

# Warrick® Conductivity-Based Liquid Level Control

The concept is simple: Take advantage of a liquid's conductive properties to complete a circuit and cause a control relay to actuate. Use of permanently-mounted stationary electrodes gives the user precise accuracy, repeatability and no-moving-parts reliability.

## Application Versatility

**Pumps.** For feeding of elevated tanks; drainage of wastewater from industrial sumps; batch processing; irrigation and flood control; sewage disposal; seal leakage detection.

**Boilers.** Supervise feedwater flow; critical low water cutoff protection; alarm functions.

**Steam.** Steam cookers; steam generators; evaporators; sterilizers. Automatic shut off of heat source in the event of a low water level; proper water level maintenance through the energizing of a solenoid valve.

**Drink Dispensers.** Control the carbonator tanks' water level.

**High and/or Low Level Alarms.** In boilers, process and storage tanks and similar equipment.

**Solenoid Control.** As simple on/off devices, for process control.

**Fuel.** Fuel storage tank level detection and leakage indication.

**Sewage.** Sewage and waste water level detection.

**Specialty Control Panels.**



## System Components

The illustration, to the right, graphically defines the typical Warrick® liquid level control system, which includes three basic elements:

- 1. Controls.** The control is an electrical device with contacts that open and close in response to liquid levels sensed by the probes. Because it is wired directly to the power source and to the sensing source, it can send signals that activate or de-activate solenoids, pumps, or alarms.

Warrick® controls are available in many different designs and sensitivity ratings for a wide range of application requirements.

- 2. Fittings.** The fitting is a housing that holds the probes (or floats), insulates them from the vessel, and provides a means of connection to the control.

Warrick® fittings are available for single-probe or multi-probe applications, for mounting to vessels in a variety of ways, and in open or pressure tight styles.

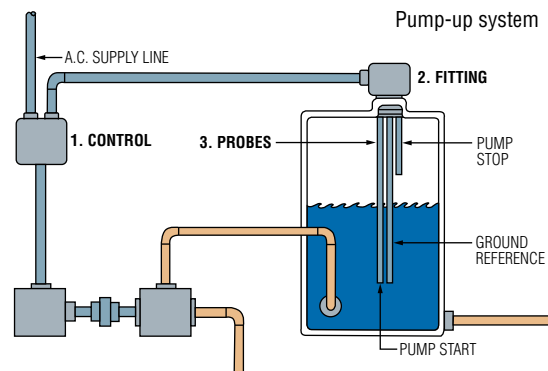
- 3. Probes.** The probe is a sensor that extends downward from the fitting, with the tip positioned precisely at the level where the control should be activated.

Warrick® probes are available in a variety of materials to suit different liquids and a variety of lengths to fit different depth requirements.

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## Example of Warrick System Application

The liquid level control system shown here is designed for "pump up" application. The pump will start refilling the vessel when the liquid reaches the lower probe tip, then stop refilling the vessel when the liquid reaches the higher probe tip.



## Principle of Operation

**Solid State Controls** employ two separate circuits, one for sensing and comparing current flow and one for energizing the output relay. This 'switch within a switch' allows solid state controls to operate at much lower secondary voltages (12VAC typical), and much higher sensitivities. Advantages of this technology include reduced shock hazard, one moving part the output relay, wide sensitivity range and latching capability for auto refill or empty applications.



**Intrinsically Safe Controls** are solid state controls which limit current and voltage to a level incapable of igniting flammable gasses, vapors or dust. They can be used as conductivity liquid level controls or with dry contact devices such as Gems Flow and Level Switches or other non voltage storing or producing devices.



## Sensitivity Data

Sensitivity vs. Maximum Probe Wire Distances – in feet\*

Ohms	Controls							
	Series 16, 16D, 16M, 16DM, 16VM	Series 17	Series 27, 37	Series 47	Series 67	Series 26, 26M	Series 19MR	Series DF
50	—	—	—	—	—	—	—	—
450	—	—	—	—	—	—	—	—
1,500	—	—	—	—	—	—	—	—
3,000	—	—	4000	—	—	—	—	—
3,300	—	5000	—	—	—	—	—	—
4,700	10000	3500	—	—	4000	900	—	900
7,000	—	—	—	—	—	—	—	—
10,000	5700	1750	900	—	2400	600	—	600
11,000	—	—	—	—	—	—	5500	—
19,000	—	—	—	—	—	—	3000	—
20,000	—	—	—	—	—	—	—	—
22,000	—	1000	—	—	—	—	—	—
26,000	2200	—	—	1500	1200	250	—	250
47,000	—	500	—	—	—	—	—	—
50,000	1075	—	—	900	600	—	—	—
100,000	570	250	75	—	—	—	—	—
470,000	270	—	—	—	—	—	—	—
1,000,000	38	—	—	400	300	—	—	—
3,000,000	Contact factory for more information							
5,500,000								

\* Based on type MTW or THHN #14 or #16 AWG wire. Other wire size and sensing medium may reduce overall maximum distance.

### Notes:

1. DC on probe circuit-maximum distance between control and probe is limited to the total resistance of the wire and liquid.
2. Total resistance must not exceed the sensitivity of the control.
3. On controls directly connected to floats rather than probes, maximum distance is limited only to the total resistance of the wire.
4. AC on probe circuit has greater restrictions on maximum distance.

## Sensitivity & Material Selection

Liquid or Material	Sensitivity-Conductivity		Probe Material	
	Ohms/cm	Micro-Mhos/cm	Good <sup>1</sup>	Better <sup>2</sup>
Acids <sup>3</sup>	Consult Factory		Consult Factory	
Aluminum Hydroxide	2.2K	450	316 Stainless Steel	Titanium
Aluminum Sulfate	2.2K	250	316 Stainless Steel	Hastelloy C
Ammonia	5K	200	316 Stainless Steel	N.A.
Ammonium Chloride	1K	1K	316 Stainless Steel	Titanium
Ammonium Hydroxide	10K	100	316 Stainless Steel	Titanium
Ammonium Nitrate	18K	50	316 Stainless Steel	316 Stainless Steel
Ammonium Sulfate	10K	100	316 Stainless Steel	Titanium
Baby Foods	1K	1K	316 Stainless Steel	316 Stainless Steel
Barium Chloride	1K	1K	Carpenter 20	N.A.
Barium Nitrate	1K	1K	316 Stainless Steel	N.A.
Beer	2.2K	450	316 Stainless Steel	316 Stainless Steel
Black Liquor	1K	1K	Consult Factory	
Borax – Aqueous	10K	100	Brass	316 Stainless Steel
Bourbon	200K	5	N.A.	316 Stainless Steel
Brine	1K	1K	N.A.	Hastelloy C
Buttermilk	1K	1K	N.A.	316 Stainless Steel
Cadmium Chloride	1K	1K	316 Stainless Steel	N.A.
Cadmium Nitrate	1K	1K	316 Stainless Steel	N.A.
Cake Batter	5K	200	316 Stainless Steel	316 Stainless Steel
Calcium Chloride	1K	1K	Carpenter 20	Hastelloy C
Calcium Hydroxide	10K	100	316 Stainless Steel	Titanium
Catsup	2.2K	450	316 Stainless Steel	316 Stainless Steel
Caustic Soda	1K	1K	316 Stainless Steel	Hastelloy B
Cement Slurry	5K	200	316 Stainless Steel	316 Stainless Steel
Coffee	2.2K	450	316 Stainless Steel	316 Stainless Steel
Corn Syrup	45K	21	316 Stainless Steel	316 Stainless Steel
Corn – Cream Style	2.2K	450	316 Stainless Steel	316 Stainless Steel
Ferric Chloride	10K	100	N.A.	Titanium
Ferrous Sulfate	10K	100	Carpenter 20	Titanium
Ink (Water Base)	2.2K	450	N.A.	316 Stainless Steel
Jams/Jellies	45K	21	316 Stainless Steel	316 Stainless Steel
Juices – Fruit/Vegetable	1K	1K	316 Stainless Steel	316 Stainless Steel
Lithium Chloride	1K	1K	N.A.	Carpenter 20
Magnesium Chloride	1K	1K	316 Stainless Steel	Carpenter 20
Magnesium Hydroxide	2.2K	450	316 Stainless Steel	N.A.
Mayonnaise	5K	200	316 Stainless Steel	316 Stainless Steel
Mercuric Chloride	90K	11	N.A.	Titanium
Milk	1K	1K	316 Stainless Steel	316 Stainless Steel
Molasses	10K	100	316 Stainless Steel	316 Stainless Steel
Mustard	1K	1K	316 Stainless Steel	316 Stainless Steel
Oil – Soluble	10K	100	N.A.	316 Stainless Steel
Paper Stock	5K	200	Titanium	N.A.
Photographic Solutions	1K	1K	316 Stainless Steel	Hastelloy C
Plating Solutions	2.2K	450	N.A.	316 Stainless Steel
Potassium Chloride	1K	1K	316 Stainless Steel	Titanium
Salts – Chemical	2.2K	450	Monel	N.A.
Sewage	5K	200	316 Stainless Steel	316 Stainless Steel
Silver Nitrate	1K	1K	316 Stainless Steel	Carpenter 20
Soap Foam	18K	50	316 Stainless Steel	316 Stainless Steel
Sodium Carbonate	2.2K	450	316 Stainless Steel	Monel
Sodium Hydroxide	1K	1K	316 Stainless Steel	Hastelloy B
Soups	1K	1K	316 Stainless Steel	316 Stainless Steel
Starch Solutions	5K	200	316 Stainless Steel	316 Stainless Steel
Vinegar – Aqueous	2.2K	450	316 Stainless Steel	Carpenter 20
Water – Carbonated	3K	330	316 Stainless Steel	316 Stainless Steel
Water – Condensate	18K	50	Brass	316 Stainless Steel
Water – Chlorinated	5K	200	316 Stainless Steel	Monel
Water – Distilled	450K	2	Brass	316 Stainless Steel
Water – Deionized	2.0M	0.5	Brass	316 Stainless Steel
Water – Hard/Natural	5K	200	Brass	316 Stainless Steel
Water – Salt	2.2K	450	Monel	N.A.
Water – R.O.	18M	0.056	N.A.	N.A.
Wine	2.2K	450	316 Stainless Steel	316 Stainless Steel
Zinc Chloride	1K	1K	Carpenter 20	Titanium
Zinc Sulfate	2.2K	450	316 Stainless Steel	Titanium

Notes:

1. Less than .020" erosion per year.
  2. Less than .002" erosion per year.
  3. Liquid concentration and temperature will affect conductivity and material erosion rate. Contact factory for detailed information.
- N.A. – No material available with this erosion rate.

## Series 16 Modules Controls – Solid State Plug-In Modules

- ▶ Compact Size
- ▶ Modular Plug-in Design
- ▶ Various Time Delays
- ▶ Low Voltage Sensor
- ▶ Solid State Reliability
- ▶ LED Monitoring
- ▶ U.L. “Motor Control”

### Series 16M – General Purpose Control

- New Microprocessor Design

Designed for either differential or single-level service. U.L. “Motor Controller” listing, 8 pin socket with screw-type connections make the unit easy to install and service. Sensitivity of up to 1 million ohm/cm.

### Series 16HM – High Sensitivity Control

Series 16HM is similar to Series 16M but provides higher sensitivity up to 5.5 million ohm/cm. Probe voltage is 12 VDC for applications with low conductive media.

### Series 16DM – DPDT Load Contact

Similar to Series 16M but with DPDT load contacts. Eliminates the need for slave relays. 11 pin octal plugs. Requires little panel space. General purpose single-level or differential applications. U.L. listed.

### Series 16VM – Field Selectable Sensitivity

Similar to Series 16M but with the added flexibility of field adjustable sensitivity, made possible through external setpoint resistors. Uses 11pin octal socket. U.L. listed.

### Specifications

<b>Contact Design</b>	
<b>Series 16M &amp; 16HM</b>	1 N.O. & 1 N.C. (1 form C)
<b>Series 16DM</b>	2 N.O. & 2 N.C. (2 form C)
<b>Series 16VM</b>	1 N.O. & 1 N.C. (1 form C)
<b>Contact Rating (120. 240 VAC)</b>	
<b>Series 16M &amp; 16HM</b>	10 amp Resistive 1/3 hp
<b>Series 16DM</b>	5 amp Resistive 1/10 hp
<b>Series 16VM</b>	10 amp Resistive 1/3 hp
<b>Mode of Operation</b>	Direct/Inverse, factory set
<b>Sensitivity</b>	
<b>Series 16M</b>	0-1M ohm, factory set
<b>Series 16HM</b>	0-5.5M ohm, factory set
<b>Series 16DM</b>	0-1M ohm, factory set
<b>Series 16VM</b>	0-1M ohm, field adjustable
<b>Primary Voltage</b>	24 VAC, 120 VAC, 240 VAC (+10%/-15%) 208/240: 187 V min. to 255 V max. VAC 50/60 Hz
<b>Secondary Voltage</b>	
<b>Series 16M</b>	12 VAC, 1.5 mA
<b>Series 16HM</b>	12 VDC
<b>Series 16DM &amp; 16VM</b>	12 VAC, 1.5 mA
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals</b>	U.L. 508 File #E44426
<b>Terminal Style</b>	Screw connector
<b>Options</b>	Time Delays



Series 16M/16HM

Series 16DM/16VM

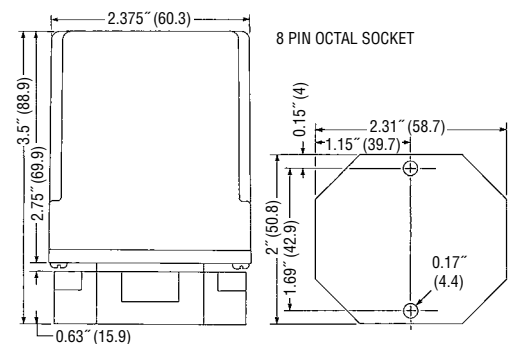


### Applications

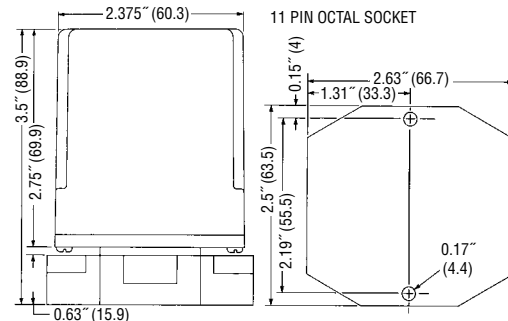
- Single-Level Service
- Point Level
- Valve Control
- Differential Service
- Alarms
- Pump Control

### Dimensions

#### Series 16M & 16HM



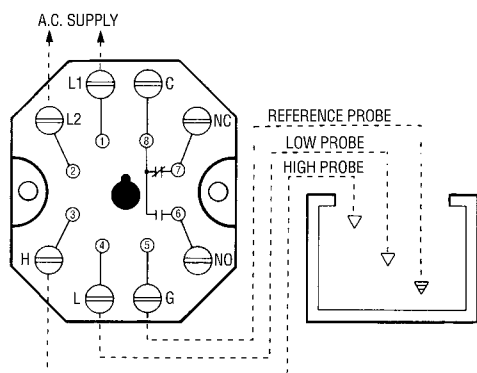
#### Series 16DM & 16VM



Note: Controls also available with DIN mount socket.

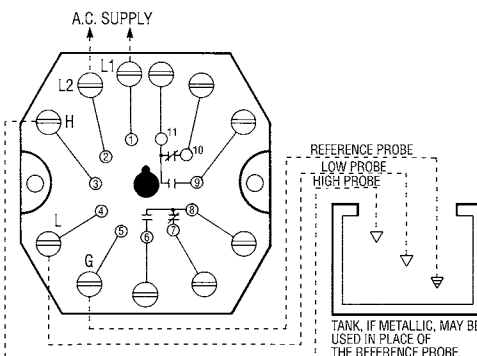
## Wiring

### Series 16M & 16HM

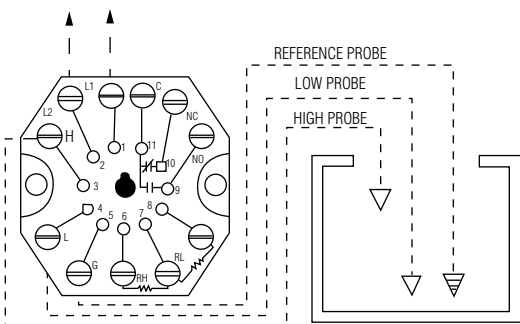


Note: For single level service, use "H" and "G" connections.

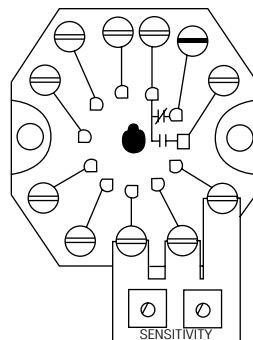
### Series 16DM



### Series 16VM



### Variable Sensitivity Option



Part number 16Z1VG Potentiometer Board available for 16VM only. Consult factory.

## How to Order

Use the **Bold** characters from the chart below to construct a product code.

### 16M Series – Microprocessor Version

1. Series	<b>16M</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>XX</b>																
2. Mode of Operation	<table border="0"> <tr> <td><b>Direct</b></td> <td><b>Inverse</b></td> </tr> <tr> <td><b>A</b> – 4.7K</td> <td><b>E</b> – 100K</td> </tr> <tr> <td><b>B</b> – 10K</td> <td><b>F</b> – 470K</td> </tr> <tr> <td><b>C</b> – 26K</td> <td><b>G</b> – 1M</td> </tr> <tr> <td><b>D</b> – 50K</td> <td><b>N</b> – 50K</td> </tr> <tr> <td></td> <td><b>P</b> – 100K</td> </tr> <tr> <td></td> <td><b>R</b> – 470K</td> </tr> <tr> <td></td> <td><b>S</b> – 1M</td> </tr> </table>								<b>Direct</b>	<b>Inverse</b>	<b>A</b> – 4.7K	<b>E</b> – 100K	<b>B</b> – 10K	<b>F</b> – 470K	<b>C</b> – 26K	<b>G</b> – 1M	<b>D</b> – 50K	<b>N</b> – 50K		<b>P</b> – 100K		<b>R</b> – 470K		<b>S</b> – 1M
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	<b>S</b> – 1M																							
3. Supply Voltage	<b>1</b> 120 VAC; <b>2</b> 240 VAC; <b>3</b> 24 VAC; <b>8</b> 208/240 VAC																							
4. Socket Style*	<b>A</b> 8 Pin Octal <b>M</b> Module Only <b>B</b> 8 Pin DIN																							
5. Enclosure	<b>0</b> None; <b>1</b> NEMA 1; <b>4</b> NEMA 4																							
6. Time Delay (increasing level) Option	<b>00-90</b> seconds <b>Blank</b> 0 seconds																							
7. Time Delay (decreasing level) Option	<b>00-90</b> seconds <b>Blank</b> 0 seconds																							
8. Time Out Option	See page E-11, Chart A																							

\*See page E-11 for descriptions.

### 16 HM, 16DM or 16VM Series

1. Series	<b>16HM</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>XX</b>																						
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3. Supply Voltage	<b>1</b> 120 VAC; <b>2</b> 240 VAC; <b>3</b> 24 VAC; <b>8</b> 208/240 VAC																												
4. Socket Style	<b>A</b> 8 Pin Octal (16M & 16HM), 11 Pin Octal (16DM & 16VM); <b>B</b> DIN Mount; <b>M</b> None, Module Only <sup>6</sup>																												
5. Enclosure	<b>0</b> None; <b>1</b> NEMA 1; <b>4</b> NEMA 4																												
6. Time Delay (increasing level) Option	<b>01-20</b> seconds; <b>0V</b> variable (16VM only)																												
7. Time Delay (decreasing level) Option	<b>01-20</b> seconds; <b>0V</b> variable (16VM only)																												

#### Notes:

- 16VM select modes **A**, **K**, **Y** or **Z** only.
- 16HM & 16DM only. Series 16VM includes full set of the resistors listed above. Specify a sensitivity to determine mode of operation.
- 16VM only.
- All Series except 16HM.
- 16VM only.
- Socket style M requires enclosure **0** – None.
- Mounting style A (11 pin octal only)

Socket Details and Option Availability are located on web site.

## Series 16 – Open Circuit Board Controls

- ▶ Solid State Reliability
- ▶ Spade Terminals
- ▶ Time Delays Available
- ▶ U.L. “Motor Control”
- ▶ Optional Dirty Electrode Detection\*
- ▶ AC Current Minimizes Electrolysis
- ▶ Compact Size
- ▶ Low-Voltage Sensor
- ▶ LED Monitoring

### Series 16 – General Purpose Control

- New Microprocessor Design

Engineered for general purpose single-level or differential applications, these economy priced controls have spade terminals for easy wiring and provide sensitivities up to 1 million ohm/cm.

### Series 16D – DPDT Load Contacts

Same features and specifications as Series 16, but these controls also have DPDT load contacts to eliminate the need for slave relays.

### Specifications

<b>Contact Design</b>	
<b>Series 16</b>	1 N.O. & 1 N.C. (1 form C)*
<b>Series 16D</b>	2 N.O. & 2 N.C. (2 form C)
<b>Contact Rating (120, 240 VAC)</b>	
<b>Series 16</b>	10 amp Resistive 1/3 hp*
<b>Series 16D</b>	5 amp Resistive 1/10 hp
<b>Mode of Operation</b>	
Direct/Inverse, factory set	
<b>Sensitivity</b>	
0-1M ohm, factory set	
<b>Primary Voltage</b>	
120 VAC, 240 VAC, 24 VAC, 208 VAC (+10%/-15%) 50/60 Hz	
208/240: 187 V min. to 255 V max. VAC 50/60 Hz	
<b>Secondary Voltage</b>	
12 VAC, 1.5 mA	
<b>Temperature</b>	
-40°F to +150°F (-40°C to +65°C)	
<b>Approvals</b>	
U.L. 508 File # E44426	
<b>Terminal Style</b>	
Spade connection	
<b>Options</b>	
Time Delays, Retrofit Plate, Time Out.	
See page E-11 for descriptions.	

### How to Order

Use the **Bold** characters from the chart below to construct a product code.

1. Series	<b>16</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>XX</b>	<b>X</b>
2. Mode of Operation								
<b>Direct</b>								
<b>Inverse</b>								
<b>A</b> – 4.7K	<b>E</b> – 100K	<b>K</b> – 4.7K	<b>P</b> – 100K					
<b>B</b> – 10K	<b>F</b> – 470K	<b>L</b> – 10K	<b>R</b> – 470K					
<b>C</b> – 26K	<b>G</b> – 1M	<b>M</b> – 26K	<b>S</b> – 1M					
<b>D</b> – 50K		<b>N</b> – 50K						
3. Supply Voltage								
<b>1</b> 120 VAC; <b>2</b> 240 VAC; <b>3</b> 24 VAC; <b>8</b> 208/240 VAC								
4. Standoff Style								
<b>A</b> 1/16" Panel	<b>C</b> Screw Mount							
<b>B</b> 1/8" Panel	<b>D</b> Retrofit							
5. Enclosure								
<b>0</b> None; <b>1</b> NEMA 1; <b>4</b> NEMA 4								
6. Retrofit Plate Option								
<b>R</b> Yes; <b>Blank</b> No								
7. Time Delay (increasing level) Option								
<b>01-20</b> seconds (Series 16D only)								
<b>00-90</b> seconds; <b>Blank</b> 0 seconds (Series 16 only)								
8. Time Delay (decreasing level) Option								
<b>01-20</b> seconds (Series 16M only)								
<b>00-90</b> seconds; <b>Blank</b> 0 seconds (Series 16 only)								
9. Time Out Option*								
See page E-11, Chart A								

\* New Series 16 Microprocessor Design only.

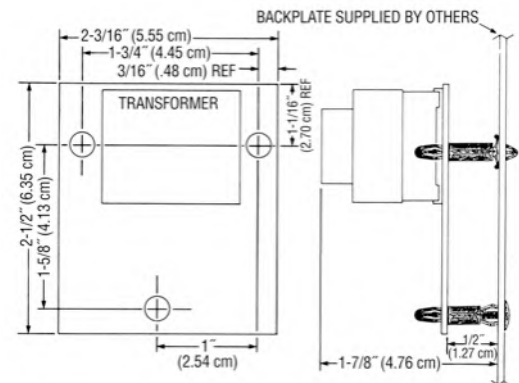


Series 16

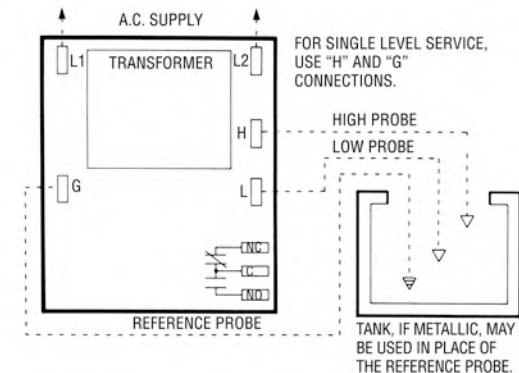
### Applications

- Single-Level Service
- Point Level
- Valve Control
- Low-Water Cutoff
- Differential Service
- Alarms
- Pump Control

### Dimensions



### Wiring



Note: Series 16D similar to Series 16, but with DPDT load contacts.

## Series 26 Modules Low-Water Cutoff – Plug-In Modules

- ▶ Powered Contacts
- ▶ Modular Plug-In Design
- ▶ Low Voltage Sensor
- ▶ 11-Pin Socket
- ▶ U.L. "Limit Control"
- ▶ Optional Dirty Electrode Detection
- ▶ Optional Manual Reset Button Feature.  
If Level Drops, Control is Deactivated Until Liquid Level Returns to Normal and Pushbutton is Depressed
- ▶ Optional Power Outage Feature Ignores Nuisance Outages and Resets When Power is Restored
- ▶ Solid State Reliability
- ▶ LED Monitoring
- ▶ Time Delays Available
- ▶ Meets CSD1 Requirements
- ▶ Optional Test Feature

### Series 26M – General Purpose Control

Series 26M is designed for low-water cutoff protection. This control meets CSD1 requirements for boiler low water cutoff. Series 26M features powered contacts. If non-powered contacts are required, request information on Series 26NM.

### Specifications

<b>Contact Design</b>	1 N.O. & 1 N.C. (powered)
<b>Contact Rating (24/120/240VAC)</b>	10 amp Resistive 1/3 hp
<b>Mode of Operation</b>	Direct
<b>Sensitivity</b>	0 - 26K ohm, factory set
<b>Primary Voltage</b>	24 VAC, 120 VAC, 240 VAC <sup>1</sup>
<b>Secondary Voltage</b>	12 VAC
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals<sup>1</sup></b>	U.L. 353 File # MP1430
<b>Terminal Style</b>	Screw connector
<b>Options</b>	Time Delays, Power Outage, Manual Reset, Test Feature, Dirty electrode detection; See page E-11 for descriptions

Notes:

1. 240 VAC and 208/240 VAC units do not carry U.L. Limit Control recognition.

### How to Order

Use the **Bold** characters from the chart below to construct a product code.

1. Series	<b>26M</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>XX</b>
2. Sensitivity	<b>A</b> – 4.7K <b>B</b> – 10K <b>C</b> – 26K	<b>D</b> – 50K <b>E</b> – 100K						
3. Supply Voltage	<b>1</b> – 120 VAC <b>3</b> – 24 VAC	<b>2</b> – 240 VAC <b>8</b> – 208/240 VAC						
4. Socket Style	<b>A</b> – 11 Pin Octal <b>B</b> – DIN Mount <b>M</b> – None, Module Only							
5. Enclosure	<b>0</b> – None <b>1</b> – NEMA 1 <b>4</b> – NEMA 4							
6. Option Package	See page E-11, Chart B for code letter.							
7. Time Delay (decreasing level) Option	<b>03-90</b> seconds <b>Blank</b> 3 seconds							
8. Time Delay (increasing level) Option	<b>00-90</b> seconds <b>Blank</b> 0 seconds							

Socket Details and Option Availability are located on web site.

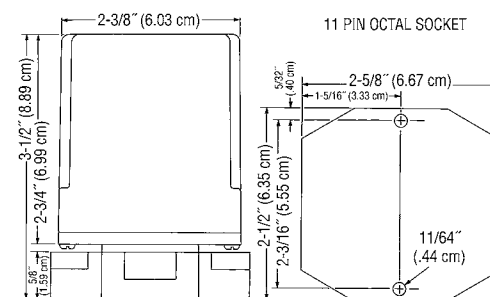


Series 26M

### Applications

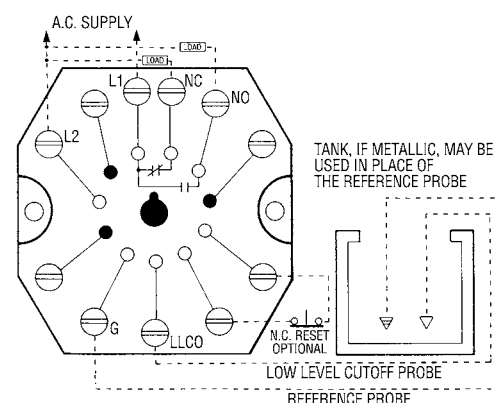
- Low-Water Cutoff
- Point Level
- Alarms

### Dimensions



Note: Controls also available with DIN mount socket.

### Wiring



Caution: Contacts are powered. If non-powered contacts are required, request information on Series 26NM.

## Series 26

### Low Water Cutoff – Standoff Mount

- ▶ Meets CSD1 Requirements
- ▶ Non Powered Contacts
- ▶ Time Delays Available
- ▶ LED Monitoring
- ▶ Test Feature
- ▶ AC Current Minimizes Electrolysis
- ▶ Snap-Thru Standoff Mounting
- ▶ Compact Size
- ▶ Power Outage Feature
- ▶ U.L. "Limit Control"

#### Series 26 – General Purpose Control

Designed for boiler low-water cutoff protection. A snap-through standoff mounting device is available for Series 26 units. Optional Power Outage feature resets after nuisance outages. Optional reset button is used when device has been deactivated because of low water condition. Reset is functional only if water has returned to normal level. Optional Test Feature available allows LLCO circuit to be tested without draining the water level in the boiler. Built-in 3 second time delay is standard. Up to 90 seconds available for increasing and decreasing levels.

#### Specifications

<b>Contact Design</b>	1 N.O. & 1 N.C. (1 form C)
<b>Contact Rating</b>	10 amp Resistive 1/3 hp at 120, 240 VAC
<b>Mode of Operation</b>	Direct
<b>Sensitivity</b>	0-100K ohm, factory set
<b>Primary Voltage</b>	120 VAC, 240 VAC <sup>1</sup> , 24 VAC, 208/240 VAC (+10%/-15%) 50/60 Hz
<b>Secondary Voltage</b>	12 VAC, 1.5 mA
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals<sup>1</sup></b>	U.L. 353, U.L. 508 File # MP1430
<b>Terminal Style</b>	Spade connection
<b>Options</b>	Time Delays, Power Outage, Retrofit Plate, Test Feature, See page E-11 for descriptions

Notes:

1. 240 VAC and 208/240 VAC are not U.L. recognized

#### How to Order

Use the **Bold** characters from the chart below to construct a product code.

	26	X	X	X	X	X	XX	XX
1. Series	<b>26</b>							
2. Sensitivity		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>		
3. Supply Voltage			<b>1</b>	<b>2</b>	<b>3</b>	<b>8</b>		
4. Standoff Style <sup>1</sup>			<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
5. Enclosure				<b>0</b>	<b>1</b>	<b>4</b>		
6. Option Package								
7. Time Delay (decreasing level) Option							<b>03-90</b>	<b>Blank</b>
8. Time Delay (increasing level) Option							<b>00-90</b>	<b>Blank</b>

Notes:

1. Standoff Style **D** only.

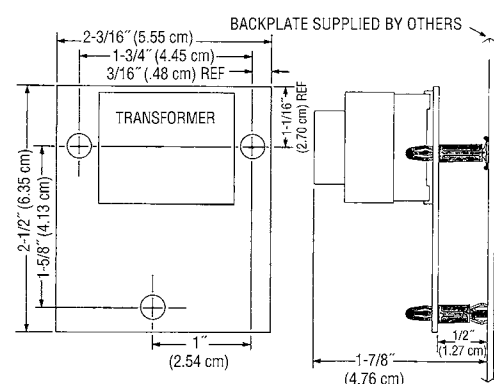
Socket Details and Option Availability are located on web site.



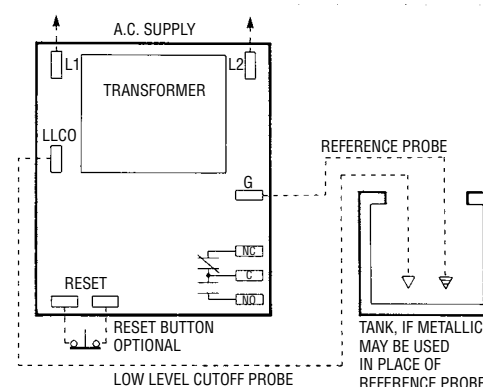
#### Applications

- Low-Water Cutoff
- Point Level
- Valve Control
- Single-Level Service
- Alarms
- Pump Control

#### Dimensions



#### Wiring



## Series DF Dual Function Controls

- ▶ Solid State Reliability
- ▶ Compact Size
- ▶ Meets CSD1 Requirements
- ▶ U.L. "Motor Control"
- ▶ AC Current Minimizes Electrolysis
- ▶ Optional Test Feature
- ▶ Optional Dirty Electrode Detection
- ▶ Spade Terminals for Easy Wiring
- ▶ Manual Reset (optional)
- ▶ Power Outage Feature (optional)
- ▶ U.L. "Limit Control"
- ▶ Time Out Option

Dual function Series DF models are designed to control two independent level functions, one single-level control operation and one differential-level operation.

Optional Power Outage feature resets after nuisance outages. Optional Reset Button is used when device has been deactivated due to low water condition. Reset is activated only after water has returned to normal level. This control is ideal in applications on boilers, food service equipment, and chemical delivery systems.

### Specifications

<b>Contact Design</b>	1 N.O. & 1 N.C. (1 form C) extra function
<b>Contact Rating (120, 240 VAC)</b>	10 amp Resistive 1/3 hp
<b>Mode of Operation</b>	H/L Direct/Inverse, LLCO – factory set
<b>Sensitivity</b>	0-26K ohm, factory set
<b>Primary Voltage</b>	120 VAC, 240 VAC <sup>1</sup> , 24 VAC (+10%/-15%) 208/240: 187 V min. to 255 V max. VAC 50/60 Hz
<b>Secondary Voltage</b>	12 VAC
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals</b>	U.L. 508 File # E44426, U.L. 353 File # MP1430
<b>Terminal Style</b>	Spade connection
<b>Options</b>	Time Delays, Manual Reset, Power Outage, Retrofit Plate, Test Feature, Dirty Electrode Detection; See page E-11 for descriptions

#### Notes:

1. 240 VAC and 208/240 VAC units do not carry U.L. Limit Control recognition.

### How to Order

Use the **Bold** characters from the chart below to construct a product code.

- |   |  |                        |          |          |          |          |           |           |           |
|---|--|------------------------|----------|----------|----------|----------|-----------|-----------|-----------|
| 1. Series   | <b>DF</b>  | <b>X</b>               | <b>X</b> | <b>X</b> | <b>X</b> | <b>X</b> | <b>XX</b> | <b>XX</b> | <b>XX</b> |
| 2. Mode of Operation                                | Direct   | Inverse                |          |          |          |          |           |           |           |
|   | <b>A</b> – 4.7K  | <b>K</b> – 4.7K        |          |          |          |          |           |           |           |
|   | <b>B</b> – 10K   | <b>L</b> – 10K         |          |          |          |          |           |           |           |
|   | <b>C</b> – 26K   | <b>M</b> – 26K         |          |          |          |          |           |           |           |
|   | <b>D</b> – 50K   | <b>N</b> – 50K         |          |          |          |          |           |           |           |
|   | <b>E</b> – 100K  | <b>P</b> – 100K        |          |          |          |          |           |           |           |
| 3. Supply Voltage                                   | <b>1</b> – 120 VAC; <b>2</b> – 240 VAC;<br><b>3</b> – 24 VAC; <b>8</b> – 208/240 VAC |                        |          |          |          |          |           |           |           |
| 4. Standoff Style*                                  | <b>A</b> – 1/16" Panel   | <b>C</b> – Screw Mount |          |          |          |          |           |           |           |
|   | <b>B</b> – 1/8" Panel  | <b>D</b> – Retrofit    |          |          |          |          |           |           |           |
| 5. Enclosure  | <b>0</b> – None; <b>1</b> – NEMA 1; <b>4</b> – NEMA 4                                |                        |          |          |          |          |           |           |           |
| 6. Option Package                                   | See page E-11, Chart B for code letter.  |                        |          |          |          |          |           |           |           |
| 7. Time Delay (increasing level) H/L function       | <b>00-90</b> seconds; <b>Blank</b> 0 seconds   |                        |          |          |          |          |           |           |           |
| 8. Time Delay (decreasing level) H/L function       | <b>00-90</b> seconds; <b>Blank</b> 0 seconds   |                        |          |          |          |          |           |           |           |
| 9. Time Delay (decreasing level) LLCO function only | <b>03-90</b> seconds; <b>Blank</b> 3 seconds   |                        |          |          |          |          |           |           |           |



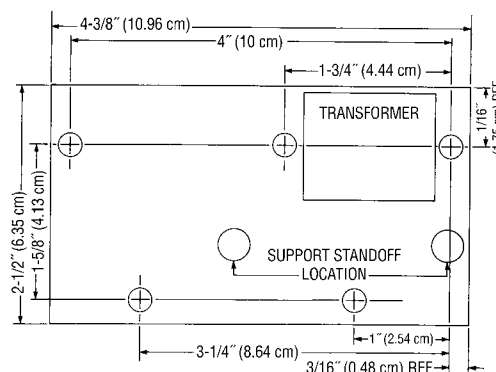
Series DF



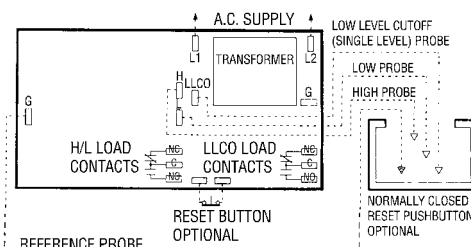
### Applications

- Dual Function
- Single-Level Service
- Differential Service
- Feedwater Control / Low-Water Cutoff
- High Level / Low Level
- Pump Down / High Level

### Dimensions



### Wiring



Note: For single level service, use "H" and "G" connections.

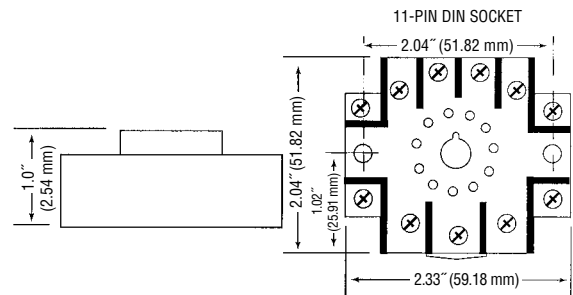
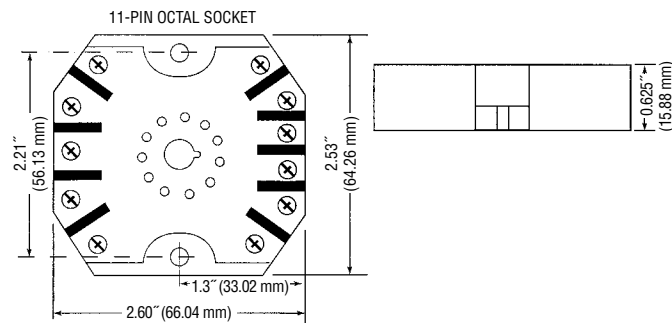
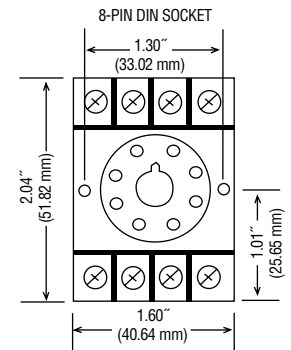
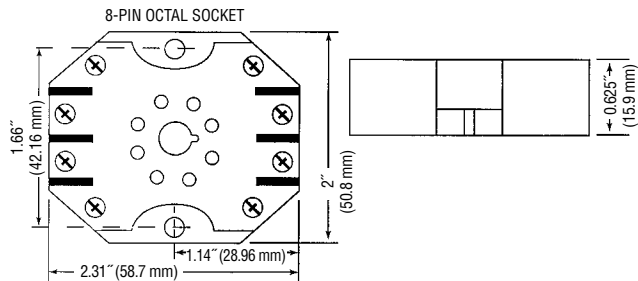
Socket Details and Option Availability  
are located on web site.

## Sockets and Standoffs – 16, 26 and DF Series Only



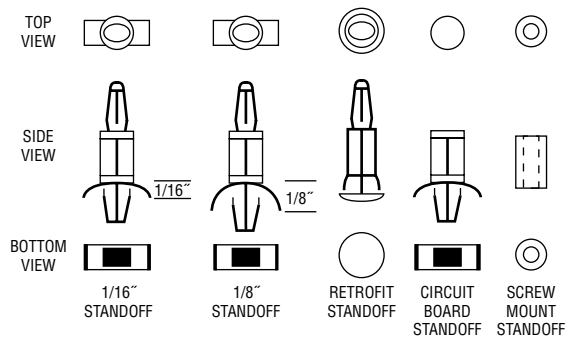
### Sockets

Warrick provides four different types of sockets for use with plug-in control modules.



### Standoffs

Warrick provides four different types of standoffs designed to connect circuit boards to panels.



## Optional Character Reference – 16, 26 and DF Series Only

### Manual Reset

#### Available on Series 26, 26M and DF controls

(Normally closed pushbutton across reset terminals. Pushbutton ordered separately): Manual reset only applies to the function associated with terminal LLCO. When the liquid rises to the electrode on terminal LLCO, the control will remain de-energized (load contacts in original state) until the pushbutton is depressed. The control will then energize, (LED will be lit) changing the state of the contacts. The control remains energized until the liquid level recedes below electrode on terminal LLCO. The control then de-energizes, (LED will go off) returning load contacts to their original state. Unless otherwise specified, there is a three second time delay on decreasing level. Liquid must be below probe on terminal LLCO for full three seconds before control de-energizes.

### Manual Reset with Power Outage Feature

#### Available on Series 26, 26M, and DF controls

Reset (Normally closed pushbutton across reset terminals. Pushbutton ordered separately) Control will ignore power loss to control. With liquid in contact with electrode on terminal LLCO, a power outage will cause the control to de-energize, but will automatically energize upon return of power. However, loss of liquid will cause control to de-energize and remain so until liquid again rises to electrode and pushbutton is depressed.

### Time Delays Associated with Terminals H and L

#### Available on Series 16, 16M, and DF controls

With time delay on increasing level, the liquid must be in contact with the high electrode for the full duration of the time delay before control will operate. With delay on decreasing level, the liquid must be below the low electrode for the full duration of the time delay before control will operate. In single level service, terminals 3 and 4 must be jumpered together to achieve time delays on both increasing and decreasing levels or just decreasing level.

### Time Delays Associated with Terminal LLCO

#### Available on Series 26, 26M, and DF controls

3 Second time delay on decreasing level is standard. Delay up to 90 seconds, can be specified and would act in the same manner as listed above.

### Time Out Option

#### Available on Series 16, 16M, and DF controls

The latching circuit for the high and low electrode has an optional timer. In some applications the High or Low electrode may become short circuited or disconnected. Such an occurrence may potentially over fill in fill applications, or cause the pump to run dry in pump down applications. The time option is custom programmed up to 3 minutes. When a fault condition occurs, the FILL LED will have a blink sequence of .5 seconds on 2 seconds off. See Chart A for time delay options.

### Test Feature

#### Available on Series 26, 26M, and DF controls

Allows LLCO circuit to be tested. Holding down the reset button for 3 seconds will allow the LLCO circuit to trip which simulates the loss of water, without the need of draining the water level in the boiler. The control will return to normal operation once the reset button is pressed a second time. (Test feature option only available with the manual reset function.)

Chart A – Time Out Option

Optional Character	Time Out (in seconds)					
	30	60	90	120	150	180
K	•					
L		•				
M			•			
N				•		
P					•	
Q						•

Chart B – Optional Character Information

Option Components					Control Series	Optional Character
Reset Function	Normally Closed Pushbutton*	Power Outage	Retrofit Plate	Test Feature		
•					DF "LLCO"	D
•	•				26, 26M, 26NM	C
•		•			26, 26M, 26NM	E
•			•		16, 16D, 26, DF	R
•	•				DF "LLCO"	S
•		•			DF "LLCO"	K
•			•		DF	W
•				•	26, 26M, 26NM, DF"LLCO"	B
•	•	•			26, 26M, 26NM	F
•		•	•		26	N
•	•	•			DF "LLCO"	G
•	•		•		DF	T
•	•			•	26, 26M, 26NM, DF"LLCO"	Y
•		•	•		DF	L
•		•		•	26, 26M, 26NM, DF"LLCO"	Z
•	•	•	•		26	P
•	•	•	•		DF	J
•	•	•		•	26, 26M, 26NM, DF"LLCO"	A
No options						X

\* N.C. pushbutton when purchased in conjunction with open control must be remotely

## Series 19MR

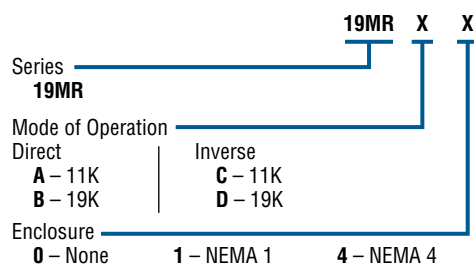
### Direct Motor Load of 30 Amps @ 240 VAC

Series 19MR controls are the ideal choice where pump up or pump down service is necessary. This control eliminates the need for contactors because it can directly handle motors up to 1 HP at 120 VAC, or motors up to 2 HP at 240 VAC.

<b>Enclosures</b>	Optional
<b>Output Contact Rating</b>	30 amp @ 240 VAC
<b>Powered Output Contact</b>	SPST 30 A at supply voltage (120 or 240 VAC)
<b>Horsepower Range</b>	1 hp for 120 VAC; 2 hp for 240 VAC
<b>Terminals</b>	3/16" spade lug on probe connections 1/4" spade lug on power connections
<b>Primary Voltage</b>	120 VAC or 240 VAC (+10%/-15%), 50/60 Hz
<b>Secondary Voltage</b>	11.0 VAC, 1.5 mA
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals</b>	U.L. 508 File # E44426, Vol. 1 Sec. 6

### How to Order

Use the **Bold** characters from the chart below to construct a product code.

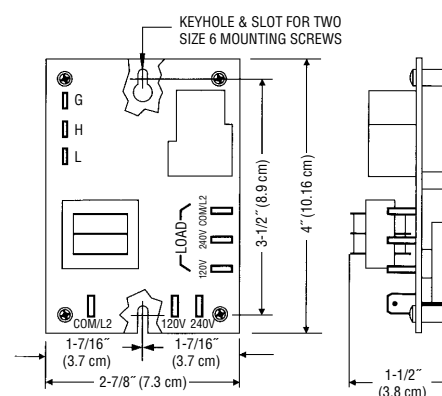


Series 19MR

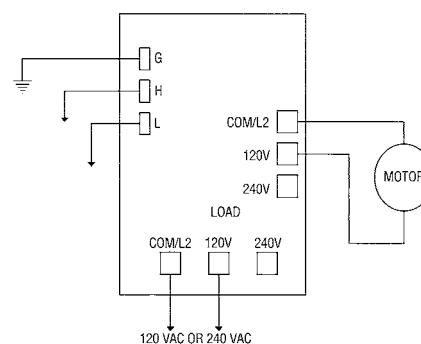
### Applications

- Carbonators
- Appliances
- Sumps
- Low-Water Cutoff
- Direct Motor Load

### Dimensions



### Wiring



**Caution:** 19MR contacts are powered contacts. When power is applied to the 19MR controller, power may be present on relay output connections. Output voltage will be same as input voltage.

## Series DC For Remote Applications

Series DC controls are designed for applications where only direct current power is available. DC units can be used as differential level controls or single point alarm contactors. Because of solid state reliability, plug-in convenience, and choice of 12 or 24 VDC supply voltage, Warrick DC controls can be used with confidence in many applications.

<b>Contact Design</b>	SPDT 1 N.O. & 1 N.C. (1 form C), non-powered contacts
<b>Contact Rating</b>	5 amp @ 30 VDC or 120 VAC Resistive 1/8 hp
<b>Mode of Operation</b>	Direct/Inverse, factory set
<b>Sensitivity</b>	0 - 1M ohm maximum, factory set
<b>Primary Voltage</b>	12 VDC, 24 VDC, negative ground ( $\pm 20\%$ )
<b>Supply Current</b>	40 mA when relay energized, 10 mA w/relay de-energized
<b>Secondary Voltage</b>	12 VDC
<b>Terminal Style</b>	Screw connector
<b>Temperature</b>	-50°F to +150°F (-46°C to +65°C)
<b>Options</b>	Time Delay

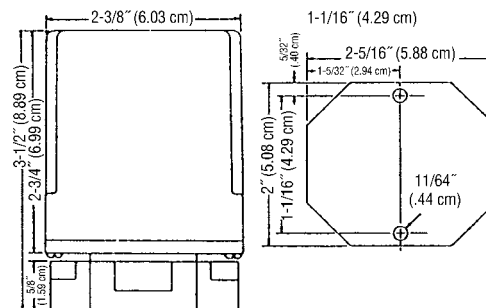


Series DC

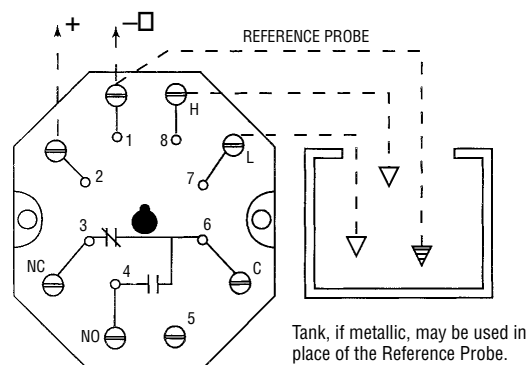
### Applications

- Single and Differential Service
- Solar and Wind Powered Pumps
- Portable Cleaning Equipment
- Battery-Powered Level Control
- Well Pumps
- Remote Reservoirs
- Remote Irrigation
- Onboard Ship Level Control

### Dimensions

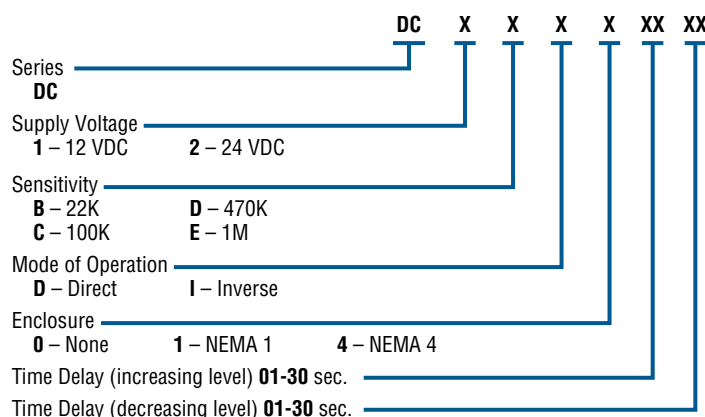


### Wiring



### How to Order

Use the **Bold** characters from the chart below to construct a product code.



## Series 27 Intrinsically Safe Controls

- ▶ Cannot Ignite Flammable Materials
- ▶ Solid State Reliability
- ▶ Up to 100K Ohm/cm Sensitivity
- ▶ Internal Surge Suppression
- ▶ SPDT Contacts
- ▶ Can Be Used for Single Level or Differential Service

### Series 27 – UL-CSA Approved

Series 27 is UL approved for use in Class I, Groups A, B, C, D; Class II, Groups E, F, G; and Class III hazardous locations. SPDT output contacts. UL Pilot Duty rated.

CSA Certified for Class 1, Groups A, B, C and D; Class II, Groups E, F and G; Class III

### Specifications

<b>Contact Design</b>	
<b>Series 27</b>	1 N.O. & 1 N.C. (1 form C)
<b>Contact Rating (24/120/240VAC)</b>	8 amp Resistive
<b>Mode of Operation</b>	Direct/Inverse, factory set
<b>Sensitivity</b>	
<b>Series 27</b>	0-100K ohm, factory set
<b>Primary Voltage</b>	
<b>Series 27</b>	120 VAC, 240 VAC (+10%/-15%) 50/60Hz
<b>Secondary Voltage</b>	
<b>Series 27</b>	11 VAC, 2.3 mA
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals</b>	
<b>Series 27</b>	U.L. 913 File # E44570; CSA #2174246
<b>Connections</b>	All screw type connections

### How to Order

Use the **Bold** characters from the chart below to construct a product code.

Series	<b>27</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Mode of Operation	<b>A</b> – Direct	<b>B</b> – Inverse			
Supply Voltage	<b>1</b> – 120 VAC	<b>2</b> – 240 VAC <sup>1</sup>			
Sensitivity (ohms)	<b>D</b> – 3K	<b>E</b> – 10K	<b>G</b> – 100K		
Enclosure	<b>0</b> – None	<b>1</b> – NEMA 1	<b>4</b> – NEMA 4		

#### Notes:

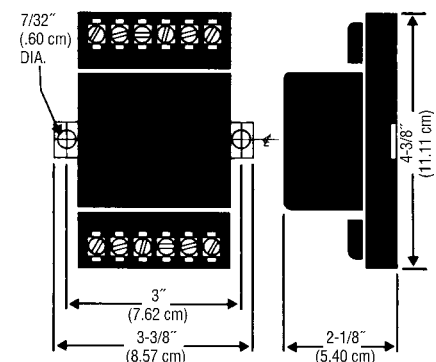
1. Non- standard, but available in Series 27.



### Applications

- Hazardous Atmospheres
- Pumps
- Waste Treatment
- Alarms
- Sewage
- CP Industry

### Dimensions



## Series 47 4-Channel Relay, Alarm Panel Control

- ▶ Solid State Reliability
- ▶ 0-50K Ohm/cm Sensitivity
- ▶ Alarm Contacts for Audible and Visual Alarms
- ▶ 4 Channel Relay
- ▶ Removable Terminal Strips
- ▶ Inverse or Direct Acting Field Selectable
- ▶ U.L. Listed

Series 47 controls offer complete alarm panel control in a single package. Powered output contacts allow quick connection of lights and audible alarms. Test and silence functions are built in. Unit also carries one SPDT master alarm contact for remote alarm activation.

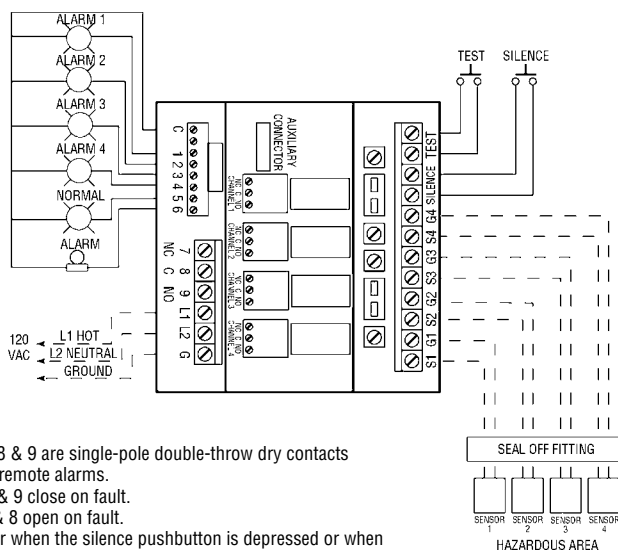
Approved for Class I, II, III, Division 1, Groups C, D, E, F, G hazardous atmospheres, Series 47 controls supply four channels which can be used with conductivity liquid level sensors or dry contact sensors.

This device functions as an alarm or single point control. Field adjustable for direct or inverse operation, it can operate separate visual alarms with a common audible alarm channel. Silence and test terminals are standard. For additional lights, alarms or outputs, auxiliary contacts must be ordered.

### Alarm Specifications

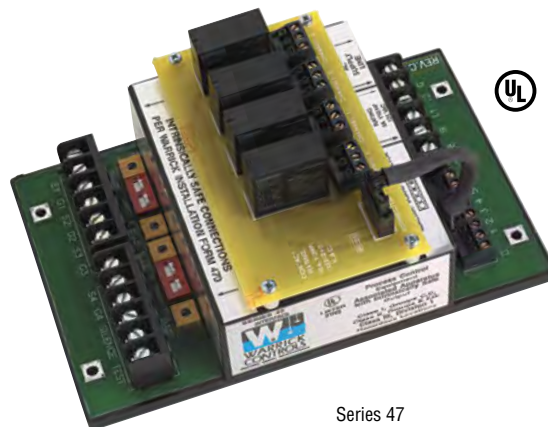
<b>Contact Design</b>	SPDT 1 N.O. & 1 N.C.
<b>Master Alarm Contact Rating (30VDC, 120/240VAC)</b>	5 amp Resistive, 1/10 hp
<b>Indicator Contacts</b>	Powered 120 VAC 25mA
<b>Indicator Contacts for Audible Alarm</b>	Powered 120 VAC 5A
<b>Auxiliary Contacts (optional)</b>	SPDT 120 VAC 10A (not powered)
<b>Sensitivity</b>	0-50K ohm maximum specific resistance
<b>Primary Voltage</b>	120 VAC (+10%/-15%) 50/60 Hz
<b>Secondary Voltage</b>	12 VAC @ 6mA RMS
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals</b>	U.L. 913 File # E44570

### Wiring



#### Notes:

1. Terminals 7, 8 & 9 are single-pole double-throw dry contacts designed for remote alarms.
2. Terminals 8 & 9 close on fault.
3. Terminals 7 & 8 open on fault.
4. Contacts clear when the silence pushbutton is depressed or when the fault condition is cleared.

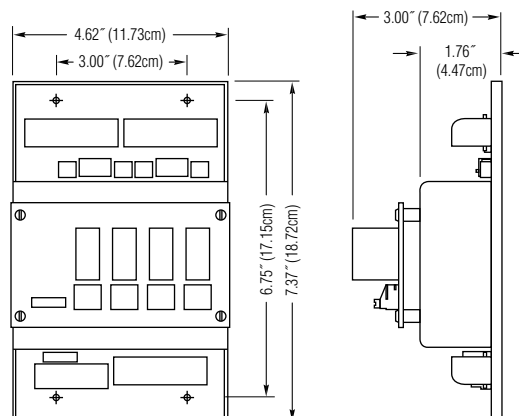


Series 47

### Applications

- Hazardous Atmospheres
- Monitoring and Control
- Storage Tank Alarm Panels
- Input for Computer
- Input for Phone Dialer

### Dimensions

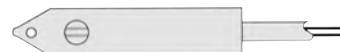


### How to Order

Use the **Bold** characters from the chart below to construct a product code.

Series	<b>47</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XXX</b>
Sensitivity (ohms)	<b>C</b> - 26K	<b>D</b> - 50K	<b>E</b> - 100K		
Supply Voltage	<b>1</b> - 120 VAC				
Auxiliary Contacts	<b>A</b> - Auxiliary Contacts	<b>B</b> - No Auxiliary Contacts			
Number of Probe Channels	<b>3A1</b> - One	<b>2A2</b> - Two	<b>1A3</b> - Three	<b>0A4</b> - Four	

See Our Interstitial Tank Monitoring Products on page A-22.



# Series 67 Multi-Function Control Duplex Pump System Control

- ▶ Inverse or Direct Acting, Field Selectable
- ▶ Solid State Reliability
- ▶ Compact Size
- ▶ Four Independent Channels – 2 Single, 2 Differential
- ▶ Field Adjustable, Sensitivity and Mode Selection
- ▶ LED Channel Indicators
- ▶ Built-in Silence/Acknowledge Circuit
- ▶ U.L. “Intrinsically Safe”

Warrick's Series 67 four channel level control is an ideal solution to liquid level problems in hazardous applications for the sewage, waste water, chemical and groundwater remediation industries.

Connected to floats or conductance probes this versatile control provides simplex or duplex pump/solenoid valve control; automatic or manual alternation; high and/or low level alarms with silence/acknowledge capabilities.

The Series 67 can be used in hazardous applications as an intrinsically safe interface to non-powered contacts and sensors such as push button operators, limit, temperature, pressure and vacuum switches.

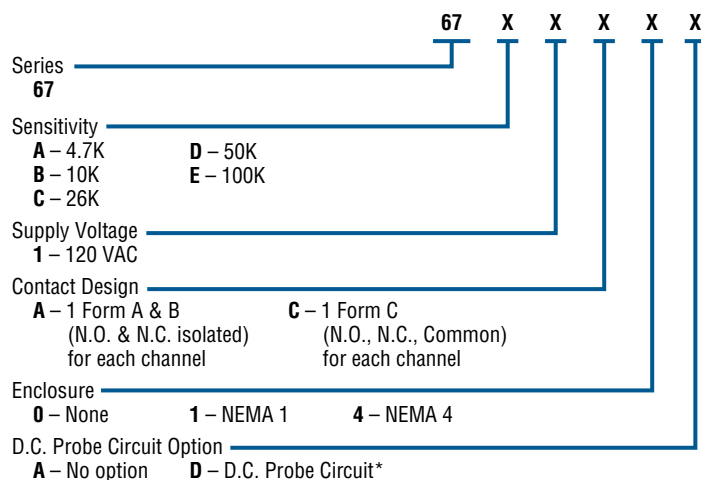
Designed for hazardous applications, its low cost, integrated features and compact size also make it ideal for non-hazardous applications.

## Specifications

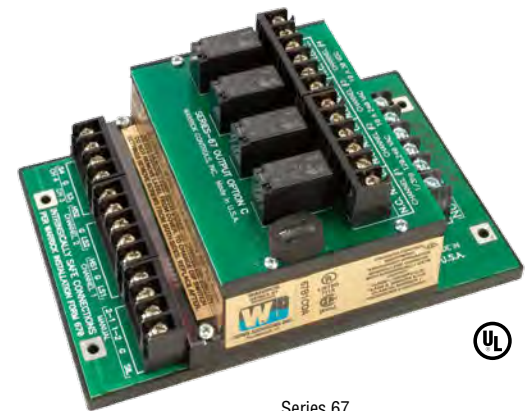
<b>Contact Design</b>	Standard N.O., N.C. (form C); Optional N.O., N.C.
<b>Contact Rating (30VDC, 120/240VAC)</b>	10 amp (style C); 5 amp (style A)
<b>Primary Voltage</b>	120 VAC, 50/60 Hz
<b>Secondary Voltage</b>	12 VAC @ 6mA RMS
<b>Sensitivity</b>	4.7K - 100K ohms maximum specific resistance, factory set
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C)
<b>Approvals</b>	U.L. 913 File # E44570

## How to Order

Use the **Bold** characters from the chart below to construct a product code.



\*Eliminates short cycles

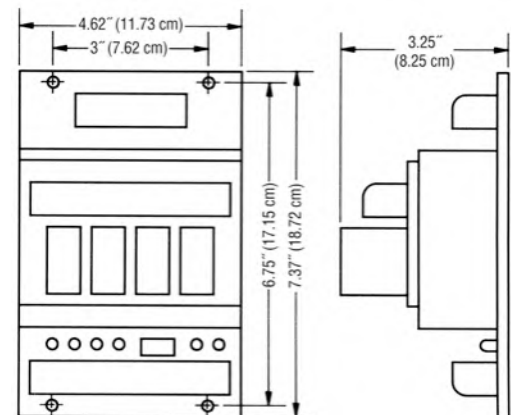


Series 67

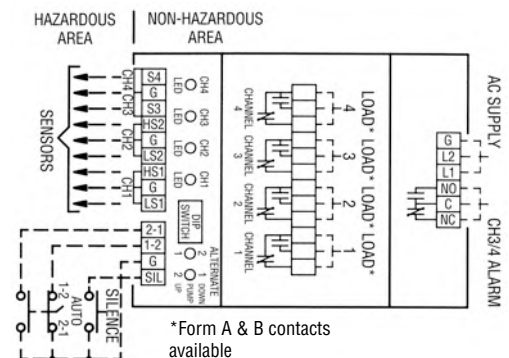
## Applications

- Hazardous Atmospheres
- Multiple Functions
- Simplex or Duplex
- High/Low Level Alarms
- Auto or Manual Alternation
- Pump/Solenoid Valves
- Sewage Lift Stations
- Wastewater Treatment
- Chemical Plants
- Groundwater Remediation

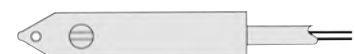
## Dimensions



## Wiring



See Our Interstitial Tank Monitoring Products on page A-22.



## Warrick® Sensor Fittings and Probes

Warrick Liquid Level Sensors are available in single- and multi-probe models and with a variety of fittings. The versatility of the Warrick design makes these sensors ideal for a diverse range of applications.

Examples include:

- Food and Beverage
- Pharmaceuticals
- Caustics and Acids
- Boilers and Steam Generators
- Sumps
- Ponds
- Reservoirs
- Sewage and Wastewater

### Probe Styles

- Metal Rods
- Wire Suspended
- Corrosion Resistant
- Sanitary



### Fitting Styles

- 3/8" to 3" Threaded Mount
- Bracket Mount
- Flange Mount
- External Mount
- Sanitary Mount
- Condulet Mount






### Sensor Selection Chart

SERIES		3E	3N	3F	3G	3C	3K	3J	3L	3M	3MT	3S	3R	3T	3B	3H	3W	3Y
Page Number		E-20	E-20	E-19	E-19	E-23	E-23	E-18	E-18	E-25	E-25	E-24	E-21	E-21	E-20	E-18	E-22	E-22
Body Options	Flange			•	•													
	Pipe Thread	•			•			•										
	Flat Mount		•		•													
	Side Chamber					•	•											
	Non-Contact Electrodes											•						
	Food Grade Connection									•	•							
	Bracket Mount											•						
Fitting Body Material Options	Brass	•	•	•		•		•										
	PVC		•	•	•													
	1018 Carbon Steel			•														
	Stainless Steel	•		•														
	Forged Steel			•														
	Nylon									•	•							
	Cast Iron	•				•	•	•				•						
Housing Material	Coated Aluminum	•	•	•		•	•	•				•						
	Polycarbonate				•													
Number of Probes	1 to 3		•					•										
	1 to 4					•	•			•	•							
	1 to 7	•		•	•							•						
Electrodes	Electrode Only								•				•	•	•	•	•	•

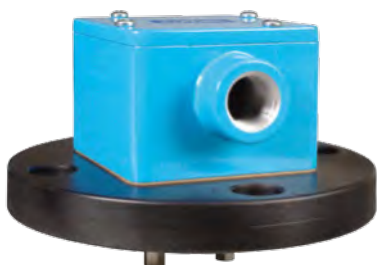

# Designed for OEM

- ▶ Compact
- ▶ One-Piece Probe/Body Construction
- ▶ Quick Install & Connect
- ▶ Order Sized to Your Spec

These Warrick fitting are designed for OEM use. They are shipped ready for quick installation. Integrated probes eliminate pre-assembly tasks, and avoid potential vibration-induced loosening when installed with power tools. Choose from single- or multi-electrode probe series. Gems supplies these series with probes pre-cut to lengths you specify.

Series	3J	3H	3L
			
Probe Quantity	1, 2 or 3	1	1
Mounting Size	1" NPT	3/8" NPT or 5/8" NF/NFE	1/8" NPT
Materials			
Body	Case iron or red brass	316 stainless steel	316 stainless steel
Terminal Housing	Diecast aluminum, epoxy coated (optional)	—	—
Probe	316 stainless steel	316 stainless steel	316 stainless steel
Insulation	Teflon®	Teflon®	Teflon®
Probe Diameter	3/16"	1/4"	3/16"
Pressure/Temperature	0 psig @ 500°F	250 psig @ 406°F	150 psig @ 365°F
Approvals	—	U.L. File #MP2489, Vol. 1 Sec. 1; CSA; FM	U.L. File #MP2489
Use the <b>Bold</b> characters from the chart below to construct a product code.	<p>Series <b>3J</b></p> <p>Number of Probes <b>1</b> – One <b>2</b> – Two <b>3</b> – Three</p> <p>Body Material<sup>1</sup> <b>B</b> – Cast Iron <b>C</b> – Red Brass</p> <p>Housing <b>0</b> – None <b>1</b> – Optional Housing</p> <p>Length of Probes<sup>2</sup> <b>A</b> – All probes 10-1/4" <b>C</b> – For lengths less than 10-1/4" indicate length as inches in decimal form</p>	<p>Series <b>3H</b></p> <p>Thread <b>1</b> – 3/8" – 18 NPT <b>2</b> – 5/8" – 18 UNF <b>3</b> – 5/8" – 24 UNEF</p> <p>Sleeve<sup>1</sup> <b>B</b> – Teflon® 3/4" Long</p> <p>Length (Feet)<sup>2</sup> <b>1</b> – One <b>2</b> – Two <b>3</b> – Three</p>	<p>Series <b>3L</b></p> <p>Connection Size <b>1</b> – 1/8" NPT</p> <p>Insulator Length <b>D</b> – Teflon® 1-1/4"</p> <p>Length in Inches<sup>1, 2</sup> <b>02</b> – Two <b>06</b> – Six <b>10</b> – Ten <b>03</b> – Three <b>07</b> – Seven <b>11</b> – Eleven <b>04</b> – Four <b>08</b> – Eight <b>12</b> – Twelve <b>05</b> – Five <b>09</b> – Nine</p>
Notes	<p>1. Probes are stainless steel.</p> <p>2. 10-1/4" maximum</p>	<p>1. Longer Teflon® sleeves are available. Contact factory or your representative</p> <p>2. Custom probe and insulation lengths are available. Contact your representative.</p>	<p>1. 12" maximum</p> <p>2. Indicate fractional inches in decimal form (01.75 = 1-3/4")</p>




## Top Mounting Fixtures – General Purpose

Series	3F	3G																									
																											
Mounting Connection	Flange — 4.5" to 7.5" Dia.	NPT, Flange, Bracket (Plate)																									
Probe Quantity	1 thru 7	1 thru 7																									
Description	Designed for general purpose service, Series 3F flanged, pressure-tight fittings can handle up to 7 probes. They mate with standard pipe flanges coupled to the top of the vessel. Available in a variety of materials.	Series 3G fittings are designed for general purpose use, and are made of PVC to withstand corrosive conditions. The flanged assemblies are sized to accommodate up to 7 probes and to mate with standard flanges on the tops of vessels.																									
Materials																											
Terminal Housing	Die-cast aluminum, epoxy coated	Polycarbonate																									
Body	Forged steel, red brass, 316 S.S., 1018 C.S, PVC	PVC																									
Probe Insulation	Teflon®	Teflon®																									
Pressure/Temperature	125 psig @ 323°F (cast iron) 225 psig @ 150°F (brass) 230 psig @ 100°F (316 S.S.) 275 psig @ 100°F (1018 C.S.) PVC – not rated	0 psig @ 150°F (PVC)																									
Approvals	CSA	—																									
Dimensions	<table><tr><th>No. of Probes</th><th>Nominal Pipe Flange Size</th><th>Diameter of Flange</th><th>Conduit Boss Thread Size</th><th>Terminal Housing Size (W" x D" x H")</th></tr><tr><td>1</td><td>1</td><td>4-1/2"</td><td>1/2" NPT</td><td>2-1/4 x 2-1/4 x 2-1/4</td></tr><tr><td>2-3</td><td>2</td><td>6"</td><td>1/2" NPT</td><td>3-1/4 x 3-1/4 x 2-3/8</td></tr><tr><td>4</td><td>2-1/2</td><td>7"</td><td>1/2" NPT</td><td>3-1/4 x 3-1/4 x 2-3/8</td></tr><tr><td>5-7</td><td>3</td><td>7-1/2"</td><td>3/4" NPT</td><td>4 x 4 x 2-1/2</td></tr></table>	No. of Probes	Nominal Pipe Flange Size	Diameter of Flange	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")	1	1	4-1/2"	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	2-3	2	6"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	4	2-1/2	7"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	5-7	3	7-1/2"	3/4" NPT	4 x 4 x 2-1/2	
No. of Probes	Nominal Pipe Flange Size	Diameter of Flange	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")																							
1	1	4-1/2"	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4																							
2-3	2	6"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8																							
4	2-1/2	7"	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8																							
5-7	3	7-1/2"	3/4" NPT	4 x 4 x 2-1/2																							
How to Order	<p>Use the <b>Bold</b> characters from the chart at right to construct a product code.</p> <p>Electrode Probes are ordered separately.</p> <p>Series <b>3F</b> <b>X</b> <b>X</b></p> <p>Number of Probes <b>1 thru 7</b></p> <p>Body Material <b>A</b> – Forged Steel (Raised Face) <b>B</b> – Red Brass (Flat Face) <b>C</b> – 316 S.S. (Raised Face) <b>D</b> – 1018 C.S. (Raised Face) <b>E</b> – PVC (Flat Face)</p>	<p>Series <b>3G</b> <b>X</b> <b>X</b> <b>X</b></p> <p>Number of Probes <b>1 thru 7</b></p> <p>Base Size and Style <b>A</b> – 2" Flange (6" O.D.)<sup>3</sup> <b>E</b> – 2" NPT<sup>3</sup> <b>B</b> – 3" Flange (7-1/2" O.D.) <b>H</b> – 3" NPT <b>C</b> – 3-1/4" x 6" x 3/4" PVC Plate</p> <p>Probe Type <b>1</b> – 316 S.S. Inserts for Use with 1/4" Rod Extensions<sup>4</sup> <b>2</b> – Tapered Probe Assembly<sup>5</sup> <b>3</b> – Wire-Suspended Probes<sup>6</sup></p>																									
Compatible Electrode Probes (order separately)	3R, 3W <sup>1</sup> , 3Y <sup>2</sup>	3R, 3T, 3W <sup>1</sup> , 3Y <sup>2</sup>																									

### Notes:

- Requires 3Z1B Adapter and 3Z1A Wire.
- Requires 3Z1B Adapter.
- Maximum 4 probes.
- Order 3R rods separately. See page E-21.
- Order 3T rods separately. See page E-21.
- Order 3W/3Y probes separately. See page E-22.

Custom options available. Consult factory.

<b>3E</b>		<b>3N</b>		<b>3B</b>	
					
1" to 3" NPT		#10 Machine Screws from Underside		3/8" - 18NPT, 5/8" - 18UNF, 5/8" - 24UNEF	
1 thru 7		1 thru 3		1	
Series 3E fittings are cast metal, pressure-tight assemblies capable of handling 1-7 probes. Attachment to vessels is accomplished with external pipe threading. 3E Fittings require the use of 3R rigid or 3W wire suspended electrodes.		Series 3N fittings accommodate 1-3 probes operating at atmospheric pressure. The assembly mounts on a flat surface atop open tanks or closed vessels. 3N Fittings require the use of 3R rigid or 3W wire suspended electrodes.		Series 3B fittings are compact pressure tight assemblies that hold a single electrode probe for use in water and chemicals. These fittings incorporate a 1/4-20 female thread that must be combined with a Series 3R (rigid rod electrode) or Series 3W/3Y (wire suspended electrode) to make a complete assembly.	
Die-cast aluminum, epoxy coated		Die-cast aluminum, epoxy coated		—	
Cast iron, red brass, 316 stainless steel		PVC, red brass, 316 stainless steel		316 stainless steel	
Teflon®		Teflon®		Teflon®	
125 psig @ 353°F (cast iron) 250 psig @ 406°F (brass, 316 S.S.)		0 psig @ 150°F (PVC) 0 psig @ 500°F (brass, 316 S.S.)		250 psig @ 406°F 500 psig @ 75°F	
U.L. File #MP2489, Vol. 1 Sec. 1; CSA		CSA File #LR11644		U.L. File #MP2489, Vol. 1 Sec. 1; CSA	
	No. of Probes	Attachment to Vessel	Conduit Boss Thread Size	Terminal Housing Size (W" x D" x H")	
<b>3E</b>	1	1" NPT	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	
	2-3	2" NPT	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	
	4	2-1/2" NPT	1/2" NPT	3-1/4 x 3-1/4 x 2-3/8	
	5-7	3" NPT	3/4" NPT	4 x 4 x 2-1/2	
<b>3N</b>	1-3	2-1/4" square flat pad, 1-1/2" dia. hole in top of vessel secured with #10 machine screws at the corners of a 1-1/2" square	1/2" NPT	2-1/4 x 2-1/4 x 2-1/4	
Series <b>3E</b> Number of Probes <b>1 thru 7</b> Body Material <b>A</b> – Cast Iron <b>B</b> – Red Brass <b>C</b> – 316 Stainless Steel		Series <b>3N</b> Number of Probes <b>1 thru 3</b> Body Material <b>A</b> – PVC <b>B</b> – Red Brass <b>C</b> – 316 Stainless Steel		Series <b>3B</b> Thread <b>1</b> – 3/8" - 18 NPT <b>2</b> – 5/8" - 18 UNF <b>3</b> – 5/8" - 24 UNEF Metal Parts <b>B</b> – 316 Stainless Steel	
3R, 3W <sup>1</sup>		3R, 3W <sup>1</sup>		3R solid rod (up to 4') 3W <sup>1</sup> or 3Y <sup>2</sup> (greater than 4')	

Custom options available. Consult factory.

## Series 3R/3T General Purpose Probes

- ▶ Metallic Rods
- ▶ Available in Many Materials for Various Requirements
- ▶ Adaptable for Various Fittings

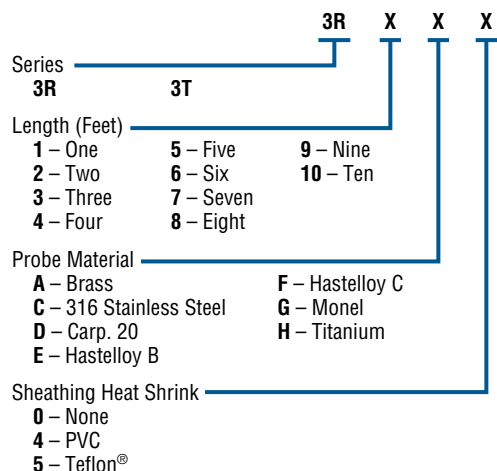
For general purpose use, Series 3R probes are metallic rods with threaded ends that screw into a fitting that extends vertically down into the liquid. Available in a variety of materials for different applications. 3T tapered rods are also available.

### Specifications

<b>Style</b>	
<b>Series 3R</b>	1/4" (.64 cm) threaded rod
<b>Series 3T</b>	1/4" (.64 cm) tapered rod
<b>Material</b>	Brass, Hastelloy C, Monel, 316 stainless steel, titanium, Carp. 20
<b>Sheathing (optional)</b>	PVC heat shrink 200°F (93°C), Teflon® heat shrink 350°F (177°C)

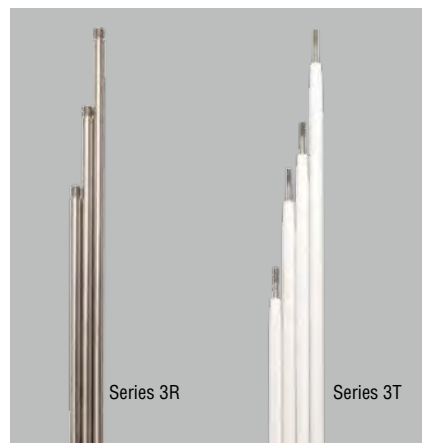
### How to Order

Use the **Bold** characters from the chart below to construct a product code.



Contact your representative for custom lengths.

Note: Long lengths can be coupled to facilitate shipping and installation. Consult factory.

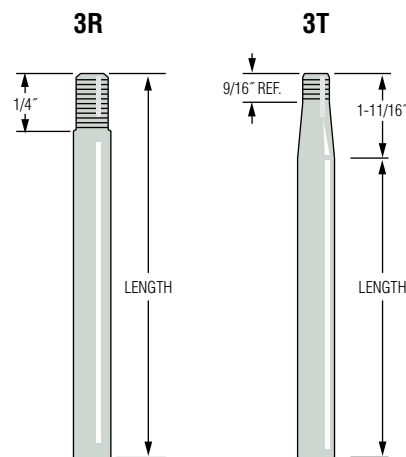


### Applications

3R: For use with Series 3E, 3F, 3G, 3B fittings

3T: For use with Series 3G and other custom configurations

### Dimensions



## Series 3W – Wire Suspended Probes

- ▶ Metallic Bars
- ▶ Plastic Shield Protected
- ▶ Adaptable to Many Fittings
- ▶ Field Assembled

Series 3W probes, consisting of metallic bars within a protective plastic shield, are designed to be suspended in liquid with PVC-insulated wires. They are ideal for applications where rigid electrode rods are impractical or cumbersome, such as:

- Deep Wells
- Pump Control
- Waste Water
- Deep Tanks

7/8" (2.22 cm) diameter x 3-3/4" (9.52 cm) length. 3Z1A wire and 3Z1B adaptor kit required for use with 3E, 3F and 3N fittings.

### How to Order

Select a 3W electrode, a 3Z1B adaptor and a length of 3Z1A suspension wire to form a complete suspended probe.

#### 1. 3W Electrodes

Probe Material	Part Number
Brass	3W1
316 Stainless Steel	3W2

#### 2. 3Z1B Adaptor Kit

For use with 3E, 3F and 3N fittings.  
**Part Number: 3Z1B**

#### 3. 3Z1A Suspension Wire

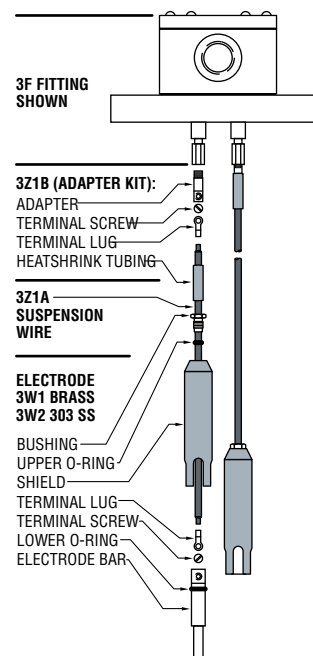
Order in standard or custom length.

Length (Feet)	Part Number
500	3Z1A-500
1000	3Z1A-1000
5000	3Z1A-5000
Custom	3Z1A-XX
Specify in one foot increments up to 5000 ft.	



Series 3W

### Components Detail



## Series 3Y – Corrosion Resistant Probes

- ▶ Metallic Bars
- ▶ Corrosion Resistant
- ▶ Available in Many Materials for Various Requirements
- ▶ Adaptable for Various Fittings

Series 3Y wire suspended probes consist of metallic bars within a protective plastic shield, designed to be suspended in liquid. Series 3Y suspension wires are PVC or Teflon® insulated for use in corrosive liquid applications. 7/8" (2.22 cm) diameter x 3-1/2" (8.90 cm) length.

### Specifications

<b>Style</b>	Wire suspended
<b>Tip Material</b>	Carp. 20, Hastelloy C, 316 stainless steel
<b>Shield Material</b>	PVC 150°F (66°C), Teflon®

### How to Order

Use the **Bold** characters from the chart below to construct a product code.

Series	<b>3Y</b>	<b>X</b>	<b>X</b>	<b>X</b>
Shield Material	<b>1</b> – PVC	<b>3</b> – Teflon®		
Probe Tip Material	<b>C</b> – 316 Stainless Steel	<b>F</b> – Hastelloy C		
	<b>D</b> – Carp. 20			
Length of Wire	<b>1</b> – 10 feet	<b>3</b> – 30 feet etc.		
	<b>2</b> – 20 feet			

Note: 3Z1B Connector is used to connect suspension wire with 3B, 3E, 3F, 3G or 3N fitting.



Series 3Y

### Applications

- General Purpose
- Wire Suspended Probes
- Corrosive Liquids, Chemicals

Order from: **C A Briggs Company**; 622 Mary Street; Suite 101 - Warminster, PA 18974  
Phone: 267-673-8117 - Fax: 267-673-8118; E-Mail: [Sales@cabriggs.com](mailto:Sales@cabriggs.com) - [www.cabriggs.com](http://www.cabriggs.com)

## Series 3C – Short External Mount Side Chamber

## Series 3K – Long External Mount Side Chamber

- ▶ Side Mounting
- ▶ Gauge Tappings
- ▶ Pressure Tight
- ▶ CSA Approved
- ▶ FM Approved
- ▶ Tricock Tappings
- ▶ 1-4 Probes
- ▶ Cast Iron and Brass
- ▶ U.L. Recognized

Series 3C side chamber fittings are cast iron or brass, pressure-tight chambers containing up to 4 probes from 1-1/2" to 6" in length. Pipe tappings provide connection to the side of boilers and pressure vessels to equalize the level in the chamber with the level in the vessel.

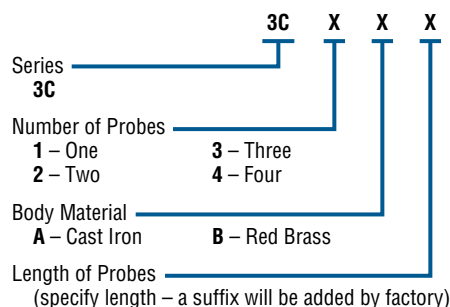
Series 3K fittings contain up to 4 probes and accommodate probes from 1-3/4" to 13" in length. Additional tappings are available for tricocks and gauges.

### Specifications

<b>Probes</b>	1 thru 4, with 316 Stainless Steel/Teflon® wetted parts
<b>Body Material</b>	
<b>Series 3C</b>	Cast iron, red brass
<b>Series 3K</b>	Cast iron
<b>Pressure/Temperature</b>	250 psig (17.2 bar) @ 406°F (200°C) (saturated steam)
<b>Probe Length</b>	
<b>Series 3C</b>	1-1/2" to 6" (3.81 cm to 15.24 cm)
<b>Series 3K</b>	1-3/4" to 13" (4.45 cm to 33.02 cm)
<b>Approvals</b>	U.L. File # MP2489, Vol. 1, Sec. 2; CSA; FM

### How to Order Series 3C

Use the **Bold** characters from the chart below to construct a product code.



#### Notes:

- Contact your representative for more details on this fitting.
- The 3C attaches to a vessel by two 1" NPT tappings, one 1" NPT blowdown port and one 3/4" NPT side port.

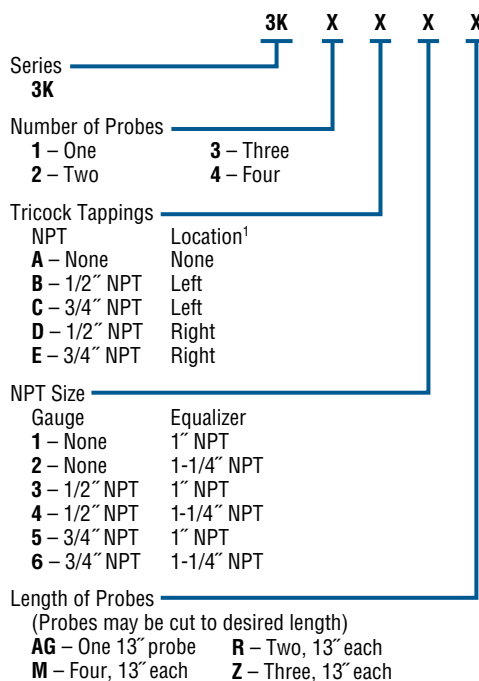


### Applications

- Boilers
- Hydropneumatic Tanks
- Steam Generators
- Pressure Vessels
- Pump Operation
- Low Water / High Water Alarm

### How to Order Series 3K

Use the **Bold** characters from the chart below to construct a product code.



#### Note:

- Viewer facing gauge glass

## Series 3S Multi-Wire Suspended Fittings

- ▶ Probe Isolation
- ▶ Long Length

The 3S series electrode fitting is designed to provide isolation of electrodes from liquids containing solids, grease, soaps, sludge, rags, paper and other debris commonly found in wastewater and sewage pumping applications.

Isolation is accomplished by enclosing wire suspended electrodes within a 1-1/2" galvanized pipe assembly with a neoprene flexible bulb installed on the lower end of the pipe. The bulb and pipe assemblies contain 3-1/2 quarts clean water with one ounce of sodium bicarbonate (baking soda).

When mounted in a sump, the pipe and bulb assembly is acted on by the hydrostatic pressure exerted by the liquid outside the bulb. Assuming the density of the liquid outside is equal to water, the height of the water inside the bulb will equal the height outside.

### Specifications

<b>Probes</b>	1 thru 7
<b>Materials of Construction</b>	Cast iron, galvanized pipe, stainless steel, neoprene
<b>Type of Connection</b>	3" flange (7-1/2" O.D.), or bracket
<b>Terminal Housing</b>	Die-cast aluminum, epoxy coated
<b>Pressure</b>	Atmosphere
<b>Temperature</b>	-40°F to +212°F (-40°C to +100°F)

### How to Order

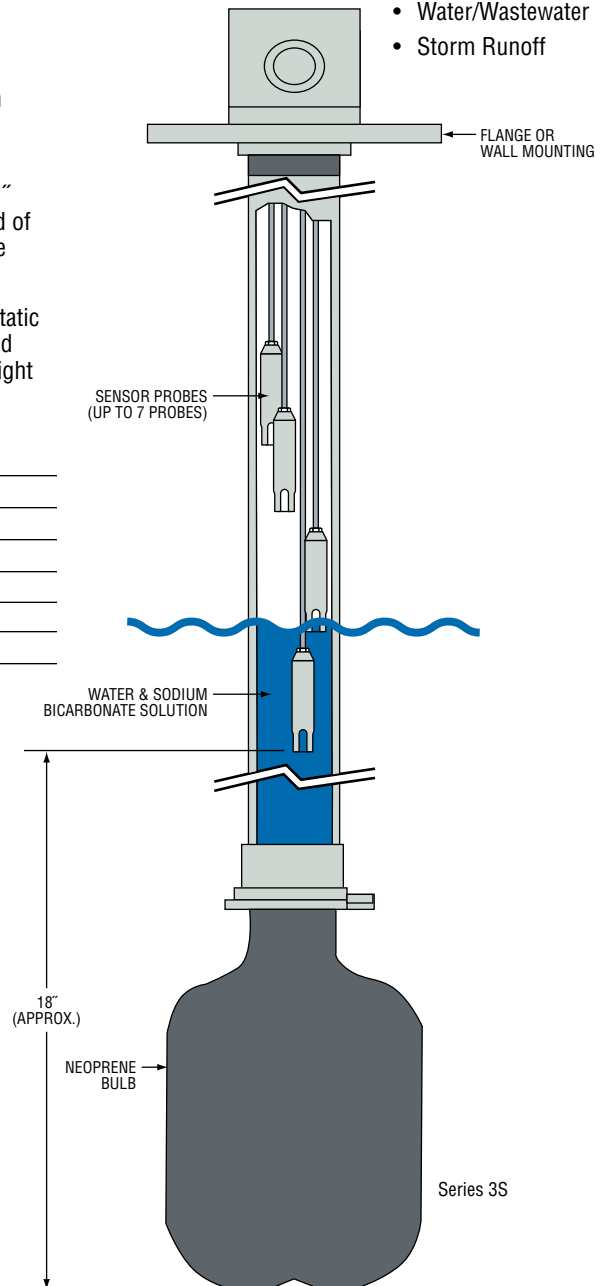
Use the **Bold** characters from the chart below to construct a product code.

Series	<b>3S</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>X</b>
Number of Probes	<b>1</b> – One	<b>4</b> – Four	<b>7</b> – Seven		
	<b>2</b> – Two	<b>5</b> – Five			
	<b>3</b> – Three	<b>6</b> – Six			
Mounting Method	<b>A</b> – Flange	<b>B</b> – Wall mount bracket			
Length of Longest Probe					
(Enter dimension in inches)					
Pipe	<b>blank</b> – Standard 1-1/2" galvanized pipe (included)				
	<b>A</b> – No pipe (customer supplied pipe)				

Note:  
Overall length is approximately 18" more than distance to longest electrode.  
Probe is adjusted by customer in the field.

### Applications

- Sewage
- Water/Wastewater
- Storm Runoff



## Series 3M – Food Grade Fitting

## Series 3MT – Food Grade Fitting

- ▶ Easy Removal for Cleaning
- ▶ CSA Approved
- ▶ FDA Approved Materials

Designed for use in food, beverage and pharmaceutical applications where cleanliness is vital. Two-piece Series 3M assemblies can handle up to 4 probes. FDA-approved materials. Engineered for fast removal of fitting to facilitate cleaning and sterilization.

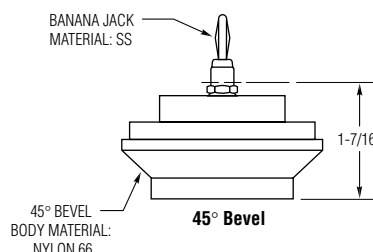
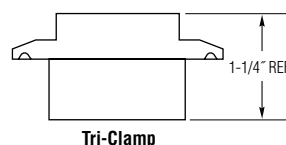
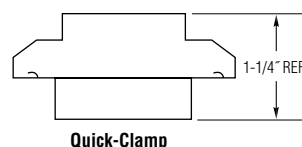
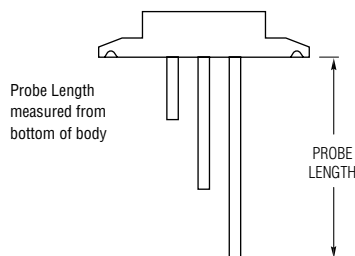
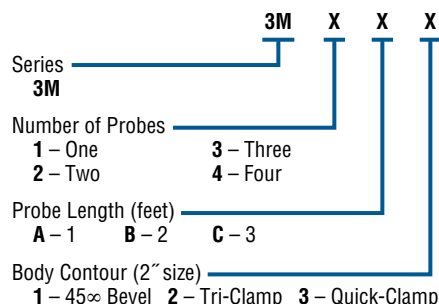
Series 3MT fittings are similar to 3M fittings, except they also feature Teflon®-covered probes with polished tips to meet the most demanding application requirements.

### Specifications

<b>Probes</b>	1 thru 4
<b>Body Contour</b>	45° bevel, Tri-Clamp, Quick Clamp
<b>Body Material</b>	Type 66 Nylon
<b>Probe Material</b>	
<b>Series 3M</b>	316 stainless steel, cut to length by user
<b>Series 3MT</b>	Teflon®-covered 316 stainless steel probes. Tip polished to RA <25 microns max. spec. (factory set lengths)
<b>Pressure/Temperature</b>	150 psig (10.3 bar) @ 150°F (65°C)
<b>Approvals</b>	FDA-approved materials; CSA

### How to Order Series 3M

Use the **Bold** characters from the chart below to construct a product code.



### How to Order Series 3MT

**3MT components must be ordered separately.**

#### Step 1. Upper Assembly\*:

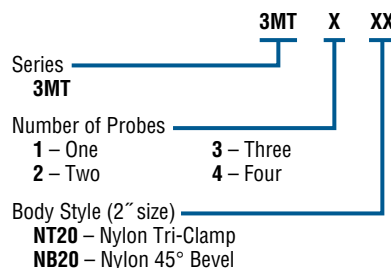
Select one part number.

- 7790575** – 1 Probe
- 7790577** – 2 Probes
- 7790581** – 3 Probes
- 7790584** – 4 Probes

\*10" lead length standard.

#### Step 2. Lower Assembly:

Complete part number based on Upper Assembly selected and Body Style.



#### Step 3. Probe Lengths\*:

Select a length for each probe to be used; maximum four.

- Probe 1 3MTPRL \_\_\_\_ (inches)
- Probe 2 3MTPRL \_\_\_\_ (inches)
- Probe 3 3MTPRL \_\_\_\_ (inches)
- Probe 4 3MTPRL \_\_\_\_ (inches)

\*Probe length must be specified in whole inches, 06" to 36". Length is not field adjustable.

## LWC-800 Series Low Level Cut Off Control

- ▶ External Mounting
- ▶ Meets CSD1 Requirements
- ▶ U.L. Recognized "Limit Control"
- ▶ Compact Size
- ▶ Options Include: Manual Reset, Power Outage Feature, and Test Feature

Gems LWC-800 is designed for boiler low-water cutoff protection, and offers the most compact package for boiler and steam generators. For added safety, the sensor assembly incorporates redundant reed switches at the actuation level. The LWC-800 Series is ideal for R.O., distilled, or deionized water systems.

### Optional Features:

- Power Outage feature allows for resets after nuisance power outages;
- Reset Button feature to be used when device has been deactivated due to low water condition. A Reset is activated only after water has returned to normal level.

### Specifications

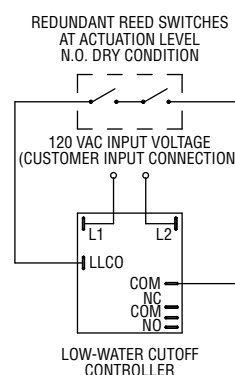
<b>Wetted Materials</b>	
<b>Bottle Housing</b>	Brass
<b>Stem and Mounting</b>	Brass
<b>Float Assembly</b>	316 Stainless Steel
<b>O-Ring</b>	Viton®
<b>Retaining Ring</b>	Beryllium Copper
<b>Pressure Rating</b>	150 PSI (1034 KPA)
<b>Temperature Range</b>	0°F to 305°F (-18°C to 151°C); 350°F (176°C) max. intermittent
<b>Mounting Attitude</b>	Vertical, J-Box Up
<b>Controller</b>	
<b>Contacts</b>	SPDT, Dry Contacts
<b>Contact Ratings</b>	10A @ 120/220/240 VAC Resistive (120°F/49°C) 1A @ 120, 208/240, 240 Resistive (150°F/66°C) 1/3 HP @ 120, 208/240, 240 VAC
<b>Secondary Circuit</b>	2.3 VAC RMS, <1 mA
<b>Sensitivity</b>	10K
<b>Ambient Temperature</b>	-40°F to +150°F (-40°C to +66°C)
<b>Time Delay</b>	0.5 Seconds on Rising Level
<b>Approvals</b>	UL Recognized per UL-353, Limit Controls (for supply voltages of 120 VAC or less)

### How to Order

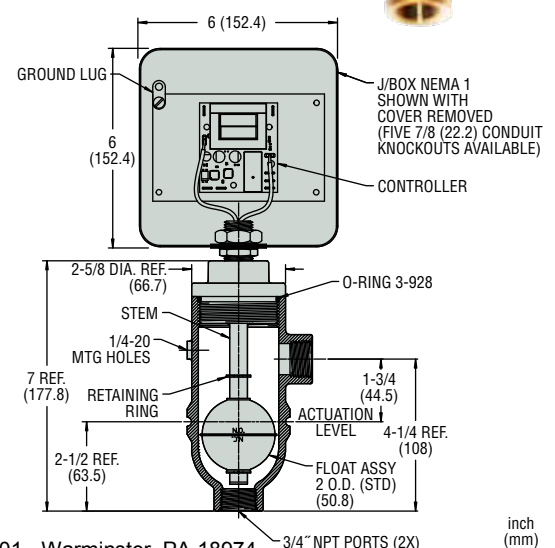
Specify Part Number based on configuration.

Description	Part Number
LWC-800 Integrated	243340
LWC-800 – 1-Foot Conduit	243345
LWC-800 – 2-Foot Conduit	243350

### Switch Actuation



### Dimensions



Order from: **C A Briggs Company**; 622 Mary Street; Suite 101 - Warminster, PA 18974

Phone: 267-673-8117 - Fax: 267-673-8118; E-Mail: [Sales@cabriggs.com](mailto:Sales@cabriggs.com) - [www.cabriggs.com](http://www.cabriggs.com)

## LWC-700/720 Series Low Level Cut Off and Pump Up Control

- ▶ Internal Mounting
- ▶ Meets CSD1 Requirements
- ▶ U.L. Recognized "Limit Control"
- ▶ Compact Size
- ▶ Options Include: Manual Reset, Power Outage Feature, and Test Feature

Gems LWC-700 is designed for boiler low-water cutoff protection, and offers the most compact internally mounting package for boiler and steam generators. The 720 Series includes the low-water cutoff function and adds Pump Up control for more sophisticated and convenient automation. For added safety, the sensor assembly incorporates redundant reed switches at the actuation level. The LWC-700 and LWC-720 Series are ideal for R.O., distilled, or deionized water systems.

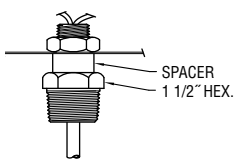
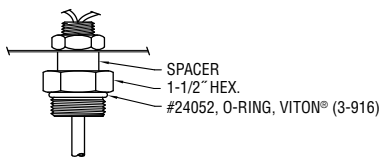
### Optional Features:

- Power Outage feature allows for resets after nuisance power outages;
- Reset Button feature to be used when device has been deactivated due to low water condition. A Reset is activated only after water has returned to normal level.

### Specifications

<b>Wetted Materials</b>	
<b>Stem, Mounting, Collars</b>	Brass or Stainless Steel
<b>Float Assembly</b>	316 Stainless Steel
<b>Pressure Rating</b>	150 PSI (1034 KPA)
<b>Temperature Range</b>	0°F to 305°F (-18°C to 151°C); 350°F (176°C) max. intermittent
<b>Float Acceptable Overtravel</b>	1/16" to 1/4" (1.6 mm to 6.5 mm) on Closure; 1/16" (1.6 mm) min. on Opening
<b>Mounting Attitude</b>	Vertical, J-Box Up
<b>Controller</b>	
<b>Contacts</b>	SPDT, Dry Contacts
<b>Contact Ratings</b>	10A @ 120/220/240 VAC Resistive (120°F/49°C) 1A @ 120, 208/240, 240 Resistive (150°F/66°C) 1/3 HP @ 120, 208/240, 240 VAC
<b>Secondary Circuit</b>	2.3 VAC RMS, <1 mA
<b>Sensitivity</b>	10K
<b>Ambient Temperature</b>	-40°F to +150°F (-40°C to +66°C)
<b>Time Delay</b>	0.5 Seconds on Rising Level
<b>Approvals</b>	UL Recognized per UL-353, Limit Controls (for supply voltages of 120 VAC or less)

### Mounting Types

Type 1 1" NPT	Type 2 1-5/16"-12UNF-2A <sup>1</sup>
	

Notes:

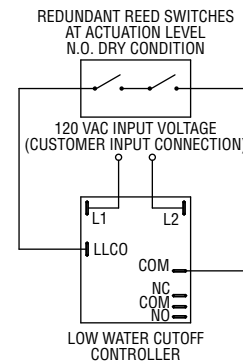
1. Mounting plug dimensions per SAE J1926.



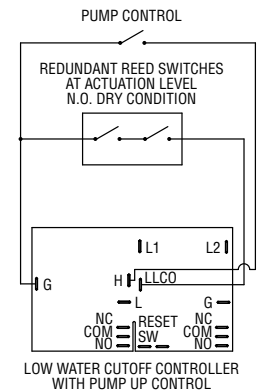
720 Series shown

### Switch Actuation

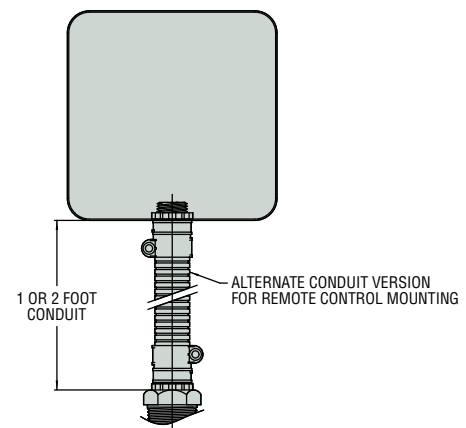
#### 700 Series



#### 720 Series

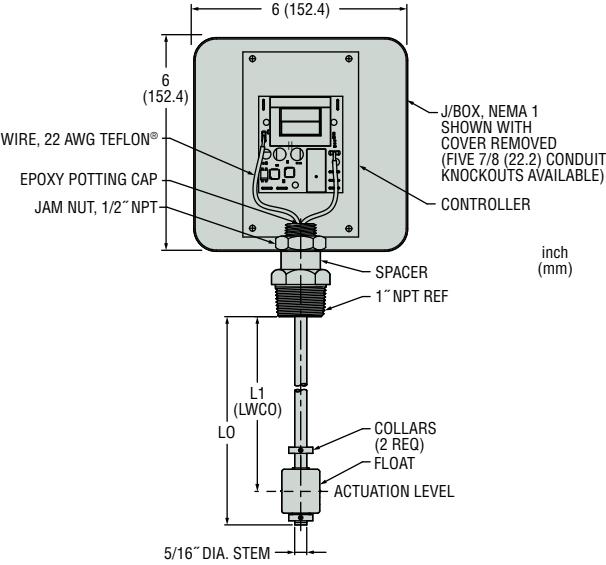


### Conduit Option



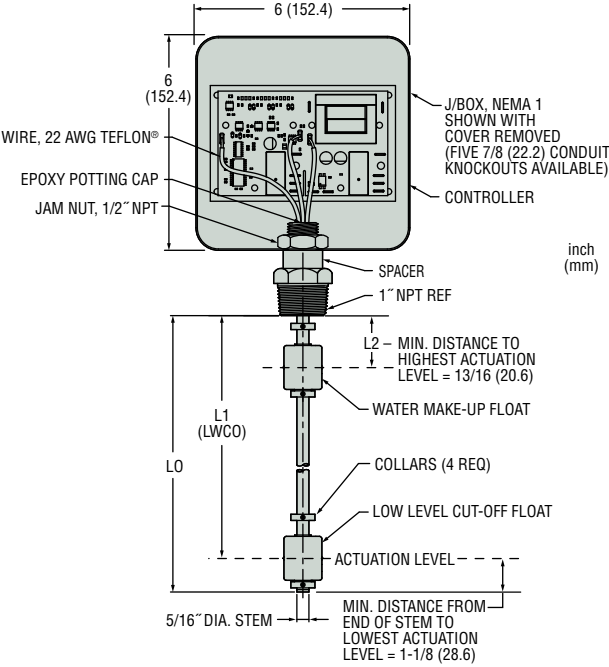
Dimensions

700 Series



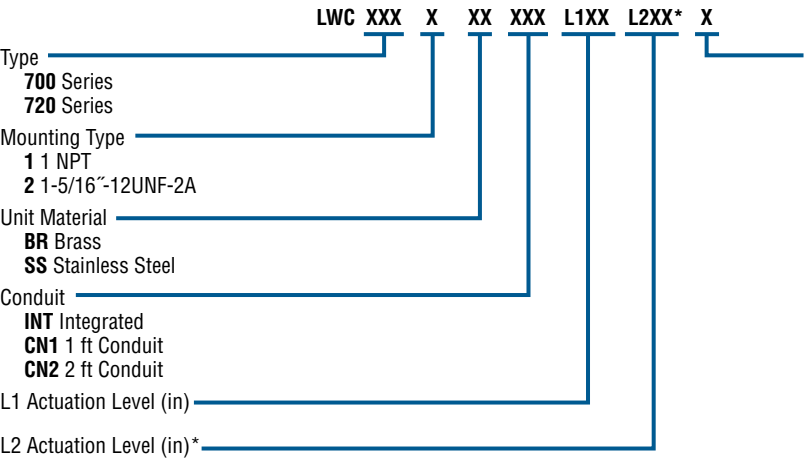
**Note:** Actuation levels are calibrated on ascending fluid levels.

720 Series



How to Order

Use the **Bold** characters from the chart below to construct a product code.



\* Used for 720 Series only; leave blank for 700 Series.

- Actuation level distances and LO (Length Overall) are measured from the inner surface of the mounting plug.
- LO = L1 + 1-1/8" (28.6mm)
- L2 may be no less than 2 inches (50.8mm) from L1 actuation level.

Notes:

- Dimensions based on liquid specific gravity of 1.0.
- Tolerance on actuation levels is  $\pm 1/8"$  (3.2mm).

Control Options

700 Series

Control Options			Part No. Code
N.C. Pushbutton	Power Outage	Test Feature	
•			C
	•		E
		•	B
•	•		F
•		•	Y
	•	•	Z
•	•	•	A

720 Series

Control Options			Part No. Code
N.C. Pushbutton	Power Outage	Test Feature	
•			S
	•		K
		•	B
•	•		G
•		•	Y
	•	•	Z
•	•	•	A

## CP Series Control Panels Standard Level Control System Electrical Panels

- ▶ NEMA-1 Enclosure – General Purpose
- ▶ NEMA-4 Enclosure – Water Resistant
- ▶ NEMA-4X Enclosure – Corrosion and Water Resistant
- ▶ Optional Equipment – Visual Alarms, High & Low Audible/Silent Alarms, Hand-off Auto Switches

When it comes to control panels, Gems Sensors can satisfy most requirements with our new family of CP Series Panels. These standard models were specifically designed around our most popular panel types. These industrial control panels interface with level and flow switches, Warrick conductance probes and a variety of sensors and are factory set for pump up/pump down. Gems can provide the panel and sensors you need for intrinsically safe and non-intrinsically safe environments. With each control panel, Gems provides electrical and mechanical drawings along with installation and operations manuals.

### Specifications

<b>Contact Design</b>	SPST
<b>Contact Rating (120 VAC)</b>	10 amp Resistive
<b>Primary Voltage</b>	120 VAC (+10%/-15%) 50/60 Hz
<b>Temperature</b>	-40°F to +150°F (-40°C to +65°C) Ambient
<b>Enclosure Type</b>	NEMA 1, NEMA 4, NEMA 4X Fiberglass
<b>Approvals</b>	U.L. 508A File # E100709; U.L. 698A File # E120178 (Series 67 control only)

### How to Order

Use the **Bold** characters from the chart below to construct a product code.

	CP	XX	XX	X	X	X	1	X	X
Control Relay									
16 Series 16M; 67 Series 67									
Panel Function									
A1 Simplex Pump Down; A2 Simplex Pump Up; B1 Duplex Pump Down w/Alternation; B2 Duplex Pump Up w/Alternation; S1 Solenoid Valve Drain; S2 Solenoid Valve Fill									
Visual Alarms									
A None; B High Level; C Low Level; D High & Low Level									
Optional Features									
0 None; 1 Hand-Off Auto Switches; 2 Running/Valve Open Lights; 3 Both Options 1 & 2									
Alarm Options									
A None; B Audible/Visual/Contacts									
Input Voltage									
1 120 VAC									
Control Sensitivity									
C 26K ohms direct; M 26K ohms inverse; D 50K ohms direct; N 50K ohms inverse									
Enclosure Type									
1 NEMA 1 (indoor); 4 NEMA 4 (indoor/outdoor); 4X NEMA 4X Fiberglass (indoor/outdoor)									



Single-function standard panel



### Applications

- Simplex Pump Up/Down
- Duplex Pump Up/Down
- Pump Alternation
- Valve Fill & Drain

See Our Interstitial Tank Monitoring Products on page A-22.



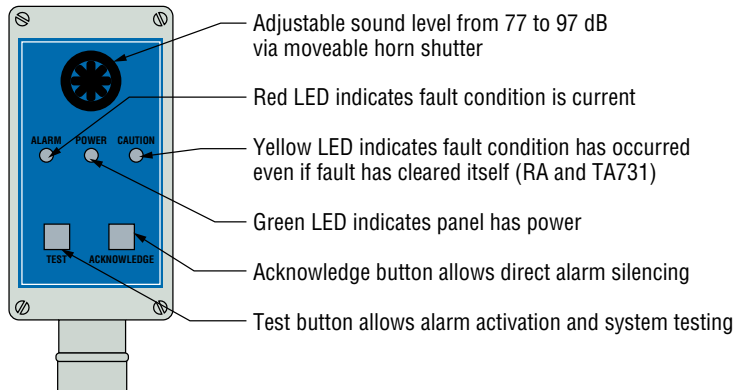
# RA431 and TA73x Alarm Panels Scream Warning @ 97 dB

## RA Features

- Can be used with conductivity probes
- Small footprint design
- Size 6 pan head screw connections

## TA Features

- Intrinsically safe approved
- Auxiliary contact for remote annunciation or cutoff
- One or two channels
- Two conduit connection hubs



## Specifications

<b>Supply Voltage</b>	120 VAC +10%/-15%, 4.8 VA Max.
<b>Indicators</b>	Red, Green and Yellow Solid-State LED's
<b>Audible Alarm</b>	Field Adjustable From 77 to 97 dB @ 2 Feet
<b>Enclosure</b>	
<b>TA Series</b>	Polycarbonate
<b>RA Series</b>	NEMA 4 – Weather tight polycarbonate
<b>Sensor Voltage</b>	12 VAC or 12 VDC
<b>Terminals</b>	Size 6 Pan Head Screws with Captive Wire Clamping Plate
<b>Temperature</b>	-22°F to +150°F (-5.5°C to +65.5°C)
<b>Sensitivity</b>	0-26K Ohm Maximum Specific Resistance
<b>Maximum Wire Run</b>	1000 Feet (14 or 16 Gauge MTW or THHN Wire)
<b>Conduit Connection</b>	3/4" FNPT, PVC Material
<b>Listings</b>	
<b>TA Series</b>	U.L. 913 Intrinsically Safe, File # E44570
<b>RA Series</b>	U.L. 508 Motor Control, File # E138209

## How To Order

Select Part Number based on switch logic and number of channels.

## RA Series

Used for non-hazardous liquid monitoring applications.

Interface Contacts	Part Number
N.O. Dry (Sensor Normally Dry)	<b>RA-431A-0</b>
N.C. Dry (Sensor Normally Wet)	<b>RA-431B-0</b>

## TA Series

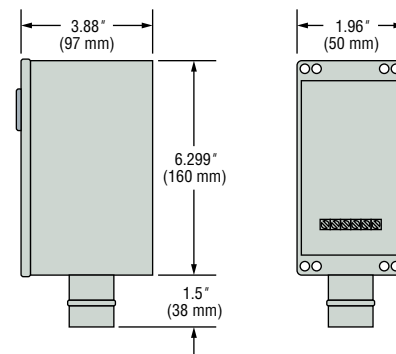
Intrinsically-safe for hazardous locations.

Interface Contacts	Number of Channels	Part Number
N.O. Dry (Sensor Normally Dry)	1	<b>TA-731A-0</b>
	2	<b>TA-732A-0</b>
N.C. Dry (Sensor Normally Wet)	1	<b>TA-731B-0</b>
	2	<b>TA-732B-0</b>

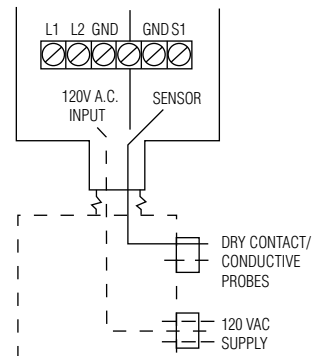


RA-431 shown.  
TA Series includes an additional 1/2" NPT conduit connection for power.

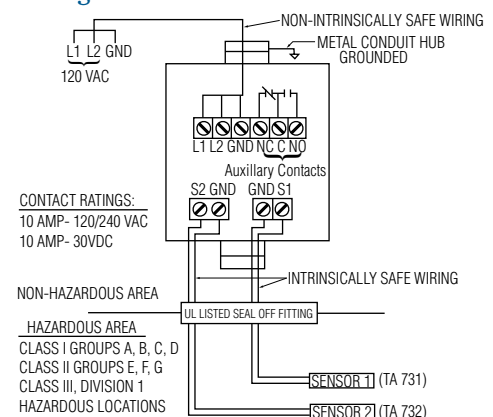
## Dimensions



## Wiring – RA Series



## Wiring – TA Series



## DMS 470/570 Series Leak Detection Systems for UST and AST Storage Tanks

- ▶ Low Cost
- ▶ U.L. Approved Intrinsically Safe
- ▶ Easily Maintained
- ▶ Audio/Visual Alarm

The DMS 470/570 monitoring systems are ideal for a number of UST and AST monitoring applications. The DMS 470 includes an audible bell while the DMS 570 uses a piezoelectric horn. Applications include vapor monitoring of monitoring wells surrounding single wall tanks, high/low product level alarms, vapor sensors for single wall piping and piping sump sensors for double wall piping.

### Auxiliary Contacts

Auxiliary alarm contacts are also available for interfacing to remote alarms, computers, tank gauging systems, phone dialers, etc.

### Specifications

<b>Contact Design</b>	SPDT (1 form C), one normally open, one normally closed
<b>Contact Rating</b>	120 VAC or 30 VAC, 10A, 1/3 h.p.
<b>Sensitivity Range</b>	0-50,000 ohms max. specific resistance
<b>Remote Alarm Contact</b>	Terminals; 7 N.C., 8 com, 9 N.O.
<b>Primary Voltage</b>	120 VAC (+10%/-15%) 60 Hz
<b>Probe Voltage</b>	Nominal 12 VAC @ 6ma RMS
<b>Optional Auxiliary Contacts</b>	One relay contact per channel
<b>Optional "Check" Push Button Board*</b>	Terminals: Size four (4) pan head screw with a clamping plate; will accept up to 14 AWG.
<b>Enclosure Type</b>	NEMA 3R; optional NEMA 4, Weather-proof; optional NEMA 4X, Fiberglass
<b>Temperature</b>	-40°F to +150°F (-40°C to +65.5°C)
<b>Approval</b>	U.L. Listed (U.L. 913) E120178

\*For media discrimination in-storage tank

### How to Order

Use the **Bold** characters from the chart below to construct a product code. One set of auxiliary contacts is standard with every four (4) channels supplied. A common test button is standard for every four (4) channels supplied. The fuel/water check buttons listed below are used to distinguish water or hydrocarbon when three wire sensors are used. Each sensor or detection point requires its own channel.

	<b>DMS</b>	<b>XX</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>
Series						
	<b>47</b> audible bell; <b>57</b> piezoelectric horn					
Number of Channels						
	<b>1</b> 1 Channel; <b>2</b> 2 Channels; <b>3</b> 3 Channels; <b>4</b> 4 Channels; <b>8</b> 8 Channels; <b>12</b> 12 Channels; <b>16</b> 16 Channels;					
Fuel/Water Check Push Buttons						
	<b>A</b> No Check Buttons; <b>B</b> Check Buttons, 4; <b>C</b> Check Buttons, 8; <b>D</b> Check Buttons, 12; <b>F</b> Check Button, 1; <b>G</b> Check Buttons, 2; <b>H</b> Check Buttons, 3					
Auxiliary Contacts						
	<b>1</b> None; <b>2</b> Aux. Contacts, 4; <b>3</b> Aux. Contacts, 8; <b>4</b> Aux. Contacts, 12; <b>6</b> Aux. Contact, 1; <b>7</b> Aux. Contacts, 2; <b>8</b> Aux. Contacts, 3					
Enclosure						
	<b>N4</b> NEMA 4 option; <b>N4XFG</b> NEMA 4X fiberglass option					



### Applications

Above Ground Fuel Storage Tanks (AST)

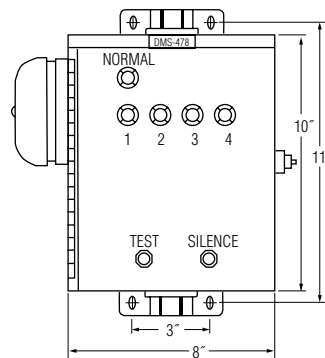
- Leak Detection
- Overfill
- Refill

Underground Fuel Storage Tanks (UST)

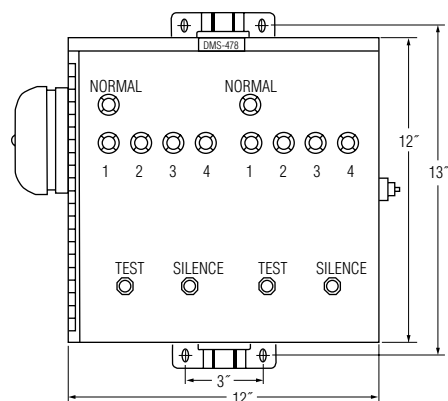
- High Level Alarm
- Leak Detection
- Piping Sumps
- Monitoring Well

### Dimensions

#### 4 Channel



#### 8 Channel



See Our Interstitial Tank Monitoring Products on page A-22.



## Solutions in a Box: Application-Specific Kits Bring Simplicity to Systems Engineering

- ▶ Time Savers
- ▶ No Component Selection Hassles
- ▶ Compatible Components
- ▶ Little or No Assembly

If you need to automatically refill or drain tanks, wells or pressurized vessels, these convenient pre-packaged kits contain everything you need. These Warrick® level control kits combine all the know-how and components you'll need to add automatic control to pump-up/pump-down operations. Each kit is supplied with controllers, probes, electrical enclosures and full instructions.

### TK Kits – Refill or Drain Open Tanks

TK-1 Kits are designed to automatically control the refill pump in open tanks and ponds that drain regularly, turning the pump ON when the liquid level in the tank drops to a point and turning it OFF when the level rises back to a second point. No assembly is required, just connect wire to control.

TK-2 Kits are designed for the opposite application—controlling the drain pump in open tanks and ponds that fill regularly. It turns the pump ON when the liquid level rises to a point and turns it OFF when the level drops back to a point.

### WK Kits – Refill or Drain Wells

WK Kits are designed for use in wells. WK-1 Kits control refill in wells that drain regularly; WK-2 Kits control the pump-down in wells that fill regularly. Minimal assembly is required. WK Kits can also be used for low-water cutoff applications.

Length of suspension wire is 50 feet. Additional suspension wire (3Z1A) is available from your local Warrick Controls Stocking Representative or Distributor.

### HP Kits – Refill or Drain Pressure Vessels

HP-1 Kits are designed to automatically control the refill pump in up to 125 psi pressure vessels that drain regularly, turning the pump ON when the liquid level in the vessel drops to a low point and turning it OFF when the level rises back to a high point. Minimal assembly is required. Also for low-pressure sealed vessels.

HP-2 Kits are designed for the opposite application—controlling the drain pump in pressure vessels that fill regularly. It turns the pump ON when the liquid level rises to a high point and turns it OFF when the level drops back to a certain point.

### How To Order

Select Part Number based on application. Each kit contains everything needed for specified application: control, fitting, probes, electrical enclosure, and instructions.

Part No.	Application	Primary Voltage	Secondary Voltage	Sensitivity	Contact Rating	Mode of Operation
TK-1	Tank refill	115 VAC	12 VAC	26K	10 amp Resistive 1/3 hp	Inverse
TK-2	Tank drain					Direct
WK-1	Well or sump refill	115 VAC or 230 VAC		19K	30 amp Resistive 1 hp @ 115VAC or 2 hp @ 240 VAC	Inverse
WK-2	Well or sump drain					Direct
HP-1	Tank refill	115 VAC		26K	10 amp Resistive 1/3 hp	Inverse
HP-2	Tank drain					Direct



TK-1 shown



WK-1 shown



HP-2 shown

## NOTES