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.

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

**Electromechanical Controls** employ a simple series circuit which includes the transformer, relay coil, electrode probes and the liquid media being monitored. When liquid contacts both the reference and set point electrode probes, current flows through the liquid media which in turn energizes the relay coil and mechanically changes the output contacts state.

When liquid is below the electrode probes, the probe circuit is open, the relay coil is not energized, and the output contacts return to their 'normal' state.

Sensitivity (the maximum liquid resistance allowable) is adjusted by changing the secondary voltage passed through the electrodes and liquid media (500 VAC max).

**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**

<table>
<thead>
<tr>
<th></th>
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* 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

<table>
<thead>
<tr>
<th>Liquid or Material</th>
<th>Sensitivity-Conductivity</th>
<th>Probe Material</th>
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<tbody>
<tr>
<td></td>
<td>Ohms/cm</td>
<td>Micro-Mhos/cm</td>
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<tr>
<td>Baby Foods</td>
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<td>Beer</td>
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<td>Ink (Water Base)</td>
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<td>Salts – Chemical</td>
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<td>Silver Nitrate</td>
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<td>Soap Foam</td>
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<td>Sodium Carbonate</td>
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<td>Sodium Hydroxide</td>
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<td>Water – Condensate</td>
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<td>Water – Chlorinated</td>
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<td>Water – Distilled</td>
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<td>Water – Deionized</td>
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<td>Water – Hard/Natural</td>
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<td>Water – Salt</td>
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<tr>
<td>Zinc Sulfate</td>
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</tbody>
</table>

### 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 11 pin octal socket. U.L. listed.

Specifications

| Contact Design | Series 16M & 16HM | 1 N.O. & 1 N.C. (1 form C) |
| Series 16DM | 2 N.O. & 2 N.C. (2 form C) |
| Series 16VM | 1 N.O. & 1 N.C. (1 form C) |

| Contact Rating (120. 240 VAC) |
| Series 16M & 16HM | 10 amp Resistive 1/3 hp |
| Series 16DM | 5 amp Resistive 1/10 hp |
| Series 16VM | 10 amp Resistive 1/3 hp |

| Mode of Operation | Direct/Inverse, factory set |

| Sensitivity |
| Series 16M | 0-1M ohm, factory set |
| Series 16HM | 0-5.5M ohm, factory set |
| Series 16DM | 0-1M ohm, factory set |
| Series 16VM | 0-1M ohm, field adjustable |

| Primary Voltage |
| 24 VAC, 120 VAC, 240 VAC (+10%/-15%) |
| 208/240: 187 V min. to 255 V max. VAC 50/60 Hz |

| Secondary Voltage |
| Series 16M | 12 VAC, 1.5 mA |
| Series 16HM | 12 VDC |
| Series 16DM & 16VM | 12 VAC, 1.5 mA |

| Temperature |
| -40°F to +150°F (-40°C to +65°C) |

| Approvals |
| U.L. 508 File #E44426 |

| Terminal Style | Screw connector |

| Options | Time Delays |

### Wiring

**Series 16M & 16HM**

![Diagram of wiring for 16M & 16HM modules]

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

**Series 16DM**

![Diagram of wiring for 16DM modules]

**Series 16VM**

![Diagram of wiring for 16VM modules]

### How to Order

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

#### 16M Series – Microprocessor Version

1. **Series**
   - 16M General Purpose;
2. **Mode of Operation**
   - Direct
     - A – 4.7K
     - B – 10K
     - C – 26K
     - D – 50K
   - Inverse
     - E – 100K
     - F – 470K
     - G – 1M
     - H – 3M
     - I – 5.5M
     - J – 50K
     - K – 4.7K
     - L – 10K
     - M – 26K
     - N – 50K
     - P – 100K
     - Q – 0-700K
     - R – 470K
     - S – 1M
     - T – 3M
     - U – 5.5M
     - V – 10K
     - W – 0-700K
     - X – 1M
     - Y – 100K
     - Z – 0-700K
3. **Supply Voltage**
   - 1 120 VAC; 2 240 VAC; 3 24 VAC; 8 208/240 VAC
4. **Socket Style**
   - A 8 Pin Octal
   - B 8 Pin DIN
   - M Module Only
5. **Enclosure**
   - 0 None; 1 NEMA 1; 4 NEMA 4
6. **Time Delay (increasing level) Option**
   - 00-90 seconds
   - Blank 0 seconds
7. **Time Delay (decreasing level) Option**
   - 00-90 seconds
   - Blank 0 seconds
8. **Time Out Option**
   - See page E-11, Chart A

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

1. **Series**
   - 16HM High Sensitivity;
   - 16DM DPDT Load Contact;
   - 16VM Field Selectable Sensitivity
2. **Mode of Operation**
   - Direct
     - A – 4.7K
     - B – 10K
     - C – 26K
     - D – 50K
     - E – 100K
     - F – 470K
     - G – 1M
     - H – 3M
     - I – 5.5M
     - J – 50K
     - K – 4.7K
     - L – 10K
     - M – 26K
     - N – 50K
     - P – 100K
     - Q – 0-700K
     - R – 470K
     - S – 1M
     - T – 3M
     - U – 5.5M
     - V – 10K
     - W – 0-700K
     - X – 1M
     - Y – 100K
     - Z – 0-700K
   - Inverse
     - A – 4.7K
     - B – 10K
     - C – 26K
     - D – 50K
     - E – 100K
     - F – 470K
     - G – 1M
     - H – 3M
     - I – 5.5M
     - J – 50K
     - K – 4.7K
     - L – 10K
     - M – 26K
     - N – 50K
     - P – 100K
     - Q – 0-700K
   - Note: 16VM select modes A, K, Y or Z only.
3. **Supply Voltage**
   - 1 120 VAC; 2 240 VAC; 3 24 VAC; 8 208/240 VAC
4. **Socket Style**
   - A 8 Pin Octal (16M & 16HM), 11 Pin Octal (16DM & 16VM);
   - B DIN Mount;
   - M None, Module Only
5. **Enclosure**
   - 0 None; 1 NEMA 1; 4 NEMA 4
6. **Time Delay (increasing level) Option**
   - 01-20 seconds; 0V variable (16VM only)
7. **Time Delay (decreasing level) Option**
   - 01-20 seconds; 0V variable (16VM only)

### Notes:

1. 16VM select modes A, K, Y or Z only.
2. 16HM & 16DM only. Series 16VM includes full set of the resistors listed above.
3. Specify a sensitivity to determine mode of operation.
4. 16VM only.
5. All Series except 16HM.
6. Socket style M requires enclosure 0 – None.
7. Mounting style A (11 pin octal only)

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*Socket Details and Option Availability are located on web site.*

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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

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

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<th>Contact Design</th>
<th>Series 16</th>
<th>Series 16D</th>
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<td>2 N.O. &amp; 2 N.C. (2 form C)</td>
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<thead>
<tr>
<th>Mode of Operation</th>
<th>Direct/Inverse, factory set</th>
</tr>
</thead>
</table>

| Sensitivity       | 0-1M ohm, factory set       |

<table>
<thead>
<tr>
<th>Primary Voltage</th>
<th>120 VAC, 240 VAC, 24 VAC, 208 VAC (+10%/-15%) 50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>208/240: 187 V min. to 255 V max. VAC 50/60 Hz</td>
</tr>
</tbody>
</table>

| Secondary Voltage  | 12 VAC, 1.5 mA                                      |

| Temperature        | -40°F to +150°F (-40°C to +65°C)                     |

| Approvals          | U.L. 508 File # E44426                              |

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

1. **Series**
   - **16** General Purpose,*
   - **16D** DPDT Load Contacts

2. **Mode of Operation**
   - **Direct**
   - **Inverse**
   - **A** – 4.7K
   - **B** – 10K
   - **C** – 26K
   - **D** – 50K
   - **E** – 100K
   - **F** – 470K
   - **G** – 1M
   - **H** – 50K
   - **K** – 4.7K
   - **L** – 10K
   - **M** – 26K
   - **N** – 50K
   - **P** – 100K

3. **Supply Voltage**
   - **1** 120 VAC
   - **2** 240 VAC
   - **3** 24 VAC
   - **8** 208/240 VAC

4. **Standoff Style**
   - **A** 1/16” Panel
   - **C** Screw Mount
   - **B** 1/8” Panel
   - **D** Retrofit

5. **Enclosure**
   - **0** None
   - **1** NEMA 1
   - **4** NEMA 4

6. **Retrofit Plate Option**
   - **R** Yes; **Blank** No

7. **Time Delay (Increasing level) Option**
   - **01-20** seconds (Series 16D only)
   - **00-90** seconds; **Blank** 0 seconds (Series 16 only)

8. **Time Delay (Decreasing level) Option**
   - **01-20** seconds (Series 16M only)
   - **00-90** seconds; **Blank** 0 seconds (Series 16 only)

9. **Time Out Option**
   - **See page E-11, Chart A**

* New Series 16 Microprocessor Design only.

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

Dimensions

Wiring

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

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

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

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
   26M
2. Sensitivity
   A – 4.7K
   B – 10K
   C – 26K
3. Supply Voltage
   1 – 120 VAC
   2 – 240 VAC
   3 – 24 VAC
   4 – 8/208/240 VAC
4. Socket Style
   A – 11 Pin Octal
   B – DIN Mount
   M – None, Module Only
5. Enclosure
   0 – None
   1 – NEMA 1
   4 – NEMA 4
6. Option Package
   See page E-56, Chart B for code letter.
7. Time Delay (decreasing level) Option
   03-90 seconds
   Blank 3 seconds
8. Time Delay (increasing level) Option
   00-90 seconds
   Blank 0 seconds
```

Socket Details and Option Availability are located on web site.

Series 26
Low Water Cutoff – Standoff Mount

- Meets CSD1 Requirements
- Non Powered Contacts
- Time Delays Available
- LED Monitoring
- Test Feature
- AC Current Minimizes Electrolysis
- Optional Dirty Electrode Detection

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. Built-in 3 second time delay is standard. Up to 90 seconds available for increasing and decreasing levels.

Specifications

| Contact Design | 1 N.O. & 1 N.C. (1 form C) |
| Contact Rating | 10 amp Resistive 1/3 hp at 120, 240 VAC |
| Mode of Operation | Direct |
| Sensitivity | 0-100K ohm, factory set |
| Primary Voltage | 120 VAC, 240 VAC, 24 VAC, 208/240 VAC (+10%/−15%) 50/60 Hz |
| Secondary Voltage | 12 VAC, 1.5 mA |
| Temperature | −40°F to +150°F (-40°C to +65°C) |
| Approvals¹ | U.L. 353, U.L. 508 File # MP1430 |
| Terminal Style | Spade connection |
| Options | Time Delays, Power Outage, Retrofit Plate, Test Feature, Dirty Electrode Detection; 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.

1. Series 26 General Purpose;
2. Sensitivity A 4.7K; B 10K; C 26K; D 50K; E 100K
3. Supply Voltage 1 120 VAC; 2 240 VAC; 3 24 VAC; 8 208/240 VAC
4. Standoff Style¹ A 1/16˝ Panel; B 1/8˝ Panel; C Screw mount; D Retrofit
5. Enclosure 0 None; 1 NEMA 1; 4 NEMA 4
6. Option Package See page D-36, Chart B for code letter
7. Time Delay (decreasing level) Option 03-90 seconds; Blank 3 seconds
8. Time Delay (increasing level) Option 00-90 seconds; Blank 0 seconds

Socket Details and Option Availability are located on web site.
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

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

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

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 DF
2. Mode of Operation
   - Direct
   - Inverse
   A – 4.7K
   B – 10K
   C – 26K
   D – 50K
   E – 100K
3. Supply Voltage
   - 1 – 120 VAC; 2 – 240 VAC; 3 – 24 VAC; 8 – 208/240 VAC
4. Standoff Style*
   - A – 1/16˝ Panel
   - B – 1/8˝ Panel
   - C – Screw Mount
   - D – Retrofit
5. Enclosure
   - 0 – None
   - 1 – NEMA 1
   - 4 – NEMA 4
6. Option Package
   - See page D-36, Chart B for code letter.
7. Time Delay (increasing level) H/L function
   - 00-90 seconds; Blank 0 seconds
8. Time Delay (decreasing level) H/L function
   - 00-90 seconds; Blank 0 seconds
9. Time Delay (decreasing level) LLCO function only
   - 03-90 seconds; Blank 3 seconds

Applications

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

Dimensions

![Image of dimensions diagram]

Wiring

![Image of wiring diagram]

Socket Details and Option Availability are located on web site.

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 increasing 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**

<table>
<thead>
<tr>
<th>Character</th>
<th>30</th>
<th>60</th>
<th>90</th>
<th>120</th>
<th>150</th>
<th>180</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
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<td>B</td>
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<td></td>
</tr>
</tbody>
</table>

---

**Chart B – Optional Character Information**

<table>
<thead>
<tr>
<th>Character</th>
<th>26, 26M, 26NM, DF LLCO</th>
<th>DF LLCO</th>
<th>26, 26M, 26NM, DF LLCO</th>
<th>26, 26M, 26NM, DF LLCO</th>
<th>26, 26M, 26NM, DF LLCO</th>
<th>DF LLCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>H</td>
<td>I</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td>M</td>
<td>N</td>
</tr>
<tr>
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<td>P</td>
<td>Q</td>
<td>R</td>
<td>S</td>
<td>T</td>
<td>U</td>
</tr>
<tr>
<td>V</td>
<td>W</td>
<td>X</td>
<td>Y</td>
<td>Z</td>
<td>No options</td>
<td></td>
</tr>
</tbody>
</table>

* N.C. pushbutton when purchased in conjunction with open control must be remotely mounted by customer

**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.

<table>
<thead>
<tr>
<th>Enclosures</th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Contact Rating</td>
<td>30 amp @ 240 VAC</td>
</tr>
<tr>
<td>Powered Output Contact</td>
<td>SPST 30 A at supply voltage (120 or 240 VAC)</td>
</tr>
<tr>
<td>Horsepower Range</td>
<td>1 hp for 120 VAC; 2 hp for 240 VAC</td>
</tr>
</tbody>
</table>
| Terminals         | 3/16" spade lug on probe connections  
                   | 1/4" spade lug on power connections |
| Primary Voltage   | 120 VAC or 240 VAC (+10%/-15%), 50/60 Hz |
| Secondary Voltage | 11.0 VAC, 1.5 mA              |
| Temperature       | -40°F to +150°F (-40°C to +65°C) |
| Approvals         | 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 Diagram](image)

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

**Dimensions**

- Series 19MR X X

**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.

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

How to Order

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

- **Series DC**
- **Supply Voltage**: 1 – 12 VDC, 2 – 24 VDC
- **Sensitivity**: B – 22K, C – 100K, D – 470K, E – 1M
- **Mode of Operation**: D – Direct, I – Inverse
- **Enclosure**: O – None, 1 – NEMA 1, 4 – NEMA 4
- **Time Delay (increasing level)**: 01-30 sec.
- **Time Delay (decreasing level)**: 01-30 sec.

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

- Tank, if metallic, may be used in place of the Reference Probe.

Wiring
Series A & AM
Solid State Alternators

Series A has an open circuit board design. Series AM provides convenient plug-in design, either octal socket or DIN mount. The housing carries no NEMA rating.

Contact Rating: 10 amp @ 120 VAC or 24 VAC Resistive
Primary Voltage: 120 VAC, 24 VAC (+10%/-15%) 50/60 Hz
Secondary Voltage: 20 mA @ 120 VAC, 80 mA @ 24 VAC
Temperature: -40°F to +150°F (-40°C to +65°C)
Terminal Style
- Series A: 1/4˝ spade
- Series AM: Screw connector
Approvals: U.L. 508 Recognized Motor Control

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

### Series A
- **Series** A
- **Supply Voltage** 1 – 120 VAC
- **Standoff Style** C – Screw Mount
- **Number of Loads** 2 – 2
- **Power Outage Time Delay** 15 – 15 Seconds

### Series AM
- **Series** AM
- **Supply Voltage** 1 – 120 VAC
- **Socket Style** A – Octal
- **Number of Loads** 2 – 2

### Applications
- **Power Outage Time Delay Available on Open Version (Series A)**

### Dimensions
**Series A**

### Wiring
**Series A**

Note: For ease of wiring, L1 and L2 each have two tabs.

**Series AM**

Series 17 and 27 Intrinsically Safe Controls

- Cannot Ignite Flammable Materials
- Solid State Reliability
- Up to 470K Ohm/cm Sensitivity (Series 17)
- Internal Surge Suppression
- SPST Contacts (Series 17)
- SPDT Contacts (Series 27)
- Can Be Used for Single Level or Differential Service

Series 17 – FM Approved
Series 17 is FM Approved for use in Class I or II, Division 1, Groups A-G hazardous atmospheres. SPST isolated contacts. Field adjustable sensitivity by use of external resistors.

Series 27 – UL 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.

Specifications

| Contact Design | Series 17 | 1 N.O. & 1 N.C. Isolated Contacts |
| Series 27 | 1 N.O. & 1 N.C. (1 form C) |

| Contact Rating (24/120/240VAC) | 8 amp Resistive |
| Mode of Operation | Direct/Inverse, factory set |

| Sensitivity | Series 17 | 0-470K ohm, field adjustable |
| Series 27 | 0-100K ohm, factory set |

| Primary Voltage | Series 17 | 24 VAC, 120 VAC, 240 VAC (+10%/-15%) 50/60 Hz |
| Series 27 | 120 VAC, 240 VAC (+10%/-15%) 50/60Hz |

| Secondary Voltage | Series 17 | 13 VAC, 4 mA |
| Series 27 | 11 VAC, 2.3 mA |

| Temperature | -40°F to +150°F (-40°C to +65°C) |

| Approvals | Series 17 | FM File # 1G9A1.AX |
| Series 27 | U.L. 913 File # E44570 |

| Connections | All screw type connections |

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

Dimensions

How to Order

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

**Notes:**
2. 24V available only in Series 17.
3. Series 27 only. Series 17 includes a full set of resistors (3.3K, 4.7K, 10K, 47K, 100K, 220K, 470K ohms) to allow modification of sensitivity in the field. Product code symbol in this position for Series 17 is “X.”

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. Recognized

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

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

Wiring

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

Dimensions

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

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

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

How to Order

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

Applications

- Hazardous Atmospheres
- Multiple Functions
- Simplex or Duplex
- High/Low Level Alarms
- Auto or Manual Alternation

Dimensions

Wiring

See Our Interstitial Tank Monitoring Products on page A-22.
Models 2800 and 2810 Moisture Detectors

- Neon Warning Lamps
- Choice of Voltages
- Pushbutton Test Circuit
- Easy Screw-in Connections
- NEMA Enclosures

These Warrick devices are designed to detect seal leaks in submersible, oil-filled pump motors. Using conductivity technology, the Model 2800 moisture detection system signals the presence of water in an oil-filled cavity. When combined with a Warrick 3H fitting installed by pump manufacturer, it will indicate the presence of water in the oil when the pump is operating.

The Model 2810 is similar to the 2800, except it also provides an indicator lamp for outer seal leakage.

Specifications

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>115 VAC, 230 VAC, 460 VAC, 575 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary Voltage</td>
<td>500 VAC</td>
</tr>
<tr>
<td>Connections</td>
<td>All screw type connections</td>
</tr>
<tr>
<td>Contact Rating</td>
<td>16 amp Resistive 1 hp</td>
</tr>
</tbody>
</table>

How to Order

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

<table>
<thead>
<tr>
<th>Model</th>
<th>2800</th>
<th>2810</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>1 – 115 VAC</td>
<td>4 – 460 VAC</td>
</tr>
<tr>
<td>2 – 230 VAC</td>
<td>5 – 575 VAC</td>
<td></td>
</tr>
<tr>
<td>Contact Configuration</td>
<td>C – 2 (N.O.), 0 (N.C.)&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>D – 1 (N.O.), 1 (N.C.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E – 0 (N.O.), 2 (N.C.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F – 3 (N.O.), 0 (N.C.)&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G – 2 (N.O.), 1 (N.C.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H – 1 (N.O.), 2 (N.C.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J – 0 (N.O.), 3 (N.C.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure</td>
<td>0 – Open</td>
<td></td>
</tr>
<tr>
<td>1 – NEMA 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. 2800 only. On 2810, one (1) N.C. contact is dedicated to outer seal leakage indicator.

Applications

- Submersible Pumps
- Seal Leak Warning
- Preventive Maintenance

Wiring – 2800

![Wiring diagram for Model 2800](image1)

Wiring – 2810

![Wiring diagram for Model 2810](image2)

Notes:
1. 2800 only. On 2810, one (1) N.C. contact is dedicated to outer seal leakage indicator.
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
- Caustics and Acids
- Sumps
- Reservoirs
- Pharmaceuticals
- Boilers and Steam Generators
- Ponds
- 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

<table>
<thead>
<tr>
<th>SERIES</th>
<th>3E</th>
<th>3N</th>
<th>3F</th>
<th>3G</th>
<th>3C</th>
<th>3K</th>
<th>3J</th>
<th>3L</th>
<th>3M</th>
<th>3MT</th>
<th>3S</th>
<th>3R</th>
<th>3T</th>
<th>3B</th>
<th>3H</th>
<th>3W</th>
<th>3Y</th>
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<tbody>
<tr>
<td>Body Options</td>
<td>Flange</td>
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<td>Polycarbonate</td>
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<td>Number of Probes</td>
<td>1 to 3</td>
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<td>1 to 7</td>
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<tr>
<td>Electrodes</td>
<td>Electrode Only</td>
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</tr>
</tbody>
</table>
## 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.

### 3J Series
- **Probe Quantity**: 1, 2 or 3
- **Mounting Size**: 1" NPT
- **Materials**:
  - **Body**: Case iron or red brass
  - **Terminal Housing**: Diecast aluminum, epoxy coated (optional)
  - **Probe**: 316 stainless steel
  - **Insulation**: Teflon®
- **Probe Diameter**: 3/16" or 1/4"
- **Pressure/Temperature**: 0 psig @ 500°F 250 psig @ 406°F 150 psig @ 365°F

### 3H Series
- **Probe Quantity**: 1
- **Mounting Size**: 3/8" NPT or 5/8" NF/NFE
- **Materials**:
  - **Body**: 316 stainless steel
  - **Terminal Housing**: —
  - **Probe**: 316 stainless steel
  - **Insulation**: Teflon®
- **Probe Diameter**: 1/4" 3/8" - 18 NPT

### 3L Series
- **Probe Quantity**: 1, 2 or 3
- **Mounting Size**: 1/8" NPT
- **Materials**:
  - **Body**: 316 stainless steel
  - **Terminal Housing**: —
  - **Probe**: 316 stainless steel
  - **Insulation**: Teflon®
- **Probe Diameter**: 3/16" 3/8" - 18 NPT 3/8" - 24 UNEF

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

## Notes
- Custom options available. Consult factory.
- 1. Probes are stainless steel.
- 2. 10-1/4" maximum
- 1. Longer Teflon® sleeves are available. Contact factory or your representative
- 2. Custom probe and insulation lengths are available. Contact your representative
- 1. 12" maximum
- 2. Indicate fractional inches in decimal form (01.75 = 1-3/4")

---

# Top Mounting Fixtures – General Purpose

<table>
<thead>
<tr>
<th>Series</th>
<th>3F</th>
<th>3G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting Connection</td>
<td>Flange — 4.5” to 7.5” Dia.</td>
<td>NPT, Flange, Bracket (Plate)</td>
</tr>
<tr>
<td>Probe Quantity</td>
<td>1 thru 7</td>
<td>1 thru 7</td>
</tr>
<tr>
<td>Description</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Housing</td>
<td>Die-cast aluminum, epoxy coated</td>
<td>Polycarbonate</td>
</tr>
<tr>
<td>Body</td>
<td>Forged steel, red brass, 316 S.S., 1018 C.S, PVC</td>
<td>PVC</td>
</tr>
<tr>
<td>Probe Insulation</td>
<td>Teflon®</td>
<td>Teflon®</td>
</tr>
<tr>
<td>Pressure/Temperature</td>
<td>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</td>
<td>0 psig @ 150°F (PVC)</td>
</tr>
<tr>
<td>Approvals</td>
<td>CSA —</td>
<td>—</td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Probes</td>
<td>Nominal Pipe Flange Size</td>
<td>Diameter of Flange</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>4-1/2”</td>
</tr>
<tr>
<td>2-3</td>
<td>2</td>
<td>6”</td>
</tr>
<tr>
<td>4</td>
<td>2-1/2</td>
<td>7”</td>
</tr>
<tr>
<td>5-7</td>
<td>3</td>
<td>7-1/2”</td>
</tr>
<tr>
<td>How to Order</td>
<td>Use the <strong>Bold</strong> characters from the chart at right to construct a product code. Electrode Probes are ordered separately.</td>
<td></td>
</tr>
</tbody>
</table>

**Series**
- **3F**
- **3G**

**Number of Probes**
- 1 thru 7

**Body Material**
- **A** – Forged Steel (Raised Face)
- **B** – Red Brass (Flat Face)
- **C** – 316 S.S. (Raised Face)
- **D** – 1018 C.S. (Raised Face)
- **E** – PVC (Flat Face)

**Compatible Electrode Probes**
- **3F**
- **3G**

**Series**
- **3F**
- **3G**

**Number of Probes**
- 1 thru 7

**Base Size and Style**
- **A** – 2” Flange (6’ O.D.)
- **B** – 3” Flange (7-1/2’ O.D.)
- **C** – 3-1/4” x 6’ x 3/4” PVC Plate

**Probe Type**
- **1** – 316 S.S. Inserts for Use with 1/4” Rod Extensions
- **2** – Tapered Probe Assembly
- **3** – Wire-Suspended Probes

**Notes:**

[Visit www.GemsSensors.com for most current information.]
### WARRICK CONDUCTIVITY SENSORS

#### 3E Series
- **Number of Probes:** 1 thru 7
- **Body Material:**
  - A – Cast Iron
  - B – Red Brass
  - C – 316 Stainless Steel
- **Thread:**
  - 1” to 3” NPT
- **Attachment to Vessel:**
  - 1” NPT
- **Conduit Boss Thread Size:**
  - 1/2” NPT
- **Terminal Housing Size:**
  - 2-1/4” x 2-1/4” x 2-1/4”

#### 3N Series
- **Number of Probes:** 1 thru 3
- **Body Material:**
  - A – PVC
  - B – Red Brass
  - C – 316 Stainless Steel
- **Thread:**
  - 3/8” - 18NPT, 5/8” - 18UNF, 5/8” - 24UNEF
- **Attachment to Vessel:**
  - 1” NPT
- **Conduit Boss Thread Size:**
  - 1/2” NPT
- **Terminal Housing Size:**
  - 2-1/4” x 2-1/4” x 2-1/4”

#### 3B Series
- **Number of Probes:** 1
- **Body Material:**
  - B – 316 Stainless Steel
- **Thread:**
  - 1/4-20 female thread
- **Attachment to Vessel:**
  - 1/4-20 female thread
- **Conduit Boss Thread Size:**
  - 1/4-20 female thread
- **Terminal Housing Size:**
  - 2-1/4” x 2-1/4” x 2-1/4”

### Compatible Electrode Probes
- 3R, 3W
- 3R solid rod (up to 4’)
- 3W or 3Y (greater than 4’)

---

**Notes:**
- 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.

---

**Materials**
- **Terminal Housing**
  - Die-cast aluminum, epoxy coated
  - Polycarbonate
- **Body**
  - Forged steel, red brass, 316 stainless steel, cast iron, red brass, 316 stainless steel, PVC, red brass, 316 stainless steel
- **Probe Insulation**
  - 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)
  - 0 psig @ 500°F (brass, 316 S.S.)
  - 400 psig @ 406°F (saturated steam)
- **Approvals**
  - CSA — U.L. File #MP2489, Vol. 1 Sec. 1; CSA; FM
  - CSA File #LR11644
  - U.L. File #MP2489, Vol. 1 Sec. 1; CSA; FM

---

**How to Order**
- Use the bold characters from the chart at right to construct a product code.
- Electrode Probes are ordered separately.

---

**Dimensions**

<table>
<thead>
<tr>
<th>No. of Probes</th>
<th>Attachment to Vessel</th>
<th>Conduit Boss Thread Size</th>
<th>Terminal Housing Size (W” x D” x H”)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3E</td>
<td>1</td>
<td>1/2” NPT</td>
<td>2-1/4” x 2-1/4” x 2-1/4”</td>
</tr>
<tr>
<td>3N</td>
<td>1</td>
<td>1/2” NPT</td>
<td>2-1/4” x 2-1/4” x 2-1/4”</td>
</tr>
<tr>
<td>3B</td>
<td>1</td>
<td>3/4” NPT</td>
<td>4 x 4 x 2-1/2”</td>
</tr>
</tbody>
</table>

---

**U.L. File #MP2489, Vol. 1 Sec. 1; CSA; FM**

---

**Visit www.GemsSensors.com for most current information.**
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

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

How to Order

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

<table>
<thead>
<tr>
<th>Series</th>
<th>3R</th>
<th>3T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (Feet)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – One</td>
<td>5 – Five</td>
<td>9 – Nine</td>
</tr>
<tr>
<td>2 – Two</td>
<td>6 – Six</td>
<td>10 – Ten</td>
</tr>
<tr>
<td>3 – Three</td>
<td>7 – Seven</td>
<td></td>
</tr>
<tr>
<td>4 – Four</td>
<td>8 – Eight</td>
<td></td>
</tr>
</tbody>
</table>

|----------------|-----------|------------------------|--------------|----------------|----------------|----------|-------------|

| Sheathing Heat Shrink | 0 – None | 4 – PVC | 5 – Teflon® |

Contact your representative for custom lengths.

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

<table>
<thead>
<tr>
<th>Probe Material</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brass</td>
<td>3W1</td>
</tr>
<tr>
<td>316 Stainless Steel</td>
<td>3W2</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Length (Feet)</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>100325-500</td>
</tr>
<tr>
<td>1000</td>
<td>100325-1000</td>
</tr>
<tr>
<td>5000</td>
<td>100325-5000</td>
</tr>
<tr>
<td>Custom</td>
<td>3Z1A-XX</td>
</tr>
</tbody>
</table>

Specify in one foot increments up to 5000 ft.

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

<table>
<thead>
<tr>
<th>Style</th>
<th>Wire suspended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip Material</td>
<td>Carp. 20, Hastelloy C, 316 stainless steel</td>
</tr>
<tr>
<td>Shield Material</td>
<td>PVC 150°F (66°C), Teflon®</td>
</tr>
</tbody>
</table>

How to Order

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

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

Applications

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

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

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

How to Order Series 3C

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

- Series 3C
- Number of Probes: 1 – One, 2 – Two, 3 – Three, 4 – Four
- Body Material: A – Cast Iron, B – Red Brass
- Length of Probes: (specify length – a suffix will be added by factory)

How to Order Series 3K

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

- Series 3K
- Number of Probes: 1 – One, 2 – Two, 3 – Three, 4 – Four
- Tricock Tappings
  - NPT Location: A – None, B – 1/2” NPT, C – 3/4” NPT, D – 1/2” NPT, E – 3/4” NPT
- Equalizer: G – None, H – 1-1/4” NPT, J – 1-1/4” NPT
- NPT Size Gauge:
  - 1 – None, 2 – None, 3 – 1/2” NPT, 4 – 1/2” NPT, 5 – 3/4” NPT, 6 – 3/4” NPT
- Length of Probes (Probes may be cut to desired length)
  - AG – One 13” probe, M – Four, 13” each
  - R – Two, 13” each, Z – Three, 13” each

Notes:
1. Contact your representative for more details on this fitting.
2. 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

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

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

How to Order

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

Series 3S

<table>
<thead>
<tr>
<th>Number of Probes</th>
<th>1 – One</th>
<th>2 – Two</th>
<th>3 – Three</th>
<th>4 – Four</th>
<th>5 – Five</th>
<th>6 – Six</th>
<th>7 – Seven</th>
</tr>
</thead>
</table>

Mounting Method

| A – Flange | B – Wall mount bracket |

Length of Longest Probe

(Enter dimension in inches)

Pipe

**Blank** – Standard 1-1/2” galvanized pipe (included)

**A** – 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

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

How to Order Series 3M

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

<table>
<thead>
<tr>
<th>Series 3M</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Probes</td>
<td>1 – One</td>
<td>3 – Three</td>
<td>4 – Four</td>
</tr>
<tr>
<td>Probe Length</td>
<td>A – 1</td>
<td>B – 2</td>
<td>C – 3</td>
</tr>
<tr>
<td>Body Contour</td>
<td>1 – 45° Bevel</td>
<td>2 – Tri-Clamp</td>
<td>3 – Quick-Clamp</td>
</tr>
</tbody>
</table>

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

**Step 2. Lower Assembly**: Complete part number based on Upper Assembly selected and Body Style.

<table>
<thead>
<tr>
<th>Series 3MT</th>
<th>X</th>
<th>XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Probes</td>
<td>1 – One</td>
<td>3 – Three</td>
</tr>
<tr>
<td>Body Style (2” size)</td>
<td>NT20 – Nylon Tri-Clamp</td>
<td>NB20 – Nylon 45° Bevel</td>
</tr>
</tbody>
</table>

**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.

Applications

- Food & Beverage
- Pharmaceutical
- CIP

Body Styles

- Quick-Clamp
- Tri-Clamp

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

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

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

How to Order

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

Control Relay
- CP 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;
- M 50K ohms direct; N 50K ohms inverse

Enclosure Type
- 1 NEMA 1 (indoor); 4 NEMA 4 (indoor/outdoor);
- 4X NEMA 4X Fiberglass (indoor/outdoor)

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

Adjustable sound level from 77 to 97 dB via moveable horn shutter
Red LED indicates fault condition is current
Yellow LED indicates fault condition has occurred even if fault has cleared itself (RA and TA731)
Green LED indicates panel has power
Acknowledge button allows direct alarm silencing
Test button allows alarm activation and system testing

Specifications
Supply Voltage
120 VAC +10%/-15%, 4.8 VA Max.

Indicators
Red, Green and Yellow Solid-State LED’s

Audible Alarm
Field Adjustable From 77 to 97 dB @ 2 Feet

Enclosure
NEMA 4X – Weather tight polycarbonate

Sensor Voltage
12 VAC or 12 VDC

Terminals
Size 6 Pan Head Screws with Captive Wire Clamping Plate

Temperature
-22°F to +150°F (-5.5°C to +65.5°C)

Sensitivity
0-26k Ohm Maximum Specific Resistance

Maximum Wire Run
1000 Feet (14 or 16 Gauge MTW or THHN Wire)

Conduit Connection
3/4˝ FNPT, PVC Material

Listings
- TA Series: U.L. 913 Intrinsically Safe, File # E44570
- RA Series: 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.

<table>
<thead>
<tr>
<th>Interface Contacts</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.O. Dry (Sensor Normally Dry)</td>
<td>RA-431A-0</td>
</tr>
<tr>
<td>N.C. Dry (Sensor Normally Wet)</td>
<td>RA-431B-0</td>
</tr>
</tbody>
</table>

TA Series
Intrinsically-safe for hazardous locations.

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

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

<table>
<thead>
<tr>
<th>Series</th>
<th>47</th>
<th>57</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>1 Channel; 2 2 Channels; 3 3 Channels; 4 4 Channels; 8 8 Channels; 12 12 Channels; 16 16 Channels;</td>
<td></td>
</tr>
<tr>
<td>Fuel/Water Check Push Buttons</td>
<td>A No Check Buttons; B Check Buttons, 4; C Check Buttons, 8; D Check Buttons, 12; F Check Button, 1; G Check Buttons, 2; H Check Buttons, 3</td>
<td></td>
</tr>
<tr>
<td>Auxiliary Contacts</td>
<td>1 None; 2 Aux. Contacts, 4; 3 Aux. Contacts, 8; 4 Aux. Contacts, 12; 6 Aux. Contact, 1; 7 Aux. Contacts, 2; 8 Aux. Contacts, 3</td>
<td></td>
</tr>
<tr>
<td>Enclosure</td>
<td>N4 NEMA 4 option; N4XFG NEMA 4X fiberglass option</td>
<td></td>
</tr>
</tbody>
</table>

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 (321A) 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.

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