



FLUID FLOW — AND — LIQUID LEVEL SWITCHES

LIQUID LEVEL PUMP UP/PUMP DOWN CONTROLLERS
PUMP EMERGENCY SHUT DOWN CONTROLLERS

WETTED SURFACES

BRASS • STAINLESS STEEL • HASTELLOY® C. • FORTRON®
NORYL® • VITON® • EPDM • TITANIUM • TEFLON®

ASISTENCIA DISPONIBLE EN ESPAÑOL

HARWIL CORPORATION
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FLUID FLOW AND LIQUID LEVEL SWITCHES

CHEMICAL FEED PUMP CONTROLLER

WIRELESS SWITCHING SYSTEMS

LIQUID LEVEL PUMP UP/PUMP
DOWN CONTROLLERS

PUMP EMERGENCY SHUT
DOWN CONTROLLERS

WETTED MATERIALS

BRASS, STAINLESS STEEL,
HASTELLOY[®] C., TITANIUM,
NORYL[®], FORTRON[®], TEFLON[®],
EPDM, VITON[®]



OPERATIONAL INFORMATION

We DO NOT use multiple choice menu driven voice mail in response to your important telephone call.

WE ANSWER THE TELEPHONE with actual human beings experienced in taking your order for standard products or providing technical application assistance.

Our PERSON TO PERSON order desk is open 7:30 am to 4:00 PM (PST), Monday through Friday.

Our voice mail is on at all other times. We WILL respond to your important message at the beginning of our next business day.

Our FAX machine is never turned off. (805) 988-6804

TECHNICAL APPLICATION ASSISTANCE

In depth technical information to help you select the optimum HARWIL product for your particular application is as close as your telephone and fax machine.

- PHONE: (805) 988-6800, FAX (805) 988-6804
- We can modify standard units for special applications.
- We also design and manufacture completely new models for O.E.M. applications.

EMERGENCY DELIVERIES

Our 50 year history of supplying support items such as level controllers, fluid flow and liquid level switches to a broad spectrum of industries has impressed on us the importance of fast delivery of emergency orders to keep our customers "on line." To this end we:

- Attempt to keep reasonable numbers of all standard models in stock, i.e. physically on our "emergency shelf" for instantaneous delivery of small orders.
- We have shipped orders received by 9:00 AM local time that same day.

ORIGIN OF PRODUCTS

Almost all of the products listed in this catalog are conceived, designed, developed, manufactured and marketed by HARWIL Corporation in Oxnard, CA.

BACKGROUND

HARWIL Corporation was formed in 1956. Electromechanical fluid flow and liquid level switches were one of our initial product lines and are now the major product line. Current development is directed toward electronic and wireless switches and controls.

TRADEMARKS

Teflon® is a registered trademark of DuPont. Viton® is a registered trademark of DuPont Performance Elastomers. Noryl® is a registered trademark of Sabic Innovative Plastics Holding BV. Fortron® is a registered trademark of Fortron Industries LLC. HASTELLOY® registered trademarks of Haynes International, Inc.

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FLOW SWITCHES

| Model | Process Connection | Pipe Size | Flow Range (GPM) | Chemical Resistant | Max. Working Temp | Max. Working Pressure | Electrical Switch | Page |
|----------------|--------------------|-----------|------------------|--------------------|-------------------|-----------------------|-------------------|-----------|
| Q-1 | ½" NPT | ½" | 0.12–8 | | 180°F (82°C) | 300 psi | *SPDT 15A | 8 |
| Q-4E | 1" NPT | 1" | 4–70 | | 180°F (82°C) | 300 psi | *SPDT 15A | 10 |
| Q-5 | 1" NPT | 1–48" | 5–85,000+ | | 180°F (82°C) | 300 psi | *SPDT 15A | 12 |
| Q-5SS | 1" NPT | 1–48" | 10–102,000+ | | 180°F (82°C) | 300 psi | *SPDT 15A | |
| Q-8N | 1" NPT | 1–10" | 8–1,900+ | | 180°F (82°C) | 50 psi | *SPDT 15A | 14 |
| Q-8CR | 1" NPT | 1–10" | 8–1,900+ | ✓ _{CR} | 200°F (93°C) | 50 psi | *SPDT 15A | |
| Q-8DS | 1" NPT | 1–4" | 5–80 | | 180°F (82°C) | 50 psi | *SPDT 15A | |
| Q-10N | 1" NPT | 1–10" | 0.9–1,025 | | 180°F (82°C) | 200 psi | SPNO 0.5A | 18 |
| Q-10VCR | 1" NPT | 1–10" | 0.9–1,025 | ✓ _{VCR} | 200°F (93°C) | 250 psi | SPNO 0.5A | |
| Q-12N | ½" or ¾" NPT | 1–6" | 0.7–590 | | 180°F (82°C) | 200 psi | SPNO 0.5A | 20 |
| Q-12DS | | | | | | | | |
| Q-12CR | ½" or ¾" NPT | 1–6" | 0.7–590 | ✓ _{CR} | 200°F (93°C) | 250 psi | SPNO 0.5A | |
| Q-15N | ¾" NPT | 1–6" | 0.2–340 | | 180°F–200°F | 200 psi | Hall Effect | 22 |
| Q-15CR | | 1–6" | 0.2–340 | ✓ _{CR} | 180°F–200°F | 200 psi | Hall Effect | |
| Q-16 | 1" NPT | 1–10" | 4–500 | | 250°F (121°C) | 200 psi | *SPDT 15A | 24 |

*Dry Circuit Available

LEVEL SWITCHES

| Model | Process Connection | On/Off Liquid Differential | Specific Gravity | Chemical Resistant | Max. Working Temp | Max. Working Pressure | Electrical Switch | Page |
|----------------|--------------------|----------------------------|---------------------------|--------------------|-------------------|-----------------------|------------------------------|-----------|
| L-5 | 1" NPT | ≈ ¼" | Cont. adjustable 0.6–1.0+ | | 180°F (82°C) | 300 psi | *SPDT 15A | 26 |
| L-5SS | 1" NPT | ≈ ¼" | Cont. adjustable 0.6–1.0+ | | 180°F (82°C) | 300 psi | *SPDT 15A | |
| L-8N | 1" NPT | ≈ ¼" | Cont. adjustable 0.6–1.5 | | 180°F (82°C) | 75 psi | *SPDT 15A | 28 |
| L-8CR | 1" NPT | ≈ ¼" | Cont. adjustable 0.6–1.5 | ✓ _{CR} | 200°F (93°C) | 75 psi | *SPDT 15A | |
| L-21N | 1¼" NPT | 1", 3" or 5" | 0.7 Minimum | | 180°F (82°C) | 200 psi | SPDT 11A | 30 |
| L-21VCR | 1¼" NPT | 1", 3" or 5" | 0.7 Minimum | ✓ _{CR} | 200°F (93°C) | 250 psi | SPDT 11A | |
| L-30N | 1" NPT | ≈ ¼" | 0.8 Minimum | | 180°F (82°C) | 75 psi | *SPDT 15A | 32 |
| L-30CR | 1" NPT | ≈ ¼" | 0.7 Minimum | ✓ _{CR} | 200°F (93°C) | 100 psi | *SPDT 15A | |
| L-40N | ¼" NPT | ≈ ¼" | 0.7–0.9 | | 180°F (82°C) | 200 psi | SPST or SPDT, 50 or 100 watt | 34 |
| L-40VCR | ¼" NPT | ≈ ¼" | 0.7–0.9 | ✓ _{VCR} | 200°F (93°C) | 250 psi | SPST or SPDT, 50 or 100 watt | |

*Dry Circuit Available

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CONTROLLERS

| Model | Type | Features | Page |
|------------------------|--|--|-----------|
| CF-112N | Chemical feed pump controller with lights. | Stand-alone interface module automatically actuates a chemical feed pump when primary bulk fluid begins to flow. | 36 |
| CF-12 | Chemical Feed Pump Controller (Medium Duty) for ¾ inch to 2 inch pipe. Turns on Chemical feed pump when the water or any fluid starts to flow. | Includes both "Switched" and "Always-On" receptacles for controlling any device such as a Chemical Feed Pump, UV or Ozone system. A DPDT (Normally Open (NO) and Normally Closed (NC) Version is available for controlling a secondary device such as an alarm. Model available with 2 (1G) or 4 (2G) receptacles. | 38 |
| CF-8 | Chemical Feed Pump Controller (Heavy Duty) for 1 inch to 6 inch pipe. Turns on Chemical feed pump when the water starts to flow. Ideal for residential and commercial water treatment or commercial irrigation. | Includes both "Switched" and "Always-On" receptacles for controlling any device such as a Chemical Feed Pump, UV or Ozone system. A DPDT (Normally Open (NO) and Normally Closed (NC) Version is available for controlling a secondary device such as an alarm. Model available with 2 (1G) or 4 (2G) receptacles. | 41 |
| LC-1 | Liquid Level Control - Two (2) point pump up/pump down control module. | Any 2 Harwil level switches can be combined with the LC-1 to provide infinitely variable level differential. Also see Wireless Switch Control (WSC). | 42 |
| L-21N, L-21 VCR | Liquid Level Control - Single point rigid float liquid level pump up/pump down module. | 1", 2", 3", or 5" pump up/pump down differential | 30 |
| SDC-101 | Pump Run Dry Protection - Pump automatic shut-down control module. | Monitors output of pump and shuts pump off if flow is below set point. Prevents pumps from running dry. | 44 |
| WSC | Wireless Switch Control (WSC) replaces switch wires up to 1000 feet. For 1 or 2 single switches or a two (2) point pump-up/pump-down module. | Eliminate the costs of wire, installation and maintenance for virtually any switch including latching relay systems. Can be used in place of the Harwil LC-1 with any 2 level switches. | 46 |

APPENDICES

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HARWIL CORPORATION PRODUCT/ COMPONENT BILLING & RETURN TERMS

Ownership of all products and components is transferred from Harwil to the purchasing entity at the time and place of initial delivery of subject products and components to the transporting carrier (UPS, USPS, or FedEx) Harwil will make its best effort to follow up, monitor, and trace shipment of all items indicated above, but cannot guarantee delivery and cannot assume any liability for any damages, labor costs or delays incidental thereto.

Non-Credit Terms – Cash, C.O.D. or VISA/AMEX/
MasterCard

Credit Terms – Net 30 days on approved credit

Credit Approval – Allow 2 WEEKS for approval

F.O.B. – Oxnard, CA

Invoices will be dated the day of shipment. All accounts are due and payable in terms stated on the invoice.

Claims: If product and/or component shortage, breakage or discrepancy is found, advise us at once in writing. No claims honored after 20 days from date of shipment.

Returns: No credit will be allowed for goods returned without an approved Returned Merchandise Authorization (RMA) number.

A **restocking fee** of 20% will be charged for merchandise returned unused and in new condition.

Finance Charges: After 30 days, a finance charge of 1.5% (18% per annum) will be charged on all past-due accounts. A reminder statement will be sent after an account is 60 days past due. After 90 days, a second statement will be sent, incurring a \$5.00 follow-up service charge. All additional statements and telephone calls will be billed at \$5.00 each.

Delinquent Invoices: An overdue invoice (60 days or more) or exceeding written credit limit will require holding delivery of current and future purchase orders until either or both conditions are corrected. An invoice that is 90 days delinquent will be mailed a final 10 day notice. Response requires payment or contact with our accounting department for special payment arrangements. If we receive no response, Harwil will assume the customer does not intend to honor the debt and the account will be turned over to our collection agency, which could effect subject credit rating. Collection fees and related costs will be added to the original invoice plus other charges as listed above.

We appreciate your interest in our products and strive to provide you with dependable products that satisfy your requirements. We do not have the financial resources to act as a bank or lending institution to companies that do not pay their invoices in a timely manner. If you experience payment difficulties, we will be happy to work with you to arrange a mutually satisfactory payment schedule. To do so, please contact Accounts Receivable by phone at (805) 988-6800 or by fax (805) 988-6804.

CERTIFICATE OF CONFORMANCE

All Harwil Corporation ("HARWIL") products are manufactured using new materials and components. Our products meet the applicable performance and materials

specifications indicated in our current Specifications Sheets and Parts List. HARWIL endeavors to obtain its materials and components from American Companies.

DOMINANCE OF HARWIL LIMITED EXPRESS WARRANTY

Each user MUST make appropriate analysis and tests to determine the suitability of the HARWIL product for the intended use prior to purchase.

HARWIL warrants that all HARWIL products will be free from defects in material and workmanship for a period of one year from the date of original shipment. This Warranty shall be LIMITED to the replacement and reconditioning of our products and parts. HARWIL reserves the right and sole discretion to modify or change the composition, design and appearance of its products at anytime.

THIS WARRANTY SHALL BE IN LIEU OF ALL WARRANTIES OF MERCHANTABILITY AND OF ALL WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE RELATING TO HARWIL PRODUCTS AND PARTS. BUYER'S SOLE REMEDY SHALL BE REPLACEMENT OR RECONDITIONING AS SET FORTH HEREIN.

HARWIL SHALL INCUR NO OBLIGATIONS HEREUNDER AND NO LIABILITY IN THE EVENT OF (1) BUYER NOT FULFILLING ITS RESPONSIBILITIES; INCLUDING AS SET FORTH HEREIN; (2) NEGLIGENCE, ALTERATION OR IMPROPER PRODUCT USE, INCLUDING USE WITH NON-COMPATIBLE DEVICES OR CHEMICALS; OR (3) REPAIR BY ANOTHER COMPANY OR PERSON THAN HARWIL.

ANY LAWSUIT RELATING TO THIS LIMITED EXPRESS WARRANTY MUST BE COMMENCED WITHIN ONE YEAR OF THE DATE THE LAWSUIT ACCRUES.

HARWIL provides NO WARRANTY and ASSUMES NO RESPONSIBILITY for corrosive attack on any material, component or design features associated with any of its products.

Corrosion resistance information listed in HARWIL specification sheets, information sheets and product brochures is

solely for general background information. This information table has been compiled from literature published by various material suppliers and by equipment manufacturers who use these materials in their products. Inasmuch as these data are based on tests by entities over which HARWIL has no control, HARWIL DOES NOT GUARANTEE AND DOES NOT ACCEPT ANY RESPONSIBILITY FOR THE ACCURACY OF SUCH THIRD PARTY TESTING. When using the table, please remember that in any given case several factors such as concentration, temperature, degrees of agitation and presence of impurities influence the rate of corrosion. The information table is intended, in a general way, to rate materials for resistance to chemicals which contain their usual impurities and for types of equipment in common use. Ratings should be used only as a general tool to first approximation of your material requirements rather than as the final answer.

- When in doubt, test materials before installation.
- After installation, follow up with preventative maintenance and periodic inspection.

FLOW SWITCH

MODEL Q-1

Designed for extreme, long-term reliability.

Detects and signals flow change.

Continuously adjustable while in operation.

6 interchangeable orifices plus 2:1 continuous switch adjustment with each orifice.

Calibrated independent of line pressure and temperature.

Maintains calibration limits when subjected to reasonable line hydraulic hammer or surge pulses.

Super-simple maintenance and checkout for personnel using a standard test meter.

Model Q-1 can also be fitted with a SPDT gold cross-bar switch for computer/PLC interface.

DPDT model available per request.



KEY FEATURES

| | |
|--------------------|------------------------------------|
| Flow Range | 0.12–8 GPM (0.45– 30.4 L/m) |
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 300 psig (2,068 kPa) |
| Process Connection | ½" NPT |
| Electrical Switch | SPDT 15A or Dry Circuit |
| Enclosure | NEMA 4 / IP 66 |

TYPICAL USES

Monitoring flow of coolants and fluids supplied to:

| | |
|----------------------------|---------------------------|
| Air Conditioning Systems | Plastic Molding Equipment |
| Cooling in Data Centers | Scrubbers |
| Diodes, SCRs, Triacs, etc. | Spot Welders |
| High Power Transistors | Transformers |
| Fluid Blending Systems | Vacuum Systems |

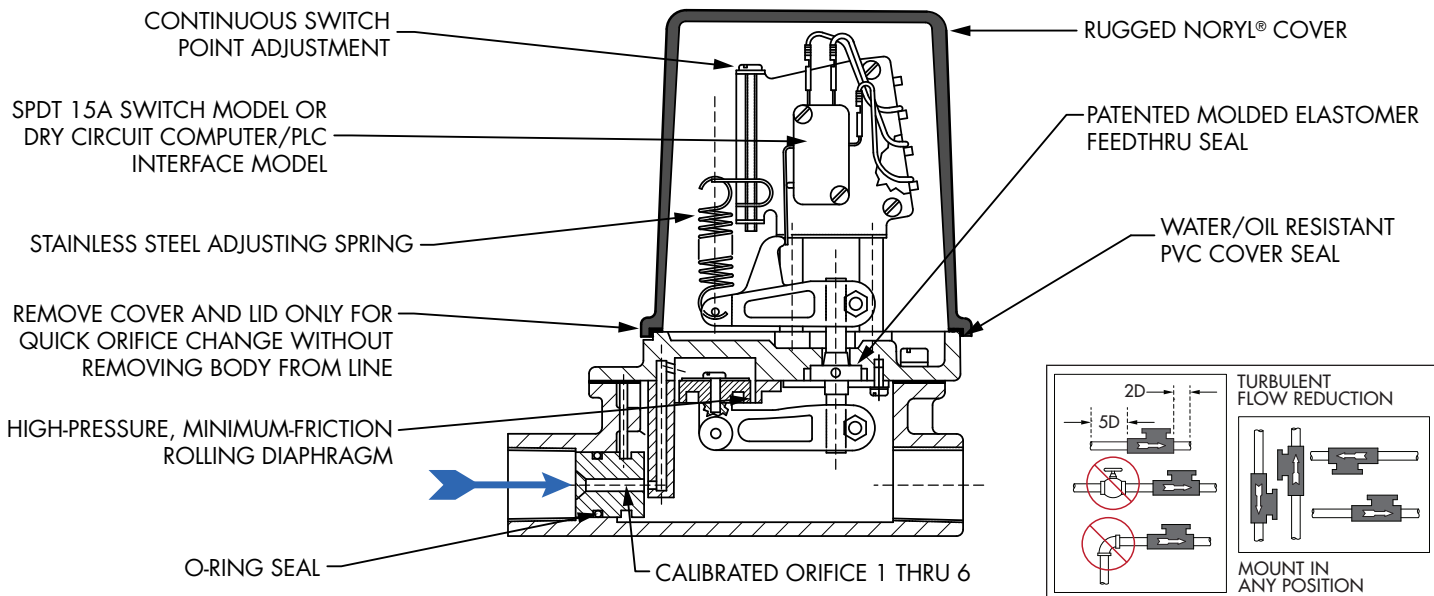
Other Uses:

| | |
|-------------------------|--------------------------------------|
| Starting Back-up Pumps | Oil Supply to Bearing & Gear Systems |
| Monitor Filter Clogging | Metal Fabrication Systems |

≈ TYPICAL WORKING FLUIDS

| | |
|-----------------------|---------------|
| Filtered Sewage Water | Oils |
| Glycols | Potable Water |
| Hydrocarbons | |

PRODUCT DIAGRAM



**WEIGHT: 3.5 lb
1.59 kg**



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Email: harwil@harwil.com

MODEL Q-1

MODEL SELECTION CHART

Flow Range (Water calibrated at 70°F / 21°C)

| ORIFICE # | CONTINUOUS SWITCH POINT ADJUSTMENT RANGE |
|-----------|--|
| 1 | 0.12 to 0.25 GPM |
| 2 | 0.25 to 0.50 GPM |
| 3 | 0.50 to 1 GPM |
| 4 | 1 to 2 GPM |
| 5 | 2 to 4 GPM |
| 6 | 4 to 8 GPM |

Note: Maximum recommended flow rate for each orifice is four (4) times the upper-end of the adjustment range.

ELECTRICAL CONNECTION

| GROMMET | CABLE O.D. | DIAGRAM |
|---------|------------|---------|
| A | 0.25" | |
| AA | 0.30" | |
| B | 0.37" | |
| C | 0.50" | |

CONDUIT FITTINGS

| F | 0.5" straight | | F90° | 0.5" 90° | |
|---|---------------|--|------|----------|--|
| | | | | | |

SAMPLE PART NUMBERS

| OPTION 1: Q-1 / 3 / A | | | OPTION 2: Q-1 / 6 / F | | |
|-----------------------|---|---|-----------------------------|---|---|
| BASE MODEL | ↑ | ↑ | BASE MODEL | ↑ | ↑ |
| ORIFICE | | | ORIFICE | | |
| GROMMET SIZE | | | ½" FLEXIBLE CONDUIT FITTING | | |

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ FLOW RATE TO ACTIVATE/DEACTIVATE SWITCH)

≈ 5% at upper end of flow range
 ≈ 25% at lower end of flow range

DIFFERENTIAL PRESSURE DROPS ACROSS UNIT

Under normal operating conditions:

≈ 1.0 psig at upper end of flow range
 ≈ 5.0 psig at lower end of flow range

WORKING LINE PRESSURE

300 psi max.

WORKING TEMPERATURE

180°F max.
 (250°F model available)

WETTED MATERIALS

Body: Red brass
 Hardware: Noryl® (PPO) (10% glass fibers), 316 stainless steel, Plastic
 Working fluid "sees" red brass,

316 stainless steel, phosphor bronze, and EPDM elastomer seal
 Gasket: Cork/Nitrile blend
Optional Seal: Hypalon, Viton® or FKM

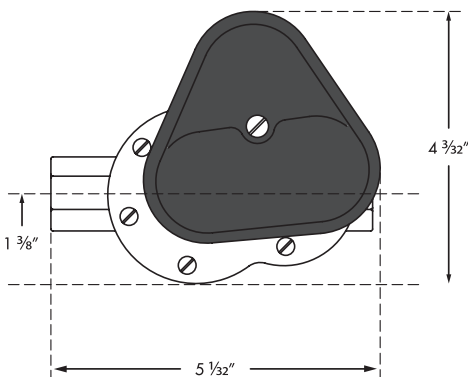
ELECTRICAL SWITCH CHARACTERISTICS

SPDT
 15A, ½ hp @ 125 or 250VAC
 ½A @ 125VDC, ¼A @ 250VDC
 5A @ 125VAC (tungsten lamp load)

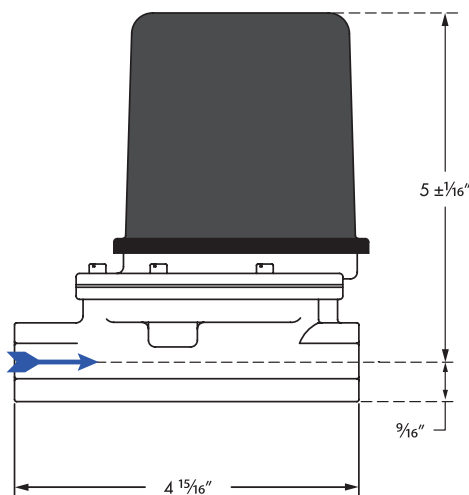
10,000,000 operations, median
 (Switch may be overloaded to 20A @ 125 or 250VAC for a minimum of 20,000 operations.)

INSTALLATION DIMENSIONS

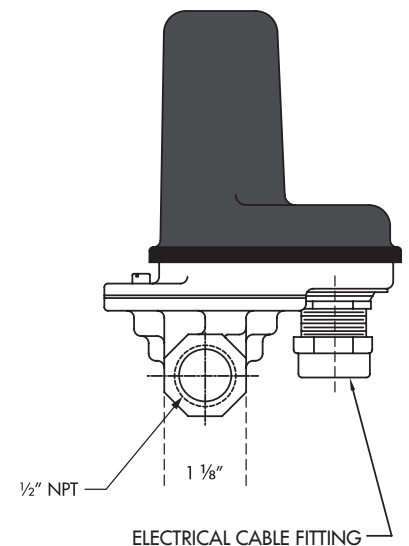
TOP VIEW



SIDE VIEW



FRONT VIEW



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH

MODEL Q-4E

Designed for extreme, long-term reliability.

Detects and signals flow change.

Continuously adjustable while in operation.

Four (4) individual Paddle options plus continuous adjustment provides wide operating range.

For use in particle contaminated fluids.

Maintains calibration limits when subjected to reasonable line hydraulic hammer or surge pulses.

Super-simple maintenance and checkout for personnel using a standard test meter.

DPDT model available per request.



KEY FEATURES

| | |
|--------------------|---------------------------------|
| Flow Range | 4-70 GPM (15.14-265 L/m) |
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 300 psig (2,068 kPa) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT 15A or Dry Circuit |
| Enclosure | NEMA 4 / IP 66 |

TYPICAL USES

Monitoring flow of coolants and fluids supplied to:

| | |
|----------------------------|---------------------------|
| Air Conditioning Systems | Plastic Molding Equipment |
| Cooling in Data Centers | Scrubbers |
| Diodes, SCRs, Triacs, etc. | Spot Welders |
| Fluid Blending Systems | Transformers |
| High Power Transistors | Vacuum Systems |

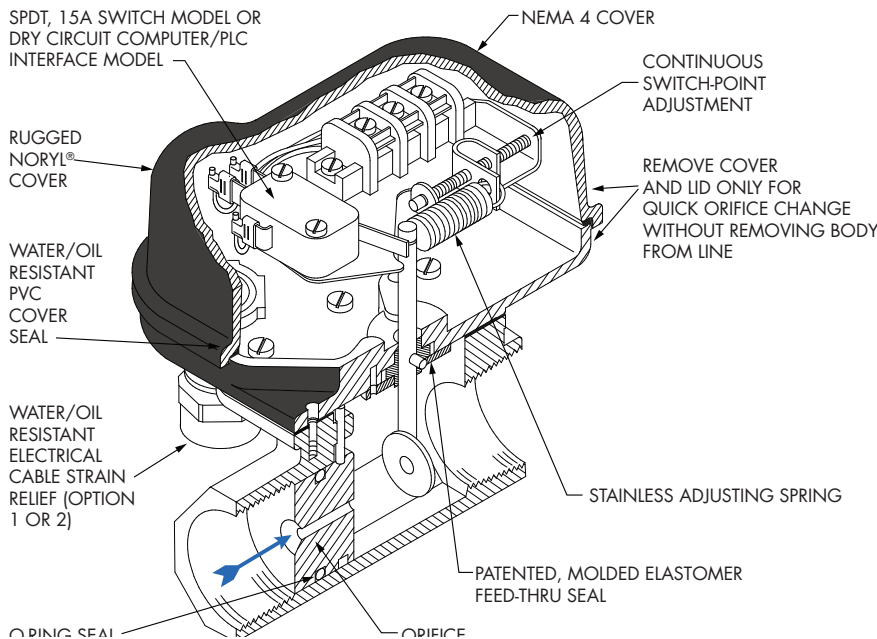
Other Uses:

| | |
|-------------------------|----------------------------|
| Monitor Filter Clogging | Starting Back-up Pumps |
| | Fire Sprinkler Flow Alarms |

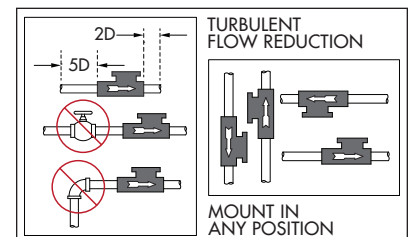
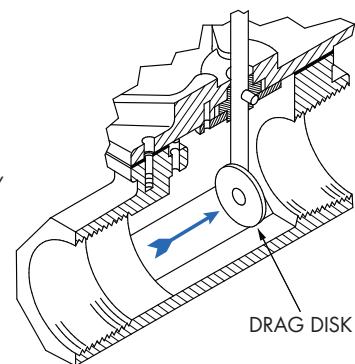
≈ TYPICAL WORKING FLUIDS

| | |
|--------------|---------------|
| Glycols | Oils |
| Hydrocarbons | Potable Water |

PRODUCT DIAGRAM



MODELS Q-4E/2, 3, AND 4 USE DRAG DISK ONLY



**WEIGHT: 5 lb
2.27 kg**



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MODEL Q-4E

| MODEL SELECTION CHART | | | | | |
|---|--|---------|------|----------|--|
| Flow Range (Water calibrated at 70°F / 21°C) | | | | | |
| ORIFICE/ PADDLE # | CONTINUOUS SWITCH POINT ADJUSTMENT RANGE | | | | |
| 1 | 4 to 8 GPM | | | | |
| 2 | 6 to 20 GPM | | | | |
| 3 | 15 to 35 GPM | | | | |
| 4 | 25 to 70 GPM | | | | |
| Note: Model Q-4E/1 uses a #1 orifice and a #4 paddle. Models Q-4E/2, 3, and 4 use paddle only. | | | | | |
| ELECTRICAL CONNECTION | | | | | |
| GROMMET | CABLE O.D. | DIAGRAM | | | |
| A | 0.25" | | | | |
| AA | 0.30" | | | | |
| B | 0.37" | | | | |
| C | 0.50" | | | | |
| CONDUIT FITTINGS | | | | | |
| F | 0.5" straight | | F90° | 0.5" 90° | |

| SAMPLE PART NUMBERS | | | | | |
|---------------------|-------------|------------|-----------------------------|------------------|---------------------|
| OPTION 1: | Q-4E | / 1 | / B | OPTION 2: | Q-4E / 3 / F |
| BASE MODEL | ↑ | ↑ | | BASE MODEL | ↑ ↑ |
| ORIFICE/PADDLE # | | | | ORIFICE/PADDLE # | |
| GROMMET SIZE | | | ½" FLEXIBLE CONDUIT FITTING | | |

HYSTERESIS (Δ FLOW RATE TO ACTIVATE/DEACTIVATE SWITCH)

≈ 5% at upper end of flow range
 ≈ 25% at lower end of flow range

DIFFERENTIAL PRESSURE DROPS ACROSS UNIT

Under normal operating conditions:

≈ 1.0 psig at upper end of flow range
 ≈ 5.0 psig at lower end of flow range

WORKING LINE PRESSURE

300 psig max. @ 180°F max
 (Proof tested to 1,200 psi @ 70°F)

WORKING TEMPERATURE

180°F max. (May be extended to 200°F for short periods.)

WETTED MATERIALS

Body: Red brass
 Hardware: Noryl® (PPO) (10% glass fibers), 316 stainless steel, Plastic
 Working fluid "sees" red brass,

316 stainless steel, phosphor bronze, and EPDM Elastomer Seal
 Gasket: Cork/Nitrile blend
Optional Seal: Hypalon, Viton® or FKM

ELECTRICAL SWITCH CHARACTERISTICS

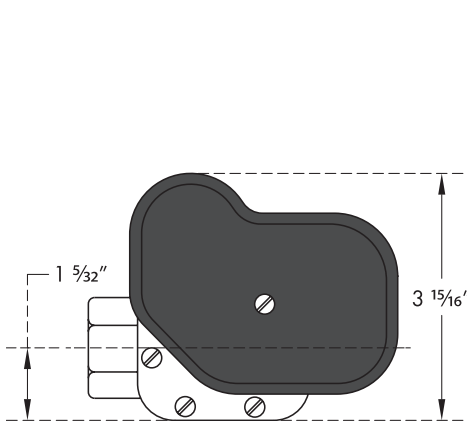
SPDT
 15A, ½ hp @ 125 or 250VAC
 ½A @ 125VDC, ¼A @ 250VDC
 5A @ 125VAC (tungsten lamp load)

10,000,000 Operations Median
 Switch may be overloaded to 20A @ 125 or 250VAC for a minimum of 20,000 operations.

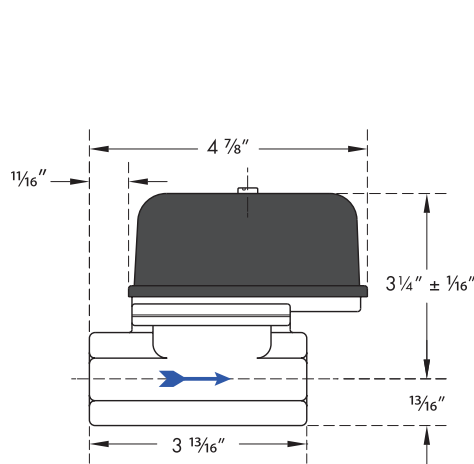
Model Q-4E can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface.

▲ INSTALLATION DIMENSIONS

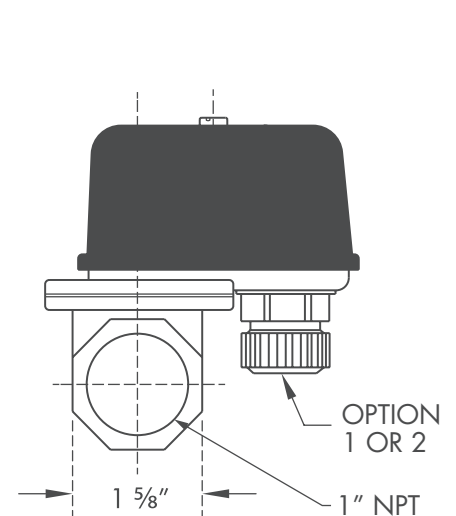
TOP VIEW



SIDE VIEW



FRONT VIEW



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH

MODEL Q-5 Q-5SS

Designed for extreme, long-term reliability.

Detects and signals flow change.

Continuously adjustable while in operation.

For use in particle contaminated fluids.

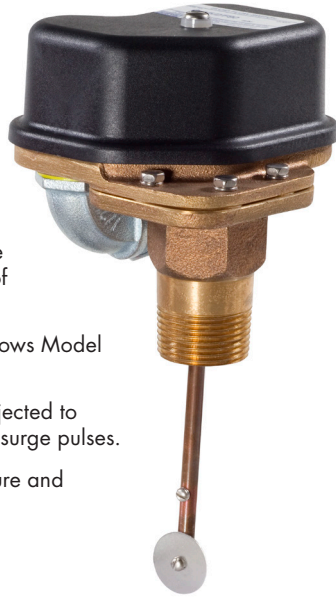
Multiple quick change paddles (and continuous spring adjustment) provide an incredibly wide operating range of flow rates and viscosities.

Use with an intrinsically safe relay allows Model Q-5 to be used in hazardous areas.

Maintains calibration limits when subjected to reasonable line hydraulic hammer or surge pulses.

Calibrated independent of line pressure and temperature.

DPDT model available per request.



KEY FEATURES

| | |
|--------------------|---|
| Flow Range | 5-102,000+ GPM (18.9-386.1 kL/m) |
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 300 psig (2,068 kPa) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT 15A or Dry Circuit |
| Enclosure | NEMA 4 / IP 66 |

TYPICAL USES

Monitoring flow of coolants and fluids supplied to:

| | |
|----------------------------|---------------------------|
| Air Conditioning Systems | Plastic Molding Equipment |
| Boilers | Scrubbers |
| Cooling in Data Centers | Spot Welders |
| Diodes, SCRs, Triacs, etc. | Transformers |
| Fluid Blending Systems | Vacuum Systems |
| High Power Transistors | |

Other Uses:

| | |
|----------------------------|--------------------------------------|
| Fire Sprinkler Flow Alarms | Municipal Water Supply Systems |
| | Oil Supply to Bearing & Gear Systems |

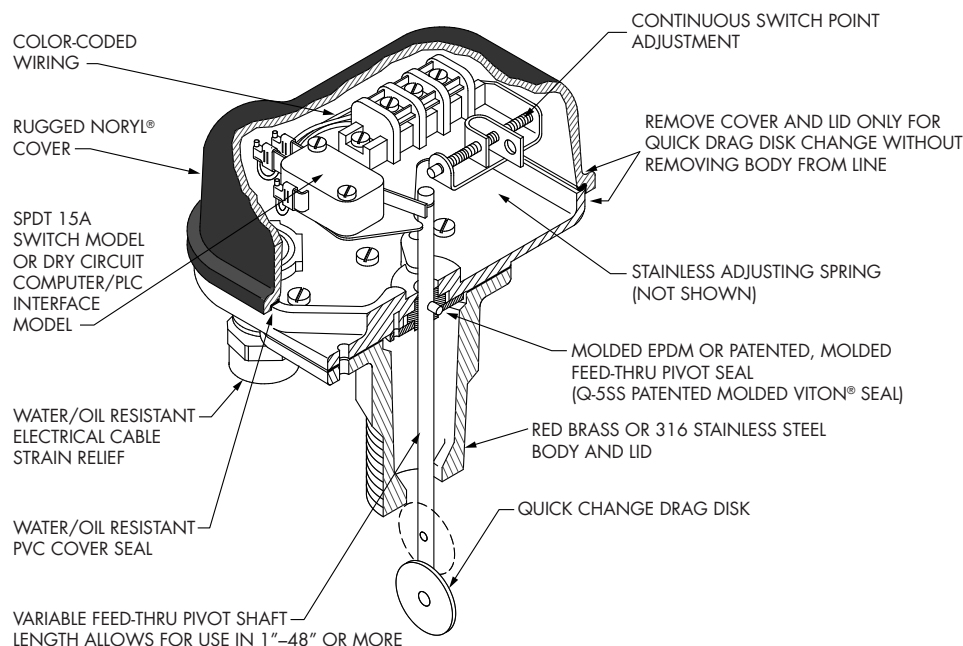
TYPICAL WORKING FLUIDS

| | |
|-----------------------|---------------|
| Filtered Sewage Water | Glycols |
| Hydrocarbons | Potable Water |







SAMPLE PART NUMBERS

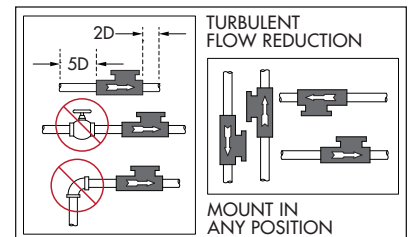
| OPTION 1: Q-5 | / 3 | / 2 | / B | OPTION 2: Q-5 | / 3 | / 2 | / F |
|---------------|-----|-----|-----|-----------------------------|-----|-----|-----|
| BASE MODEL | ↑ | ↑ | ↑ | BASE MODEL | ↑ | ↑ | ↑ |
| PIVOT SHAFT | | | | PIVOT SHAFT | | | |
| PADDLE # | | | | PADDLE # | | | |
| GROMMET SIZE | | | | ½" FLEXIBLE CONDUIT FITTING | | | |

PRODUCT DIAGRAM



PADDLE (PADDLE/STRIP) NUMBER

| | |
|---|--|
|  NO. 1: 0.5" DIA ALL PIPE SIZES |  NO. 2: 0.9" DIA ALL PIPE SIZES |
|  NO. 3: 0.94 x 1.4" 1½" PIPES AND LARGER | |
|  NO. 4: 0.9" x 2.0" 2" PIPES AND LARGER | |
|  NO. 5: 0.9" x 4.0" 5" PIPES AND LARGER | |
|  NO. 6: 0.9" x 6.0" 6" PIPES AND LARGER | |



**WEIGHT: 3.5 lb.
1.59 kg**



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MODEL Q-5 Q-5SS

MODEL SELECTION CHART

Flow Range (Water calibrated at 70°F / 21°C)

| PIPE SIZE NPT | CONTINUOUS SWITCH POINT ADJUSTMENT RANGE (GPM) | | PIVOT SHAFT # | PADDLE # |
|------------------|--|---------------------|------------------|-------------|
| | Red Brass | 316 Stainless Steel | | |
| 1" | 5 to 15 | 10 to 20 | 2 | 2 |
| | 12 to 36 | 20 to 60 | 2 | 1 |
| 1½" | 7 to 21 | 14 to 42 | 3 | 3 |
| | 10 to 30 | 20 to 60 | 3 | 2 |
| | 20 to 75 | 30 to 90 | 3 | 1 |
| 2" | 14 to 42 | 21 to 63 | 3 | 4 |
| | 20 to 60 | 30 to 90 | 3 | 2 |
| | 50 to 150 | 60 to 180 | 3 | 1 |
| 3" | 27 to 81 | 45 to 135 | 5 | 4 |
| | 45 to 135 | 75 to 225 | 5 | 2 |
| | 110 to 330 | 130 to 390 | 5 | 1 |
| 6" | 65 to 195 | 103 to 309 | 5 | 6 |
| | 80 to 240 | 125 to 375 | 5 | 5 |
| | 190 to 570 | 300 to 900 | 5 | 2 |
| | 450 to 1,350 | 550 to 1,650 | 5 | 1 |

Call our customer support for a wider range of pipe sizes. (805) 988-6800

ELECTRICAL CONNECTION

| GROMMET | CABLE O.D. | DIAGRAM |
|---------|------------|---------|
| A | 0.25" | |
| AA | 0.30" | |
| B | 0.37" | |
| C | 0.50" | |

CONDUIT FITTINGS

| F | 0.5" straight | | F90° | 0.5" 90° | |
|---|---------------|--|------|----------|--|
| | | | | | |

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ FLOW RATE TO ACTIVATE/DEACTIVATE SWITCH)

- ≈ 10% at upper end of flow range
- ≈ 30% at lower end of flow range

DIFFERENTIAL PRESSURE DROPS ACROSS UNIT

- Under normal operating conditions:
- ≈ 1"-3" pipe, less than 1 psi
- ≈ 4"-48" pipe, negligible

WORKING LINE PRESSURE:

300 psig max. @ 180°F max (Proof tested to 1200 psig @ 70°F)

WORKING TEMPERATURE:

180°F max. continuous.

ELECTRICAL SWITCH CHARACTERISTICS

SPDT 10,000,000 Operations Median
 15A, ½ hp @ 125 or 250VAC Switch may be overloaded to 20A
 ½A @ 125VDC, ¼A @ 250VDC @ 125 or 250VAC (min 20,000
 5A @ 125VAC (W lamp load) operations.)

Q-5N: WETTED MATERIALS:

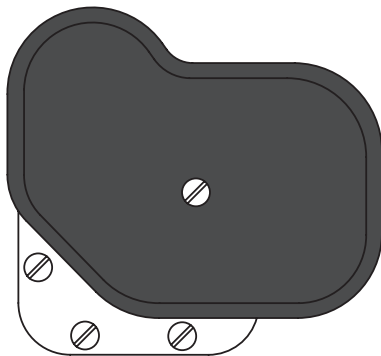
Body and Lid: Brass
 Hardware: Noryl® (PPO) (10% glass fibers), 316 stainless steel
 Working fluid "sees" red brass, phosphor bronze and EPDM
 elastomer seal
 Gasket: Cork/Nitrile blend *Optional Seal: Hypalon, Viton® or FKM*

Q-5SS: WETTED MATERIALS:

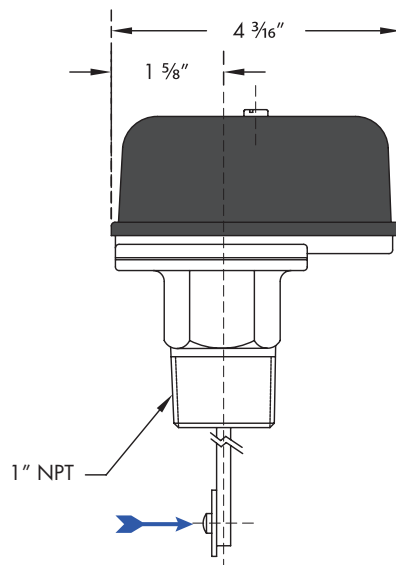
Body and Lid: 316 Stainless steel. Hardware: Noryl® (PPO) (10%
 glass fibers), 316 stainless steel
 Working fluid "sees" 316 stainless, Teflon® or PTFE gasket and
 Viton® or FKM elastomer seal.

INSTALLATION DIMENSIONS

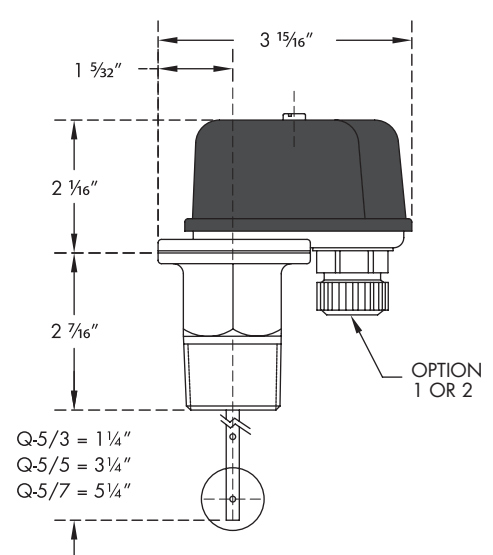
TOP VIEW



SIDE VIEW



FRONT VIEW



Model Q-5 can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface.

- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH ADJUSTABLE

MODEL Q-8N Q-8CR



During normal operations flow switches increase efficiency, save time and money by the continuous monitoring of deviations from optimum flow rates. During emergency conditions flow switches signal system malfunctions such as line breakage, pump failure, incorrect valve opening or closing, pipe, valve or filter clogging, etc.

Designed for long-term reliability and chemical resistance.

Detects and signals flow change.

Particle contamination resistance is provided by a single convolute elastomeric seal which is continually flushed by working fluid flow.

Continuously adjustable while in operation.

Responds to flow only, independent of line pressure, temperature, environment

Super-simple maintenance and checkout for personnel using a standard test meter.

KEY FEATURES

| | |
|--------------------|---|
| Flow Range | 8-1,900+ GPM (30-7,192 L/m) |
| Working Temp | 200°F (93°C) Maximum |
| Working Pressure | 50 psig (690 kPa) @ 180°F (N) 50 psig (690 kPa) @ 200°F (CR) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT, ½hp 15A or Dry Circuit |
| Enclosure | NEMA 6P / IP 67 |

TYPICAL USES

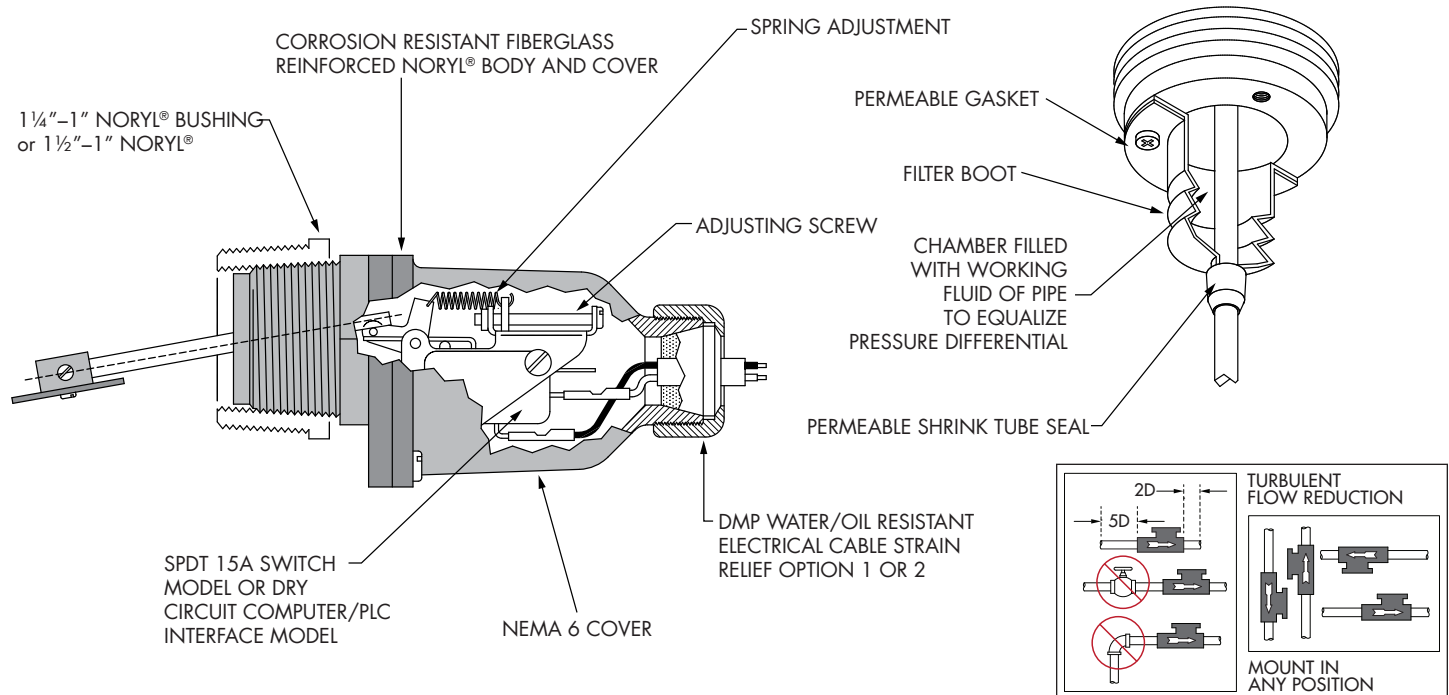
Monitoring fluid flow in:

| | |
|--------------------------|----------------------------------|
| Air Conditioning Systems | Industrial Refrigeration Systems |
| Cooling in Data Centers | Pools and Spas |
| Chillers | Scrubbers |
| Fluid Blending Systems | Water Treatment Systems |
| Natural Gas | |

≈ TYPICAL WORKING FLUIDS

| | |
|-----------------------|-------------------------------|
| Filtered Sewage Water | Contaminated Ground Water |
| Mild Acids | Sulfolane |
| Rusty Coolant Water | Sea Water |
| Waste Water | Pool Water (low ppm Chlorine) |

PRODUCT DIAGRAM



**WEIGHT: 0.5 lb.
0.23 kg**



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MODEL Q-8N Q-8CR

MODEL SELECTION CHART

Flow Range (Water calibrated at 70°F / 21°C)

| PIPE SIZE NPT | CONTINUOUS SWITCH POINT ADJUSTMENT RANGE | SHAFT LENGTH | PADDLE SIZE |
|---------------|--|--------------|-------------|
| 1" | 12 to 20 GPM | 1 | 2 |
| | 24 to 34 GPM | 1 | 1 |
| 1½" | 16 to 28 GPM | 2 | 3 |
| | 25 to 37 GPM | 2 | 2 |
| | 38 to 70 GPM | 2 | 1 |
| 2" | 30 to 50 GPM | 2 | 3 |
| | 44 to 65 GPM | 2 | 2 |
| | 67 to 90 GPM | 2 | 1 |
| 3" | 45 to 140 GPM | 3 | 3 |
| | 100 to 145 GPM | 3 | 2 |
| | 152 to 200 GPM | 3 | 1 |
| 4" | 80 to 170 GPM | 3 | 3 |
| | 175 to 240 GPM | 3 | 2 |
| | 160 to 290 GPM | 3 | 1 |

Call our customer support for a wider range of pipe sizes. (805) 988-6800

ELECTRICAL CONNECTION

| GROMMET | CABLE O.D. | DIAGRAM |
|---------|------------|---------|
| A | 0.25" | |
| AA | 0.30" | |
| B | 0.37" | |
| C | 0.50" | |

CONDUIT FITTINGS (AVAILABLE AT EXTRA COST)

| F | 0.5" straight | | F90° | 0.5" 90° | |
|---|---------------|--|------|----------|--|
| | | | | | |

SAMPLE PART NUMBERS

| OPTION 1: Q-8N | / 1 | / 1 | / B | OPTION 2: Q-8N | / 1 | / 1 | / F |
|----------------|-----|-----|-----|-----------------------------|-----|-----|-----|
| BASE MODEL | ↑ | ↑ | ↑ | BASE MODEL | ↑ | ↑ | ↑ |
| SHAFT LENGTH | | | | SHAFT LENGTH | | | |
| PADDLE SIZE | | | | PADDLE SIZE | | | |
| GROMMET SIZE | | | | ½" FLEXIBLE CONDUIT FITTING | | | |

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ FLOW RATE TO ACTIVATE/DEACTIVATE SWITCH)

- ≈ 10% at upper end of flow range
- ≈ 30% at lower end of flow range

DIFFERENTIAL PRESSURE DROPS ACROSS UNIT

Under normal operating conditions:

- ≈ 1"-3" pipe, less than 0.5 psi
- ≈ 4"-10" pipe, negligible

WORKING LINE PRESSURE:

- 50 psi max., operating @ 180°F
- 100 psi max. non-operating @ 180°F
- Pressure over 50 psi can affect the switch point range

ELECTRICAL SWITCH CHARACTERISTICS

- SPDT
- 10,000,000 Operations Median
- 15A, ½ hp @ 125 or 250VAC
- ½A @ 125VDC

(tungsten lamp load)

Model Q-8N can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface.

Q-8N (NORYL®)

WORKING TEMPERATURE: 180°F @ ambient pressure

WETTED MATERIALS:

- Body, Cover, and Bushing: Noryl® (PPO) (10% glass fibers)
- Shaft: 316 stainless steel
- Elastomer Seal: EPDM
- Optional Filter Boot: EPDM (Viton® available by special order)

Q-8CR (FORTRON®)

WORKING TEMPERATURE: 200°F max. continuous

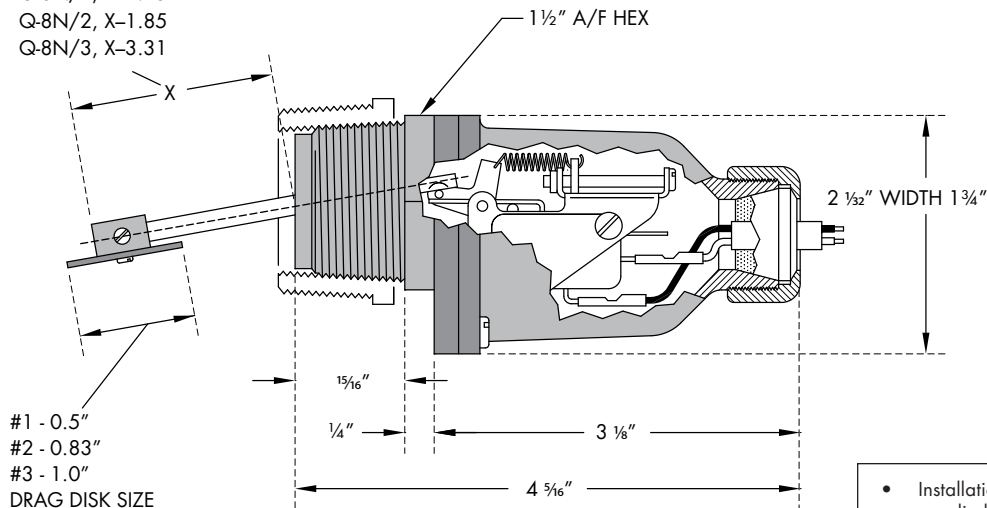
WETTED MATERIALS:

- Body and Cover: Fortron® (PPS) (40% glass fibers)
- Shaft: HASTELLOY® C
- Elastomer Seal: EPDM
- Optional Filter Boot: EPDM (Viton® or FKM available by special order)

INSTALLATION DIMENSIONS

DRAG DISK ARM LENGTH

- Q-8N/1, X-1.15
- Q-8N/2, X-1.85
- Q-8N/3, X-3.31



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH

MODEL Q-8DS Q-8DS DPDT



During normal operations flow switches increase efficiency, save time and money by the continuous monitoring of deviations from optimum flow rates. During emergency conditions flow switches signal system malfunctions such as line breakage, pump failure, incorrect valve opening or closing, pipe, valve or filter clogging, etc.

Designed for long-term reliability and chemical resistance.

Detects and signals flow change.

Responds to flow only, independent of line pressure, temperature, environment

Super-simple maintenance and checkout for personnel using a standard test meter.



KEY FEATURES

| | |
|--------------------|-------------------------------------|
| Flow Range | 5 - 80 GPM (18-302 L/m) |
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 50 psig @ 180°F (466°F kPa) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT, ½hp 15A or Dry Circuit |
| Enclosure | NEMA 6P / IP 67 |

TYPICAL USES

Monitoring fluid flow in:

| | |
|--------------------------|----------------------------------|
| Air Conditioning Systems | Industrial Refrigeration Systems |
| Cooling in Data Centers | Pools and Spas |
| Chillers | Scrubbers |
| Fluid Blending Systems | Water Treatment Systems |
| Natural Gas | |

≈ TYPICAL WORKING FLUIDS

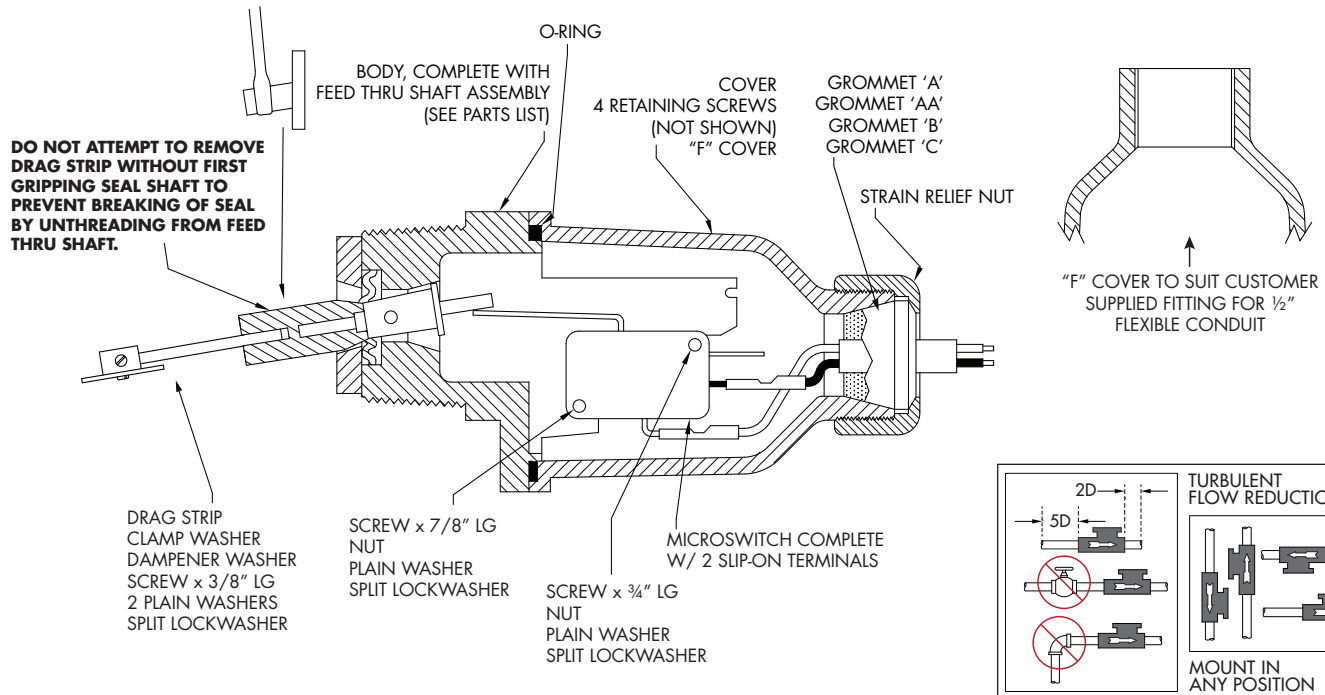
| | |
|-----------------------|-------------------------------|
| Filtered Sewage Water | Contaminated Ground Water |
| Mild Acids | Sulfolane |
| Rusty Coolant Water | Sea Water |
| Waste Water | Pool Water (low ppm Chlorine) |

Q-8DS DPDT

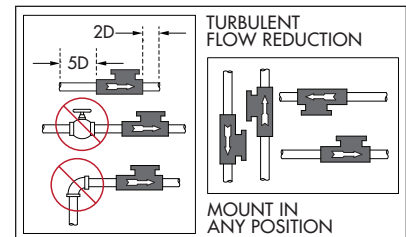
Now available

- 230 Volt
- 11 Amp
- 1/3 Hp

PRODUCT DIAGRAM



**WEIGHT: 0.5 lb.
0.23 kg**



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MODEL Q-8DS Q-8DS DPDT

| MODEL SELECTION CHART | | | |
|---|---|--------------|-------------------|
| Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10% | | | |
| PIPE SIZE NPT | NOMINAL ON/OFF SWITCH POINT RANGE (GPM) | SHAFT LENGTH | PADDLE NUMBER |
| 1" | 5.0 - 3.0 | - | 10512 |
| | 9.6 - 7.5 | 1 | 2 |
| | 15.4 - 18.0 | 1 | 1 |
| 1 1/2" | 12.0 - 9.5 | - | 10502 |
| | 14.2 - 11.8 | 2 | 3 |
| | 19.0 - 13.5 | - | 10570A |
| | 22.5 - 19.0 | 2 | 2 |
| | 34.4 - 30.4 | 2 | 1 |
| 2" | 14.4 - 10.2 | - | 10593 |
| | 16.5 - 11.0 | - | 10566 |
| | 25.8 - 21.8 | 2 | 3 |
| | 39.8 - 33.6 | 2 | 2 |
| | 58.0 - 50.8 | 2 | 1 |
| 3" | 42.4 - 37.0 | 3 | 3 |
| | 55.6 - 49.8 | 3 | 2 |
| | 80.6 - 65.2 | 3 | 1 |
| Call our customer support for a wider range of pipe sizes. (805) 988-6800 | | | |
| ELECTRICAL CONNECTION | | | |
| GROMMET | CABLE O.D. | DIAGRAM | |
| A | 0.25" | | |
| AA | 0.30" | | |
| B | 0.37" | | |
| C | 0.50" | | |
| CONDUIT FITTINGS (AVAILABLE AT EXTRA COST) | | | |
| F | 0.5" straight | | F90° 0.5" 90° |

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ FLOW RATE TO ACTIVATE/DEACTIVATE SWITCH)

- ≈ 10% at upper end of flow range
- ≈ 30% at lower end of flow range

DIFFERENTIAL PRESSURE DROPS ACROSS UNIT

Under normal operating conditions:

- ≈ 1"-3" pipe, less than 0.5 psi
- ≈ 4"-10" pipe, negligible

WORKING LINE PRESSURE:

50 psi max., operating @ 180°F
 100 psi max. non-operating @ 180°F
 Pressure over 50 psi can affect the switch point range

ELECTRICAL SWITCH CHARACTERISTICS

SPDT 10,000,000 Operations Median
 15A, 1/2 hp @ 125 or 250VAC
 1/2A @ 125VDC
 (tungsten lamp load)

Model Q-8DS can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface or 25A micro switch.

Q-8DS (NORYL®)

WORKING TEMPERATURE: 180°F @ ambient pressure

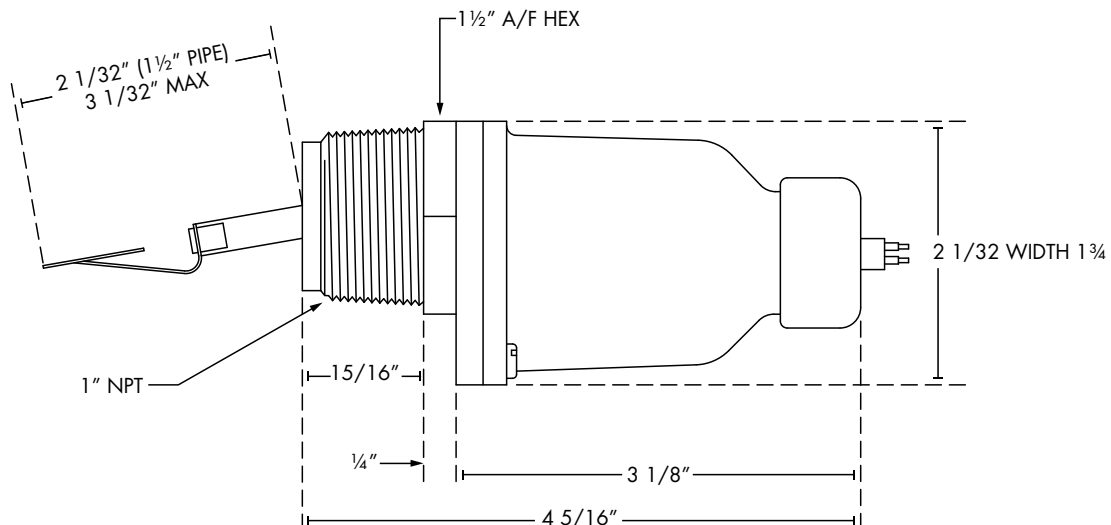
WETTED MATERIALS:

Body, Cover, and Bushing: Noryl® (PPO) (10% glass fibers)
 Shaft: 316 stainless steel
 Elastomer Seal: Viton®

SAMPLE PART NUMBERS

| OPTION 1: Q-8DS | | | | OPTION 2: Q-8DS | | | |
|-----------------|-----|-----|-----|-------------------------------|-----|-----|-----|
| BASE MODEL | / 1 | / 1 | / B | BASE MODEL | / 1 | / 1 | / F |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| SHAFT LENGTH | | | | SHAFT LENGTH | | | |
| PADDLE SIZE | | | | PADDLE SIZE | | | |
| GROMMET SIZE | | | | 1/2" FLEXIBLE CONDUIT FITTING | | | |

INSTALLATION DIMENSIONS



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH

MODEL Q-10N Q-10VCR

FLEXIBLE DESIGN:

Model Q-10 is provided with three factory adjustable parameters which provide performance flexibility to meet a multitude of applications:

- Paddle Area
- Paddle Length
- Paddle Stiffness

Responds to fluid flow only, independent of line pressure and temperature.

Max. flow may be five times normal flow.

Positive stop eliminates fatigue effects of turbulence, vibration and flow surge on flow detecting element.

Small size and low profile provides easy mounting in crowded installations.

Very low pressure drop - typically less than 1.0 psig at normal flow rate.

Quick response.

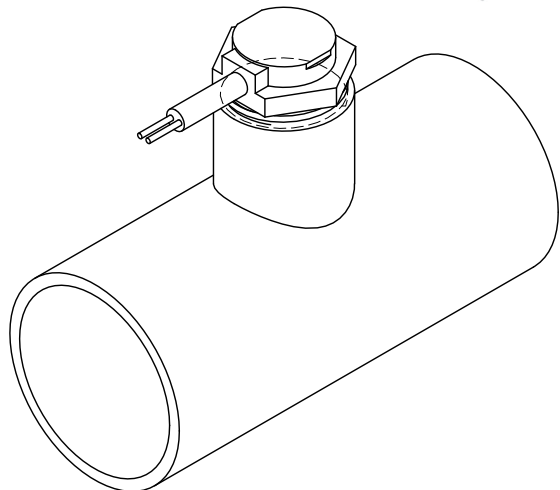
Available with NO, NC or SPDT Reed Switch

Switches 5VDC to 240VAC.

Switches resistive and light inductive loads.

Switch employs magnetic coupling.

Send us your special requirements. We will quote a special unit to meet those requirements.



KEY FEATURES

| | |
|--------------------------|--------------------------------------|
| Flow Range | 0.7-1,025 GPM (2.6-3,880 L/m) |
| Working Temp | 200°F (93°C) Maximum |
| Working Pressure | 250 psig (1.724 kPa) |
| Process Connection | 1" NPT |
| Electrical (Reed) Switch | SPNO 0.5A |
| Enclosure | NEMA 4X / IP 66 |

TYPICAL USES

Monitoring flow of coolant supplied to:

| | |
|----------------------------|-------------------------------|
| Brakes and Clutches | Emergency Wash-Down Showers |
| Computer Systems | Marine and Stationary Engines |
| Diodes, SCRs, Triacs, etc. | RF and Radar Transmitters |
| Electromagnets | Spot welders |
| Fire Sprinkler Flow Alarms | Transformers |
| Lasers | Vacuum Systems |

In Chemical Processing:

| | |
|---|-------------------------|
| Fluid Blending Systems | Liquid Transfer |
| Heat Transfer Fluids | Monitor Filter Clogging |
| Liquid Scrubbers | Starting back-up pumps |
| Monitoring pump output, valve position, systems flow status | |

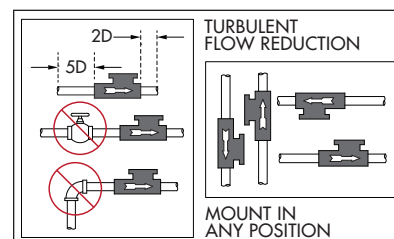
In Water Treatment:

| | |
|--------------------|--------------------------------|
| Irrigation Systems | Municipal Water Supply Systems |
|--------------------|--------------------------------|

≈ TYPICAL WORKING FLUIDS

For use in concentrated acids, bases, ketones, esters, alcohols, phenols, etc.

| | |
|-------------------|------------------------------------|
| Mild Acids | Hydrocarbons |
| Mild Bases | Ketones |
| Plating Solutions | Lubricating Oils |
| Gasoline | Cooling Tower Water |
| Glycol Solutions | Water (saltwater, pure, tap, etc.) |
| JP-4 | |



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MODEL Q-10N Q-10VCR

MODEL SELECTION CHART

Flow Range (Water calibrated at 70°F / 21°C)

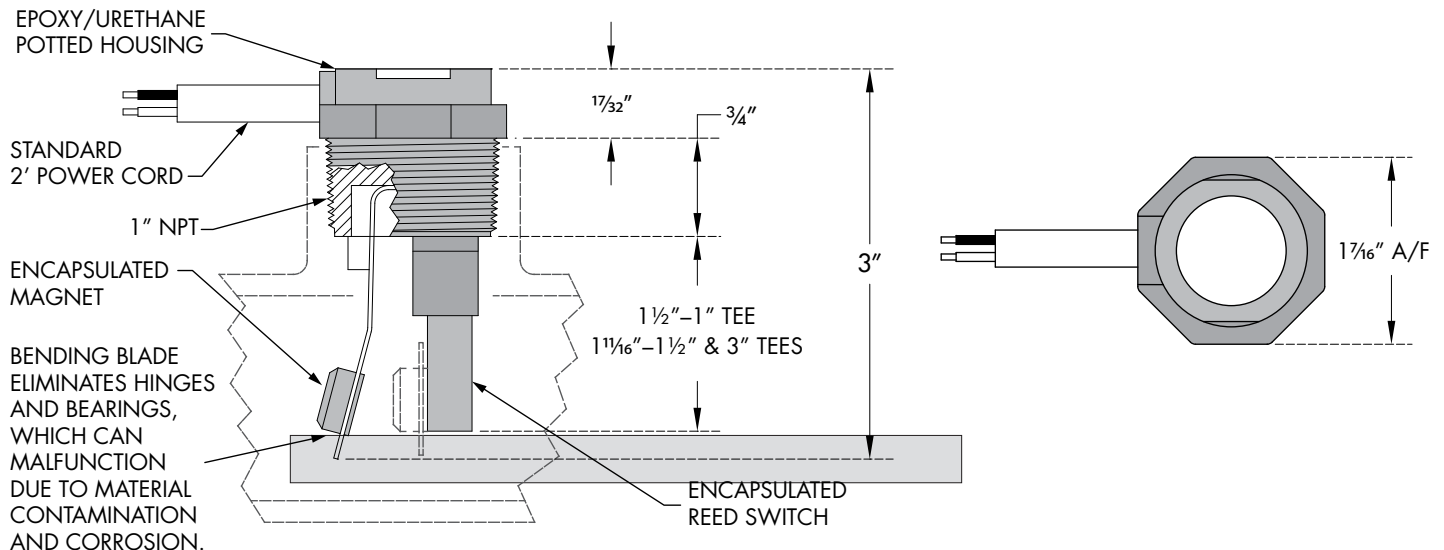
| PIPE SIZE NPT | NOMINAL ON/OFF SWITCH POINT RANGE (GPM) | | PADDLE NUMBER |
|---------------|---|-----|---------------|
| | ON | OFF | |
| 1" | 1.3 | 0.9 | 1 |
| | 4 | 2 | 2 |
| 1½" | 3 | 2 | 10691A |
| | 8 | 4 | 3 |
| | 17 | 14 | 4 |
| 2" | 5 | 4 | 10691A |
| | 10 | 7 | 5 |
| | 16 | 11 | 6 |
| 3" | 12 | 8 | 10691A |
| | 22 | 15 | 7 |
| | 36 | 25 | 8 |
| 4" | 21 | 14 | 10691A |
| | 39 | 27 | 9 |
| | 64 | 45 | 10 |
| 5" | 33 | 25 | 10691A |
| | 61 | 43 | 11 |
| | 100 | 70 | 12 |
| 6" | 48 | 35 | 10691A |
| | 88 | 62 | 13 |
| | 144 | 101 | 14 |

Call our customer support for a wider range of pipe sizes. (805) 988-6800

SAMPLE PART NUMBER

| OPTION 1: Q-10N | / 13 | / NO | / 4' |
|------------------------------------|------|------|------|
| BASE MODEL | ↑ | ↑ | ↑ |
| PADDLE # | | | |
| SWITCH OPERATION (NO, NC, OR SPDT) | | | |
| POWER CORD LENGTH | | | |

INSTALLATION DIMENSIONS



TECHNICAL SPECIFICATIONS

ELECTRICAL (REED) SWITCH CHARACTERISTICS

SPNO

Contact Ratings:

| | |
|-----------------------------------|---------------------------|
| AC Voltage (max. switching) | 300VAC |
| DC Voltage (max. switching) | 350VDC |
| Current (max. switching) | 0.5A |
| Current (max. carrying) | 2.5A |
| Power (max) (VA, W) | 50 watts |
| Contact resistance (max. initial) | 0.15 ohms |
| Insulation resistance | 10 ¹⁰ ohms |
| Operating temperature | -40°F-240°F (-40°C-115°C) |

OPTIONAL: SPNC or SPDT, 3 watt, 100VAC/VDC.

Q-10N (NORYL®)

WORKING PRESSURE: 200 psig max. @ 70°F

WORKING TEMPERATURE: 180°F @ ambient pressure

WETTED MATERIALS: Body and Cover: Noryl® (PPO) (10% glass fibers) Shaft: 316 stainless steel

Q-10VCR (FORTRON®)

WORKING PRESSURE: 250 psig max. @ 70°F

WORKING TEMPERATURE: 200°F @ ambient pressure

WETTED MATERIALS: Body and Cover: Noryl® (PPS) (40% glass fibers) Shaft: 316 HASTELLOY® C

INDUCTIVE LOADS

Switch contacts have been tested with small relays and 30A J-C relay inductive driving coils at 120/240VAC to 500,000 operations without failure.

Model Q-10N can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface.

NOTE: Model Q-10N employs magnetic coupling between bending blade and switch body. Magnetic particles can accumulate on and around magnetic housing which may affect proper operation. Please conduct appropriate fluid magnetic particle evaluation and operational tests prior to and during installation and use.

- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH

MODEL Q-12N Q-12CR Q-12DS POOL & SPA VERSION

Model Q-12 is provided with three factory adjustable parameters which provide performance flexibility to meet a multitude of applications:

- Paddle Area
- Paddle Length
- Paddle Stiffness

Max. flow may be five times normal flow.

Positive stop eliminates fatigue effects of turbulence, vibration and flow surge on flow detecting element.

Very low pressure drop - typically less than 1.0 psig at normal flow rate.

Small size and low profile provides easy mounting in crowded installations.

Power the driving coil of small ice cube relays as well as some 30A power relays.

Available with NO, NC or SPDT Reed Switch

Switches 5VDC to 240VAC.

Switch employs magnetic coupling.

Send us your special requirements. We will quote a special unit to meet those requirements.



KEY FEATURES

| | |
|--------------------------|------------------------------------|
| Flow Range | 0.7-590 GPM (2.6-2,233 L/m) |
| Working Temp | 200°F (93°C) Maximum |
| Working Pressure | 250 psi (1.724 kPa) |
| Process Connection | ½" NPT, ¾" NPT |
| Electrical (Reed) Switch | SPNO 0.5A* |
| Enclosure | NEMA 4X / IP 66 |

* Other models available

TYPICAL USES

Monitoring flow of coolant supplied to:

| | |
|----------------------------|-------------------------------|
| Brakes and Clutches | Emergency Wash-Down Showers |
| Computer Systems | Marine and Stationary Engines |
| Diodes, SCRs, Triacs, etc. | RF and Radar Transmitters |
| Electromagnets | Spot welders |
| Fire Sprinkler Flow Alarms | Transformers |
| Lasers | Vacuum Systems |

In Chemical Processing:

| | |
|---|-------------------------|
| Fluid Blending Systems | Liquid Transfer |
| Heat Transfer Fluids | Monitor Filter Clogging |
| Liquid Scrubbers | Starting back-up pumps |
| Monitoring pump output, valve position, systems flow status | |

In Water Treatment:

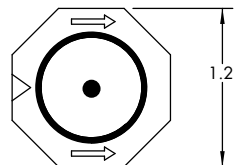
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|--------------------|------------------------------|
| Irrigation Systems | Salt and Fresh Water Systems |
|--------------------|------------------------------|

≈ TYPICAL WORKING FLUIDS

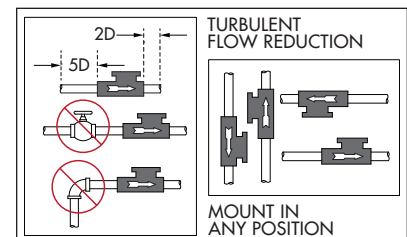
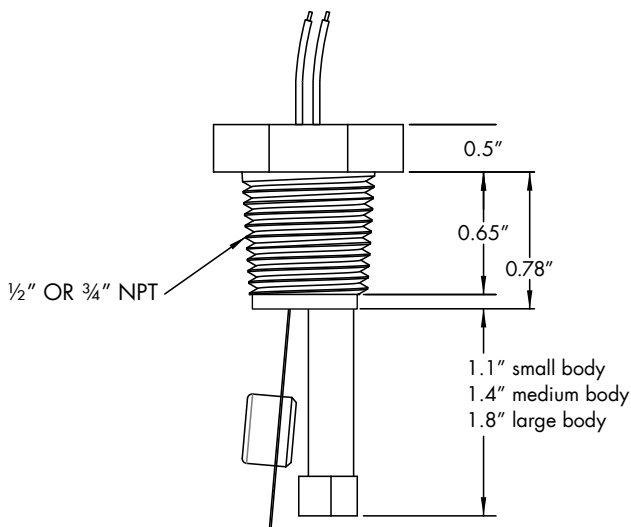
For use in a broad spectrum of industrial fluids, such as:

| | |
|---------------------|------------------------------------|
| Cooling Tower Water | Water (saltwater, pure, tap, etc.) |
| Glycol Solutions | Lubricating Oils |
| Mild Acids | Gasoline |
| Plating Solutions | JP-4 |

TOP VIEW



SIDE VIEW



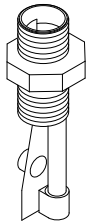
541 Kinetic Drive
Oxnard, CA 93030
www.harwil.com
16.285

Phone: (805) 988-6800
Fax: (805) 988-6804
Email: harwil@harwil.com

| MODEL SELECTION CHART | | | |
|--|---|------|---------------|
| Flow Range (Water calibrated at 70°F / 21°C) | | | |
| PIPE SIZE NPT | NOMINAL ON/OFF SWITCH POINT RANGE (GPM) | | PADDLE NUMBER |
| | ON | OFF | |
| ¾" | 0.9 | 0.8 | 3 (.7SM)* |
| | 3 | 2 | 3SM |
| | 11 | 10 | 6S |
| 1" | 1.1 | 1.0 | 3 (.7M)* |
| | 4 | 3 | 4S |
| | 6 | 5 | 6S |
| 1½" | 2.8 | 2.5 | 4 (.7L)* |
| | 13 | 12 | 4S |
| | 16 | 15 | 6M |
| | 21 | 19 | 6S |
| 2" | 4.9 | 4.4 | 4 (.7L)* |
| | 15 | 12 | 4M |
| | 23 | 18 | 4S |
| | 27 | 22 | 6M |
| 3" | 11.0 | 9.9 | 4 (.7L)* |
| | 33 | 25 | 4M |
| | 57 | 45 | 4S |
| | 65 | 58 | 6M |
| | 82 | 78 | 6S |
| 4" | 19.6 | 17.6 | 4 (.7L)* |
| | 56 | 43 | 4M |
| | 95 | 83 | 4S |
| | 120 | 108 | 6M |
| | 150 | 140 | 6S |
| 5" | 30.6 | 27.5 | 4 (.7L)* |
| | 92 | 69 | 4M |
| | 150 | 130 | 4S |
| | 180 | 170 | 6M |
| | 230 | 220 | 6S |
| 6" | 135 | 95 | 4M* |
| | 220 | 180 | 4S |
| | 260 | 220 | 6M |
| | 340 | 310 | 6S |

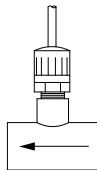
Call our customer support for a wider range of pipe sizes. (805) 988-6800
 * = Requires ¾ NPT process connection

ELECTRICAL CONNECTION OPTIONS



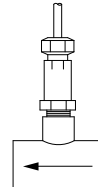
OPTION 1

BASIC UNIT SUPPLIED WITH TWO 0.187 x 0.020 MALE SPADE TERMINALS RECESSED IN ½" NPT NIPPLE SECTION.



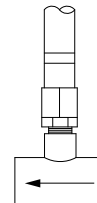
OPTION 2

BASIC UNIT WITH TWO-CONDUCTOR INSTRUMENT CABLE POTTED IN PLACE. PVC TEE OPTIONAL.



OPTION 3

BASIC UNIT W/ DMP TAPERED RUBBER GROMMET ATTACHMENT FOR WATERTIGHT SEAL & STRAIN RELIEF. PVC TEE OPTIONAL.



OPTION 4

BASIC UNIT WITH ½" FLEXIBLE SPIRADUCT PLASTIC CONDUIT & FITTINGS. ELECTRICAL CABLE NOT SUPPLIED. PVC TEE OPTIONAL.

Q-12N Q-12CR

Q-12DS POOL & SPA VERSION

TECHNICAL SPECIFICATIONS

ELECTRICAL (REED) SWITCH CHARACTERISTICS

SPNO

Contact Ratings:

| | |
|-----------------------------------|---------------------------|
| AC Voltage (max. switching) | 300VAC |
| DC Voltage (max. switching) | 350VDC |
| Current (max. switching) | 0.5A |
| Current (max. carrying) | 2.5A |
| Power (max) (VA, W) | 50 watts |
| Contact resistance (max. initial) | 0.15 ohms |
| Insulation resistance | 10 ¹⁰ ohms |
| Operating temperature | -40°F–240°F (-40°C–115°C) |

OPTIONAL: SPNC or SPDT, 3 watt, 100VAC/VDC.

INDUCTIVE LOADS

Switch contacts have been tested with small relays and 30A J-C relay inductive driving coils at 120/240VAC to 500,000 operations without failure.

Q-12N (NORYL®)

WORKING PRESSURE: 200 psig max. @ 70°F

WORKING TEMPERATURE: 180°F @ ambient pressure

WETTED MATERIALS: Body: Noryl® (PPO) (10% glass fibers)
 Paddle: 316 stainless steel Seal: Epoxy

Q-12CR (FORTRON®)

WORKING PRESSURE: 250 psig max. @ 70°F

WORKING TEMPERATURE: 200°F @ ambient pressure

WETTED MATERIALS: Body: Fortron® (PPS) (40% glass fibers)
 Paddle: HASTELLOY® C. Seal: Epoxy

SAMPLE PART NUMBER

| OPTION 1: Q-12N | / ¾ | / SB | / 4S | / NO | / 1 |
|---------------------------------|-----|------|------|------|-----|
| BASE MODEL | ↑ | ↑ | ↑ | ↑ | ↑ |
| PROCESS CONNECTION ½" or ¾" NPT | | | | | |
| PIPE SIZE: SB ¾" TO 1"; LB 1½"+ | | | | | |
| PADDLE NUMBER | | | | | |
| SWITCH OPERATION (NO OR NC) | | | | | |
| ELECTRICAL CONNECTION OPTION | | | | | |

Note: Tee and orifice options available when ordering.

NOTE: Model Q-12N employs magnetic coupling between bending blade and switch body. Magnetic particles can accumulate on and around magnetic housing which may affect proper operation. Please conduct appropriate fluid magnetic particle evaluation and operational tests prior to and during installation and use.

- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH

MODEL Q-15N Q-15CR

Model Q-15 is the most sensitive paddle type flow switch available. It utilizes Hall Effect technology and is programmed for the highest sensitivity.

Model Q-15 comes standard with 8 conductor modular cable and Cat 3 modular connector. Other cable/connector combinations available upon special order.

Max. flow may be five times normal flow.

Positive stop eliminates fatigue effects of turbulence, vibration and flow surge on flow detecting element.

Very low pressure drop - typically less than 1.0 psig at normal flow rate.

Small size and low profile provides easy mounting in crowded installations.

Switch employs magnetic coupling.

Send us your special requirements. We will quote a special unit to meet those requirements.



KEY FEATURES

| | |
|---------------------|------------------------------------|
| Flow Range | 0.7-590 GPM (2.6-2,233 L/m) |
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 250 psi (1.724 kPa) |
| Process Connection | 3/4" NPT |
| Electrical Contacts | SPNO .25A (250 mA) |
| Enclosure | NEMA 4 / IP 66 |

TYPICAL USES

Monitoring flow of coolant supplied to:

| | |
|----------------------------|-------------------------------|
| Brakes and Clutches | Emergency Wash-Down Showers |
| Computer Systems | Marine and Stationary Engines |
| Diodes, SCRs, Triacs, etc. | RF and Radar Transmitters |
| Electromagnets | Spot welders |
| Fire Sprinkler Flow Alarms | Transformers |
| Lasers | Vacuum Systems |

In Chemical Processing:

| | |
|---|-------------------------|
| Fluid Blending Systems | Liquid Transfer |
| Heat Transfer Fluids | Monitor Filter Clogging |
| Liquid Scrubbers | Starting back-up pumps |
| Monitoring pump output, valve position, systems flow status | |

In Water Treatment:

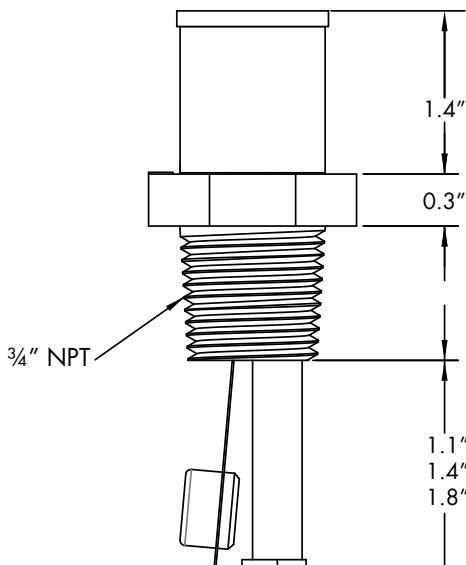
| | |
|--------------------|------------------------------|
| Irrigation Systems | Salt and Fresh Water Systems |
|--------------------|------------------------------|

≈ TYPICAL WORKING FLUIDS

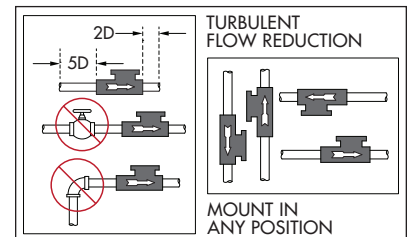
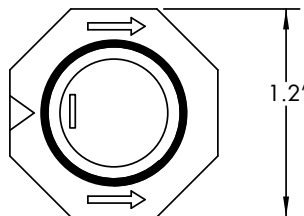
For use in a broad spectrum of industrial fluids, such as:

| | |
|---------------------|------------------------------------|
| Cooling Tower Water | Water (saltwater, pure, tap, etc.) |
| Glycol Solutions | Lubricating Oils |
| Mild Acids | Gasoline |
| Plating Solutions | JP-4 |

SIDE VIEW



TOP VIEW



541 Kinetic Drive
Oxnard, CA 93030
www.harwil.com
16.285

Q-15N Q-15CR

MODEL SELECTION CHART

Flow Range (Water calibrated at 70°F / 21°C)

| PIPE SIZE NPT | NOMINAL ON/OFF SWITCH POINT RANGE (GPM) | | PADDLE NUMBER |
|---------------|---|------|---------------|
| | ON | OFF | |
| ¾" | 0.9 | 0.8 | 3 (.7SM)* |
| | 3 | 2 | 3SM |
| | 11 | 10 | 6S |
| 1" | 1.1 | 1.0 | 3 (.7M)* |
| | 4 | 3 | 4S |
| | 6 | 5 | 6S |
| 1½" | 2.8 | 2.5 | 4 (.7L)* |
| | 13 | 12 | 4S |
| | 16 | 15 | 6M |
| | 21 | 19 | 6S |
| 2" | 4.9 | 4.4 | 4 (.7L)* |
| | 15 | 12 | 4M |
| | 23 | 18 | 4S |
| | 27 | 22 | 6M |
| 3" | 11.0 | 9.9 | 4 (.7L)* |
| | 33 | 25 | 4M |
| | 57 | 45 | 4S |
| | 65 | 58 | 6M |
| | 82 | 78 | 6S |
| 4" | 19.6 | 17.6 | 4 (.7L)* |
| | 56 | 43 | 4M |
| | 95 | 83 | 4S |
| | 120 | 108 | 6M |
| | 150 | 140 | 6S |
| 5" | 30.6 | 27.5 | 4 (.7L)* |
| | 92 | 69 | 4M |
| | 150 | 130 | 4S |
| | 180 | 170 | 6M |
| | 230 | 220 | 6S |
| 6" | 135 | 95 | 4M* |
| | 220 | 180 | 4S |
| | 260 | 220 | 6M |
| | 340 | 310 | 6S |

Call our customer support for a wider range of pipe sizes. (805) 988-6800

* = Requires ¾ NPT process connection

TECHNICAL SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

SPNO

Input Voltage 8 to 24 vdc

Contact Rating
 Switching Voltage 28 vdc max
 Switching Current 1.5 amp (250 mA) max
 Contact Resistance .25 ohms

Q-15N (NORYL®)

WORKING PRESSURE: 200 psig max. @ 70°F

WORKING TEMPERATURE: 180°F @ ambient pressure

WETTED MATERIALS: Body: Noryl® (PPO)
 (10% glass fibers) Paddle: 316 stainless steel Seal: Epoxy

Q-15CR (FORTRON®)

WORKING PRESSURE: 250 psig max. @ 70°F

WORKING TEMPERATURE: 200°F @ ambient pressure

WETTED MATERIALS: Body: Fortron® (PPS) (40% glass fibers)
 Paddle: 316 HASTELLOY® C. Seal: Epoxy

SAMPLE PART NUMBER

| OPTION 1: Q-15N | / ¾" | / SB | / 4S | / 2FT |
|---------------------------------|------|------|------|-------|
| BASE MODEL | ↑ | ↑ | ↑ | ↑ |
| PROCESS CONNECTION ¾" NPT | | | | |
| PIPE SIZE: SB ¾" TO 1"; LB 1½"+ | | | | |
| PADDLE NUMBER | | | | |
| LENGTH OF CABLE (FT) | | | | |

Note: Tee and orifice options available when ordering.

NOTE: Model Q-15N employs magnetic coupling between bending blade and switch body. Magnetic particles can accumulate on and around magnetic housing which may affect proper operation. Please conduct appropriate fluid magnetic particle evaluation and operational tests prior to and during installation and use.

- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

FLOW SWITCH

MODEL Q-16



THE Q-16. MAXIMUM RELIABILITY, MINIMUM COST.

The Q-16 is the newest addition to Harwil's heavy-duty line of flow switches. The switch is used to signal, start, or stop electronically operated equipment when flow or no-flow conditions occur. The Q-16 benefits from 40 years of flow switch development experience for every conceivable application.

Harwil's patented elastomeric sealing system is superior to the metal bellows that are subject to metal fatigue and corrosion. This seal system has been field-proven for over a decade.

The Q-16 can be used in pipes 1 inch and larger, with set points as low as 4 GPM (15.2 LPM) to over 500 GPM (1,893 LPM) in larger pipe sizes. The Q-16 uses a 15A SPDT micro switch that can control a 1/2 horsepower motor.

- Multiple Quick-Change Paddles
- Patented EPDM Seal, Superior To Metal Bellows
- Field Adjustable Set Points
- Field Adjustable Paddles
- Direct Replacement For Most Paddle-Type Flow Switches
- Best Flow Sensitivity Among Paddle-Type Flow Switches
- Stainless Steel Paddles And Shaft
- NEMA 1 Enclosure
- Industry-Leading 3 Year Warranty**



KEY FEATURES

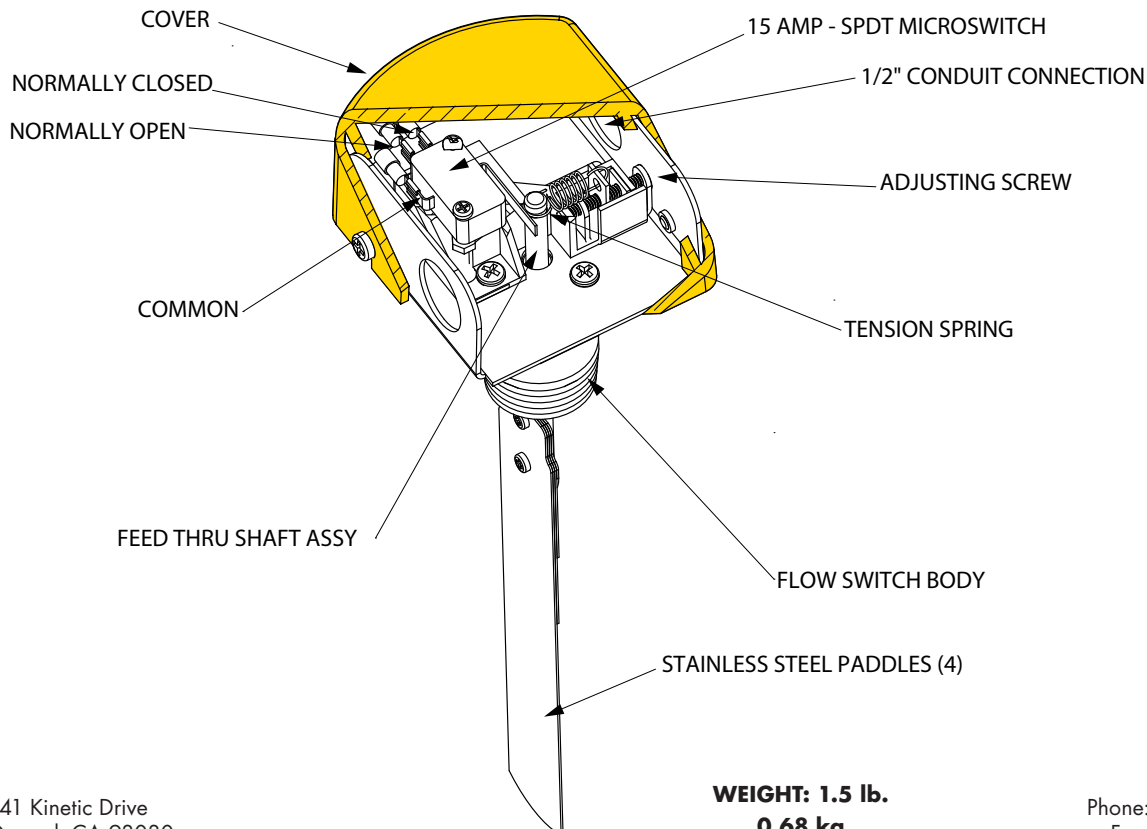
| | |
|--------------------|--|
| Flow Range | 4-500 GPM (15-1,893 L/m) |
| Working Temp | 250°F (121°C) Maximum |
| Working Pressure | 200 psi (1.379 kPa) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT 15A or Dry Circuit |
| Enclosure | NEMA 1 (Not for use in hazardous locations) |
| Approvals | UL 508 & UL 353 |
| Enclosure | NEMA 1 / IP 10 |

TYPICAL USES

- For use in
- Boilers
 - Chillers
 - Irrigation
 - Cooling Towers
 - Water Treatment

For direct replacement of most 1" paddle style flow switches.

PRODUCT DIAGRAM



**WEIGHT: 1.5 lb.
0.68 kg**

Phone: (805) 988-6800
Fax: (805) 988-6804
Email: harwil@harwil.com



541 Kinetic Drive
Oxnard, CA 93030
www.harwil.com
16.285

MODEL Q-16

| MODEL SELECTION CHART | | | | |
|--|-------------------------|-----|--------------|-----|
| Flow Range (Water calibrated at 70°F / 21°C) | | | | |
| PIPE SIZE NPT | SWITCHPOINT RANGE (GPM) | | | |
| | MIN. ADJUST. | | MAX. ADJUST. | |
| | ON | OFF | ON | OFF |
| 1" | 4 | 2 | 8 | 7 |
| 1½" | 7 | 5 | 13 | 11 |
| 2" | 12 | 7 | 27 | 26 |
| 2½" | 18 | 12 | 35 | 32 |
| 3" | 27 | 19 | 52 | 49 |
| 4" | 63 | 50 | 123 | 120 |
| 5" | 125 | 100 | 238 | 232 |
| 6" | 190 | 158 | 350 | 338 |

Call our customer support for a wider range of pipe sizes. (805) 988-6800

* Special fittings required for use in PVC or CPVC pipe.

HYSTERESIS (Δ FLOW RATE TO ACTIVATE/DEACTIVATE SWITCH)

- ≈ 10% at upper end of flow range
- ≈ 30% at lower end of flow range

DIFFERENTIAL PRESSURE DROPS ACROSS UNIT

Under normal operating conditions:

- ≈ 1"-3" pipe, less than 1 psi
- ≈ 4"-48" pipe, negligible

WORKING LINE PRESSURE

200 psig max.

WORKING TEMPERATURE

250°F max. continuous.

WETTED MATERIALS

Body: Brass
Shaft: 304 Stainless Steel

Paddle: 316 stainless steel
Seal: EPDM

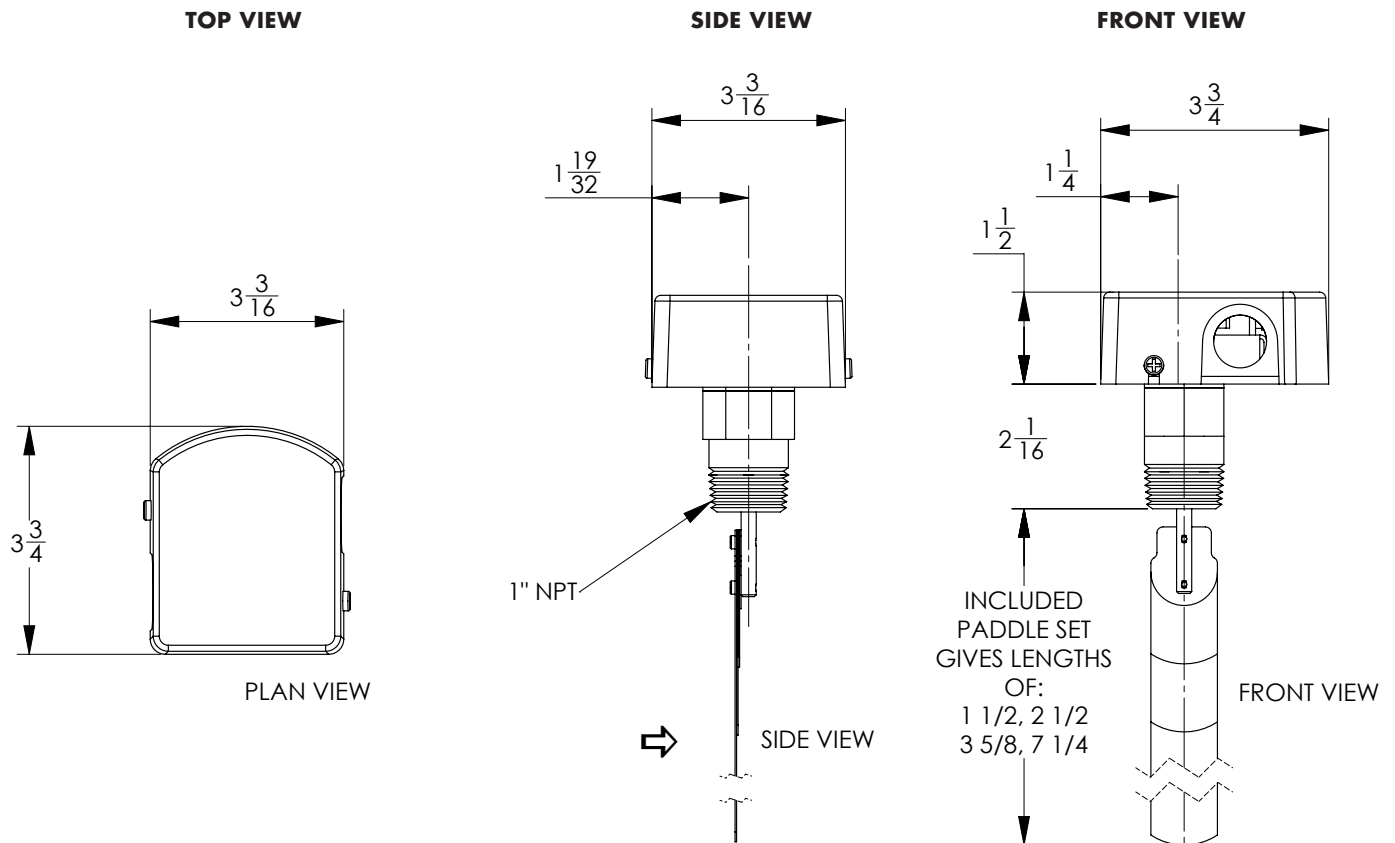
ELECTRICAL SWITCH CHARACTERISTICS

SPDT
15A, ½ hp @ 125 or 250VAC
½A @ 125VDC

¼A @ 250VDC
10,000,000 Operations Median

Model Q-16 can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface.

INSTALLATION DIMENSIONS



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

LEVEL SWITCH

MODEL L-5 L-5SS

SPECIFIC GRAVITY COMPENSATING.

Featuring continuously adjustable float buoyancy control to allow use in fluids with specific gravity down to 0.6.

Continuous buoyancy control allows switch activation at oil/water interface.

May be used in hazardous areas when used with intrinsically safe relays.

Consult factory for other dual-component fluid interface systems.

Horizontal Mounting Only

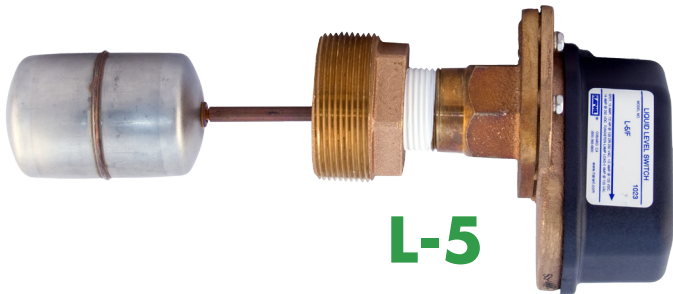
High/Low Liquid Level Alarm

Solenoid Valve On/Off Control



KEY FEATURES

| | |
|--------------------------------|--|
| Working Fluid Specific Gravity | Adjustable between 0.6 & 1.0+ |
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 300 psi (2,068 kPa) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT 15A or Dry Circuit |
| Enclosure | NEMA 4 / IP 66 |

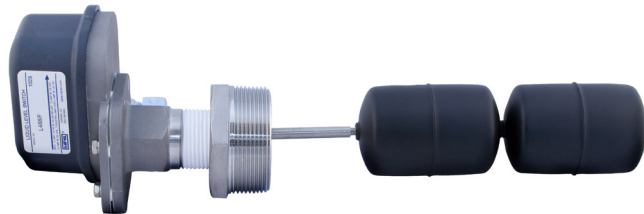


L-5

TYPICAL USES

For use in particle contaminated fluids, such as:

- Seawater
- Sewage
- Waste Water
- Contaminated Ground Water
- Rusty Coolant Water

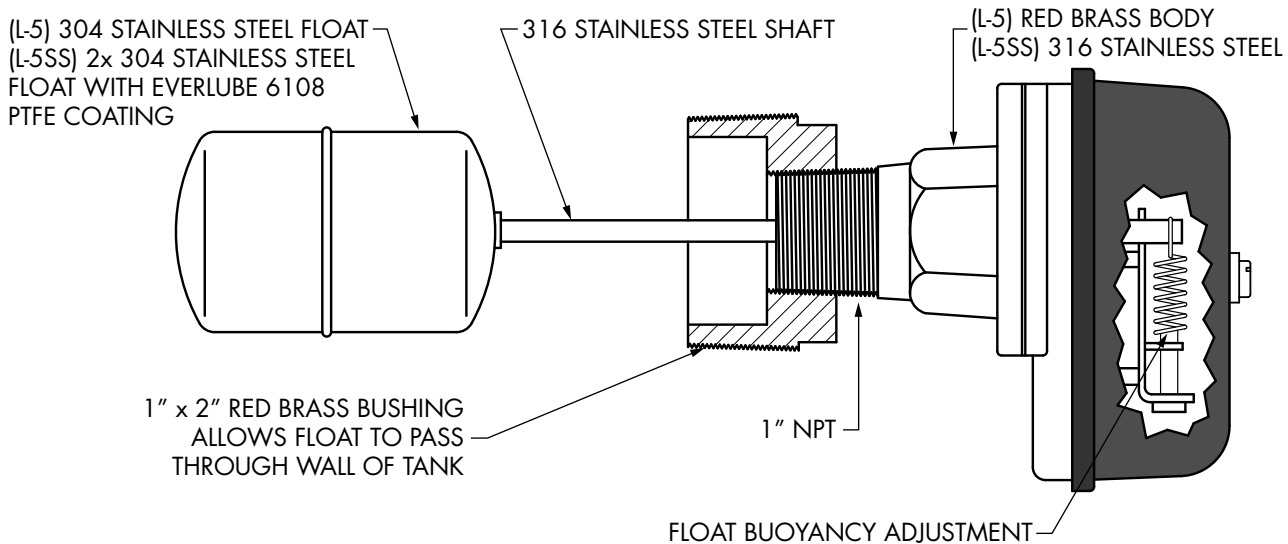


L-5SS

TYPICAL WORKING FLUIDS

- Alcohols
- Glycols
- Soap Solutions
- Machine Cutting Oils
- Slurries
- Water

PRODUCT DIAGRAM



**WEIGHT: 3 lb.
1.36 kg**



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Phone: (805) 988-6800
Fax: (805) 988-6804
Email: harwil@harwil.com

MODEL L-5 L-5SS

DOUBLE POLE, DOUBLE THROW (DPDT)

MODEL **LD-5** ALSO AVAILABLE

2 single pole, double throw (SPDT) switches provide DPDT action. 2 physically ganged but electronically independent switches provide a combination of 2 isolated AC or DC circuits; high or low voltage circuits; or power or gold cross bar computer/PLC dry circuits.

Electrical connection is made directly to switch terminals with standard spade "Quick Connects" supplied with each unit.

ELECTRICAL CONNECTION

| GROMMET | CABLE O.D. | DIAGRAM |
|---------|------------|---------|
| A | 0.25" | |
| AA | 0.30" | |
| B | 0.37" | |
| C | 0.50" | |

CONDUIT FITTINGS

| F | 0.5" straight | | F90° | 0.5" 90° | |
|---|---------------|--|------|----------|--|
| | | | | | |

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)

$\approx 1/4$ " travel

WORKING FLUID SPECIFIC GRAVITY RANGE

Adjustable between 0.6 and 1.0+

WORKING PRESSURE

300 psi max. continuous

WORKING TEMPERATURE

180°F max. continuous.

WETTED MATERIALS (RED BRASS)

Body and Bushing: Red brass
Float Shaft: Phosphor bronze
Hardware: 316 stainless steel

Float: 304 stainless steel
Seal: EPDM
Gasket: Cork/Nitrile blend

WETTED MATERIALS (STAINLESS STEEL)

Body, Bushing, Float Shaft,
Hardware: 316 stainless steel
Float: 304 stainless steel

Float Coating: Everlube 6108 PTFE
Seal: Viton® or FKM
Gasket: Teflon® or PTFE

ELECTRICAL SWITCH CHARACTERISTICS

SPDT

15 A, 1/2 hp @ 125 or 250VAC

1/2A @ 125VDC, 1/4A @ 250VDC

5A @ 125VAC (Tungsten lamp load)

10,000,000 operations median

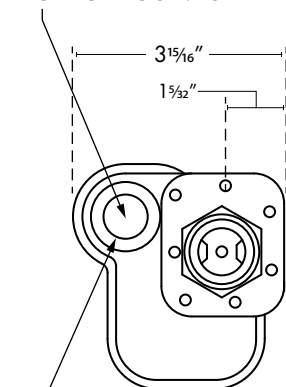
Gold Cross Bar Dry Circuit Computer/PLC Interface SPDT Switch Model also available.

SAMPLE PART NUMBERS

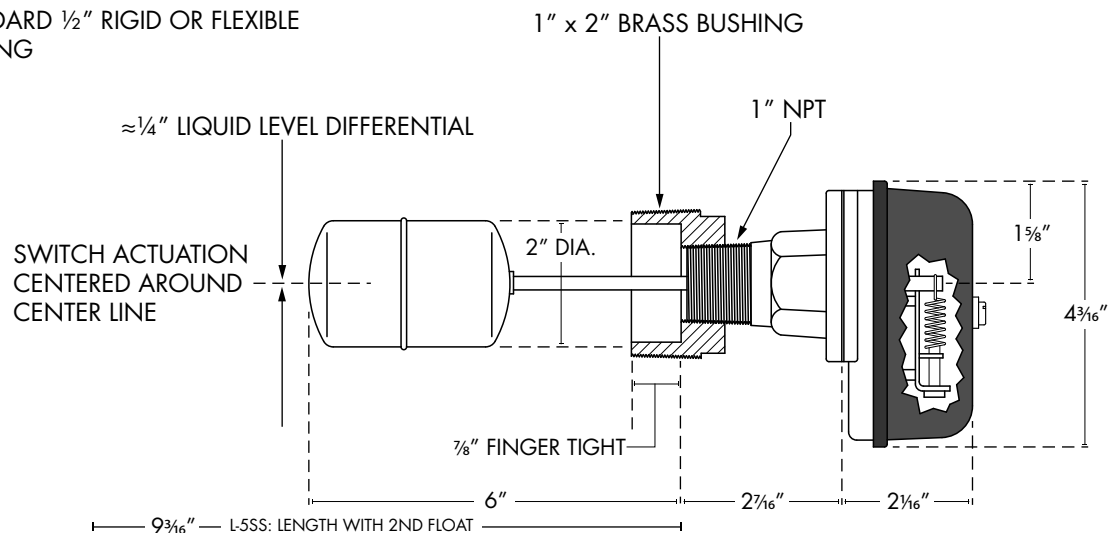
| OPTION 1: L-5 / A | / F | OPTION 2: L-5 | / F |
|-------------------|-----|-------------------------------|-----|
| BASE MODEL | ↑ | BASE MODEL | ↑ |
| GROMMET SIZE | | 1/2" FLEXIBLE CONDUIT FITTING | |

INSTALLATION DIMENSIONS

HOLE TO SUIT STRAIN RELIEF CABLE FITTING SUPPLIED BY HARWIL OR ANY STANDARD 1/2" RIGID OR FLEXIBLE ELECTRICAL CONDUIT FITTING



OPTION 1, 2



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

LEVEL SWITCH

MODEL L-8N L-8CR

SPECIFIC GRAVITY COMPENSATING.

Featuring continuously adjustable float buoyancy control to allow use in fluids with specific gravity down to 0.6.

Continuous buoyancy control allows switch activation at oil/water interface.

May be used in hazardous areas when used with intrinsically safe relays.

Consult factory for other dual-component fluid interface systems.

Horizontal Mounting Only

Water/Oil Interface switch point

Foam/Fluid interface switch point

High/Low Liquid Level Alarm

Liquid level indication

Direct pump control

Solenoid Valve On/Off Control

Available with Optional Filter Boot For Use in Highly Particle Contaminated Liquids.

Super-simple maintenance and checkout for personnel using a standard test meter.



KEY FEATURES

| | |
|--------------------------------|--|
| Working Fluid Specific Gravity | Adjustable between 0.6 & 1.5+ |
| Working Temp | 200°F (93°C) Maximum |
| Working Pressure | 75 psi (517 kPa) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT 15A or Dry Circuit |
| Enclosure | NEMA 6P / IP 67 |

TYPICAL USES

For use in particle contaminated fluids, such as:

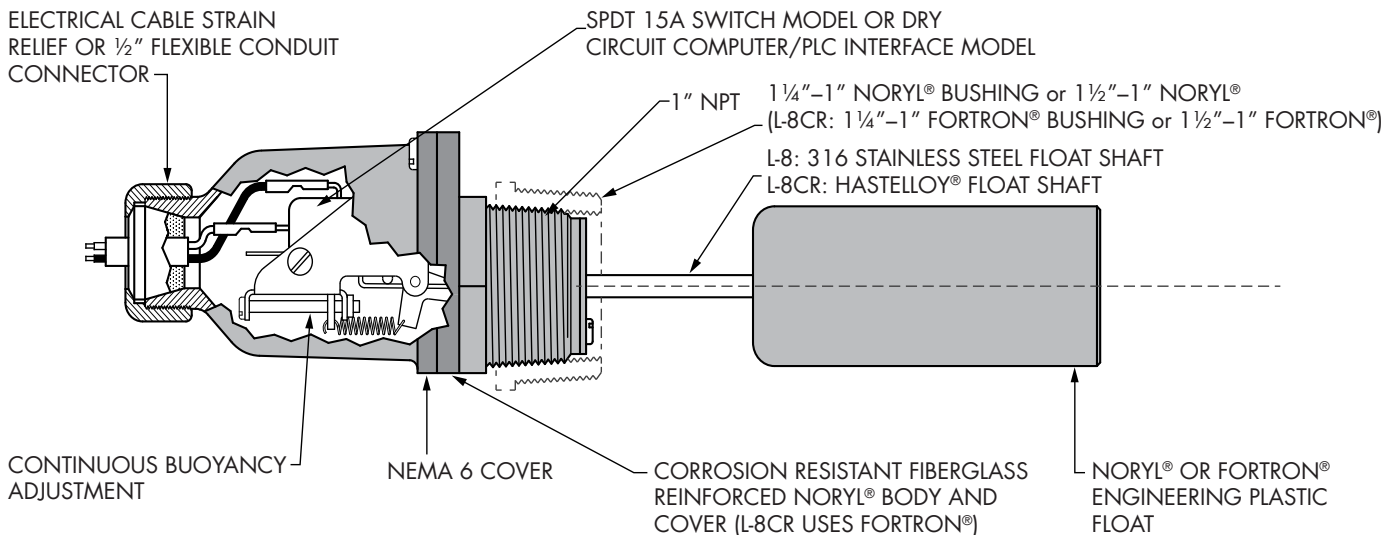
| | |
|----------------|---------------------------|
| Seawater | Contaminated Ground Water |
| Sewage | Rusty Coolant Water |
| Soap Solutions | Soap Solutions |

TYPICAL WORKING FLUIDS

| | |
|--------------------|------------|
| Water | Mild Acids |
| Some Hydrocarbons | Mild Bases |
| Chemical Solutions | Inorganics |
| Glycols | Oils |
| | Pure Water |



PRODUCT DIAGRAM



**WEIGHT: 0.5 lb.
0.23 kg**



541 Kinetic Drive
Oxnard, CA 93030
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16.285

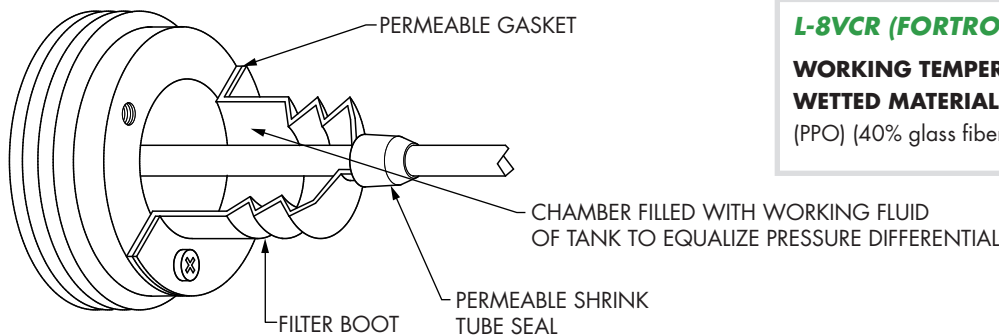
Phone: (805) 988-6800
Fax: (805) 988-6804
Email: harwil@harwil.com

MODEL L-8N L-8CR

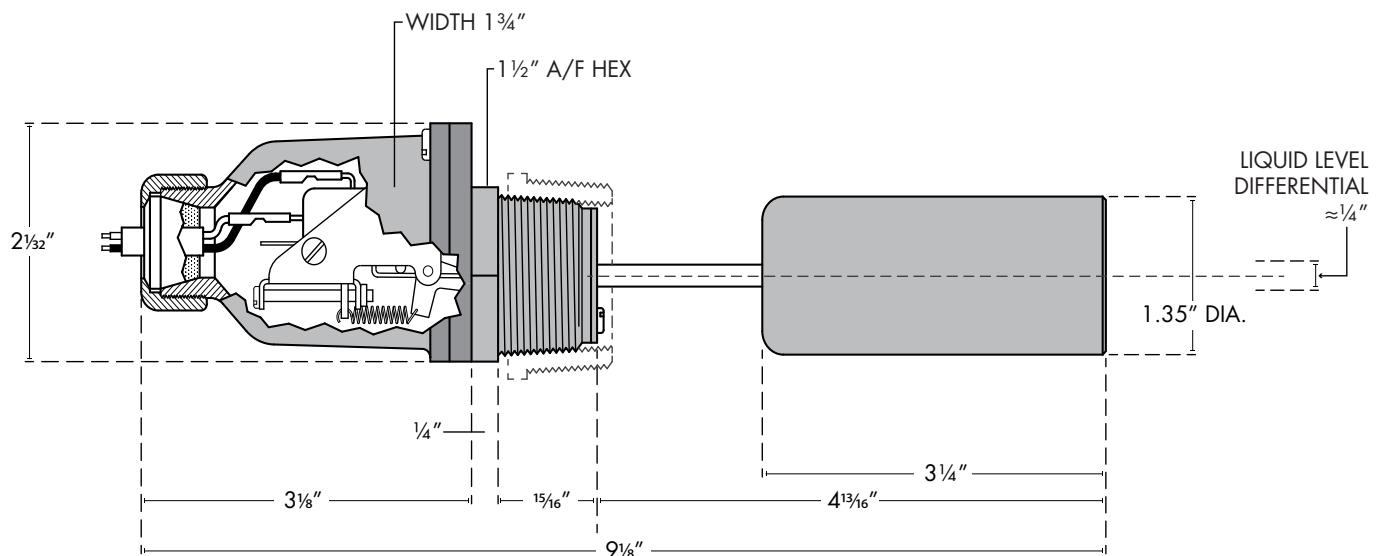
| ELECTRICAL CONNECTION | | | | | |
|--|---------------|---------|------|----------|--|
| GROMMET | CABLE O.D. | DIAGRAM | | | |
| A | 0.25" | | | | |
| AA | 0.30" | | | | |
| B | 0.37" | | | | |
| C | 0.50" | | | | |
| CONDUIT FITTINGS (AVAILABLE AT EXTRA COST) | | | | | |
| F | 0.5" straight | | F90° | 0.5" 90° | |

| SAMPLE PART NUMBERS | | | |
|---------------------|-----|-----------------------------|-----|
| OPTION 1: L-8N / A | / A | OPTION 2: L-8N / F | / F |
| BASE MODEL | ↑ | BASE MODEL | ↑ |
| GROMMET SIZE | | ½" FLEXIBLE CONDUIT FITTING | |

FILTER BOOT



▲ INSTALLATION DIMENSIONS



➤ TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)
 ≈ ¼" max. travel

WORKING FLUID SPECIFIC GRAVITY RANGE
 Adjustable between 0.6 and 1.5+

WORKING PRESSURE:
 75 psi max. continuous & 100 psi max. non-operating

ELECTRICAL SWITCH CHARACTERISTICS
 SPDT 5A @ 125VAC (Tungsten lamp load)
 15 A, ½ hp @ 125 or 250VAC
 ½A @ 125VDC, ¼A @ 250VDC 10,000,000 operations median
 Gold Cross Bar Dry Circuit Computer/PLC Interface SPDT Switch Model also available. 0.1A or less, 5–24 VAC/DC.

L-8N (NORYL®)
WORKING TEMPERATURE: 180°F max. continuous.
WETTED MATERIALS: Body, Float and Bushing: Noryl® (PPO) (10% glass fibers) Float Shaft and Screws: 316 stainless (Hypalon available by special order) Diaphragm: EPDM
 Optional Filter Boot: EPDM (Viton® available by special order)

L-8VCR (FORTRON®)
WORKING TEMPERATURE: 200°F max. continuous.
WETTED MATERIALS: Body, Float and Bushing: Fortron® (PPO) (40% glass fibers) Pivot Pin: HASTELLOY® C

- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

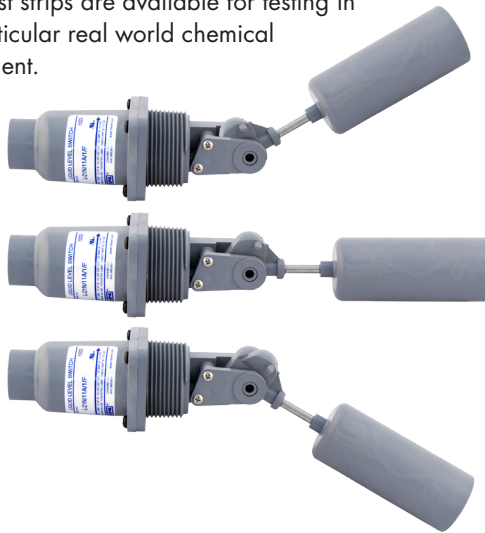
LEVEL SWITCH

MODEL L-21+ L-21N L-21VCR

The L-21 is a low cost, high performance level switch made from highly durable plastics. It features a variable liquid level differential and a single point pump up/pump down level control.

Interchangeable differential band modules, for all non-L-21+ versions, allow for 5 minute on-site switching of differentials from 1.0" to 2.0" to 3.0" to 5.0" in any sequence to satisfy variable operational requirements as they occur. Its large differential provides immunity to nuisance switch tripping due to severe wave action and turbulence. The large differential also provides very low cost single point pump up/pump down level control.

Maintenance and checkout is a snap for plant maintenance personnel using any standard multimeter. Each unit comes with detailed instruction manual and parts list. Plastic test strips are available for testing in your particular real world chemical environment.



KEY FEATURES

| | |
|--------------------------------|-----------------------------|
| Working Fluid Specific Gravity | 0.7 minimum |
| Working Temp | 200°F (93°C) Maximum |
| Working Pressure | 250 psig (1.724 MPa) |
| Process Connection | 1¼" NPT |
| Electrical Switch | SPDT 15A |
| Enclosure | NEMA 6P / IP 67 |

TYPICAL USES

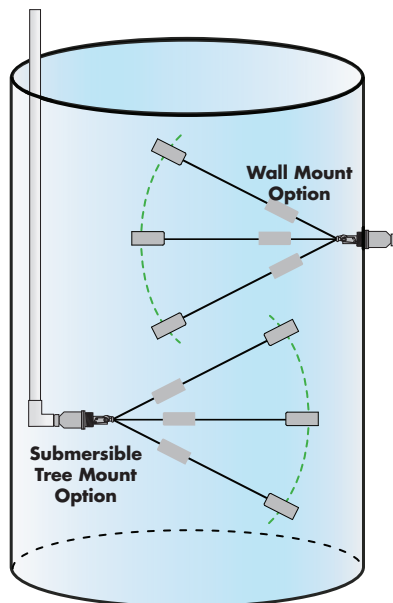
Water Level Control In:

| | |
|----------------|---------------|
| Cooling Towers | Plating Tanks |
| Washing Tanks | Fish Farms |
| Fountains | Aquariums |

TYPICAL WORKING FLUIDS

| | |
|-----------------|-----------------------------|
| Clean Water | Contaminated Ground Water |
| Filtered Sewage | Filtered Waste Water |
| Mild Acids | Inorganic Aqueous Solutions |
| Mild Bases | Sea Water |

LIQUID LEVEL DIFFERENTIAL DIMENSIONS



| A | B | C | D | E |
|---------------------------|---------------|--------------|-------------------|--------------------|
| Level Differential Inches | Outside Mount | Inside Mount | Deep Below Switch | Depth Above Switch |
| ~1" | 4.5" | 7.5" | ~1" | ~0 |
| ~2" | 5.2" | 8.2" | ~1" | ~1" |
| ~3" | 5.9" | 8.9" | ~1" | ~2" |
| ~5" | 7.3" | 10.3" | ~3" | ~2" |

WEIGHT: 5 oz.

142 g



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MODEL L-21+ L-21N L-21VCR

| ELECTRICAL CONNECTION | | | | | |
|--|---------------|---------|------|----------|--|
| GROMMET | CABLE O.D. | DIAGRAM | | | |
| A | 0.25" | | | | |
| AA | 0.30" | | | | |
| B | 0.37" | | | | |
| C | 0.50" | | | | |
| CONDUIT FITTINGS (AVAILABLE AT EXTRA COST) | | | | | |
| F | 0.5" straight | | F90° | 0.5" 90° | |

| SAMPLE PART NUMBERS | | | | |
|-------------------------------|---|---|---|---|
| OPTION 1: L-21N / 15A / 1 / A | | | | |
| BASE MODEL | ↑ | ↑ | ↑ | ↑ |
| SWITCH CAPACITY | | | | |
| LIQUID LEVEL DIFFERENTIAL | | | | |
| GROMMET SIZE | | | | |

| OPTION 2: L-21N / 15A / 5 / F | | | | |
|-------------------------------|---|---|---|---|
| BASE MODEL | ↑ | ↑ | ↑ | ↑ |
| SWITCH CAPACITY | | | | |
| LIQUID LEVEL DIFFERENTIAL | | | | |
| 1/2" FLEXIBLE CONDUIT FITTING | | | | |

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)
 \approx 5" max. travel (N/VCR). \approx 15" max. travel (+).

ELECTRICAL SWITCH CHARACTERISTICS

SPDT 4A @ 125VAC (Tungsten lamp load)
 15 A, 1/4 hp @ 125 or 250VAC
 1/2A @ 125VDC, 1/4A @ 250VDC

Note: Model L-21 employs magnetic coupling between float arm and switch body. Magnetic particles can accumulate on and around magnet housing which may affect proper operation. Please conduct appropriate fluid magnetic particle evaluation and operational tests prior to and during installation and use.

WORKING FLUID SPECIFIC GRAVITY

0.7 minimum

L-21+ & L-21N (NORYL®)

WORKING PRESSURE: 250 psi max. continuous

WORKING TEMPERATURE: 180°F max. continuous.

WETTED MATERIALS: Body, Float and Bushing: Noryl® (PPO) (10% glass fibers) screws + shaft: 316 stainless steel

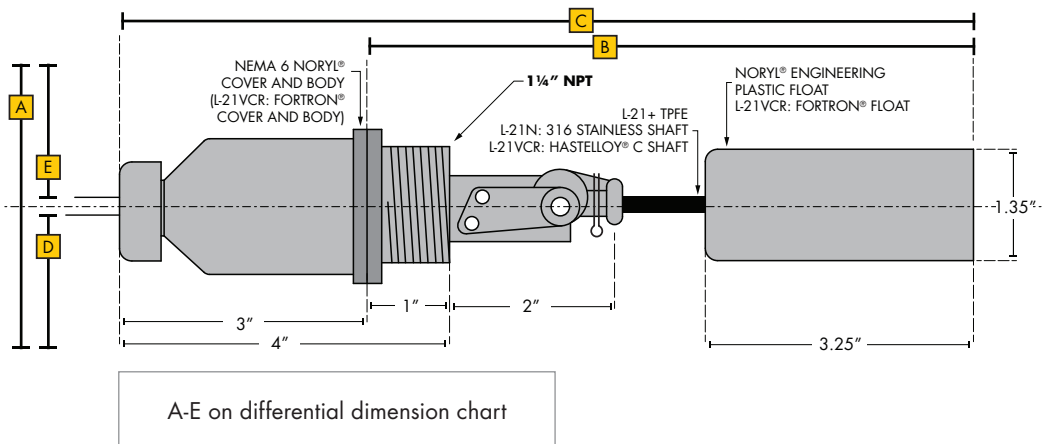
L-21VCR (FORTRON®)

WORKING PRESSURE: 250 psi max. continuous

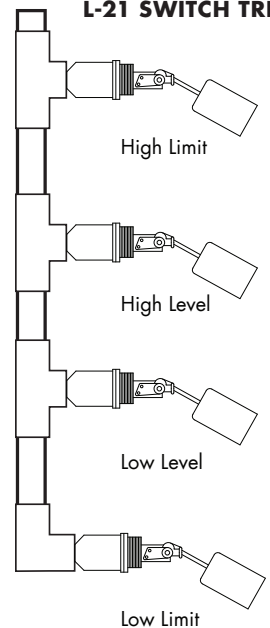
WORKING TEMPERATURE: 200°F max. continuous.

WETTED MATERIALS: Body, Float and Bushing: Fortron® (PPO) (40% glass fibers) screws + shaft: HASTELLOY® C

INSTALLATION DIMENSIONS



L-21 SWITCH TREE



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

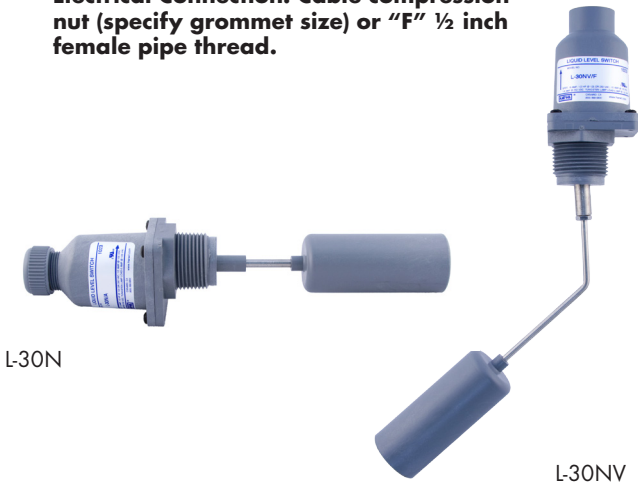
LEVEL SWITCH

MODEL L-30N L-30CR



The L-30 Level Switch is designed for use in potable water or a wide variety of chemicals. See Chemical Compatibility Chart. The liquid seal is continuously flushed by the working fluid and is available with an Optional Rubber Boot if there is particulate in the water. The L-30 Level Switch has models for horizontal or vertical installations. The L-30 Level Switch uses a 15 amp micro switch (SPDT - Single Pole Double Throw).

- Super-simple maintenance and checkout for personnel using a standard test meter.
- High/Low Liquid level alarm
- Solenoid Valve control
- Pump Up/ Pump Down Control (Use with LC-1 or Wireless)
- Intrinsically Safe Relay allows Model L-30 to be used in hazardous areas.
- Connection 1" NPT with 1 x 1/4" NPT bushing included
- **Electrical Connection: Cable compression nut (specify grommet size) or "F" 1/2 inch female pipe thread.**



L-30N

L-30NV

KEY FEATURES

| | |
|--------------------------------|---------------------------------|
| Working Fluid Specific Gravity | 0.8 minimum |
| Working Temp | 200°F (93°C) Maximum |
| Working Pressure | 75 psi (517 kPa) |
| Process Connection | 1" with 1 x 1/4" Bushing |
| Electrical Switch | SPDT 15A or Dry Circuit |
| Weight | 0.5 lb. (0.23 kg) |
| Enclosure | NEMA 6P / IP 67 |

TYPICAL USES

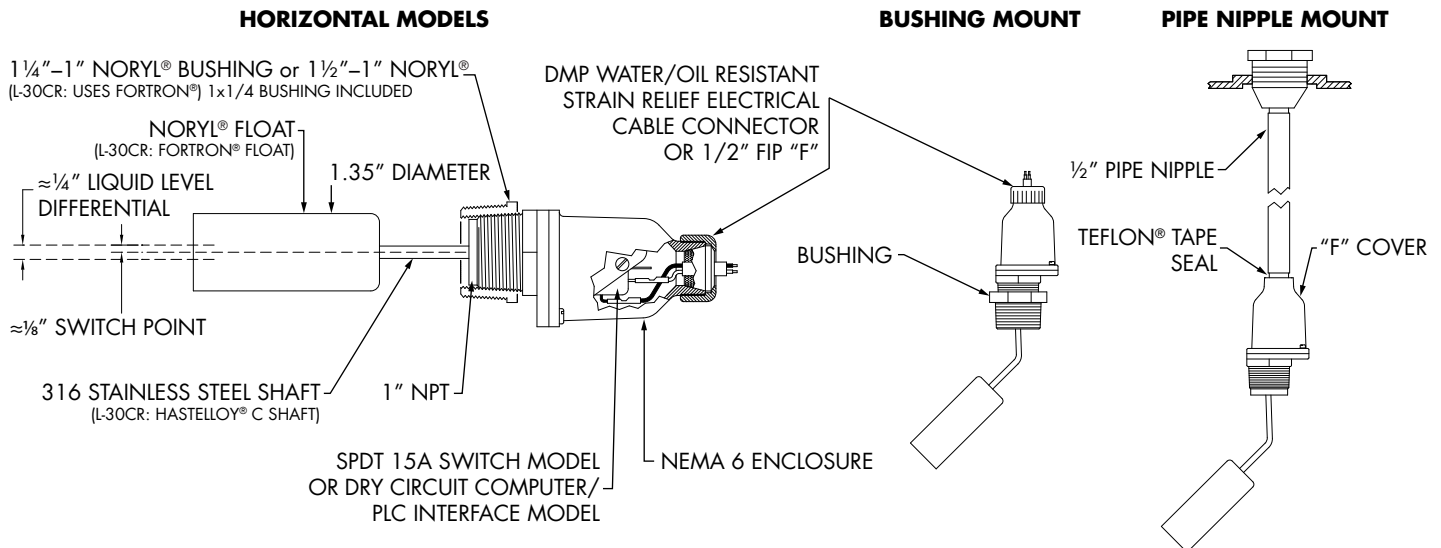
For use in particle contaminated fluids, such as:

| | |
|-----------------|---------------------------|
| Medium Slurries | Contaminated Ground Water |
| Sewage | Machine Cutting Oils |
| Waste Water | |

TYPICAL WORKING FLUIDS

| | |
|---------------------|-------------------|
| Water | Mild Acids |
| Seawater | Mild Bases |
| Rusty Coolant Water | Various Chemicals |

PRODUCT DIAGRAM



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MODEL L-30N L-30CR

ELECTRICAL CONNECTION

| GROMMET | CABLE O.D. | DIAGRAM |
|---------|------------|---------|
| A | 0.25" | |
| AA | 0.30" | |
| B | 0.37" | |
| C | 0.50" | |

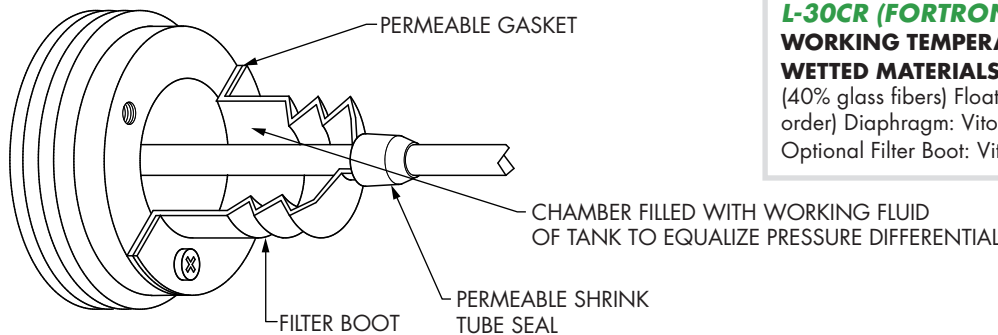
CONDUIT FITTINGS (AVAILABLE AT EXTRA COST)

| F | 0.5" straight | | F90° | 0.5" 90° | |
|---|---------------|--|------|----------|--|
|---|---------------|--|------|----------|--|

SAMPLE PART NUMBERS

| OPTION 1: L-30N / A | OPTION 2: L-30N / F |
|---------------------|-----------------------------|
| BASE MODEL ↑ | BASE MODEL ↑ |
| GROMMET SIZE | ½" FLEXIBLE CONDUIT FITTING |

FILTER BOOT



TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)

≈ ¼" max. travel

ELECTRICAL SWITCH CHARACTERISTICS

SPDT 5A @ 125VAC (Tungsten lamp load)
 15 A, ½ hp @ 125 or 250VAC
 ½ A @ 125VDC, ¼ A @ 250VDC 10,000,000 operations median

Gold Cross Bar Dry Circuit Computer/PLC Interface SPDT Switch Model also available. 0.1A or less, 5–24 VAC/DC.

WORKING FLUID SPECIFIC GRAVITY:

0.8 minimum

WORKING PRESSURE:

75 psi max. operating
 100 psi max. non-operating

L-30N (NORYL®)

WORKING TEMPERATURE: 180°F max. continuous.

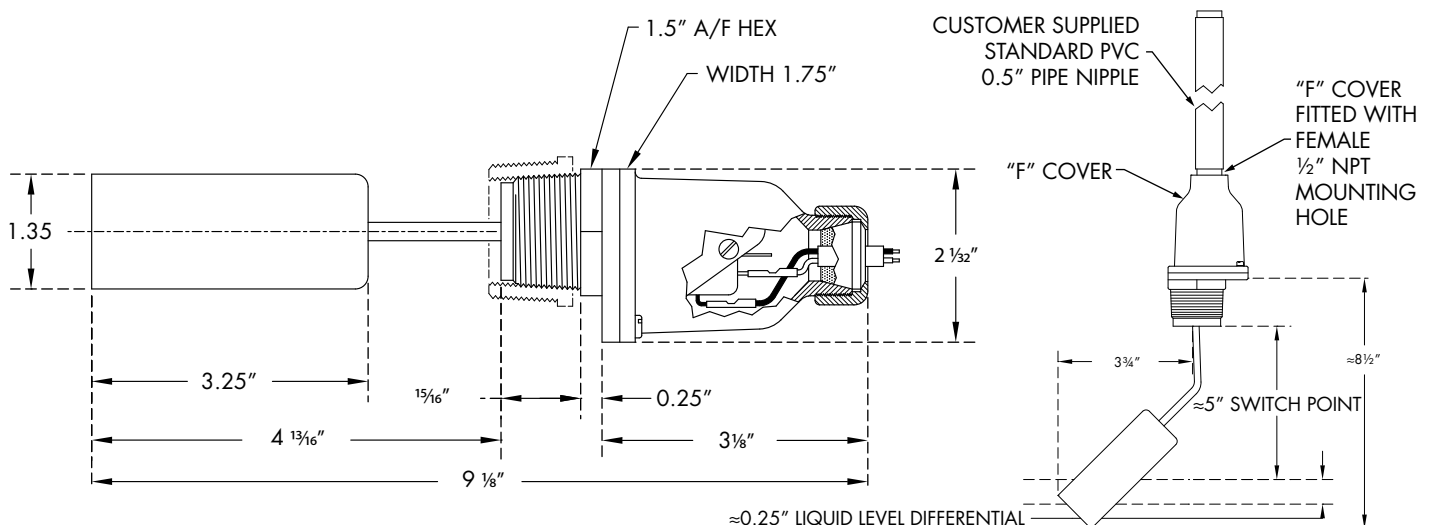
WETTED MATERIALS: Body, Float and Bushing: Noryl® (PPO) (10% glass fibers) Float Shaft and Screws: 316 stainless steel Diaphragm: EPDM (Hypalon optional) Optional Filter Boot: EPDM (Viton® available by special order) Optional Float Material: Polypropylene

L-30CR (FORTRON®)

WORKING TEMPERATURE: 200°F max. continuous.

WETTED MATERIALS: Body, Float and Bushing: Fortron® (PPS) (40% glass fibers) Float Shaft: HASTELLOY® C (Titanium by special order) Diaphragm: Viton® Optional Filter Boot: Viton Optional Float Material: Polypropylene

INSTALLATION DIMENSIONS



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

LEVEL SWITCH

MODEL L-40N L-40VCR

Side and Top Mount

Corrosion-resistant plastic with optional metal pivot pin (available in 316 stainless steel, HASTELLOY® C, Titanium, or Teflon® or PTFE).

10 times less sensitive from deposit and build-up of contaminants than sliding float models.

Each unit can be supplied with a special made to order 1 1/4" x 1/4" x 1/2" reducer bushing for through wall mounting.

Output wire can be twisted pair 22 gauge or two conductor PVC heavy wall instrument cable.

STANDARD: SPST reed switch for 120/240VAC 50 Watt power or DC dry circuit for computer/PLC interface.



KEY FEATURES

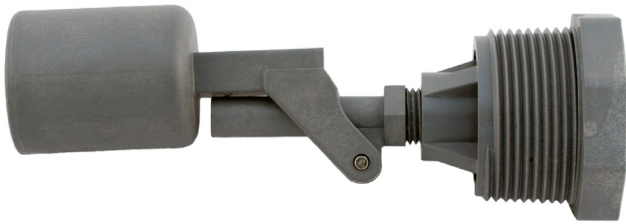
| | |
|--------------------------------|---|
| Working Fluid Specific Gravity | Top Mount: 0.8 Side Mount: 0.7 |
| Working Temp | 0°-200°F (-18°-93°C) |
| Working Pressure | 250 psi (1.724 MPa) |
| Process Connection | 1/4" NPT |
| Electrical Switch | SPNO or SPNC, 0.5A |
| Enclosure | NEMA 6P / IP 67 |

TYPICAL USES

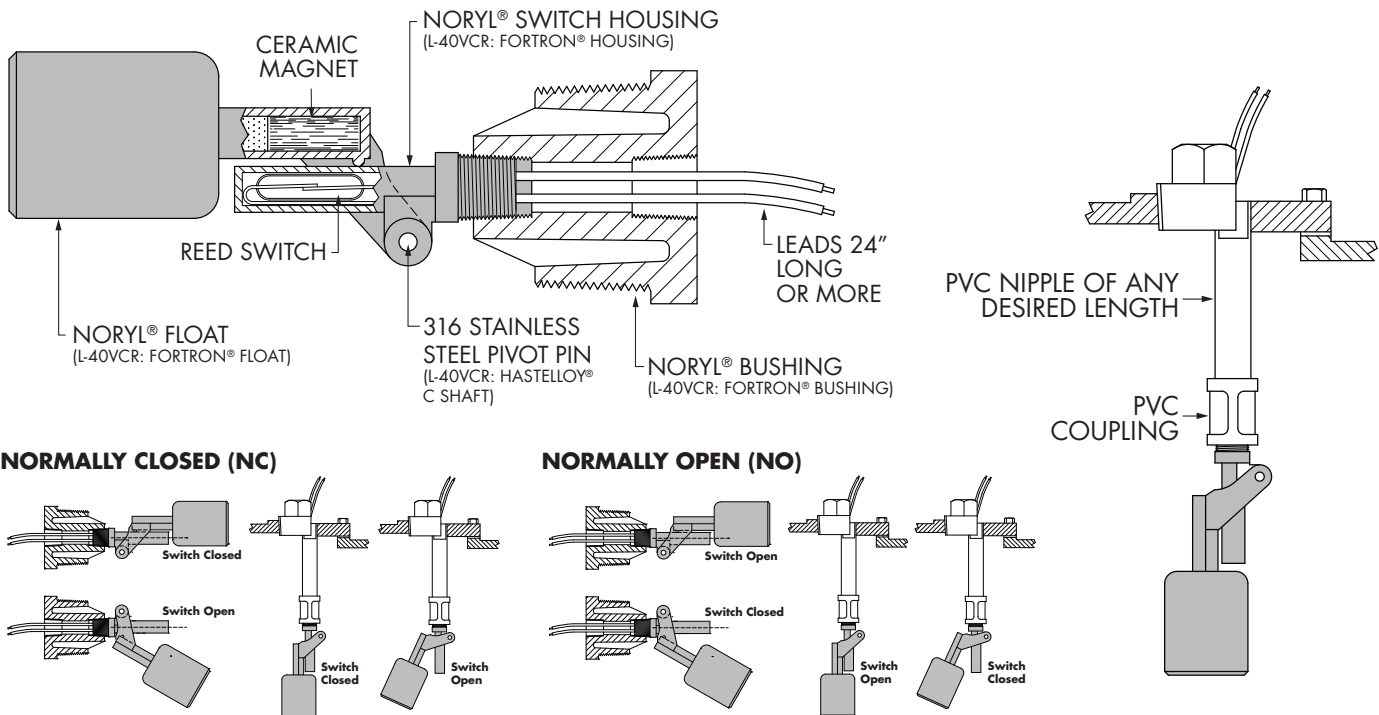
For use in particle contaminated fluids, such as:

TYPICAL WORKING FLUIDS

| | |
|---------------|---------------------------|
| Mild Acids | Seawater |
| Mild Bases | Filtered Sewage |
| Pure Water | Contaminated Ground Water |
| Process Water | |



PRODUCT DIAGRAM



WEIGHT: 5 oz.

142 g



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SPECIFIC GRAVITY COMPENSATING
 MODEL L-40N/SG ALSO AVAILABLE

Customer specified specific gravity sensitivity.

Unique design enhances specific gravity sensitivity.

Applications include fuel/water detection, oil/water detection, or detection of ground water contamination.

| SAMPLE PART NUMBER | | | |
|--------------------|------|-------|-------|
| OPTION 1: L-40N | / NO | / HOR | / 316 |
| BASE MODEL | ↑ | ↑ | ↑ |
| SWITCH OPERATION | | | |
| MOUNTING POSITION | | | |
| PIVOT PIN MATERIAL | | | |

INDUCTIVE LOADS

Switch contacts have been tested with small relays and 30A J-C relay inductive driving coils at 120/240VAC to 500,000 operations without failure. Steady state driving coil Volt/Amp rating should be 8VA or less.

DRY CIRCUIT OPERATION

Switch can interface with microprocessor based controllers and related computer circuits.

NOTE: Model L-40 employs magnetic coupling between float arm and switch body. Magnetic particles can accumulate on and around magnetic housing which may affect proper operation. Please conduct appropriate fluid magnetic particle evaluation and operational tests prior to and during installation and use.

MODEL L-40N L-40VCR

TECHNICAL SPECIFICATIONS

ELECTRICAL (REED) SWITCH CHARACTERISTICS

SPNO
 Contact Ratings:
 AC Voltage (max. switching) 300VAC
 DC Voltage (max. switching) 350VDC
 Current (max. switching) 0.5A
 Current (max. carrying) 2.5A
 Power (max) (VA, W) 50 watts
 Contact resistance (max. initial) 0.15 ohms
 Insulation resistance 10¹⁰ ohms
 Operating temperature -40°F–240°F (-40°C–115°C)
 OPTIONAL: SPNC or SPDT, 3 watt, 100VAC/VDC.

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)

≈ 3/8" (0.375") max. travel

L-40N (NORYL®)

WORKING FLUID SPECIFIC GRAVITY:

Top Mount: 0.8 Side Mount: 0.7

WORKING PRESSURE: 200 psi max. continuous

WORKING TEMPERATURE: 180°F max. continuous.

WETTED MATERIALS: Body, Float and Bushing: Noryl® (PPO) (10% glass fibers) Pivot Pin: 316 stainless steel

L-40VCR (FORTRON®)

WORKING FLUID SPECIFIC GRAVITY:

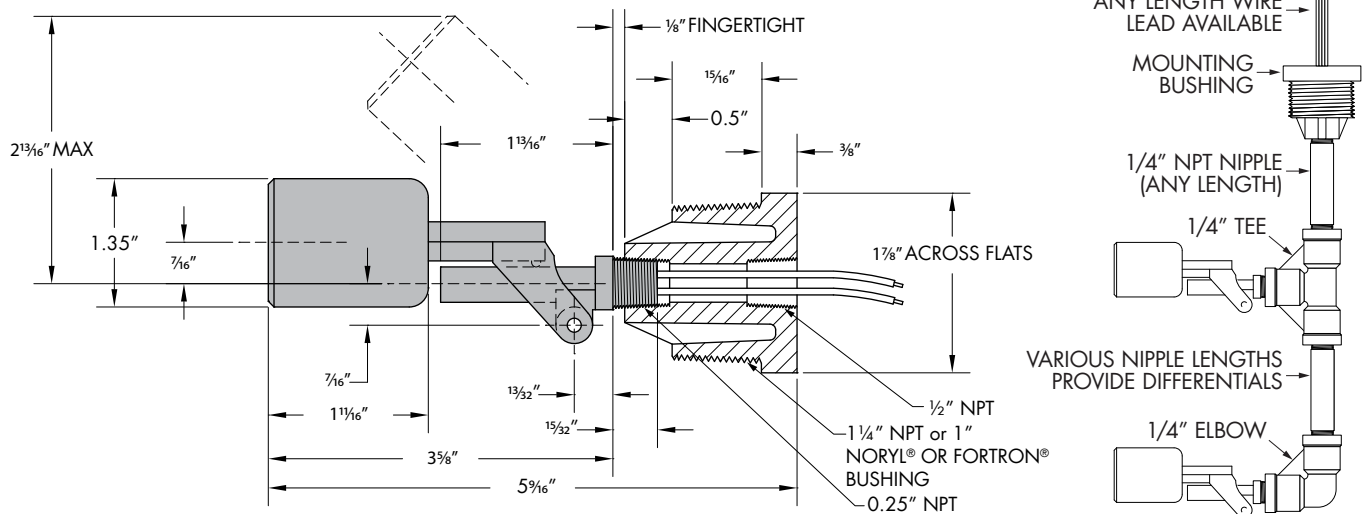
Top Mount: 0.9 Side Mount: 0.7

WORKING PRESSURE: 200 psi max. continuous

WORKING TEMPERATURE: 200°F max. continuous.

WETTED MATERIALS: Body, Float and Bushing: Fortron® (PPO) (40% glass fibers) Pivot Pin: HASTELLOY® C

INSTALLATION DIMENSIONS



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

CONTROLLER

MODEL CF-112

The CF-112 is a stand alone interface module that automatically actuates a chemical feed pump when primary bulk fluid begins to flow.

This module can be used in isolated stand alone systems or part of large complex systems.

Model CF-112 is available for 120VAC or 240VAC, 50-60 Hz power as standard.

Other AC and DC power combinations available per request.



KEY FEATURES

| | |
|--------------------|-------------------------------------|
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 250 psi (1.724 MPa) |
| Process Connection | ¾" NPT (½" Option Available) |
| Electrical Switch | SPNO |
| Voltages | 120V & 240V |
| Enclosure | NEMA 6 / IP 67 |

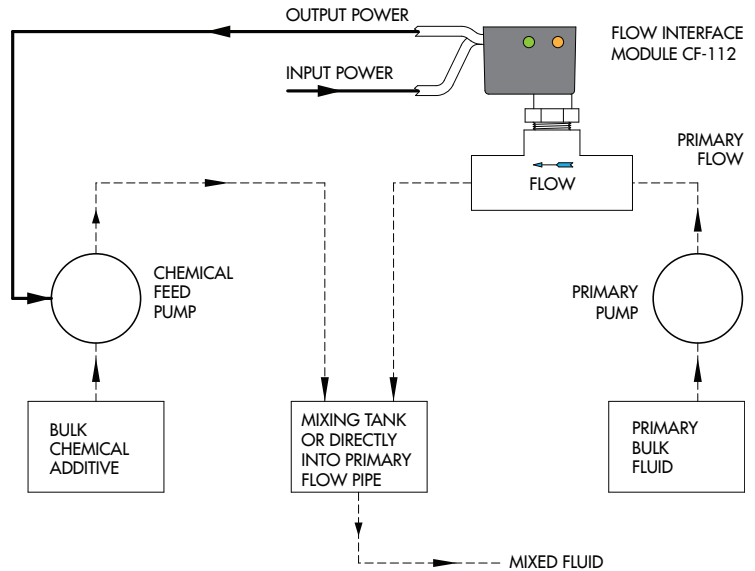
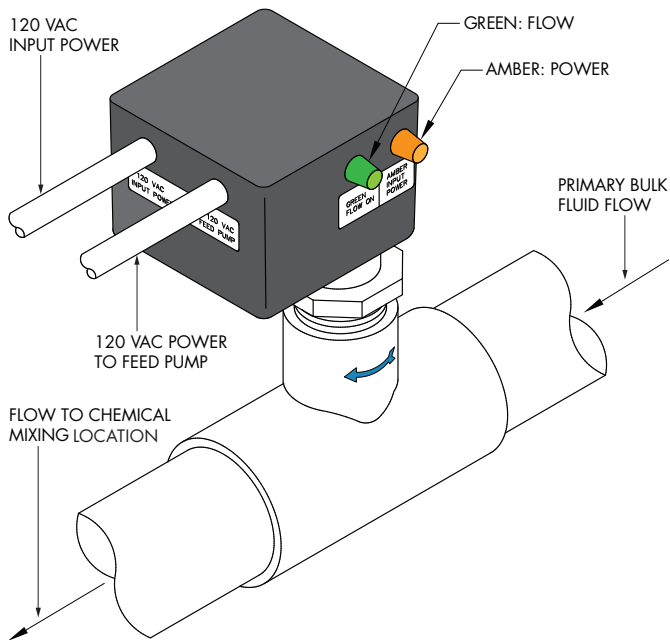
TYPICAL USES

For metering and/or adding chemicals in both continuous and batch fluid systems such as:

- Well Water
- Cooling Tower pH/orp Control
- Drinking Water
- Metal Plating Make Up Solutions
- Waste Fluid Processing
- Boiler Treatment Additives

ALSO SEE:
CF-112: Light Duty
CF-12: Medium Duty
CF-8: Heavy Duty

PRODUCT DIAGRAM



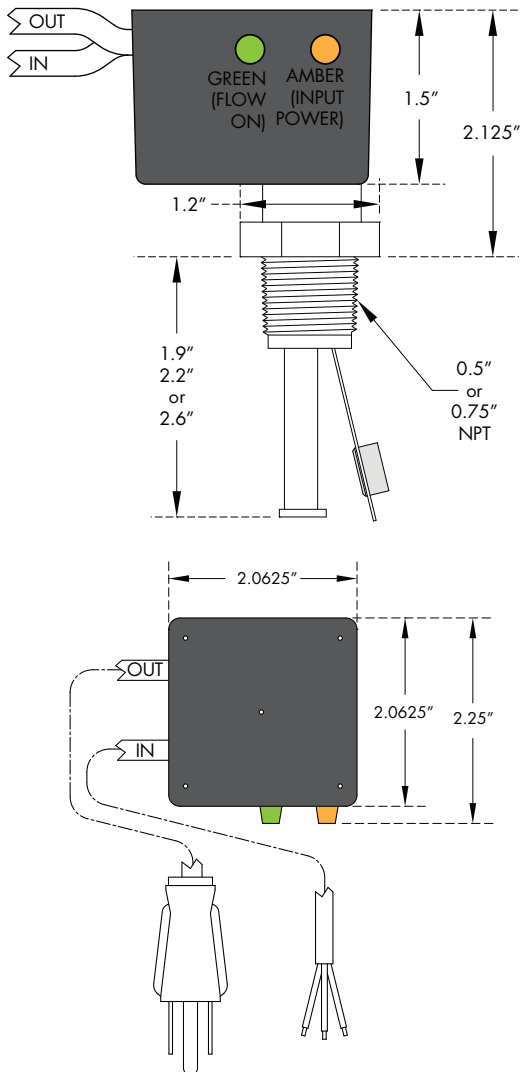
MODEL CF-112

| MODEL SELECTION CHART | | | |
|--|-------------------------------------|------|---------------------|
| Flow Range (Water calibrated at 70°F / 21°C) | | | |
| PRIMARY FLOW LINE SIZE | PRIMARY FLOW ON/OFF SET POINT (GPM) | | CF-112N PART NUMBER |
| | ON | OFF | |
| ¾" | 0.9 | 0.8 | CF-112N-.75 |
| 1" | 1.1 | 1.0 | CF-112N-1 |
| 1½" | 2.8 | 2.5 | CF-112N-1.5 |
| 2" | 4.9 | 4.4 | CF-112N-2 |
| 3" | 11.0 | 9.9 | CF-112N-3 |
| 4" | 19.6 | 17.6 | CF-112N-4 |
| 5" | 30.6 | 27.5 | CF-112N-5 |

Note: Consult factory for larger pipes and lower ON/OFF switch set points.

| SAMPLE PART NUMBER | | | |
|----------------------------|-----------|---------|--|
| OPTION 1: CF-112N | /PIPE | /VOLT | |
| BASE MODEL AND PART NUMBER | 1 | 120 | |
| | PIPE SIZE | VOLTAGE | |

INSTALLATION DIMENSIONS



WORKING PRESSURE

250 psi max. continuous

WORKING TEMPERATURE

180°F max. continuous.

SHOCK OPERATION

10g for 11ms with no contact open.

SHOCK LIMIT

10g

WETTED MATERIALS

Body and Bushing: Noryl® (PPO)
(10% glass fibers)

Blade: 316 stainless steel
Seal: Epoxy

ELECTRICAL SWITCH CHARACTERISTICS

Feed pump motor maximum contact ratings.

VOLTAGE: 120VAC, 220VAC

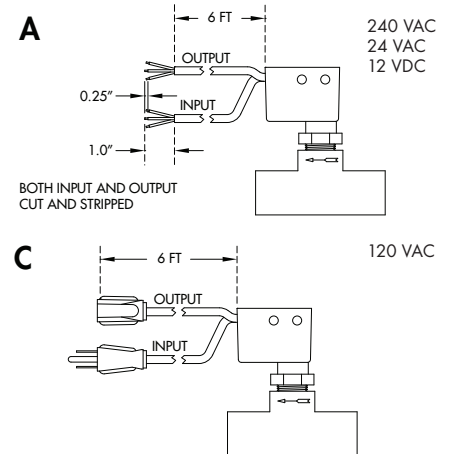
LOAD TYPE (RESISTIVE): 10A

MOTOR: ⅓ hp

SWITCH CONTACTS: SPNO

Consult factory for other AC motor voltages plus DC motor operation.

NOTE: All circuitry potted in flexible urethane for max. Long term shock, thermal, stress, and moisture protection.



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

CHEMICAL FEED CONTROLLER

MODEL CF-12/1G CF-12/2G

The CF-12 is a stand alone interface module that automatically actuates a chemical feed pump when primary bulk fluid begins to flow.

This module can be used in isolated stand alone systems or part of large complex systems.

Model CF-12 is available for 120VAC, 50-60 Hz power as standard.

Available with 1 or 2 sets of receptacles.



**12' 16/3 AWG
CORD LENGTH**

KEY FEATURES

| | |
|--------------------|-------------------------------------|
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 250 psi (1.724 MPa) |
| Process Connection | ¾" NPT (½" Option Available) |
| Electrical Switch | SPNO |
| Voltages | 120V 50/60 Hz |
| Enclosure | NEMA 3R / IP 14 |

TYPICAL USES

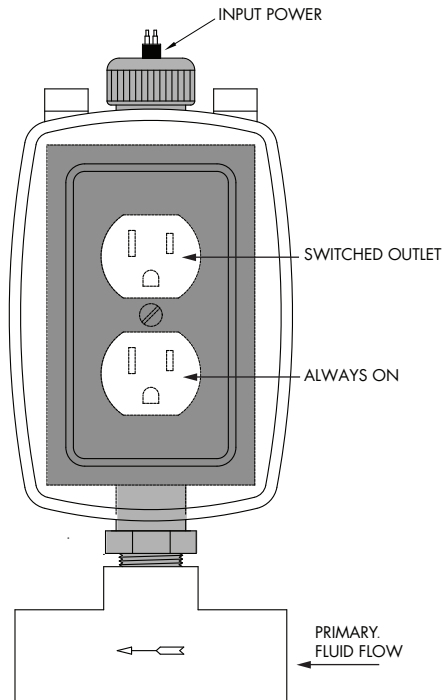
For metering and/or adding chemicals in both continuous and batch fluid systems such as:

- Well Water
- Drinking Water
- Waste Fluid Processing
- Cooling Tower pH/orp Control
- Metal Plating Make Up Solutions
- Boiler Treatment Additives

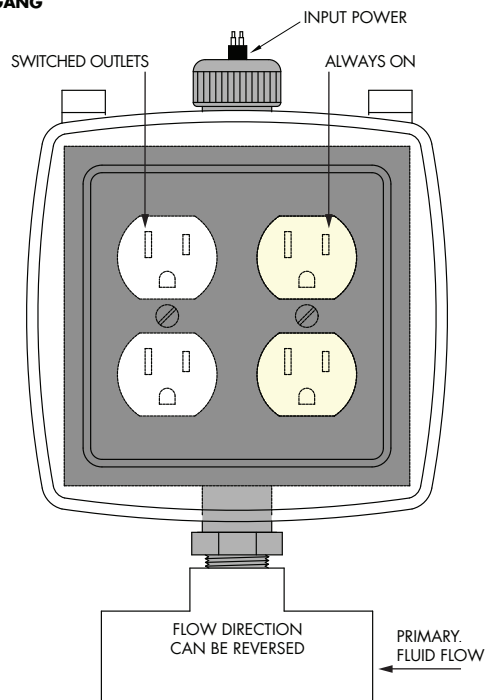
ALSO SEE:
CF-112: Light Duty
CF-12: Medium Duty
CF-8: Heavy Duty

PRODUCT DIAGRAM

1 GANG



2 GANG



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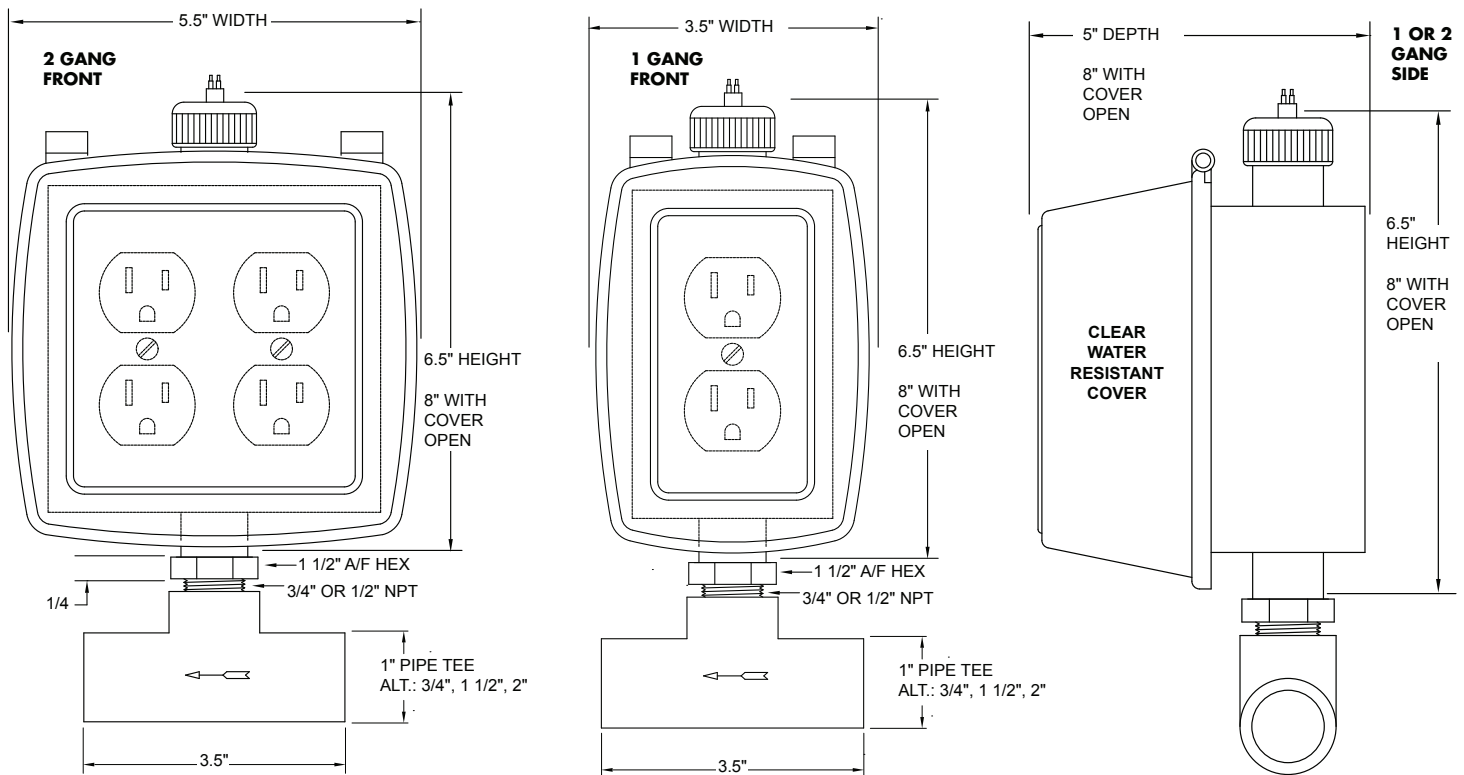
MODEL CF-12/1G CF-12/2G

| MODEL SELECTION CHART | | | |
|------------------------|-------------------------------------|------|--------------------|
| PRIMARY FLOW LINE SIZE | PRIMARY FLOW ON/OFF SET POINT (GPM) | | CF-12N PART NUMBER |
| | ON | OFF | |
| ¾" | 0.9 | 0.8 | CF-12N-.75 |
| 1" | 1.1 | 1.0 | CF-12N-1 |
| 1½" | 2.8 | 2.5 | CF-12N-1.5 |
| 2" | 4.9 | 4.4 | CF-12N-2 |
| 3" | 11.0 | 9.9 | CF-12N-3 |
| 4" | 19.6 | 17.6 | CF-12N-4 |
| 5" | 30.6 | 27.5 | CF-12N-5 |

Note: Consult factory for larger pipes and lower ON/OFF switch set points.

| SAMPLE PART NUMBER | | | |
|----------------------------|-----------|---------|--|
| OPTION 1: CF-12N | /PIPE | /VOLT | |
| BASE MODEL AND PART NUMBER | 1 | 120 | |
| | PIPE SIZE | | |
| | | VOLTAGE | |

INSTALLATION DIMENSIONS



WORKING PRESSURE

250 psi max. continuous

WORKING TEMPERATURE

180°F max. continuous.

SHOCK OPERATION

10g for 11ms with no contact open.

SHOCK LIMIT

10g

WETTED MATERIALS

Body and Bushing: Noryl® (PPO)
(10% glass fibers)
PVC Tee

Blade: 316 stainless steel
Seal: Epoxy

ELECTRICAL SWITCH CHARACTERISTICS

Feed pump motor maximum contact ratings.

VOLTAGE: 120VAC

LOAD TYPE (RESISTIVE): 13A

MOTOR: ½ hp

SWITCH CONTACTS: SPNO

- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

CHEMICAL FEED CONTROLLER

MODEL CF-8/1G CF-8/2G

The CF-8 is a stand alone interface module that automatically actuates a chemical feed pump when primary bulk fluid begins to flow.

This module can be used in isolated stand alone systems or part of large complex systems.

Model CF-8 is available for 120VAC, 50-60 Hz power as standard.

Available with 1 or 2 sets of receptacles.



12' 16/3 AWG
CORD LENGTH

ALSO SEE:

- CF-112: Light Duty**
- CF-12: Medium Duty**
- CF-8: Heavy Duty**

KEY FEATURES

| | |
|--------------------|-------------------------------------|
| Flow Range | 5 - 80 GPM (18-302 L/m) |
| Working Temp | 180°F (82°C) Maximum |
| Working Pressure | 100 psig @ 180°F (466°F kPa) |
| Process Connection | 1" NPT |
| Electrical Switch | SPDT, ½hp 13A or Dry Circuit |
| Enclosure | NEMA 3R / IP 14 |

TYPICAL USES

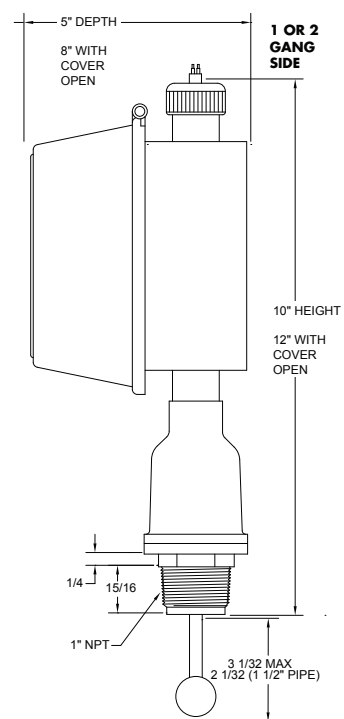
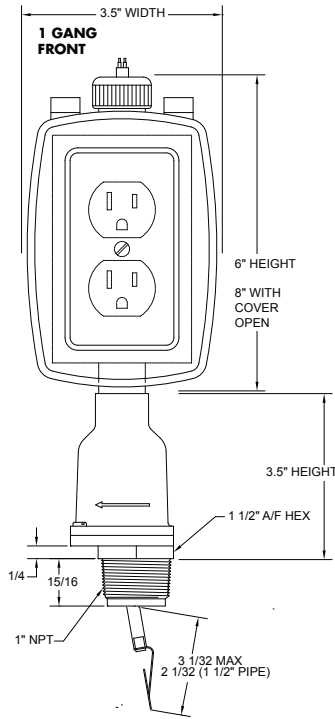
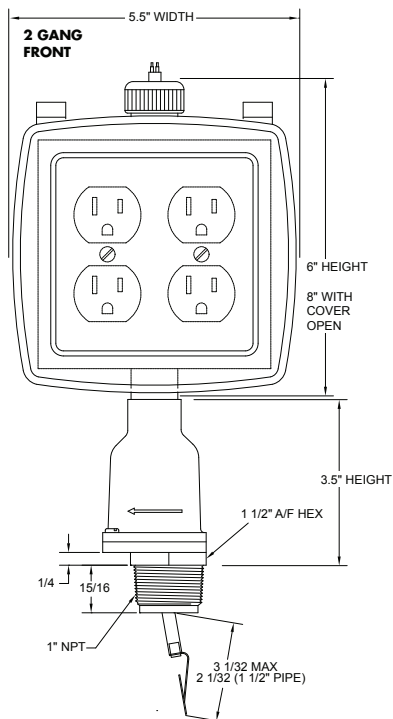
Monitoring fluid flow in:

- Air Conditioning Systems
- Cooling in Data Centers
- Chillers
- Fluid Blending Systems
- Natural Gas
- Industrial Refrigeration Systems
- Pools and Spas
- Scrubbers
- Water Treatment Systems

≈ TYPICAL WORKING FLUIDS

- Filtered Sewage Water
- Mild Acids
- Rusty Coolant Water
- Waste Water
- Contaminated Ground Water
- Sulfolane
- Sea Water
- Pool Water (low ppm Chlorine)

▲ INSTALLATION DIMENSIONS



541 Kinetic Drive
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Phone: (805) 988-6800
Fax: (805) 988-6804
Email: harwil@harwil.com

MODEL CF-8/1G CF-8/2G

| MODEL SELECTION CHART | | | |
|--|---|--------------|---------------|
| Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10% | | | |
| PIPE SIZE NPT | NOMINAL ON/OFF SWITCH POINT RANGE (GPM) | SHAFT LENGTH | PADDLE NUMBER |
| 1" | 5.0 - 3.0 | - | 10512 |
| | 9.6 - 7.5 | 1 | 2 |
| | 15.4 - 18.0 | 1 | 1 |
| 1 1/2" | 12.0 - 9.5 | - | 10502 |
| | 14.2 - 11.8 | 2 | 3 |
| | 19.0 - 13.5 | - | 10570A |
| | 22.5 - 19.0 | 2 | 2 |
| | 34.4 - 30.4 | 2 | 1 |
| 2" | 14.4 - 10.2 | - | 10593 |
| | 16.5 - 11.0 | - | 10566 |
| | 25.8 - 21.8 | 2 | 3 |
| | 39.8 - 33.6 | 2 | 2 |
| | 58.0 - 50.8 | 2 | 1 |
| 3" | 42.4 - 37.0 | 3 | 3 |
| | 55.6 - 49.8 | 3 | 2 |
| | 80.6 - 65.2 | 3 | 1 |

Call our customer support for a wider range of pipe sizes. (805) 988-6800

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ FLOW RATE TO ACTIVATE/DEACTIVATE SWITCH)

- ≈ 10% at upper end of flow range
- ≈ 30% at lower end of flow range

DIFFERENTIAL PRESSURE DROPS ACROSS UNIT

Under normal operating conditions:

- ≈ 1"-3" pipe, less than 0.5 psi
- ≈ 4"-10" pipe, negligible

WORKING LINE PRESSURE:

- 50 psi max., operating @ 180°F
- 100 psi max. non-operating @ 180°F
- Pressure over 50 psi can affect the switch point range

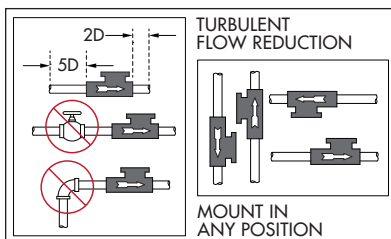
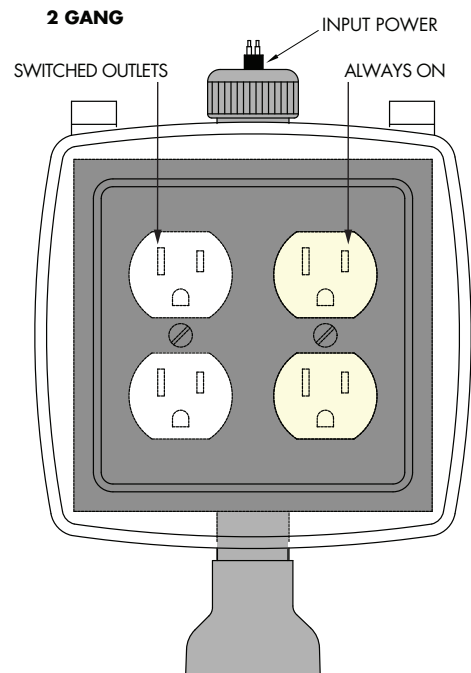
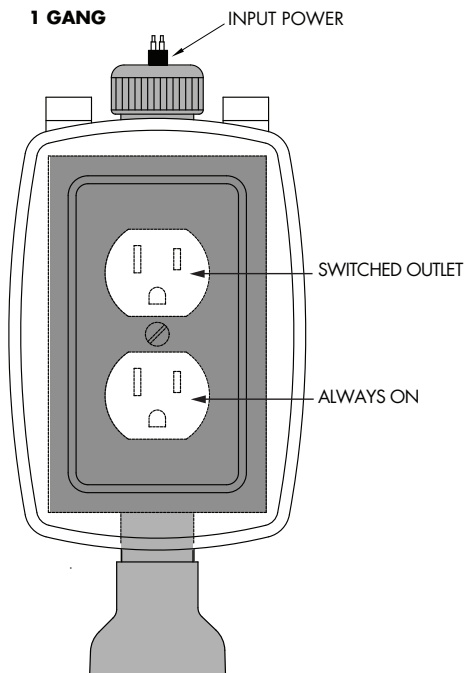
ELECTRICAL SWITCH CHARACTERISTICS

- SPDT 10,000,000 Operations Median
- 13A, 1/2 hp @ 125VAC
- 1/2A @ 125VDC (tungsten lamp load)

SAMPLE PART NUMBER

| | | | |
|--|----------------|----|----|
| | OPTION 1: CF-8 | /1 | /1 |
| | BASE MODEL | ↑ | ↑ |
| | SHAFT LENGTH | | |
| | PADDLE SIZE | | |

PRODUCT DIAGRAM



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

CONTROLLER

MODEL LC-1

The combination of any two Harwil liquid level switches and an electronic control module mounted in a weather-resistant box provide a ready-to-go system for the automatic filling or emptying of tanks or vessels.

System is composed of:

Electronic Latching/Unlatching Control Module

Special electronic module design eliminates false starts due to turbulent wave action.

NEMA 4/IP 66 weather resistant box with two standard 1/2" seal tight flexible conduit fittings.

A secondary 10A SPDT relay output is also provided.

Color coded w/ ring and labeled terminal strip.

120 or 240VAC 50/60 Hz models available.

30A DPST motor contactor output for driving 1 1/2 (120VAC)/3 hp (240VAC) pumps.

Choose from any two Harwil liquid level switch models.

Models for clean or contaminated fluids such as water, sea water, sewage, thin slurries, contaminated ground water, etc.

Models for strong acids, bases, hydrocarbons, alcohols, inorganic compounds, ketones, esters or ethers.

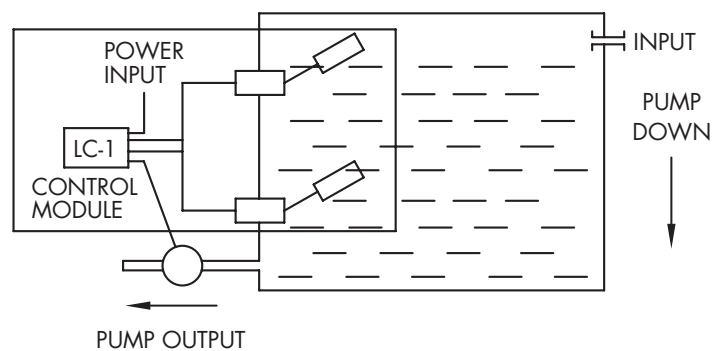
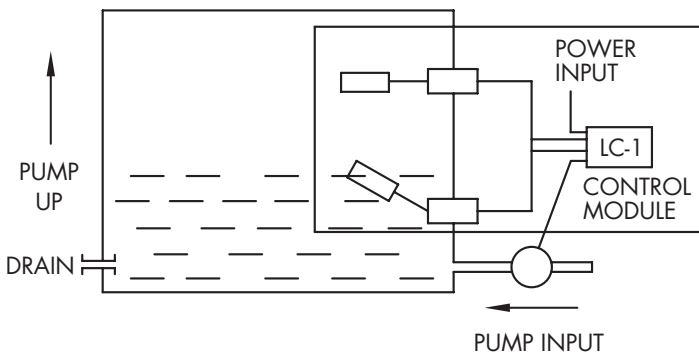
Each system is provided with a complete, descriptive parts list and an installation and wiring diagram for both level switches and control module.

Maintenance and check out requires only a standard multimeter.

LC-1 Control Module is delivered pre-wired and is ready to hook-up to control your liquid level.

Upper and lower level switches comprising any two of the following Harwil models:

L-5 **L-21**
LD-5 **L-30**
L-8 **L-40**



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| SAMPLE PART NUMBER | | | |
|-----------------------------|-------|-----|-------|
| OPTION 1: LC-1 | / L-5 | / 8 | / 120 |
| CONTROL MODULE | ↑ | ↑ | ↑ |
| LIQUID LEVEL SWITCH | | | |
| CABLE LENGTH | | | |
| 120VAC 50/60 HZ INPUT POWER | | | |

ELECTRONIC LATCHING CONTROL MODULE SPECIFICATIONS:

Operating Voltage (Input)
Voltage: 120 or 240VAC
Tolerance: ±15%
Frequency: 50/60 Hz

OUTPUT

Electromechanical relay
Form: Single pole double throw, isolated
Rating: 10A resistive at 240VAC

PROTECTION

Transient Protected
Dielectric Breakdown: 1500 volts RMS minimum between input, output and probe.

ENVIRONMENT

Operating Temperatures: -20°C to +55°C
Storage Temperatures: -20°C to +55°C
Coating: Printed circuit board is conformal coated to resist moisture and corrosion.

MOTOR CONTACTOR SPECIFICATIONS

OPERATING COIL

120VAC or 208-240VAC 50/60 HZ
Inrush: 31 VA
Continuous use: 7 VA
Pickup: 90VAC (120VAC Coil)
170VAC (208-240 VA Coil)

Coil Insulation: Class B
Coil Connections: Double Male ¼" quick connect
Maximum Ambient Temperature: 155°F

OUTPUT POWER CONTACTS

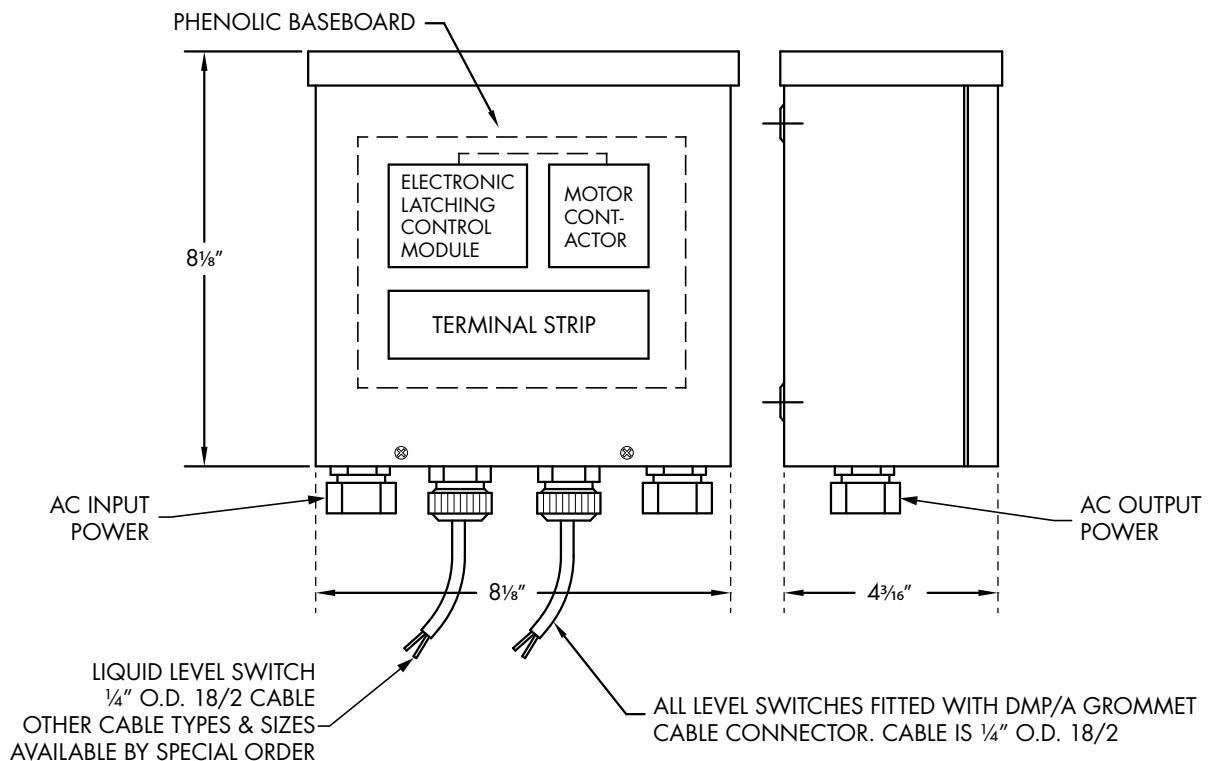
Type: DPST - Normally Open
Contact rating per pole:
Terminal Strip - 812 Series
Electrical Rating
Rated voltage - 1600 Volts RMS
Current rating - 30A
Wire Size
Will accommodate lugs for wire sizes AWG #14 to 12
Hardware
Screws and terminals - brass, nickel plated
Solder terminals - brass, hot-tinned
Molded Material
G.P. Phenolic (94V-0).

Complete operating instructions, mechanical and electrical installation drawing and a numbered parts list is supplied with each unit.

HOW TO ORDER:

Four items are required to order a complete control system:

1. Basic Model Number: LC-1
 2. Level Switch Model Number: Choose from 15 standard models.
 3. Length of cable in feet between control module
 4. Operating Voltage.
- and liquid level switches.
Standard cable is ¼" O.D. SVJ 18-2/90°C UL listed. Note: if customer is to supply cable, enter "O"



- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

CONTROLLER

MODEL SDC-101

THE PROBLEM

Failure to establish programmed flow after pump turn on signal has been applied.

Failure to maintain proper flow during normal operation due to line clogging, line rupture, incorrect valve positioning, etc.

THE SOLUTION

Insertion of an SDC-101 shut down control in the input power line of pumps, heaters, valves, etc., that are flow critical will interrupt power automatically upon loss of flow.

Power will remain off until the problem has been corrected and proper flow re-established.

Loss of pump prime is a persistent fluid system problem. A flow switch at the pump output is a viable solution, except that it presents a "catch 22"

situation, i.e. lack of flow at start up will not allow the flow switch to supply power to the pump. A manual push to start or automatic time delay relay switch in parallel with the flow switch is required to supply power to the pump motor during startup. After the pump is up to speed the parallel switch kicks out and the flow switch takes over flow monitoring. Model SDC-101 is provided with a parallel variable time delay relay switch/flow switch combination to provide pump protection during startup as well as the continuous phase of operation.

SDC-101 modules may be connected to monitor:

Critical points in simple one pump systems or, in series, with pumps, heaters, valves, etc., so that failure of any part will shut the whole system down.

Isolated or remote components and sub-systems.



TYPICAL USES

For use in:

| | |
|---------------------|----------------------------------|
| Chemical Processing | Sanitation |
| Food Processing | Aerospace ground support systems |
| Water Treatment | Mining |
| Agriculture | Transportation |

ADDITIONAL FEATURES:

Continuous adjustment of time delay cycle.

120/240VAC and DC power options

Rain resistant housing for rugged, industrial usage

Can be used in mobile vehicles, ships, trains, etc.

OPERATIONAL FEATURES:

Supplied pre-wired and ready for immediate installation

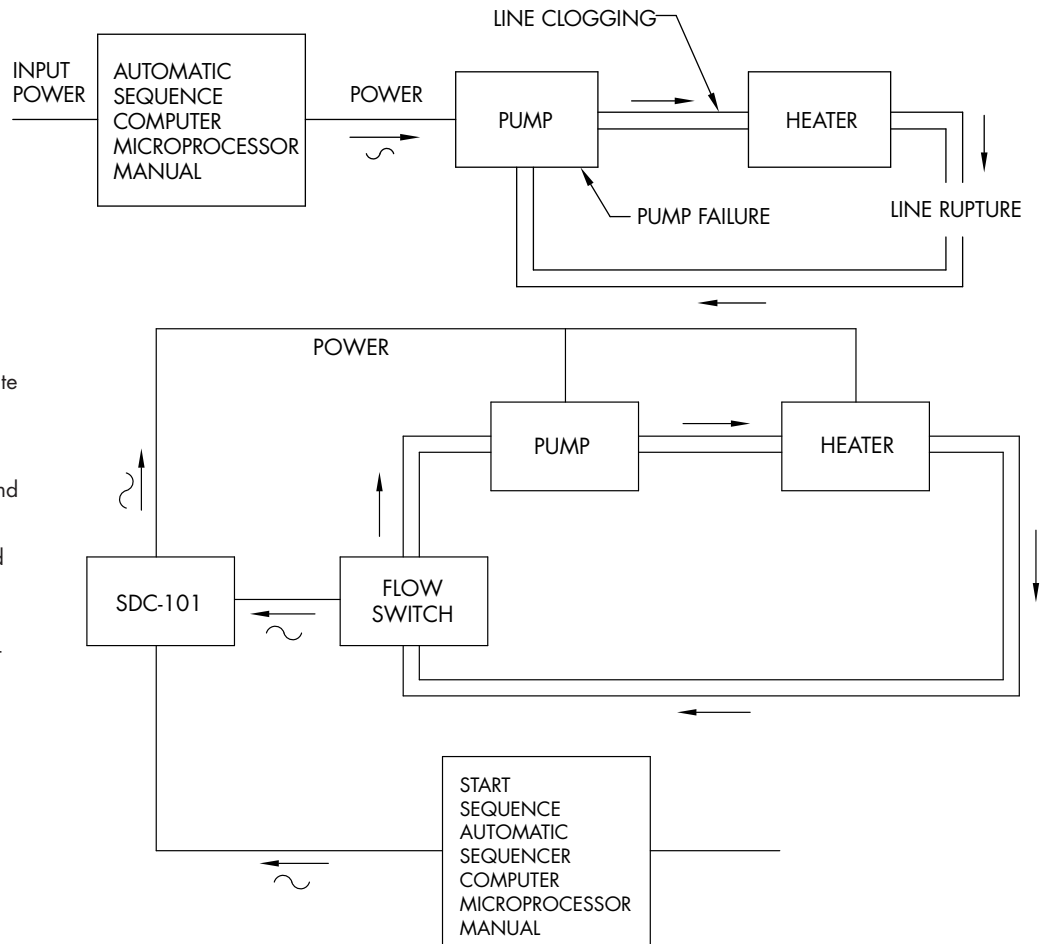
All components UL listed or recognized

Input and output power lines are quickly and easily attached to 30A terminal block

Terminal block positions are numbered and wiring is color coded for easy, fast and accurate installation and servicing.

Performance checks are quick and straightforward using an uncomplicated, standard multimeter.

Enclosure: NEMA 4 / IP 66.



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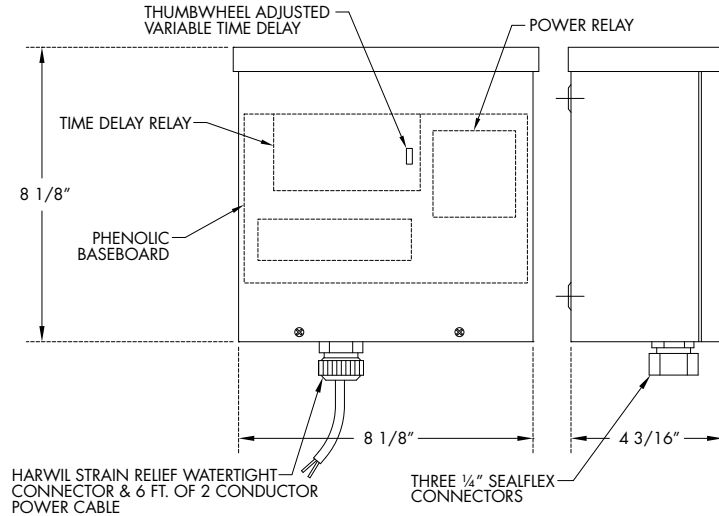
Phone: (805) 988-6800
Fax: (805) 988-6804
Email: harwil@harwil.com

SPECIFICATIONS:

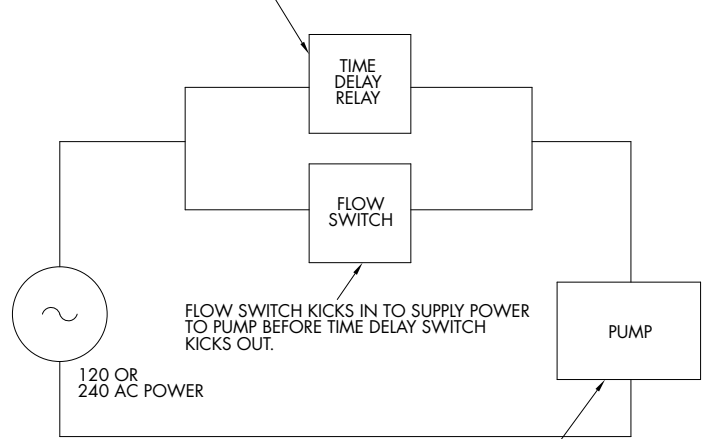
Control Box

Rain resistant type 3R - UL listed.

MODEL SDC-101



POWER IS SUPPLIED TO THE PUMP IMMEDIATELY ON START UP. THE TIME DELAY IS ALSO INITIATED WHICH THEN OPENS THE PARALLEL BYPASS SWITCH AT END OF THE DELAY PERIOD.



IF PUMP FAILS TO INITIATE FLOW ON START UP, PUMP POWER IS IMMEDIATELY SHUT OFF. IF PUMP IS ESTABLISHED AT START UP BUT IS LOST AT A LATER TIME, PUMP POWER IS SHUT OFF.

TIME DELAY RELAY

Operation

When rating voltage is applied to the input, the timing cycle begins and the DPDT relay is activated. At the end of the timing cycle, the relay is de-activated and remains in that condition until power is removed from the input. Switching off and then turning on of input power re-starts the timing cycle. This timing sequence will repeat each time the system is turned on.

- Input Voltage - 120/240VAC, 50/60 Hz
- Output Contact Arrangement - DPDT
- Contact Rating
- 10A, 1/2 hp @ 120/240VAC, 50/60 Hz
- Standard Time Cycle
- 1 to 180 sec., Continuously adjustable
- Ambient Operating Temp. Range -5° to 140°F
- Termination - 1/4" quick disconnect terminals

MOTOR CONTACTOR SPECIFICATIONS

OPERATING COIL

- 120VAC or 208-240VAC 50/60 Hz
- Inrush: 31 VA
- Continuous Use: 7 VA
- Pickup: 90VAC (120VAC Coil)
- 170VAC (208 VA Coil)
- Coil Insulation: class B
- Coil Connections: Double Male 1/4" quick connect
- Maximum Ambient Temperature: 155°

OUTPUT POWER CONTACTS

- Type: DPST - Normally Open
- Contact rating per pole.

SWITCH PERFORMANCE DATA

Refer to manufacturer's specification sheets for information regarding performance of:

- Harwil Fluid Flow switches
- Harwil Air Flow switches
- Pressure switches
- Motion Limit switches
- Proximity Switches, etc. which may be used in conjunction with, but are not included with, the SDC-101 module.

Complete operating instructions. Mechanical and Electrical installation drawing and a numbered parts list is supplied with each unit.

Super-simple maintenance and checkout for personnel using a standard test meter.

Terminal Strip - 812 Series

ELECTRICAL RATING

- Rated voltage - 1600 Volts RMS
- Current rating - 30A

WIRE SIZE

- Will accommodate lugs for wire sizes AWG #14 to #12

HARDWARE

- Screws and terminals - brass, nickel plated
- Solder terminals - brass, hot-tinned

MOLDED MATERIAL

- G.P. phenolic (94V-0).
- UL Recognized

- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

WIRELESS SWITCH CONTROLLERS



Eliminate the cost of installing and maintaining wires between any switch and the device it controls.

KEY FEATURES

| | |
|------------------------------------|-----------------------------------|
| Radio Frequency | 2.4Ghz |
| RF Input/Output Impedance | 50 OHM NOMINAL |
| Transmitter/Receiver Code Matching | FACTORY SET |
| Wire Connection | TERMINAL BLOCKS |
| Operating Temperature | -10 TO 130°F (-23 TO 54°C) |
| Enclosure | NEMA 6 / IP 67 |

- Wireless Bridge Between Dry-contact Switch & Relay Controller
- Sold As Transmitter/Receiver Factory Match Set: No Field Programming
- Up To 1000 Feet Typical Transmit/Receive Distance (Line-of-Sight)
- License Free Point-to-point Radio Operation
- Microprocessor Sleep Function Provides Long battery Life
- Any Dry-Contact Flow or Level Switch Will Activate and Send Signals
- Connect Two Level Switches For Pump Up or Pump Down Operation
- Relay Board Features User Selectable Latching or Non-Latching Option
- Switch Transmitter Board Can Be Hard wired or Battery Powered
- Relay Board Can Be 15-24 Vdc or 120/240 Vac Powered
- Point-to-point Operation Via Standard 2.4 GHz License Free ISM Band
- Provides Two Independent Switch/Relay Control Circuits.
- 15 Amp, 120/240 Vac Relay Capacity For Switching Pump, Motor or Valve
- RF Strength Meter Aids In Finding Optimum Installation Location
- Low Battery LED Indicates Switch Transmitter Battery Needs Replacing

REGULATORY APPROVALS

Regulatory: FCC Part 15 (No license required)

FCC(USA): OUR-XBEEPRO

IC (Canada): 4214A-XBEEPRO

This enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

REGULATORY APPROVALS

SWITCH TRANSMITTER SPECIFICATIONS

Input Signal: Dry-Contact Switch (2 Ea.)

RF Power Output: 63mW

RF Data Rate: 250 Kbps

OPERATING POWER

Hard Wired DC Supply: 9-24Vdc @ 300mA

Battery Powered: 3V, Alkaline C-cells (3 Ea.)

RELAY RECEIVER SPECIFICATIONS

Receive Sensitivity: -100 dBm

OPERATING POWER

Hard Wired DC Supply: 15-24Vdc @ 500mA

Hard Wired AC Supply: 120/240VAC 50/60Hz @ 12 Watts

CONTROL RELAYS

Relay 1: SPDT, 15A 120/240VAC

Relay 2: SPDT, 10A 120/240VAC

Latching/Non-latching: User Selectable

For Pump Up/Pump Down Liquid Level Control



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EPOXY AND PTFE COATINGS OF FLUID FLOW AND LIQUID LEVEL SWITCHES

LONG-TERM PROTECTIVE COATINGS

All metal wetted materials of our fluid flow switches (Models Q-1, Q-4E, Q-5, Q-5SS, QD Series) and liquid level switches (Models L-5, L-5SS, LD series) are now available with baked on epoxy or PTFE (Polytetrafluoroethylene)* coatings.

PTFE coatings are similar to the non-stick coatings commonly found on household cookware, from spoons to frying pans. These plastic coated surfaces provide greater long-term protection against chemical corrosive attack of virgin metal substrate, such as brass, 316 Stainless, or HASTELLOY® C.

Plastic coated surfaces also provide protection on the other end of the scale, (e.g. leaching of alloy components from brass by ultra-pure water). The coating of low cost substrate metals to provide superior chemical resistance is thus a cost effective solution of special situations where all plastic or exotic metal solutions are not available at any reasonable price, or time scale. These epoxy and PTFE coatings provide increased protection against:

- Chloric Acid
- Chromic Acid
- Contaminated Water
- Ferric Chloride
- Gasoline
- Hydrocarbons
- Hydraulic Acid
- NaOH
- Nitric Acid
- Sea Water
- Sewage
- Skydrol
- Sulfuric Acid
- Ultra-Pure Water
- Waste Waters

COATINGS AVAILABLE

Everlube 6108 thermal cured PTFE.
Everslik 1201 thermal cured epoxy.

PIN HOLES AND SCRATCHES

All coating of metal substrate for corrosion protection from automobiles to super tankers is subject to imperfections such as pin holes and scratches. Diligent adherence to mil spec quality procedures and careful handling minimizes these effects.

DELIVERY

A small quantity (10 to 50) of epoxy coated parts of all standard models are normally in stock for immediate delivery. Larger quantities of epoxy and PTFE coated parts are normally available within 4-6 weeks.

HOW TO ORDER

All standard fluid flow and liquid level switch models with exposed metal surfaces are available with EPOXY or PTFE coating of these surfaces. Adding EC (epoxy coating) or PTFE to the end of a model number is all that is required.

EXAMPLES

UNCOATED MODEL NO: Q-1 / 3 / F
UNCOATED MODEL NO: L-30CR / A

COATED MODEL NO: Q-1 / 3 / F / EC
COATED MODEL NO: L-30CR / A / PTFE

WARRANTY

The Epoxy Coating No. 1201 & PTFE Coating No. 6060 are guaranteed to be applied per mil spec procedures. Coatings cannot be guaranteed to be free of pin holes and scratches, however all coatings are subject to written QC procedures and are 100% visually inspected for pin holes and scratches. All units with visible pin holes and scratches are rejected.

CHEMICAL RESISTANCE CHART FOR VARIOUS PUMP MATERIALS

The recommendations listed on the following pages are based upon information from material suppliers and careful examination of available information and are believed to be accurate. However, since the resistance of metals, plastics, and elastomers can be affected by concentration, temperature, presence of other chemicals and other factors, this information should be considered as a general guide rather than an unqualified guarantee. Ultimately the customer must determine the suitability of the pump used in various solutions.

All recommendations assume ambient temperatures unless otherwise noted. The ratings for these materials are based upon the chemical resistance only. Added consideration must be given to pump selections when the chemical is abrasive, viscous in nature, or has a specific gravity greater than 1:1.

How to use this chart: Column at left lists chemicals in alphabetic order. Columns at right list various pump materials, and their resistance to the chemicals are rated by a letter code.

Chemical Effect Ratings

A – NO EFFECT - ACCEPTABLE

B – MINOR EFFECT - ACCEPTABLE

C – MODERATE EFFECT - QUESTIONABLE

D – SEVERE EFFECT - NOT RECOMMENDED

*** – NOT TESTED**

FOOTNOTES

1. P.V.C. - Satisfactory to 72°F
2. Polypropylene - Satisfactory to 72°F
3. Polypropylene - Satisfactory to 120°F
4. Buna-N - Satisfactory for "O" Rings
5. Polyacetal - Satisfactory to 72°F
6. Ceramag - Satisfactory to 72°F

The performance comments and limitations listed above are supplied by Harwil Corporation for information only. Ultimately the customer must determine the suitability of Harwil Corporation products used in various solutions, situations and environments.

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|-------------------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| A | | | | | | | | | | | | | | | | |
| Acetaldehyde ⁵ | A | A | B | A | A | D | * | D | A | * | B | A | D | B | B | A |
| Acetamide | B | A | * | * | * | * | * | * | * | * | * | * | A | A | A | A |
| Acetate Solv. ² | B | A | B | * | * | A | C | B | A | * | D | * | D | D | * | A |
| Acetic Acid, Glacial ¹ | B | A | B | A | A | C | C | C | A | C | B | A | D | D | B | B |
| Acetic Acid 20% | B | A | * | A | A | * | C | B | A | A | A | A | A | C | * | B |
| Acetic Acid 80% | B | A | * | A | A | * | C | D | A | B | B | * | A | C | * | B |
| Acetic Acid | B | A | B | A | A | C | C | A | A | A | A | A | C | C | B | A |
| Acetic Anhydride | A | A | B | A | A | C | D | D | A | D | A | A | D | A | B | A |
| Acetone ⁶ | A | A | A | A | A | A | A | D | A | D | B | A | D | D | A | B |
| Acetyl Chloride | C | A | * | * | * | D | * | * | A | * | * | A | A | * | * | A |
| Acetylene ² | A | A | A | B | * | B | * | B | * | * | D | A | A | A | A | A |
| Acrylonitrile | A | C | B | B | B | A | * | * | * | * | B | A | C | D | D | A |
| Alcohols | | | | | | | | | | | | | | | | |
| Amyl | A | A | C | A | A | A | B | A | A | C | B | A | A | A | A | A |
| Benzyl | A | A | B | A | A | A | C | D | * | A | A | * | A | D | B | A |
| Butyl | A | A | B | B | A | B | C | A | A | A | B | A | A | A | A | A |
| Diacetone ² | A | A | A | A | A | A | C | D | * | A | D | * | D | D | A | A |
| Ethyl | A | A | B | A | A | A | C | A | * | A | A | * | A | A | B | A |
| Hexyl | A | A | A | A | A | A | C | * | * | A | A | * | A | A | A | A |
| Isobutyl | A | A | B | A | A | A | C | * | * | A | A | * | A | C | A | A |
| Isopropyl | A | A | B | A | A | A | C | * | * | A | A | * | A | C | A | A |
| Methyl ⁶ | A | A | B | A | A | A | C | B | A | A | A | * | C | B | A | A |
| Octyl | A | A | A | A | A | A | C | * | * | A | * | * | A | B | A | A |
| Propyl | A | A | A | A | A | A | * | A | A | A | A | * | A | A | A | A |
| Aluminum Chloride 20% | D | C | B | A | A | D | * | A | * | A | A | A | A | A | A | A |
| Aluminum Chloride | D | C | D | C | A | C | * | A | A | A | A | A | A | A | * | A |
| Aluminum Fluoride | D | C | * | D | B | * | * | A | A | A | A | * | A | A | * | A |
| Aluminum Hydroxide ⁶ | A | A | A | * | * | A | * | A | A | A | A | * | A | A | * | A |
| Alum Potassium Sulfate (Alum), 10% | A | * | A | * | B | * | * | A | A | * | * | * | A | * | * | A |
| Alum Potassium Sulfate (Alum), 100% | D | A | B | * | B | C | * | A | A | A | A | * | A | A | * | A |
| Aluminum Sulfate | C | C | A | A | A | C | C | A | A | A | A | A | A | A | A | A |
| Amines | A | A | A | B | A | B | * | C | A | B | * | * | D | D | B | A |
| Ammonia 10% | * | A | * | A | A | * | * | A | A | A | A | A | A | D | * | B |
| Ammonia, Anhydrous | B | A | B | B | A | D | * | A | A | A | A | B | D | B | A | A |
| Ammonia, Liquids | A | A | D | * | B | D | * | A | A | A | A | * | D | B | A | A |
| Ammonia, Nitrate | A | A | C | * | * | D | * | B | * | A | A | * | * | A | * | A |
| Ammonium Bifluoride | C | A | D | * | B | * | * | A | * | A | A | * | A | A | * | A |
| Ammonium Carbonate | A | A | C | A | B | B | * | A | A | A | A | * | B | D | A | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORYL | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|---------------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| Ammonium Casenite | * | A | * | * | * | * | * | * | * | A | * | * | * | * | * | A |
| Ammonium Chloride | A | C | C | D | A | D | C | A | A | A | A | A | A | A | A | A |
| Ammonium Hydroxide | A | A | C | A | A | D | D | A | A | A | A | A | B | B | A | A |
| Ammonium Nitrate | A | A | B | A | A | D | D | A | A | A | A | A | D | A | A | A |
| Ammonium Oxalate | A | A | * | * | A | * | * | * | * | * | * | * | * | A | * | A |
| Ammonium Persulfate | A | A | C | C | A | A | * | A | A | A | A | * | C | A | A | A |
| Ammonium Phosphate, Dibasic | A | A | B | A | A | C | * | A | A | A | A | * | A | A | A | A |
| Ammonium Phosphate, Monobasic | A | A | B | A | A | D | * | A | A | A | A | * | A | A | A | A |
| Ammonium Phosphate, Tribasic | A | A | B | A | A | C | * | A | A | A | A | * | A | A | A | A |
| Ammonium Sulfate | D | B | B | A | A | B | C | A | A | A | A | A | D | A | A | A |
| Ammonium Thio-Sulfate | * | A | * | A | * | * | * | * | * | * | * | * | * | A | * | A |
| Amyl-Acetate | A | A | B | A | A | C | * | D | A | D | D | A | D | D | A | A |
| Amyl Alcohol | A | A | B | A | A | A | * | A | A | C | A | * | B | B | A | A |
| Amyl Chloride | C | B | D | * | A | A | * | D | A | D | D | * | A | D | D | A |
| Aniline | A | A | C | A | B | C | * | D | A | D | B | A | C | D | B | A |
| Anti-Freeze | A | A | A | * | A | B | B | A | A | A | A | A | A | A | A | A |
| Antimony Trichloride | D | D | D | C | A | * | * | A | A | * | * | * | A | * | * | A |
| Aqua Regia (80%, HCl, 20%, HNO) | D | D | D | A | D | D | * | D | A | D | C | * | C | D | D | D |
| Arochlor 1248 | * | * | * | * | * | * | * | * | * | D | * | * | A | D | B | A |
| Aromatic Hydrocarbons | * | A | A | * | * | A | * | D | * | D | * | * | A | D | D | A |
| Arsenic Acid | A | A | D | * | * | D | B | A | A | A | A | * | A | A | * | A |
| Asphalt | B | A | C | * | * | A | * | A | * | * | A | A | A | B | D | A |

B

| | | | | | | | | | | | | | | | | |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium Carbonate | A | A | B | A | A | B | * | A | A | A | A | * | A | A | * | A |
| Barium Chloride | D | A | D | A | A | B | * | A | A | A | A | A | A | A | A | A |
| Barium Cyanide | * | A | * | * | * | C | * | * | * | * | * | * | A | C | A | A |
| Barium Hydroxide | C | A | D | B | B | B | * | A | A | A | A | A | A | A | A | A |
| Barium Nitrate | A | A | * | A | * | D | * | B | * | A | * | * | A | A | A | B |
| Barium Sulfate | A | A | D | A | A | C | * | A | A | A | A | A | A | A | A | B |
| Beet Sugar Liquids | A | A | A | * | * | A | B | A | A | A | A | * | A | A | A | A |
| Benzaldehyde ³ | A | A | B | A | A | A | * | D | A | D | D | A | D | D | A | A |
| Benzene ² | A | A | B | A | B | B | A | D | A | D | D | A | A | D | D | A |
| Benzoic Acid ² | A | A | B | A | A | B | * | A | A | A | D | * | A | D | D | A |
| Benzol | A | A | B | A | A | B | A | D | A | D | A | * | D | D | * | A |
| Borax (Sodium Borate) | A | A | C | B | A | A | B | A | A | A | A | A | A | B | A | A |
| Boric Acid | A | A | B | A | A | B | C | A | A | A | A | * | A | A | A | A |
| Brewery Slop | * | A | * | * | * | A | * | * | * | * | * | * | A | A | * | A |
| Bromine ² (wet) | D | D | D | A | A | C | * | B | A | D | D | D | A | D | D | C |
| Butadiene | A | A | A | * | * | C | A | A | A | * | * | B | A | A | A | A |
| Butane ^{2 1} | A | A | A | * | * | A | A | A | A | D | D | A | A | A | D | A |
| Butanol | A | A | A | * | A | A | * | * | A | * | * | * | * | * | * | * |
| Butter | B | A | A | * | * | D | * | * | * | B | * | * | A | A | A | A |
| Buttermilk | A | A | A | * | * | D | * | * | A | A | * | * | A | A | * | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORYL | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|----------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| Butylene | B | A | A | * | * | A | A | B | A | * | * | A | A | B | D | A |
| Butyl Acetate ¹ | * | C | A | * | A | A | * | D | A | D | D | A | D | B | B | A |
| Butyric Acid ¹ | B | A | B | A | A | C | * | B | A | A | A | * | D | D | B | A |
| Butyl Acetate | B | A | C | A | A | C | * | A | A | A | A | * | A | A | * | * |
| Butyric Acid | A | A | C | A | A | C | * | A | A | A | A | * | A | A | * | A |

C

| | | | | | | | | | | | | | | | | |
|-------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium Bisulfate | D | A | D | * | * | D | D | A | A | * | * | * | A | A | * | A |
| Calcium Bisulfide | * | B | C | A | A | C | * | A | A | A | A | * | A | A | D | A |
| Calcium Bisulfite | B | A | C | A | A | C | * | A | A | A | A | * | A | A | * | * |
| Calcium Carbonate | A | A | C | A | A | C | * | A | A | A | A | * | A | A | * | A |
| Calcium Chlorate | B | A | * | B | B | C | * | A | A | * | * | * | A | * | * | A |
| Calcium Chloride | A | D | C | A | A | B | * | A | A | A | A | A | A | A | A | A |
| Calcium Hydroxide | A | A | C | A | A | B | * | A | A | A | A | * | A | A | A | A |
| Calcium Hypochlorite | D | C | C | A | B | D | * | D | A | A | A | * | A | B | A | A |
| Calcium Sulfate | A | A | B | A | B | B | * | A | A | A | A | A | A | A | * | A |
| Calgon | A | A | * | * | * | C | * | * | * | A | A | * | A | A | * | A |
| Cane Juice ² | A | A | B | * | * | B | C | A | * | * | D | * | * | A | * | A |
| Carbolic Acid (See Phenol) | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| Carbon Bisulfide ² | A | A | A | * | * | C | * | D | * | * | D | * | A | D | D | A |
| Carbon Dioxide (wet) | A | A | C | * | A | C | C | * | A | * | * | * | * | * | * | * |
| CarbonDisulfide ² | B | A | C | * | * | C | C | D | A | D | D | A | A | D | D | A |
| Carbon Monoxide | A | A | A | * | * | * | * | A | * | B | A | * | A | A | A | A |
| Carbon Tetrachloride ^{2 1} | B | B | C | A | A | C | A | C | A | D | D | C | A | C | * | C |
| Carbonated Water | A | A | A | * | * | B | * | A | * | A | A | * | A | A | A | A |
| Carbonic Acid | A | B | A | * | A | B | * | A | A | A | A | * | A | B | A | A |
| Catsup | A | A | D | * | * | C | * | A | * | A | A | * | A | A | * | A |
| Chloracetic Acid ² | D | D | C | A | A | D | * | A | A | * | D | * | D | D | B | B |
| Chloric Acid | D | D | * | * | * | * | * | D | A | * | * | * | * | D | * | D |
| Chlorinated Glue | A | A | D | * | * | C | * | * | * | C | * | * | A | C | B | A |

Chlorine

| | | | | | | | | | | | | | | | | |
|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anhydrous Liquid | D | D | D | D | A | D | * | D | A | A | D | C | A | D | B | B |
| Chlorine (dry) | A | A | D | D | A | A | B | * | A | * | * | C | D | * | * | D |
| Chlorine Water | * | D | D | A | B | D | D | A | A | C | D | C | A | D | * | * |
| Chlorobenzene (Mono) | A | A | B | * | A | B | * | D | A | D | D | A | A | D | D | A |
| Chloroform | A | A | D | A | A | B | * | D | A | D | D | C | A | D | D | A |
| Chlorosulfonic Acid ¹ | D | * | D | A | B | D | * | C | A | D | D | D | D | D | D | C |
| Chlorox (Bleach) | A | A | C | * | A | A | * | A | A | A | D | C | A | C | B | A |
| Chocolate Syrup | A | A | A | * | * | * | * | * | * | * | * | A | A | * | A | A |
| Chromic Acid 5% | A | A | C | A | A | D | D | A | * | C | A | A | A | D | A | B |
| Chromic Acid 10% | B | * | * | A | A | * | D | A | A | A | A | * | A | D | * | C |
| Chromic Acid 30% | B | * | * | A | A | * | D | A | A | D | A | * | A | D | * | D |
| Chromic Acid 50% | B | B | C | A | A | D | D | B | A | D | B | B | A | D | A | C |
| Cider | A | A | B | * | * | A | * | A | * | A | * | * | A | A | * | A |
| Citric Acid | A | A | C | A | A | D | C | A | A | A | B | * | A | D | A | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORYL | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|-------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| Citric Oils | A | A | C | * | * | B | * | * | * | A | A | * | A | A | * | A |
| Coffee | A | A | A | * | * | B | * | * | A | A | A | * | A | A | * | A |
| Copper Chloride | D | D | D | A | A | D | * | A | A | A | A | A | A | A | A | A |
| Copper Cyanide | A | A | D | A | A | C | * | A | A | A | A | B | B | A | C | A |
| Copper Florobate | D | D | D | * | B | D | * | A | A | * | * | * | A | B | * | A |
| Copper Nitrate | A | A | D | A | A | D | * | A | A | A | A | * | A | A | * | A |
| Copper Sulfate (5% Sol) | A | A | D | A | A | D | D | A | A | A | A | A | A | A | * | A |
| Copper Sulfate | B | * | * | A | A | C | D | A | A | A | A | * | B | B | A | A |
| Cream | A | A | A | * | * | C | * | * | * | A | A | * | A | A | * | A |
| Cresols ² | A | A | B | * | * | D | C | D | * | * | C | A | D | D | D | A |
| Cresylic Acid | A | A | C | A | B | C | * | B | A | * | * | * | A | D | D | A |
| Cyclohexane | A | * | A | A | * | A | * | * | * | D | D | A | A | A | D | A |
| Cyanic Acid | A | * | * | * | * | * | * | * | * | * | * | * | * | C | * | A |

| D | | | | | | | | | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Detergents | A | A | A | * | * | A | * | A | * | A | A | A | A | A | A | A |
| Dichlorethane | A | A | * | * | A | * | * | D | A | * | * | * | B | * | * | A |
| Diesel Fuel | A | A | A | * | * | A | * | * | * | D | D | A | A | A | D | A |
| Diethylamine | A | * | A | * | * | A | * | D | A | B | C | * | D | B | B | A |
| Diethylene Glycol | A | * | * | * | * | A | * | * | * | A | * | * | A | A | A | A |
| Diphenyl Oxide | A | * | * | * | * | A | * | * | * | * | * | * | A | D | D | A |
| Dyes | A | A | B | * | * | C | * | * | * | A | * | * | A | * | * | A |

| E | | | | | | | | | | | | | | | | |
|---------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Epsom Salts (Magnesium Sulfate) | A | A | A | A | B | B | * | A | * | A | A | * | A | A | * | A |
| Ethane | A | * | A | * | * | A | * | * | * | D | * | * | A | A | D | A |
| Ethanolamine | A | A | * | * | * | * | * | * | * | * | * | A | D | B | * | A |
| Ether ³ | A | A | A | * | B | B | A | D | * | D | * | A | C | D | C | A |
| Ethyl Acetate ² | A | A | B | * | B | B | * | D | A | D | C | A | D | D | B | A |
| Ethyl Chloride | A | A | B | A | B | B | * | D | A | D | D | A | A | D | A | A |
| Ethyl Sulfate | D | * | * | * | * | * | * | * | * | * | * | * | A | A | * | A |
| Ethylene Chloride ² | A | A | C | B | B | A | * | D | A | D | D | A | A | D | C | A |
| Ethylene Dichloride | A | A | D | A | B | C | * | D | A | D | A | A | A | D | C | A |
| Ethylene Glycol ⁴ | A | A | A | * | A | B | B | A | A | A | A | A | A | A | A | A |
| Ethylene Oxide | * | A | A | * | * | A | * | D | A | A | * | * | D | D | C | A |

| F | | | | | | | | | | | | | | | | |
|------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fatty Acids | A | A | B | A | A | C | * | A | A | B | A | * | A | C | C | A |
| Ferric Acid | D | D | D | A | B | D | D | A | A | A | A | A | A | D | A | A |
| Ferric Nitrate | A | A | D | A | A | D | * | A | A | A | A | A | A | A | A | A |
| Ferric Sulfate | A | C | D | A | A | D | D | A | A | A | A | A | A | B | * | A |
| Ferrous Chloride | D | D | D | A | B | C | * | A | A | A | A | A | A | B | * | A |
| Ferrous Sulfate | A | C | D | A | B | C | * | A | A | A | A | A | A | B | * | A |
| Fluoboric Acid | D | B | * | D | A | * | * | A | A | B | A | * | A | B | * | A |
| Fluorine | D | D | D | D | A | D | * | C | C | * | * | * | * | * | * | D |
| Fluosilicic Acid | * | B | D | D | B | * | * | A | A | A | A | * | B | A | * | C |
| Formaldehyde 40% | * | A | * | A | A | * | * | B | A | A | A | A | D | B | * | A |
| Formaldehyde | A | A | A | A | B | A | B | A | A | D | A | A | D | C | B | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORYL | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|-----------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| Formic Acid ⁶ | A | B | D | C | A | C | C | D | A | A | A | A | B | D | A | B |
| Freon 11 ¹ | * | A | B | * | * | B | * | B | A | D | * | A | B | C | D | A |
| Freon 12 (wet) ² | * | D | B | * | * | B | * | B | A | D | A | A | A | A | B | A |
| Freon 22 | * | A | B | * | * | B | * | D | * | B | * | A | D | D | A | A |
| Freon 113 | * | A | B | * | * | B | * | C | * | * | * | A | C | A | * | A |
| Freon T.F. ⁴ | * | A | B | * | * | B | * | B | * | D | D | A | B | A | D | A |
| Fruit Juice | A | A | B | * | * | B | * | A | D | A | A | * | A | A | * | A |
| Fuel Oils | A | A | A | A | A | B | * | A | A | A | B | A | A | A | D | A |
| Furan Resin | A | A | A | * | * | A | * | * | A | * | * | A | A | D | * | A |
| Furfural ¹ | A | A | A | * | B | A | * | D | A | D | D | A | D | D | B | A |

| G | | | | | | | | | | | | | | | | |
|--------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gallic Acid | A | A | A | * | A | A | * | A | A | * | * | * | B | A | * | * |
| Gasoline ^{1 4} | A | A | A | D | A | A | * | C | A | D | C | A | A | A | C | A |
| Gelatin | A | A | A | * | A | A | C | A | A | A | A | * | A | A | A | A |
| Glucose | * | A | A | * | * | A | A | A | A | B | A | * | A | A | A | A |
| Glue P.V.A. ¹ | B | A | B | A | * | A | * | A | A | * | * | * | A | A | * | A |
| Glycerine | A | A | A | A | A | A | B | A | A | A | A | * | A | A | A | A |
| Glycolic Acid | * | * | * | * | A | * | * | * | * | A | A | A | A | A | * | A |
| Gold Monocyanide | * | A | * | * | * | A | * | * | * | * | * | * | A | A | * | A |
| Grape Juice | A | A | B | * | * | B | * | A | * | A | * | * | A | A | * | A |
| Grease ⁴ | A | A | A | * | * | B | * | * | A | * | * | * | A | A | * | A |

| H | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Heptane ¹ | * | A | A | * | A | A | * | A | A | D | D | A | A | A | D | A |
| Hexane ¹ | A | A | A | * | A | B | * | C | A | D | C | A | A | A | D | A |
| Honey | A | A | A | * | * | A | * | A | * | A | * | A | A | A | A | A |
| Hydraulic Oils (Petroleum) ¹ | A | A | A | * | * | B | * | * | A | * | D | * | A | A | D | A |
| Hydraulic Oils (Synthetic) ¹ | A | A | A | * | * | A | * | * | * | * | D | * | A | C | * | A |
| Hydrazine | A | A | * | * | * | * | * | * | * | * | * | * | A | B | A | A |
| Hydrobromic Acid 20% | * | D | * | A | A | * | * | A | A | A | A | * | A | D | * | B |
| Hydrobromic Acid ⁴ | D | D | D | A | A | D | * | A | A | C | B | * | A | D | A | A |
| Hydrochloric Acid (Dry Gas) | C | A | D | * | A | * | * | A | A | * | * | * | * | * | A | A |
| Hydrochloric Acid 20% ⁴ | D | D | D | C | B | D | * | A | A | A | A | D | A | C | A | A |
| Hydrochloric Acid 37% ⁴ | D | D | D | C | B | D | * | A | A | A | A | D | A | C | C | A |
| Hydrochloric Acid 100% | D | D | D | D | C | D | * | A | A | * | * | * | C | D | * | A |
| Hydrocyanic Acid | A | A | A | A | A | D | D | A | A | A | A | * | A | C | * | A |
| Hydrocyanic Acid (Gas 10%) | D | D | * | * | * | * | * | A | A | * | * | * | * | * | A | A |
| Hydrofluoric Acid 20% ¹ | D | D | D | D | B | D | * | D | A | A | A | C | A | D | A | B |
| Hydrofluoric Acid 75% ^{1 2} | C | D | D | D | C | D | * | C | A | D | B | C | A | D | C | C |
| Hydrofluoric Acid 100% | D | D | D | D | B | D | * | C | A | * | * | C | * | D | * | A |
| Hydrofluosilicic Acid 20% | D | D | D | D | B | A | * | D | A | B | A | * | A | B | A | C |
| Hydrofluosilicic Acid | D | D | C | * | C | D | * | * | A | * | * | * | * | * | * | * |
| Hydrogen Gas | A | A | A | * | * | A | * | A | A | * | * | * | A | * | * | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|------------------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| Hydrogen Peroxide 10% | C | C | A | C | A | D | D | A | A | * | * | B | * | A | * | D |
| Hydrogen Peroxide 30% | * | B | * | B | A | * | D | A | A | * | A | C | A | D | * | B |
| Hydrogen Peroxide | A | B | A | B | A | D | D | A | A | B | A | C | A | D | C | A |
| Hydrogen Sulfide, Aqueous Solution | D | A | C | A | A | D | C | A | A | A | A | A | D | C | A | A |
| Hydrogen Sulfide (dry) | C | A | D | * | A | D | C | A | A | * | * | A | D | * | * | A |
| Hydroxyacetic Acid (70%) | * | * | D | B | * | * | * | A | * | * | * | * | A | A | A | A |

I

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|------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ink | A | A | C | * | * | C | * | * | * | B | * | * | A | A | * | A |
| Iodine | D | D | D | A | B | D | * | D | A | A | D | * | A | B | B | A |
| Iodine (in Alcohol) | * | B | * | D | A | * | * | D | A | C | B | * | A | D | * | * |
| Iodoform | C | A | A | * | * | C | * | * | A | * | * | * | A | * | * | * |
| Isotane ² | * | * | A | * | * | * | * | * | * | D | D | * | A | A | * | A |
| Isopropyl Acetate | * | B | C | * | * | * | * | * | * | * | * | * | D | D | B | A |
| Isopropyl Ether ² | * | A | A | * | * | A | * | * | A | D | D | * | D | B | D | * |

J

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|--------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jet Fuel (JP#, JP4, JP5) | A | A | A | * | * | A | * | A | A | D | D | A | A | A | D | A |
|--------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

K

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|-----------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kerosene ² | A | A | A | A | A | A | A | A | A | D | D | A | A | A | A | A |
| Ketones | A | A | B | A | A | A | * | D | A | D | D | A | D | D | D | C |

L

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|----------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lacquers | A | A | A | * | * | A | C | * | * | C | A | * | D | D | * | A |
| Lacquer Thinners | * | A | * | A | A | * | C | C | A | D | B | * | * | D | A | * |
| Lactic Acid | A | B | C | A | A | D | * | A | A | A | A | A | B | B | B | A |
| Lard | A | A | A | * | * | A | * | A | * | * | A | * | A | A | * | A |
| Latex | A | A | A | * | * | A | * | * | * | A | * | * | A | A | A | A |
| Lead Acetate | A | A | D | A | A | C | * | A | A | A | A | * | D | B | A | A |
| Lead Sulfamate | * | * | * | * | * | * | * | * | * | * | A | * | A | B | D | A |
| Ligroin ³ | * | A | * | * | * | A | * | * | * | D | D | * | A | A | A | A |
| Lime | A | A | C | A | * | A | * | A | * | A | * | * | A | A | D | A |
| Lubricants | A | A | A | A | A | B | * | A | A | * | A | A | A | A | * | A |

M

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|-------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Magnesium Carbonate | A | A | * | * | B | * | * | A | * | A | A | * | * | A | A | A |
| Magnesium Chloride | B | B | D | A | A | B | C | A | A | A | A | A | A | A | A | A |
| Magnesium Hydroxide | A | A | D | A | A | C | B | A | A | A | A | A | A | B | * | A |
| Magnesium Nitrate | A | A | * | A | A | * | * | A | A | A | A | * | A | A | * | A |
| Magnesium Oxide | A | A | * | * | * | * | * | * | * | * | * | * | * | A | A | A |
| Magnesium Sulfate | B | A | B | A | B | B | B | A | A | A | A | A | A | A | D | A |
| Maleic Acid | A | A | B | A | A | C | * | A | A | A | C | * | A | D | D | A |
| Maleic Anhydride | * | * | * | * | A | * | * | * | * | * | * | * | A | D | * | A |
| Malic Acid | A | A | C | * | A | D | * | A | A | * | * | * | B | * | * | * |
| Mash | A | A | * | * | * | A | * | * | * | A | * | * | * | A | * | A |
| Mayonnaise | A | A | D | * | * | D | * | * | A | A | A | * | A | A | * | A |
| Melamine | D | D | * | * | * | D | * | * | * | * | * | * | * | C | * | A |
| Mercuric Chloride (Dilute Solution) | D | D | D | A | B | D | D | A | A | A | A | * | A | A | A | A |
| Mercuric Cyanide | A | A | D | A | * | D | * | A | A | A | A | * | * | A | * | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|-------------------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| Mercury | A | A | C | C | A | D | D | A | A | A | A | * | A | A | A | A |
| Methanol (See Alcohol Methyl) | | | | | | | | | | | | | | | | |
| Methyl Acetate | * | A | A | * | A | A | * | * | A | * | * | * | D | D | B | * |
| Methyl Acrylate | * | * | * | * | * | * | * | * | * | * | * | * | D | D | B | A |
| Methyl Acetone | * | A | A | * | * | A | * | * | A | D | * | * | D | D | * | C |
| Methyl Alcohol 10% | * | A | C | * | A | C | * | A | A | * | * | * | * | B | * | A |
| Methyl Bromide | * | * | * | * | * | * | * | * | * | * | * | * | A | B | D | B |
| Methyl Butyl Ketone | * | A | A | * | * | * | * | * | * | D | * | * | D | D | A | B |
| Methyl Cellosolve | * | * | A | * | * | A | * | * | * | C | A | * | D | D | B | C |
| Methyl Chloride | A | A | D | A | A | A | * | D | A | D | D | * | A | D | C | A |
| Methyl Dichloride | * | * | * | * | * | * | * | * | * | D | * | * | A | D | D | A |
| Methyl Ethyl Ketone | A | A | A | A | A | A | * | D | A | D | A | A | D | D | A | B |
| Methyl Isobutyl Ketone ² | * | A | * | A | A | * | * | D | A | D | C | A | D | D | C | B |
| Methyl Isopropyl Ketone | * | A | * | * | * | * | * | * | * | D | * | * | D | D | B | B |
| Methyl Methacrylate | * | * | * | * | * | * | * | * | * | * | * | * | D | D | D | A |
| Methylamine | * | A | A | * | * | D | * | * | * | B | * | * | * | B | * | A |
| Methylene Chloride | A | A | A | A | A | A | C | D | A | D | D | * | D | D | D | A |
| Milk | A | A | A | * | * | C | C | A | * | A | A | * | A | A | A | A |
| Molasses | A | A | A | * | * | A | B | A | * | B | A | * | A | A | * | A |
| Mustard | A | A | B | * | * | B | * | A | * | B | A | * | A | B | * | A |
| Molasses | A | A | B | * | * | B | * | * | * | * | A | * | A | A | C | A |
| Mustard | A | A | B | * | * | B | * | A | A | * | A | A | A | A | C | A |

N

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|-------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Naptha | A | A | A | A | A | B | * | A | A | D | A | A | A | B | D | A |
| Napthalene | A | B | B | A | A | C | * | D | A | D | B | A | B | D | D | A |
| Nickel Chloride | A | B | D | A | A | D | * | A | A | A | A | * | A | A | A | A |
| Nickel Sulfate | A | B | D | A | B | C | C | A | A | A | A | * | A | A | A | A |
| Nitric Acid (10% Solution) | A | A | D | A | A | D | * | A | A | A | A | D | A | D | B | A |
| Nitric Acid (20% Solution) | A | A | D | A | A | D | * | A | A | A | A | C | A | D | D | B |
| Nitric Acid (50% Solution) | A | A | D | A | A | D | * | A | A | A | D | C | A | D | D | D |
| Nitric Acid (Concentrated Solution) | D | B | B | A | B | D | D | D | A | D | D | C | B | D | D | D |
| Nitrobenzene ² | A | B | C | A | B | D | * | D | A | D | C | B | D | D | D | B |

O

| Oils | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY |
|-----------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|-------|
| Aniline | A | A | C | A | D | A | * | D | A | D | A | * | A | D | B | A |
| Anise | A | A | * | * | * | * | * | * | * | * | * | * | * | * | * | A |
| Bay | A | A | * | * | * | * | * | * | * | * | * | * | A | * | * | A |
| Bone | A | A | * | * | * | A | * | * | * | * | * | * | A | A | * | A |
| Castor | A | A | A | * | * | A | * | A | * | * | * | * | A | A | B | A |
| Cinnamon | A | A | * | * | * | * | * | * | A | * | A | * | D | * | * | A |
| Citric | A | A | * | * | * | D | * | * | * | * | A | * | A | A | * | A |
| Clove | A | A | * | * | * | * | * | * | * | * | B | * | * | A | * | A |
| Coconut | A | A | B | * | * | A | * | * | * | * | A | * | A | A | A | A |
| Cod Liver | A | A | B | * | * | * | * | * | * | * | A | * | A | A | A | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPRYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY | | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPRYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE | EPOXY | |
|-------------------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|-------------|---------|-------|--------|--------------------|-------|---|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|-------------|---------|-------|--------|--------------------|-------|--|
| Corn | A | A | B | * | * | B | * | * | * | * | A | * | A | A | C | A | Arsenic Plating 110°F | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | |
| Cotton Seed | A | A | B | * | * | B | * | A | A | * | A | A | A | A | C | A | Brass Plating Regular Brass Bath 100°F | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | |
| Cresote ² | A | A | A | * | * | * | * | * | * | * | D | * | A | A | D | A | High Speed Brass Bath 110°F | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | |
| Diesel Fuel (2D, 3D, 4D, 5D) | A | A | A | * | * | A | * | * | * | D | A | A | A | A | D | A | Bronze Plating Copper-Cadmium Bronze Bath R.T. | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | |
| Fuel (1,2,3,5A, 5B, 6) | A | A | A | A | A | A | * | A | A | D | B | * | A | B | D | A | Copper-Tin Bronze Bath 160°F | * | A | * | A | A | * | * | D | A | A | A | * | A | A | * | C | |
| Oils (Cont.) Ginger | A | A | * | * | * | * | * | * | * | * | * | * | A | A | * | A | Platings (Cont.) Copper-Zinc Bronze Bath 100°F | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | |
| Hydraulic (See Hydraulic) | | | | | | | | | | | | | | | | | Cadmium Plating Cyanide Bath 90°F | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | |
| Lemon | A | A | * | * | * | * | * | * | * | * | D | * | A | * | * | A | Fluoroborate Bath 100°F | * | A | * | D | A | * | * | A | A | A | A | * | A | B | * | B | |
| Linseed | A | A | A | * | * | A | * | A | * | * | A | * | A | A | D | A | Chromium Plating Chromic-Sulfuric Bath 130°F | * | C | * | A | A | * | * | A | A | D | A | * | C | D | * | D | |
| Mineral | A | A | A | * | * | A | * | A | * | B | B | A | A | A | D | A | Fluosilicate Bath 95°F | * | C | * | C | A | * | * | A | A | D | A | * | C | D | * | D | |
| Olive | A | A | A | * | * | B | * | A | A | * | A | * | A | A | * | A | Fluoride Bath 130°F | * | D | * | C | A | * | * | A | A | D | A | * | C | D | * | D | |
| Orange | A | A | * | * | * | * | * | * | * | A | * | A | A | A | * | A | Black Chrome Bath 115°F | * | C | * | A | A | * | * | A | A | D | A | * | C | D | * | D | |
| Palm | A | A | A | * | * | B | * | A | * | * | * | * | A | A | * | A | Barrel Chrome Bath 95°F | * | D | * | C | A | * | * | A | A | D | A | * | C | D | * | D | |
| Peanut ³ | A | A | A | * | * | A | * | A | * | * | D | * | A | A | * | A | Copper Plating (Cyanide) Copper Strike Bath 120°F | A | A | * | * | * | * | * | * | * | * | * | * | * | * | * | * | |
| Peppermint ² | A | A | * | * | * | A | * | * | * | * | D | * | A | D | * | A | Rochelle Salt Bath 150°F | * | A | * | A | A | * | * | D | A | A | A | * | A | A | * | C | |
| Pine | A | A | A | * | * | D | * | A | A | * | * | * | A | A | * | A | High Speed Bath 180°F | * | A | * | A | A | * | * | D | A | A | A | * | A | A | * | C | |
| Rape Seed | A | A | * | * | * | A | * | A | * | * | * | * | A | B | * | A | Copper Plating (Acid) Copper Sulfate Bath R.T. | * | D | * | A | A | * | * | A | A | A | A | * | A | A | * | D | |
| Rosin | A | A | A | * | * | * | * | * | * | * | A | * | A | A | * | A | Copper Fluoroborate Bath 120°F | * | D | * | D | A | * | * | A | A | A | A | * | A | B | * | D | |
| Sesame Seed | A | A | A | * | * | A | * | A | * | * | * | * | A | A | * | A | Copper (Misc.) Copper Pyrophosphate 140°F | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | |
| Silicone | A | A | * | * | * | A | * | * | * | A | A | * | A | A | * | A | Copper (Electroless) 140°F | * | * | * | * | * | D | * | A | A | A | A | * | A | D | * | B | |
| Soybean | A | A | A | * | * | B | * | A | * | * | A | * | A | A | * | A | Gold Plating Cyanide 150°F | * | A | * | A | A | C | * | D | A | A | A | * | A | A | * | D | |
| Sperm | A | A | * | * | * | A | * | A | * | * | * | * | A | A | * | A | Neutral 75°F | * | C | * | A | A | * | * | A | A | A | A | * | A | A | * | A | |
| Tanning | A | A | * | * | * | * | * | * | * | * | * | * | A | A | * | A | Acid 75°F | * | C | * | A | A | * | * | A | A | A | A | * | A | A | * | A | |
| Turbine | A | A | A | * | * | A | * | A | * | * | * | * | A | A | * | A | Indium Sulfamate Plating R.T. | * | C | * | A | A | * | * | A | A | A | A | * | A | A | * | A | |
| Oleic Acid | A | A | B | * | B | B | C | A | A | C | C | * | D | B | D | A | Iron Plating Ferrous Chloride Bath 190°F | * | D | * | A | D | * | * | D | A | A | C | * | A | B | * | D | |
| Oleum 25% | * | * | * | * | A | * | * | D | A | D | * | * | A | D | D | D | Ferrous Sulfate Bath 150°F | * | C | * | A | A | * | * | D | A | A | A | * | A | A | * | D | |
| Oleum | * | A | B | * | * | C | C | D | A | * | D | * | A | C | D | A | Ferrous Am. Sulfate Bath 150°F | * | C | * | A | A | * | * | D | A | A | A | * | A | A | * | D | |
| Oxalic Acid (Cold) | A | B | C | C | B | B | C | A | A | C | A | * | A | B | A | A | Sulfate-Chloride Bath 160°F | * | D | * | A | D | * | * | D | A | A | A | * | A | B | * | D | |
| P | | | | | | | | | | | | | | | | | Fluoroborate Bath 145°F | * | D | * | D | B | * | * | D | A | A | A | * | A | B | * | D | |
| Paraffin | A | A | A | * | * | A | * | A | A | B | A | * | A | A | * | A | Sulfamate 140°F | * | D | * | A | B | * | * | A | A | A | A | * | A | A | * | A | |
| Pentane | C | C | A | * | B | A | * | * | A | D | * | * | A | A | D | A | Lead Fluoroborate Plating | * | C | * | D | A | * | * | A | A | A | A | * | A | B | * | A | |
| Perchloroethylene ² | A | A | A | * | * | C | * | * | A | D | D | A | A | C | D | A | Nickel Plating Watts Type 115-160°F | * | C | * | A | A | * | * | D | A | A | A | * | A | A | * | D | |
| Petrolatum | * | A | B | * | * | B | * | * | A | D | * | * | A | A | A | A | High Chloride 130-160°F | * | C | * | A | A | * | * | D | A | A | A | * | A | A | * | D | |
| Phenol 10% | A | A | A | * | B | C | * | A | A | * | * | A | B | D | D | C | Fluoroborate 100-170°F | * | C | * | D | A | D | * | D | A | A | A | * | A | B | * | D | |
| Phenol (Carbolic Acid) | A | A | B | C | A | B | D | A | A | C | B | A | A | D | D | B | Sulfamate 100-140°F | * | C | * | A | A | * | * | A | A | A | A | * | A | A | * | A | |
| Phosphoric Acid (to 40% Solution) | B | A | D | A | A | D | D | A | A | A | A | A | A | D | B | A | Electroless 200°F | * | * | * | * | * | * | * | D | A | D | D | * | A | D | * | B | |
| Phosphoric Acid (40-100% Solution) | C | B | D | B | A | D | D | A | A | A | A | A | A | D | B | C | Rhodium Plating 120°F | * | D | * | D | D | * | * | A | A | A | A | * | A | A | * | A | |
| Phosphoric Acid (Crude) | D | C | D | C | A | D | D | * | A | * | * | A | A | D | B | A | | | | | | | | | | | | | | | | | | |
| Phosphoric Anhydride (Dry or Moist) | A | A | * | * | * | * | D | D | A | * | * | * | D | D | * | * | | | | | | | | | | | | | | | | | | |
| Phosphoric Anhydride (Molten) | A | A | D | * | * | D | D | D | A | * | * | * | D | C | * | A | | | | | | | | | | | | | | | | | | |
| Photographic (Developer) | C | A | C | A | A | * | * | A | * | A | A | * | A | A | * | A | | | | | | | | | | | | | | | | | | |
| Phthalic Anhydride | A | B | B | * | A | B | * | * | A | * | * | * | A | C | * | * | | | | | | | | | | | | | | | | | | |
| Picric Acid | A | A | C | * | A | D | D | A | A | * | * | * | A | A | * | A | | | | | | | | | | | | | | | | | | |
| Plating Solutions | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * | B | | | | | | | | | | | | | | | | | | |
| Antimony Plating 130°F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE |
|---|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|
| Silver Plating 80-120°F | * | A | * | A | A | * | * | A | A | A | A | * | A | A | * |
| Tin-Fluoroborate Plating 100°F | * | C | * | D | A | * | * | A | A | A | A | * | A | B | * |
| Tin-Lead Plating 100°F | * | C | * | D | A | * | * | A | A | A | A | * | A | B | * |
| Zinc Plating Acid Chloride 140°F | * | D | * | A | D | * | * | A | A | A | A | * | A | A | * |
| Acid Sulfate Bath 150°F | * | C | * | A | A | * | * | D | A | A | A | * | A | A | * |
| Platings (Cont'd) Acid Fluoroborate Bath R.T. | * | * | * | D | * | * | * | A | A | A | A | * | A | B | * |
| Alkaline Cyanide Bath R.T. | * | * | * | A | A | * | * | A | A | A | A | * | A | A | * |
| Potash | A | * | C | * | A | C | * | A | * | A | A | * | A | A | * |
| Potassium Bicarbonate | A | * | C | A | B | B | * | A | A | A | A | A | A | A | * |
| Potassium Bromide | A | * | C | A | B | C | * | A | A | A | A | C | A | A | A |
| Potassium Carbonate | A | * | C | A | A | C | * | A | A | A | A | A | A | B | * |
| Potassium Chlorate | A | A | B | A | B | B | * | A | A | A | A | A | A | A | * |
| Potassium Chloride | A | A | B | A | A | C | C | A | A | A | A | A | A | A | A |
| Potassium Chromate | * | B | A | * | B | A | * | A | * | A | * | A | A | A | * |
| Potassium Cyanide Solutions | A | B | D | A | A | D | * | A | A | A | A | B | A | A | A |
| Potassium Dichromate | A | A | A | A | B | C | * | A | A | A | A | A | B | A | A |
| Potassium Ferrocyanide | A | * | C | * | B | A | * | A | A | * | * | * | * | D | * |
| Potassium Hydroxide (50%) | B | B | D | C | A | D | D | A | A | A | A | A | D | B | A |
| Potassium Nitrate | A | B | B | A | B | B | * | A | A | A | A | C | B | A | A |
| Potassium Permanganate | A | B | B | B | B | B | * | A | A | A | B | A | B | A | * |
| Potassium Sulfate | A | B | A | A | A | B | B | A | A | A | A | A | A | A | A |
| Potassium Sulfide | A | * | B | * | B | B | * | A | A | * | * | * | * | A | * |
| Propane (Liquified) ^{1 2} | A | * | A | * | * | A | A | D | A | D | D | * | A | A | D |
| Propylene Glycol | B | * | A | * | * | B | * | * | A | * | * | * | A | A | * |
| Pyridine | C | * | B | * | * | * | * | A | D | B | A | D | D | B | |
| Pyrogallic Acid | A | A | B | * | A | B | * | A | A | * | * | * | A | A | * |
| Electroless 200°F | A | B | D | A | A | C | D | A | A | A | A | B | D | D | * |
| Rhodium Plating 120°F | A | D | D | A | B | C | D | A | A | A | A | B | B | D | * |
| Silver Plating 80-120°F | C | C | C | A | A | D | D | A | A | A | D | C | A | C | B |
| Tin-Fluoroborate Plating 100°F | * | A | D | A | A | D | * | A | A | A | A | C | B | B | * |
| Tin-Lead Plating 100°F | * | A | A | * | * | C | C | * | A | * | D | * | A | A | A |
| Zinc Plating | * | A | B | * | * | B | * | * | A | * | * | * | A | A | * |
| Acid Chloride 140°F | A | A | A | A | B | B | C | A | A | A | A | * | D | C | A |
| Acid Sulfate Bath 150°F | * | C | B | * | * | C | C | * | A | A | A | * | A | B | A |
| Acid Fluoroborate Bath R T | A | A | C | * | B | C | C | A | A | * | * | * | A | C | A |
| Alkaline Cyanide Bath R T | A | A | D | A | A | C | * | * | A | A | * | * | A | A | A |
| Potash | A | B | C | A | B | C | C | A | A | A | A | * | A | A | A |
| Potassium Bicarbonate | A | A | B | A | B | B | B | A | A | A | A | A | A | A | A |
| Potassium Bromide | A | B | D | A | B | D | D | A | A | A | A | A | A | C | A |
| Potassium Carbonate | C | C | C | A | A | C | * | A | A | * | * | * | A | A | * |
| Potassium Chlorate | * | A | * | * | * | * | * | A | * | A | * | * | A | A | * |
| Potassium Chloride | A | A | B | A | * | D | D | A | A | A | A | A | A | B | A |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE |
|---------------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|
| Potassium Chromate | A | A | * | * | * | * | * | * | * | * | * | * | A | A | * |
| Potassium Cyanide | A | A | A | * | * | A | * | * | * | A | * | * | A | A | * |
| Solutions | D | D | D | A | B | D | * | A | A | A | A | * | A | A | A |
| Potassium Dichromate | * | A | * | * | * | * | * | * | * | A | * | * | A | A | * |
| Potassium Ferrocyanide | D | C | D | A | A | D | * | A | A | * | * | * | B | C | * |
| Potassium Hydroxide (50%) | A | A | A | * | * | B | * | A | A | A | * | * | A | A | * |
| Potassium Nitrate | A | A | A | A | A | A | A | A | A | D | D | A | A | B | D |
| Potassium Permanganate | A | A | A | * | * | A | * | * | A | A | * | * | B | D | D |
| Potassium Sulfate | A | A | A | * | A | A | * | * | A | A | A | * | A | A | * |
| Potassium Sulfide | C | C | B | * | A | C | * | * | * | * | A | * | * | * | * |
| Propane (Liquified) | D | D | D | * | * | C | D | A | A | A | D | * | A | D | D |
| Propylene Glycol | A | A | A | A | B | B | * | D | A | D | D | A | D | D | A |
| Pyridine | A | A | A | * | A | A | C | D | A | * | * | * | D | * | * |
| Pyrogallic Acid | A | C | A | * | * | B | * | A | A | D | * | * | A | D | B |
| R | | | | | | | | | | | | | | | |
| Rosins | A | A | A | * | B | A | C | * | A | * | A | * | * | A | * |
| Rum | A | * | * | * | * | * | * | A | * | A | A | * | A | A | * |
| Rust Inhibitors | A | * | * | * | * | A | * | * | * | * | A | * | A | A | * |
| S | | | | | | | | | | | | | | | |
| Salad Dressing | A | * | B | * | * | B | * | A | * | A | A | * | A | A | * |
| Sea Water | A | C | C | A | * | C | * | A | A | A | A | * | A | A | A |
| Shellac (Bleached) | A | * | A | * | * | A | B | * | A | * | A | * | * | A | * |
| Shellac (Orange) | A | * | A | * | * | A | C | * | A | * | A | * | * | A | * |
| Silicone | B | * | B | * | * | A | * | * | * | A | A | * | A | A | A |
| Silver Bromide | C | C | D | * | * | * | * | * | * | A | * | * | * | * | * |
| Silver Nitrate | A | B | D | A | A | D | * | A | A | A | A | * | A | C | C |
| Soap Solutions | A | A | C | A | B | B | B | B | A | A | A | A | A | B | C |
| Soda Ash (See Sodium Carbonate) | | | | | | | | | | | | | | | |
| Sodium Acetate | A | A | B | A | A | B | * | A | A | A | A | * | D | D | * |
| Sodium Aluminate | * | * | C | B | B | B | * | * | A | A | * | A | A | A | A |
| Sodium Bicarbonate | A | A | A | A | * | B | A | A | A | A | A | A | A | A | A |
| Sodium Bisulfate | A | * | D | B | B | C | C | A | A | A | A | A | B | A | * |
| Sodium Bisulfate | A | * | A | A | B | C | * | A | A | A | A | A | A | A | * |
| Sodium Borate | A | * | C | * | A | A | * | C | A | * | * | * | A | * | * |
| Sodium Carbonate | A | B | C | A | A | B | B | A | A | A | A | A | A | A | A |
| Sodium Chlorate | A | * | B | A | B | B | * | A | A | A | A | A | A | D | * |
| Sodium Chloride | A | C | C | A | A | B | C | A | A | A | A | A | A | A | A |
| Sodium Chromate | A | A | D | * | B | B | * | * | A | A | A | A | B | A | * |
| Sodium Cyanide | A | * | D | A | * | D | D | A | A | A | A | A | A | A | A |
| Sodium Fluoride | C | * | C | A | A | C | * | D | A | * | * | * | B | D | * |
| Sodium Hydrosulfite | * | * | A | * | A | C | * | C | A | * | * | * | A | * | * |
| Sodium Hydroxide (20%) | A | A | D | A | A | C | D | A | A | A | A | A | A | A | |
| Sodium Hydroxide (50% Solution) | A | B | D | A | A | C | D | A | A | A | A | B | D | D | * |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE |
|---|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|
| Sodium Hydroxide (80% Solution) | A | D | D | A | B | C | D | A | A | A | A | B | B | D | * |
| Sodium Hypochlorite (to 20%) | C | C | C | A | A | D | D | A | A | A | D | C | A | C | B |
| Sodium Hypochlorite | * | A | D | A | A | D | * | A | A | A | A | C | B | B | * |
| Sodium Hyposulfate | A | A | D | * | * | D | * | A | * | * | * | * | * | * | * |
| Sodium Metaphosphate2 | * | A | A | * | * | C | C | * | A | * | D | * | A | A | A |
| Sodium Metasilicate | * | A | B | * | * | B | * | A | * | * | * | A | A | * | * |
| Sodium Nitrate | A | A | A | A | B | B | C | A | A | A | A | * | D | C | A |
| Sodium Perborate | * | C | B | * | * | C | C | * | A | A | A | * | A | B | A |
| Sodium Peroxide | A | A | C | * | B | C | C | A | A | * | * | * | A | C | A |
| Sodium Polyphosphate (Mono, Di, Tribasic) | A | A | D | A | A | C | * | * | A | A | * | * | A | A | A |
| Sodium Silicate | A | B | C | A | B | C | C | A | A | A | A | * | A | A | A |
| Sodium Sulfate | A | A | B | A | B | B | B | A | A | A | A | A | A | A | A |
| Sodium Sulfide | A | B | D | A | B | D | D | A | A | A | A | A | A | C | A |
| Sodium Sulfide | C | C | C | A | A | C | * | A | A | * | * | * | A | A | * |
| Sodium Tetraborate | * | A | * | * | * | * | * | A | * | A | * | * | A | A | * |
| Sodium Thiosulphate ("Hypo") | A | A | B | A | * | D | D | A | A | A | A | A | A | B | A |
| Sorghum | A | A | * | * | * | * | * | * | * | * | * | * | A | A | * |
| Soy Sauce | A | A | A | * | * | A | * | * | * | A | * | * | A | A | * |
| Stannic Chloride | D | D | D | A | B | D | * | A | A | A | A | * | A | A | A |
| Stannic Fluoborate | * | A | * | * | * | * | * | * | A | * | * | A | A | * | * |
| Stannous Chloride | D | C | D | A | A | D | * | A | A | * | * | * | B | C | * |
| Starch | A | A | A | * | * | B | * | A | A | A | * | * | A | A | * |
| Stearic Acid ² | A | A | B | A | A | C | C | A | A | A | D | * | A | B | B |
| Stoddard Solvent | A | A | A | A | A | A | A | A | A | D | D | A | A | B | D |
| Styrene | A | A | A | * | * | A | * | * | A | A | * | * | B | D | D |
| Sugar (Liquids) | A | A | A | * | A | A | * | * | A | A | A | * | A | A | * |
| Sulfate Liquors | C | C | B | * | A | C | * | * | * | * | A | * | * | * | * |
| Sulfur Chloride | D | D | D | * | * | C | D | A | A | A | D | * | A | D | D |
| Sulfur Dioxide ² | A | A | A | A | B | B | * | D | A | D | D | A | D | D | A |
| Sulfur Dioxide (dry) | A | A | A | * | A | A | C | D | A | * | * | * | D | * | * |
| Sulfur Trioxide (dry) | A | C | A | * | * | B | * | A | A | D | * | * | A | D | B |
| Sulfuric Acid (to 10%) | D | C | * | A | * | D | A | * | A | A | A | A | * | * | * |
| Sulfuric Acid 10%-75% | D | D | * | * | B | * | D | A | * | B | A | B | A | * | * |
| Sulfuric Acid 75%-100% | * | D | * | * | B | * | D | B | * | A | B | C | A | * | * |
| Sulfurous Acid | C | B | * | * | B | * | * | A | * | A | A | * | A | * | B |
| Sulfuryl Chloride | * | * | * | * | * | * | * | A | * | * | * | * | * | * | * |
| Syrup | A | A | * | * | * | * | * | A | * | A | A | * | A | * | * |

T

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|------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tallow | A | A | A | * | * | * | * | * | * | A | * | * | A | A | * |
| Tannic Acid | A | A | C | A | B | B | * | A | A | A | A | * | A | D | A |
| Tanning Liquors | A | A | C | A | A | A | * | A | A | * | A | * | A | C | * |
| Tartaric Acid | A | B | C | A | B | A | C | A | A | A | A | * | A | D | * |
| Tetrachlorethane | * | A | * | A | A | * | * | D | A | D | A | * | A | D | D |
| Tetrahydrofuran | A | A | D | * | * | D | * | D | A | D | C | A | D | D | B |

| | 304 STAINLESS STEEL | 316 STAINLESS STEEL | ALUMINIUM | TITANIUM | HASTELLOY C | BRONZE | BRASS | PVC (TYPE 1) | TEFLON | NORLY | POLYPROPYLENE | FORTRON | VITON | BUNA N | ETHYLENE PROPYLENE |
|-------------------------------|---------------------|---------------------|-----------|----------|-------------|--------|-------|--------------|--------|-------|---------------|---------|-------|--------|--------------------|
| Toluene, Toluol ³ | A | A | A | A | A | A | A | D | A | D | D | A | C | D | D |
| Tomato Juice | A | A | A | * | * | C | * | * | A | A | A | A | A | A | * |
| Trichlorethane | C | A | C | A | A | C | * | * | A | D | * | * | A | D | D |
| Trichlorethylene ² | A | A | B | A | A | B | A | D | A | D | D | C | A | D | D |
| Trichloropropane | * | A | * | * | * | A | * | * | * | D | * | * | A | A | * |
| Tricresylphosphate | * | A | * | B | A | A | * | D | A | A | * | * | B | D | A |
| Triethylamine | * | * | * | * | * | A | * | A | * | B | * | * | A | A | * |
| Turpentine ³ | A | A | C | * | A | B | C | A | A | D | B | A | A | D | D |

U

| | | | | | | | | | | | | | | | |
|-------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Urine | A | A | B | * | * | C | * | A | * | A | A | * | A | A | A |
|-------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

V

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vegetable Juice | A | A | A | * | * | C | * | * | * | A | * | * | A | A | * |
| Vinegar | A | A | D | A | A | B | B | A | A | A | C | * | A | * | * |
| Varnish (Use Viton [®] for Aromatic) | A | A | A | * | * | A | B | * | A | D | A | * | A | B | * |

W

| | | | | | | | | | | | | | | | |
|-------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water, Acid, Mine | A | A | C | * | * | C | D | A | * | A | A | B | A | A | * |
| Water, Distilled, Lab Grade 7 | A | A | B | * | * | A | * | A | A | A | A | A | A | A | A |
| Water, Fresh | A | A | A | * | * | A | C | A | A | A | A | A | A | A | A |
| Water, Salt | A | A | B | * | * | B | C | A | * | A | A | A | A | A | A |
| Weed Killers | A | A | C | * | * | C | * | * | * | * | * | * | A | B | * |
| Whey | A | A | B | * | * | * | * | * | * | * | * | * | A | A | * |
| Whiskey & Wines | A | A | D | * | * | B | B | A | A | A | A | * | A | A | A |
| White Liquor (Pulp Mill) | A | A | * | * | A | D | * | A | A | A | A | * | A | A | * |
| White Water (Paper Mill) | A | A | * | * | A | * | * | * | * | A | * | A | * | * | * |

X

| | | | | | | | | | | | | | | | |
|---------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Xylene ² | A | A | A | * | A | A | A | D | A | D | D | A | A | D | D |
|---------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Z

| | | | | | | | | | | | | | | | |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zinc Chloride | D | B | D | A | B | D | D | A | A | A | A | A | A | A | A |
| Zinc Hydrosulphite | * | A | D | * | * | D | * | * | * | A | * | A | * | A | A |
| Zinc Sulfate | A | A | D | A | B | B | C | C | A | A | A | A | A | A | A |

