



Ordering Guide & Technical Information

Continuous & Point Liquid Level Sensors



**ABSOLUTE PROCESS CONTROL
KNOW WHERE YOU ARE... REGARDLESS**





FROM its inception in 1933, BIW Controls was on the leading edge of liquid level control. It all started with BIW's original idea of taking advantage of the electrical conductivity of most liquids to achieve floatless level control. Since then the idea has earned worldwide acceptance as the most reliable and versatile system of its kind. It has been utilized throughout such industries as the food, beverage, dairy, pharmaceutical, and chemical processing industries; in municipal waterworks and sewage treatment plants; and for numerous other commercial and industrial applications where close, constant control or monitoring of liquids and/or moist bulk materials is crucial.

The many advantages of conductivity liquid level control systems over conventional mechanical control devices are readily apparent:

- Because there are no moving parts in the liquid the many problems typically encountered when using mechanical equipment with linkages and so forth are entirely eliminated.
- Installation is easy, there is virtually no maintenance. It has a long and trouble-free life. It is safe, accurate, and reliable.
- Its operational efficiency is impervious to fluctuations in pressure, temperature, turbulence, or consistency of the liquid.
- Moreover, since the relays we supply are always matched in sensitivity to the specific resistance of the liquid to be controlled, our systems are adaptable to most applications requiring control or monitoring of liquid or semi-solids.

Ametek has added to the BIW Controls brand of point level controls to include the use of our unique, patented magnetostrictive sensor technology for precise continuous liquid level sensing. Many thousands of these sensors are used around the world in such areas as petroleum, chemical, food, beverage, and other industries.

In addition to providing these magnetostrictive probes to the OEM market, various end user focused probes are available. Easy to use analog probes are available for both shallow and deep tank applications. Accurate measurement with resolution to 0.01" is standard. These units feature the Stik™ technology with a loop powered 4-20mA communication and an intrinsically safe hazardous area approval. Analog probes are available in neither a rigid design up to 24' or flexible up to 40'. A Modbus RTU probe is available in an explosion proof design which provides multivariate measurements for total level, interface and temperature measurement from a single sensor. An OEM version probe with digital communication allows for resolution to 0.0001", multivariate measurements with up to 5 temperature zone measurements.

Ametek has the design experience you need and is eager to work on your unique design needs. Should you require engineering assistance or need application information, our sales engineers are only a phone call away. Call us direct or contact the BIW Controls distributor nearest to you.

Table of Contents

| | |
|---|-----------|
| Series 1500 Induction Relays..... | 4 |
| Series 5200 Solid State Relays..... | 14 |
| Series 5400 Plug-In Style Relays | 20 |
| Series 5600 Solid State Relays..... | 22 |
| Series 6012/6013 Electrodes, Holders | 24 |
| Series 7010 Liquid Level Float Switches..... | 38 |
| Series 7014 Unifloat™ Level Sensors | 41 |
| Series 7230 Liquid Level Sensors..... | 48 |
| Series 7330 Liquid Level Sensors..... | 50 |
| Series 8040/8041 Control Panels | 54 |
| Series 8044 Custom Control Panels | 55 |
| Other Products | 56 |

Series 1500 Induction Relays

THE SERIES 1500 INDUCTION RELAY WITH FIELD CONVERTIBLE CONTACTS PROVIDES A VERSATILE AND RELIABLE LIQUID LEVEL CONTROL

APPLICATION

As the pioneer producer of electrode-activated float-less level control systems, we acquired broad, practical experience in developing and manufacturing equipment to meet the requirements of a wide range of liquid level applications.

The Series 1500 Induction Relays provide versatile and economical means of controlling many processing and production functions from remote locations with the safety inherent in a low energy sensing circuit that is isolated from the AC power source.

Installed near pumps, motors or other operating equipment, the Series 1500 Induction Relay permits use of low-cost light gauge wires for the control circuit to level sensing electrodes. Relays with low voltage secondary coils provide remote control up to 36,000 feet from contact type pilot devices.

Available as open chassis units or furnished factory mounted in a choice of standard or special enclosures, these relays are connected to a constant source of alternating current. When properly installed, they will draw a maximum of 9 volt-amperes regardless of the line or electrode circuit voltage.

FEATURES

The 1500 Series Induction Relay, not only retains the high quality and durability of the Series 1100 Induction Relay, but also provides these important features.

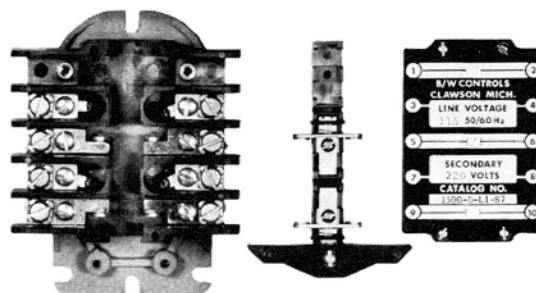
- Available with 1, 2 or 3 isolated double break contacts
- Contacts can be added in the field
- Contact arrangement can be added or changed in the field from N.O. to N.C. or N.C. to N.O.
- All terminals are completely accessible and have #8 pan head screws with captivated wire clamp
- All contacts rated 25 AMP at 120V or 240VAC

CONTACT RATINGS

25 Amp Resistive at 120, 240, or 480 VAC
1 HP Single Phase at 120 or 240 VAC
Heavy Duty Pilot 120 to 600 VAC
2 Amp Resistive at 120 VDC
10 Amp Resistive at 48 VDC

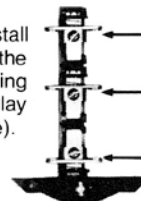
CIRCUIT VERSATILITY

The Series 1500 Induction Relay can have contacts easily added and/or changed from N.O. to N.C. or N.C. to N.O.



Remove cover plate and armature

For a N.O. contact, install the moveable contact in the armature assembly facing toward the top of the relay (away from the armature).



ARMATURE

For a N.C. contact, install the moveable contact in the armature assembly facing toward the bottom of the relay (toward the armature).

N.O. CONTACT



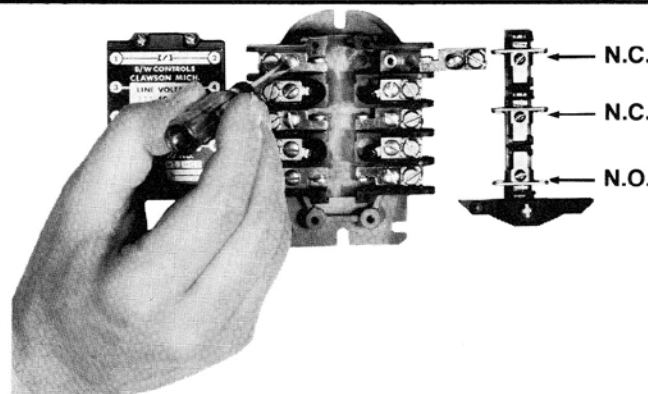
N.C. CONTACT



For a N.O. contact, install the stationary contacts facing toward the bottom of the relay (toward the armature).

For a N.C. contact, install the stationary contacts facing toward the top of the relay (away from the armature).

Replacement Contact #15-000001





PRINCIPLE OF OPERATION

A floatless liquid level control system consists of a relay of the proper type, a holder designed to support one or more electrodes or probes in the liquid container.

The corrosion resistant electrodes for all B/W induction relays are quite similar, differing only in contact arrangement.

As shown in diagrams below, the laminated core of the relay is **A** shaped. The primary coil is assembled to the upper bar of the core, and the secondary coil for the electrode is placed on the lower bar. An armature located below the legs of the **A** core is connected to an insulated arm carrying the movable contacts. When the armature is raised, these contacts close or open the motor and electrode circuits, depending upon whether the contacts are normally open or closed. (Contacts shown normally open in this example.)

When a source of alternating current is connected to the primary coil at terminals 3 and 4, the primary coil sets up a magnetic flux which — following the lines of least resistance — circulates through the shortest path. As shown in Figure 1, this is through the lower bar of the laminated core on which the secondary coil is mounted. This magnetic flux induces a voltage in the secondary or electrode circuit coil. No current can flow in this coil, however, until the circuit is completed between the electrodes. **Thus, the**

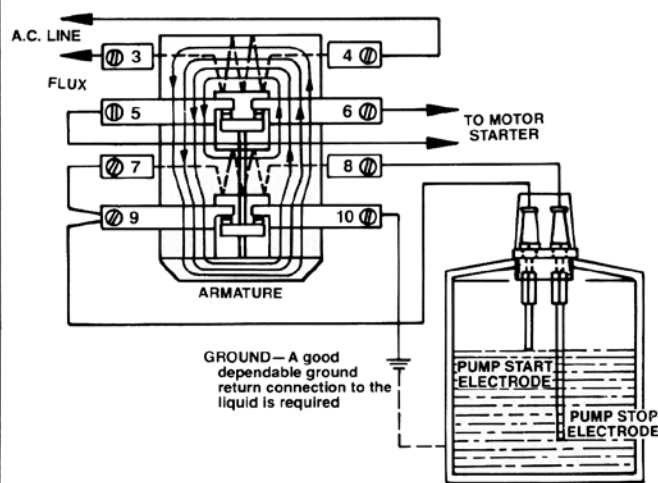
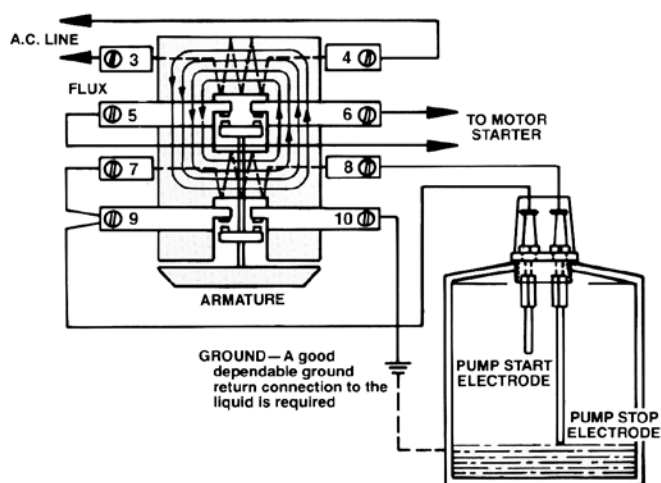
electrode circuit voltage being generated within the relay has no connection with the power line.

The BIW 1500 induction relay utilizes the liquid as an electrical conductor to complete the secondary circuit between the upper and lower electrodes. Thus, when the liquid contacts the upper electrode, the resulting flow of current in this circuit sets up a bucking action in the lower bar of the core. This action tends to divert lines of magnetic force to the core legs and sets up an attraction that pulls the armature into contact with the legs, as shown in Figure 2. This armature movement closes the electrode and load contacts.

The lower contacts on 1500-C Relays (terminals 9 and 10) connect the secondary circuit to ground when liquid contacts the upper electrode and act as a holding circuit to maintain the relay in its closed position until the liquid falls below the lower electrode. This holding circuit provides control of the relay over any desired range in the liquid level, depending on the distance between the upper and lower electrodes.

The flow of current through the low energy secondary circuit is very small and varies with the voltage of the secondary coil. The secondary coil is selected to operate over the resistance of the liquid being controlled. Accordingly, since there is a wide range of secondary coils from which to choose, it is important that complete information regarding the nature of the liquid be furnished when ordering B/W induction relays.

1500-C RELAY USED FOR PUMP DOWN CONTROL



Series 1500 Induction Relays

INDUCTION RELAY COIL SELECTION DATA

PRIMARY COIL

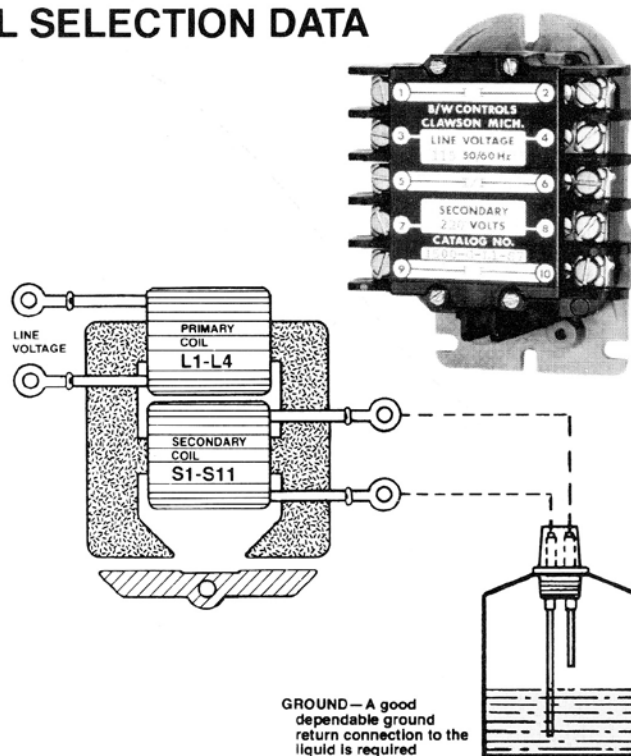
The primary coil voltage should be chosen to match the line voltage of the control system. The 1500 Series Induction Relay can be supplied with any of the following line voltages:

PRIMARY COIL

| LINE VOLTAGE | FREQUENCY (Hertz) | MAXIMUM AMPERES (Secondary Shorted) | B W COIL NUMBER |
|--------------|-------------------|-------------------------------------|-----------------|
| 110-120 | 50-60 | .075 | 02-089000 |
| 208-240 | 50-60 | .038 | 02-089200 |
| 440-480 | 50-60 | .019 | 02-089300 |
| 550-600 | 50-60 | .015 | 02-089400 |

SECONDARY COIL SELECTION

Since B|W level control systems use the liquid as an electrical conductor to complete the relay's secondary circuit — and since the resistance of liquids varies, it is necessary that each induction relay be equipped with a secondary coil that will operate over the resistance of the liquid it controls. The following tables list the operating characteristics of various coils available. All values are based on line voltage of 115, 230, 460 or 575 volts at 60 Hertz.



RECOMMENDED SECONDARY COILS FOR VARIOUS TYPES OF LIQUIDS

| COIL VOLTAGE | TYPICAL LIQUIDS | MAXIMUM AMPERES (Shorted) | MAX. SPECIFIC RESISTANCE OF LIQUID (ohms-cm) | MIN. SPECIFIC CONDUCTIVITY OF LIQUID (micromho/cm) | COIL NUMBER |
|--------------|---|---------------------------|--|--|-------------|
| 12 | Metallic circuits. | .44 | 15 | 67,000 | 02-088700 |
| 24 | Metallic circuits. | .22 | 61 | 16,000 | 02-088800 |
| 40 | Acid or caustic solutions; Milk; Brine and salt solutions; Plating solutions; Buttermilk; Soups. | .117 | 216 | 4,630 | 02-088900 |
| 90 | Weak acid or caustic solutions; Beer, Baby foods; Fruit juices. | .053 | 1,065 | 940 | 02-089000 |
| 220 | Sewage; Most water — except very soft; Pottery slip; Water soluble oil solutions; Starch solutions. | .022 | 6,650 | 150 | 02-089500 |
| 360 | Very soft water; Sugar syrup. | .013 | 17,000 | 59 | 02-089300 |
| 480 | Steam condensate; Strong alcohol solutions. | .011 | 26,600 | 38 | 02-089400 |
| 800 | Demineralized or distilled water.* | .006 | 92,600 | 11 | 02-123700 |

*Exceptionally pure water produced for some industrial applications requires use of B|W Type 52-Series Solid-State Relay. (See Page 5 of Catalog Section 5200.)

NOTE 1: The maximum closing resistance in ohms over which each coil will operate is approximately equal to the specific resistance values shown above. All B|W relays may be energized indefinitely with the secondary circuit shorted without damaging the coils.

NOTE 2: Maximum distance limitations for typical induction relay secondary circuits are: 220 secondary - 900 feet, 360 secondary - 350 feet, 480 secondary - 250 feet and 800 secondary - 70 feet. For others see Section 8040.

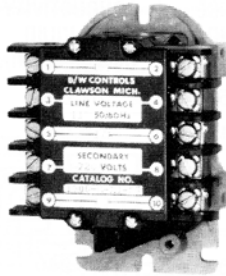
See Page 10 for additional liquids.

METEK®

FACTORY AUTOMATION

MANUAL RESET RELAYS FOR USE WITH ONE ELECTRODE

BIW Manual Reset relays are basic induction relays equipped with a N.O. or N.C. reset button which permits an operator to reestablish the electrode for high or low level cutoff operation. Once a pump has been stopped by the liquid leaving or contacting the electrode, it cannot be started again until the relay has been manually reset by means of the pushbutton. Available as single pole or double pole —



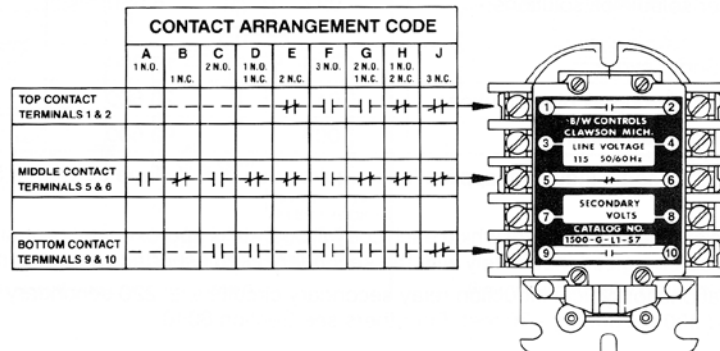
normally open or normally closed — and as single pole, double throw relays. When ordering, please specify operation desired.

NOTE: When ordering a manual reset relay, indicate an "M" for the last digit of the catalog number on page 11 and indicate if a N.O. or N.C. reset button is required.

CATALOG CODE

See Pages 10 & 11 for Complete Catalog Numbers

| | CONTACT ARRANGEMENT | | | RESET BUTTON | OPERATION AND APPLICATION |
|---|---------------------|--------------------|--------------------|-----------------|---|
| | Normally Open | Normally Closed | Holding Circuit | | |
| C | 1 | 0 | 1 | N.O. | Low level cut off with manual reset. |
| F | 2 | 0 | 1 | N.O. | Same as Type above with additional contact. |
| D | 0 | 1 | 1 | N.C. | High level cutoff with manual reset. |
| H | 0 | 2 | 1 | N.C. | Same as above with additional contact. |
| G | 1 | 1 | 1 | N.C. | High level cutoff and or signal, manual reset. |
| G | 1 | 1 | 1 | N.O. | Low level cutoff and or signal, manual reset. |



Series 1500 Induction Relays

REFER TO SERVICE BULLETIN FORM 511 FOR DETAILED WIRING

| INDUCTION RELAY CONTACT ARRANGEMENT | WIRING DIAGRAM AND OPERATION | TYPICAL APPLICATIONS | | | | | | |
|--|---------------------------------|-------------------------|-----------------|---|---|---|-----------------|---|
| 1500-A RELAY Contact Arrangement <table> <tr> <td>Normally Open</td><td>Normally Closed</td><td>Holding Circuit</td></tr> <tr> <td>1</td><td>0</td><td>0</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 1 | 0 | 0 | <p>Form 594</p> | High Level Signal Control. Low Level Cutoff when wired in series with Stop button in 3-wire pushbutton stations. Remote, long distance and low voltage manual control applications, etc. (Similar to 1100-L) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 1 | 0 | 0 | | | | | | |
| 1500-C RELAY Contact Arrangement <table> <tr> <td>Normally Open</td><td>Normally Closed</td><td>Holding Circuit</td></tr> <tr> <td>2</td><td>0</td><td>0</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 2 | 0 | 0 | <p>Form 596</p> | Same as 1500-A Relay above except that an additional Normally Open contact is provided to permit simultaneous operation of different types of secondary signal devices in remote locations. (Similar to 1100-2L) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 2 | 0 | 0 | | | | | | |
| 1500-B RELAY Contact Arrangement <table> <tr> <td>Normally Open</td><td>Normally Closed</td><td>Holding Circuit</td></tr> <tr> <td>0</td><td>1</td><td>0</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 0 | 1 | 0 | <p>Form 595</p> | Low Level Signal Control. High Level Cutoff when wired in series with Stop button in 3-wire pushbutton stations. Remote, long distance and low voltage manual control applications, etc. (Similar to 1100-R) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 0 | 1 | 0 | | | | | | |
| 1500-E RELAY Contact Arrangement <table> <tr> <td>Normally Open</td><td>Normally Closed</td><td>Holding Circuit</td></tr> <tr> <td>0</td><td>2</td><td>0</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 0 | 2 | 0 | <p>Form 598</p> | Same as 1500-B Relay above except that an additional Normally Closed contact is provided to permit simultaneous operation of different types of secondary signal devices in remote locations. (Similar to 1100-2R) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 0 | 2 | 0 | | | | | | |
| 1500-D RELAY Contact Arrangement <table> <tr> <td>Normally Open</td><td>Normally Closed</td><td>Holding Circuit</td></tr> <tr> <td>1</td><td>1</td><td>0</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 1 | 1 | 0 | <p>Form 597</p> | High or Low Level Signal Control. High or Low Level Cutoff when wired in series with Stop button in 3-wire pushbutton stations. Can also be used to interlock various types of signal devices. (Similar to 1100-D) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 1 | 1 | 0 | | | | | | |

CAUTION: Electrodes are terminals of live electrical circuits and must be installed to prevent accidental contact by personnel. Control power must be disconnected before servicing.

* A GOOD DEPENDABLE GROUND RETURN CONNECTION TO THE LIQUID IS REQUIRED.

‡ For direct wiring to a 208-240VAC, 1 phase load device, 2 load contacts are required; see Series 1500E, F & H Relays.

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FACTORY AUTOMATION

REFER TO SERVICE BULLETIN FORM 511 FOR DETAILED WIRING

| INDUCTION RELAY CONTACT ARRANGEMENT | WIRING DIAGRAM AND OPERATION | TYPICAL APPLICATIONS | | | | | | |
|--|---------------------------------|-------------------------|-----------------|---|---|---|-----------------|---|
| 1500-C RELAY Contact Arrangement <table> <tr> <th>Normally Open</th><th>Normally Closed</th><th>Holding Circuit</th></tr> <tr> <td>1</td><td>0</td><td>1</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 1 | 0 | 1 | <p>Form 596</p> | Pump Down Control for sewage and sump pumps, condensate return systems, etc. Low Level Cutoff for submersible pumps. Normally closed Solenoid Valve Control for discharging liquids from tanks, etc. (Similar to 1100-LH) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 1 | 0 | 1 | | | | | | |
| 1500-F RELAY Contact Arrangement <table> <tr> <th>Normally Open</th><th>Normally Closed</th><th>Holding Circuit</th></tr> <tr> <td>2</td><td>0</td><td>1</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 2 | 0 | 1 | <p>Form 599</p> | Same as 1500-C Relay above except that additional Normally Open contact is provided to permit simultaneous operation of second pump. Extra contact can also be used for signal purposes if desired. (Similar to 1100-2LH) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 2 | 0 | 1 | | | | | | |
| 1500-D RELAY Contact Arrangement <table> <tr> <th>Normally Open</th><th>Normally Closed</th><th>Holding Circuit</th></tr> <tr> <td>0</td><td>1</td><td>1</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 0 | 1 | 1 | <p>Form 597</p> | Pump Up Control for supply pumps on elevated tanks and towers, carbonators, etc. High Level Cutoff for pumps and valves. Normally closed Solenoid Valve Control for plating tank and boiler make-up, etc. (Similar to 1100-RH) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 0 | 1 | 1 | | | | | | |
| 1500-H RELAY Contact Arrangement <table> <tr> <th>Normally Open</th><th>Normally Closed</th><th>Holding Circuit</th></tr> <tr> <td>0</td><td>2</td><td>1</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 0 | 2 | 1 | <p>Form 601</p> | Same as 1500-D Relay above except that additional Normally Closed contact is provided to permit simultaneous operation of second pump. Extra contact can also be used for signal purposes if desired. (Similar to 1100-2RH) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 0 | 2 | 1 | | | | | | |
| 1500-G RELAY Contact Arrangement <table> <tr> <th>Normally Open</th><th>Normally Closed</th><th>Holding Circuit</th></tr> <tr> <td>1</td><td>1</td><td>1</td></tr> </table> | Normally Open | Normally Closed | Holding Circuit | 1 | 1 | 1 | <p>Form 600</p> | Pump Up or Pump Down Control for same applications listed above for B/W 1500-C and 1500-D Relays. It is also suitable for use in controlling hydropneumatic tanks and motorized valve installations. (Similar to 1100-DH) |
| Normally Open | Normally Closed | Holding Circuit | | | | | | |
| 1 | 1 | 1 | | | | | | |

CAUTION: Electrodes are terminals of live electrical circuits and must be installed to prevent accidental contact by personnel. Control power must be disconnected before servicing.

*** A GOOD DEPENDABLE GROUND RETURN CONNECTION TO THE LIQUID IS REQUIRED.**

‡ For direct wiring to a 208-240VAC, 1 phase load device, 2 load contacts are required; see Series 1500E, F & H Relays.

Series 1500 Induction Relays

CONDUCTIVE LIQUIDS

With the exception of products such as oil, gasoline, animal fats and other similar products, most liquids and some moist bulk materials have sufficient conductivity to use BIW level detecting relays. The Series 1500 relay can be used on liquids with resistance up to about 90,000 ohm-cm (conductivity to 11 micromho/cm). For liquids with higher resistance the BIW Series 5200 relays must be used for applications up to 12 megohms resistance.

Liquids such as milk and beer, and some pharmaceutical products will foam during processing. The liquid phase is always a better conductor than the foam, and when the interface level is to be detected, the relay sensitivity must be carefully selected and it would be wise to check the factory for our recommendation.

With nearly 50 years of experience, Ametek has compiled a history of applications in most major industries around the world. If you have questions regarding the proper relay selection, write us, phone us, or send a sample for test. Chances are that we have the answer for you.

TYPICAL LIQUIDS

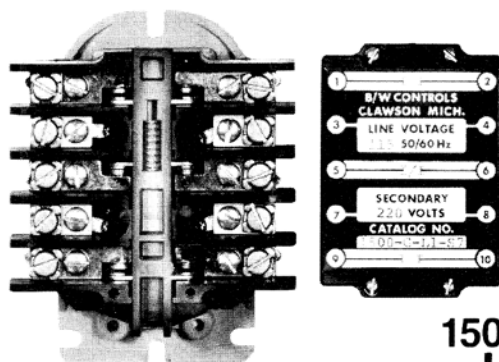
The following recommendations are satisfactory for general use, but because the conductivity of liquids varies greatly with concentration, purity, temperature and other factors, some applications may require a different selection.

A number of the products listed are produced as solids such as crystals or powders, and our relay selection is based on the normally used commercial solutions of these materials.

| Liquid Description | Secondary Coil |
|---------------------------------|------------------|
| Acetic Acid — Up to 75% | 90 Volt * |
| — 75 to 90% | 220 Volt * |
| — Glacial | Use 5200-H Relay |
| Acetone | Use 5200-H Relay |
| Acids — General | 40 or 90 Volt * |
| — Anhydrous | Use 5200-H Relay |
| Alcohols | Use 5200-H Relay |
| Alkalies — General | 40 or 90 Volt |
| — Anhydrous | Use 5200-H Relay |
| Alum Solutions | 220 Volt |
| Aluminum Sulphate | 90 Volt |
| Aluminum Hydroxide | 90 Volt |
| Amino Acids | 90 Volt |
| Ammonia-Anhydrous Liquid | Use 5200-H Relay |
| Ammonium Chloride | 40 Volt |
| Ammonium Hydroxide (Ammonia) | 220 Volt |
| Ammonium Nitrate | Use 5300 Relay |
| Ammonium Sulphate | 220 Volt |
| Baby Foods | 90 Volt |
| Barium Chloride | 40 Volt |
| Barium Nitrate | 40 Volt |
| Beer | 90 Volt |
| Black Liquor | 40 Volt |
| Blood | 220 Volt |
| Borax — Up to 10% | 220 Volt |
| — Greater than 10% | 90 Volt |
| Boric Acid | 220 Volt |
| Bread Dough | 90 Volt |
| Buttermilk | 24 or 40 Volt |
| Cadmium Chloride | 40 Volt |
| Cake Batter | 220 Volt |
| Calcium Chloride | 40 Volt |
| Calcium Hydroxide | 220 Volt |
| Carbolic Acid — Up to 90% | 220 Volt |
| — 90 to 100% | Use 5200-H Relay |
| Catsup | 90 Volt |
| Caustic Soda (Sodium Hydroxide) | 40 Volt |
| Cement Slurry | 220 Volt |
| Chromic Acid | 40 Volt * |
| Citric Acid | 40 or 90 Volt * |
| Coffee | 90 Volt |
| Condensate — Ordinary Water | 480 Volt |
| — D.I. Water | Use 5200-H Relay |
| Corn Syrup | 480 Volt |
| Corn — Cream Style | 90 Volt |
| Ethylene Glycol | Use 5200-H Relay |
| Ferric Chloride | Use 5200-L Relay |
| Ferrous Sulphate | 220 Volt |

| Liquid Description | Secondary Coil |
|---------------------------------|--------------------------|
| Formaldehyde | Use 5200-H Relay |
| Formic Acid — Up to 75% | 90 Volt * |
| — 75 to 90% | 220 Volt * |
| Glycerine (Glycerol) | Use 5200-H Relay |
| Hydrochloric Acid | Use 5200-L Relay |
| Hydrofluoric Acid — Up to 20% | 220 Volt * |
| — Above 20% | 40 Volt * |
| Hydrofluorsilicic Acid | 90 Volt * |
| Hydrogen Peroxide | Use 5200-H Relay |
| Jams & Jellies | 360 Volt |
| Juices — Fruit & Vegetable | 40 or 90 Volt |
| Lemon Oil Essence | Use 5200-H Relay |
| Lignite | 800 Volt |
| Lithium Chloride | 40 Volt |
| Magnesium Hydroxide | 90 Volt |
| Mayonnaise | 220 Volt |
| Methanol | Use 5200-H Relay |
| Methyl Ethyl Ketone (MEK) | Use 5200-H Relay |
| Milk | 40 Volt |
| Molasses | 220 Volt |
| Muriatic Acid | 40 Volt * |
| Mustard | 40 Volt |
| Nitric Acid | 40 or 90 Volt * |
| Orange Juice | 90 Volt |
| Paper Stock | 220 Volt |
| Penicillin | 220 Volt |
| Phosphoric Acid | 40 Volt * |
| Plating Solutions | 40 or 90 Volt * |
| Salts — Chemical | 40 or 90 Volt * |
| Sodium Carbonate (Soda Ash) | 90 Volt |
| Sodium Chloride (Table Salt) | 40 Volt * |
| Sodium Hydroxide (Caustic Soda) | 40 Volt * |
| Sodium Hypochlorite | 40 Volt |
| Sodium Silicate (Water Glass) | 90 Volt |
| Soups | 40 Volt |
| Starch Solutions | 220 Volt |
| Sugar — Low Concentrations | 220 Volt |
| — High Concentrations | 360 Volt |
| Sulphuric Acid | Use 5200-L Relay |
| Vinegar | 90 Volt |
| Water — Sea | 40 Volt |
| — Ordinary Potable | 220 Volt |
| — Ordinary Soft | 360 Volt |
| — Ordinary Condensate | 480 Volt |
| — Purified Distilled | 800 Volt or 5200-H Relay |
| — Purified Deionized | Use 5200-H Relay |
| Zinc Chloride | 40 Volt |

* Use 5200-L to minimize corrosion



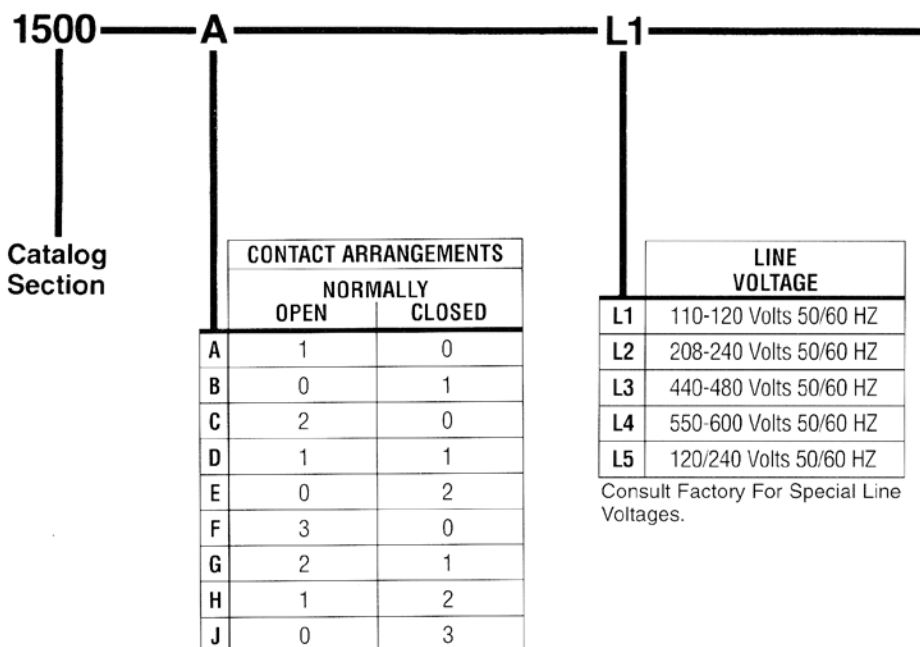
Cat. No. 1500-G-L1-S7
Shown with cover removed



B/W PART NUMBER CROSS REFERENCE

| OLD PART NO. | 1100 RELAY | 1500 RELAY |
|--------------|-------------|--|
| 11-045000 | 1100-LH-* | 1500-C-* |
| 11-045300 | 1100-2LH-* | 1500-F-* |
| 11-044500 | 1100-RH-* | 1500-D-* |
| 11-044800 | 1100-2RH-* | 1500-H-* |
| 11-045500 | 1100-DH-* | 1500-G-* |
| 11-044900 | 1100-L-* | 1500-A-* |
| 11-045200 | 1100-2L-* | 1500-C-* |
| 11-044300 | 1100-R-* | 1500-B-* |
| 11-044700 | 1100-2R-* | 1500-E-* |
| 11-045400 | 1100-D-* | 1500-D-* |
| 11-045100 | 1100-LM-* | 1500-C-* |
| 11-052900 | 1100-2LM-* | 1500-F-* |
| 11-044600 | 1100-RM-* | 1500-D-* |
| 11-053000 | 1100-2RM-* | 1500-H-* |
| 11-052800 | 1100-DM-1-* | 1500-G-* |
| 11-045600 | 1100-DM-2-* | 1500-G-* |
| | | *See Catalog Numbering for Completion of Catalog Number. |

INDUCTION TYPE CONTROL RELAY CATALOG NUMBERING SYSTEM



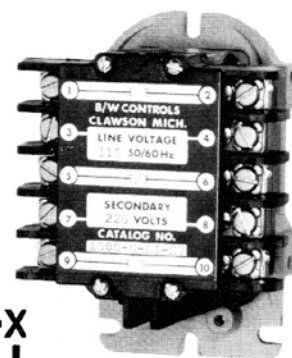
Consult Factory For Special Line Voltages.

All contacts rated at:
25 Amp Resistive at 120, 240, or 480 VAC
1 HP Single Phase at 120 or 240 VAC
Heavy Duty Pilot 120 to 600 VAC
2 Amp Resistive at 120 VDC
10 Amp Resistive at 48 VDC

EXAMPLE: A liquid level application requires 1 N.O., 1 N.C. and 1 N.O. Holding Contact. The line voltage available is 115 VAC. It is desired to detect the level of storm run-off water. The installation is outside requiring a NEMA 4 water tight enclosure.

CAT. NO. 1500—G—L1—S8—N4—X

Series 1500 Induction Relays



-S7

N1

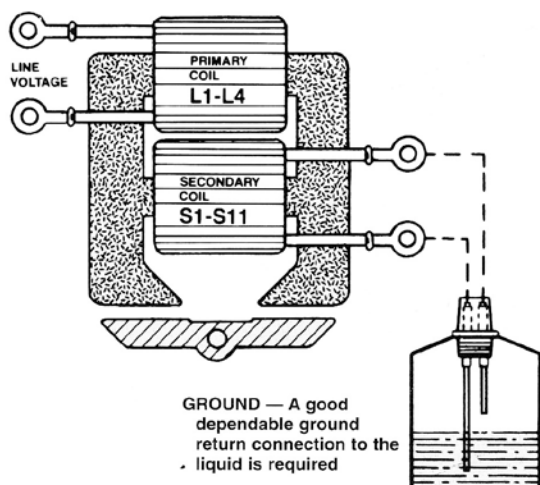
X

| | • SECONDARY COIL VOLTAGE | TYPICAL LIQUIDS |
|-----|--------------------------|---|
| S1 | 12 Volts A.C. | Metallic circuits |
| S2 | 24 Volts A.C. | Metallic circuits |
| S3 | 40 Volts A.C. | Acid or caustic solutions; Milk; Brine and salt solutions; Plating solutions; Buttermilk; Soups. |
| S4 | 90 Volts A.C. | Weak acid or caustic solutions; Beer; Baby foods; Fruit juices. |
| S7 | 220 Volts A.C. | Sewage; Most water-except very soft; Pottery slip; Water soluble oil solutions; Starch solutions. |
| S8 | 360 Volts A.C. | Very soft water; Sugar syrup. |
| S9 | 480 Volts A.C. | Steam condensate; Strong alcohol solutions. |
| S11 | 800 Volts A.C. | Demineralized or distilled water.* |

• Additional Secondary Coil Voltages Available - Consult Factory

* Exceptionally Pure Water May Require BIW 5200H Series Relay. Catalog Page 17

| | ADDITIONAL OPTIONS |
|---|--|
| X | None |
| M | Manual Reset Button |
| | reset relay. Consult factory for NEMA 7 manual reset option. |



TYPE OF ENCLOSURE

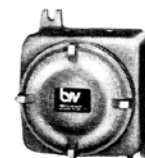
| | |
|-----|---|
| OC | Open Chassis |
| N1 | NEMA 1, General Purpose |
| N4 | NEMA 4, Weather Proof, Watertight & Dust Tight |
| N4X | NEMA 4X Fiberglass Watertight, Dust Tight & Corrosion Resistant |
| N7 | NEMA 7, Class I, Group D; Class II, Groups E, F & G |
| N12 | NEMA 12, Oil Tight |



NEMA 1



NEMA 4



NEMA 7



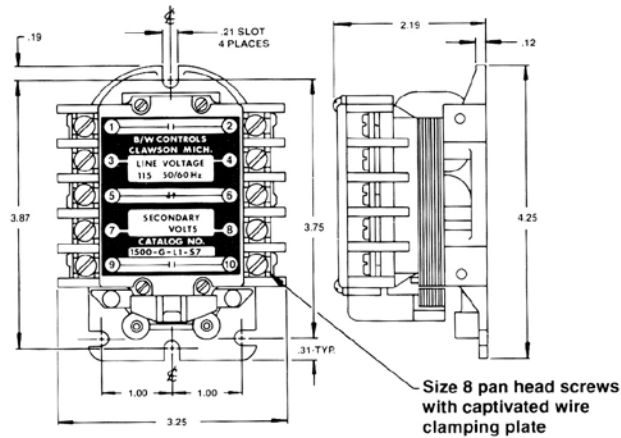
NEMA 12

METEK®

FACTORY AUTOMATION

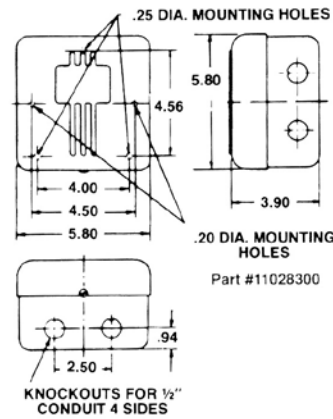
DIMENSIONS

OPEN CHASSIS



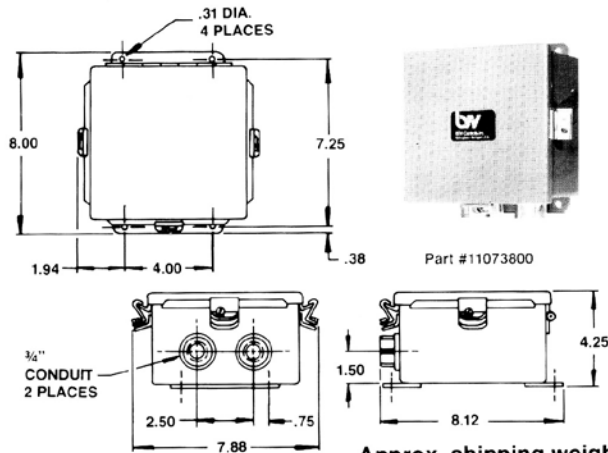
Approx. Shipping weight
1.5 pounds.

NEMA TYPE 1 GENERAL PURPOSE ENCLOSURE



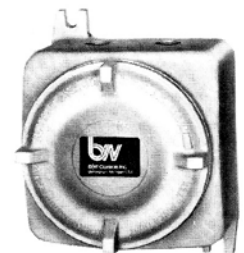
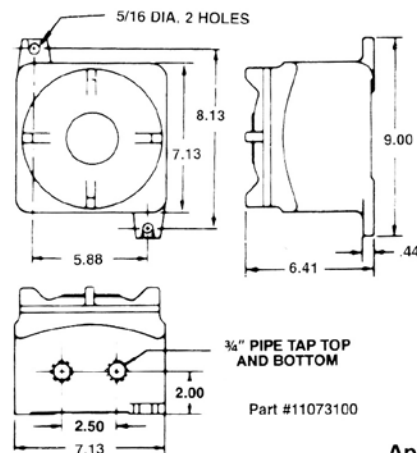
Approx. shipping weight:
5 pounds with relay.

NEMA TYPE 4 WATER & DUST TIGHT ENCLOSURE



Approx. shipping weight:
9 pounds with relay.

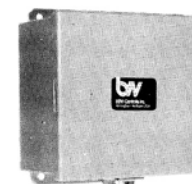
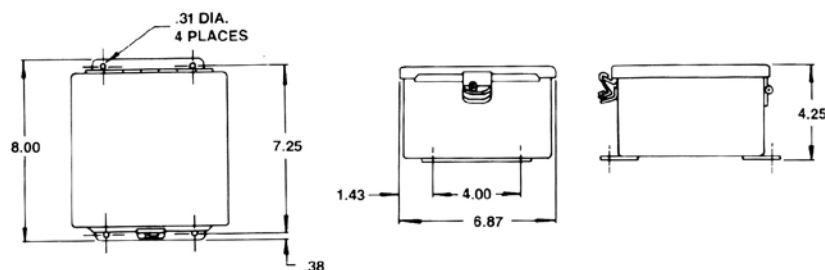
NEMA TYPE 7 EXPLOSION-PROOF ENCLOSURE



UL & CSA Rating
Class I, Group D
Class II, Group E, F & G

Approx. shipping weight:
12 pounds with relay.

NEMA TYPE 12 OIL-TIGHT ENCLOSURES



Part #11073900

Approx. shipping weight:
7 pounds with relay.

Series 5200 Solid State Relays

DESIGN FEATURES

Series 5200 Solid-State Level Control Relays were developed to provide optimum stability and reliability on controlling a wide variety of high and low resistance liquids and moist bulk materials — all well as for general purpose use in applications requiring low voltage control.

Supplied as compact packaged units, they combine performance-proved solid-state printed circuitry with an electromechanical load relay that features isolated double pole/double throw load contacts for energizing pump motors, valves and other operating equipment.

Equipped with silicon controlled rectifiers to assure years of service without change in operating characteristics. They will operate with less than 10% difference between pull-in and drop-out resistance and they can be mounted in any position. Units are field selectable for either direct or inverse operation.

Series 5200 solid state relays are available in two sensitivity ranges—low or high.

UL Recognized and CSA Listed.

SPECIFICATIONS

Dual Voltage: Either 115 or 240 VAC, +10% -20% — 50/60 Hz.

Contacts: Silver cadmium oxide.

Contact Ratings: 10 amperes at 120 or 240 volts ac.—or 28 volts dc.; 1/4 hp at 120 volts ac. and 1/3 hp at 240 volts ac.

Arrangement: Double pole, double throw load contacts plus single pole, double throw holding circuit contacts.

Power Required: 9 voltampere, 6 watt.

Operating Temperature: -40°F to + 180°F

SENSING CIRCUIT:

Low Sensitivity: 8 volt ac and less than 30 ma shortcircuit

High Sensitivity: 9.6 volt dc and less than 1 ma short circuit.

SENSITIVITY: See page 14.

LOW SENSITIVITY RELAY



Low Sensitivity Relay
With R1 Fixed Sensitivity
Resistor
Cat No. 5200-LF1-OC



Low Sensitivity Relay
With Variable Sensitivity
Resistor Potentiometer
Cat No. 5200-LV1-OC

The **LOW SENSITIVITY RELAY** is designed for the control or detection of electrically conductive liquids with low to medium specific resistance.

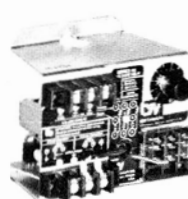
Typical liquids are ordinary potable and waste water, most acids, plating solutions, fruit juices, soups, beer, milk and soft drinks.

With a low voltage A-C electrode potential the **LOW SENSITIVITY RELAY** operates with no shock or sparking hazard, and no product contamination due to electrolysis. It is ideal for food, drug, dairy and chemical processing applications.

HIGH SENSITIVITY RELAY



High Sensitivity Relay
With R1 Fixed Sensitivity
Resistor
Cat. No. 5200-HF2-OC,



High Sensitivity Relay
With Variable Sensitivity
Resistor Potentiometer
Cat. No. 5200-HV3-OC

The **HIGH SENSITIVITY RELAY** is recommended for the control or detection of electrically conductive liquids with medium to high specific resistance. Typical liquids are distilled and deionized water steam condensate, alcohol, glycols and anhydrous ammonia. It is also suitable for detecting or controlling ore, foundry sand and other bulk materials with low moisture content.

The **HIGH SENSITIVITY RELAY** has a low voltage D-C electrode potential and no shock hazard exists in the electrode circuit. Also, the D-C sensing potential makes this relay an excellent choice for use in applications where the relay must be located many thousands of feet away from the electrodes.

METEK®

FACTORY AUTOMATION

SENSITIVITY SELECTION

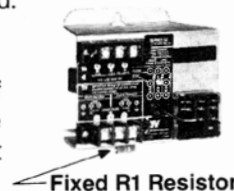
BIW level control systems use the liquid as an electrical conductor to complete the Series 5200 relay sensing circuit, and it is necessary that the relay have an operating sensitivity greater than the resistance of the liquid to be controlled. The sensitivity of both models of the Series 5200 relay is determined

by the value of the replaceable R1 resistor used. Since the resistance of liquids vary over a very large range, a wide selection of fixed and variable sensitivities are available as detailed on the chart below.

When operating from contacts of pilot switches, any of the resistors can be used but the smallest R1 resistor value is recommended.

FIXED SENSITIVITY

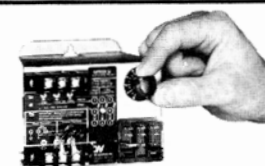
Both the high and the low sensitivity relays are shipped from the factory with a complete set of fixed resistors. The proper R1 resistor must be selected during installation as shown in the diagrams on page 6. Fixed sensitivity resistors are recommended when operating from pilot switch contacts or when the liquid being controlled is always the same.



Fixed R1 Resistor

VARIABLE SENSITIVITY

Both high and low sensitivity relays are available with variable resistance potentiometers. A kit can be supplied for field installation. The low sensitivity model has two variable sensitivity ranges and the high sensitivity model has three sensitivity ranges as shown in the table below. Variable sensitivity models are recommended for applications where the relay is to be used on a variety of liquids. They also should be used for interface detection or on applications where foam is present and it is necessary to operate on the liquid phase only.



Adjustable R1 Potentiometer

| | R1 SENSITIVITY RESISTOR | | SENSING CIRCUIT LIMITATIONS | | MAXIMUM OPERATING SENSITIVITY | |
|--|-------------------------|-------------|--|---------------------------|-------------------------------|-------------------|
| | Nominal Resistance | Part Number | Maximum Capacitance Electrode Wire to Ground | Maximum Lead Wire Lengths | Direct Operation | Inverse Operation |
| LOW SENSITIVITY RELAY Maximum Sensitivity Direct Operation: 16,000 Ohms Inverse Operation: 26,000 Ohms Electrode Potential 8 volts A.C. Electrode Current Less than 30 Milliampers | 270 Ohms | 04154900 | 3.7 Microfarads | 15,000 feet | 200 Ohms | 330 Ohms |
| | 470 Ohms | 04155000 | 1.7 Microfarads | 15,000 feet | 340 Ohms | 570 Ohms |
| | 1,000 Ohms | 04138300 | .80 Microfarads | 15,000 feet | 730 Ohms | 1,200 Ohms |
| | 1,800 Ohms | 04155100 | .44 Microfarads | 11,000 feet | 1,300 Ohms | 2,200 Ohms |
| | 3,900 Ohms | 04155200 | .20 Microfarads | 5,000 feet | 2,800 Ohms | 4,800 Ohms |
| | 10,000 Ohms | 04149400 | .08 Microfarads | 2,000 feet | 7,300 Ohms | 12,000 Ohms |
| | 22,000 Ohms | 04138400 | .036 Microfarads | 900 feet | 16,000 Ohms | 26,000 Ohms |
| | Variable | 52110205 | .80 Microfarads | 15,000 feet | 100-700 Ohms | 200-1200 Ohms |
| | Variable | 52110206 | .036 Microfarads | 900 feet | .6K-15K Ohms | 1K-24K Ohms |
| HIGH SENSITIVITY RELAY Maximum Sensitivity Direct Operation: 11.6 Megohms Inverse Operation: 12.0 Megohms Electrode Potential 9.6 volts D.C. Electrode Current Less than 1 Milliampere | 10,000 Ohms | 04149400 | 120 Microfarads | 50,000 feet | 9,600 Ohms | 9,600 Ohms |
| | 22,000 Ohms | 04138400 | 55 Microfarads | 50,000 feet | 21,000 Ohms | 21,000 Ohms |
| | 68,000 Ohms | 04138500 | 18 Microfarads | 50,000 feet | 66,000 Ohms | 66,000 Ohms |
| | .33 Megohms | 04138600 | 4.0 Microfarads | 50,000 feet | .31 Megohms | .32 Megohms |
| | .82 Megohms | 04138800 | 1.5 Microfarads | 35,000 feet | .80 Megohms | .81 Megohms |
| | 2.2 Megohms | 04138900 | 0.5 Microfarads | 12,000 feet | 2.1 Megohms | 2.2 Megohms |
| | 5.6 Megohms | 04139000 | 0.2 Microfarads | 4,000 feet | 5.4 Megohms | 5.6 Megohms |
| | 12.0 Megohms | 04139100 | 0.1 Microfarads | 2,000 feet | 11.6 Megohms | 12.0 Megohms |
| | Variable | 52120205 | 12 Microfarads | 50,000 feet | 2K-100K Ohm | 2K-100K Ohms |
| | Variable | 52120206 | 1.2 Microfarads | 28,000 feet | 7K-1.0 Megohms | 7K-1.0 Megohms |
| | Variable | 52120207 | 0.2 Microfarads | 4,000 feet | 47K-5.0 Megohms | 47K-5.0 Megohms |

Distances shown in the tables above are based upon the use of two 18-gauge lead wire in ½" diameter conduit.

Series 5200 Solid State Relays

DIRECT AND INVERSE OPERATION

Positive fail-safe control can be obtained simply by connecting the proper R1 resistor to the terminal block for direct or inverse operation as shown in the diagrams at right.

In *direct operation*, the load relay is energized when the liquid contacts the *upper* electrode, or Unifloat® reed switch, and electrode current is flowing. In *inverse operation*, the load relay is energized when the liquid falls below the *lower* electrode, or Unifloat® reed switch, and current ceases to flow.

GROUND CONNECTIONS

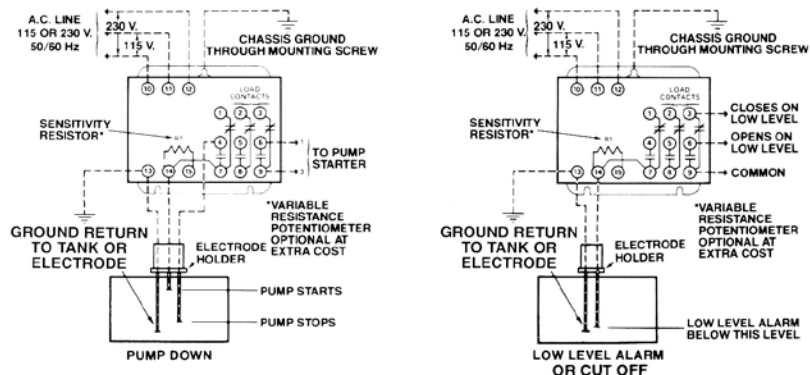
In all installations, a good external ground connection and a dependable return circuit to the liquid are required. In most instances, grounding to a metal pipe leading to the tank is suitable, but electrical conduit should not be used for this purpose.

If a good ground connection to the liquid is not available, an additional ground electrode is required. When used, the ground electrode should extend slightly below the longest operating electrode. In addition, it is also desirable to ground the relay chassis directly to ground terminal or through a relay mounting screw.

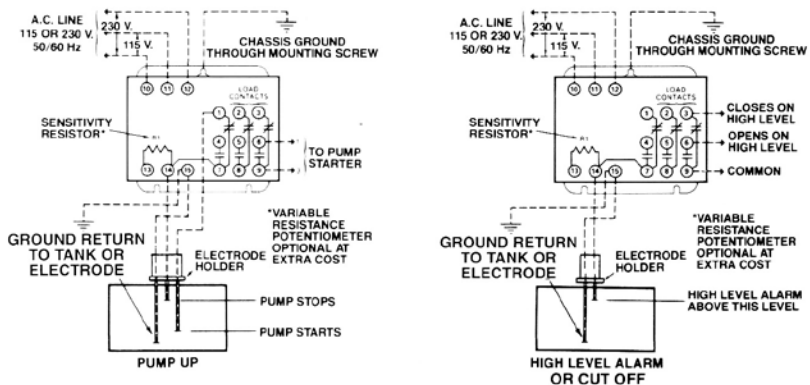
ELECTRODE LEAD WIRES

Shielded cable is not required, and ordinary insulated wire can be used for electrode leads. Lead wires should be isolated from, not run in the same conduit with, power and load carrying circuits to avoid direct coupling with these circuits. While capacitance of the lead wire to ground has some slight affect on sensitivity, this factor need only be considered when relay is located more than 900 feet away from electrodes.

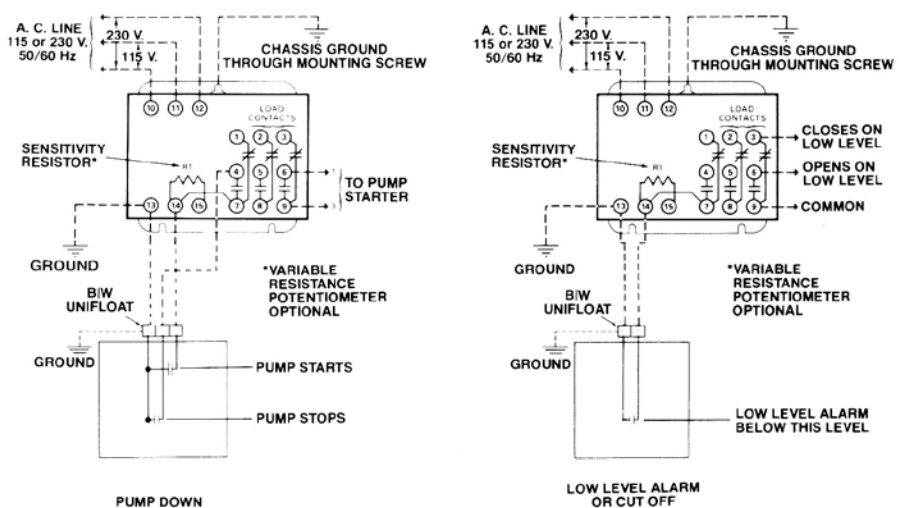
DIRECT OPERATION FROM BIW ELECTRODES



INVERSE OPERATION FROM BIW ELECTRODES



DIRECT OPERATION FROM BIW UNIFLOAT®



AMETEK[®]

FACTORY AUTOMATION

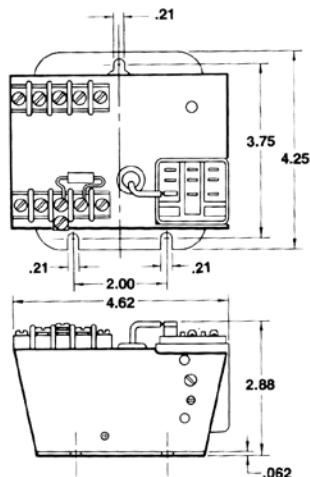


Series 5200 Solid State Relay
with replaceable fixed sensitivity resistor R1

PART NO. CROSS REFERENCE

| | OLD PART NO. | NEW CAT. NO. |
|---|--------------|--------------|
| Low Sensitivity | 52-110100 | 5200-LF1-* |
| | 52-110201 | 5200-LV1-* |
| | 52-110202 | 5200-LV2-* |
| High Sensitivity | 52-120100 | 5200-HF2-* |
| | 52-120201 | 5200-HV3-* |
| | 52-120202 | 5200-HV4-* |
| | 52-120203 | 5200-HV5-* |
| *See Cat. Numbering System for Completion of Catalog Number | | |

Series 5200 Relay Chassis Dimensions



5200

Catalog
Section

**LOW SENSITIVITY
CONTROL RELAYS**

CAUS
E67365

**HIGH SENSITIVITY
CONTROL RELAYS**



Series 5200
Solid State Relay
with variable sensitivity
Potentiometer.

Series 5200

Solid State Relays

SERIES 5200 CATALOG NUMBERING SYSTEM

| —LF1— | | | N1 | |
|------------------------|---------------------------------|---|-------------------|--|
| | R1 Sensitivity Resistance | Application Recommendations | TYPE OF ENCLOSURE | |
| LF1 Fixed | 270 ohms | All metallic circuits, BiW Unifloat. | OC | Open Chassis |
| | 470 ohms | Strong electrolytes: Plating solutions. | N1 | NEMA 1, General Purpose |
| | 1,000 ohms | Weak electrolytes: Ammonium hydroxide, borax, acetic acid | N4 | NEMA 4, Water Tight |
| | 1,800 ohms | Most food processing applications: Beer, wine, fruit juices, milk buttermilk. | N4X | NEMA 4X Fiberglass Water Tight, Dust Tight & Corrosion Resistant |
| | 3,900 ohms | Highly corrosive acid or caustic solutions where electrode current must be minimized to extend electrode life: Hydrochloric acid, sulfuric acid, etc. | N7 | NEMA 7, Explosion Proof Class I, Group D, Class II, Group E, F & G |
| | 10,000 ohms | Ordinary water with medium to high mineral content, sewage, water soluble oil and starch solutions. | N12 | NEMA 12, Oil Tight |
| | 22,000 ohms | Most water with low mineral content. (Soft water—not distilled or deionized water. Use High Sensitivity Relay Control) | | |
| LV1 Variable | Variable 100-700 ohms | Same as above for 270 or 470 or 1000 ohms | | |
| LV2 Variable | Variable .6K-15K ohms | Same as above for 1,800 thru 22,000 ohms | | |
| HF2 Fixed | 10,000 ohms | Ordinary water with medium to high mineral content, sewage, water soluble oil and starch solutions, long distance applications | | |
| | 22,000 ohms | Water with low mineral content (soft water — not distilled or demineralized), sugar syrup solutions, long distance applications. | | |
| | 68,000 ohms | Steam condensate, corn syrup, strong alcohol solutions up to 50% | | |
| | 330,000 ohms | Alcohol solutions up to 70% | | |
| | 820,000 ohms | Deionized or distilled water, 95% glycerine, 90% hydrogen peroxide, 95% ethyl alcohol, granular solids with high moisture content | | |
| | 2.2 megohms | Glacial acetic acid, acetone, granular solids with some moisture content | | |
| | 5.6 megohms | M.E.K. (Methyl ethyl ketone) | | |
| | 12.0 megohms | Anhydrous ammonia | | |
| HV3 Variable | Variable 2K-100K ohms | Same as above for 10,000 thru 68,000 ohms | | |
| HV4 Variable | Variable 7K-1.0 megohms | Same as above for 330,000 and 820,000 ohms | | |
| HV5 Variable | Variable 47K-5.0 megohms | Same as above for 2.2 and 5.6 megohms | | |



NEMA 1



NEMA 7



NEMA 4



NEMA 12

See page 12 for enclosure dimensions.

Note: D1 water, glycols, alcohols and granular solids may require the 2.2, 5.6 or 12.0 megohms R1 resistor depending upon their purity or moisture content.
5200-LF1 and 5200-HF2 Solid State Relays are furnished as standard with a complete set of R1 sensitivity resistors as listed.
Selection of proper resistor should be based on the specific resistance of the material to be controlled. It is important that the R1 resistor selected be rated higher than the resistance of the liquid or other sensing circuit.



LONG DISTANCE AND LOW VOLTAGE REMOTE CONTROL SYSTEM USING THE SERIES 5200 SOLID STATE RELAY

The Series 5200 Solid State Relay is ideal for long distance and low voltage remote control systems. The Series 5200 Low Sensitivity Relay is used for applications requiring AC sensing circuits. The Series 5200 High Sensitivity Relay is used for applications requiring DC sensing circuits.

In general the maximum distance for an AC sensing circuit is limited by the **capacitance** of the wires connecting the relay to the pilot device. If a DC sensing circuit is used, distance is limited by the **resistance** of the control circuit. (See tables below.) In most cases the size of wire is based on the physical strength required to meet given installation conditions. #14 to #18 gauge wire is generally strong enough for private buried or overhead wiring.

The Series 5200 Solid State Relays are capable of performing control functions directly from electrodes or pilot switching devices located **several miles** away.

Telephone circuits and some communication cables use small wires having relatively high resistance. In all cases, however, control circuit wires must have good insulation, and splices or connections must be water-tight and well insulated from ground.

The built-in holding circuit feature shown below allows the Series 5200 Relay to operate over a range of levels and from pushbuttons or other momentary contact switches.

Low Sensitivity 5200-L Relay with 270 ohm R1 resistor: output—8 Volts AC. Current—30 milliamperes. Maximum circuit resistance—200 ohms. Maximum capacitance—3.7 microfarads.

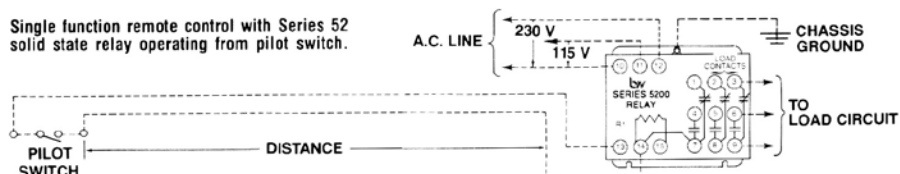
High Sensitivity 5200-H Relay with 10,000 ohm R1 resistor: Output—9.6 Volts DC. Current—1 milliampere. Maximum circuit resistance—9,600 ohms. Maximum capacitance—120 microfarads.

TYPICAL CAPACITANCE AND RESISTANCE VALUES

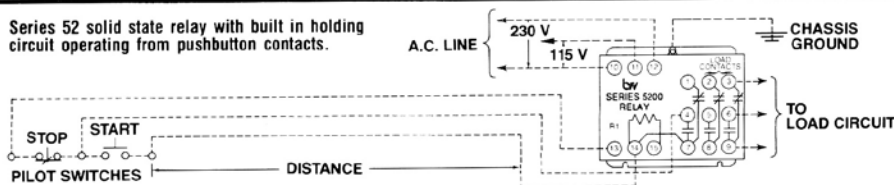
| CONTROL WIRES | CAPACITANCE Mfd/1000 feet |
|---|------------------------------|
| Telephone pair | 0.015 mfd |
| Two #14 in open air | 0.02 mfd |
| Two #14 in ½" conduit | 0.04 mfd |
| Two #14 in lead sheath | 0.30 mfd |
| Smaller wires have less capacitance. | |

| COPPER WIRE SIZE | RESISTANCE Ohms/1000 feet |
|---------------------|------------------------------|
| 14 gauge | 2.6 ohms |
| 16 gauge | 4.1 ohms |
| 18 gauge | 6.5 ohms |
| 20 gauge | 10.4 ohms |
| 22 gauge | 16.5 ohms |
| 24 gauge | 26.2 ohms |
| 26 gauge | 41.7 ohms |

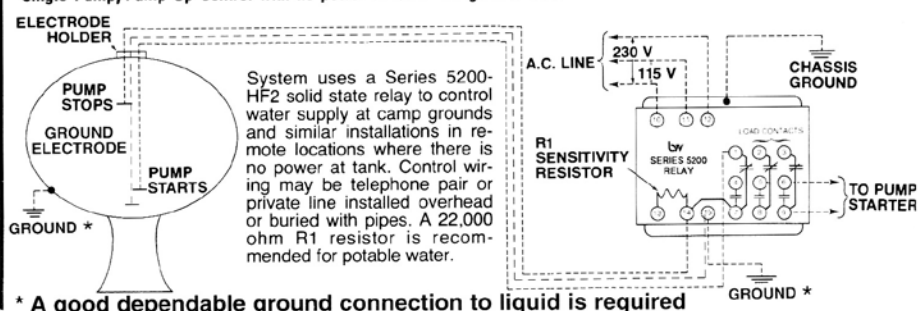
Single function remote control with Series 52 solid state relay operating from pilot switch.



Series 52 solid state relay with built in holding circuit operating from pushbutton contacts.



Single Pump/Pump Up Control with no power at tank—Diagram F-1704



Series 5400

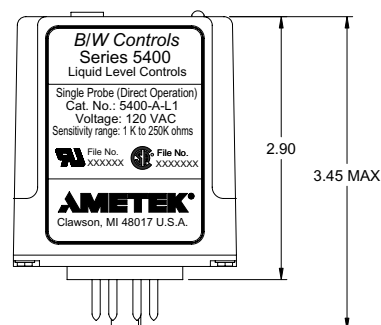
Plug-In Style Relays

Series 5400 Plug-In Style Liquid Level Control Relay

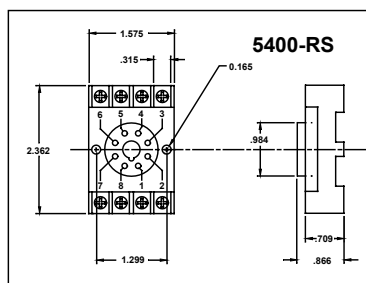
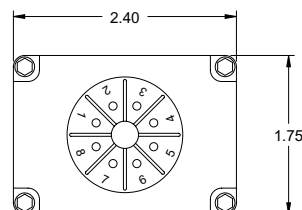
Ordering Information

| | SINGLE LEVEL | | DUAL LEVEL | |
|----------------|--|--|---------------------------------|--------------------------------|
| | Direct Operation (High Level Alarm) | Inverse Operation (Low Level Alarm) | Direct Operation (Pump Down) | Inverse Operation (Pump Up) |
| 110 Volts A.C. | 5400-A-L1 | 5400-B-L1 | 5400-C-L1 | 5400-D-L1 |

Series 5400 Relay Dimensions



NOTE:
Disconnect
power before
servicing.



| | Telephone Pair | Two #14 in open air | Two #14 in 1/2" conduit | Two #14 in lead sheath |
|--|--------------------------------|--------------------------------|-----------------------------|---------------------------|
| Minimum (1.0k ohms) Sensitivity | In excess of 50,000 feet | In excess of 50,000 feet | In excess of 50,000 feet | 8,000 feet |
| Maximum (250K ohms) Sensitivity | 700 feet | 530 feet | 265 feet | 35 feet |

COMPACT, PLUG IN, STYLE RELAYS

Designed to operate from electrodes or probes contacting conductive liquids, they are suited to level control applications such as vending, dispensing, ice-making machines, water softeners, dishwashers, and coffee makers, plus many types of operating equipment in the food, drug, dairy, brewing, distilling and chemical processing industries.

Series 5400 Relays have a low energy sensing circuit with a lock-in holding feature that permits operation over a range of levels, or from momentary contact pilot devices such as float, pressure and limit switches, thermostats and push-button actuators, etc. They are equally suitable for use as original equipment components in many products and systems that require monitoring and control of such process variables as temperature, pressure, humidity, flow, voltage and current, etc.

BASIC SPECIFICATIONS

Voltage: 120 volts ac, 50/60 hertz

24 volts ac, 50/60 hertz (special order)

Power Required: 1.2 volt-amperes max.

Load Contacts: Single pole, double throw. Silver Cadmium Oxide

Contact Ratings: 10 amps resistive load or 1/3 hp at 120 volts ac; 6 amps at 240 volts ac or 28 volts dc. Minimum load is 100 mA at 5 vdc.

Sensing Voltage: 18 vac RMS max.

NOTE: All line voltage circuits are isolated from the low voltage ac sensing circuit to assure optimum safety in service.

Sensing Current: 2.0 mA RMS max.

Sensitivity: Adjustable 1K to 250K ohms +/- 10%. factory set at 100k OHMS +/- 10%

Mounting: 8 pin octal base socket (sold separately)

Time Delay: 5 seconds +/- 10%, other delay times available on 5400-A and 5400-B series only



5400 Wiring Diagram

DIAGRAM C:

HIGH LEVEL ALARM
5400-A DIRECT OPERATION

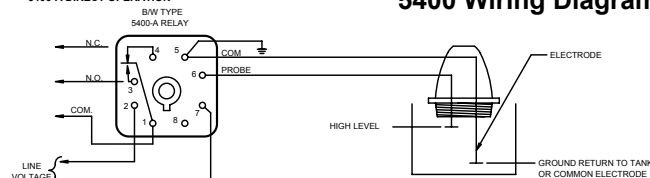


DIAGRAM D:

LOW LEVEL ALARM
5400-B INVERSE OPERATION

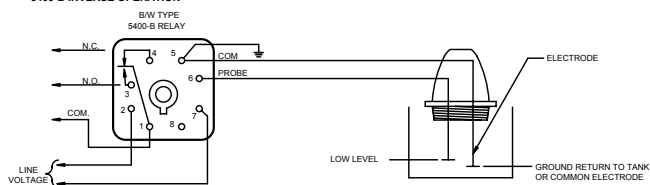


DIAGRAM A:

PUMP DOWN CONTROL
5400-C DIRECT OPERATION

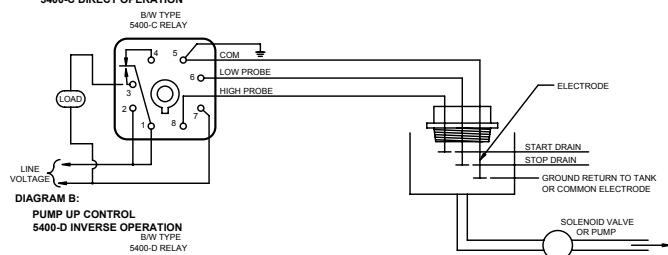
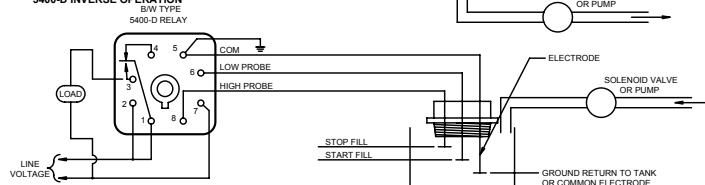
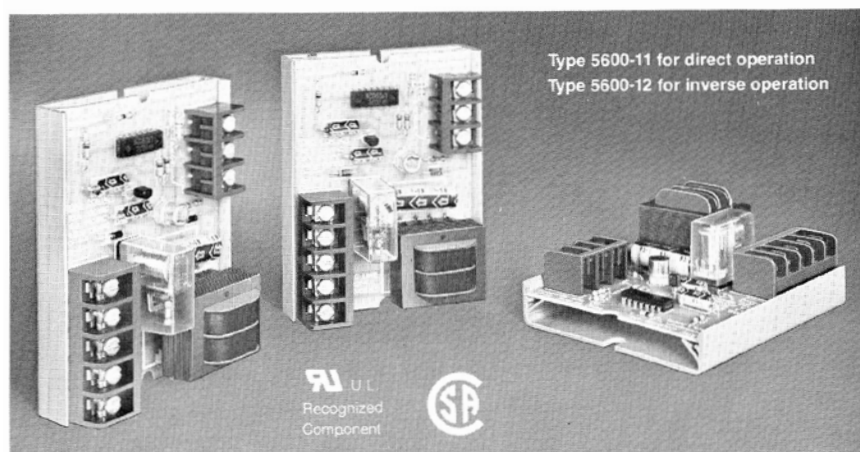


DIAGRAM B:

PUMP UP CONTROL
5400-D INVERSE OPERATION



Series 5600 Solid State Relays



NEW COMPACT, LOW-COST RELAYS PROVIDE SAFE, RELIABLE LONG-LIFE OPERATION FOR A BROAD RANGE OF ORIGINAL EQUIPMENT APPLICATIONS

BIW Series 5600 Relays were developed especially for use as safe, reliable, economical original equipment components in many different types of commercial and industrial products.

Designed to operate from electrodes or probes contacting conductive liquids, they are ideally suited for level control applications in such products as vending, dispensing and ice-making machines—water softeners, dishwashers, coffee makers—plus many types of operating equipment in the food, drug, dairy, brewing, distilling and chemical processing industries.

In addition, Series 5600 Relays have a low energy sensing circuit with a lock-in holding feature that permits operation over a range of levels or from momentary contact pilot devices such as float, flow, pressure and limit switches, thermostats and pushbutton actuators, etc. Thus, they are equally suitable for use as original equipment components in many products and systems that require monitoring and control of such process variables as temperature, pressure, humidity, flow, voltage and current, etc.

OTHER FEATURES AND ADVANTAGES

- Choice of direct or inverse operation to provide fail-safe control.
- UL Recognized Component File No. E67365.

- In *direct* operation, load relay is *energized* when the low voltage dc sensing circuit is completed. In *inverse* operation, load relay is *de-energized* when the low voltage dc sensing circuit is completed.

NOTE: When ordering, please specify Type 5611-00 relays for direct operation applications, and Type 5612-00 relays for inverse operation.

- All line voltage circuits are isolated from the low voltage dc sensing circuit to assure optimum safety in service.
- Low voltage dc sensing circuit also permits location of relays several thousand feet from electrodes or remote pilot devices.
- Relays will operate reliably when mounted in any position required to meet a complete range of application design requirements.
- Barrier-type terminal blocks with saddle clamp screw terminals for 12 to 18 gauge wire are standard. Quick-disconnect tabs or other wiring terminals can also be supplied to meet specific application requirements.
- Load contacts are covered with a clear plastic housing to protect against dust and moisture to assure reliable long-life operation.
- Relays will operate over ambient temperature range from -40° to $+150^{\circ}\text{F}$ (-40° to $+66^{\circ}\text{C}$).

BASIC SPECIFICATIONS

Voltage: 120 volts ac, 50/60 hertz
240 volts ac, 50/60 hertz
12 volts dc
24 volts dc

Other voltages available on special order.

Power Required: 4 volt-amperes, 2 watts.

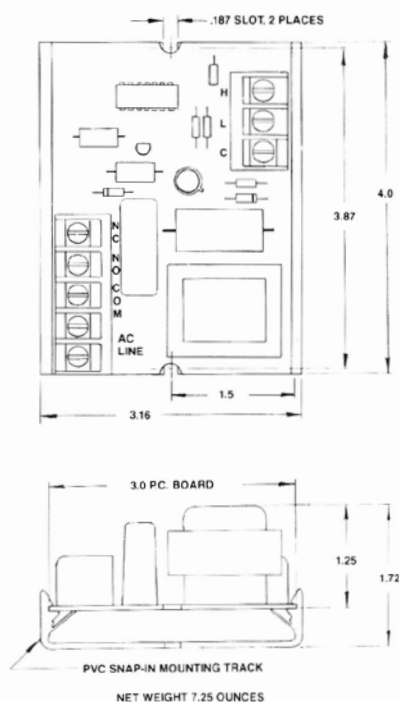
Load Contacts: Single pole, double throw. Gold-flashed silver cadmium oxide.

Contact Ratings: 10 amperes resistive load or 1/3 hp at 120 volts ac; 6 amperes resistive load at 240 volts ac or 28 volts dc.

Sensing Circuit: 17.5 volts dc open circuit; 400 micro-amperes short circuit. Includes a lock-in feature for greater versatility.

Sensitivity: 50,000 ohms fixed is standard. Other sensitivities, fixed or adjustable, are available on special order.

SERIES 5600 RELAY DIMENSIONS



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FACTORY AUTOMATION

TYPICAL APPLICATIONS

Diagrams at right illustrate basic details of typical applications in which Series 5600 Relays are used as original equipment components to provide fail-safe control by de-energizing the load in event of power or relay failure.

In Diagram A, Type 5611-00 Relay is used for direct operation to provide automatic *pump down* control for dehumidifiers, sumps, or any other product requiring control of a liquid at a given high level set point. In Diagram B, a Type 5612-00 Relay is used for *inverse* operation to provide *pump-up* control for carbonators, humidifiers, purification stills, etc. where liquid must be kept above a low level set point.

Diagram C shows use of a Type 5611-00 Relay for direct operation to provide low level alarm and/or cutoff with lock-in and manual reset for automatic dispensing, bottling and mixing machines.

Diagram D shows direct operation from a transducer or any other pilot device to perform specific control functions required by many commercial and industrial products.

INSTALLATION NOTES

Because Series 5600 Relays feature a low voltage, low current sensing circuit, inexpensive small gauge lead wires may be used between relays and electrodes, sensors, or pilot switching devices. Shielded cable is not required, and lead wires do not have to be isolated from other wiring. Also, in many level control applications, a common electrode is not required so long as a good, dependable metallic ground return from the relay to the liquid is provided.

DIAGRAM A: PUMP DOWN CONTROL — DIRECT OPERATION

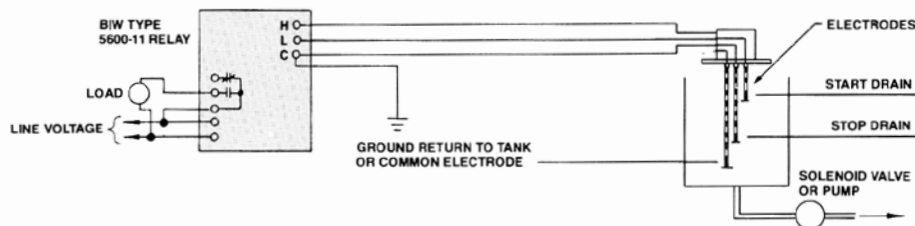


DIAGRAM B: PUMP UP CONTROL — INVERSE OPERATION

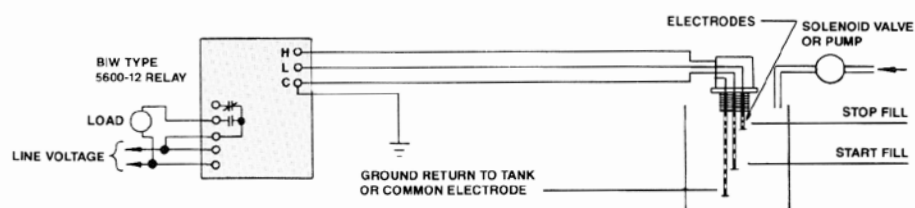


DIAGRAM C: LOW LEVEL ALARM OR CUT OFF — DIRECT OPERATION — WITH LOCK-IN & RESET PUSHBUTTON

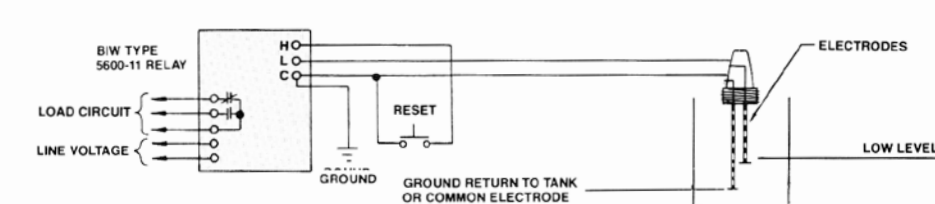
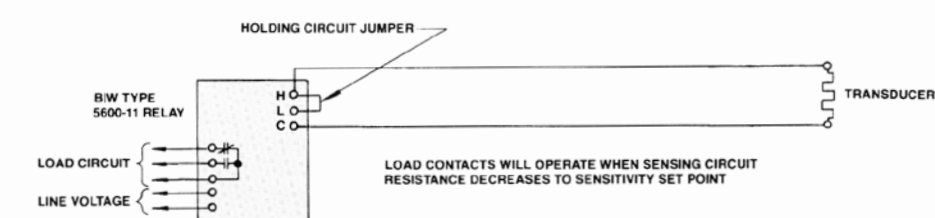


DIAGRAM D: CONTROL FROM RESISTIVE TRANSDUCER — DIRECT OPERATION — LOAD ACTUATION ON DECREASING RESISTANCE



CATALOG NUMBER

5611-0000 Relay for Direct Operation — Specify line voltage

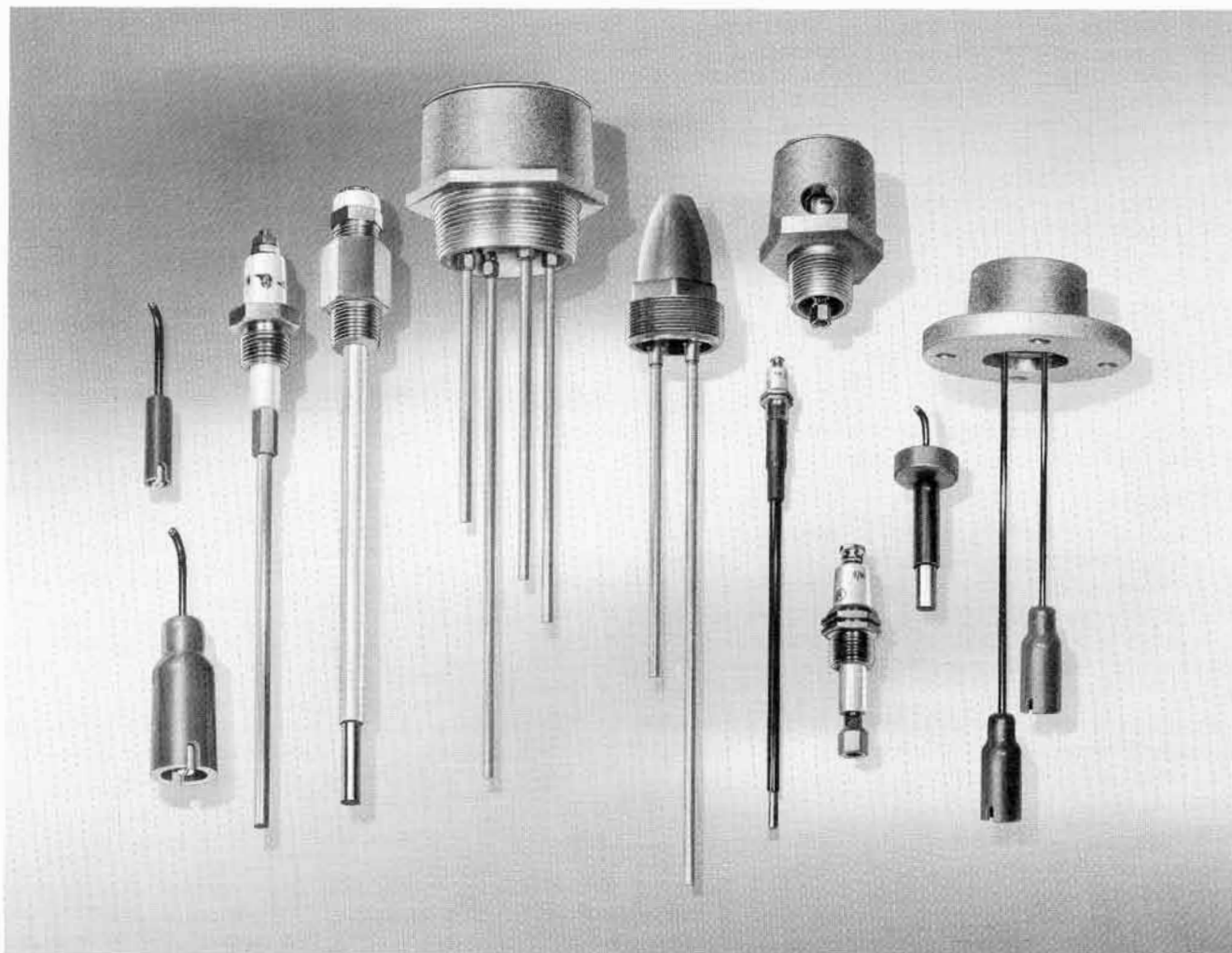
5612-0000 Relay for Inverse Operation — Specify line voltage

The standard sensitivity of the Series 5600 Control Relay is 50,000 ohms. Other sensitivities, fixed or adjustable, are available.

Many special features are available such as time delays, high power relay outputs, and triac outputs.

Consult the factory for your specific requirements.

Series 6012/6013 Electrode Holders/Electrodes



Since its introduction in 1933, the original BIW concept of utilizing the electrical conductivity of most liquids as a means of achieving liquid level control has won widespread acceptance as the most versatile and reliable system of its kind. In the BIW system of floatless liquid level control, electrodes or probes are suspended in the container to make contact with the liquid and thus complete a circuit which actuates a BIW relay. The relay contacts in turn are used for a wide range of applications such as controlling pumps and valves, or sounding alarms on level conditions.

Electrodes and holders should be selected according to the specific characteristics of the liquid involved, the lengths required to obtain the desired control of levels, and the physical nature of the container. Because of these factors, the BIW line of electrodes and holders presented in this section has been developed to provide a practical,

economical solution to almost every conceivable application and installation problem. When necessary, special equipment can also be supplied to meet specific needs.

Electrodes are normally used with a suitable holder and, wherever possible, should be suspended vertically downward from the top of the tank or other vessel containing the liquid. Also, electrodes are connected to the sensing circuit of a BIW relay. While this is a low energy circuit with inherently limited low current, the electrodes are terminals of a live electrical circuit and must be installed to prevent contact by unauthorized personnel.



SELECTING AND ORDERING ELECTRODE EQUIPMENT

The first step in selecting electrode equipment is to establish the overall general conditions for the specific application. The control functions desired will determine the BIW relays to be used, and also the number of electrodes required. Factors to be considered include: type of service such as indoor or outdoor installation; type of container for the liquid; nature, temperature and pressure of the liquid; any corrosive or hazardous condition existing; number and length of electrodes.

BIW electrode type of level control may be used on liquids that have sufficient conductivity to operate one of the BIW control relays, and they include potable water, steam condensate D.I. water, sewage, slurries acids, alkalies, salts, beer, blood, alcohols, milk, juices, water soluble oils, brine, plating solutions, baby foods, soups, and many others.

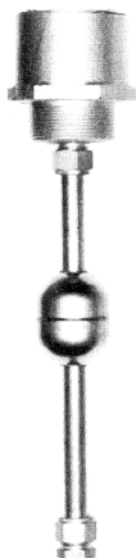
The BIW Unifloat® shown at the bottom of this page should be used for non-conducting liquids such as fuel and vegetable oils, gasolines and many organic chemicals that have specific resistance above 12 megohms-cm (Conductivity less than 0.1 micromho).

To assist in the selection of electrode equipment see the following pages where pictures and basic information is furnished for quick comparison of available types.

ELECTRODE HOLDERS

In general, BIW electrode holders have mounting provisions to mate with standard pipe fittings on the vessel, and the pressure and temperature ratings for the various types are shown on the specification pages. Most holders have water-tight protection for the conduit or cable entrance. Where possible, all electrodes should be grouped into a single holder and mounted on top of the tank with the electrodes extending vertically downward.

Standard electrode holders are suitable for location in explosive hazardous areas, when BIW Series 5300 or 5510 relays with intrinsically safe sensing circuits are used to operate from the electrodes.



BIW Unifloat®

- Ideal for non-conductive liquids such as gasoline, fuel oil, oily waste and organic chemicals.
- Just one float operates switches for up to 12 sensing levels.
- Simple level adjustment without disturbing tank connections.
- See Catalog Section 7014

ELECTRODE HOLDER

For mechanical mounting and electrical isolation.



ELECTRODE

Solid rod or wire suspension types are available.

ORDERING INFORMATION

For Electrode Holders

Provide *complete* catalog number which will include number of electrode provisions and any special features.

For Solid Rod Electrodes

Provide *complete* catalog number which will include type, material and length.

For Wire Suspension Electrodes

Provide *complete* catalog number. In most cases the suspension wire and wire connector must be ordered as separate items.

ELECTRODES

Solid rod electrodes are generally used where relatively short lengths of 6 feet or less are required. However, care should be exercised when specifying lengths over 3 feet to be certain there is head room to install them, and that liquid movement will not cause bare rods to deflect to touch one another, causing false relay operation.

Wire suspension electrodes are used for long lengths, and generally are more convenient to field set and adjust for operating lengths.

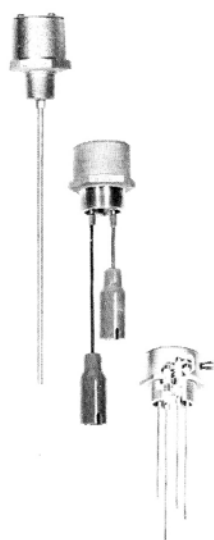
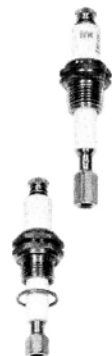

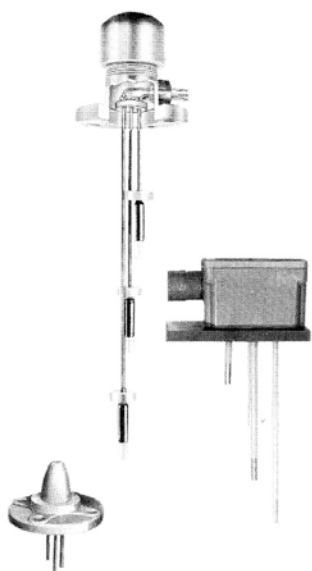
Electrodes subject to turbulence such as found in batching or slurry mixing applications should be strengthened with spacers, protected with a stilling tube, or Ruggedized Electrodes should be used. Gland electrode assemblies are recommended for installation in pipe lines or other applications where side thrust is to be encountered.

CORROSION RESISTANCE

Ametek offers holders and electrodes in a variety of materials, and a standard arrangement is usually available to meet most situations. However, the rate of corrosion is affected by the concentration and temperature of the liquid as well as the presence of impurities or other compounds. Therefore, corrosion information in this catalog should be used as a general guide and the final choice should be based on previous experience and knowledge for the actual application conditions.

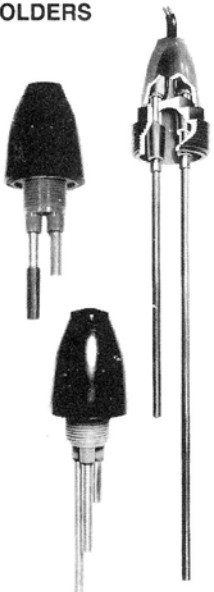
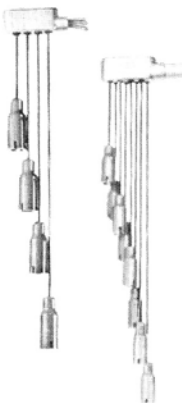

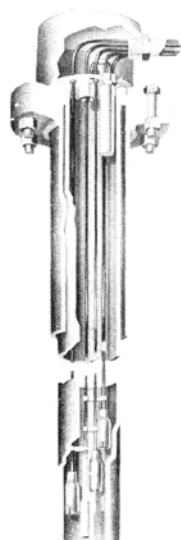
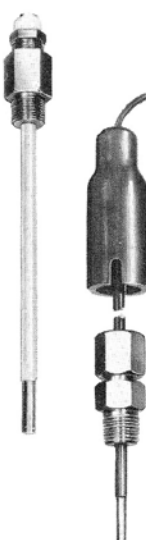
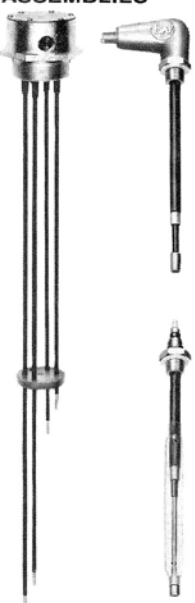
Series 6012/6013

Electrode Holders/Electrodes

| | | | | | | | | | | | |
|---|---|-----------------------|----------------------|---|--|---|-----------|---|-----------|-----------|-------------|
| <p>The following chart is provided to assist in selecting the proper Electrode Holder for your application. Refer to the Catalog Sections listed below for dimensions, list prices and additional engineering information.</p> <p>For information on electrodes see Catalog Section 6013 page 43 for wire suspension electrodes and page 44 for solid rod electrodes.</p> | EXTERNAL PIPE THREADED ELECTRODE HOLDERS | | | ELECTRODE PLUGS | FLANGED CAST IRON ELECTRODE HOLDERS | | | FLANGED PVC ELECTRODE HOLDERS | | | |
| |  | | |  |  | | |  | | | |
| MOUNTING ATTACHMENT TO VESSEL | 1" NPT | 2" NPT | 3" NPT | 3/4" PTF | 3" FLANGE | 4" FLANGE | 6" FLANGE | 1" FLANGE | 2" FLANGE | 4" FLANGE | 5"x6" RECT. |
| Number of Electrodes | 1 | 2-3 | 4-7 | 1 | 1-7 | 1-13 | 1-13 | 1 Bare Or 2 Insulated | 1-4 | 1-7 | 1-5 |
| Temperature and Pressure of Liquid *Specify #04141300 Electrode Plug | Mat'l. | Max. Temp. °F. | Max. Pressure | Up to 2000 psi | 190°F 0 psi | 180°F 0 psi with Wire Suspended Electrodes 10 psi with Rod Electrodes | | | | | |
| | | Brass | 200°F | | | | | | | | 500 psi |
| | | | 400°F* | | | | | | | | 250 psi |
| | | Cast Iron | 200°F | | | | | | | | 500 psi |
| | | | 400°F* | | | | | | | | 250 psi |
| | 316 Stainless | 200°F | 2000 psi | | | | | | | | |
| | | 450°F | 400 psi | | | | | | | | |
| CORROSION RESISTANCE | Available in Brass, Cast Iron or 316 Stainless | | | 304SS | Cast Iron | | | Unplasticized Polyvinyl Chloride (PVC) | | | |
| Solid Rod Electrode (For lengths less than 6 ft.) | Available | | | Available | Not Available | | | Available | | | |
| Wire Suspended Electrodes | Available | | | Available | Available | | | Available | | | |
| Type of Service | Watertight, Outdoor Heavy Duty | | | Industrial Duty | Watertight, Outdoor Heavy Duty | | | Industrial Duty PVC for Corrosion Resistance and Watertight | | | |
| Electrode Height Adjustability | Solid Rod Electrodes Cut to Desired Length | | | | Adjustable | | | Adjustable with Wire Suspended Electrodes | | | |
| | Catalog Section 6012 | | | Catalog Section 6012 | Catalog Section 6012 | | | Catalog Section 6012 | | | |

METEK®

FACTORY AUTOMATION

| MOLDED EXTERNAL THREADED ELECTRODE HOLDERS | | | CONDUIT ELECTRODE HOLDERS | | CORD GRIP ELECTRODE HOLDERS | | ICE-FREE ELECTRODE ASSEMBLY | GLAND ELECTRODE ASSEMBLIES | | SPECIAL PURPOSE ELECTRODE ASSEMBLIES |
|---|----------------------------|------------------------------------|---|-----------------------------------|---|-------------------------|--|---|---------------------------|---|
|  | | |  | |  | |  |  | |  |
| 1-14 STRAIGHT THREAD | 1-14 STRAIGHT THREAD | 2" NPT | ½" NPT or ½" PVC | 1" NPT or 1" PVC | ½" NPT | ½" NPT | 4" FLANGE | ¾" NPT | ½" NPT | VARIOUS |
| 2 | 3 | 2 | 1-4 | 1-8 | 1 | 2 | 1-9 | 1 | 1 | 1 |
| Up To 200 psi and 350°F | | 100°F 250 psi 180°F 0 psi | 190°F 0 psi | 190°F 0 psi | 190°F 0 psi | 190°F 0 psi | 100 psi @ 150°F or 250 psi @ 400°F | 190°F 0 psi | See Catalog Section | |
| Thermoplastic Holder with 304 Stainless Studs | | PVC or Cast Iron | Aluminum | Cast Iron | Various | 304 ss | | | | |
| Available | | Not Available | | Special | Standard | | | | | |
| Not Available | Avail- able | Available | Available | Standard | Not Available | | | | | |
| Special Applications | | Watertight Industrial Duty | Industrial Duty | Watertight, Outdoor Heavy Duty | Special Applications | | | | | |
| Solid Rod Electrodes Cut to Desired Length | | Adjustable | Adjustable | Adjustable | Fixed | Adjust- able | | | | |
| Catalog Section 6012 | | Catalog Section 6012 | Catalog Section 6012 | Catalog Section 6012 | Catalog Section 6013 | Catalog Section 6013 | | Catalog Section 6013 | | |

Series 6012/6013

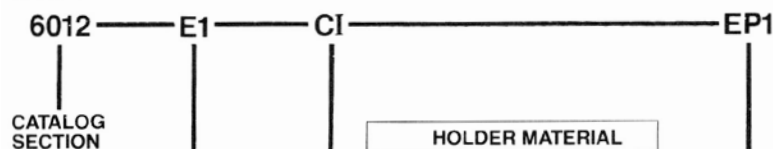
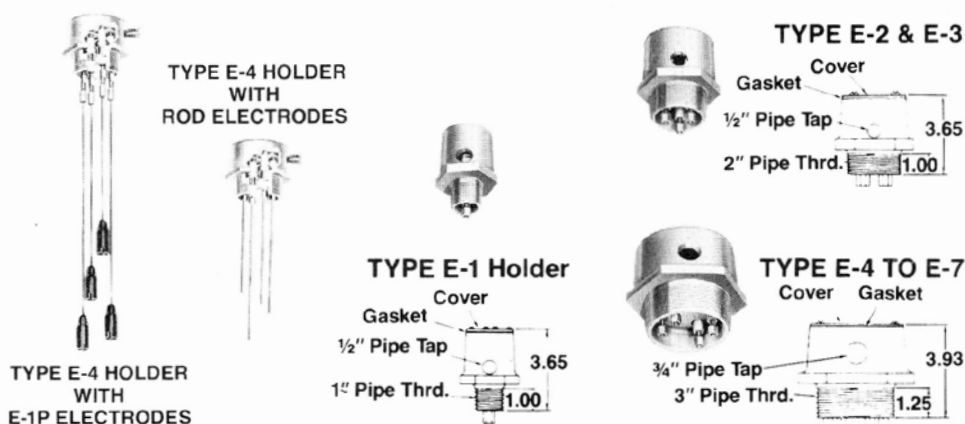
Electrode Holders/Electrodes

CAST PRESSURE-TIGHT ELECTRODE HOLDERS WITH EXTERNAL PIPE THREAD

B/W pressure-tight electrode holders are designed especially for applications which require a positive, leak-proof assembly. Such installations include boiler feed and condensate return systems, hydropneumatic tanks, and various types of chemical processing equipment, etc.

Whenever possible, these holders should be mounted in a vertical position through the top of the tank with the electrodes extending downward to the desired operating levels.

For applications requiring flange mounting B/W offers companion flanges in 2", 3", or 4" sizes made of cast iron or 304 SS. See Catalog Section 7014.



| HOLDER MATERIAL | |
|-----------------|---------------------|
| CI | Cast Iron |
| BR | Brass |
| SS | 316 Stainless Steel |

| | No. of Electrodes | Mounting Thread | Shipping Weight |
|----|-------------------|-----------------|-----------------|
| E1 | 1 | 1" Pipe | 1.5 LB |
| E2 | 2 | 2" Pipe | 3.0 LB |
| E3 | 3 | 2" Pipe | 3.0 LB |
| E4 | 4 | 3" Pipe | 5.0 LB |
| E5 | 5 | 3" Pipe | 5.0 LB |
| E6 | 6 | 3" Pipe | 6.0 LB |
| E7 | 7 | 3" Pipe | 6.0 LB |

NOTE — Price of electrode holder includes a standard electrode plug as indicated in the chart to the right.

CROSS REFERENCE TO OLD BIW PART NUMBERS

| HOLDER TYPE | NUMBER OF ELECTRODES | MATERIALS AND PART NUMBERS | | |
|-------------|----------------------|----------------------------|-----------|---------------|
| | | BRASS | CAST IRON | 316 STAINLESS |
| E-1 | 1 | 12-048000 | 12-048100 | 12-048200 |
| E-2 | 2 | 12-048400 | 12-048500 | 12-048600 |
| E-3 | 3 | 12-048800 | 12-048900 | 12-049000 |
| E-4 | 4 | 12-049200 | 12-049300 | 12-049400 |
| E-5 | 5 | 12-049600 | 12-049700 | 12-049800 |
| E-6 | 6 | 12-050000 | 12-050100 | 12-050200 |
| E-7 | 7 | 12-050400 | 12-050500 | 12-050600 |

ELECTRODE PLUGS FOR CAST IRON & BRASS HOLDERS

| | |
|-----|---|
| EP1 | Furnished as standard equipment. Suitable for most applications. Up to 250 psi at 212°F (100°C). Up to 700°F (371°C) at 100 psi. |
| EP2 | Recommended for saturated steam applications. Up to 250 psi at 400°F (204°C). Up to 550°F (288°C) at 200 psi. |
| EP3 | Recommended for low pressure applications that are subject to some vibration or shock. Also for long electrode rods. |
| EP4 | Used only for non pressure applications and only for wire suspension electrodes where the standard plug and wire connector arrangement is not suitable. |
| X | Holder furnished without electrode plugs but with the specified number of 3/8-18 Dryseal pipe thread holes for the plugs. |

ELECTRODE PLUGS FOR 316 SS HOLDERS

| | |
|-----|---|
| EP2 | Furnished as standard equipment. Suitable for many corrosive applications, and for saturated steam up to 400 psi and 445°F (230°C). |
| EP3 | Recommended for low pressure applications that are subject to some vibration or shock. Also for long electrode rods. |
| X | Holder furnished without electrode plugs but with the specified number of 3/8-18 Dryseal pipe thread holes for the plugs. |

METEK®

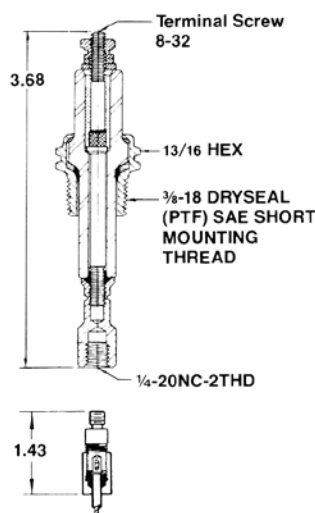
FACTORY AUTOMATION

Ametek offers a wide selection of BIW electrode plugs for mounting electrodes in tanks and vessels. They are designed to meet a variety of environmental conditions to provide a strong mechanical mounting and to insulate the electrode from the tank structure; they also have a secure method to make the electrode lead wire connection to the BIW control relay. Details of a typical pressure tight electrode plug are shown in the diagram at the right. The central rod is sealed to the inside of the ceramic insulator glass, and the stainless steel bushing is sealed to the outside of the insulator with copper and/or Teflon® gaskets.

Electrode plugs are included in the Type E electrode holders. Also, these plugs are often used on OEM applications to provide reliable and inexpensive individual mounting of electrodes in special situations.

Other types of electrode plug and electrode assemblies are described in this Section. Should none of our standard items be suitable, special electrodes can be made to order to meet specific operating and/or installation conditions.

ELECTRODE PLUGS



WIRE CONNECTOR
One required with each wire suspension electrode.

SOLID ROD ELECTRODES

Type A rod is used for short electrodes and is available in a variety of corrosion-resisting materials.

WIRE SUSPENSION ELECTRODES

These electrodes are used for long lengths and where space prevents use of rod electrodes.

6012 — EP2

CATALOG SECTION

These plugs can be installed in Type E Holders.

| | OLD PART NUMBER | MOUNTING THREAD | CONSTRUCTION MATERIALS | PRESSURE/TEMPERATURE RATINGS |
|-----|-----------------|--|--|---|
| EP1 | 04-126400 | 3/8-18 Dryseal (PTF) SAE Short Pipe Thread | Shell-303SS Insulator-Ceramic Seal-Glass & Copper | 2000 psi Up to 200°F (93°C) 700°F (371°C) Up to 100 psi |
| EP2 | 04-141300 | 3/8-18 Dryseal (PTF) SAE Short Pipe Thread | Shell-303SS Insulator-Ceramic Seal-Glass & Teflon® | 2000 psi Up to 200°F (93°C) 550°F (288°C) Up to 200 psi Saturated Steam Up to 450 psi |
| EP3 | 04-149600 | 3/8-18 Dryseal (PTF) SAE Short Pipe Thread | Shell-303SS Insulator-Teflon® Seal-Teflon® | 500 psi Up to 270°F (132°C) 300°F (149°C) Up to 250 psi Saturated Steam Up to 125 psi |
| EP4 | 12-066400 | 3/8-18 NPT Pipe Thread | Shell-Aluminum Cord Grip with Neoprene Packing | For Nonpressure Use Up to 190°F (88°C) (Only for wire suspension electrodes) |

6012 — EP5

CATALOG SECTION

This plug is for separate mounting only.

| | OLD PART NUMBER | MOUNTING THREAD | CONSTRUCTION MATERIALS | PRESSURE/TEMPERATURE RATINGS |
|-----|-----------------|-----------------------------|---|--|
| EP5 | 04-134900 | 5/8-24 NEF-3 Machine Thread | Shell-303SS Insulator-Ceramic Seal-Glass & Copper | 2000 psi Up to 200°F (93°C) 700°F (371°C) Up to 100 psi |

ELECTRODE PLUG COVER

| Catalog Number | Old Part No. | Designed to insulate and protect the electrode lead connection. Made of neoprene and fits all standard plugs. |
|----------------|--------------|---|
| 6012-PC | 04-129000 | |



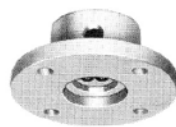
Series 6012/6013

Electrode Holders/Electrodes

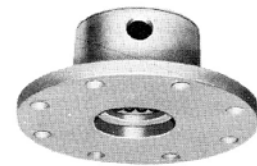
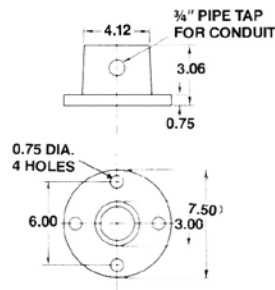
FLANGED CAST IRON ELECTRODE HOLDERS

These flanged holders are for use with B/W wire suspension electrodes in non-pressure applications such as elevated tanks, water reservoirs, underground storage tanks, sewage wet wells and other installations requiring relatively long electrode lengths. They are of rugged construction made of cast iron with baked aluminum paint finish to be very durable for many years of outdoor exposure. Available in 3", 4" and 6" sizes which fit the 125 Lb. CI and 150 Lb. steel mounting flange specifications.

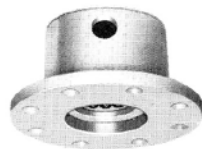
These holders have a removable inner plate provided with a grommet for each wire suspension electrode. The grommets are sized to give a snug vapor tight fit with B/W Type SW electrode suspension wire, and the electrodes are secured by means of a simple overhand knot in the suspension wire as shown in the picture below. The mounting plate with electrodes attached can be easily removed through the top of the electrode holder to facilitate cleaning and adjustment of the electrodes when required.



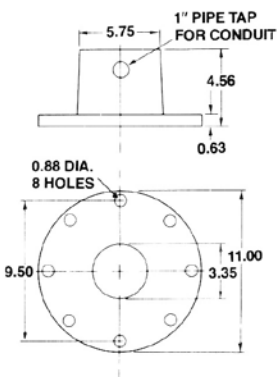
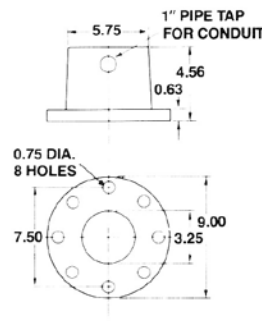
TYPE E-55-3 HOLDER
3 inch Cast Iron 125 lb.
Mounting With Aluminum Paint
Finish For 1 to 7 Wire
Suspension Electrodes.



TYPE E-55-6 HOLDER
6 inch Cast Iron 125 lb. Mounting
With Aluminum Paint Finish For 1
to 13 Wire Suspension Electrodes.



TYPE E-55-4 HOLDER
4 inch Cast Iron 125 lb. Mounting
With Aluminum Paint Finish For 1 to
13 Wire Suspension Electrodes.

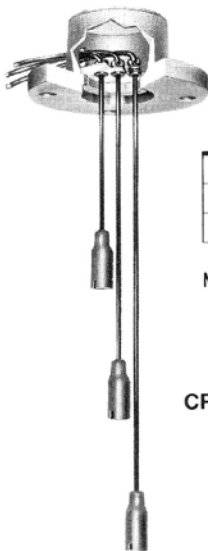


6012
CATALOG
SECTION

E553

5E

These electrode holders are for non pressure applications only



| | Mounting Provision | Number Of Electrodes | Shipping Weight |
|------|--------------------|----------------------|-----------------|
| E553 | 3 in. Flange | 1-7 | 14 lb. |
| E554 | 4 in. Flange | 1-13 | 24 lb. |
| E556 | 6 in. Flange | 1-13 | 30 lb. |

NOTE: These holders are not available for use with solid rod electrodes. For applications requiring rod electrodes with flange mounting, use a Type E holder and a separate threaded mounting flange.

CROSS REFERENCE TO OLD B/W PART NUMBERS

| Holder Type | Old Part Number |
|-------------|-----------------|
| E-55-3 | 12-054400 |
| E-55-4 | 12-056400 |
| E-55-6 | 12-056700 |

Number Of Openings Provided For Wire Suspension Electrodes

| | |
|-----|----|
| 1E | 1 |
| 2E | 2 |
| 3E | 3 |
| 4E | 4 |
| 5E | 5 |
| 6E | 6 |
| 7E | 7 |
| 8E | 8 |
| 9E | 9 |
| 10E | 10 |
| 11E | 11 |
| 12E | 12 |
| 13E | 13 |

NOTE: The required wire suspension electrodes must be ordered as separate items.

METEK®

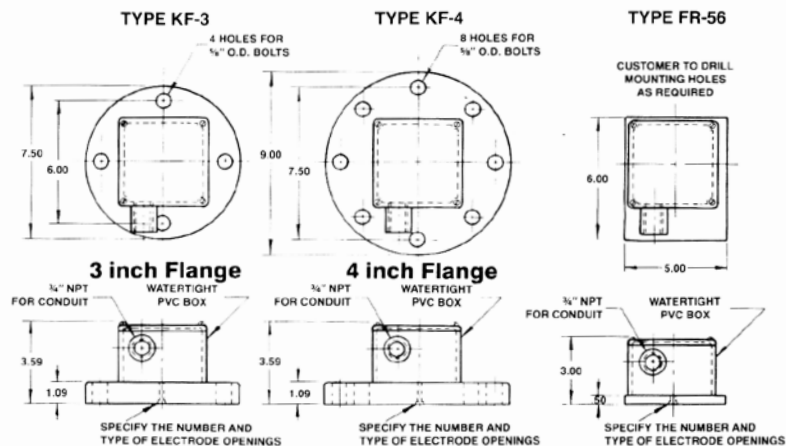
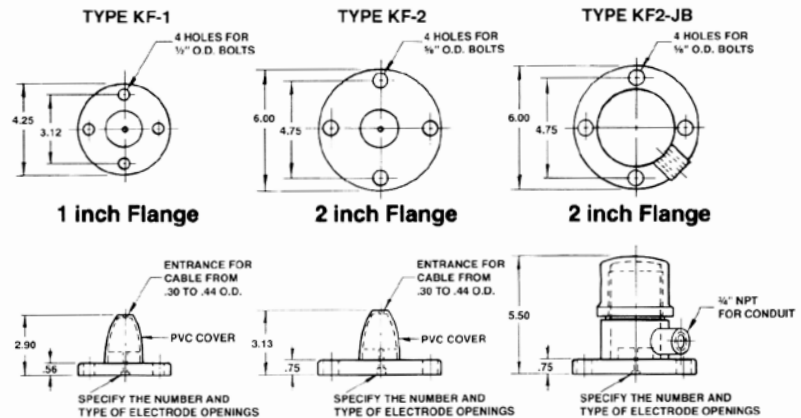
FACTORY AUTOMATION

These versatile corrosion resistant electrode holders are made of unplasticized PVC for use on industrial and chemical applications such as acid storage tanks, plating tanks and liquid waste treatment systems. They are suitable for ambient temperatures up to 180°F (82°C). They include a watertight PVC cover or a junction box. Types are available for mounting on standard 1", 2", 3" or 4" flanges. The Type FR56 is intended for mounting on the corner of an open flanged rim tank, and only requires minimum space in the tank.

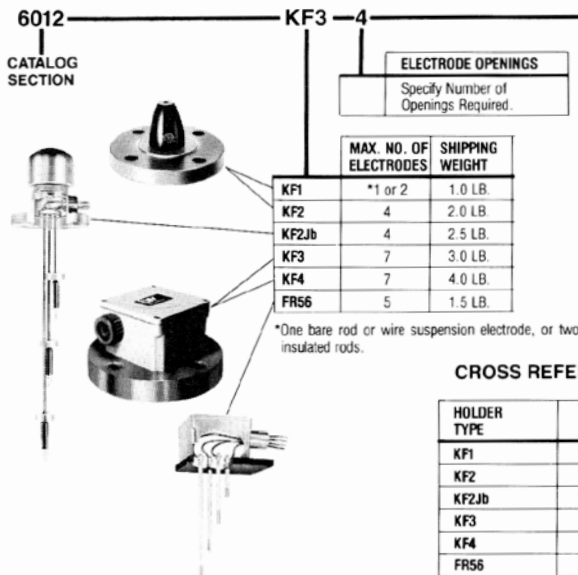
Models are available for use with either solid rod or wire suspension electrodes which must be ordered as separate items for field assembly at time of installation.

Solid rod electrodes extend thru the bottom of the holder and are tightened against a shoulder which provides a vapor tight seal for up to 10 psi. Rods should be insulated for lengths greater than 30 in.

Wire suspension electrodes are recommended for lengths over 6 feet. The BIW Type SW suspension wire is brought into the holder through a clearance hole and is secured by a knot as illustrated below. The Type 13-064700 electrodes are available in the same selection of materials as the solid rods and must be used for corrosive liquids.



6012
CATALOG
SECTION

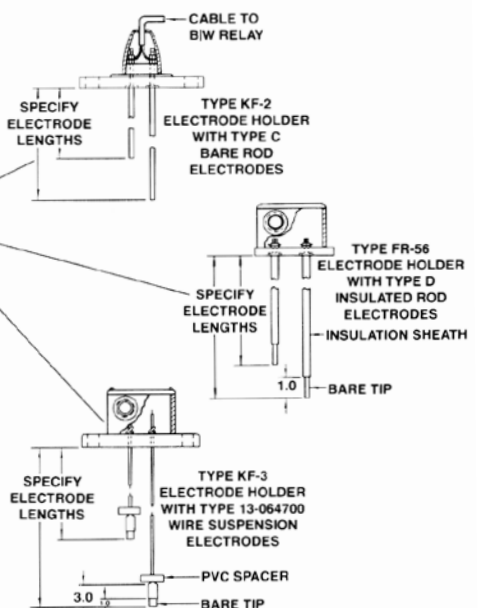


| RC | Type of Electrode To Be Used |
|----|--|
| RC | Type C Solid Rod For Type KF Holders |
| RD | Type D Solid Rod For Type FR Holders |
| WS | Wire Suspension Electrodes For Type KF or FR Holders |

NOTE: The required electrodes must be ordered as separate items for field assembly to holder.

CROSS REFERENCE TO OLD PART NUMBERS

| HOLDER TYPE | Bare Rods | Insulated Rods | Wire Suspension |
|-------------|-----------|----------------|-----------------|
| KF1 | 12-066300 | 12-066100 | 12-083400 |
| KF2 | 12-063800 | 12-062400 | 12-077800 |
| KF2Jb | 12-083500 | 12-082900 | 12-083100 |
| KF3 | 12-065200 | 12-070700 | 12-077300 |
| KF4 | 12-071100 | 12-071500 | 12-081700 |
| FR56 | 12-080500 | 12-080300 | 12-083300 |



Series 6012/6013

Electrode Holders/Electrodes

MOLDED ELECTRODE HOLDERS



Type AE-2
with rod
electrodes

Type CE-2 & CE-3 Holders — These small holders are primarily for use in original equipment applications where available space is limited and where desired level control can be obtained with two or three short solid rod electrodes. They are furnished with a flexible PVC water-tight cover to protect lead wire junctions.

A choice of two thermoplastic materials is available with ratings as shown below. Pressure seal is accomplished with a Buna N gasket included with each holder. They have 303SS studs with 6-32 male thread for electrode connections.

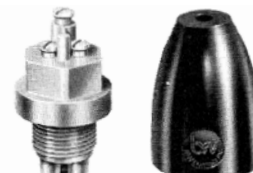
| HOLDER MATERIAL | MAXIMUM RATINGS |
|-----------------|---|
| Nylon | 200 psi @ 200°F (93°C) 350°F (177°C) @ 0 psi |



Type CE-2 Holder
For 2 Rod Electrodes
1"-14 Straight Machine Thread

CATALOG NUMBER
6012 — CE2N

| Holder Material | Old Part Number |
|-----------------|-----------------|
| CE2N Nylon | 12-082500 |



Type CE-3 Holder
For 3 Rod Electrodes
1"-14 Straight Machine Thread

CATALOG NUMBER
6012 — CE3N

| Holder Material | Old Part Number |
|-----------------|-----------------|
| CE3N Nylon | 12-082700 |

NOTE: The required Type 6B rod electrodes must be ordered as separate items. Maximum recommended bare rod length is 12 inches. Not available for wire suspension electrodes.

Type AE-2 Holders — Molded of ABS corrosion-resistant thermoplastic material, these holders are ideal for use in applications involving control of many corrosive liquids. Designed to permit the use of either two solid rod or two wire suspension electrodes, they are supplied with flexible PVC water-tight covers to protect the lead wire junctions.

They have 303SS couplings with 1/4-20 female thread for electrode connections.

| MAXIMUM RATINGS |
|--|
| 250 psi @ 100°F (38°C) 180°F (82°C) @ 0 psi |



TYPE AE-2 HOLDER

For 2 Rod or Wire
Suspension Electrodes
2" NPT Pipe Thread Mounting

Catalog No. 6012-AE2
Old Part No. 12-034500

NOTE: The required electrodes must be ordered as separate items, see Catalog Section 6013 for information.
Rod Electrodes — Type A rods are used.
Wire Suspension Electrodes — A wire connector is required for each wire suspension electrode.

CONDUIT ELECTRODE HOLDERS



Designed for use with B/W wire suspension electrodes, these versatile low-cost holders are recommended for underground drainage sumps, septic dosing tanks, open sumps and similar applications. Available in cadmium plated cast iron for general purpose applications, or rigid polyvinyl chloride for corrosive situations.

These holders are mounted by attaching to a length of standard conduit extending over the liquid being controlled. They have grommets for each wire suspension electrode, and come in two sizes to accommodate up to eight electrodes.

CATALOG NUMBER
6012 — C4I

| | No. of Electrodes | Holder Material | Conduit Size | Connection Type | Old Part Number |
|-----|-------------------|-----------------|--------------|-----------------|-----------------|
| C4I | 1-4 | Cast Iron | 1/2" NPT | Threaded | 12-056900 |
| C4P | 1-4 | PVC | 1/2" PVC | Cement | 12-065400 |
| C8I | 1-8 | Cast Iron | 1" NPT | Threaded | 12-081800 |
| C8P | 1-8 | PVC | 1" PVC | Cement | 12-081900 |

NOTE: The required wire suspension electrodes must be ordered as separate items.

CORD GRIP ELECTRODE HOLDERS



Type CG1
with E-IP
Electrode

B/W cord grip electrode holders provide a simple, low-cost means of sealing lead wire openings against leakage of gases and liquids in non-pressure applications requiring use of wire suspension electrodes. These include submersible pump installations with low level cutoff control, underground water storage tanks, covered sumps, and sewage pumping stations.

Made of aluminum machined for 1/2" pipe thread mounting, they are furnished with compressible Neoprene packing to support either one or two wire suspension electrodes.



Type CG2
with E-IS
Electrodes

CATALOG NUMBER
6012 — CG1

| | No. of Electrodes | Holder Material | Mounting Thread | Old Part Number |
|-----|-------------------|-----------------|-----------------|-----------------|
| CG1 | 1 | Aluminum | 1/2" NPT | 12-055900 |
| CG2 | 2 | Aluminum | 1/2" NPT | 12-056000 |

NOTE: The required wire suspension electrodes must be ordered as separate items.

METEK®

FACTORY AUTOMATION

STANDARD ASSEMBLY

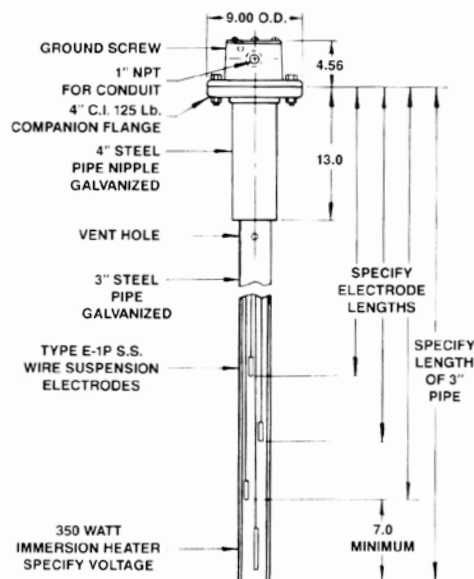
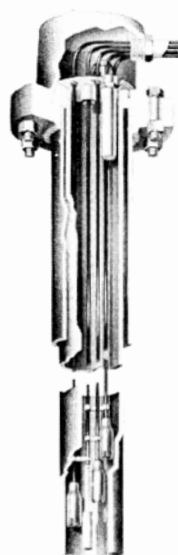
BIW ice-free electrode units are designed to provide positive, reliable pump control in areas where severe winter temperatures cause icing conditions which would normally interfere with or prevent proper pump operation.

The assembly consists of a Type 6012-E554 cast iron flanged electrode holder threaded onto a 3" steel pipe and details are illustrated at the right. The thermostat is factory set to close at 32°F (0°C), and the heater will keep the water inside the 3" pipe free of ice even when heavy ice forms on the surface of the water surrounding the ice-free electrode assembly. The 4" pipe nipple with companion flange is provided to mount the unit. The nipple must be attached vertically to the tank top, and the rest of the assembly is then lowered and bolted into place.

When designing the control system, provisions must be made to cut-off the power to the immersion heater whenever the water level falls below the lowest electrode because the heater will burn out if it is energized when exposed to air.

A single pump, pump up system requires a B/W Type 1500-G relay with the NC contact controlling the pump, and the NO contact providing cut-off for the heater. See Catalog Sections 8040 and 8044 for information on standard and custom control panels.

TYPE IFW



6012-IFW-4-L1

CATALOG SECTION

| LINE VOLTAGE | |
|--------------|-------------------|
| L1 | 115 Volt-50/60 Hz |
| L2 | 230 Volt-50/60 Hz |

E-IF Old Part Number 12-041500

Other voltages not available.

The type IFW is for non-pressure applications. Contact factory if a pressure-tight ice-free unit is required.

| SPECIFY QUANTITY AND LENGTH OF ELECTRODES | |
|---|----------------------------|
| Type W2 E-1P 304SS | Wire Suspension Electrodes |
| 1 to 9 (Maximum) | |

| SPECIFY LENGTH OF 3 INCH PIPE — FEET | |
|--------------------------------------|--|
| 2 ft. (Minimum) to 6 ft. | |
| 7 ft. to 21 ft. | |
| Over 21 ft. | |

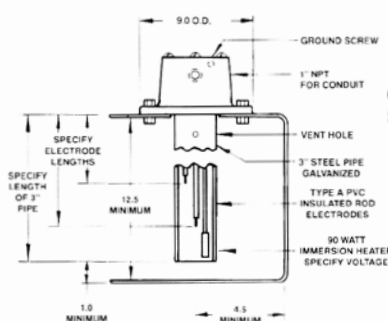
If electrode lengths are not specified, they will be factory set at maximum length based on the 3" pipe length.

| OPTIONAL FEATURES | |
|-------------------|---|
| X | None |
| LP | Omit 3 inch Pipe Old Part No. 01-226000 |
| LN | Omit 4 inch Pipe Nipple Old Part No. 09-155600 |
| LF | Omit 4 inch Companion Flange, Bolts, & Nuts Old Part No. 04-105400 |

NOTE — if more than one item is to be omitted, include the symbol for each item deducted.
Example — LP-LN-LF

TYPE IFR

Some applications such as cooling tower basins require short electrode lengths, and as shown at the left, the Type IFR will mount directly on a tank top, or on a bracket inside the basin.



6012-IFR-3-L1

CATALOG SECTION

| LINE VOLTAGE | |
|--------------|-------------------|
| L1 | 115 Volt-50/60 Hz |

E-IF Old Part Number 12-074400

| SPECIFY QUANTITY AND LENGTH OF ELECTRODES | |
|---|----------------------|
| Type A 316SS PVC Ins. | Solid Rod Electrodes |
| 1 to 4 (Maximum) | |

SHALLOW TANK ASSEMBLY

These assemblies have electrode plug and stainless PVC insulated solid rod electrodes. The 115 VAC heater is designed for operation in air and low level cut-off provision should not be provided.

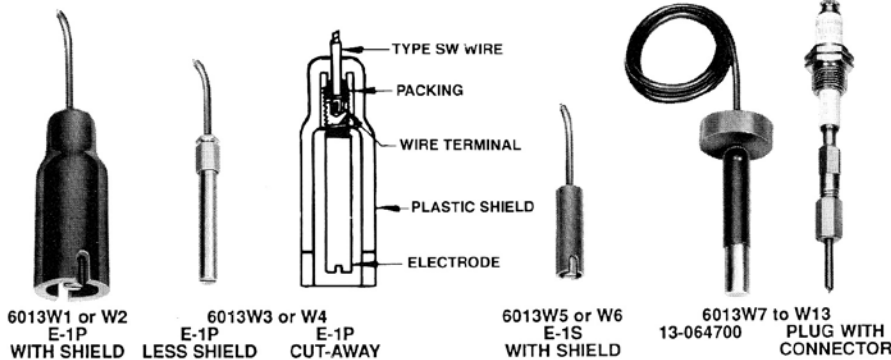
| SPECIFY LENGTH OF 3 INCH PIPE-INCHES | |
|--------------------------------------|--|
| 12 inch minimum | |
| to 48 inch maximum | |

- Other voltages not available.
- Order cannot be processed without length of each electrode and length of the 3 inch pipe.
- The Type IFR is for non-pressure applications. Contact factory if a pressure-tight ice-free unit is required.

Series 6012/6013

Electrode Holders/Electrodes

WIRE SUSPENSION ELECTRODES



WIRE CONNECTOR: This adapter is necessary to attach the Type SW suspension wire to the 1/4-20 female electrode holder connections. One is required for each wire suspension electrode used with electrode plugs, and Type E and Type AE-2 holders.

CATALOG NUMBER 6013—C—BR

| Material | |
|-----------------------------|----|
| Brass Old No. 12-038400 | BR |
| 303 SS Old No. 12-043800 | SS |

Type SW Suspension Wire: Designed to provide maximum strength and insulation, Type SW wire should always be used with B/W wire suspension electrodes to assure that a water-tight seal is accomplished by the packing in the electrode. The wire is single conductor 18 gauge, 41 strand copper with 4/64" vinyl insulation.

CATALOG NUMBER 6013—SW—10

| | |
|--|--|
| Specify Length In Feet Old No. 01-130500 | |
|--|--|

These electrodes are field assembled and the required amount of Type SW wire must be ordered as a separate item. See above.

NOTE — When wire suspension electrodes are to be used with electrode plugs, or Type E or Type AE-2 electrode holders, wire connectors must also be ordered for each electrode. See above.

Wire suspension electrodes are designed for use in applications requiring long lengths, or where limited head room prevents installation of solid rod electrodes. They can be used with all holders except Type CE-2 & 3. Electrode Types E-1P and E-1S are for use in water and non-corrosive liquids. Type 13-064700 is designed for corrosive liquids and is available with a variety of rod materials. Types E-1P and E-1S electrodes with molded plastic shields can be used at temperatures up to 150°F and other electrodes up to 190°F.

Type E-1P-Shielded: This electrode is approximately 4" long and assembled in a molded plastic insulating shield 1 7/16" in diameter. Designed for general purpose use, it is ideal for elevated tanks, sewage pumping stations, and deep well installations.

Type E-1P — Less Shield: This electrode is intended for applications where space prevents the use of other electrodes and where vertical spacing between electrodes is 4" or more.

Type E-1S-Shielded: A 2" long electrode assembled in a molded plastic shield 9/16" in diameter. Ideal for use in submersible pump installations and other applications where little clearance is provided for installation.

Type 13-064700: This electrode is intended for corrosive liquids. It is 3" long made from a 1/2" diameter rod and available in any of the materials listed below. The type SW wire is attached at the factory and the connection is completely sealed with PVC and bonded to the insulation of the SW wire.

6013—W1

CATALOG SECTION

| | ELECTRODE TYPE | ELECTRODE MATERIAL | OLD PART NO. |
|----|------------------|--------------------|--------------|
| W1 | E-1P With Shield | Brass | 13-020600 |
| W2 | E-1P With Shield | 303 Stainless | 13-020700 |
| W3 | E-1P Less Shield | Brass | 13-052700 |
| W4 | E-1P Less Shield | 303 Stainless | 13-052600 |
| W5 | E-1S With Shield | Brass | 13-022000 |
| W6 | E-1S With Shield | 303 Stainless | 13-024300 |

6013—W7

CATALOG SECTION

| | ELECTRODE TYPE | ELECTRODE MATERIAL | OLD PART NO. |
|-----|------------------------|--------------------|--------------|
| W7 | 13-064700 With SW Wire | 316 Stainless | 13-064702 |
| W8 | 13-064700 With SW Wire | Monel | 13-064703 |
| W9 | 13-064700 With SW Wire | Nickel | 13-064704 |
| W10 | 13-064700 With SW Wire | Carpenter 20 | 13-064705 |
| W11 | 13-064700 With SW Wire | Hastelloy B | 13-064707 |
| W12 | 13-064700 With SW Wire | Hastelloy C | 13-064706 |
| W13 | 13-064700 With SW Wire | Titanium | 13-064709 |

10

| |
|--------------------------------|
| Type SW Wire Length In Feet |
|--------------------------------|

These electrodes come complete with the Type SW wire permanently attached to the electrode. Lengths must be specified when ordering.

METEK®

FACTORY AUTOMATION

ELECTRODE MATERIAL SELECTION

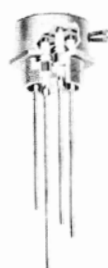
The chart below suggests electrode material for some typical liquids. Electrode corrosion is difficult to predict because the rate of corrosion is effected by many factors such as: concentration, temperature and impurities. Therefore, this information should be used as a general guide, and the final choice should be determined from actual application conditions based on previous experience and knowledge.

| ELECTRODE MATERIAL | TYPICAL LIQUID TO BE CONTROLLED |
|--------------------|---|
| Brass | Soft Water, Condensate |
| 316 SS | Water, Sewage, Beer, Alcohol, Food Products, Chemicals, Many Mild Acids |
| Monel | Acetic Acid, Sea Water |
| Nickel | Boric Acid, Calcium Hydroxide |
| Carpenter 20 | Sulphuric Acid, Alum Solutions |
| Hastelloy B | Hydrochloric Acid |
| Hastelloy C | Hydrofluoric Acid |
| Titanium | Phosphoric Acid, Brine Ferric Chloride, Hot Nitric Acid |
| Carbon Tip | Hydrochloric Acid Carbonated Water |

Contact Factory for specific recommendations.

| | | |
|-----------------|---------------------|-------------------|
| 6013—SS—P | INSULATION MATERIAL | A—4 |
| | | |
| | | |
| | | |
| CATALOG SECTION | ROD MATERIAL | ROD TYPE & LENGTH |
| | | |
| | | |
| | | |
| BR | 316 Stainless | MO |
| | | |
| | | |
| | | |
| NI | Carpenter 20 | HB |
| | | |
| | | |
| | | |
| HC | Hastelloy C | TI |
| | | |
| | | |
| | | |

SOLID ROD ELECTRODES



6012E4 HOLDER



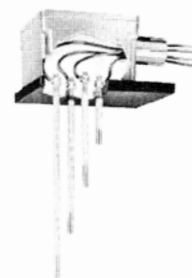
6013 ELECTRODE PLUG



AE-2 HOLDER



6012-CE2 HOLDER TYPE B RODS



6012-FR-56 HOLDER TYPE D RODS

TYPE A RODS

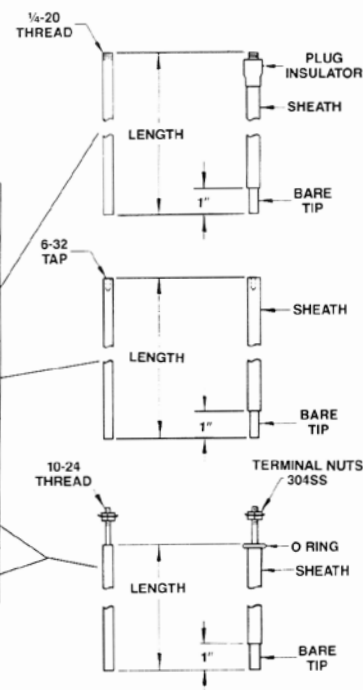
Solid rod electrodes are generally used where relatively short lengths of 6 feet or less are required. Care should be exercised when specifying lengths over 6 feet. Longer rods and those installed horizontally should be insulated. After cutting insulated rods, strip about 1 inch of insulation off lower end to expose the bare rod.

TYPE A electrode rods are 1/4" diameter and have 1/4-20 thread for use with electrode plugs, and Type E and Type AE-2 electrode holders. A boot made of the sheath material is furnished to protect and insulate the lower side of the electrode plug.

TYPE B electrode rods are 1/4" diameter and are tapped 6-32 for use only on Type CE-2 and CE-3 holders. Lengths over 12 inches should be insulated and lengths over 30 inches are not recommended.

TYPE C electrode rods are 1/4" diameter and have the upper end machined with a shoulder and 10-24 thread to assemble into Type KF holders.

TYPE D electrode rods are 1/4" diameter are similar to Type C except the upper end is machined to a length that fits only Type FR holders.



NOTE: Standard stock rods are furnished in even foot increments up to 10 ft. long, and must be field cut for intermediate operating lengths. Contact Factory for pricing on other lengths and materials.

Series 6012/6013

Electrode Holders/Electrodes



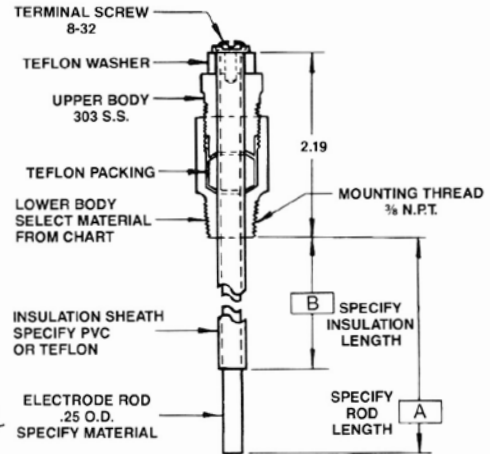
GLAND PLUG AND ROD ASSEMBLY

The packing gland construction of these units provides additional strength for electrodes on applications where there is vibration, shock or side thrust against the electrode. Installations include detecting the presence or absence of fluids in shipboard bilge discharge lines, or coal slurry pipelines.

The lower plug body is available in most of the same materials as the electrode rods so that these assemblies are quite suitable for many corrosive conditions. With teflon insulated rods they are rated for use up to 250 psi and 400°F (204°C).

These gland plug electrode assemblies can also be used in the Type E electrode holders instead of the standard electrode plugs.

The gland plug assemblies are separately ordered for field assembly.



CATALOG NUMBER
6013—GP—CA

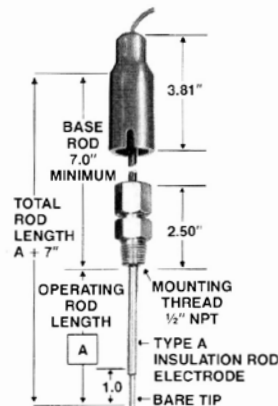
| | LOWER BODY MATERIAL | OLD PART NUMBER |
|-----|---------------------|---------------------|
| 303 | 303 Stainless | 12-065800/12-065900 |
| 316 | 316 Stainless | 12-074600 |
| MO | Monel | 12-075800 |
| NI | Nickel | 12-079600 |
| TI | Titanium | 12-078000 |

SS—P—8B—4

Electrode Rod Details
See Previous Page

A dimension is electrode length
B dimension is insulation length

ADJUSTABLE GLAND ELECTRODE ASSEMBLY



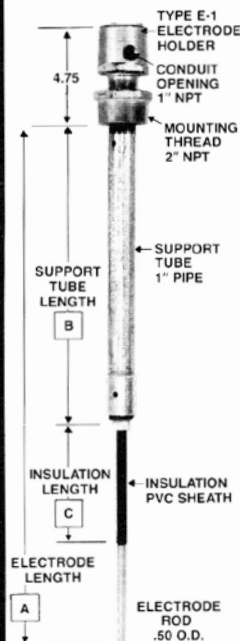
B/W adjustable gland electrode holders are designed for use in applications that require occasional changing of the high or low level control settings. Typical installations include conveyor feed, liquid proportioning, and container filling machines.

Made of 303 stainless steel with positive pressure-tight 1/2" pipe thread mounting plus Teflon or Neoprene insulation and packing. These holders are used with insulated solid rod electrodes of any desired length. To adjust level settings, simply loosen the top of the holder and slide the electrode up or down to required depth. Electrodes must be insulated over the full range of adjustability.

CATALOG NUMBER
6013—AGP—15—SS—P

| |
|--|
| Specify rod material and insulation material |
| The A dimension operating electrode rod length must be furnished with order. |
| NOTE See Catalog Section 6013 page 13 for selection of rod materials. ADD price of insulated rod to total. |
| DESCRIPTION AGP Adjustable Gland & Rod Assy. Old Part No. 12-057000 |

RUGGEDIZED ELECTRODE ASSEMBLY



These Type REA electrode assemblies are very strong for use on heavy solutions, particularly when they are being agitated with a mixer. Applications include clay or starch solutions used for sizing in the manufacturing of paper products.

The Type E-1 holder provides water-tight protection for the electrode connection and is available in cast iron, brass or 316 S.S. The support tube which provides strength to prevent deflection of the 1/2" OD stainless rod is available in galvanized steel or other materials such as stainless steel.

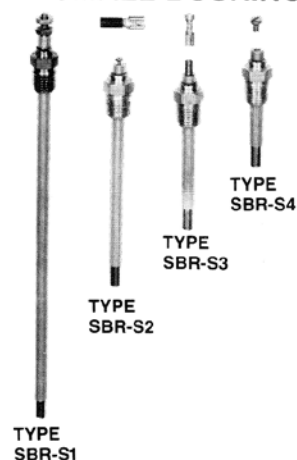
CATALOG NUMBER
6013 — REA
Old Part No. 12-070600

When placing an order or requesting a quotation, specify the required lengths for dimensions A, B, & C, and the type of material for the holder and support tube.

AMETEK®

FACTORY AUTOMATION

SMALL BUSHING AND ROD ASSEMBLIES



Ametek offers a variety of these small electrode assemblies to meet special OEM situations for single electrodes. The bushing has a 1/4" NPT pipe thread for pressure-tight mounting and is available in either cadmium plated steel or 316 S.S. The electrode rod is 1/4" O.D. and must be insulated for at least 1" below the bushing. The available PVC or teflon insulated rod materials are listed on page 35. There is a choice of four methods to connect the electrode lead wire.

CATALOG NUMBER
6013—SBR—S1—S

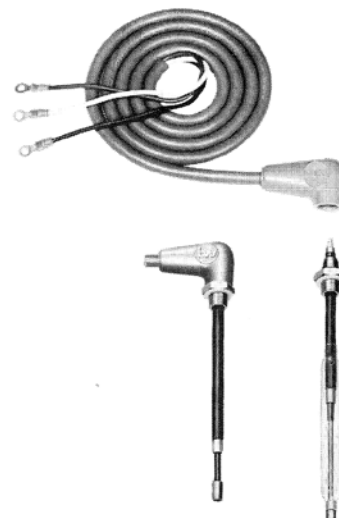
| TYPE OF WIRE CONNECTION | |
|-------------------------|-----------------|
| S1 | Double Nut |
| S2 | Push-On Spade |
| S3 | Push-On Bayonet |
| S4 | 6-32 Screw |

Minimum Order
25 pieces

For a quotation advise, type of wire connection, bushing material, material and length of insulated rod.

CONCENTRIC ELECTRODE ASSEMBLIES

These assemblies are primarily for OEM applications requiring two short electrodes and where space is limited to install them. While developed for carbonator level control, they are suitable for any small tank for use up to 150 psi and 170°F (77°C). The mounting bushing is made of 316 S.S. with 1/2"-20 machine thread, and a nylon gasket is provided. The snap-on cord set has a three conductor type SJT cord which provides ground connection to the mounting bushing, as well as the two electrode leads.



CATALOG NUMBER
6013 — CEA — S

Minimum Order
25 pieces

For a quotation advise the length of both electrodes, the length of the cord set, and the type of termination for the wire leads.

SPACERS FOR INSULATED ELECTRODE RODS



B/W rod spacers are used to stiffen long electrode rod assemblies in those situations where movement of the liquid would tend to deflect the rods. They must never be attached to bare electrode rods because liquid on the surface of the spacer could short between electrodes preventing proper operation of the B/W control relays.

The PVC spacers include heat shrinkable PVC sleeves for attaching them to PVC insulated rods. The teflon spacers have heat shrinkable teflon sleeves to secure them to teflon insulated rods.

CATALOG NUMBER

6013—RS2—P

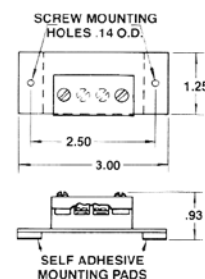
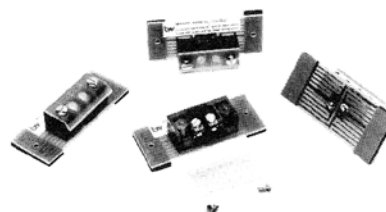
| SPACER DESCRIPTION | | |
|--------------------|--------------------------|----------------|
| Number Of Rods | For Use With Holder Type | |
| RS1 | 2 | E-2 |
| RS2 | 3 | E-3 |
| RS3 | 4 to 7 | E-4 to E-7 |
| RS4 | 2 | KF-1 |
| RS5 | 2 to 4 | KF-2 or KF-2JB |
| RS6 | 2 to 7 | KF-3 or KF-4 |
| RS7 | 2 to 5 | FR-56 |

| INSULATION MATERIAL | |
|---------------------|--------|
| P | PVC |
| T | Teflon |

NOTE

Contact factory for quote on special assemblies consisting of electrode holders with insulated electrode rods and spacers attached.

MOISTURE SENSOR



The Type MSA moisture sensor is a compact low cost device used to detect water leakage into areas such as computer room subfloors, communication vaults, below grade ductwork, floors in basements, storage areas or equipment rooms. It is easily attached to a floor or wall surface by the self adhesive strips or the mounting screws provided.

While designed as a sensor for the Series 41 Alarm Panel described in Catalog Section 8041, they can also be used to operate any of the B/W control relays. The relay or alarm is actuated when moisture bridges adjacent printed circuit paths on the underside of the sensor.

CATALOG NUMBER
6013-MSA-1
Old Part No. 13-074400

Series 7010

Liquid Level Float Switches

APPLICATIONS

B|W Float Switches are designed to be suspended vertically into the liquid being controlled. A movable weight can be attached to the multi-conductor suspension cord which keeps the cord taut, and also determines the tether length of the float.

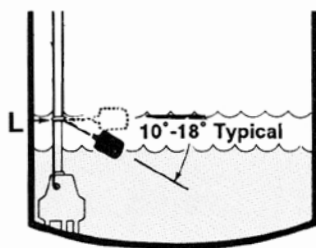
Two basic types of switches can be provided. A Wide Angle Switch (Product Code A) which operates between 60°-90° or, Narrow Angle Switches (Product Codes G, L & W) which operates at typically 10°-18°.

B|W Float Switches can be provided with the following contact configuration.

- A — Normally open for pump down operation.
- B — Normally closed for pump up operation.
- C — Single pole double throw for either operation.

Narrow Angle Switches

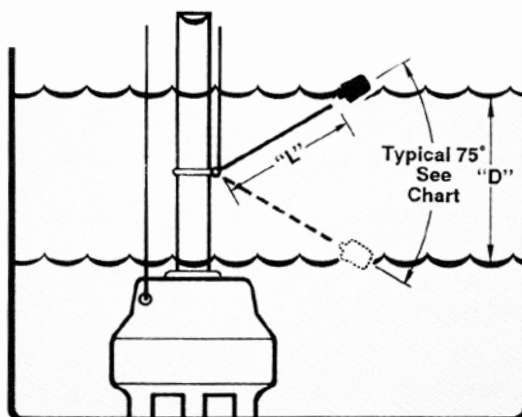
| Catalog Number Code | Typical Switch Operating Angle |
|---------------------|--------------------------------|
| 7010-G | 15° |
| 7010-L | 10° |
| 7010-W | 18° SPDT |



Note: Minimum tether length is 2 inches

All operating angles shown are approximate typical angles and are based on switch tests at full rated load.

Wide Angle Switch Catalog No. 7010-A



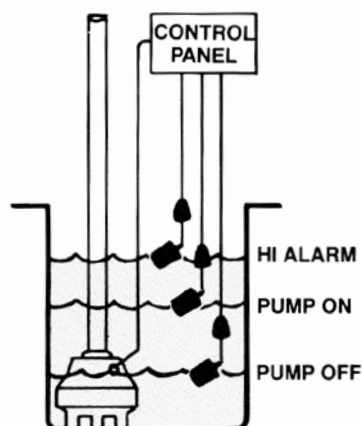
Float switch operates at typically 80°

"L" = Tether length

"D" = Switch operating differential as a function of tether length

| | | | | | | |
|-----|---|---|----|----|----|----|
| "L" | 3 | 4 | 6 | 8 | 10 | 12 |
| "D" | 7 | 8 | 11 | 14 | 17 | 21 |

Approximate length in inches

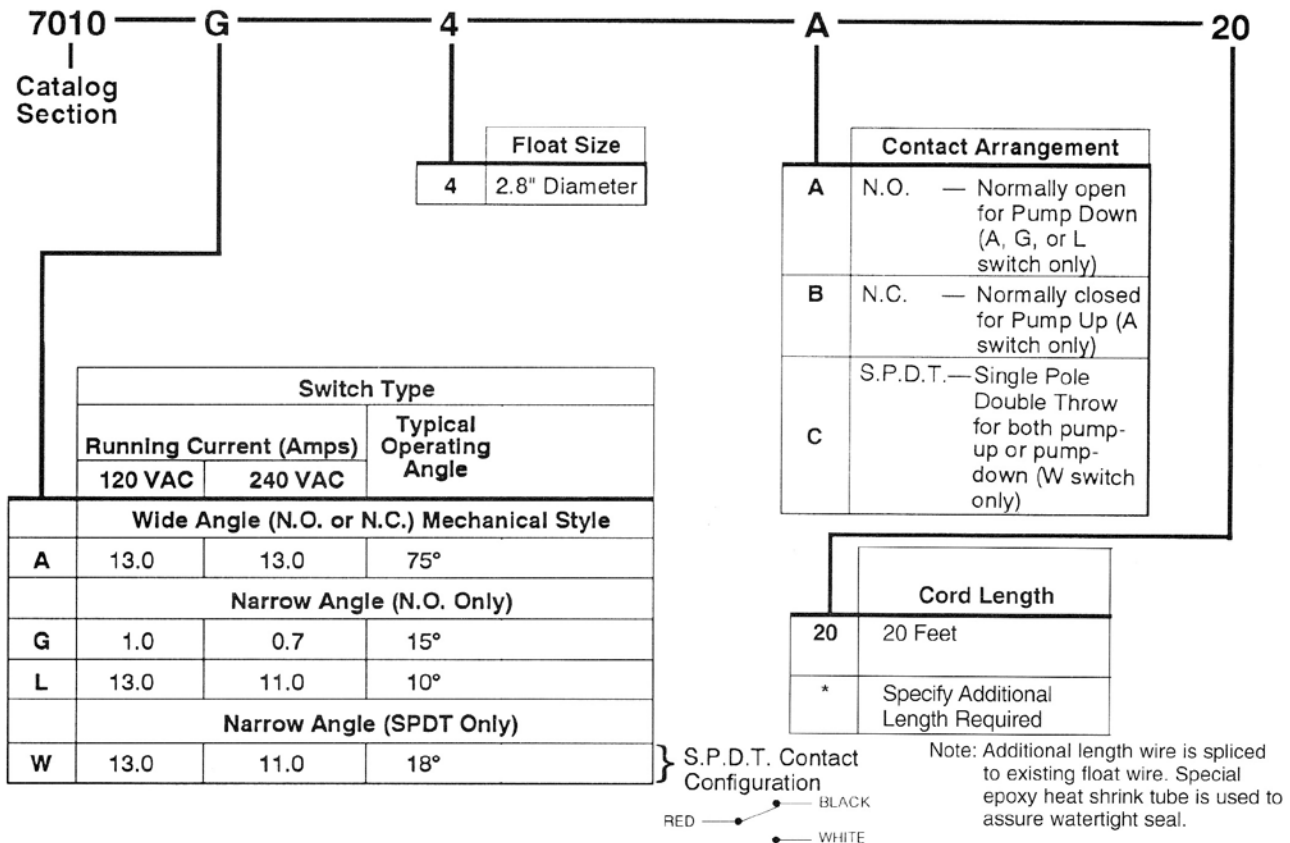


BIW Controls can provide the complete control system for a multiple float application including NEMA 1, 4 or 12 enclosures, disconnect switch, control transformer, relays, motor starters, alternators, alarms, etc.

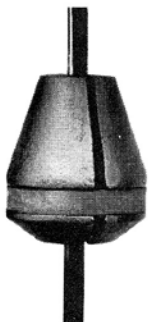
With over 60 years of experience in liquid level controls, our engineers can assist you to obtain the most economical and reliable system that's best for you.



CATALOG NUMBERING SYSTEM



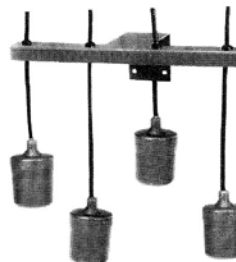
ACCESSORIES



Float Switch Weight
(20 ounces)
Part No. 12085000



1/2" Cord Grip for
Single Float Switch
Part No. 12084900



Wall Mount Bracket For
up to 4 Float Switches
Part No. 12085100



Wall Mount Bracket For
Single Float Switch
Part No. 12085200

Series 7010

Liquid Level Float Switches

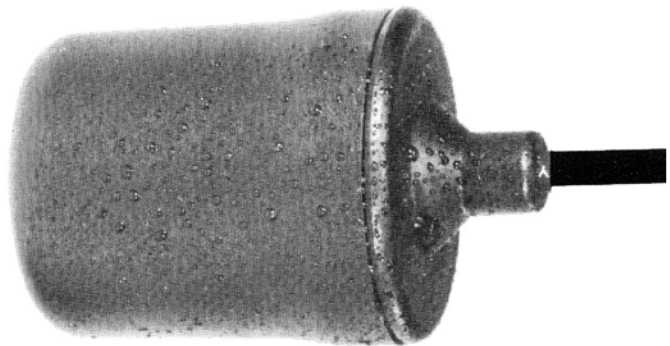
FLOAT SWITCHES

DESCRIPTION

The BIW Float Switches are tilt actuated liquid level controls, designed to operate pumps, valves, multiple alternators, relays, contactors, alarms and similar equipment for industrial and commercial use.

A hermetically sealed, axially nonposition-sensitive mercury switch is used in the narrow angle option, while the wide angle option uses a mechanical switch inside the float. These floats provide a reliable, long-lasting level control suitable for most liquid environments up to 160°F.

The BIW Float Switches provide an ideal pilot device for the control of all BIW relays and control panels. The polypropylene float, PVC cable, and hermetically sealed mercury switch provide an economical liquid level solution for controlling sewage, effluent, many chemical solutions, as well as liquids in other hostile environments containing oil, grease or other similar industrial and municipal wastes where dependable liquid level control is essential.



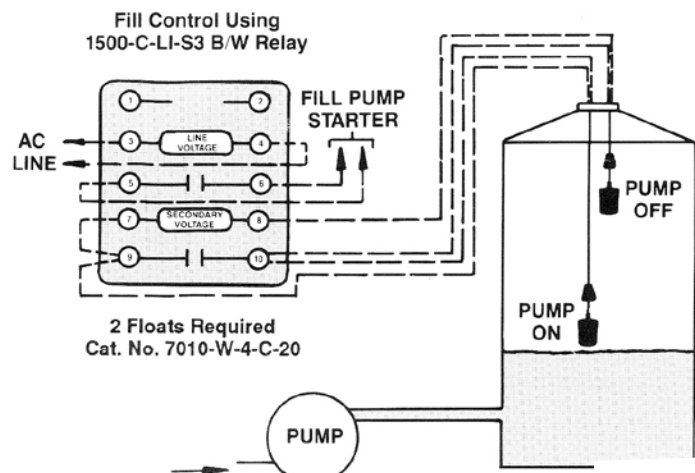
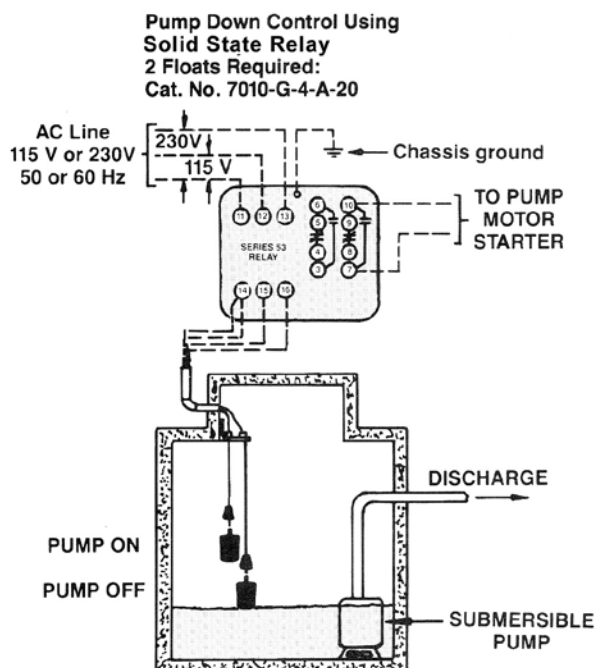
SPECIFICATIONS

| | |
|-------------------------------|---|
| Float: | Chemically Stable Polypropylene |
| Float Dimensions: | Length 3.4" Diameter 2.8" Strain Relief 1.0" |
| Cord: | 16/3 for S.P.D.T. 16/2 for either N.O. or N.C. Operation |
| Cord Length: | 20 ft. |
| Operating Temperature: | 32°F to 160°F Materials are rated to 221°F |
| Operating Pressure: | Pressure tested to 60 feet of water (26 psi.) |

Switch Ratings:

| Switch Code | | Running Current (Amps) | |
|-----------------------|----|------------------------|------------|
| | | at 120 VAC | at 240 VAC |
| Wide Angle | A* | 13.0 | 13.0 |
| Narrow Angle (N.O.) | G | 1.0 | .7 |
| | L | 13.0 | 11.0 |
| Narrow Angle S.P.D.T. | W | 13.0 | 11.0 |

* Mechanical Switch

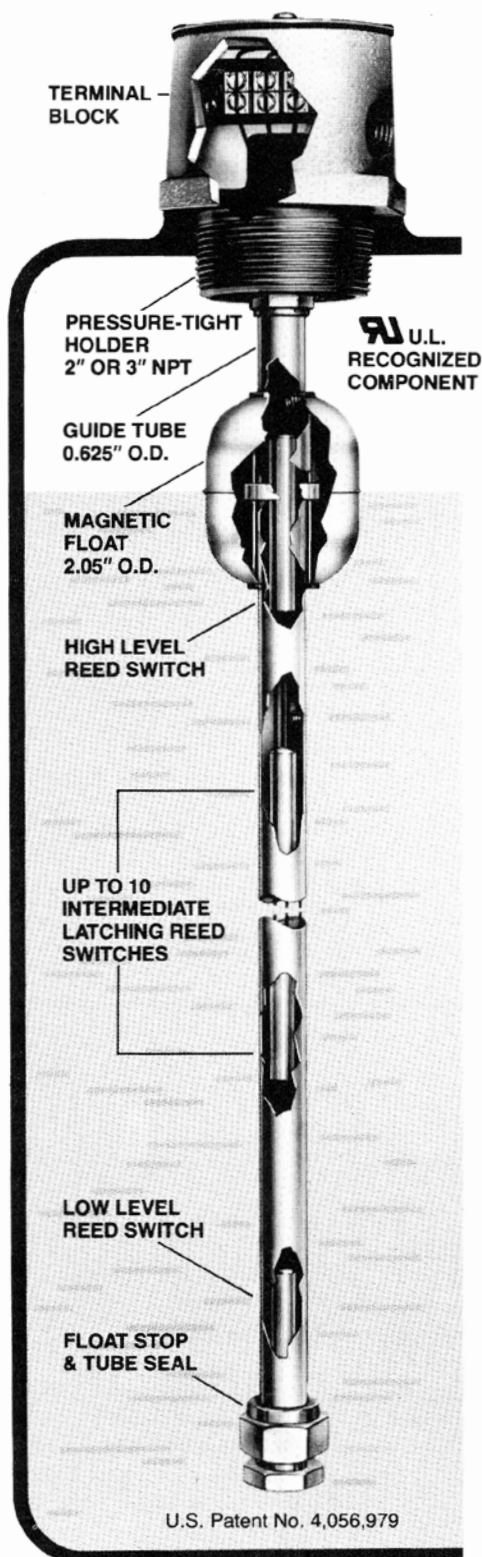


METEK®

FACTORY AUTOMATION

Series 7014

Unifloat™ Level Sensors



DESCRIPTION

The B/W Unifloat level sensing system was developed especially to permit simple, low-cost installation and ease of adjustment in service for a broad range of applications requiring accurate multiple function/multiple level control of any type of liquid.

FOUR BASIC COMPONENTS

As illustrated at left, this advanced new system consists of just four basic components:

- (1) A single MAGNETIC FLOAT that is free to travel up and down with the rise and fall of liquid. Standard material is 316 S.S.
- (2) A GUIDE TUBE of any practical length with one float stop at the bottom. Available in brass or 316 S.S.
- (3) A pressure tight WEATHER-PROOF holder available in cast iron or 316 S.S. to support the guide tube from the top of the tank.
- (4) Up to 12 REED SWITCHES suspended at any desired operating levels in the guide tube. Two types of the B/W patented magnetically latching reed switches are available.

Operating Viscosity

- Up to 1500 CP (centipose)
- Up to 6000 SSU (saybolt universal seconds)

Operating Pressures

- Minimum Vacuum
- To 14.7 psi
- Maximum 500 psi
- 3450 kPa

Operating Temperatures

- Minimum 0°F
- 19°C
- Maximum 250°F*
- 121°C*

*Consult Factory For Temperatures over 250°F

CHOICE OF TWO REED SWITCHES

CONTACT RATINGS

| MAXIMUM VOLTS | MAXIMUM CURRENT | |
|---------------|-----------------|--------|
| | A.C. | D.C. |
| 25 | 440 ma | 400 ma |
| 50 | 220 ma | 200 ma |
| 120 | 90 ma | 80 ma |

TYPE C REED SWITCH

One lead with grounded contact



Part #14000131

- Up to 7 in 2 inch holder.
- Up to 12 in 3 inch holder.

Common side of each switch must connect to grounded side of the same power supply.

Ideal for use with B/W control relays.

TYPE I REED SWITCH

Two leads with isolated contact



Part #14000151

- Up to 4 in 2 inch holder.
- Up to 6 in 3 inch holder.

Individual switches can be used in different circuits.

Greater flexibility on applications with conventional relays and devices.

Series 7014

Unifloat™ Level Sensors

FEATURES AND ADVANTAGES:

Because of its inherent simplicity, the BIW Unifloat™ Level Sensor concept provides many features and advantages not offered by other float type level sensing devices. Among them:

Fewer Parts/Lower Costs—Use of one free-moving float to actuate up to 12 hermetically sealed and encapsulated reed switches eliminates expense and problems involved in mounting a separate float plus float stops at each operating level.

Ease of Installation—Suspending all reed switches on a common circuit return line simplifies assembly and installation. Just slide switches up or down to desired control levels and position them in guide tube. Then mount the tube and its supporting holder through top of the tank, and make electrical connections to BIW relays. Because control circuit voltage between reed switches and relays is normally quite low, no special wiring is required. A numbered terminal block in the holder permits quick, easy field connections to the external relays, alarms, valves or whatever is used to perform the desired functions.

Simple Level Adjustment—Unifloat also permits quick and easy adjustment of control levels if required to meet changing operating conditions. Simply remove the internal terminal block and reed switch assembly through the top of the holder. Add, remove or change position of switches to any new levels desired and replace in the housing. No need to break any tank connections or disturb any material in the tank.

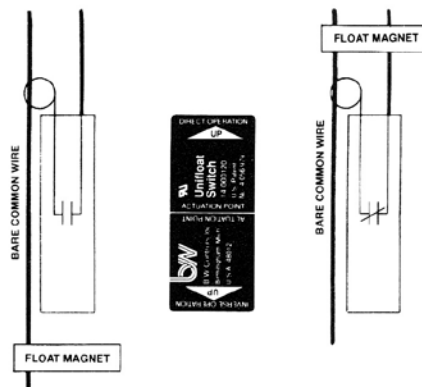
Greater Reliability—Power failures are not supposed to occur. But occasionally they do. No problem with Unifloat. Because, as the free-moving float passes each control level, the unique latching feature of the switches in the guide tube assures detection of changing level even during periods of no power, plus immediate resumption of normal operation when power is restored.

Greater Versatility—Another exclusive feature of BIW Unifloat systems is the fact that each reed switch can be used for either DIRECT or INVERSE operation. In other words, the operation of each switch can be quickly changed from NO to NC by simply reversing position of the reed switch instead of reversing the magnetic float.

DIRECT OPERATION

The reed switch contact is NORMALLY OPEN and CLOSSES ON RISING LEVEL.

With the float magnet below the switch actuation point, the contact is open until rising level causes the float to raise to the actuation point. The contact then closes and because of the patented BIW magnetic latching feature, it will remain closed until falling level brings the float back down and past the actuation point.

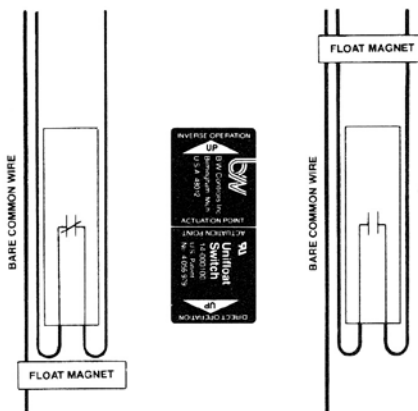


The Type C Switch is shown.
It attaches to the common wire with a spring clip.

INVERSE OPERATION

The reed switch contact is NORMALLY CLOSED and OPENS ON RISING LEVEL.

With the float magnet below the switch actuation point, the contact is closed and because of the patented magnetic latching feature, will remain closed until rising level causes the float to raise past the actuation point. The contact will then remain open until falling level brings the float back down to the actuation point causing the contact to latch in the closed position.

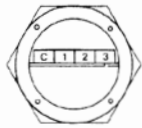


The Type I switch is shown.
It attaches to the common wire with plastic tape.

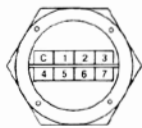
AMETEK[®]

FACTORY AUTOMATION

TERMINAL BLOCK ARRANGEMENTS FOR TYPE C REED SWITCHES (All contacts have a common ground)



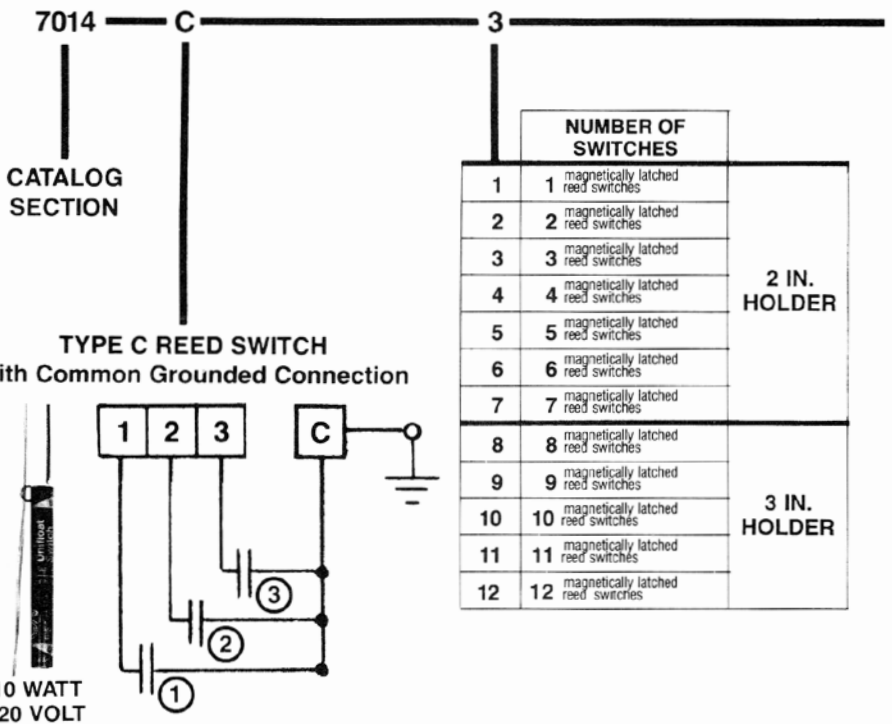
2 INCH NPT HOLDER
FOR 1 TO 3
SWITCHES



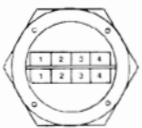
2 INCH NPT HOLDER
FOR 4 TO 7
SWITCHES



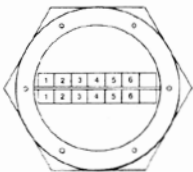
3 INCH NPT HOLDER
FOR 8 TO 12
SWITCHES



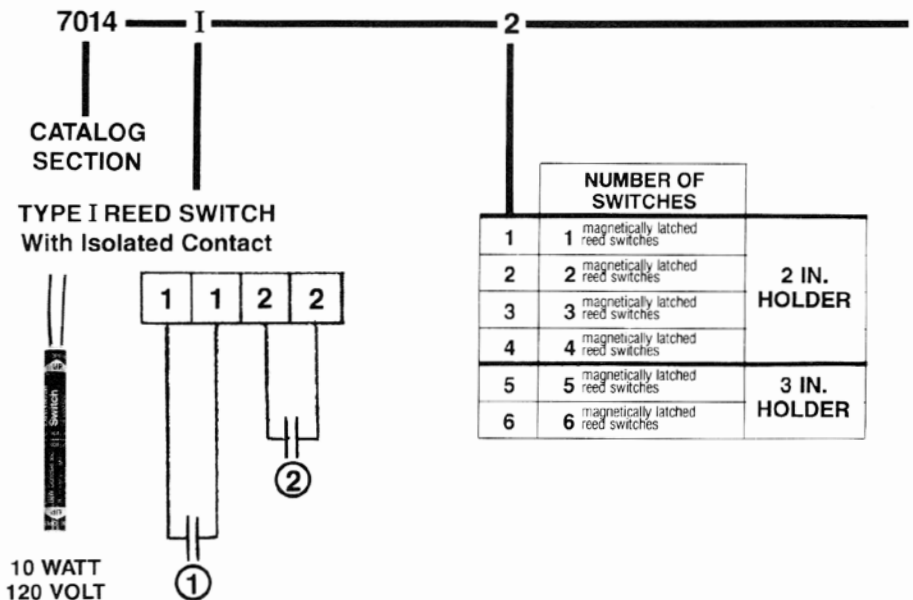
TERMINAL BLOCK ARRANGEMENTS FOR TYPE I REED SWITCHES (Isolated Contacts)



2 INCH NPT HOLDER
FOR 1 TO 4
SWITCHES



3 INCH NPT HOLDER
FOR 5 TO 6
SWITCHES



Series 7014

Unifloat™ Level Sensors

Unifloat® CATALOG NUMBERING SYSTEM

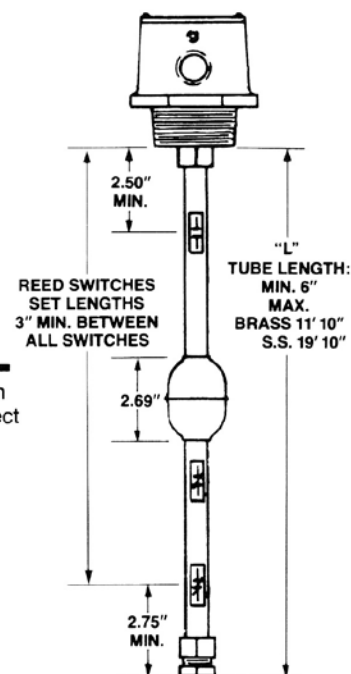
| A | | 6-SS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|---------------------|--------------------------|---|---|----|--|--|--|--|--|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|----|---------|----|---------|----|---------|
| | | <table> <tr> <th colspan="2">GUIDE TUBE MATERIAL</th></tr> <tr> <td>B</td><td>BRASS</td></tr> <tr> <td>SS</td><td>316 STAINLESS STEEL</td></tr> </table> | | GUIDE TUBE MATERIAL | | B | BRASS | SS | 316 STAINLESS STEEL | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GUIDE TUBE MATERIAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | BRASS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SS | 316 STAINLESS STEEL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table> <tr> <th colspan="2">HOLDER MATERIAL & SIZE</th></tr> <tr> <td>A</td><td>Cast Iron 2" & 3" NPT</td></tr> <tr> <td>B</td><td>316 Stainless Steel 2" NPT 1-7 Switches</td></tr> <tr> <td>C</td><td>316 Stainless Steel 3" NPT 8-12 Switches</td></tr> </table> | | HOLDER MATERIAL & SIZE | | A | Cast Iron 2" & 3" NPT | B | 316 Stainless Steel 2" NPT 1-7 Switches | C | 316 Stainless Steel 3" NPT 8-12 Switches | <table> <tr> <th colspan="2">Length of Tube For Reed Switch Set Lengths (Dimension "L" in feet)</th></tr> <tr><td>1</td><td>1 Foot</td></tr> <tr><td>2</td><td>2 Feet</td></tr> <tr><td>3</td><td>3 Feet</td></tr> <tr><td>4</td><td>4 Feet</td></tr> <tr><td>5</td><td>5 Feet</td></tr> <tr><td>6</td><td>6 Feet</td></tr> <tr><td>7</td><td>7 Feet</td></tr> <tr><td>8</td><td>8 Feet</td></tr> <tr><td>9</td><td>9 Feet</td></tr> <tr><td>10</td><td>10 Feet</td></tr> <tr><td>11</td><td>11 Feet</td></tr> <tr><td>12</td><td>12 Feet</td></tr> </table> | | Length of Tube For Reed Switch Set Lengths (Dimension "L" in feet) | | 1 | 1 Foot | 2 | 2 Feet | 3 | 3 Feet | 4 | 4 Feet | 5 | 5 Feet | 6 | 6 Feet | 7 | 7 Feet | 8 | 8 Feet | 9 | 9 Feet | 10 | 10 Feet | 11 | 11 Feet | 12 | 12 Feet |
| HOLDER MATERIAL & SIZE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | Cast Iron 2" & 3" NPT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 316 Stainless Steel 2" NPT 1-7 Switches | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | 316 Stainless Steel 3" NPT 8-12 Switches | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length of Tube For Reed Switch Set Lengths (Dimension "L" in feet) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 Foot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 2 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 5 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 6 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 7 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 8 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 9 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 10 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | 11 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | 12 Feet | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Consult factory for lengths and/or materials not listed.

See page 54 for information regarding switch settings and direct or inverse operation.

ORDERING INFORMATION

1. Specify Unifloat with a complete catalog number.
2. Specify switch setting information by including a switch specification chart from page 55.
3. Provide details on the nature of the liquid being controlled.



Consult factory for lengths and/or materials not listed.

| B | | 10-SS | | See pages 54 & 55 for information regarding switch settings and direct or inverse operation. | | | | | | |
|---------------------|---------------------|--------------|--|---|---------------------|--|----------|-------|-----------|---------------------|
| | | | | <table><tr><th colspan="2">GUIDE TUBE MATERIAL</th></tr><tr><td>B</td><td>BRASS</td></tr><tr><td>SS</td><td>316 STAINLESS STEEL</td></tr></table> | GUIDE TUBE MATERIAL | | B | BRASS | SS | 316 STAINLESS STEEL |
| GUIDE TUBE MATERIAL | | | | | | | | | | |
| B | BRASS | | | | | | | | | |
| SS | 316 STAINLESS STEEL | | | | | | | | | |
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See pages 54 & 55 for information regarding switch settings and direct or inverse operation.

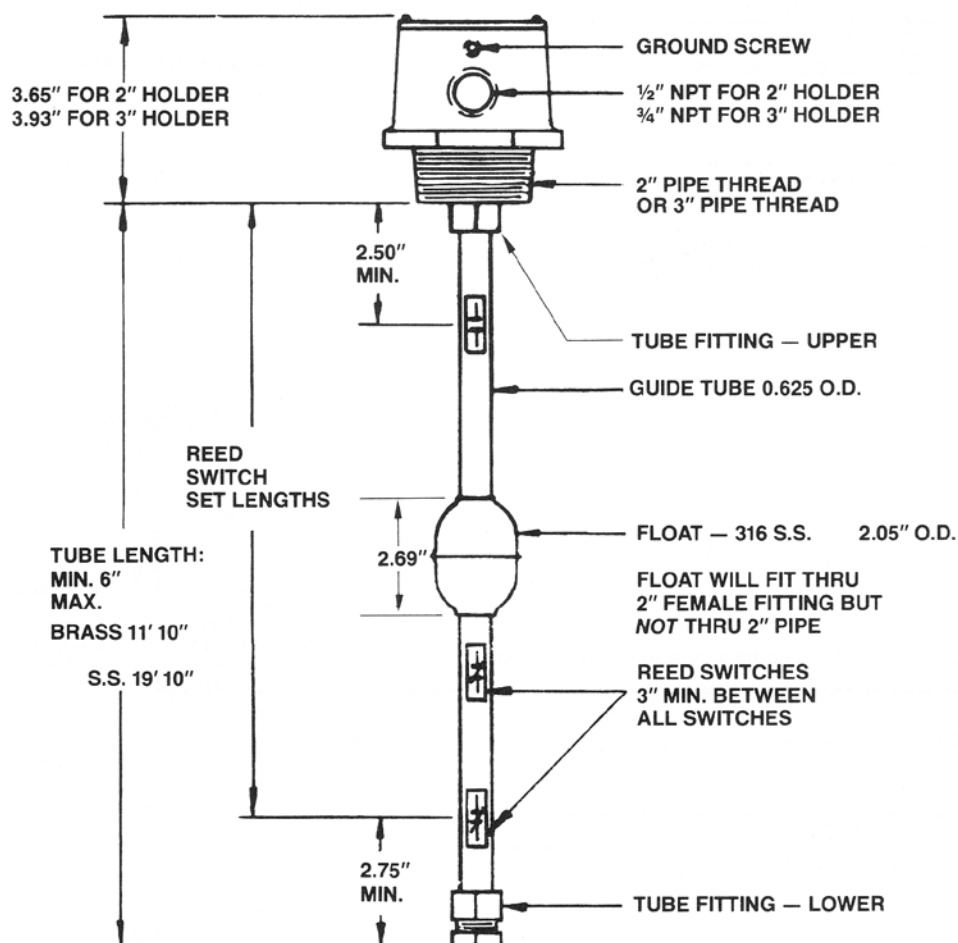
TUBE LENGTH: Tube will be cut 2.75" longer than maximum switch set length unless otherwise specified.

NOTES

1. If switch setting information is not included with order, all switches will be installed for direct operation and set at maximum lengths.
2. Unless otherwise specified, factory assembled Unifloats will have the switches set for actuation based on 1.0 S.G. for water.



DIMENSIONS AND DETAILS



Operating Pressures

| | |
|---------|---------------------|
| Minimum | Vacuum to 14.7 psi |
| Maximum | 500 psi 3450 kPa |

Operating Temperatures

| | |
|---------|------------------|
| Minimum | 0°F -19°C |
| Maximum | 250°F* 121°C* |

*Consult Factory For Temperature over 250°F

Operating Viscosity

Up to 1500 CP
Up to 6000 SSU

IMPORTANT: The reed switches are rated for 10 watts and the maximum voltage and current load must not be exceeded.

| Volts | Maximum Current | |
|-------|-----------------|--------|
| | AC | DC |
| 25 | 440 MA | 400 MA |
| 50 | 220 MA | 200 MA |
| 120 | 90 MA | 80 MA |

Just before installation into the tank, slide the float up and down the full length of tube to set the switches in their normal condition.

REED SWITCH SETTINGS

Each reed switch is marked with the actuation point and the differential travel is 0.1 inch. Switch actuation will depend on the actual specific gravity of the liquid being controlled, and unless otherwise specified, factory assembled units will have switch settings based on water with a specific gravity of 1.0. Adjustment for other specific gravities is shown in the table.

SPECIFIC GRAVITY ADJUSTMENT

| S.G. | Subtract from Length | S.G. | Add to Length |
|------|----------------------|----------------------|---------------|
| 1.5 | 0.37 in. | 1.0 | None |
| 1.4 | 0.31 in. | 0.9 | 0.12 in. |
| 1.3 | 0.25 in. | 0.8 | 0.27 in. |
| 1.2 | 0.18 in. | 0.7 | 0.48 in. |
| 1.1 | 0.10 in. | *0.65 | 0.62 in. |
| 1.0 | None | *Recommended Minimum | |

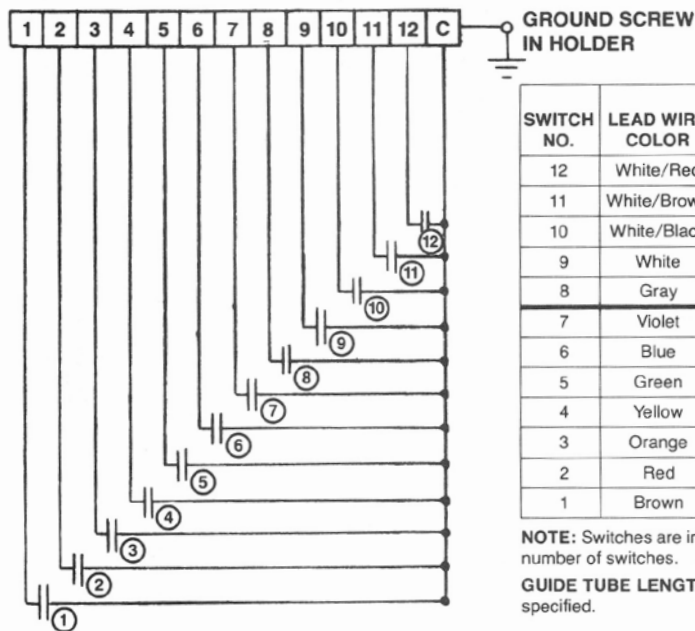
Series 7014

Unifloat™ Level Sensors

REED SWITCH SPECIFICATION CHARTS

BARRIER TERMINAL BLOCK IN HOLDER

No. 6 Screw — Saddle Clamp
Max. Wire Size: #14 A W G



TYPE C REED SWITCH

(All contacts have a common ground)
Maximum rating 10 watts at 120 volts
AC or DC.

ONE LEAD WITH GROUNDED CONTACT

Up to 7 switches in 2 inch holder.
Up to 12 switches in 3 inch holder.

Common side of each switch must connect to grounded side of the same power supply.

| SWITCH NO. | LEAD WIRE COLOR | TERMINAL NO. | FUNCTION | SWITCH OPERATION | | SET LENGTH (INCHES) |
|------------|-----------------|--------------|----------|------------------|---------|---------------------|
| | | | | DIRECT | INVERSE | |
| 12 | White/Red | 12 | | | | |
| 11 | White/Brown | 11 | | | | |
| 10 | White/Black | 10 | | | | |
| 9 | White | 9 | | | | |
| 8 | Gray | 8 | | | | |
| 7 | Violet | 7 | | | | |
| 6 | Blue | 6 | | | | |
| 5 | Green | 5 | | | | |
| 4 | Yellow | 4 | | | | |
| 3 | Orange | 3 | | | | |
| 2 | Red | 2 | | | | |
| 1 | Brown | 1 | | | | |

NOTE: Switches are installed with No. 1 as the lowest in the guide tube and working upward using the required number of switches.

GUIDE TUBE LENGTH: Tube will be cut 2.75" longer than the maximum switch set length unless otherwise specified.

TYPE I REED SWITCH

(All isolated contacts)

Maximum rating 10 watts at 120 volts
AC or DC.

TWO LEADS WITH ISOLATED CONTACT

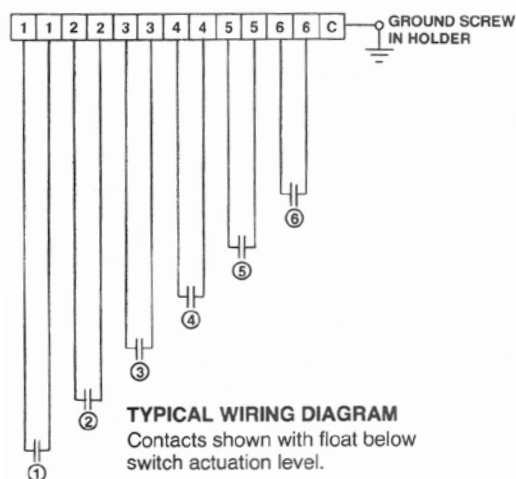
Up to 4 switches in 2 inch holder.

Up to 6 switches in 3 inch holder.

Individual switches can be used in different circuits.

BARRIER TERMINAL BLOCK IN HOLDER

No. 6 Screw — Saddle Clamp
Max. Wire Size: #14 A W G



| SWITCH NO. | LEAD WIRE COLOR | TERMINAL NO. | FUNCTION | SWITCH OPERATION | | SET LENGTH (INCHES) |
|------------|-----------------|--------------|----------|------------------|---------|---------------------|
| | | | | DIRECT | INVERSE | |
| 6 | Blue | 6 | | | | |
| 5 | Green | 5 | | | | |
| 4 | Yellow | 4 | | | | |
| 3 | Orange | 3 | | | | |
| 2 | Red | 2 | | | | |
| 1 | Brown | 1 | | | | |

NOTE: Switches are installed with No. 1 as the lowest in the guide tube and working upward using the required number of switches.

GUIDE TUBE LENGTH: Tube will be cut 2.75" longer than the maximum switch set length unless otherwise specified.

Above contacts shown as direct operation. For inverse operation show contact closed.

⎓ Direct Operation.

⎓ Inverse Operation.

TYPICAL WIRING DIAGRAM

Contacts shown with float below switch actuation level.

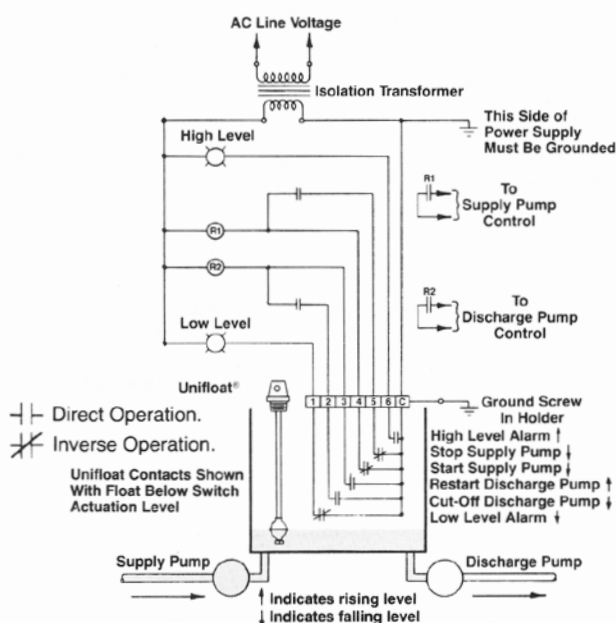
METEK®

FACTORY AUTOMATION

OTHER APPLICATIONS

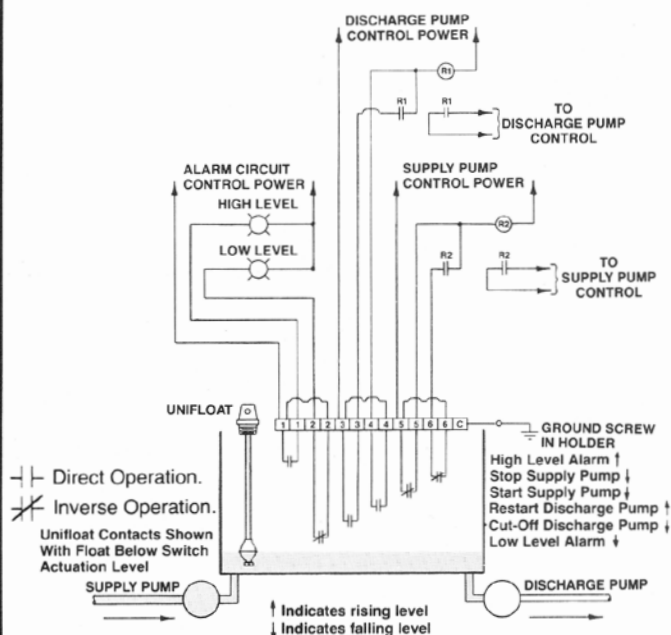
WITH TYPE C REED SWITCH Having Common Grounded Contact

The line diagram below shows the wiring method recommended when operating conventional relays and devices rather than B/W relays. To meet UL requirements, the control power must be from an isolation transformer with the common side grounded. This means that the Unifloat switches are connected in the grounded side of the relay coils rather than the hot side. If this causes a circuit design problem, then the Type I isolated contact reed switches should be used in the Unifloat.



WITH TYPE I REED SWITCH Having Isolated Contact

The versatility of the Type I reed switch is shown in the line diagram below. They can be wired in the hot side of the control voltage and be independently wired in various control circuits. While a ground screw is provided in the holder, there is no need to ground the reed switch leads. Contacts are rated 10 watts at up to 120 volts AC or DC and the maximum voltage and current ratings must not be exceeded.



ACCESSORIES

| MOUNTING FLANGES | Cast Iron 125 Lbs. Plain Face | 304 SS 150 Lbs. Stainless Steel Raised Face | 316 SS 150 Lbs. Stainless Steel Raised Face |
|--|--|---|---|
| 2 x 6 Companion, 2 inch (Weight 5 lbs.) | 04186500 | 04291013 | 04291002 |
| 2 x 7½ Reducing, 2 x 3 inch (Weight 9 lbs.) | 04186400 | 04291113 | — |
| 2 x 9 Reducing, 2 x 4 inch (Weight 15 lbs.) | 04193600 | 04294113 | 04587275 |
| 3 x 7½ Companion, 3 inch (Weight 9 lbs.) | 04193500 | 04291213 | — |
| 3 x 9 Reducing, 3 x 4 inch (Weight 15 lbs.) | 04197600 | 04294213 | — |

| DESCRIPTION |
|--|
| Relay output module having 4 S.P.D.T., 10 AMP relays and indicating lights Part No. 40070700 |
| 8" Dia. float for liquids having a specific gravity of .45 or more. (An access hole in the tank is required to attach the 8" float to the tube or a 10" flange adapter) |

Series 7230

Continuous Liquid Level Sensors

7230 HT Multivariable Digital Probe

Proven Magnetostrictive Sensing Performance Integrated with a Modbus or ASCII Digital Multivariable Protocol

The 7230 HT Digital Probe is a new magnetostrictive level measurement probe from Ametek APT for the up-stream oil and gas industry where multi-layer and temperature data is critical to everyday operations.

The 7230 Probe is a level measurement solution that provides both total and interface levels as well as temperature readings from up to 5 discrete positions. All the data is collected by installing a single sensor through a single process connection, eliminating the need for multiple sensors and insertion points. The 7230 Series is approved as Explosion Proof (without intrinsic safety barriers) for Class I, Div. 1 and Zone 1 hazardous locations.

The 7230 is available with a choice of either Modbus RTU or ASCII communication protocols. An optional analog interface module is also available for use with the Modbus RTU output. This option allows for multivariable 4-20mA outputs.

All of this performance is enhanced by Ametek APT's patented magnetostrictive design. Magnetostrictive technology requires no calibration yet provides the highest accuracy of any of the most popular level technologies


that are currently offered in today's market. The 7230 Probe is no exception, as it exceeds the high accuracy of the proven 7330 Analog STIK with an impressive accuracy of 0.01% of measured span.

Product Features

- Multivariable readings
- Modbus or ASCII Protocol
- High accuracy
- High temperature
- Reliable level measurement
- Material's electrical characteristics and densities do not affect readings
- Easy to install, no technician needed
- Mixed hydrocarbons will not cause level measurement errors
- A variety of floats are available



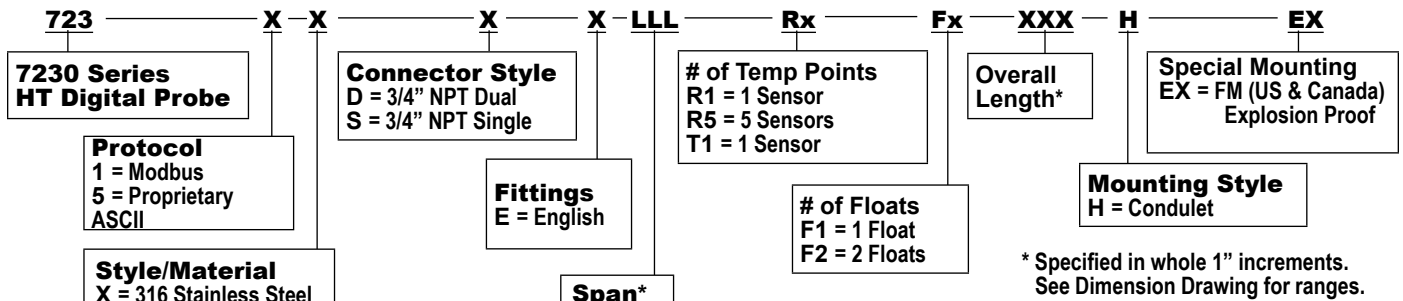
Specifications

| | | |
|--|---|---|
| Enclosure Type | Type 4/4X IP66 | Approvals FM (US and Canada) XP Class I, Div I, Group A, B, C, D, T4 DIP Class II, III, Group E, F, G, T4  |
| Output Signal/Protocol | Level, Interface and Temperature 7231: RS-485, Modbus RTU 7235: TTL, Proprietary | |
| Data | 7231: Signed, Long, Binary 7235: ASCII | |
| Range Temp. | -40°F to 257°F Process -40°F to 158°F Ambient | |
| Pressure Rating, Wetted Parts | 316SS Probe: 1000 psi max. Floats Dependent: Consult Factory. | |
| Wetted Parts | 316LSS | |
| Probe Length | Up to 24 foot, 21" to 288" | |
| Accuracy | 0.01% of Span | |
| Power Supply | 7231: 10 to 30 VDC 40mA @ 30 VDC max. 26mA @ 24 VDC Typical 7235: 5 VDC, +/-10% Typical 3.7 VDC min. 17mA max. | |
| Null Zone | 9.25" | |
| Dead Band | 2.75" | |
| Specifications are subject to change without notice. Patented. | | |

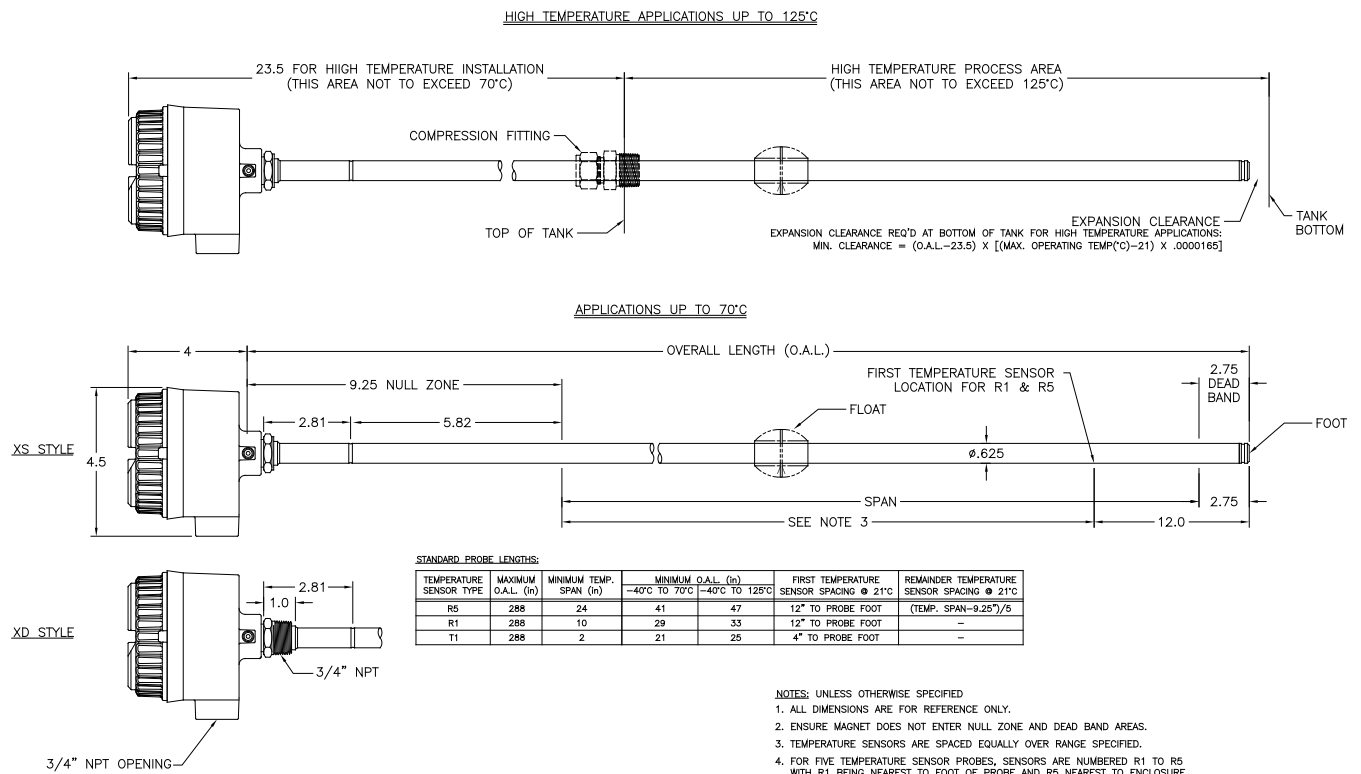


7230 HT Multivariable Digital Probe

Part Numbering



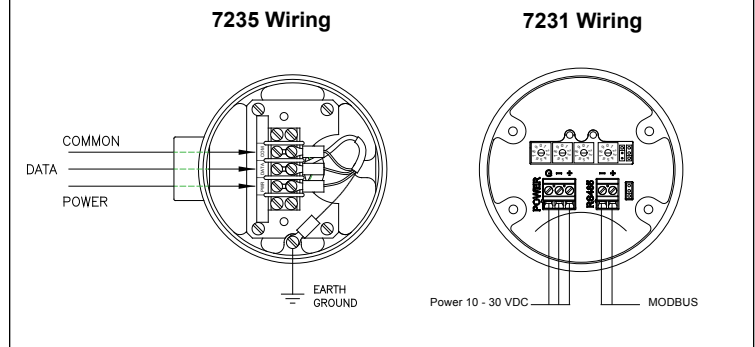
Dimension Drawing



Accessories

| Item | P/N |
|---|-----------|
| Float Kit: Level Float, 316SS, 2.05" dia., 0.54sg Float, E-clip & spacer | SD0557200 |
| Float Kit: Interface Float, 316SS, 2.05" dia., 0.96sg Float, E-clip & spacer | SD0556800 |
| Float Kit: Level Float, Nitrophyl 2.0" x 3.0" h 0.40sg, E-clip & spacer | SD0548600 |
| Float Kit: Interface Float (w/Nitro. level float), 316SS, 2.05" dia., 0.96sg, E-clip & spacer | SD0557300 |
| Adjustable Tube Coupling: 316SS, 5/8" x 3/4" NPT | 04283800 |
| Reducing Bushing: 316SS, 2" x 3/4" NPT | 04587241 |
| Analog Interface Board: Modbus RTU to analog (4-20mA) converter | 04534047 |

7230 Wiring Diagram



Series 7330

Continuous Liquid Level Sensors

7330 Series Pro-Stik II Magnetostrictive Sensor with Field Programmable Span

The 7330 Series Pro-Stik II design takes field proven technology and incorporates features including field programmable span. A variety of floats and mounting accessories is also available to fit many applications.

The construction of the sensor has all of the electronics integrated into the 5/8" diameter sensing tube. This breakthrough in package design eliminates the bulky electronics enclosure at the top of the sensor.

7330X

The 7330X Pro-Stik II is ideal for level monitoring in a variety of liquids and tanks.

- Mini connector or 3/4" NPT fitting
- Totally welded construction optional
- Cathodic protection optional
- Security feature uses a timing sequence to unlock the probe for programming.

7330V

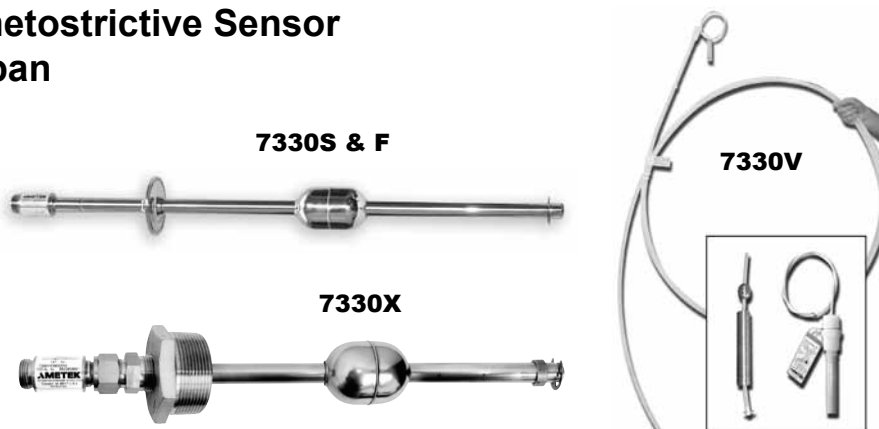
The 7330V Pro-Stik II is ideal for level monitoring in a variety of liquids and tank designs especially when overhead room is limited. Diagnostic output provides continuous information about the float's position.

Available in flexible and semi-flexible PVDF (polyvinylidene fluoride) in lengths up to 40 ft. PVDF material provides an excellent option for monitoring chemicals not compatible with stainless steel.

7330S & F

The 7330 S & F probe design eliminates unnecessary cracks and crevices and is available in a 3A CIP version with a removable float. The rugged, 316 stainless steel construction is ideal for food processing, pharmaceutical and other sanitary environments.

- Provides continuous absolute position data.
- No calibration required.
- Finish is welded, ground and polished
- Installed with a standard Tri-clamp fitting. Can also be ordered without a Tri-clamp.
- "Timing sequence" unlocks probe, preventing accidental re-programming.
- Diagnostic outputs



| Specifications | | | |
|------------------------|---|--------------------------------|---|
| Operating Voltage | 13.5 to 30 VDC | Intrinsically Safe Barrier | See Installation Drawing E0240200 on page 9 |
| Output | | Enclosure | Probe: 316 SS or PVDF |
| Operating Output | 4 to 20mA | Material Rating | IP68 |
| Diagnostic Output | 3.9mA and 20.1mA, float outside of span 3.8mA, no signal received (Note: Diagnostic Tolerance +/- 0.02mA) | | |
| Operating Temperature | | Probe Length | |
| Hazardous Locations | -40°C to 70° C | Stainless Steel R | 19" to 288" |
| | | Stainless Steel D, S, M | 18" to 288" * Consult Factory |
| Non Hazardous Location | -40°C to 100° C | PVDF Style C | 20" to 192" |
| Sensing Area | -40°C to 70° C | PVDF Style X | 25" to 840" |
| Pressure Rating | 316SS Probe: 1000 psi max. PVDF Probe: 150 psi max. Floats: Dependent. Call Factory. | Hazardous Areas Approvals | |
| Resolution | 0.025% of span or 0.014" (Whichever is Greater) | cFMus | |
| Repeatability | 0.014" + 0.05% of span typical, 0.014" + 0.4% of span maximum | -40° ≤ Tamb ≤ 70° C | |
| Accuracy | 0.1% of span or 0.050" (Whichever is Greater) | Class I, II, III, Div. 1 | |
| Null Zone | 8" | Groups C, D, E, F, G, T4 | |
| Dead Band | 2" | Class I, Div. 2 | |
| | | Groups A, B, C, D, T4 | |
| | | Class I, Zone 0, AEx ia IIB T4 | |
| | | ATEX | |
| | | Ex ia IIB T4 | |
| | | FM FM13ATEX0028X | |
| | | (See PVDF installation note) | |
| | | CE 0344 II 1G | |

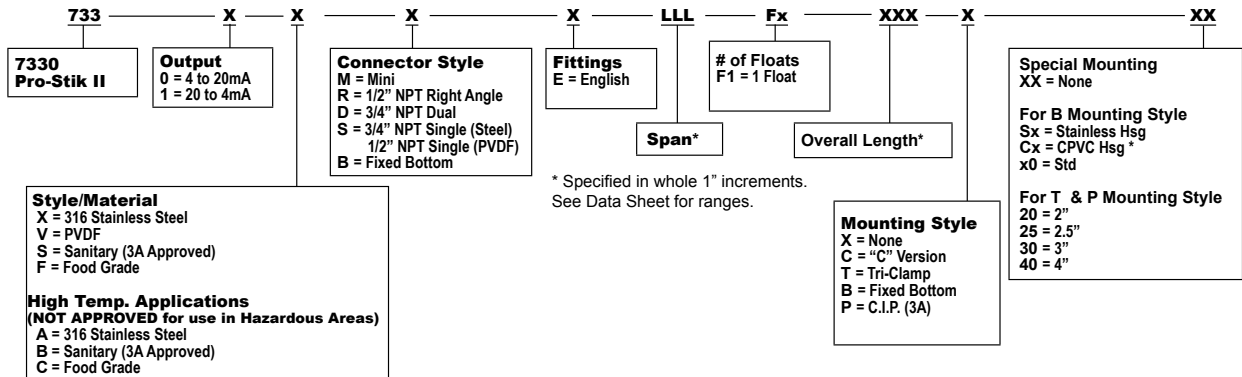
Specifications are subject to change without notice. Patented.

| Accessories | | | |
|--|-----------|---|-----------|
| Item | P/N | Item | P/N |
| 7330 V Style | | 7330 X Style | |
| Float: 316 Stainless Steel, 2.05" dia., 0.56s.g. | 14020002 | Float Kit, 316 SS, 2.05" Diameter w/ E Clip and Spacer 0.54s.g. | SD0515000 |
| Weight Kit: for use with PVDF probes with OAL of 146" to 288" 316 Stainless Steel components, 2" d x 7" h weight and retaining pin. (For use with "X" style mounting). | SD0517408 | Float Kit, Nitrophyl, 2.02" Diameter w/ E Clip and Spacer 0.40s.g. | SD0536500 |
| Weight Kit: for use with PVDF probes with OAL of 289" to 432" 316 Stainless Steel components, 2" d x 7" h weight and retaining pin. (For use with "X" style mounting). | SD0517411 | Cable Assembly, 4 pin, 6 feet long (M style only) | 01533141 |
| Weight Kit: for use with PVDF probes with OAL of 433" to 480" 316 Stainless Steel components, 2" d x 7" h weight and retaining pin. (For use with "X" style mounting). | SD0517413 | Adjustable Tube Coupling 5/8" x 3/4" NPT | 04283800 |
| Float Spacer: PVDF split ring spacer and screws. (For use with "C" style mounting). | SD0511000 | Junction Box, side mount, explosion proof with zero & span push buttons | SD0536101 |
| 7330 S & F Styles | | Safety Barrier Single Channel | 04517238 |
| Cable/Connector Ass'y, 6 ft., M Style | 01533141 | Safety Barrier Dual Channel | 04517248 |
| Meter, 4.5 Digital Display, Panel Mount, 2 Output Relays | 04541069 | Meter, 4 1/2 digit display, panel mount, 2 output relays | 04541069 |
| Sanitary Float Kit, 316SS, 1.83" dia., .61s.g., F Style Only | SD0529100 | Bushing, 3/4" x 2" NPT 316SS | 04587241 |

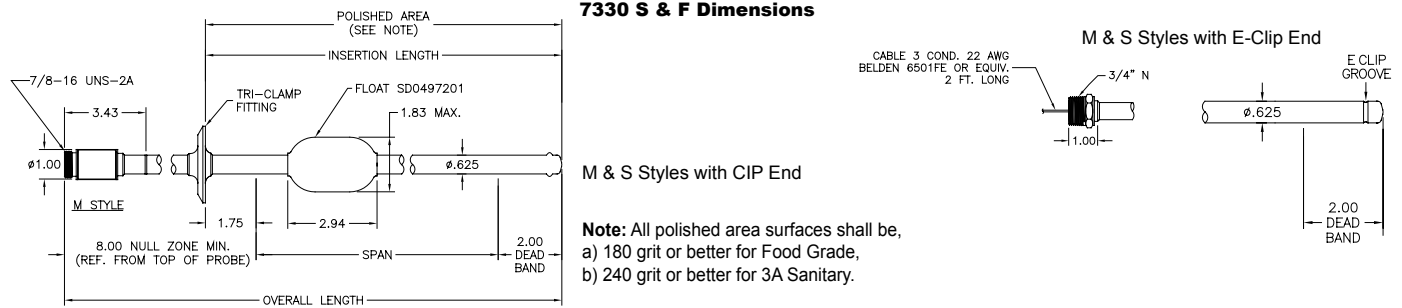
AMETEK®

FACTORY AUTOMATION

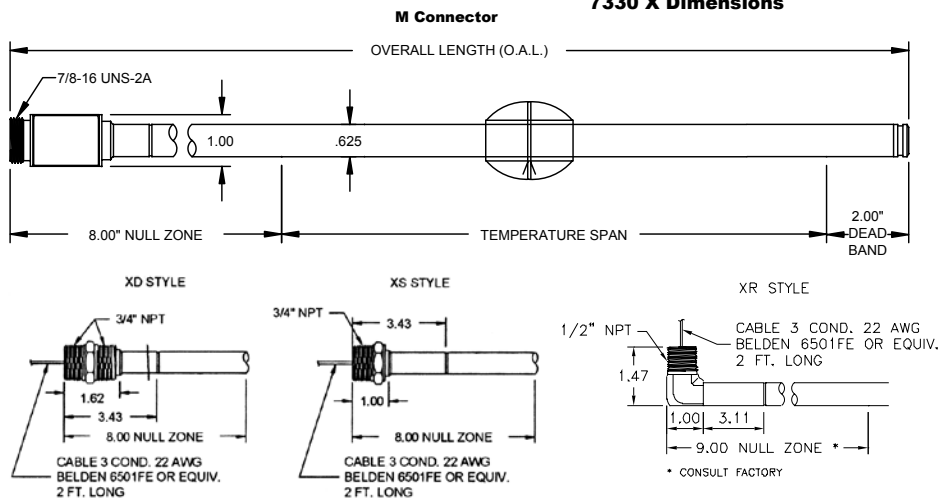
Part Numbering



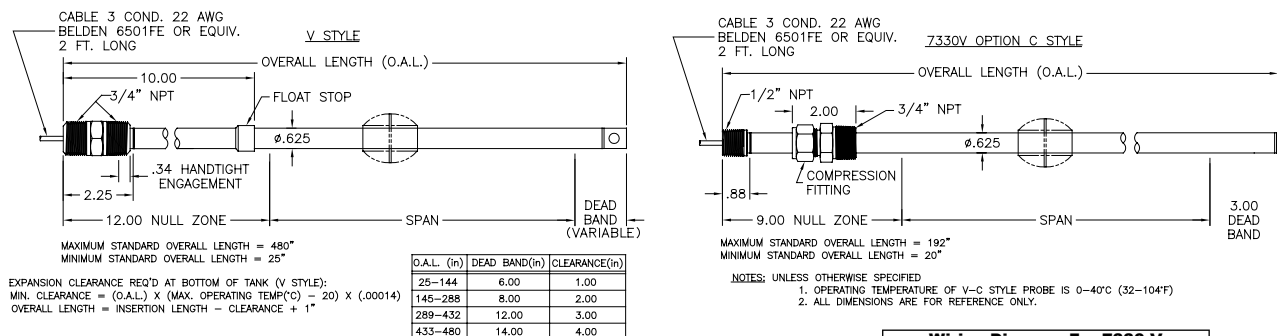
7330 S & F Dimensions



7330 X Dimensions



7330 V Dimensions



| Signal Name | Pigtail Cable |
|-------------|---------------|
| Loop (-) | Black |
| Prgm Input | White |
| Loop (+) | Red |

Series 7330

Continuous Liquid Level Sensors

Explosion Proof Magnetostrictive Sensor with Field Programmable Span

The 7330 EX/ED Series Pro-Stik II takes field proven magnetostrictive sensing technology and incorporates features such as a field programmable span. This is packaged in our patented Stik design, making the Pro-Stik II ideal for level monitoring in a variety of liquids and tanks. Sensors are available in rigid 316 stainless steel up to 24 feet.

This stainless steel version is available with a 3/4" NPT fitting joined to a housing with terminal connectors and zero/span push-buttons. The stainless steel version offers a totally welded construction and may be provided with cathodic protection.

The sensor's electronics are SMT components in a 5/8" diameter sensing tube. This packaging breakthrough eliminates the electronics enclosure at the top of the sensor, improving the environmental seal and offering greater options for insertion and mounting in tanks and vessels.

The 7330 EX Series Pro-Stik II is a loop powered explosion proof sensor with a scalable 4 to 20mA span that provides 0.1% accuracy, full scale. The only calibration required is to set the upper and lower limits of the span.

The probe provides a security feature by utilizing a timing sequence that is used to unlock the probe for programming. This ensures that the span cannot be accidentally programmed by someone in the field.


The unique diagnostic output provides continuous information about the float's position and passcode protection for programming.

The sensor can be "bench" calibrated to set the zero and span or an optional housing with push-button setting of the zero and span at the tank is available.

| If The float is... | Output |
|--|--------|
| Below set span, but within active region | 3.9mA |
| Above set span, but within active region | 20.1mA |
| Either above or below active range or signal is lost | 3.8mA |

A variety of floats and mounting accessories are available to fit virtually any application. Speak with an Applications Engineer to discuss your needs today. Call 800.635.0289 or visit us online at www.ametekapt.com.

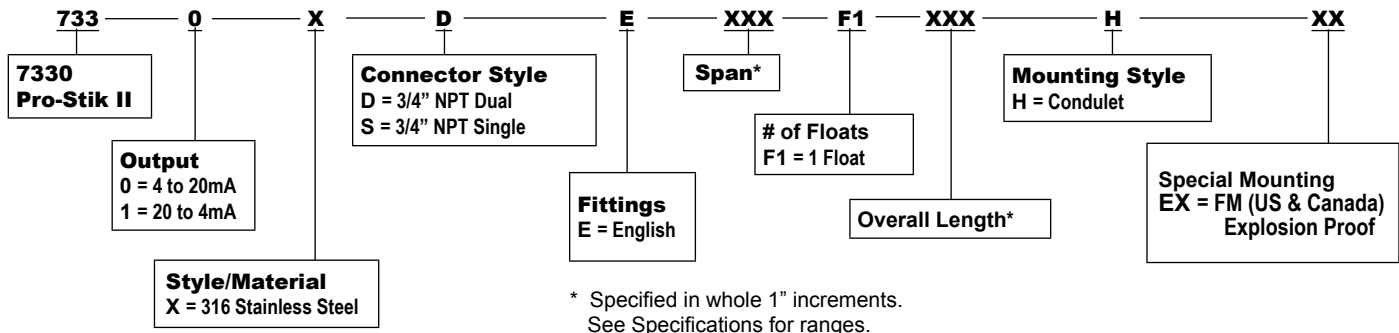


| Specifications | | | |
|--|---|--|----------------------------------|
| Operating Voltage | 13.5 to 30 VDC | Probe Length Stainless Steel D, S | 18" to 288" * Consult Factory |
| Output | | | |
| Operating Output | 4 to 20mA | | |
| Diagnostic Output | 3.9mA and 20.1mA, float outside of span 3.8mA, no signal received (Note: Diagnostic Tolerance +/- 0.02mA) | Approvals | |
| Operating Temperature | -40° to 70° C, (-40° to 158° F) | | |
| Pressure Rating | 316SS Probe: 1000 psi max. Float Dependent. Consult Factory. | FM (US & Canada) XP Class I, Div I, Group A, B, C, D, T4 DIP Class II, III, Group E, F, G, T4  | |
| Resolution | 0.025% of span or 0.014" (Whichever is Greater) | | |
| Repeatability | 0.014" + 0.05% of span typical, 0.014" + 0.4% of span maximum | | |
| Accuracy | 0.1% of span or 0.050" (Whichever is Greater) | | |
| Null Zone | 8" | | |
| Dead Band | 2" | | |
| Enclosure Material Rating | Probe: 316 SS IP68 | | |
| Specifications are subject to change without notice. Patented. | | | |

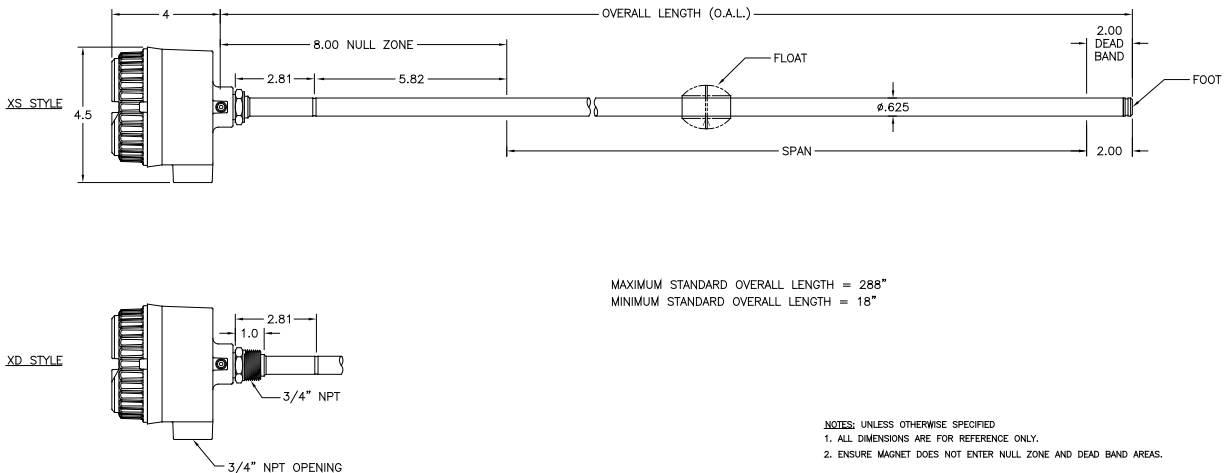
METEK®

FACTORY AUTOMATION

Part Numbering



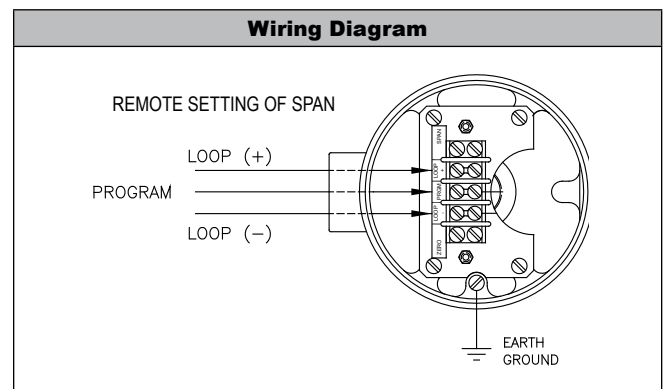
Dimension Drawing



Accessories

| Item | Part Number |
|--|-------------|
| Float Kit, 316 SS, 2.05" Diameter w/ E Clip and Spacer 0.54s.g. | SD0515000 |
| Float Kit, Nitrophyl, 2.02" Diameter w/ E Clip and Spacer 0.40s.g. | SD0536500 |
| Cable Assembly, 4 pin, 6 feet long (M style only) | 01533141 |
| Adjustable Tube Coupling 5/8" x 3/4" NPT | 04283800 |
| Meter, 4 1/2 digit display, panel mount, 2 output relays | 04541069 |
| Bushing, 3/4" x 2" NPT 316SS | 04587241 |

Wiring Diagram



Series 8040/8041

Control Panels: *Consult Factory for Additional Details*

ALARM PANELS

B/W Signal and Alarm panels are available in many standard packaged units designed for use in a wide range of high, low and intermediate level alarm applications as well as for remote control signalling. Each contains the proper B/W level sensing relays and operates from electrodes set at desired alarm levels.

These panels can also be furnished with one or more B/W pump control relays included in the package to perform any desired level control function. Also, these alarm systems can be incorporated into any of the other control systems shown in this catalog. Contact us for assistance to meet your specific needs.

FIXED SEQUENCEY PANELS

These arrangements minimize installation time and costs by combining 2 or 3 control functions into a single control panel. All wiring connections between the B/W relays are made in our shop. Field wiring is made to the rugged terminals of the B/W relays and a system wiring diagram is provided which clearly shows all required external connections to the electrodes and other devices.

The standard enclosure is rated NEMA 3R for location indoors or outdoors. It is made of steel with baked enamel

finish and has knockouts in the bottom for conduit fittings. The NEMA 4 watertight enclosure is fiberglass. It meets the NEMA 4X corrosion resistance standards and suitable aluminum conduit hubs are furnished as open chassis on a back plate for field mounting into an electrical panel.

Several of the most common control combinations are listed below and identified with catalog numbers. However, any combination of relays can be provided. Just tell us what you want.

AUTOMATIC ALTERNATOR PANELS

A basic pump down control used on systems for storm drainage condensate return, septic tank effluent, swage lift stations, water soluble machine tool coolants, and cooling tower sumps.

While any of the B/W relays can be furnished, the Type 1500 induction relays are indicated. These have heavy load contacts that are capable of directly operating single phase pumps up to 1 H.P. @ 120 or 240 Volts A.C., or up to size 5 motor starter coils.

The Model AD2C for pump down (or AU2C for pump up) has a common power supply through the B/W panel to energize

the pump control circuits. For many applications it is desirable to have the pump, motors, and/or their motor starters on their own power supplies. For these situations Model AD2I for pump down or AU2I for pump up) has an isolated load contact for each pump control circuit and should be used. B/W Alternators are compact packaged units designed to provide automatic change in the operating sequence of any number of pumps on either "pump down" or "pump up" level control applications. They provide uniform usage of all pumps under normal operating conditions, yet permit use of full pumping capacity during peak load periods.

HYDROPNEUMATIC TANK PANELS

B/W hydropneumatic tank control systems provide simple, positive means of maintaining a properly balanced relationship between the water level and air pressure in house tanks for large and small buildings, subdivision water

supplies, and other installations that require reliable, trouble free operation. Fully automatic on start up, it requires little or no maintenance and minimizes short pump cycling during high demand periods

SOLID STATE ALARM PANELS

VERSATILE NEW ALARM DETECTS MOISTURE, LEAKS AND HIGH LEVELS, PLUS OFF-NORMAL CONDITIONS INVOLVING A WIDE VARIETY OF PROCESS VARIABLES AND BUILDING SECURITY APPLICATIONS.

B/W Series 8041 Solid-State alarm systems are designed to provide new versatility, safety and reliability in monitoring and detecting off-normal conditions in a broad range of industrial, commercial and institutional applications.

OPERATING FEATURES AND ADVANTAGES

B/W Series 8041 Alarm Systems also provide field - adjustable sensitivity from 1000 ohms up to 1 megohm to assure reliable operation over long distances and in detecting leaks or high levels of a wide variety of conductive liquids. A field adjustable time-delay is also provided to eliminate false trips due to liquid turbulence or electrical transients. The alarm action does not start until the time delay is completed.



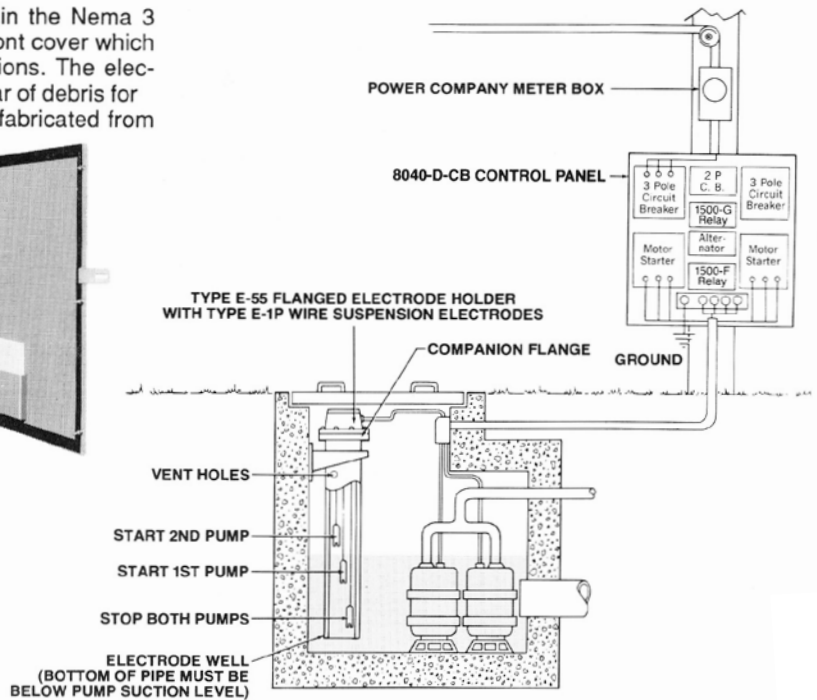
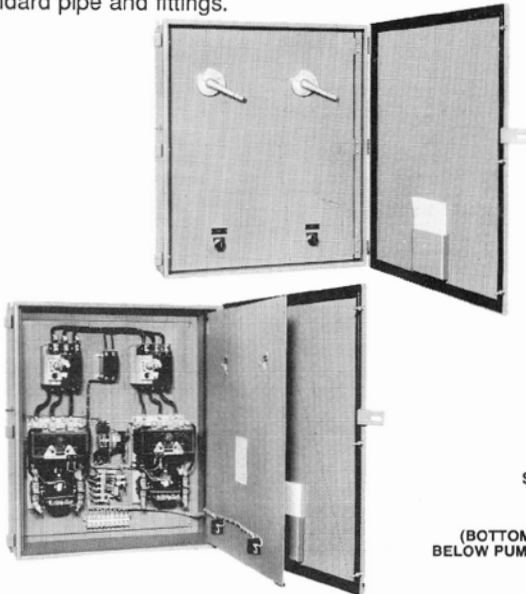
Series 8044 Custom Control Panels

CUSTOM CONTROL PANELS

Control Panels can be built to customer specifications. Modification to alarm, fixed sequence, and alternation control panels can be designed by AMETEK APT to meet the needs of each customer. Consult the factory for additional details.

TYPICAL STORM DRAIN SUMP CONTROL

Model 8040-D-C3B control panel is shown in the Nema 3 weather tight enclosure with internal dead front cover which is designed for unattended outdoor installations. The electrode will serve to keep the liquid surface clear of debris for proper contact with the electrodes, and it is fabricated from standard pipe and fittings.



Other Products



MADE IN AMERICA

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