232 to RS-485 Converter		•	•	DB9F
<b>356-9</b>	Mother Node™ Platinum RS-232 to RS-485 Converter/Isolator	•	•	•	DB9F
<b>356-9N</b>	Mother Node™ Platinum RS-232 to RS-485 Converter/Isolator	•	•	•	DB9F



# Data Acquisition and Logging Software

Designed for Love Temperature Controller Interface



**LoveLink™III** Data Acquisition and Logging Software is the second generation of data acquisition software from Love Controls. This easy to use program allows connection of up to 40 controls on a single computer port. Data logging can be set up by individual control with varying logging periods. LoveLink™III Software is compatible with all Love Controls 2600, 8600, 16A, 16L, 16S, 32A, and 32DZ Series controls and the PP45 Series Indicators.

## FEATURES

- Address and Store Data for Up to 40 Controls
- Data Logging at Individually Adjustable Rates
- On-screen Graphing for Up to 10 Zones
- Upload and Download Control Configuration Profiles
- Save and Retrieve Profiles to/from Disk
- Easy to Use Operator Interface
- Supports Love 2600, 8600, 16A, 16L, 32A & 32DZ Series Controls, and PP45 Series Indicators
- Low Cost

## SPECIFICATIONS

**COMPUTER REQUIREMENTS:** Intel compatible 486 and above. Windows® 95/98 and Windows® NT™ Workstation 4.0 (Service Pack 3 recommended), Windows® 2000, and Windows® XP with 4MB hard disk space and a free RS-232/RS-485 port.

## REQUIRED EQUIPMENT

### COMPUTER REQUIREMENTS

The LOVELINK™III software application will run on Windows® 95/98 and Windows® NT™ Workstation 4.0 (Service Pack 3 recommended), Windows® 2000, and Windows® XP Software. The hardware requirements for each of these operating systems can be found in the documentation provided with that operating system. One available RS-232 or RS-485 port is needed to communicate with the temperature control(s). A minimum of 4 MB of hard disk space is needed for the LOVELINK™III software application files, and additional hard disk space is needed to store temperature log files. Log file size will vary depending on the Duration and Rate selected for the controls and the number of controls on line.

### CONTROL REQUIREMENTS

The temperature controls supported by LOVELINK™III software are the Love 2600, 8600, 16A, 16L, 32A, 32DZ, and PP45 Series (with Options 992 or 996, RS-485 Serial Communications; or Options 993 or 995, RS-232 Serial Communications). (Note: The 32A and 32DZ Series supports RS-485 communications only. The PP45 supports only Options 995 and 996.)

### OTHER REQUIREMENTS

To communicate with controls equipped with Options 992 or 996, RS-485 Serial Communications, from an RS-232 communications port, an RS-485 to RS-232 converter (Mother Node) is needed. The converter models recommended are the Love Models 351, 352, and 356 (See page 86). For RS-485 systems a 120-ohm resistor is also needed to terminate the last control on the control network. Shielded twisted pair cable is recommended for wiring the controls together.

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NT™ is a trademark of Microsoft Corporation.

# Data Acquisition and Logging Software

Designed for Love Temperature Controller Interface

Lovelink™III Software is easy to setup and use. A complete manual is available on disk and is installed with the program in handy PDF format.

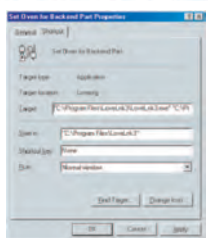
First, you select the communications port you will be using, followed by assignment of the addresses and names of the instruments on the communications line.



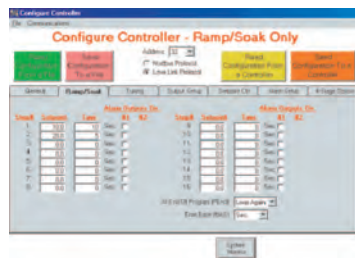
If you aren't sure what units are on line, there is a 'Find Units' screen that will scan the port and report which units are at which addresses using which protocol.



There are a number of screens which allow you to configure the controls remotely. You can download existing profiles, modify them, save them to disk, even retrieve stored profiles and automatically upload them to an instrument or group of instruments. This can be done on an individual basis or in a batch.



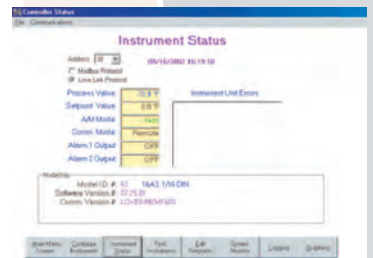
Even controls with ramp/soak function can be profiled and remotely operated.



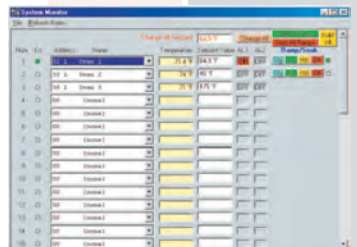
Among the features of LoveLink™III Software is the data logging capability. Each individual instrument can have its own log file with individual start and stop times and log frequency. Log files are simple CSV type, readable by any text reader and spreadsheet program. Log files may also be read directly through LoveLink™III Software.



Another handy feature is the status display. This gives a handy snapshot of a single instrument. Current process value and set value(s) are displayed. Set value(s) may be modified on this screen as well.



The powerful system monitor screen lets you see all 40 instruments on a single screen. Unit names, addresses, PVs, SVs, alarm status, and ramp/soak status are all displayed in an easy to read format. SVs and ramp/soak values or status may be changed individually or all at once.



There is also a real time graph plot screen where up to ten PVs may be displayed at the same time. This function is independent from the data logging feature.



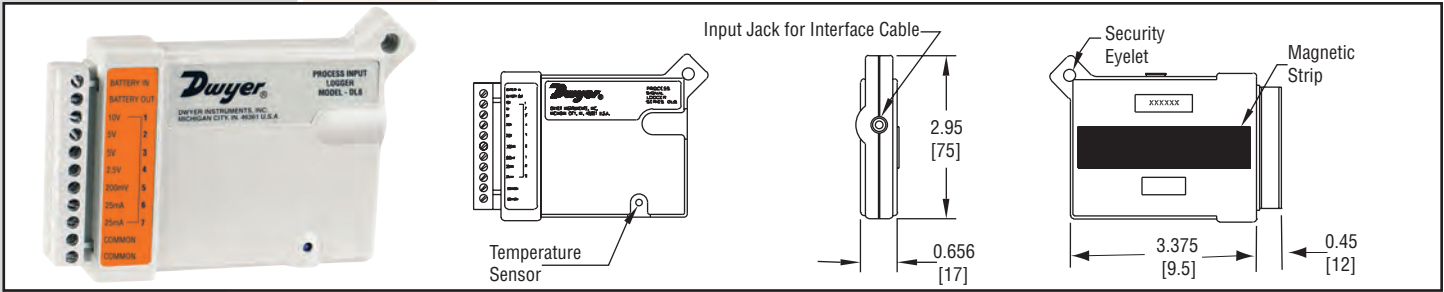
## HOW TO ORDER

LoveLink™III Software comes on a 5-1/4 inch CDR. Specify part number LovelinkIII. Save 100%! Download LoveLink™III Software for free from <http://www.love-controls.com>.

Series  
DL8

# Process Data Logger

8-Channels, Compact, Self-Powered, Stores up to 32,768 Readings



Eliminate traditional paper chart recorders with the Series DL8 Process Data Logger. This versatile, multi-channel data logger monitors and stores up to 32,768 process readings for later download to an IBM compatible computer. Seven external input channels easily interface with common transducer and transmitter outputs. Internal thermistor measures ambient temperature conditions. Programming is simple and easy with the DL200 Windows® software and connecting cable (sold separately). The Series DL8 Process Data logger is ideal for monitoring temperature, relative humidity, pressure, wind speed, current, voltage and power.

### SPECIFICATIONS

**No. of Channels:** Eight; One for internal thermistor and seven for external analog inputs.

**Internal Thermistor Range:** -40 to 158°F (-40 to 70°C).

**Memory Size:** 32,768 readings.

**Accuracy:** ±1% of full scale.

**Clock Accuracy:** ±8 seconds per day plus one sampling interval.

**Resolution:** 8 bits (1 in 256).

**Sampling Methods:** Continuous (first-in, first-out) or stop when full (fill-then-stop).

**Sampling Rates:** Selectable from 8 seconds to once every 5 days.

### Accessories

**No. DL200,** Windows® Software and cable

**Ambient Operating Temperature:** -50 to 160°F (-45 to 70°C), 0 to 95% RH, non-condensing.

**Connection:** Removable screw terminal.

**Computer Requirements:** IBM compatible 386 or above and Windows® 3.1 or later with 2 MB RAM and 2 MB hard drive disk space, one serial port.

**Power Requirements:** Built-in 3.6V Lithium battery.

**Power Consumption:** 5-10 µA.

**Housing Materials:** Polyphenylene Ether and Polystyrene PPE & PS.

**Weight:** 5 oz (110 g).

**Agency Approvals:** CE.

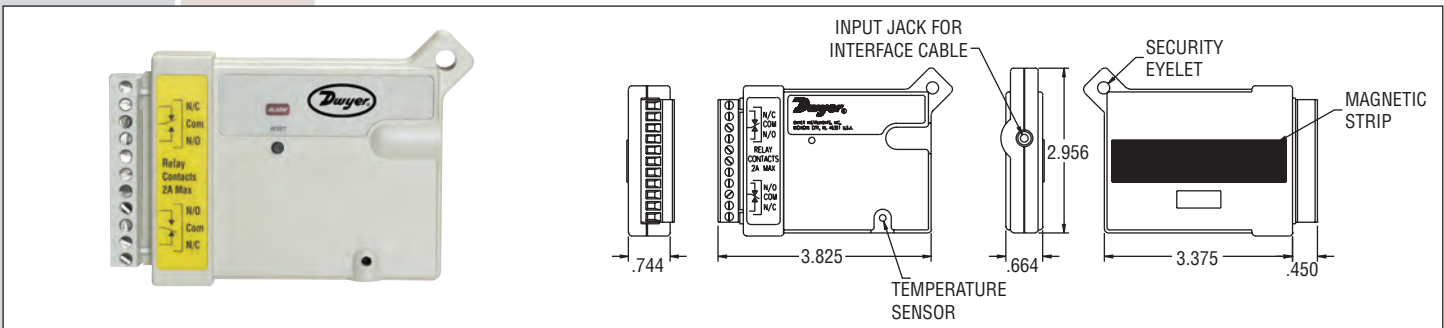
Model No.	Input Type
DL8	0 to 2.5 VDC, 0 to 5 VDC (2 ch.), 0 to 10 VDC, 0 to 200 mV DC, and 0 to 25 mA DC (2 ch).
DL81	All channels 0 to 25 mA.

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Series  
DL-A

# Logger Alarm Module

Visual and Audible Alarm, Manual Reset



Series DL-A Logger Alarm Module is designed to work with the Series DL Data Loggers, providing visual and audible indication that an alarm threshold has been triggered. The Alarm Module stays in alarm state until the reset button has been pressed. The module is also equipped with two sets of SPDT relay contacts for general purpose use. Series DL-A can be used with a single data logger or a network of data loggers.

### SPECIFICATIONS

**Output:** Two sets of SPDT relay contacts.

**Supply Requirements:** 110 VAC or 240 VAC depending on model (included).

**Case Material:** Polyphenylene Ether & Polystyrene PPE & PS plastic.

**Weight:** 3.75 oz (110 g).

**DL-AA** Logger Alarm Module, 110 VAC

**DL-AE** Logger Alarm Module, 240 VAC

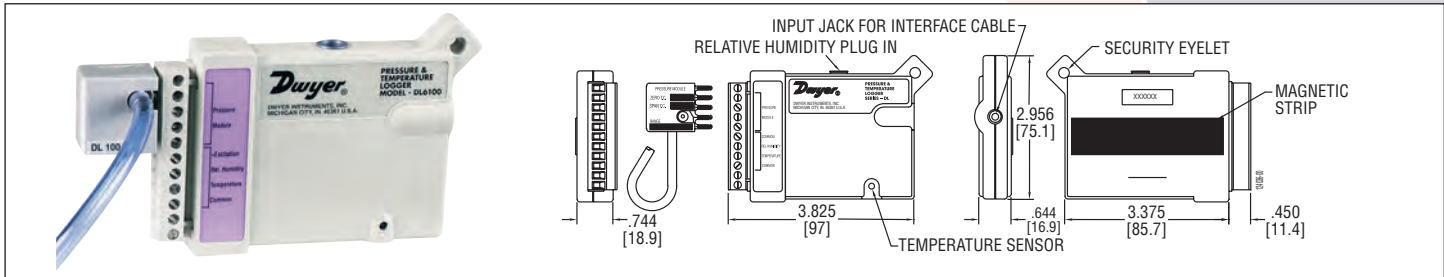
Data Acq.  
/Recorders



Series  
DL6

# Pressure/Temperature/RH Data Logger

Self-Powered, 5-Channel, Store up to 32,768 Readings, Compact



Monitor and troubleshoot HVAC systems, verify energy management systems, or track performance of pneumatically controlled valves with Series DL6 Pressure/Temperature/RH Data Logger. Units include an on-board thermistor for ambient temperature measurement and pressure module. Remote humidity/temperature sensor and plug-in humidity sensor are sold separately. Loggers can store up to 32,768 readings and operate independently from any external power supply with built-in lithium battery. Use Model DL200 Windows® software (sold separately) to quickly program the logger or upload data to a computer.

Model Number	Pressure Range
DL6005	0 to 5 psig (30 kPa)
DL6030	0 to 30 psig (200 kPa)
DL6100	0 to 100 psig (700 kPa)

### Accessories

- No. DL200, Windows® Software and Connecting Cable
- No. DL690, Remote Humidity/Temperature Sensor
- No. DL691, Plug-in Humidity Sensor

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### SPECIFICATIONS

**No. of Channels:** Five; internal thermistor, pressure module (included), plug-in humidity sensor, remote humidity/temperature sensor.

**Internal Thermistor Range:** -40 to 158°F (-40 to 70°C).

**Compensated Temperature Range:** 32 to 158°F (0 to 70°C).

**Memory Size:** 32,768 readings.

**Accuracy:** ±1% FS.

**Clock Accuracy:** ±8 sec/day plus one sampling interval.

**Thermal Accuracy:** ±1% FS.

**Drift:** ±0.2% FS/yr.

**Internal Thermistor Resolution:** 0.7°F (0.4°C), R25 value equal to 10,000Ω.

**Resolution:** 8 bits (1 in 256).

**Sampling Methods:** Continuous (First-in, First-out) or Stop when full (Fill-then-stop).

**Sampling Rates:** Selectable from 8 seconds to once every 5 days.

**Ambient Operating Temperature/RH:** -50 to 160°F (-45 to 70°C), 0 to 95% RH, non-condensing.

**Connection:** Removable screw terminal.

**Computer Requirements:** IBM compatible 386 or above and Windows® 3.1 or later with 2 MB RAM and 2 MB hard drive disk space, one serial port.

**Power Requirements:** Built-in 3.6V Lithium battery.

**Power Consumption:** 5-10 μA.

**Service:** Air and noncorrosive gases.

**Max. Pressure Rating:** 4x rated pressure.

**Housing Material:** Polypropylene Ether and Polystyrene.

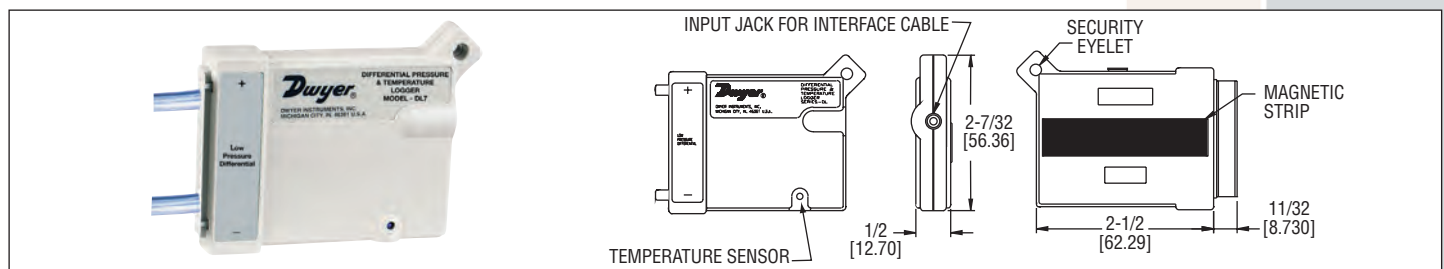
**Weight:** 5 oz (110 g).

**Agency Approvals:** CE.

Series  
DL7

# Differential Pressure Data Logger

Also Measures and Logs Temperature, Self-Powered, 2-Channel, Compact



Monitor and Record low differential pressures and temperature with the Model DL7 Differential Pressure Data Logger. Unit includes an on-board thermistor for ambient temperature measurement. Sampling rates are user selectable from 0.04 seconds to 8 hours with First-in first-out or Fill-then-stop sampling options. Loggers can store up to 21,500 readings and operate totally independently from any external power supply with built-in lithium battery. Use Model DL200 Windows® software (sold separately) to quickly program the logger or upload data to a computer. The Series DL7 logger is ideal for monitoring air duct velocity, testing and balancing HVAC systems, or verifying room pressure.

Model Number	Pressure Range
DL70	±0.5" w.c. (1.2 mbar)
DL71	±1" w.c. (2.5 mbar)
DL72	±2.5" w.c. (6.2 mbar)
DL75	±5" w.c. (12.4 mbar)
DL710	±10" w.c. (24.9 mbar)

### Accessories

- No. DL200, Windows® Software and Connecting Cable

Windows® is a registered trademark of Microsoft Corporation.

### SPECIFICATIONS

**No. of Channels:** Two; internal thermistor, and a differential pressure sensor.

**Internal Thermistor Range:** -40 to 158°F (-40 to 70°C).

**Compensated Temp Range:** 32 to 158°F (0 to 70°C).

**Memory Size:** 21,500 readings.

**Accuracy:** ±0.05 w.c.

**Thermal Accuracy:** ±0.5% FS.

**Clock Accuracy:** ±2 sec/day plus one sampling interval.

**Resolution:** ±0.01" w.c.

**Internal Thermistor Resolution:** 0.7°F (0.4°C), R25 value equal to 10,000Ω [10kΩ @ 25°C (77°F)].

**Resolution:** 12 bits (1 in 4096).

**Nonlinearity:** ±0.05% FS (BFSL).

**Hysteresis and Repeatability:** ±0.05% FS.

**Drift:** ±0.5% FS/yr.

**Sampling Methods:** Continuous (first-in, first-out; not available from 40 ms to 8 sec.), stop when full (fill-then-stop), or delayed start.

**Sampling Rates:** Selectable from 0.04 seconds to 8 hours.

**Ambient Operating Temperature/RH:** -40 to 158°F (-40 to 70°C), 0 to 95% RH, non-condensing.

**Connection:** Two 1/8" I.D. permanent protective tubing.

**Computer Requirements:** IBM compatible 386 or above and Windows® 3.1 or later with 2 MB RAM and 2 MB hard drive disk space, one serial port.

**Service:** Dry air and noncorrosive gases.

**Max. Pressure Rating:** 5X rated pressure.

**Power Requirements:** Built-in 3.6V Lithium battery.

**Power Consumption:** 5-10 μA.

**Housing Material:** Polypropylene Ether and Polystyrene PPE & PS.

**Weight:** 4 oz (110 g).

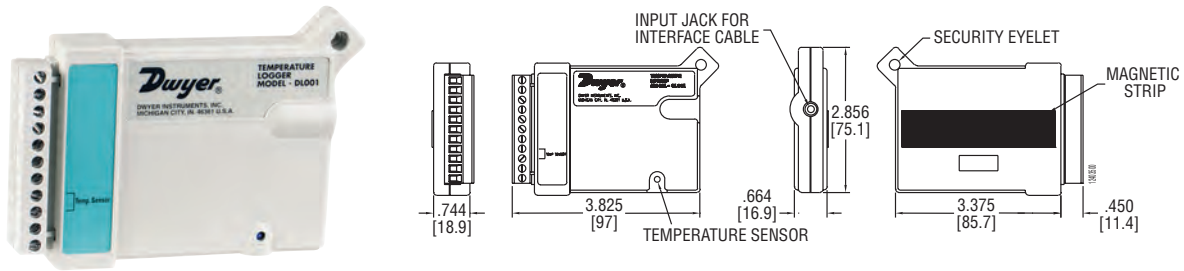
**Agency Approvals:** CE.

Data Acq.  
Recorders

Model  
DL001

# Temperature Data Logger

Self-Powered, 2-Channel, Store up to 32,768 Readings, Compact



**Record temperature** in a wide range of applications including HVAC testing and balancing, transportation, and energy management with the Model DL001 Temperature Data Logger. Temperature logger has an on-board thermistor and an external sensor channel for remote temperature measurements. Microprocessor controlled circuitry includes solid state memory that can store up to 32,768 readings. Model DL001 logger operates totally independently from any external power supply with built-in lithium battery. Units feature a magnetic backing and locking hole for easy and secure mounting. Quickly program the temperature logger or upload data to a computer using Model DL200 Windows® software (sold separately).

**DL001** Temperature Data Logger

## ACCESSORIES

**No. DL200**, Windows® Software and Connecting Cable

Windows® is a registered trademark of Microsoft Corporation.

## SPECIFICATIONS

**No. of Channels:** Two, one internal thermistor and one external temperature sensor.

**Internal Thermistor Range:** -40 to 158°F (-40 to 70°C).

**Memory Size:** 32,768 readings.

**Accuracy:** ±0.5°C (±0.9°F).

**Clock Accuracy:** ±8 seconds per day plus one sampling interval.

**Internal Thermistor Resolution:** 0.7°F (0.4°C), R25 value equal to 10,000Ω.

**Resolution:** 8 bits (1 in 256).

**Sampling Methods:** Continuous (First-in, First-out) or Stop when full (Fill-then-stop).

**Sampling Rates:** 8 seconds to once every 5 days, selectable.

**Ambient Operating Temperature/RH:** -50 to 160°F (-45 to 70°C), 0 to 95% RH, non-condensing.

**Connection:** Removable screw terminal.

**Computer Requirements:** IBM compatible 386 or above and Windows® 3.1 or later with 2 MB RAM and 2 MB hard drive disk space, one serial port.

**Power Requirements:** 3.6V Lithium battery.

**Power Consumption:** 5-10 µA.

**Housing Material:** Polyphenylene Ether and Polystyrene PPE & PS.

**External Sensor:** Interchangeable NTC (negative temperature coefficient) thermistor recommended (not included).

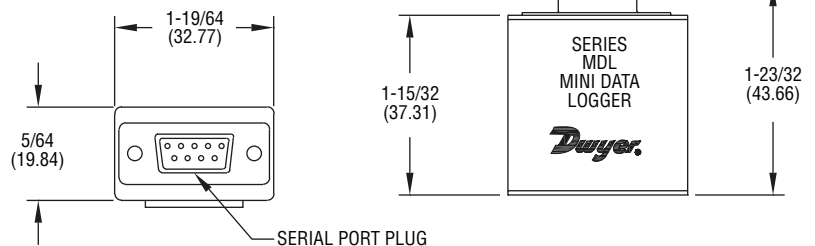
**Weight:** 5 oz (110 g).

**Agency Approvals:** CE.

Series  
MDL

# Mini Data Logger

Single Channel, Temperature



**Easy-to-use Series MDL Mini Data Logger** can record up to 244,800 temperature readings and then download the information to a computer. The Series MDL is designed with a precision calibrated internal temperature sensor. Simply place the logger in the desired location and leave it to record. Sampling rate and sampling method is user configurable. Units include software and interface cable.

**MDL-1** Mini Data Logger

**MDL-1-IS** Mini Data Logger, Intrinsically Safe

## SPECIFICATIONS

**Temperature Range:** -40 to 185°F (-40 to 85°C).

**Memory Size:** 244,800 data points.

**Accuracy:** ±0.3°F (±0.2°C) between 32 to 158°F (0 to 70°C).

**Clock Accuracy:** ±2 seconds per day.

**Resolution:** 8-bit.

**Sampling Method:** Continuous (first in, first out); stop when full.

**Sampling Rate:** User selectable rates from 8 seconds to 34 minutes.

**Computer Requirements:** IBM PC or 100% compatible running Windows® 3.1, '95, '98, 2000, Me, NT or XP with at least 2MB RAM, 2MB of hard drive disk space and one free serial port.

**Power Requirements:** Internal battery 5 yr. approximate life.

**Housing:** Polyurethane.

**Mounting:** Magnetic backing.

**Weight:** 1.23 oz (35g).

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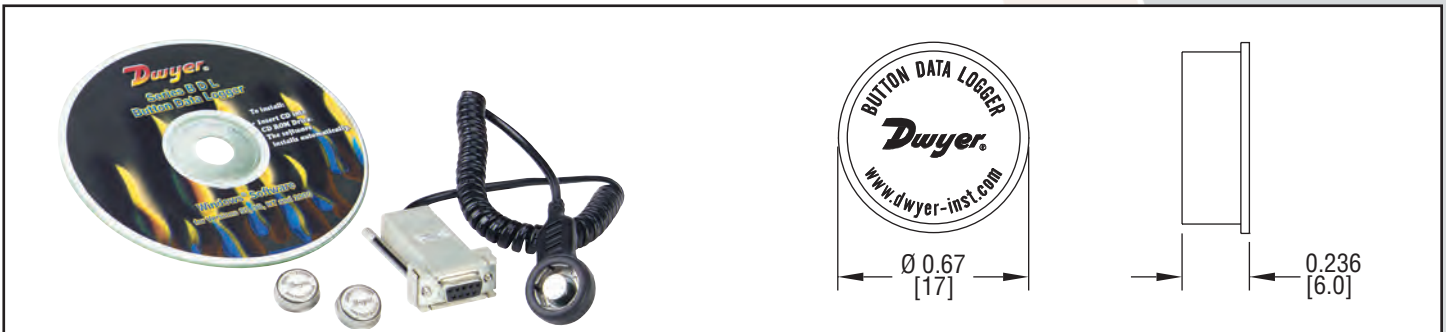
Data Acq.  
/Recorders



Series  
BDL

# Button Data Logger

Compact Size, RS-232 Interface, Capable of Storing 2048 Readings



The Series BDL Button Data Logger records temperatures in applications where size and cost effectiveness are key. The BDL is housed in a stainless steel case and is water resistant, making it durable in hostile environments where excessive moisture is present. The BDL is self-powered and is capable of storing up to 2048 readings in user selectable increments of 1 to 255 minutes. This series can accurately record temperatures in the 14 to 185°F (-10 to 85°C) temperature range. The Model BDL-K Logger kit includes two buttons, 2 plastic holders, interface cable, and Windows® software.

Model BDL-10 (Single button)  
Model BDL-K (Kit)

## APPLICATIONS

Food processing verification, pharmaceutical storage, laboratories, transportation of temperature sensitive goods, equipment run time, HVAC system testing and balancing.

Windows® is a registered trademark of Mercoird Corporation.

## SPECIFICATIONS

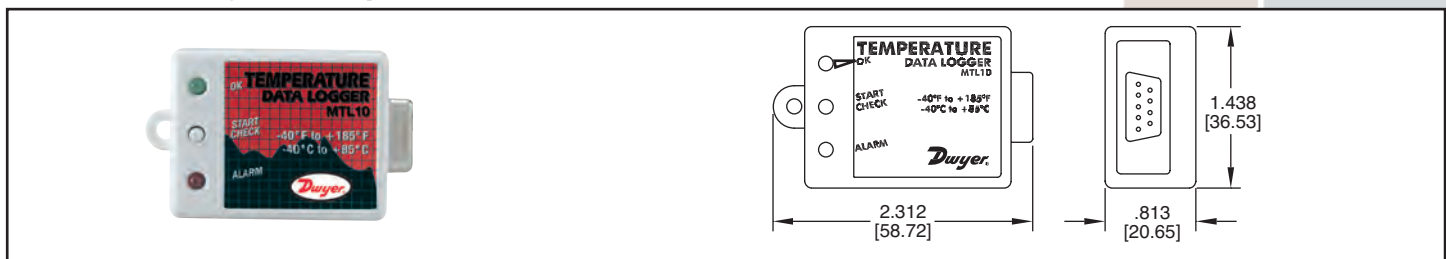
**Temperature Range:** 14 to 185°F (-10 to 85°C).  
**Memory Size:** Capable of storing 2048 readings.  
**Accuracy:** ±1.5°C.  
**Clock Accuracy:** ±2 seconds per month.  
**Resolution:** 8-bits- 0.9°F (0.5°C).  
**Sampling Methods:** Continuous (First-in, First-out); Stop when full.  
**Sampling Rates:** User selectable rates from 1 to 255 minutes.  
**Computer Requirements:** IBM or PC or 100% compatible Pentium 75 with at least one free serial port, 16 MB of RAM memory, color monitor and mouse.

**Software Requirements:** Button Data Logger For Windows® versions 95, 98, NT or 2000.  
**Power Requirements:** Internal battery; 10-year approximate life.  
**Housing:** Stainless Steel button.  
**Alarm Thresholds:** User selectable, event storage.  
**Start Delay:** Up to 255 minutes.  
**Communication:** RS-232 interface.  
**Mounting:** User selectable.  
**Weight:** .14 oz (4 g).

Model  
MTL10

# Mini Temperature Data Logger

High/Low Temperature Alarm with Visual Indication, Software Included



Measure and record the temperature of the surrounding environment with the Model MTL10 Mini Temperature Data Logger. Each unit is factory calibrated to an accuracy of ±0.9°F (±0.5°C) over the operating range of -40 to 185°F (-40 to 85°C). Model MTL10 can store up to 2048 temperature measurements and can be set for continuous measurement or stop recording when the memory becomes full. Sampling rate is selectable from one minute to once every four hours. Recordings can be programmed to begin immediately, delayed (up to 6 weeks), or initiated by a push button. The logger can also be used to monitor long-term high and low alarms. Up to 12 low and 12 high temperature alarm events can be recorded. The logger has visual indication of an alarm condition without the need to connect to the computer.

Model MTL10 Mini Temperature Data Logger

Windows® is a registered trademark of Microsoft Corporation.

## SPECIFICATIONS

**Temperature Range:** -40 to 185°F (-40 to 85°C).  
**Memory Size:** 2048 samples.  
**Alarm Memory:** Up to 12 temperature high and 12 temperature low.  
**Accuracy:** ±0.9°F (±0.5°C).  
**Resolution:** ±0.9°F (±0.5°C).  
**Sampling Mode:** Stop on memory full or continuous recording with memory rollover.  
**Sampling Rate:** Selectable from 1 min. to 4 hrs. in 1 min. increments.  
**Computer Requirements:** Intel compatible 486 or above and Windows® 95 or later with 8 MB RAM and 2 MB hard drive disk space, one free RS232 port.

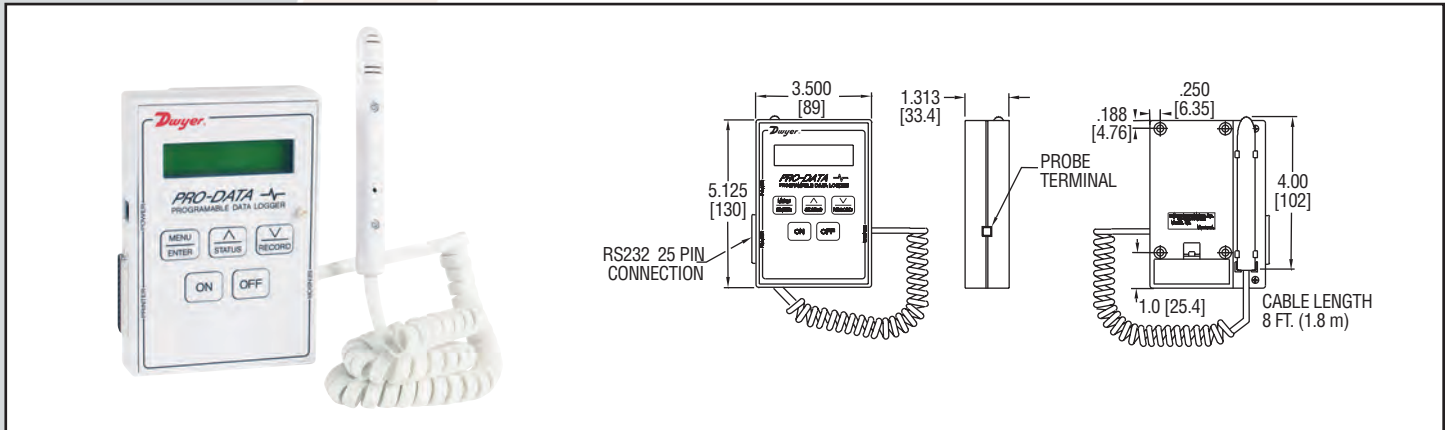
**Power Requirements:** 3.0V Lithium battery.  
**Battery Life:** 3 years (approx).  
**Housing Material:** ABS plastic.  
**Alarms:** Programmable high/low.  
**Recording Start:** Push button, computer controlled or up to 6 week delayed start.  
**Real Time Clock:** Displays seconds, minutes, hours, month, day of the week and year.  
**Real Time Status:** Updated every second.  
**Interface:** RS232 Serial Port.  
**Weight:** 3 oz (85 g).  
**Agency Approvals:** CE.

Data Acq.  
Recorders

Series  
PD

# Pro-Data Programmable Data Logger

Measure Temperature, Humidity, Dew Point, Pressure, or Voltage



**Read, measure, and record** temperature, humidity, dew point, pressure, and voltage with the multifunction Series PD Pro-Data Programmable Data Logger. The handheld measuring instrument has the capability to record 4000 day/time stamped samples and store data up to 40 days. The non-volatile memory will retain recorded information in the absence of power to be recalled later. Recorded data can be viewed on the alphanumeric LCD display, sent directly to a printer, or transferred to an IBM compatible computer for later analysis.

The dual channel logger uses plug-in sensors to measure the desired parameters. Sensors are available in three different configurations - temperature/humidity/dew point, temperature/pressure, or temperature/voltage. All sensors are field interchangeable for application flexibility and do not require recalibration when changed. Unit features programmable sampling rate, selectable °F or °C, backlit display, and rear panel keyholes for permanent mounting.

Model Number	Sensors Included
PD101	Temperature/Humidity/Dew Point
PD301	Temperature/Voltage

## ACCESSORIES

- No. PD7, Replacement Temperature/Humidity Sensor
- No. PD8, Replacement Pressure/Temperature Sensor
- No. PD9, Replacement Temperature/Event Sensor
- No. PD77, 10 ft. Extension Cable for Humidity/Temperature Sensor
- No. PD85, 25 ft. Extension for Pressure/Temperature/Event Sensor

## SPECIFICATIONS

**Temperature/Humidity/Dew Point Sensor:** 4" plastic temp sensor for air only; Temp. Range: -40 to 170°F (-40 to 75°C), accuracy: ±2°F (±1°C); Humidity Range: 0 to 100% @ 32 to 130°F (0 to 55°C), Accuracy: ±2%; Dew Point Range: 32 to 130°F (0 to 55°C).

**Temperature/Pressure Sensor:** 4" SS submersible temp sensor; Temp. Range: -40 to 170°F (-40 to 75°C), accuracy: ±2°F (±1°C); Press. Range: 0 to 500 psi (0 to 35 bar), accuracy: ±1% FS.

**Temperature/Voltage Sensor:** 4" SS submersible temp sensor; Temp. Range: -40 to 170°F (-40 to 75°C), accuracy: ±2°F (±1°C); Voltage Range: 24 to 270 VAC, 24 to 180 VDC.

**Memory Size:** 4,000 samples.

**Display:** Alphanumeric backlit LCD, 16 characters 32 lines.

**Sampling Method:** 5 hr, 15 hr, 30 hr, 60 hr, 2 weeks, or 40 days (field selectable).

**Sampling Rates:** Field selectable from 5 seconds to 15 minutes.

**Computer Requirements:** IBM compatible 286 or above and MS-DOS 3.0 or later. DB25 Male-Male.

**Power Requirements:** 115 VAC 50/60 Hz adapter (220 VAC available) or 9V alkaline battery for 24 hr backup power source (not included). External power may be supplied from any 12 VDC source.

**Printer Interface:** Parallel centronics compatible printer port.

**Cable Length:** All are 6 ft (1.8 m).

**Weight:** 10 oz (284 g).

**Agency Approvals:** CE.

# Introduction to Thermometers

Love Controls offers a wide variety of thermometers. For permanent mount applications, our line of bi-metal thermometers are available in an assortment of dial sizes and stem lengths to meet most application needs.

Product	Page
Series BT Bimetal Thermometers . . . . .	102
Series ST Surface Mount Thermometer . . . . .	103
Series HWT250 Hot Water Thermometer . . . . .	103
Series GT Spirit-Filled Glass Thermometers . . . . .	104
Model WT-10 Waterproof Thermometer . . . . .	104
Series IT Industrial Thermometer . . . . .	105
Series IT-W Industrial Thermometer Thermowells . . . . .	105

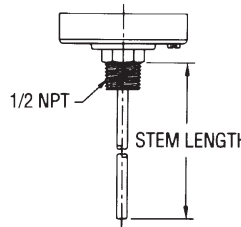
FEATURES	BT	ST	HWT250	GT	IT
<b>TYPE</b>					
Bimetal	●	●	●		
Liquid Fill				●	●
<b>MOUNTING</b>					
Back	●	●	●		
Bottom	●				
Adjustable	●				●
Vertical				●	



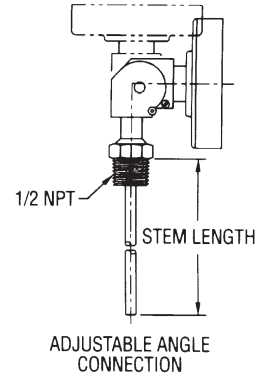
Series  
BT

# Bimetal Thermometers

2", 3" or 5" Dial, Dual Scale,  $\pm 1\%$  FS Accuracy, External Reset



BACK CONNECTION



ADJUSTABLE ANGLE CONNECTION

**Series BT Bimetal Thermometers** offer accurate, reliable service even in the toughest environments. These corrosion resistant units are constructed from stainless steel and are hermetically sealed to prevent crystal fogging. The bimetal element directly drives pointer, eliminating gears and linkage. An external reset screw allows field calibration and easy-to-read aluminum dial minimizes parallax error. Choose back connection, lower connection or adjustable angle for easy viewing and installation. Adjustable models can be rotated a full 360° and tilted over a 180° arc. **NOTE:** When using in pressurized applications, use a suitable thermowell.

## ACCESSORIES

Thermowells found on page 63.

## SPECIFICATIONS

**Wetted Materials:** 304 SS.

**Accuracy:**  $\pm 1\%$  full scale.

**Response Time:**  $\leq 40$  seconds.

**Temperature Limits:** Head: 200°F (93°C). Stem: Not to exceed 50% over-range or 1000°F (538°C) or 800°F (427°C) continuously.

**Process Connection:** 1/4" NPT on 2" dial size; 1/2" NPT on 3" or 5" dial size.

**Materials of Construction:** 304 SS stem, glass crystal, anodized aluminum dial, Series 300 SS head, bezel, and mounting bushing.

**Stem Diameter:** 1/4" O.D.

**Immersion Depth:** Minimum 2" in liquids, 4" in gas.

Model Number	Dial Size, Stem Length	Temperature Range, °F(°C)	Degree Div., °F(°C)	Model Number	Dial Size, Stem Length	Temperature Range, °F(°C)	Degree Div., °F(°C)
<b>Back Connection</b>				<b>Adjustable Angle Connection</b>			
BTB22551*	2", 2-1/2"	0/250	2	BTA54010D	5", 4"	0/200 (-20/100)	2 (2)
BTB2405D	2", 4"	0/250 (-20/120)	2 (2)	BTA5405D	5", 4"	0/250 (-20/120)	2 (2)
BTB2409D	2", 4"	200/1000 (100/550)	10 (5)	BTA5407D	5", 4"	50/550 (10/290)	5 (5)
BTB32510D	3", 2 1/2"	0/200 (-20/100)	2 (2)	BTA56010D	5", 6"	0/200 (-20/100)	2 (2)
BTB3255D	3", 2 1/2"	0/250 (-20/120)	2 (2)	BTA5605D	5", 6"	0/250 (-20/120)	2 (2)
BTB3257D	3", 2 1/2"	50/550 (10/290)	5 (5)	BTA5607D	5", 6"	50/550 (10/290)	5 (5)
BTB34010D	3", 4"	0/200 (-20/100)	2 (2)	<b>Lower Connection</b>			
BTB3405D	3", 4"	0/250 (-20/120)	2 (2)	BTC3255D	3", 2.5"	0/250(-20/120)	2 (2)
BTB3407D	3", 4"	50/550 (10/290)	5 (5)				
BTB3605D	3", 6"	0/250 (-20/120)	2 (2)				

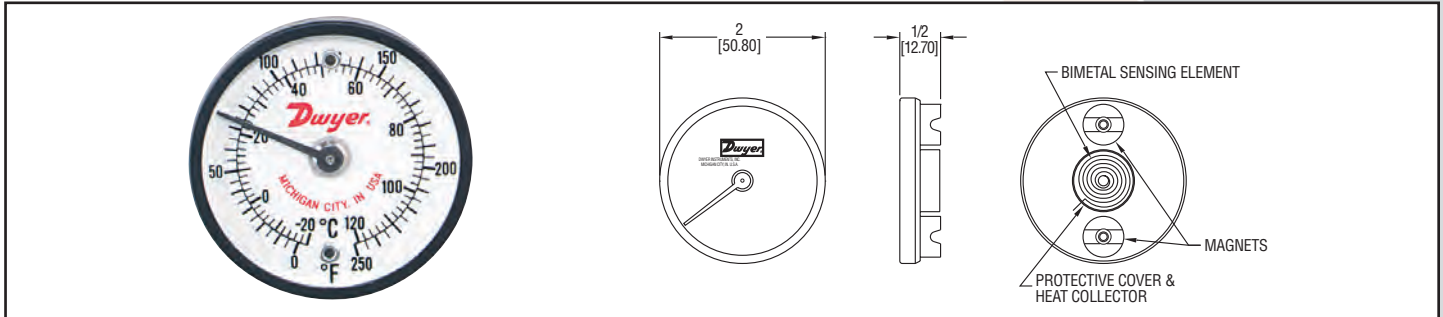
\*Model offered in Fahrenheit scale only.



Series  
ST

# Surface Mount Thermometer

2" Dual Scale Dial,  $\pm 2\%$  Full Scale Accuracy



Measure the temperature of boilers, air ducts, motors, bearings, furnaces or other surfaces with Series ST Surface Mount Thermometers. Dual magnet design allows easy mounting on any ferrous surface. Bi-metallic thermal sensing coil provides quick temperature measurement with  $\pm 2\%$  full scale accuracy.

## SPECIFICATIONS

**Accuracy:**  $\pm 2\%$  full scale.  
**Sensing Element:** Bimetal coil.  
**Response Time:** Approximately one minute.  
**Mounting:** Two Alnico magnets on back.

## Materials of Construction:

Aluminum with optically clear crystal.  
**Head Size:** 2" (5.08 cm).  
**Height:** 1/2" (1.27 cm).  
**Weight:** 2 oz (56.7 g).

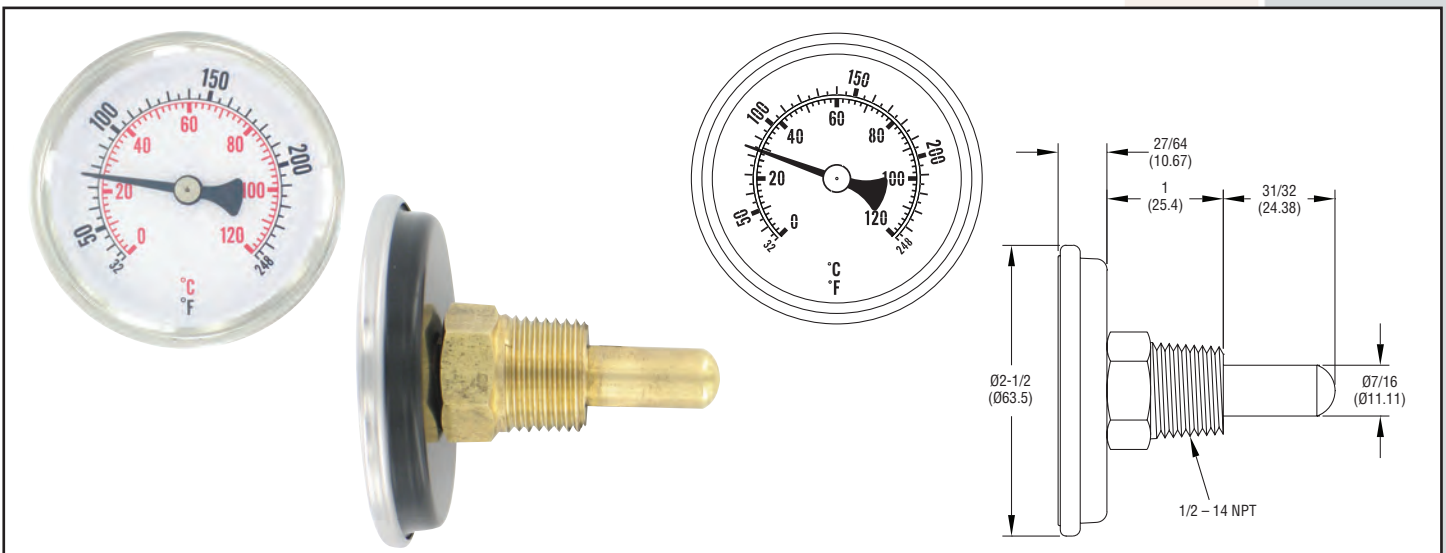
Model Number	Range
ST250	0 to 250°F (-20 to 120°C)
ST500	0 to 500°F (-20 to 260°C)
ST750	0 to 750 °F (-20 to 399°C)

## APPLICATIONS

Manifolds, platens, boilers, air ducts, furnaces, engines, motors, bearings, enclosures, cabinets, drums, plumbing, piping, refrigerators, and other ferrous surfaces.

## Model HWT250 Hot Water Thermometer

Bi-Metal Type with Brass Separable Well



The HWT250 Bi-Metal Thermometer is perfect for hot water applications. The dial has dual scales to read in °F and °C. There is an adjustment screw in the stem for easy calibration. Typical applications for the HWT250 would be heating coils, hydronic radiant in-floor systems, and outdoor wood furnaces.

## SPECIFICATIONS

**Accuracy:**  $\pm 5^\circ\text{F}$  ( $\pm 2^\circ\text{C}$ ).  
**Range:** 30 to 250°F (0 to 120°C).  
**Wetted Materials:** Case: zinc plated brass case; Bezel: plated brass; Stem and Well: brass.  
**Lens:** Glass.  
**Dial:** White finished aluminum face with black Fahrenheit markings and red Celsius markings.  
**Ambient Temperature:** -40 to 250°F (-40 to 120°C).

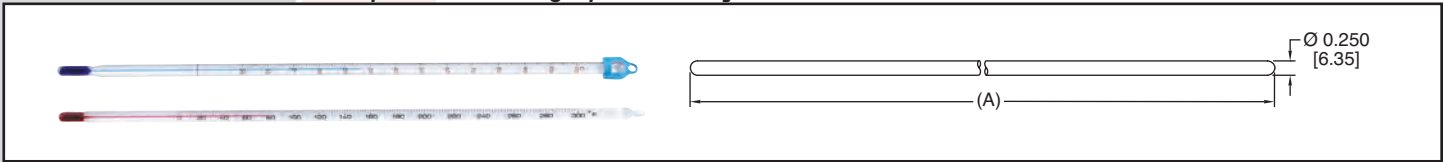
Model HWT250



Series  
GT

# Spirit-Filled Glass Thermometers

Partial Immersion, °F and °C Ranges, Individually Serialized



**Environmentally safe**, Series GT Spirit-Filled Glass Thermometers offer accurate and reliable temperature measurement without worry of mercury contamination or disposal. Organically filled with blue or red mineral spirits, these thermometers are designed for applications requiring only partial immersion. Individually serialized thermometers are calibrated over the entire scale and accurate to within NIST tolerances.

Model Number	Range	Divisions	Length (mm)	Immersion (mm)
GT120F	-30 to 120°F	1°F	12" (305)	3" (76)
GT230F	0 to 230°F	2°F	12" (305)	3" (76)
GT300F	0 to 300°F	2°F	12" (305)	3" (76)
GT500F	20 to 500°F	2°F	16" (305)	3" (76)
GT110C	-20 to 110°C	1°C	12" (305)	3" (76)
GT150C	-20 to 150°C	1°C	12" (305)	3" (76)
GT200C	-10 to 200°C	1°C	12" (305)	3" (76)
GT260C	-10 to 260°C	1°C	16" (305)	3" (76)
GT5050C	-50 to 50°C	1°C	12" (305)	3" (76)
GT10050C	-100 to 50°C	1°C	12" (305)	3" (76)

## SPECIFICATIONS

**Accuracy:** ±1 scale division below 221°F (105°C), ±1.5 scale divisions above 221°F (105°C) and ±2 scale divisions above 392°F (200°C).

**Fill Solution:** Blue fill contains Isoamyl Benzoate; Red fill may contain Kerosene, Toluene, or Pentane with aniline dye.

**Thermometer Length (A):** 12" (305 mm) all models except for GT500F and GT260C which are 16" (405 mm).

**Thermometer Diameter:** 0.250" (6.35 mm).

**Immersion Length:** 3" (76 mm).

**Weight:** 0.1 lb (0.05 kg).

## APPLICATIONS

Manufacturing processes of petrochemicals, chemicals, food and beverage products, waste water treatment, biotechnology, and pharmaceutical industries. Use in ovens, water baths, incubators, and refrigeration.

Model  
WT-10

# Waterproof Thermometer

Stainless Steel Stem, Selectable °F or °C, Max/Min Recall, Auto Off

CE



**Completely submersible**, the pocket size Model WT-10 Waterproof Thermometer is designed with a waterproof housing and a 2.75" (70 mm) stainless steel stem. The unit offers dual scale temperature measurements up to 392°F (200°C) on the 3-digit LCD display. The WT-10 comes complete with protective cover to store the unit while not in use. The features include MAX/MIN recall of high and low temperatures, hold, switchable °F or °C and auto shut off. Ideal applications include laboratory, food and beverage, HVAC and scientific markets.

## SPECIFICATIONS

**Temperature Range:** -40 to 392°F (-40 to 200°C).

**Accuracy:** ±2°F (±1°C) from -14 to 212°F (-26° to 100°C); all other temperature ranges ±3°F (±2°C).

**Display:** 3-digit LCD.

**Resolution:** 0.1°F/°C.

**Response Time:** 1 second.

**Power Requirements:** One 1.5V button style battery (included).

**Battery Life:** Approximately 1 year.

**Construction:** 2.75" (70 mm) stainless steel pointed stem and ABS waterproof housing.

**Weight:** 0.7 oz (20 g).

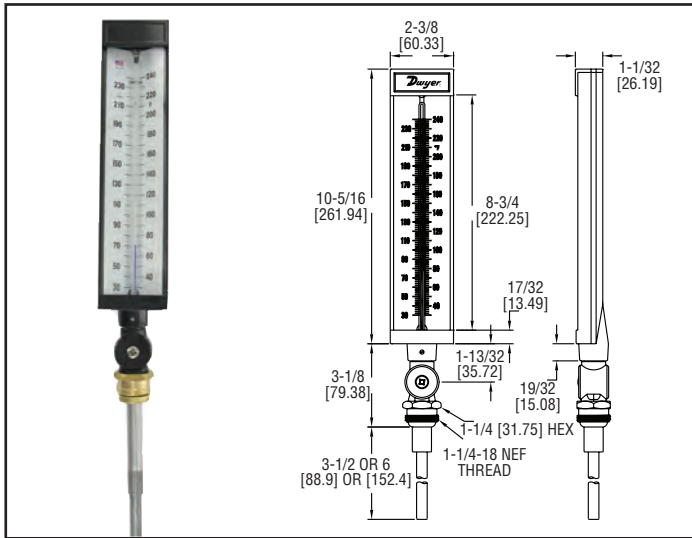
**Agency Approvals:** CE.

Model WT-10 Waterproof Thermometer

Thermometers

# Series IT Industrial Thermometer

## 9" Scale, Adjustable Angle Stem



The Series IT Industrial Thermometer allows users to easily take accurate temperature measurements in any environment. The case of the IT series is made of die cast aluminum for extra durability in industrial environments. The glass lens is easily cleaned and resists scratches for better viewing of the scale. The stem can be adjusted 180° in order to achieve the best viewing angle. The blue organic fill is non-toxic and allows users to better see the temperature reading. The scales can be ordered with dual units, °F, or °C.

### SPECIFICATIONS

- Accuracy:** 1% accuracy.
- Case:** 9" (228 mm) aluminum.
- Lens:** Glass.
- Scales:** Aluminum painted white with black markings.
- Bulb Chamber:** Tapered cast aluminum with graphite fill.
- Connection:** 1-1/4-18 NEF Thread.
- Liquid Filling:** Organic blue liquid filled tube.
- Adjustment:** Adjustable Stem: Vertical Plane 180° Horizontal Plane 360°.
- Shipping Weight:** 1 lb 7 oz.

### 3-1/2" Stem

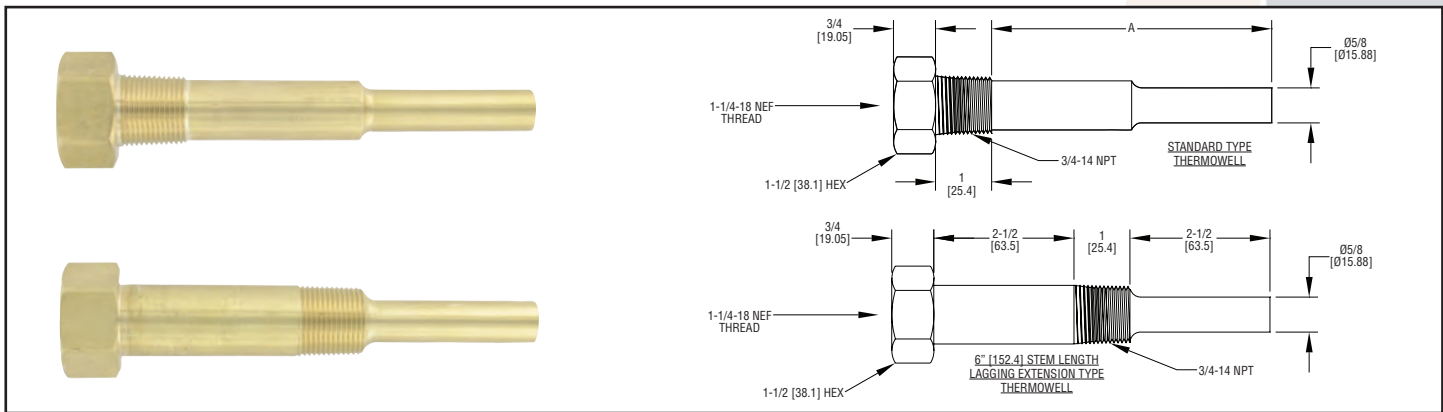
Model Number	Range
ITA9351D	-40 to 110°F (-40 to 40°C)
ITA9352D	0 to 120°F (-15 to 50°C)
ITA9353D	0 to 160°F (-15 to 70°C)
ITA9354D	30 to 180°F (0 to 80°C)
ITA9355D	30 to 240°F (0 to 115°C)
ITA9356D	30 to 300°F (0 to 150°C)
ITA9357D	50 to 400°F (10 to 205°C)
ITA9358D	100 to 550°F (40 to 300°C)

### 6" Stem

Model Number	Range
ITA9601D	-40 to 110°F (-40 to 40°C)
ITA9602D	0 to 120°F (-15 to 50°C)
ITA9603D	0 to 160°F (-15 to 70°C)
ITA9604D	30 to 180°F (0 to 80°C)
ITA9605D	30 to 240°F (0 to 115°C)
ITA9606D	30 to 300°F (0 to 150°C)

# Series IT-W Industrial Thermometer Thermowells

## Fits Thermometers with 3-1/2" and 6" Stem Lengths



The Series IT-W Thermowells reduce installation cost and time by eliminating the need to drain the system when servicing industrial thermometers. The thermowells protect industrial thermometers from high pressure, flow and corrosive media. Series IT-W Thermowells are available with 2-1/2" and 5" insertion lengths and with the option of a 2-1/2" lagging extension. These cost efficient brass, 304 stainless steel, and 316 stainless steel thermowells with 3/4" NPT threads are compatible with most applications.

Model	Materials	Insertion Length	Lag
IT-W01	Brass	2-1/2"	N/A
IT-W11	304 SS	2-1/2"	N/A
IT-W21	316 SS	2-1/2"	N/A
IT-W04	Brass	5"	N/A
IT-W14	304 SS	5"	N/A
IT-W24	316 SS	5"	N/A
IT-W07	Brass	2-1/2"	2-1/2"
IT-W17	304 SS	2-1/2"	2-1/2"
IT-W27	316 SS	2-1/2"	2-1/2"

Thermometers

# Introduction to Accessories

Love Controls offers a complete line of timers, current switches, solid state relays and current transformers to compliment our line of temperature and humidity controls. The current switches and transformers are available with both solid and split core designs for monitoring currents up to 200 Amps. The single three phase solid state relays are rated for up to 60 Amp loads.

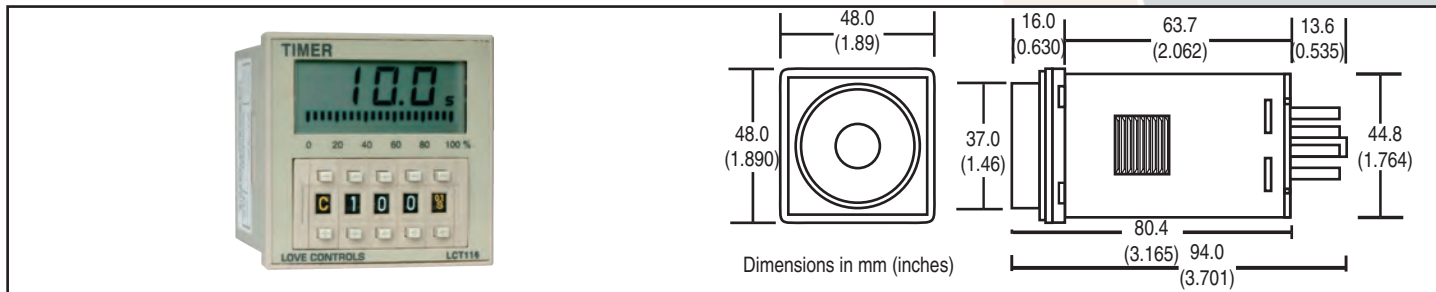
Product	Page
<b>Series LCT116</b> Digital Timers	107
<b>Series LCT016</b> Analog Timers	107
<b>Series CS</b> Current Switches	108
<b>Series CT40/50/60/70</b> Current Transformer	109
<b>Series 3868 Tell Tale Jr.</b> ™ Open Heater Detector	110
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<b>Series LTTJ</b> Current Transformer	111
<b>Series LTP</b> Single & Three Phase Solid State Relays	112-113



Series  
LCT116

# Digital Timers

Low Cost, 1/16 DIN Panel Mount, Ten Timing Functions



The **LCT116 Digital Timers** provide simple, yet economical solutions for a variety of timing applications. Installation is simple with compact 1/16 DIN package. Set point and timing functions are easily adjusted with the individual set buttons. A LCD display on the front indicates current time status and a bargraph for indicating relative time remaining. Ten different timing functions and ten different time scales give you the greatest flexibility.

#### MODELS

- LCT116-10** 8-pin timer
- LCT116-20** 11-pin timer
- 481-0159** (8-pin sockets)
- 481-0164** (11-pin sockets)

#### SPECIFICATIONS

- Operating Temperature Range:** 32 to 131°F (0 to 55°C).
- Humidity Conditions:** 35 to 85% RH, non-condensing.
- Control Output Ratings:** Relay, SPDT, 5A @ 250 VAC resistive.
- Weight:** 5.3 oz (150 g).
- Socket:** LCT116-1x: Standard 8-pin plug-in socket. LCT116-2x: Standard 11-pin plug-in socket.
- Accuracy:** Repeatability:  $\pm 0.3\%$  of maximum rated time. Line Stability:  $\pm 0.5\%$  of maximum rated time.
- Status Light:** LCD shows time and function details.

**Inputs:** Logic inputs for Start, Reset, and Inhibit.

Timing functions:

- a. Signal On - Delay; b. Flicker on Start; c. Signal ON/Off Delay; d. Signal OFF Delay; e. Interval Mode; f. One Shot and Flicker; g. Integration Time; h. Interval Delay; i. Flicker - One Shot; j. Power On Start.

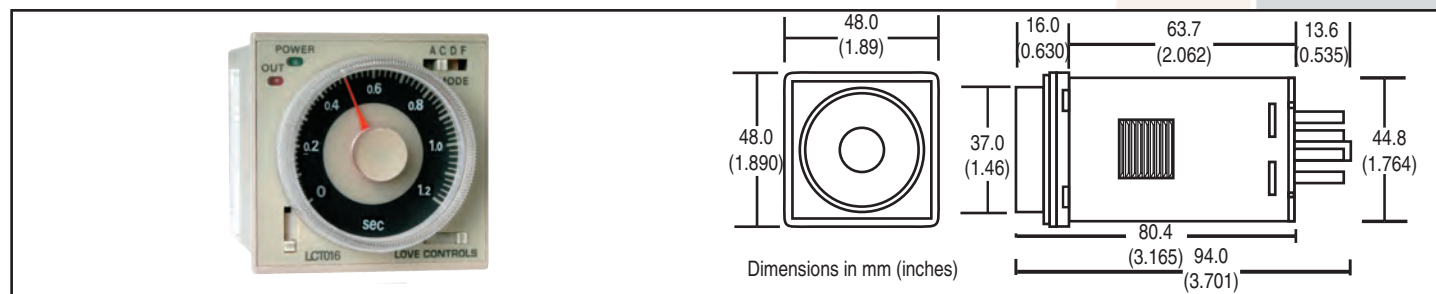
**Supply Voltage:** 100 to 240 VDC/VAC 50-60 Hz.

**Power Consumption:** 10 VA.

Series  
LCT016

# Analog Timers

Low Cost, 1/16 DIN Panel Mount, Four Timing Functions



The **LCT016 Analog Timers** provide simple, yet economical solutions for a variety of timing applications. Installation is simple with compact 1/16 DIN package. Scale and timing functions are easily adjusted with individual front mounted switches. The included tamper resistant cover discourages unauthorized changes of the scale, timing functions and restricts movement of the analog set point knob. Two LEDs on the front indicate power and output status. Four different timing functions and sixteen different time scales give you the greatest flexibility.

#### MODELS

- LCT016-10** 11-pin timer
- LCT016-30** 8-pin timer
- 481-0159** (8-pin sockets)
- 481-0164** (11-pin sockets)

#### SPECIFICATIONS

- Operating Temperature Range:** 32 to 131°F (0 to 55°C).
- Humidity Conditions:** 35 to 85% RH, non-condensing.
- Control Output Ratings:** Relay, SPDT, 5A @ 250 VAC resistive.
- Weight:** 3.17 oz (90 g).
- Socket:** LCT016-3x: Standard 8-pin plug-in socket. LCT016-1x: Standard 11-pin plug-in socket.
- Accuracy:** Repeatability:  $\pm 0.3\%$  of maximum rated time.  $\pm 0.3\% \pm 10\text{ms}$  for 1.2 sec range. Line Stability:  $\pm 0.5\%$  of maximum rated time,  $\pm 0.5\% 10\text{ms}$  for 1.2 second range.

**Reset Time:** 0.1 second, maximum.

**Status Lights:** Green LED indicates power on. Red LED indicates output status.

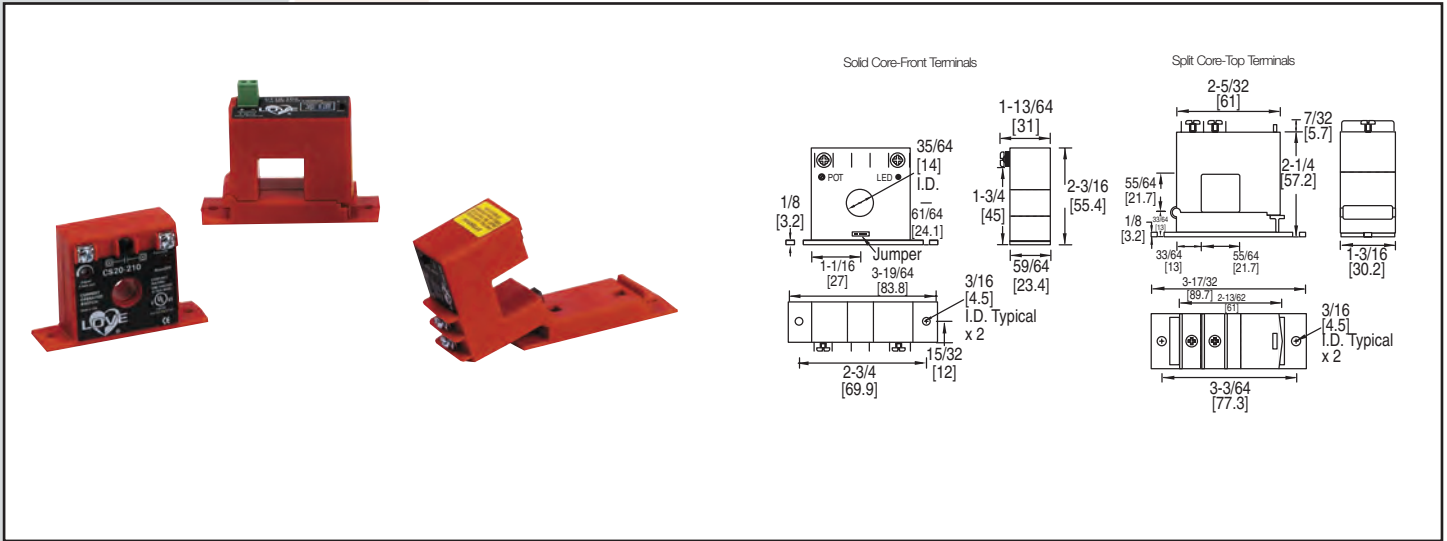
**Inputs:** Logic inputs for Start, Reset, and Inhibit. Timing functions: a. Signal On - Delay; b. Flicker OFF Start; d. Signal ON/Off Delay; e. Signal OFF delay.

**Supply Voltage:** 100 to 240 VDC/VAC 50-60 Hz.

**Power Consumption:** 10VA.

# Current Switches

Universal Output, Solid or Split Core Case



The CS Series Current Switches combine a current transformer, signal conditioner and limit alarm into a single package. The CS series has an extended current input range, universal solid-state outputs and a wide frequency response. Available in a split core or a solid core case. Switches feature LED indication for local display or switch status.

## SPECIFICATIONS

**Output:** Isolated, normally open.

**Power Requirements:** None, self powered.

**Temperature Limits:** -58 to 149°F (-50 to 65°C).

**Hysteresis:** 5% of output.

**Response Time:** CS20: 0.120 sec; CS40/50: 0.04 to .120 sec.

**Isolation Voltage:** 1270 VAC.

**Frequency:** 6-100 Hz.

**Enclosure Rating:** UL, V-O flammability rated, ABS plastic housing.

**Agency Approvals:** CE.

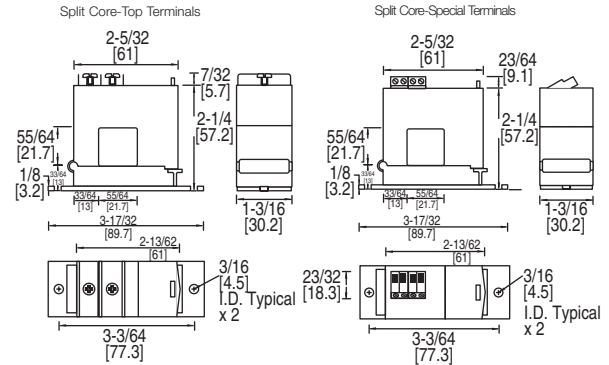
Model Number	Setpoint Range	Core	Voltage
CS20-100	Adj. 1.75-150 A	Split	240 VAC/DC
CS20-220	Adj. 1-150 A	Solid	240 VAC/DC
CS40-220	Selectable 1-6, 6-40, & 40-175 A	Solid	240 VAC
CS50-100	Selectable 1-6, 6-40, & 40-175 A	Split	240 VDC



Series  
CT40/50/60/70

# Current Transformer

4-20 mA or 0-5 VDC Output, Split Core Case



**Series CT40/50** combine current transformer and signal conditioner into a single package. Transformers feature jumper selectable ranges and split core case. Units are designed for applications on linear or sinusoidal AC loads.

**Series CT60/70 Current Transformers** provide true RMS output on distorted AC waveforms – ideal for nonlinear loads or noisy environments. Each model offers three jumper selectable ranges and 1270 VAC isolation. Split core case allows easy installation.

## SPECIFICATIONS

**Output Signal:** 0-5 VDC or 4-20 mA, true RMS depending on model.

**Power Requirements:** See Table.

**Accuracy:** CT40/50-102: 1.0% FS; CT40/50-100: 0.5% FS; CT60/70: 0.8% FS.

**Temperature Limits:** -4 to 122°F (-20 to 50°C).

**Response Time:** CT40/50-102: 100 ms; CT40/50-100: 300 ms; CT60/70: 600 ms to 90%.

**Isolation Voltage:** 1270 VAC.

**Frequency:** CT40/50-102: 50-60 Hz; CT40/50-100: 20-100 Hz; CT60/70: 10-400 Hz.

**Enclosure Rating:** UL 94V-0 flammability rated.

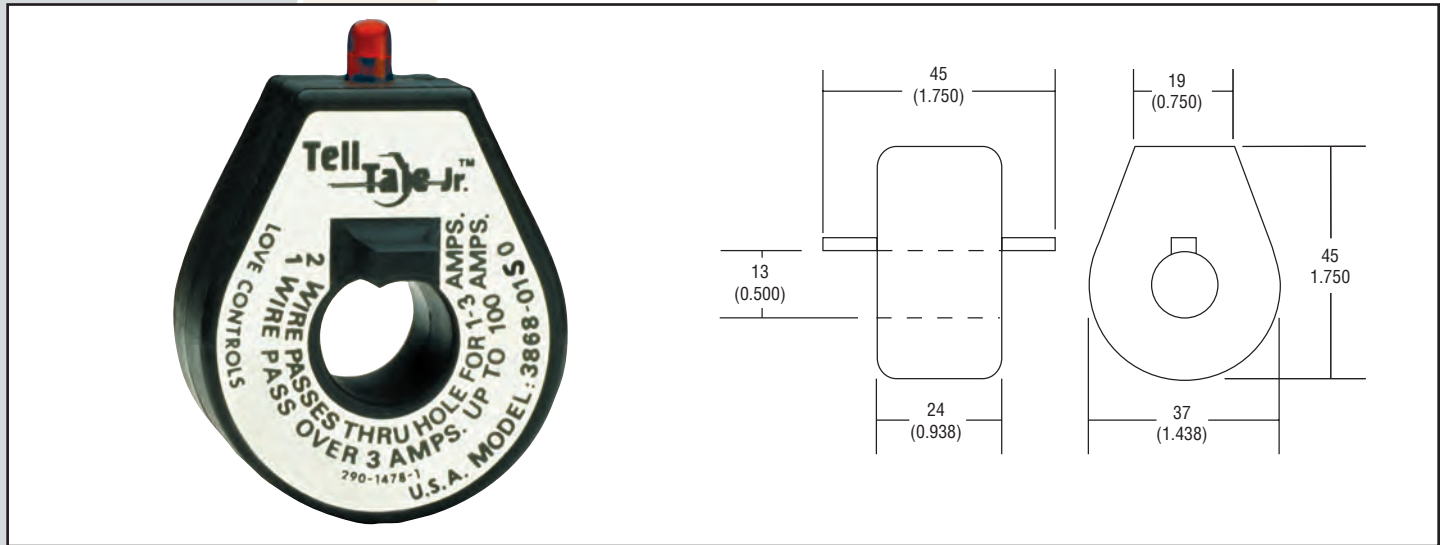
**Agency Approval:** CE.

Model Number	Range	Output	Power Requirements
CT40-100	10/20/50 A	4-20 mA	12-40 VDC, Loop Powered
CT40-102	10/20/50 A	0-5 VDC	Self Powered
CT50-100	100/150/200 A	4-20 mA	12-40 VDC, Loop Powered
CT50-102	100/150/200 A	0-5 VDC	Self Powered
CT60-100	10/20/50 A	4-20 mA	24VDC Loop Powered
CT70-100	100/150/200 A	4-20 mA	24VDC Loop Powered

Series  
3868

# Tell Tale Jr.™ Open Heater Detector

Indicates Open Loads



The Tell Tale Jr.™ Open Heater Detector is designed to indicate an open heater or other resistive load. Several models are available for various applications. The LED models light an LED when current is flowing in the circuit. If current stops flowing, the LED turns off. Solid state switch models provide either a logic output for DC applications or a triac output for AC applications. These models will satisfy those applications that need to send heater data to a PLC or computer having an appropriate power supply. They are provided with 4 foot leads. If the triac output model is used to drive an inductive load (relay coil, etc.) then the 3138-0412 snubber network is required. While the Tell Tale Jr.™ Detector is self-powered there is no power loss in the monitored load circuit when installed.

The Tell Tale Jr.™ Detector installs easily in new or existing systems. It consists of a specially designed doughnut shaped current transformer that is installed by passing one of the heater hookup wires through its center one or more times. Nylon tie wraps are included to anchor the detector to the wire. The detector can be installed on loads with ratings of 1 to 100 amperes. LED models on a 4 foot extension cable include a mounting bezel to facilitate mounting the LED on the front of a panelboard. Cables may be extended up to 3,000 feet if necessary using 22 ga. copper wire.

Ambient temperature range for LED models is 0 to 70°C, logic output 0 to 60°C and triac output 0 to 40°C at 0.5A with de-rating to 0.35A at 60°C.

## SPECIFICATIONS

**Indication:** Red or green LED depending on model.

**Output:** Logic: 0.25A @60 VDC max.; Triac: 0.5A @120 VAC.

**Operating Temperature:** Indication Only: 32 to 158°F (0 to 20°C); Logic: 32 to 140°F (0 to 60°C); Triac: 32 to 104°F (0 to 40°C).

## FEATURES

- Low Cost Current Indication
- Easy Installation
- Indicator or Switch Action
- Draws No Power from Process
- Compact Size
- Isolated - No Direct Contact with Power Lines

Model No.	Description
3868-0150	Internal, Red LED, Indication Only
3868-0180	Internal, Green LED, Indication Only
3868-0160	External, Red LED, 4 ft (1.2 m) Cable, Indication Only
3868-0170	External, Green LED, 4 ft (1.2 m) Cable, Indication Only
3868-0140	Logic Output, No LED, 4 ft (1.2 m) Cable
3868-0130	Triac Output, No LED, 4 ft (1.2 m) Cable

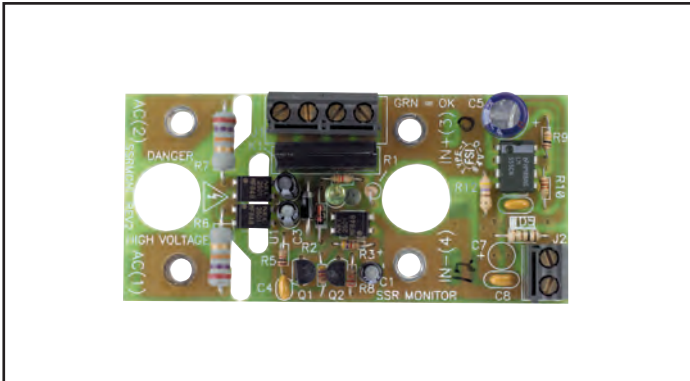
## ACCESSORY

Model 3138-0412, Network Snubber

Series  
LTT

# SSR Monitors

Monitors SSRs for Loss of Line, Open Load, Shorted SSR, Loss of DC Power



Love Controls LTT Series SSR Monitors allow easy monitoring of the operation of your SSR switches. This handy device compares the input status with the output status. An alarm operates a relay contact to tell you if the load circuit has opened or if the SSR has shorted. The LTT mounts easily on most SSRs with no additional hardware. Protect your system today.

## FEATURES

- Monitors SSRs for loss of line, open load, shorted SSR, loss of DC Power
- Mounts on standard SSRs over the Connection Terminals
- Designed to fit under finger safe cover
- LED Status Indicator
- Normally Closed dry relay contact 200 VDC @ 0.5A max.

Model Number	Description
LTT12-0	Solid State Relay Monitor, 10-19 VDC Trigger, 100-660 VAC Load
LTT24-0	Solid State Relay Monitor, 20-32 VDC Trigger, 100-660 VAC Load
LTT12-1	Solid State Relay Monitor, 10-19 VDC Trigger, 100-660 VAC Load w/Driver Circuit Test
LTT24-1	Solid State Relay Monitor, 20-32 VDC Trigger, 100-660 VAC Load w/Driver Circuit Test

Series  
LTTJ

# Current Transformers

0 to 10 VDC Analog Output, Fully Adjustable Output, Over Voltage Protection



Love Controls LTTJ Series Current Transformers allow easy monitoring of the current flowing to your load. This easy to use device provides a 0 to 10 VDC signal into both low and high impedance circuits, and is easily scalable to your needs. Available in a number of different ranges, the LTTJ Series can be easily mounted on most LTP Series Solid State Relays for convenient wiring. Some models feature an LED for visual confirmation that current is flowing through the device.

## FEATURES

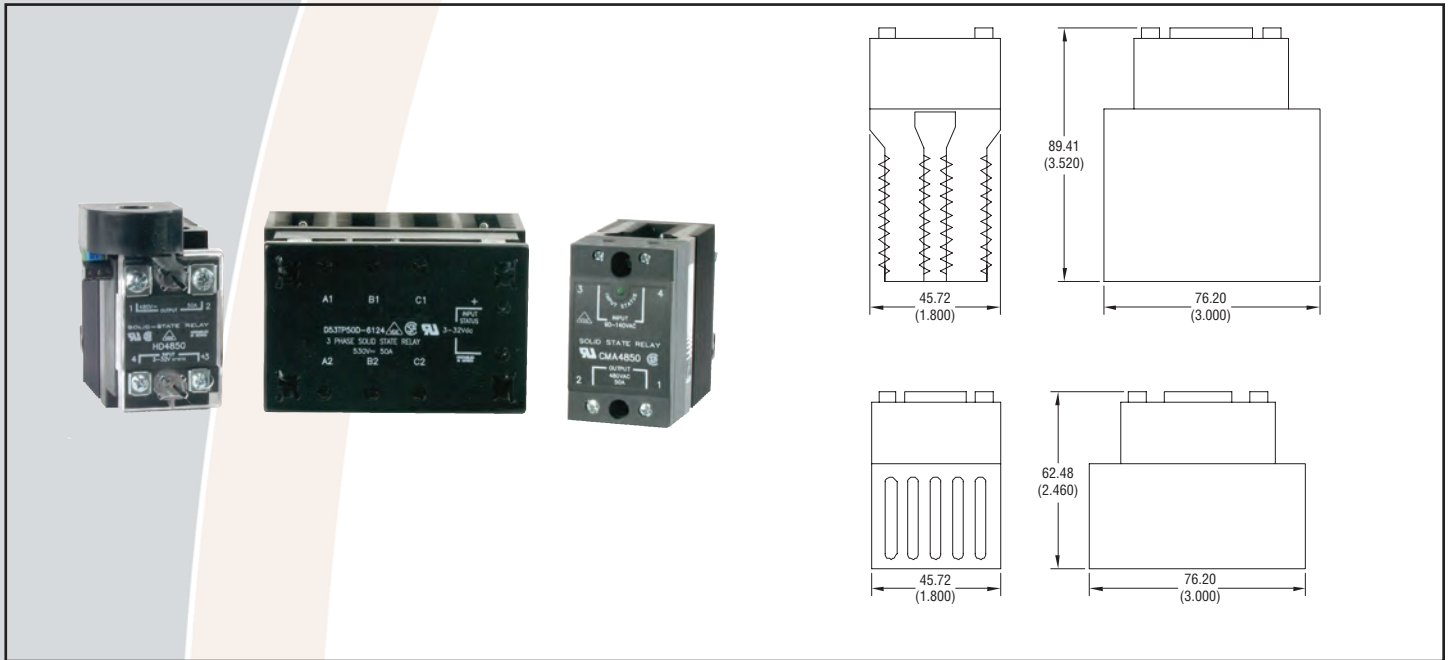
- 0 to 10 VDC Analog Output
- Impedance Matching for High or Low Impedance Inputs
- Fully Adjustable Output
- Over Voltage Protection

Model Number	Description
LTTJ-010	Current Transformer Calibrated to 10 VDC at 10 Amps
LTTJ-020	Current Transformer Calibrated to 10 VDC at 20 Amps
LTTJ-030	Current Transformer Calibrated to 10 VDC at 30 Amps
LTTJ-040	Current Transformer Calibrated to 10 VDC at 40 Amps
LTTJ-050	Current Transformer Calibrated to 10 VDC at 50 Amps
LTTJ-060	Current Transformer Calibrated to 10 VDC at 60 Amps
LTTJ-070	Current Transformer Calibrated to 10 VDC at 70 Amps
LTTJ-080	Current Transformer Calibrated to 10 VDC at 80 Amps
LTTJ-090	Current Transformer Calibrated to 10 VDC at 90 Amps
LTTJ-100	Current Transformer Calibrated to 10 VDC at 100 Amps
LTTJ-103	Current Transformer Adjustable from 10 to 30 Amps, 5-10 VDC Output
LTTJ-305	Current Transformer Adjustable from 30 to 50 Amps, 5-10 VDC Output
LTTJ-103I	Current Transformer Adjustable from 10 to 30 Amps, LED Output
LTTJ-305I	Current Transformer Adjustable from 30 to 50 Amps, LED Output
LTTJ-103S	Current Transformer Adjustable from 10 to 30 Amps, NPN Transistor Output
LTTJ-305S	Current Transformer Adjustable from 30 to 50 Amps, NPN Transistor Output

Series  
LTP

# Single & Three Phase Solid State Relays

Zero-Crossover or Phase Angle Fired



Love Controls **LTP Series Solid State Relays** allow easy control of most resistive and some inductive loads. Available in zero-crossover or phase angle fired versions, these compact solid state relays fit in many applications.

High Efficiency heat sinks allow for compact size. Combined with a convenient DIN Rail mount, these SSRs will fit where others won't. The LTT SSR Monitors and LTTJ Current Transformers mount conveniently on any of the single phase LTP Series SSRs.

## FEATURES

- Zero-Crossover or Phase Angle Fired
- Line (AC) or Low Voltage (DC) Triggers
- Single and Three Phase
- 240 VAC or 660 VAC Ratings
- Loads to 60 Amps
- High Efficiency Heat Sinks
- Easy DIN Rail Mounting

### LTPZ125

#### Series 25 Amp Zero-Crossover Fired Single Phase SSR's

<b>LTPZ125-240-D</b>	240 VAC, 25 AMP Max. Load, 3-32 VDC Trigger
<b>LTPZ125-240-A</b>	240 VAC, 25 AMP Max. Load, 90-265 VAC Trigger
<b>LTPZ125-660-D</b>	660 VAC, 25 AMP Max. Load, 3-32 VDC Trigger
<b>LTPZ125-660-A</b>	660 VAC, 25 AMP Max. Load, 90-265 VAC Trigger

### LTPZ140

#### Series 40 Amp Zero-Crossover Fired Single Phase SSR's

<b>LTPZ140-240-D</b>	240 VAC, 40 AMP Max. Load, 3-32 VDC Trigger
<b>LTPZ140-240-A</b>	240 VAC, 40 AMP Max. Load, 90-265 VAC Trigger
<b>LTPZ140-660-D</b>	660 VAC, 40 AMP Max. Load, 3-32 VDC Trigger
<b>LTPZ140-660-A</b>	660 VAC, 40 AMP Max. Load, 90-265 VAC Trigger

Series  
LTP

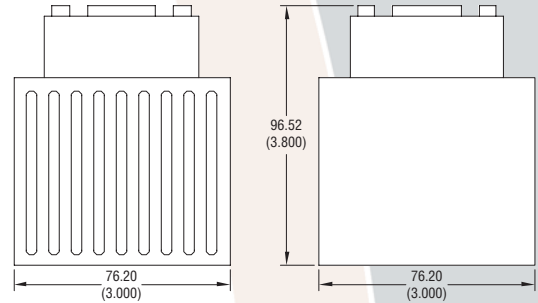
# Single & Three Phase Solid State Relays

Zero-Crossover or Phase Angle Fired

## Series LTPZ150

### 50 Amp Zero-Crossover Fired Single Phase SSR's

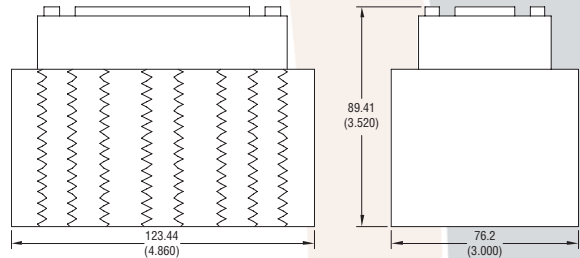
LTPZ150-240-D	240 VAC, 50 AMP Max. Load, 3-32 VDC Trigger
LTPZ150-240-A	240 VAC, 50 AMP Max. Load, 90-265 VAC Trigger
LTPZ150-660-D	660 VAC, 50 AMP Max. Load, 3-32 VDC Trigger
LTPZ150-660-A	660 VAC, 50 AMP Max. Load, 90-265 VAC Trigger



## Series LTPZ160

### 60 Amp Zero-Crossover Fired Single Phase SSR's

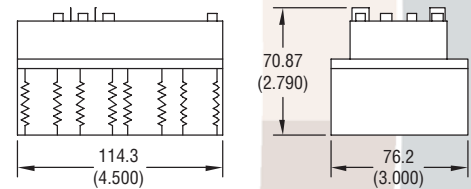
LTPZ160-240-D	240 VAC, 60 AMP Max. Load, 3-32 VDC Trigger
LTPZ160-240-A	240 VAC, 60 AMP Max. Load, 90-265 VAC Trigger
LTPZ160-660-D	660 VAC, 60 AMP Max. Load, 3-32 VDC Trigger
LTPZ160-660-A	660 VAC, 60 AMP Max. Load, 90-265 VAC Trigger



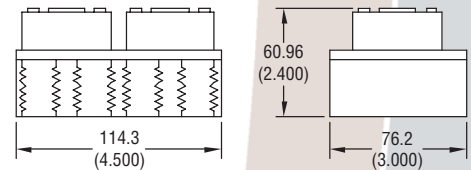
## Series LTPZ330

### 30/40 Amp Zero-Crossover High Voltage Fired Three Phase SSR's

LTPZ330-530-D	530 VAC, 30 AMP Max. Load, 3-32 VDC Trigger
LTPZ330-530-A	530 VAC, 30 AMP Max. Load, 90-265 VAC Trigger
LTPZ330-530-D	530 VAC, 40 AMP Max. Load, 3-32 VDC Trigger
LTPZ330-530-A	530 VAC, 40 AMP Max. Load, 90-265 VAC Trigger



LTPZ330-

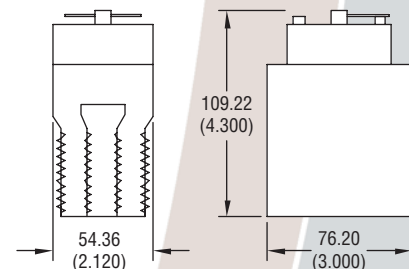


LTPZ340-

## Series LTPP125

### Phase Angle Fired Single Phase SSR's

LTPP125-240-4	240 VAC, 25 AMP Max. Load, 4-20 mA Trigger
LTPP125-660-4	660 VAC, 25 AMP Max. Load, 4-20 mA Trigger
LTPP125-240-P	240 VAC, 25 AMP Max. Load, 10 VDC or Pot. Trigger
LTPP140-660-P	660 VAC, 40 AMP Max. Load, 10 VDC or Pot. Trigger





# Reference Tables

## Equivalent Temperature Readings for Fahrenheit and Celsius Scales

$^{\circ}\text{F} = 9/5 ^{\circ}\text{C} + 32$

$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$

$^{\circ}\text{Fahrenheit}$	$^{\circ}\text{Celsius}$	$^{\circ}\text{Fahrenheit}$	$^{\circ}\text{Celsius}$	$^{\circ}\text{Fahrenheit}$	$^{\circ}\text{Celsius}$	$^{\circ}\text{Fahrenheit}$	$^{\circ}\text{Celsius}$
-76.	-60.	10.	-12.2	62.	16.7	114.	45.6
-67.	-55.	10.4	-12.	62.6	17.	114.8	46.
-58.	-50.	11.	-11.7	63.	17.2	115.	46.1
-49.	-45.	12.	-11.1	64.	17.8	116.	46.7
-40.	-40.	12.2	-11.	64.4	18.	116.6	47.
-39.	-39.4	13.	-10.6	65.	18.3	117.	47.2
-38.2	-39.	14.	-10.	66.	18.9	118.	47.8
-38.	-38.9	15.	-9.4	66.2	19.	118.4	48.
-37.	-38.3	15.8	-9.	67.	19.4	119.	48.3
-36.4	-38.	16.	-8.9	68.	20.	120.	48.9
-36.	-37.8	17.	-8.3	69.	20.6	120.2	49.
-35.	-37.2	17.6	-8.	69.8	21.	121.	49.4
-34.6	-37.	18.	-7.8	70.	21.1	122.	50.
-34.	-36.7	19.	-7.2	71.	21.7	123.	50.6
-33.	-36.1	19.4	-7.	71.6	22.	123.8	51.
-32.8	-36.	20.	-6.7	72.	22.2	124.	51.1
-32.	-35.6	21.	-6.1	73.	22.8	125.	51.7
-31.	-35.	21.2	-6.	73.4	23.	125.6	52.
-30.	-34.4	22.	-5.6	74.	23.3	126.	52.2
-29.2	-34.	23.	-5.	75.	23.9	127.	52.8
-29.	-33.9	24.	-4.4	75.2	24.	127.4	53.
-28.	-33.3	24.8	-4.	76.	24.4	128.	53.3
-27.4	-33.	25.	-3.9	77.	25.	129.	53.9
-27.	-32.8	26.	-3.3	78.	25.6	129.2	54.
-26.	-32.2	26.6	-3.	78.8	26.	130.	54.4
-25.6	-32.	27.	-2.8	79.	26.1	131.	55.
-25.	-32.9	28.	-2.2	80.	26.7	132.	55.6
-24.	-31.7	28.4	-2.	80.6	27.	132.8	56.
-23.8	-31.1	29.	-1.7	81.	27.2	133.	56.1
-23.	-30.5	30.	-1.1	82.	27.8	134.	56.7
-22.	-30.	30.2	-1.	82.4	28.	134.6	57.0
-21.	-29.4	31.	-0.6	83.	28.3	135.	57.2
-20.2	-29.	32.	0.	84.	28.9	136.	57.8
-20.	-28.9	33.	+0.6	84.2	29.	136.4	58.
-19.	-28.3	33.8	1.	85.	29.4	137.	58.3
-18.4	-28.	34.	1.1	86.	30.	138.	58.9
-18.	-27.8	35.	1.7	87.	30.6	138.2	59.0
-17.	-27.2	35.6	2.	87.8	31.	139.	59.4
-16.6	-27.	36.	2.2	88.0	31.1	140.	60.
-16.	-26.7	37.	2.8	89.	31.7	141.	60.6
-15.	-26.1	37.4	3.	89.6	32.	141.8	61.
-14.8	-26.	38.	3.3	90.	32.2	142.	61.1
-14.	-25.6	39.	3.9	91.	32.8	143.	61.7
-13.	-25.	39.2	4.	91.4	33.	143.6	62.
-12.0	-24.4	40.	4.4	92.	33.3	144.	62.2
-11.2	-24.	41.	5.	93.	33.9	145.	62.8
-11.	-23.9	42.	5.6	93.2	34.	145.4	63.
-10.0	-23.3	42.8	6.	94.	34.4	146.	63.3
-9.4	-23.	43.	6.1	95.	35.	147.	63.9
-9.	-22.8	44.	6.7	96.	35.6	147.2	64.
-8.	-22.2	44.6	7.	96.8	36.	148.	64.4
-7.6	-22.	45.	7.2	97.	36.1	149.	65.
-7.	-21.7	46.	7.8	98.	36.7	150.	65.6
-6.	-21.1	46.4	8.	98.6	37.	150.8	66.
-5.8	-21.	47.	8.3	99.	37.2	151.	66.1
-5.	-20.6	48.	8.9	100.	37.8	152.	66.7
-4.	-20.	48.2	9.	100.4	38.	152.6	67.
-3.	-19.4	49.	9.4	101.	38.3	153.	67.2
-2.2	-19.	50.	10.0	102.	38.9	154.	67.8
-2.	-18.9	51.	10.6	102.2	39.	154.4	68.
-1.	-18.3	51.8	11.	103.	39.4	155.	68.3
-0.4	-18.	52.	11.1	104.	40.	156.	68.9
0.	-17.8	53.	11.7	105.	40.6	156.2	69.
+1.	-17.2	53.6	12.	105.8	41.	157.	69.4
1.4	17.	54.	12.2	106.	41.1	158.	70.
2.	-16.7	55.	12.8	107.	41.7	159.	70.6
3.	-16.1	55.4	13.	107.6	42.	159.	71.
3.2	-16.	56.	13.3	108.	42.2	160.	71.1
4.	-15.6	57.	13.9	109.	42.8	161.	71.7
5.	-15.	57.2	14.	109.4	43.	161.6	72.
6.	-14.4	58.	14.4	110.	43.3	162.	72.2
6.8	-14.	59.	15.	111.	43.9	163.	72.8
7.	-13.9	60.	15.6	111.2	44.	163.4	73.
8.	-13.3	60.8	16.	112.	44.4	164.	73.3
8.6	-13.	61.	16.1	113.	45.	165.	73.9
9.	-12.8						

# Reference Tables

## Equivalent Temperature Readings for Fahrenheit and Celsius Scales (Continued)

°F = 9/5 °C + 32

°C = 5/9 (°F - 32)

°Fahrenheit	°Celsius	°Fahrenheit	°Celsius	°Fahrenheit	°Celsius	°Fahrenheit	°Celsius
165.2	74.	218.	103.3	270.	132.2	322.	161.1
166.	74.4	219.	103.9	271.	132.8	323.	161.7
167.	75.	219.2	104.	271.4	133.	323.6	162.
168.	75.6	220.	104.4	272.	133.3	324.	162.2
168.8	76.	221.	105.	273.	133.9	325.	162.8
169.	76.1	222.	105.6	273.2	134.	325.4	163.
170.	76.7	222.8	106.	274.	134.4	326.	163.3
170.6	77.	223.	106.1	275.	135.	327.	163.9
171.	77.2	224.	106.7	276.	135.6	327.2	164.
172.	77.8	224.6	107.	276.8	136.	328.	164.4
172.4	78.	225.	107.2	277.	136.1	329.	165.
173.	78.3	226.	107.8	278.	136.7	330.	165.6
174.	78.9	226.4	108.	278.6	137.	330.8	166.
174.2	79.	227.	108.3	279.	137.2	331.	166.1
175.	79.4	228.	108.9	280.	137.8	332.	166.7
176.	80.	228.2	109.	280.4	138.	332.6	167.
177.	80.6	229.	109.4	281.	138.3	333.	167.2
177.8	81.	230.	110.	282.	138.9	334.	167.8
178.	81.1	231.	110.6	282.2	139.	334.4	168.
179.	81.7	231.8	111.	283.	139.4	335.	168.3
179.6	82.	232.	111.1	284.	140.	336.	168.9
180.	82.2	233.	111.7	285.	140.6	336.2	169.
181.	82.8	233.6	112.	285.8	141.	337.	169.4
181.4	83.	234.	112.3	286.	141.1	338.	170.
182.	83.3	235.	112.8	287.	141.7	339.	170.6
183.	83.9	235.4	113.	287.6	142.	339.8	171.
183.2	84.	236.	113.3	288.	142.2	340.	171.1
184.	84.4	237.	113.9	289.	142.8	341.	171.7
185.	85.	237.2	114.	289.4	143.	341.6	172.
186.	85.6	238.	114.4	290.	143.3	342.	172.2
186.8	86.	239.	115.	291.	143.9	343.	172.8
187.	86.1	240.	115.6	291.2	144.	343.4	173.
188.	86.7	240.8	116.	292.	144.4	344.	173.3
188.6	87.	241.	116.1	293.	145.	345.	173.9
189.	87.2	242.	116.7	294.	145.6	345.2	174.
190.	87.8	242.6	117.	294.8	146.	346.	174.4
190.4	88.	243.	117.2	295.	146.1	347.	175.
191.	88.3	244.	117.8	296.	146.7	348.	175.6
192.	88.9	244.4	118.	296.6	147.	348.8	176.
192.2	89.	245.	118.3	297.	147.2	349.	176.1
193.	89.4	246.	118.9	298.	147.8	350.	176.7
194.	90.	246.2	119.	298.4	148.	350.6	177.
195.	90.6	247.	119.4	299.	148.3	351.	177.2
195.8	91.	248.	120.	300.	148.9	352.	177.8
196.	91.1	249.	120.6	300.2	149.	352.4	178.
197.	91.7	249.8	121.	301.	149.4	353.	178.3
197.6	92.	250.	121.1	302.	150.	354.	178.9
198.	92.2	251.	121.7	303.	150.6	354.2	179.
199.	92.8	251.6	122.	303.8	151.	355.	179.4
199.4	93.	252.	122.4	304.	151.1	356.	180.
200.	93.3	253.	122.8	305.	151.7	357.	180.6
201.	93.9	253.4	123.	305.6	152.	357.8	181.
201.2	94.	254.	123.3	306.	152.2	358.	181.1
202.	94.4	255.	123.9	307.	152.8	359.	181.6
203.	95.	255.2	124.	307.4	153.	359.6	182.
204.	95.6	256.	124.4	308.	153.3	360.	182.2
204.8	96.	257.	125.	309.	153.9	361.	182.8
205.	96.1	258.	125.5	309.2	154.	361.4	183.
206.	96.7	258.8	126.	310.	154.4	362.	183.3
206.6	97.	259.	126.1	311.	155.	363.	183.9
207.	97.2	260.	126.7	312.	155.6	363.2	184.
208.	97.8	260.6	127.	312.8	156.	364.	184.4
208.4	98.	261.	127.2	313.	156.1	365.	185.
209.	98.3	262.	127.8	314.	156.7	366.	185.6
210.	98.9	262.4	128.	314.6	157.	366.8	186.
210.2	99.	263.	128.3	315.	157.2	367.	186.1
211.	99.4	264.	128.9	316.	157.8	368.	186.7
212.	100.	264.2	129.	316.4	158.	368.6	187.
213.	100.6	265.	129.4	317.	158.3	369.	187.2
213.8	101.	266.	130.	318.	158.9	370.	187.8
214.	101.1	267.	130.6	318.2	159.	370.4	188.
215.	101.7	267.8	131.	319.	159.4	371.	188.3
215.6	102.	268.	131.3	320.	160.	372.	188.9
216.	102.2	269.	131.7	321.	160.6	372.2	189.
217.	102.8	269.6	132.	321.8	161.	373.	189.4
217.4	103.					374.	190.

# Application Guide

## Thermocouple Material

Material	Best Operational Range	Good for...	Not Recommended for...
J, Iron/Constantan	32° to 1400°F	Vacuum, reducing, or inert apps	Oxidizing or humid environments
K	-100° to 2300°F	Oxidizing or neutral applications	Use under 1000°
E	32° to 1600°F	Oxidizing or inert applications	
T, Copper/Constantan	-300° to 700°F	Oxidizing, reducing or inert apps	Wet or humid environments
R, Plt 13% Rh/Plt	1000° to 3000°F	High temperatures	Shock or vibrating equipment
S, Plt 10% Rh/Plt	1000° to 3000°F	High temperatures	Shock or vibrating equipment
B, Plt 30% Rh/Plt 6% Rh	1600° to 3100°F	High temperatures	
N, NiChroSil/NiSil	32° to 2300°F	Similar to Type K	
C, W 5% Re/W 26% Re	1000° to 4200°F	Inert or vacuum applications	
M, Ni 18% Mo/Ni	-50° to 2500°F	Inert, vacuum or hydrogen apps	Constant cycling of temperature

## Tubing, Sheath, Protection Tube, and Thermowell Materials

Material	Best Operational Range	Good for...	Not Recommended for...
304 Stainless Steel	-300° to 1650°F	Oxidizing or neutral applications	
316 Stainless Steel	-300° to 1700°F	Oxidizing or neutral applications	
Inconel® 600	32° to 1900°F	Oxidizing or reducing apps	Sulfurous environments >1000°F
Inconel® 601	32° to 2300°F	Oxidizing or reducing apps	
Wrought Iron	32° to 1200°F	Oxidizing or reducing apps	
Cast Iron	32° to 1300°F	Oxidizing or reducing apps	
Seamless Steel	32° to 1000°F	Oxidizing or reducing apps	
Mullite (63% Alumina)	32° to 2700°F	High temperatures	Mechanical shock
Alumina (>99% Al <sub>2</sub> O <sub>3</sub> )	32° to 3400°F	Induction melting, vacuum	Mechanical or thermal shock
Silicon Carbide	32° to 3000°F	Secondary protection tube	

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# Terms and Conditions of Sale

- 1. Prices and Specifications** are subject to change without notice.
- 2. Shipping dates** are approximate. They are dependent upon credit approval and subject to delays beyond our control.
- 3. Terms:** Net 30 days to companies with established credit rating. In the event Buyer fails to fulfill previous terms of payment, or in case Seller shall have any doubt at any time as to Buyer's financial responsibility, Seller may decline to make further deliveries except upon receipt of cash in advance or other special arrangements.
- 4. Liability Point and Title:** All material is sold F.O.B. Factory (Domestic) / FCA Free Carrier (International). Title to all material sold shall pass to buyer upon delivery by Seller to carrier at shipping point.
- 5. State and Local Taxes:** Any taxes which the Seller may be required to pay or collect upon or with respect to the sale, purchase, delivery, use or consumption of any of the material covered hereby shall be for the account of the Buyer and shall be added to the purchase price.
- 6. Special tooling,** dies, silk screens and molds acquired specially to produce goods for Buyer remain the property of Dwyer Instruments, Inc., and may not be removed. They will be maintained in good condition for a minimum period of three years from the date of the original purchase order.
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# LOVE CONTROLS Representatives

## ALABAMA

Pinnacle Marketing Inc.  
12021 S. Memorial Parkway, Suite P4  
Huntsville, AL 35803  
PH: 256-882-1781

## ALASKA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## ARIZONA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## ARKANSAS

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## CALIFORNIA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## COLORADO

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## CONNECTICUT

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## DELAWARE

(Southern)  
W.H. Cooke & Company Inc.  
6868 York Rd.  
Hanover, PA 17331  
PH: 717-630-2222  
FAX: 717-637-9999

## (Northern)

Francis J. Gamble Company (Rep. 140)  
571 South Fairview Street  
Riverside, NJ 08075  
PH: 609-461-4068  
FAX: 609-461-4640

## FLORIDA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## GEORGIA

Pinnacle Marketing, Inc.  
12460 Crabapple Rd., Ste 202, PMB262  
Alpharetta, GA 30004  
PH: 770-410-9980

## HAWAII

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## IDAHO

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## ILLINOIS

Markson Associates  
18 Old Barn Road  
Hawthorne Woods, IL 60047  
PH: 847-540-8167

## INDIANA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## (Gary Area)

Markson Associates  
18 Old Barn Road  
Hawthorne Woods, IL 60047  
PH: 847-540-8167

## IOWA

TMW Company  
P.O. Box 14174  
Lenexa, KS 66285  
PH: 913-492-6700

## KANSAS

TMW Company  
P.O. Box 14174  
Lenexa, KS 66285  
PH: 913-492-6700

## KENTUCKY

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## LOUISIANA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## MAINE

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## MARYLAND

W.H. Cooke & Company Inc.  
6868 York Rd.  
Hanover, PA 17331  
PH: 717-630-2222  
FAX: 717-637-9999

## MASSACHUSETTS

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## MICHIGAN

Midwestern Sales & Engineering  
5218 Autumn Glen  
Kalamazoo, MI 49009  
PH: 269-207-2991

## (Southwest Corner)

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## MINNESOTA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## MISSISSIPPI

Pinnacle Marketing, Inc.  
12021 S. Memorial Parkway, Suite P4  
Huntsville, AL 35803  
PH: 888-764-7640

## MISSOURI

TMW Company  
P.O. Box 14174  
Lenexa, KS 66285  
PH: 9130492-6700

## MONTANA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## NEBRASKA

TMW Company  
P.O. Box 14174  
Lenexa, KS 66285  
PH: 9130492-6700

## NEVADA

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

## NEW HAMPSHIRE

Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

# LOVE CONTROLS Representatives

## NEW JERSEY

(Northern)  
Prime Industrial Components, Inc.  
465 New Milford Avenue,  
Oradell, NJ 07649  
PH: 800-631-1912

(Southern)  
Francis J. Gamble Co.  
571 South Fairview St.  
Riverside, NJ 08075  
PH: 856-461-4068 • 800-866-4068

NEW MEXICO  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

NEW YORK  
Prime Industrial Components, Inc.  
465 New Milford Avenue,  
Oradell, NJ 07649  
PH: 800-631-1912

NORTH CAROLINA  
(Eastern)  
Pinnacle Marketing, Inc.  
2805 Spring Forest Road, Ste 101  
Raleigh, NC 27616  
PH: 888-764-7640

(Western)  
Pinnacle Marketing, Inc.  
8116 South Tryon Street  
Suite B3 #113  
Charlotte, NC 28273  
PH: 888-764-7640

NORTH DAKOTA  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

OHIO  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

OKLAHOMA  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

OREGON  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

PENNSYLVANIA  
Francis J. Gamble Co.  
571 South Fairview St.  
Riverside, NJ 08075  
PH: 856-461-4068 • 800-866-4068

PUERTO RICO  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

RHODE ISLAND  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588  
SOUTH CAROLINA  
Pinnacle Marketing, Inc.  
2805 Spring Forest Road, Suite 101  
Raleigh, NC 27616  
PH: 888-764-7640

SOUTH DAKOTA  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

TENNESSEE  
Pinnacle Marketing, Inc.  
12021 S. Memorial Parkway, Suite P4  
Huntsville, AL 35803  
PH: 256-882-1781

TEXAS  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

UTAH  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

VERMONT  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

VIRGINIA  
W.H. Cooke & Company Inc.  
6868 York Rd.  
Hanover, PA 17331  
PH: 717-630-2222  
FAX: 717-637-9999

WASHINGTON  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

WEST VIRGINIA  
(Northeast Corner)  
W.H. Cooke & Company Inc.  
6868 York Rd.  
Hanover, PA 17331  
PH: 717-630-2222  
FAX: 717-637-9999

(All Others)  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

WISCONSIN  
Markson Associates  
18 Old Barn Road  
Hawthorne Woods, IL 60047  
PH: 847-540-8167

WYOMING  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588  
AUSTRALIA  
Dwyer Instruments Pty. Ltd.  
Unit 4, 11 Waverley Drive  
Unanderra, NSW 2526  
PH: 61 2 4272 2055  
FAX: 61 2 4272 4055

CANADA  
Love Controls Division  
P.O. Box 338  
Michigan City, IN 46361  
PH: 219-879-8000 • 800-828-4588

UNITED KINGDOM  
Dwyer Instruments Ltd  
Unit 16, The Wye Estate, London Road  
High Wycombe, Bucks HP11 1LH-U.K.  
PH: (+44) (0)1494 461707  
FAX: (+44) (0)1494 465102



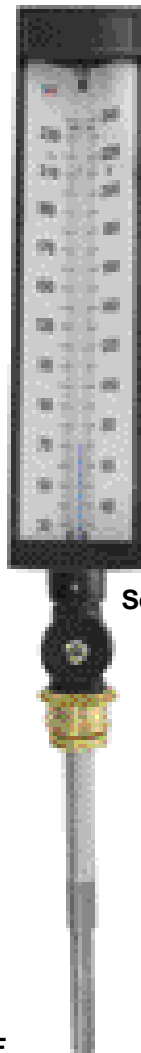
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## **Corporate Headquarters**

Love Controls  
Division of Dwyer Instruments, Inc.  
102 Indiana Highway 212  
P.O. Box 373  
Michigan City, IN 46361 U.S.A.  
Phone: 219/879-8000  
Fax: 219/872-9057

Internet:  
<http://www.love-controls.com>  
<http://www.dwyer-inst.com>  
e-mail: [info@dwyer-inst.com](mailto:info@dwyer-inst.com)

## **Branch Office/Stocking Warehouse Location**

Houston Office:  
Phone: 281/446-1146  
Fax: 281/446-0696

Dwyer Instruments, Pty. Ltd.  
Unit 1, 11 Waverley Drive  
Unanderra, NSW 2526 Australia  
Phone: 61 2 4272 2055  
Fax: 61 2 4272 4055

Dwyer Instruments Limited  
Unit 16, The Wye Estate, London  
Road  
High Wycombe, Bucks HP11 1LH  
United Kingdom  
Phone: (+44) (0)1494 461707  
Fax: (+44) (0)1494-465102