version
8.01

FLUID FLOW AND LIQUID LEVEL SWITCHES

CONTROLLERS

CHEMICAL FEED PUMP

LIQUID LEVEL PUMP UP/PUMP DOWN

PUMP EMERGENCY SHUT DOWN

WETTED MATERIALS

BRASS, STAINLESS STEEL, HASTELLOY® C., TITANIUM

NORYL®, FORTRON®, TEFLON®, EPDM, VITON®

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

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

OPERATIONAL INFORMATION

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
- Our person to person order desk is open 8:00 am - 4:30 pm (Pacifc Time), Monday through Friday.
- We answer the telephone with people experienced in taking your order for standard products.
- We provide technical appliation assistance.
- We can modify standard units for special applications.
- We will respond to your after hours message at the beginning of our next business day.

EMERGENCY DELIVERIES

Our 60 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 Pacific time that same day.

ORIGIN OF PRODUCTS

The majority 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 among our initial product lines and they continue to be widely used today.

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® is a registered trademark of Haynes International, Inc.

TABLE OF CONTENTS

FLOW SWITCHES

*Dry Circuit Available

LEVEL SWITCHES

*Dry Circuit Available

TABLE OF CONTENTS

CONTROLLERS

APPENDICES

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) NEGLECT, 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.

CE NON-MAGNETIC

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

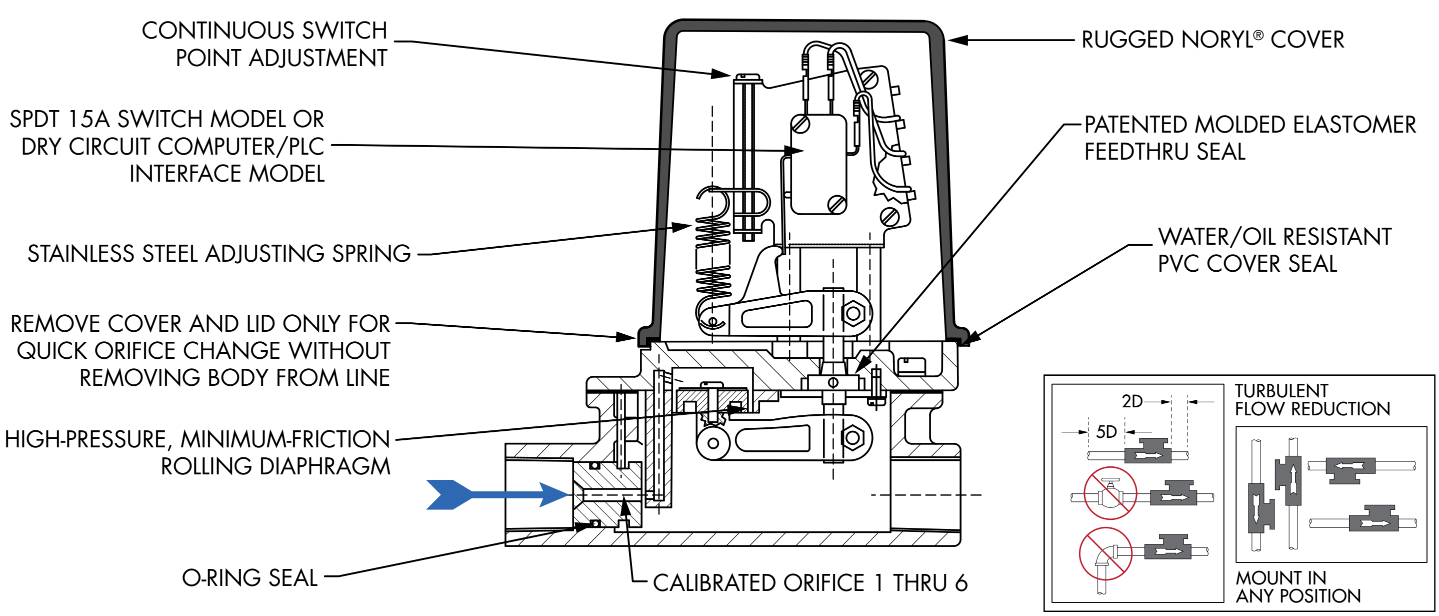
Other Uses:

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

≈ TYPICAL WORKING FLUIDS

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

PRODUCT DIAGRAM



WEIGHT: 3.5 lb
1.59 kg

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v8.01

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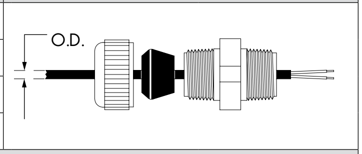
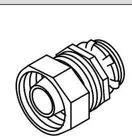
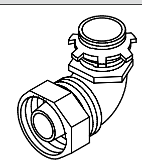
MODEL Q-1

MODEL SELECTION CHART	
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%	
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(STR) - 0.5″ straight		F90° - (0.5″ 90°)	

SAMPLE PART NUMBERS

OPTION 1:	Q-1	/ 3	/ A
BASE MODEL	✓		
ORIFICE		✓	
GROMMET SIZE			✓

OPTION 2:	Q-1	/ 6	/ F
BASE MODEL	✓		
ORIFICE		✓	
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)

Q-1 MATERIALS:

Body: Brass (working fluid "sees" red brass, 316 stainless steel, phosphor bronze, Noryl® (PPO) (10% glass fibers) and EPDM elastomer seal
Gasket: Cork/Buna blend
Optional Seal: Viton®

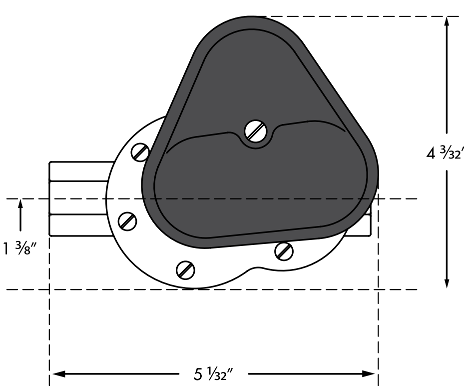
ELECTRICAL SWITCH CHARACTERISTICS

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

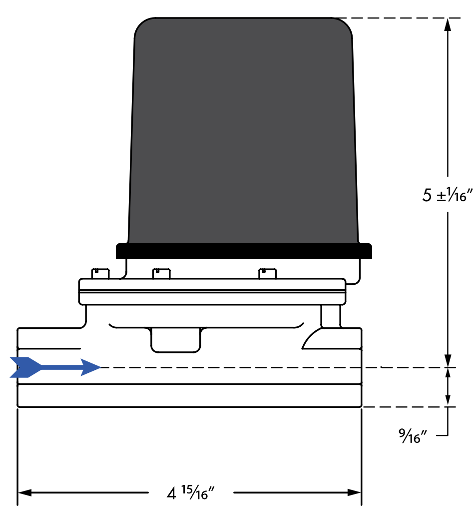
10,000,000 operations, median
(Switch may be overloaded to 20A @ 125 or 250VAC for a minimum of 20,000 operations.)

INSTALLATION DIMENSIONS

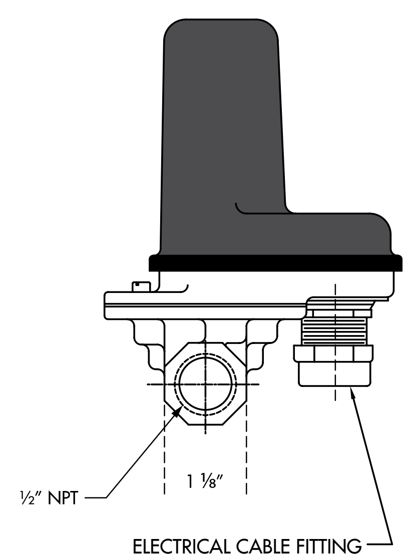
TOP VIEW



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.

CE NON-MAGNETIC

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

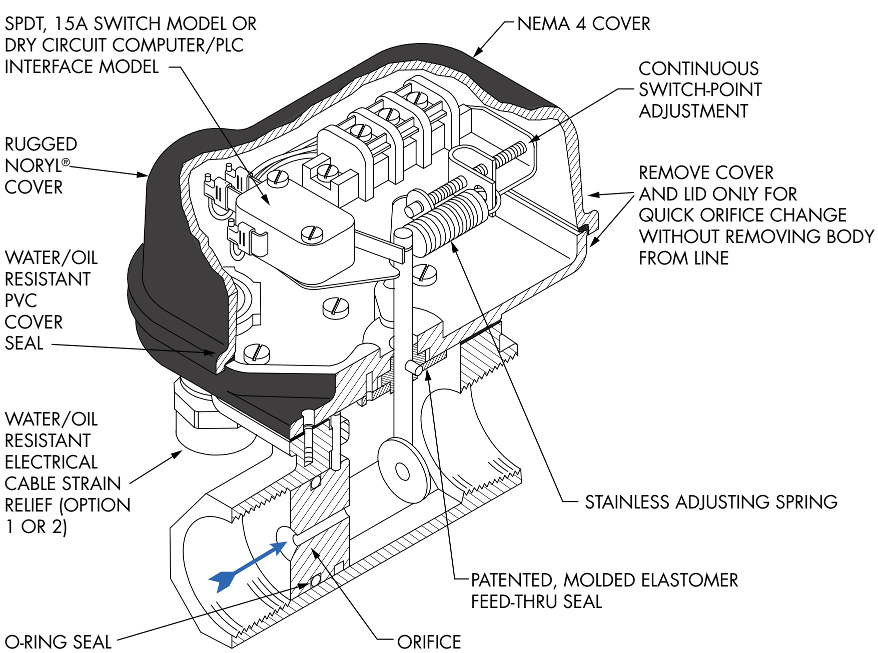
Other Uses:

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

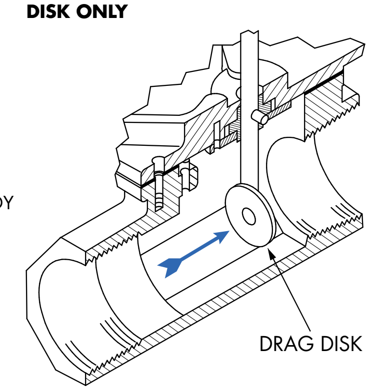
≈ TYPICAL WORKING FLUIDS

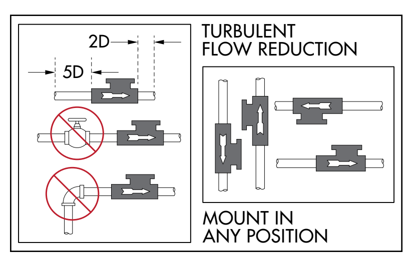
- Glycols
- Hydrocarbons
- Oils
- Potable Water

PRODUCT DIAGRAM



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





WEIGHT: 5 lb
2.27 kg

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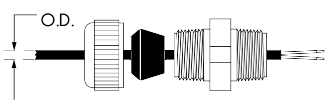
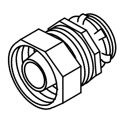
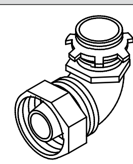
MODEL Q-4E

MODEL SELECTION CHART	
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%	
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(STR) - 0.5″ straight		F90° - (0.5″ 90°)	

SAMPLE PART NUMBERS

OPTION 1:	Q-4E	/ 1	/ B
BASE MODEL			
ORIFICE/PADDLE #			
GROMMET SIZE			

OPTION 2:	Q-4E	/ 3	/ F
BASE MODEL			
ORIFICE/PADDLE #			
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

Q-4E MATERIALS:

Body: Brass (working fluid "sees" red brass, 316 stainless steel, phosphor bronze and EPDM elastomer seal
Gasket: Cork/Buna blend
Optional Seal: Viton®

ELECTRICAL SWITCH CHARACTERISTICS

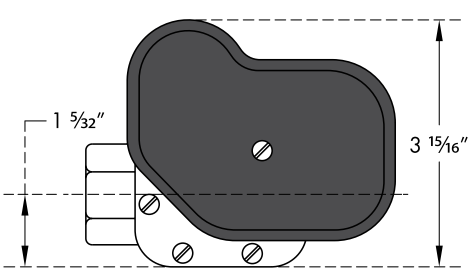
SPDT
15A, ½ hp @ 125 or 250VAC
½A @ 125VDC, ¼A @ 250VDC
5A @ 125VAC (tungsten lamp load)

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

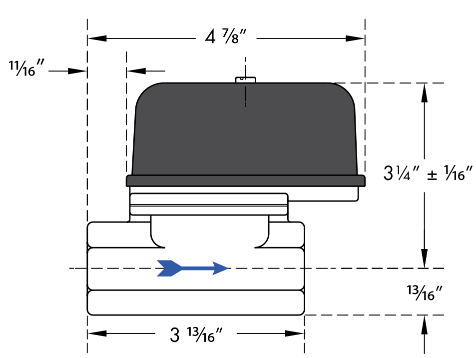
Model Q-4E can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface.

INSTALLATION DIMENSIONS

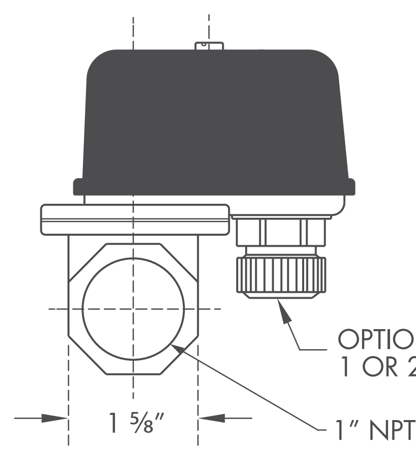
TOP VIEW



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

CE

Designed for extreme, long-term reliability.

Detects and signals flow change.

Continuously adjustable while in operation.

For use in particle contaminated fluids.

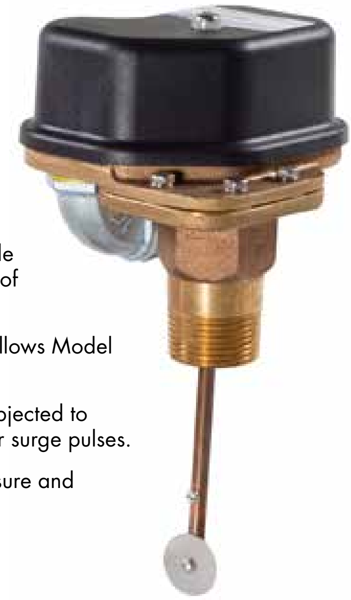
Multiple quick change paddles (and continuous spring adjustment) provide an incredibly wide operating range of flow rates and viscosities.

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**

SAMPLE PART NUMBERS

OPTION 1: Q-5	/ 3	/ 2	/ B
BASE MODEL			
PIVOT SHAFT			
PADDLE #			
GROMMET SIZE			

OPTION 2: Q-5	/ 3	/ 2	/ F
BASE MODEL			
PIVOT SHAFT			
PADDLE #			
½" FLEXIBLE CONDUIT FITTING			

TYPICAL USES

Monitoring flow of coolants and fluids supplied to:

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

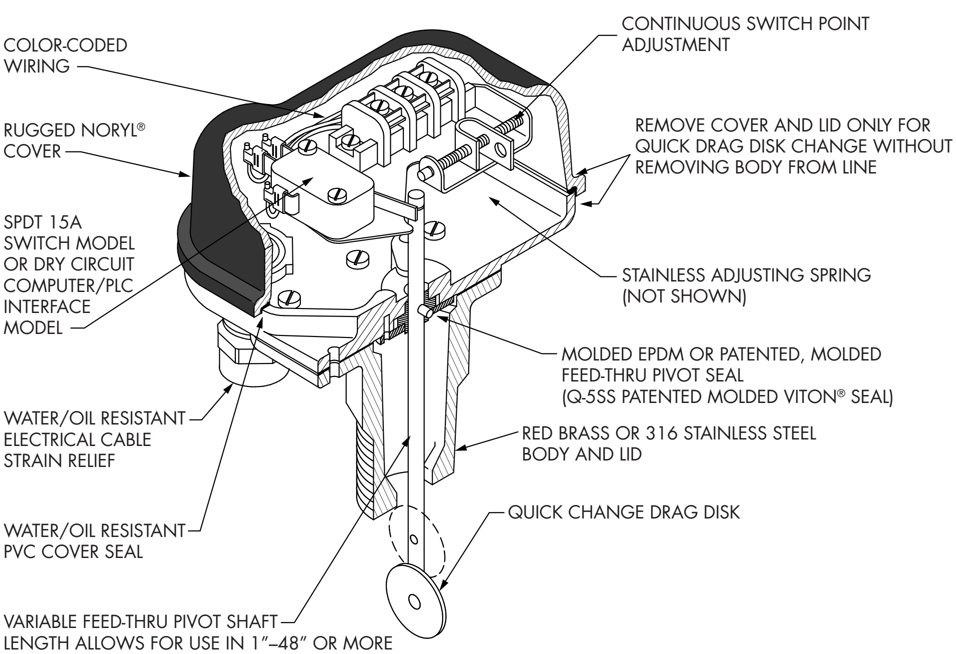
Other Uses:

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

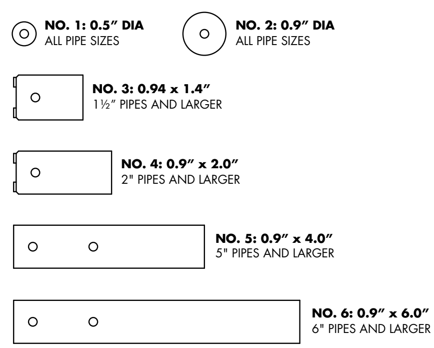
≈ TYPICAL WORKING FLUIDS

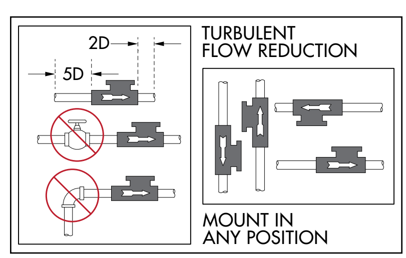
- Filtered Sewage Water
- Hydrocarbons
- Glycols
- Potable Water

PRODUCT DIAGRAM



PADDLE (PADDLE/STRIP) NUMBER





WEIGHT: 3.5 lb.
1.59 kg

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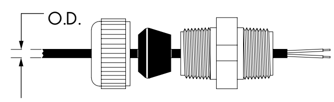
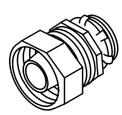
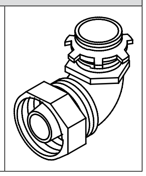
MODEL Q-5 Q-5SS

MODEL SELECTION CHART				
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%				
PIPE SIZE	**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(STR) - 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
15A, ½ hp @ 125 or 250VAC
½A @ 125VDC, ¼A @ 250VDC
5A @ 125VAC (W lamp load)

10,000,000 Operations Median
Switch may be overloaded to 20A @ 125 or 250VAC (min 20,000 operations.)

Q-5 MATERIALS:

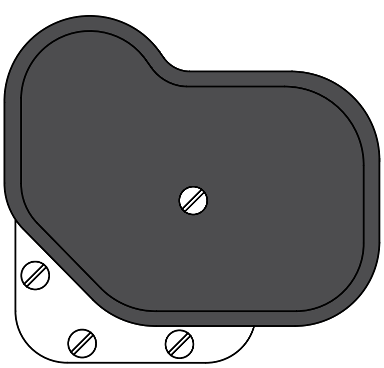
Body, shaft and drag disks/strips: Brass and 316 stainless steel
Working fluid "sees" red brass (phosphor bronze) and EPDM elastomer seal
Gasket: Cork/Buna blend
Optional Seal: Viton®

Q-5SS MATERIALS:

Body, shaft and drag disks/strips: 316 stainless steel
Working fluid "sees" 316 stainless and Viton® seal.
Gasket: Teflon®

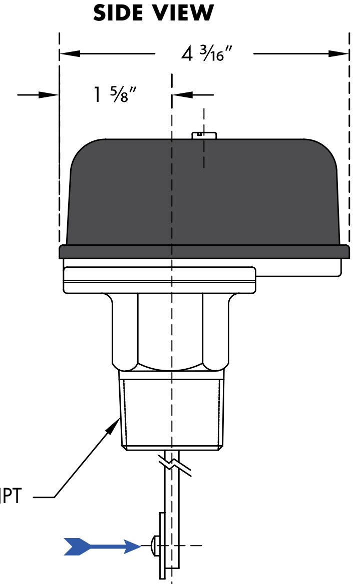
INSTALLATION DIMENSIONS

TOP VIEW

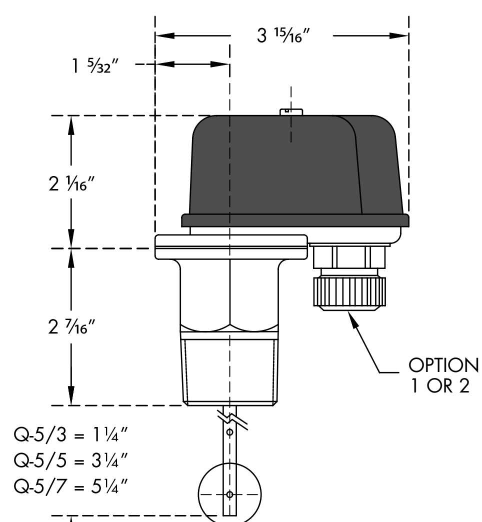


Model Q-5 can also be fitted with a SPDT Gold Cross Bar Switch for computer/PLC interface.

SIDE VIEW



FRONT VIEW



- 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

NON-MAGNETIC

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 (344 kPa) @ 180˚F (N)** **50 psig (344 kPa) @ 200˚F (CR)**
Process Connection	**1" NPT**
Electrical Switch	**SPDT, ½hp 15A or Dry Circuit**
Enclosure	**NEMA 6P / IP 67**

TYPICAL USES

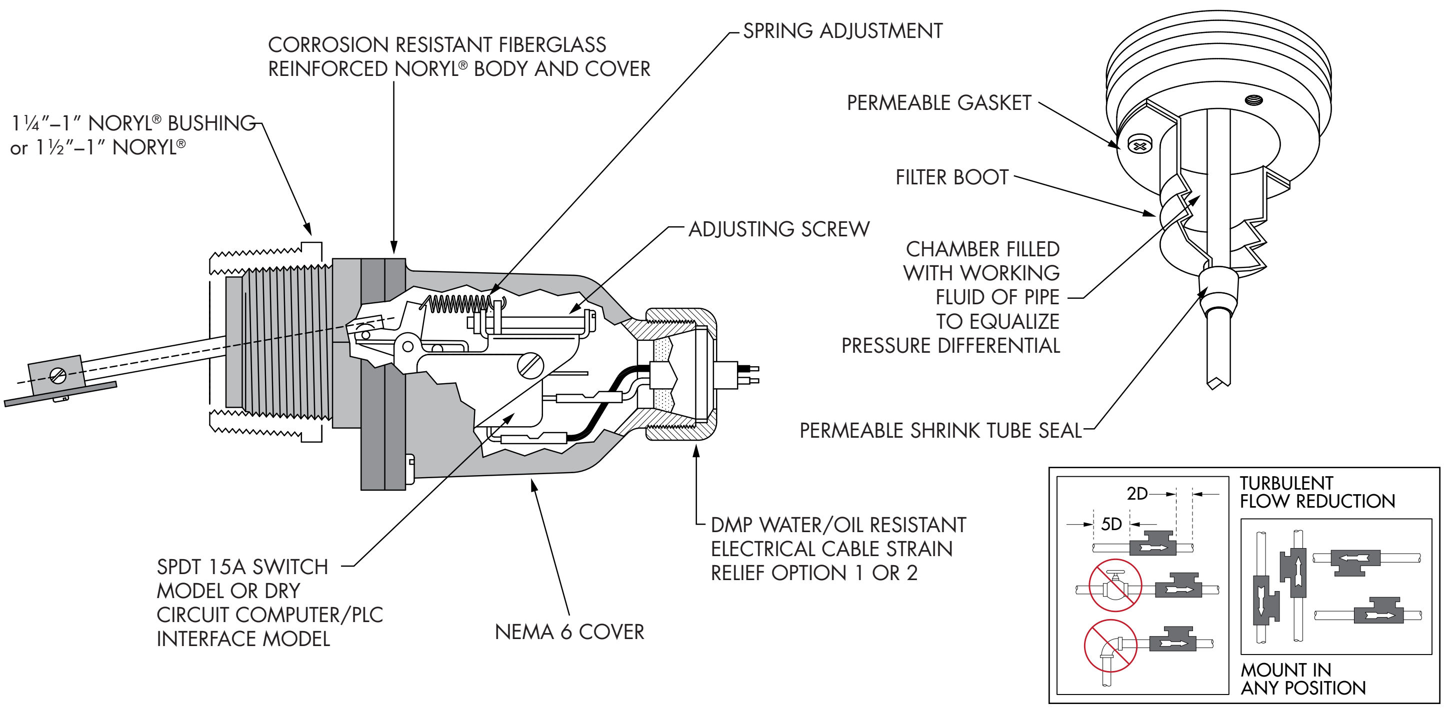
Monitoring fluid flow in:

- Air Conditioning Systems
- 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)

PRODUCT DIAGRAM



WEIGHT: 0.5 lb.
0.23 kg

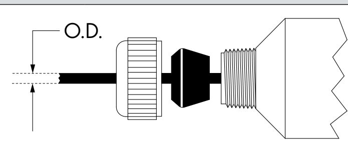
541 Kinetic Drive
Oxnard, CA 93030
www.harwil.com

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

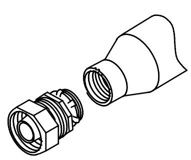
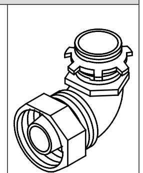
MODEL Q-8N Q-8CR

MODEL SELECTION CHART			
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%			
PIPE SIZE	**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(STR) - 0.5" straight		F90° - (0.5" 90°)	

SAMPLE PART NUMBERS

OPTION 1: Q-8N / 1 / 2 / B
- BASE MODEL
- SHAFT LENGTH
- PADDLE SIZE
- GROMMET SIZE

OPTION 2: Q-8N / 2 / 3 / F
- BASE MODEL
- SHAFT LENGTH
- PADDLE SIZE
- ½" FIPT

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

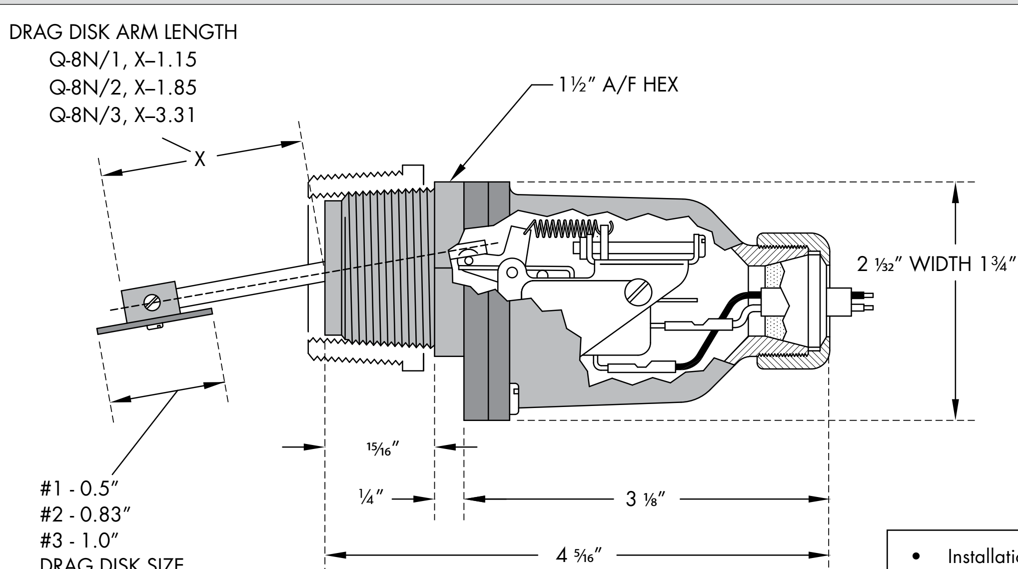
SPDT
10,000,000 Operations Median
15A, ½ hp @ 125 or 250VAC
½A @ 125VDC
(tungsten lamp load)

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

Q-8CR (FORTRON®)
WORKING TEMPERATURE: 200°F max. continuous
WETTED MATERIALS: Body and bushing: Fortron® (PPS) (40% glass fibers); Shaft: HASTELLOY® C and Viton® Elastomer Seal
Optional Filter Boot: Viton® (EPDM available by special order)

INSTALLATION DIMENSIONS



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

FLOW SWITCH

MODEL Q-8DS QD-8DS DPDT

CE cULus NON-MAGNETIC

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 (344 kPa) @ 180˚F**
Process Connection	**1" NPT**
Electrical Switch	**SPDT, DPDT, ½hp 15A or Dry Circuit**
Enclosure	**NEMA 6P / IP 67**

TYPICAL USES

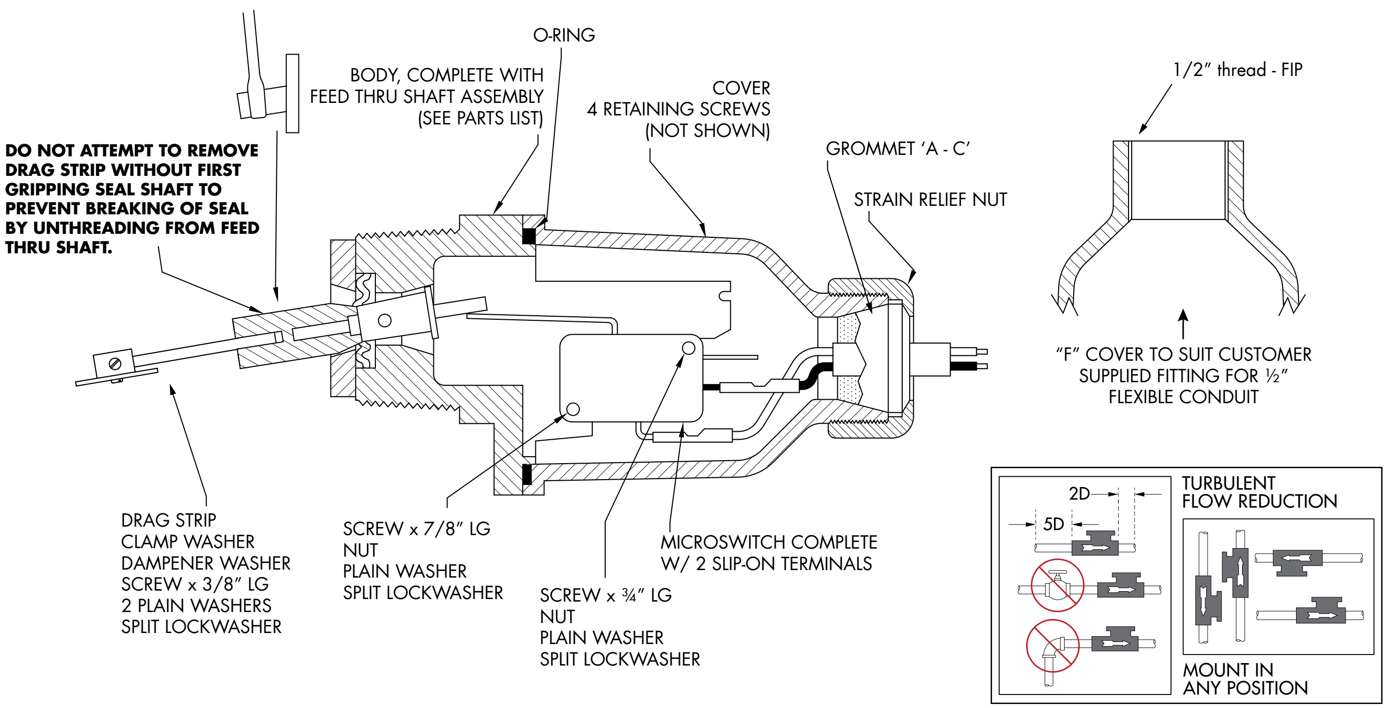
Monitoring fluid flow in:

- 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
- Potable Water
- Contaminated Ground Water
- Sulfolane
- Sea Water
- Pool Water (low ppm Chlorine)
- RO Water

PRODUCT DIAGRAM



WEIGHT: 0.5 lb.
0.23 kg

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MODEL Q-8DS QD-8DS DPDT

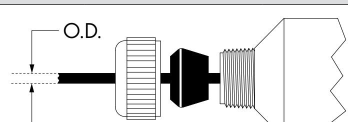
MODEL SELECTION CHART

Flow Range (Water calibrated at 70˚F / 21˚C) Accuracy ±10%

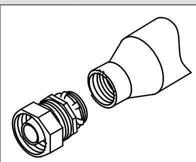
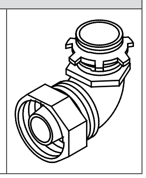
PIPE SIZE	NOMINAL ON/OFF SWITCH POINT RANGE (GPM)	SHAFT LENGTH	PADDLE NUMBER
1"	5.0 - 3.0	-	10512
	9.6 - 7.5	1	2
	18.0 - 15.4	1	1
1 ½"	12.0 - 9.5	-	10502
	14.2 - 11.8	2	3
	19.0 - 13.5	-	10570A
	22.5 - 19.0	2	2
	34.4 - 30.4	2	1
2"	19 - 12	-	10593
	25.8 - 21.8	2	3
	39.8 - 33.6	2	2
	58.0 - 50.8	2	1
3"	42.4 - 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(STR) - 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, DPDT — 10,000,000 Operations Median
15A, ½ hp @ 125 or 250VAC
½A @ 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.

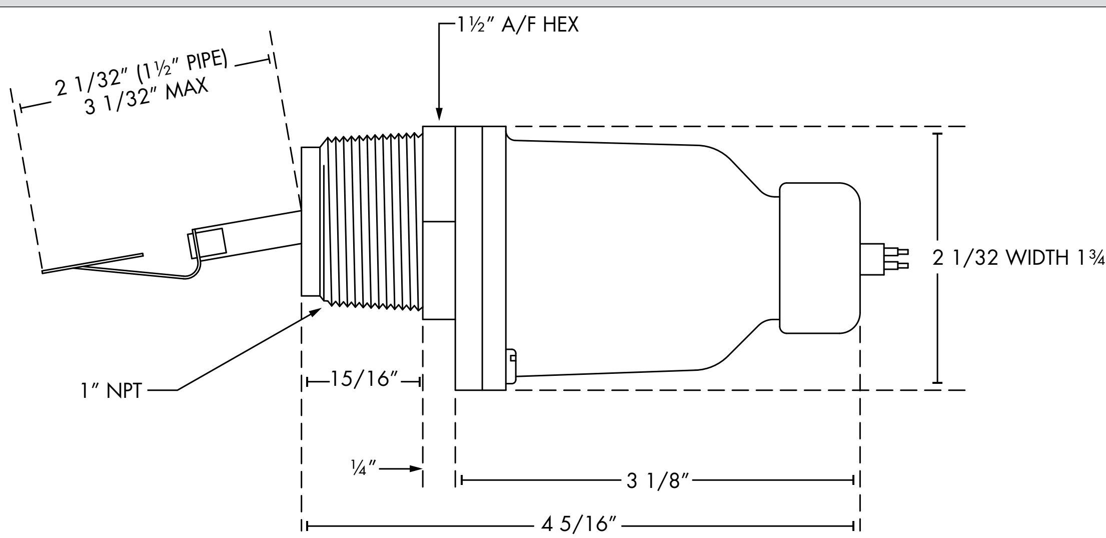
Q-8DS (NORYL®)
WORKING TEMPERATURE: 180˚F @ ambient pressure
WETTED MATERIALS: Body and Bushing: Noryl® (PPO) (10% glass fibers); Shaft: 316 stainless steel and Viton® Elastomer Seal

SAMPLE PART NUMBERS

OPTION 1: Q-8DS / 1 / 2 / B
- BASE MODEL: Q-8DS
- SHAFT LENGTH: 1
- PADDLE SIZE: 2
- GROMMET SIZE: B

OPTION 2: Q-8DS / 2 / 3 / F
- BASE MODEL: Q-8DS
- SHAFT LENGTH: 2
- PADDLE SIZE: 3
- ½" FIPT: F

INSTALLATION DIMENSIONS



- Installation drawing and a numbered parts list is supplied with each unit.

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.

Maximum flow rate should be no more than five times the close point.

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.

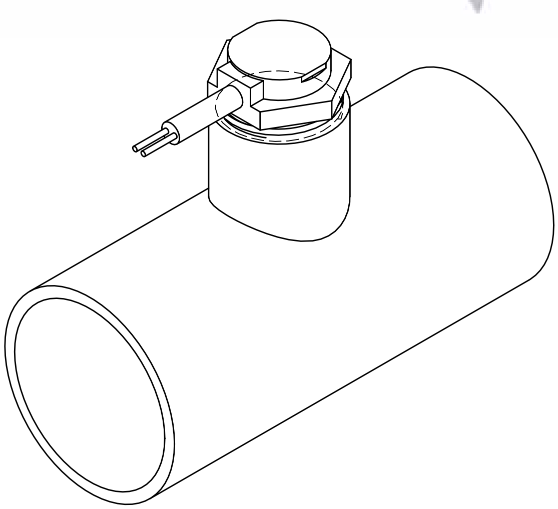
Available with NO, NC or SPDT Reed Switch

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 (1724 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

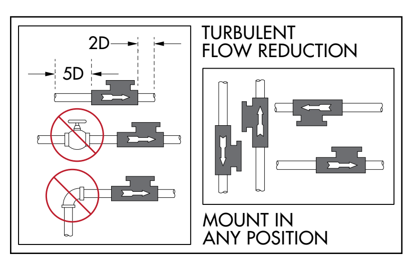
In Water Treatment:

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 SELECTION CHART			
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%			
PIPE SIZE	**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

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

MODEL Q-10N Q-10VCR

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.

Q-10N (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

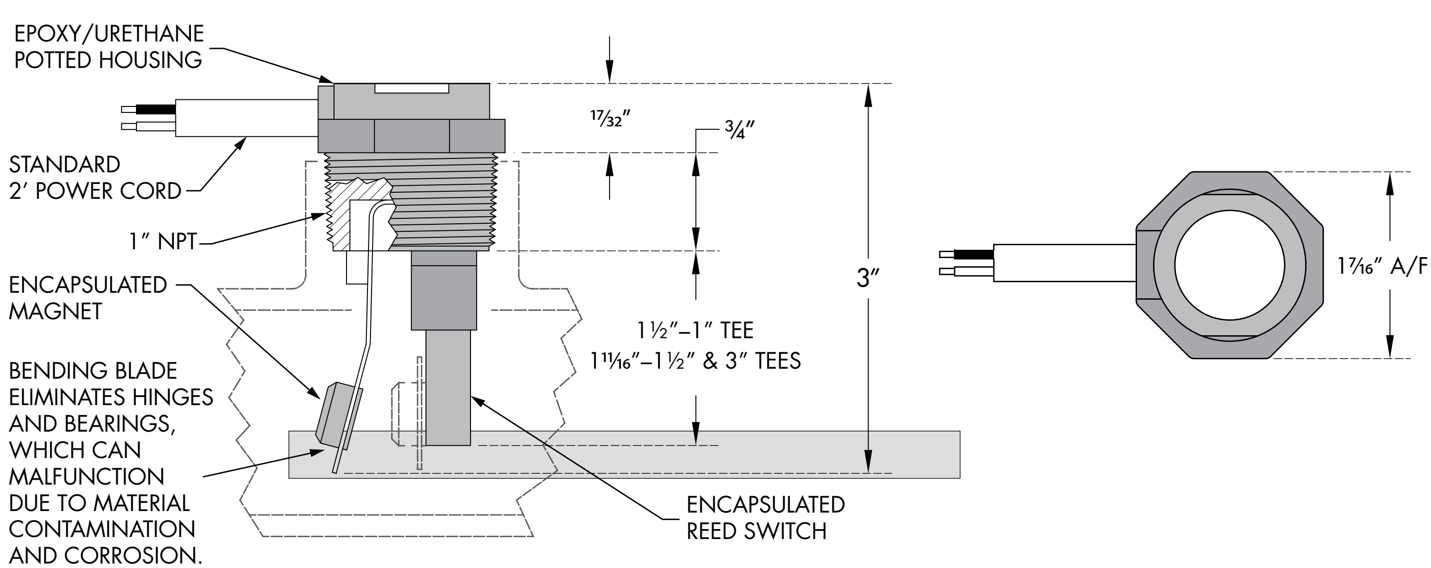
Q-10VCR (FORTRON®)
WORKING PRESSURE: 250 psig max. @ 70°F
WORKING TEMPERATURE: 200°F @ ambient pressure
WETTED MATERIALS: Body: Fortron® (PPS) (40% glass fibers); Paddle: HASTELLOY® C

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.

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 DIMENSIONS



- 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

Maximum flow rate should be no more than five times the close point.

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 (1724 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
Computer Systems
Diodes, SCRs, Triacs, etc.
Electromagnets
Fire Sprinkler Flow Alarms
Lasers
Emergency Wash-Down Showers
Marine and Stationary Engines
RF and Radar Transmitters
Spot welders
Transformers
Vacuum Systems

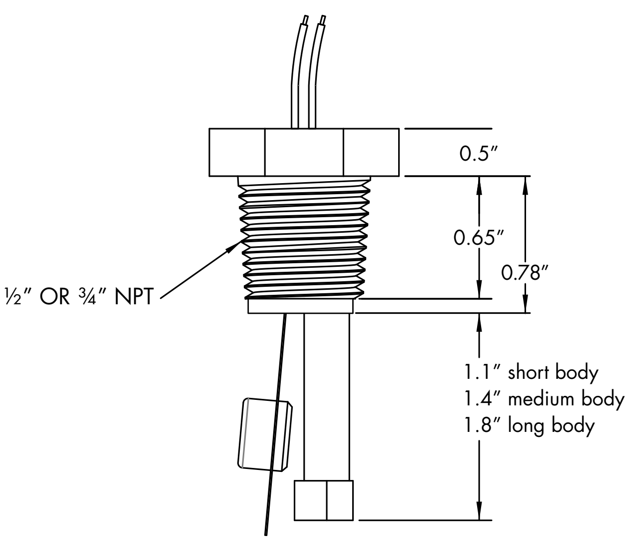
In Chemical Processing:

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

In Water Treatment:

Irrigation Systems
Salt and Fresh Water Systems

SIDE VIEW

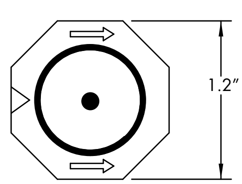


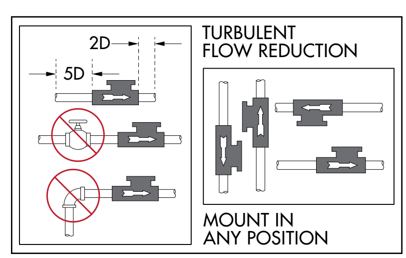
≈ TYPICAL WORKING FLUIDS

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

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

TOP VIEW





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

MODEL SELECTION CHART			
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%			
PIPE SIZE	**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 (REED) SWITCH CHARACTERISTICS

SPNO

Contact Ratings:	N50	C2
AC Voltage (max. switching)	300VAC	24-30
DC Voltage (max. switching)	350VDC	24-30
Current (max. switching)	0.5A	0.5A
Power (max) (VA, W)	50 watts	10 watts

OPTIONAL: SPNC or SPDT - 0.2A, 3 watt, 30VAC/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

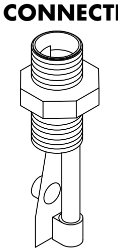
SAMPLE PART NUMBER

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, NC OR SPDT)	ELECTRICAL CONNECTION OPTION

Note: Tee and orifice options available when ordering.

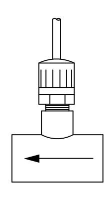
NOTE: Model Q-12N employs magnetic coupling between bending blade and switch body. Magnetic particles can accumulate on and around magnetic housing which may affect proper operation. Please conduct appropriate fluid magnetic particle evaluation and operational tests prior to and during installation and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

ELECTRICAL CONNECTION OPTIONS



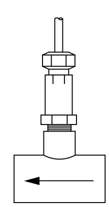
OPTION 1

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



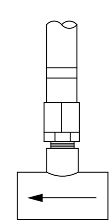
OPTION 2

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.

- 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

NOTE: CUSTOMER MUST SUPPLY PCBA BOARD AND PROGRAMMING

CE

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 (1724 kPa)**
Process Connection	**¾" NPT**
Electrical Contacts	**SPNO .25A (250 mA)**
Enclosure	**NEMA 4 / IP 66**

TYPICAL USES

Monitoring flow of coolant supplied to:

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

In Chemical Processing:

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

In Water Treatment:

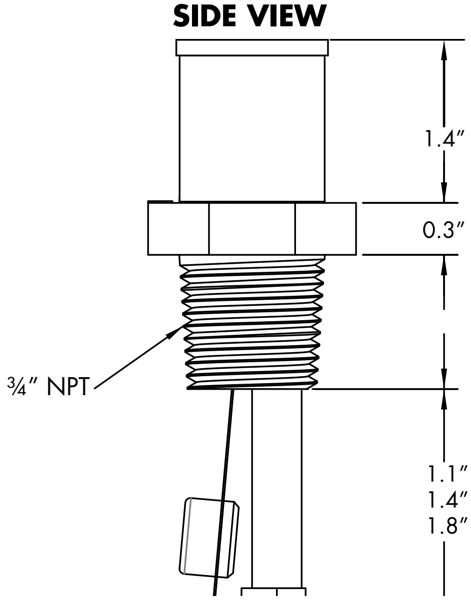
- Irrigation Systems
- Salt and Fresh Water Systems

≈ TYPICAL WORKING FLUIDS

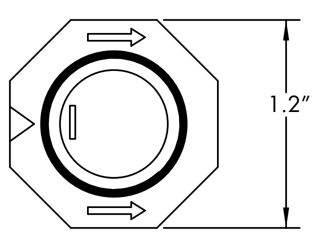
For use in a broad spectrum of industrial fluids, such as:

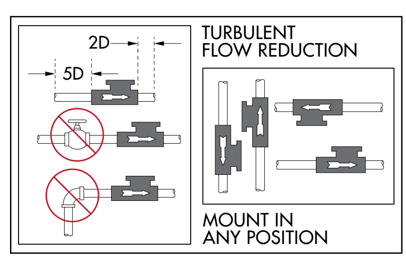
- Cooling Tower Water
- Glycol Solutions
- Mild Acids
- Plating Solutions
- Water (saltwater, pure, tap, etc.)
- Lubricating Oils
- Gasoline
- JP-4

SIDE VIEW



TOP VIEW





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MODEL Q-15N Q-15CR

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

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 Q-16SS

THE Q-16 STAINLESS STEEL. MAXIMUM RELIABILITY, MINIMUM COST.

The Q-16 Stainless Steel 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 Stainless Steel benefits from 40 years of flow switch development experience for every conceivable application.

Harwil's 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 decades.

The Q-16 Stainless Steel 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 Stainless Steel uses a 15A SPDT micro switch that can control a ½ horsepower motor.

- Multiple Quick-Change Paddles
- 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, Shaft and Body
- NEMA 1 Enclosure
- **Industry-Leading 3 Year Warranty**

KEY FEATURES

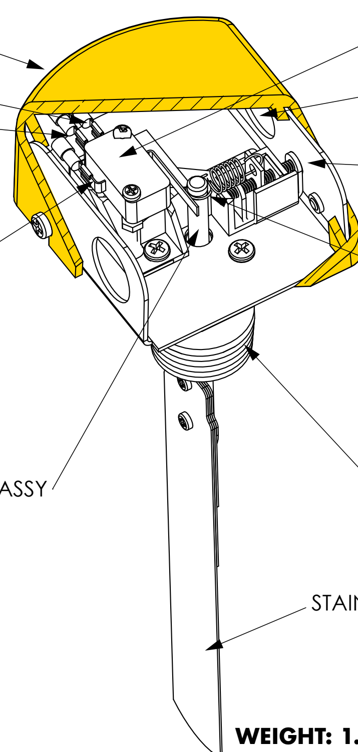
Flow Range	**4–500 GPM (15–1,893 L/m)**
Working Temp	**250˚F (121˚C) Maximum**
Working Pressure	**200 psi (1379 kPa)**
Process Connection	**1" NPT**
Electrical Switch	**SPDT 15A**
Enclosure	**NEMA 1 / IP 10** (Not for use in hazardous locations)

TYPICAL USES

For use in

Boilers	Cooling Towers
Chillers	Water Treatment
Irrigation	

PRODUCT DIAGRAM



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

WEIGHT: 1.5 lb.
0.68 kg

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MODEL Q-16 Q-16SS

MODEL SELECTION CHART				
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%				
PIPE SIZE	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				

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 conditions:

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

Q-16 MATERIALS:

Body and shaft: Brass and 304 stainless steel; Paddles: 316 stainless steel; Seal: EPDM elastomer

Q-16SS MATERIALS:

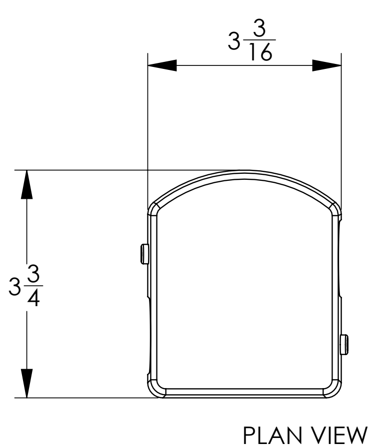
Body and shaft: 304 stainless steel; Paddles: 316 stainless steel; Seal: EPDM elastomer

ELECTRICAL SWITCH CHARACTERISTICS

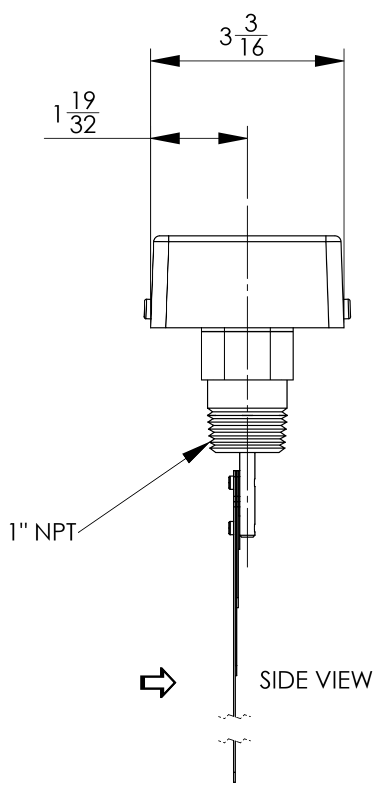
SPDT
15A, ½ hp @ 125 or 250VAC
½A @ 125VDC
¼A @ 250VDC
10,000,000 Operations Median

INSTALLATION DIMENSIONS

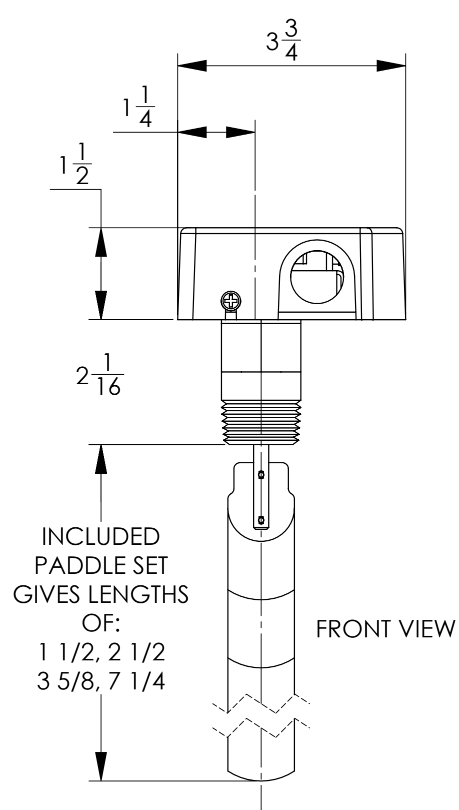
TOP VIEW



SIDE VIEW



FRONT VIEW



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

LEVEL SWITCH

MODEL L-5 L-5SS

CE NON-MAGNETIC

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.

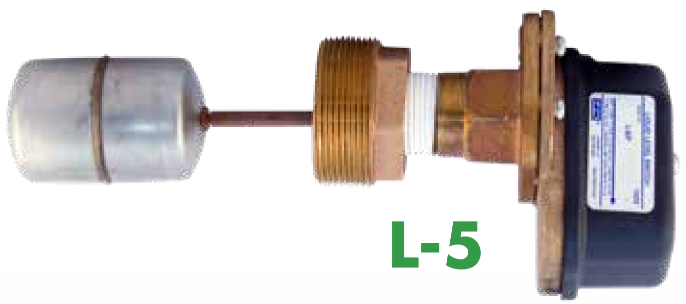
May be used in hazardous areas when used with intrinsically safe relays.

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**

TYPICAL USES

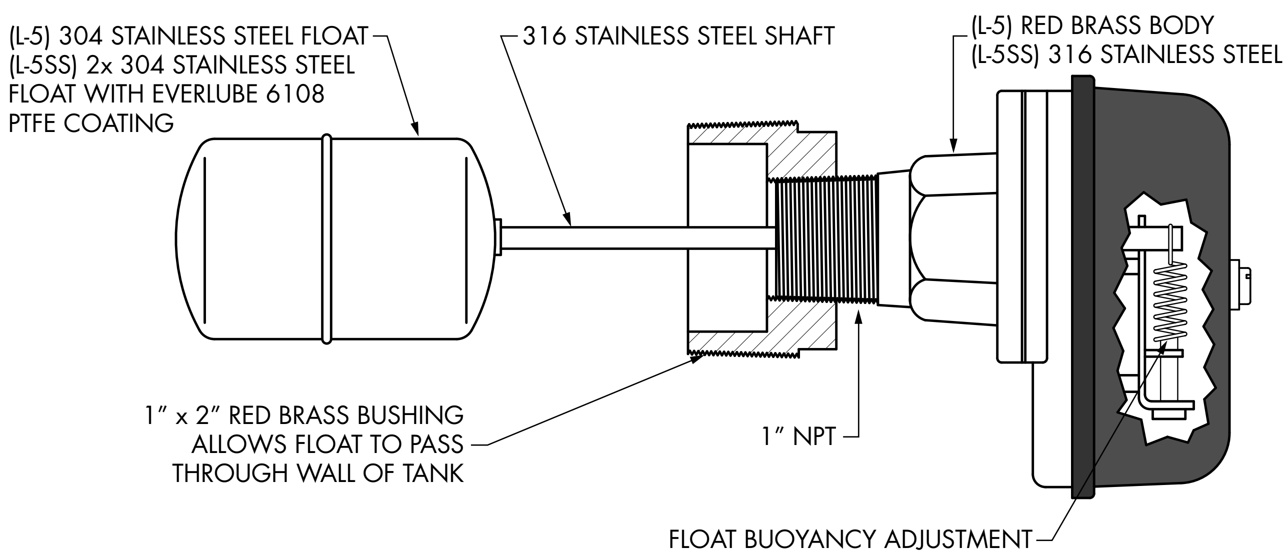
For use in particle contaminated fluids, such as:

Seawater	Contaminated Ground Water
Sewage	Rusty Coolant Water
Waste Water	

≈ TYPICAL WORKING FLUIDS

Alcohols	Machine Cutting Oils
Glycols	Slurries
Soap Solutions	Water

PRODUCT DIAGRAM



WEIGHT: 3 lb.
1.36 kg

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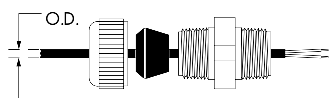
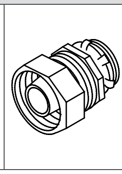
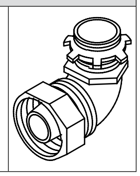
MODEL L-5 L-5SS

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(STR) - 0.5" straight		F90° - (0.5" 90°)	

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)

≈ ¼" 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

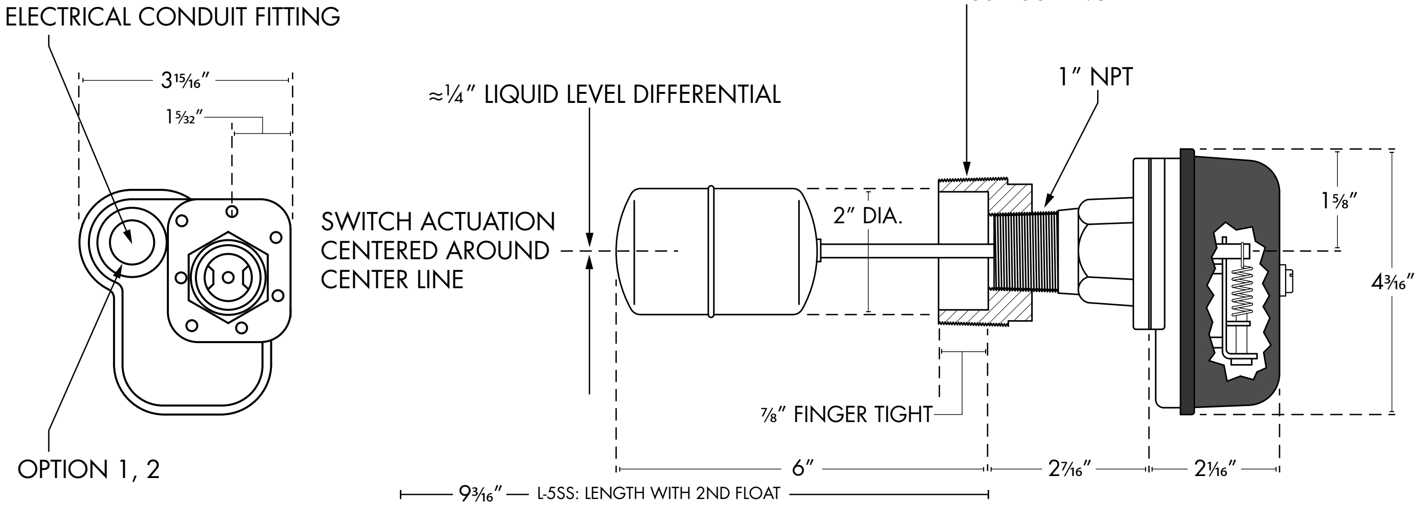
ELECTRICAL SWITCH CHARACTERISTICS

SPDT
15 A, ½ hp @ 125 or 250VAC
½A @ 125VDC, ¼A @ 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**	**OPTION 2: L-5**	**/ F**
BASE MODEL		BASE MODEL	
	GROMMET SIZE		½" FLEXIBLE CONDUIT FITTING

INSTALLATION DIMENSIONS



- 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

NON-MAGNETIC

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

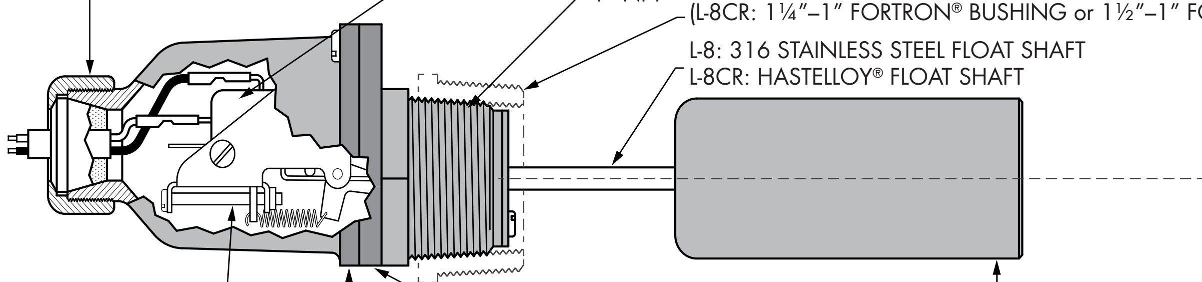
For use in particle contaminated fluids, such as:

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

≈ TYPICAL WORKING FLUIDS

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

PRODUCT DIAGRAM



WEIGHT: 0.5 lb.
0.23 kg

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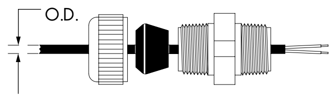
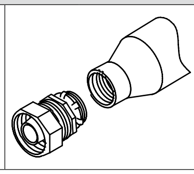
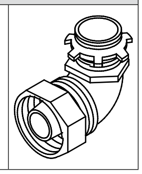
MODEL L-8N L-8CR

ELECTRICAL CONNECTION		
GROMMET	**CABLE O.D.**	**DIAGRAM**
A	0.25″	
AA	0.30″	
B	0.37″	
C	0.50″	

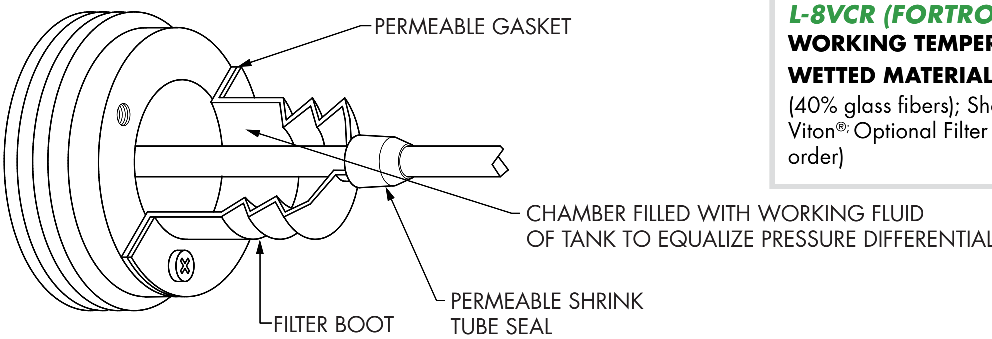
CONDUIT FITTINGS (AVAILABLE AT EXTRA COST)			
F(STR) - 0.5″ straight		F90˚ - (0.5″ 90˚)	

SAMPLE PART NUMBERS

OPTION 1: L-8N	/ A
BASE MODEL	
GROMMET SIZE	

OPTION 2: L-8N	/ F
BASE MODEL	
½" FIPT	

FILTER BOOT



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

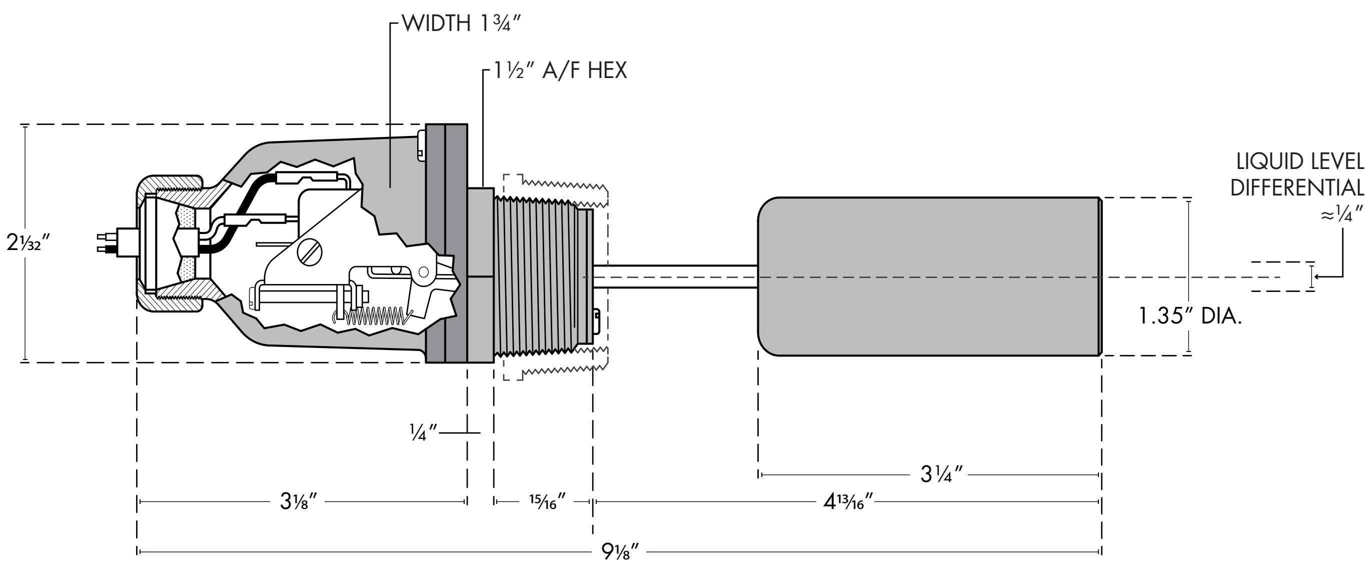
L-8N (NORYL®)

WORKING TEMPERATURE: 180˚F max. continuous.
WETTED MATERIALS: Body, Float and Bushing: Noryl® (PPO) (10% glass fibers); Shaft and Screws: 316 stainless; 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® (PPS) (40% glass fibers); Shaft and Screws: HASTELLOY® C; Diaphragm: Viton®; Optional Filter Boot: Viton® (EPDM available by special order)

INSTALLATION DIMENSIONS



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

LEVEL SWITCH

MODEL 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 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.

KEY FEATURES

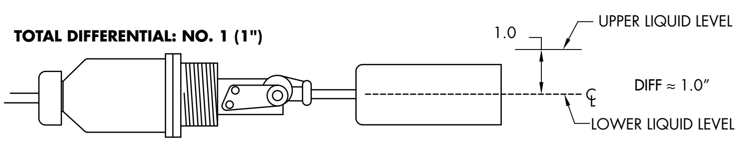
Working Fluid Specific Gravity	**0.7 minimum**
Working Temp	**200°F (93°C) Maximum**
Working Pressure	**250 psig (1724 kPa)**
Process Connection	**1¼" NPT**
Electrical Switch	**SPDT 15A**
Enclosure	**NEMA 6P / IP 67**

≈ TYPICAL WORKING FLUIDS

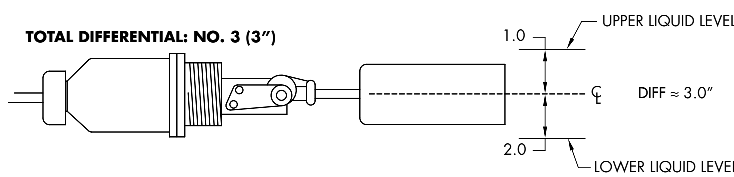
Clean Water	Contaminated Ground Water
Filtered Sewage	Filtered Waste Water
Mild Acids	Inorganic Aqueous Solutions
Mild Bases	Sea Water

LIQUID LEVEL DIFFERENTIAL DIMENSONS

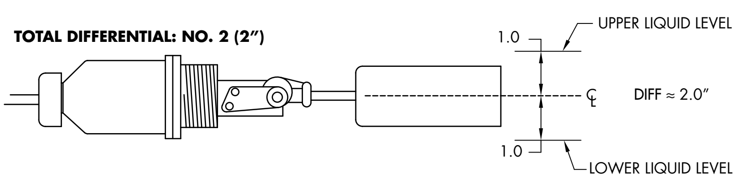
TOTAL DIFFERENTIAL: NO. 1 (1")



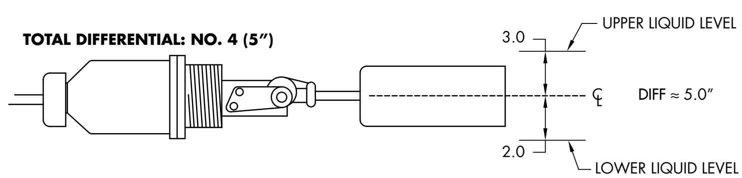
TOTAL DIFFERENTIAL: NO. 3 (3")



TOTAL DIFFERENTIAL: NO. 2 (2")



TOTAL DIFFERENTIAL: NO. 4 (5")



WEIGHT: 5 oz.
142 g

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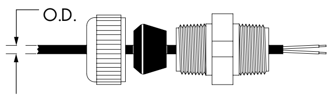
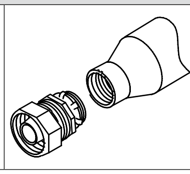
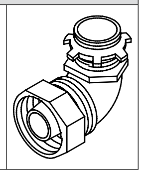
MODEL L-21N L-21VCR

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(STR) - 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-21VCR	/ 15A	/ 5	/ F
BASE MODEL			
SWITCH CAPACITY			
LIQUID LEVEL DIFFERENTIAL			
½" FIPT			

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)

1", 2", 3" or 5" travel (based on model selected)

ELECTRICAL SWITCH CHARACTERISTICS

SPDT
15 A, ½ hp @ 125 or 250VAC
½A @ 125VDC, ¼A @ 250VDC
4A @ 125VAC (Tungsten lamp load)

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.

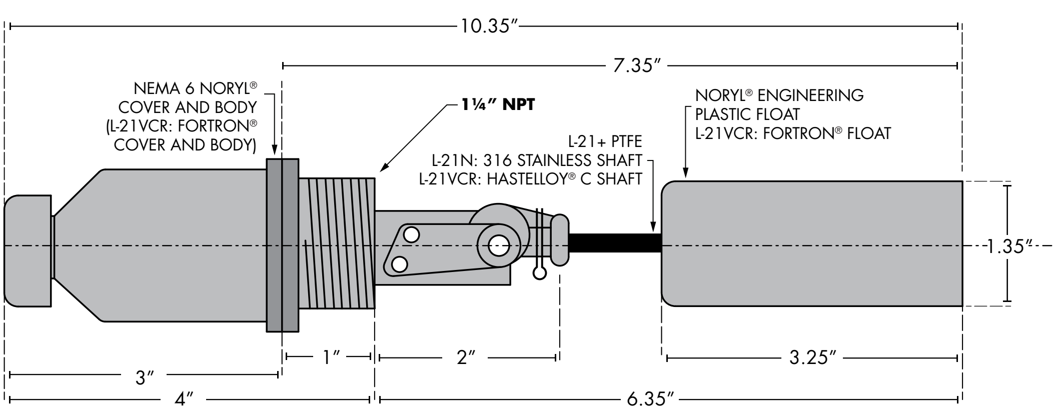
WORKING FLUID SPECIFIC GRAVITY

0.7 minimum

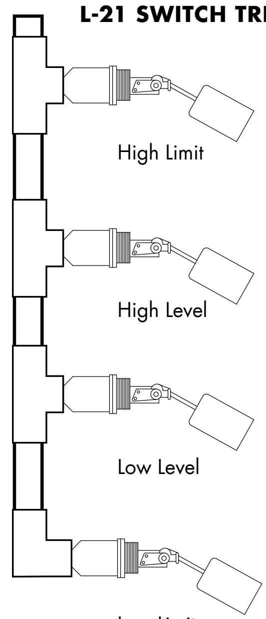
L-21N (NORYL®)
WORKING PRESSURE: 250 psi max. continuous
WORKING TEMPERATURE: 180˚F max. continuous.
WETTED MATERIALS: Body, Float and Bushing: Noryl® (PPO) (10% glass fibers); Screws and shaft: 316 stainless steel

L-21VCR (FORTRON®)
WORKING PRESSURE: 250 psi max. continuous
WORKING TEMPERATURE: 200˚F max. continuous.
WETTED MATERIALS: Body, Float and Bushing: Fortron® (PPS) (40% glass fibers); Screws and shaft: HASTELLOY® C

INSTALLATION DIMENSIONS



L-21 SWITCH TREE



- Installation drawing and a numbered parts list is supplied with each unit.

LEVEL SWITCH

MODEL L-30N L-30CR

NON-MAGNETIC

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 ¼" NPT bushing included
- Electrical Connection: Cable compression nut (specify grommet size) or "F" ½ 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 ¼ Bushing**
Electrical Switch	**SPDT 15A or Dry Circuit**
Weight	**0.5 lb. (0.23 kg)**
Enclosure	**NEMA 6P / IP 67**

TYPICAL USES

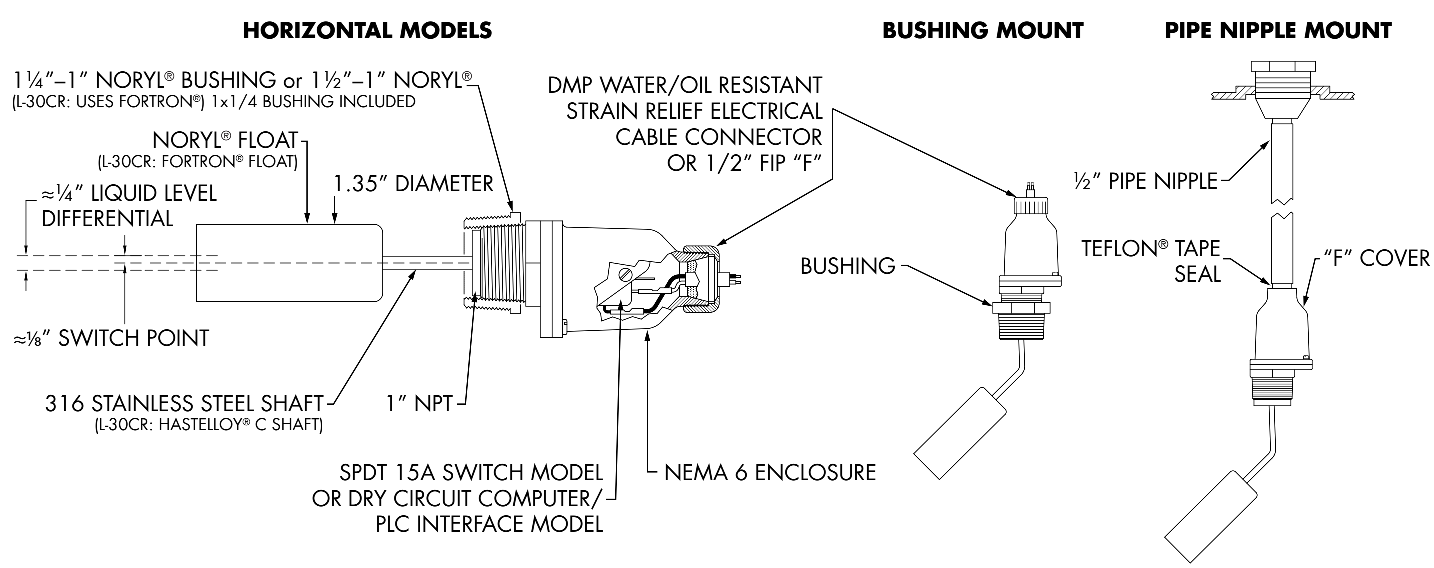
For use in particle contaminated fluids, such as:

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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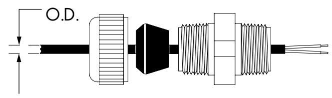
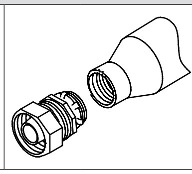
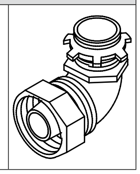
ELECTRICAL CONNECTION		
GROMMET	**CABLE O.D.**	**DIAGRAM**
A	0.25″	
AA	0.30″	
B	0.37″	
C	0.50″	

CONDUIT FITTINGS (AVAILABLE AT EXTRA COST)			
F(STR) - 0.5″ straight		F90˚ - (0.5″ 90˚)	

MODEL L-30N L-30CR

TECHNICAL SPECIFICATIONS

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)

≈ ¼" max. travel

ELECTRICAL SWITCH CHARACTERISTICS

SPDT
15 A, ½ hp @ 125 or 250VAC
½A @ 125VDC, ¼A @ 250VDC
5A @ 125VAC (Tungsten lamp load)
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); Shaft and Screws: 316 stainless steel; Diaphragm: EPDM; Optional Filter Boot: EPDM (Viton® available by special order); Optional Float Material: Polypropylene

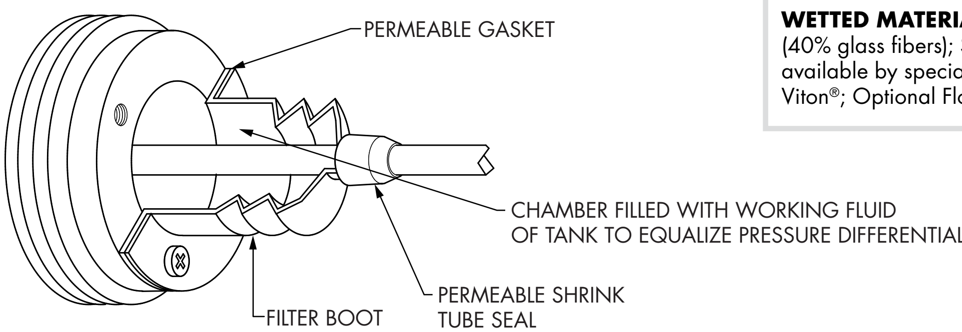
L-30CR (FORTRON®)

WORKING TEMPERATURE: 200˚F max. continuous.
WETTED MATERIALS: Body, Float and Bushing: Fortron® (PPS) (40% glass fibers); Shaft and Screws: HASTELLOY® C (Titanium available by special order); Diaphragm: Viton®; Optional Filter Boot: Viton®; Optional Float Material: Polypropylene

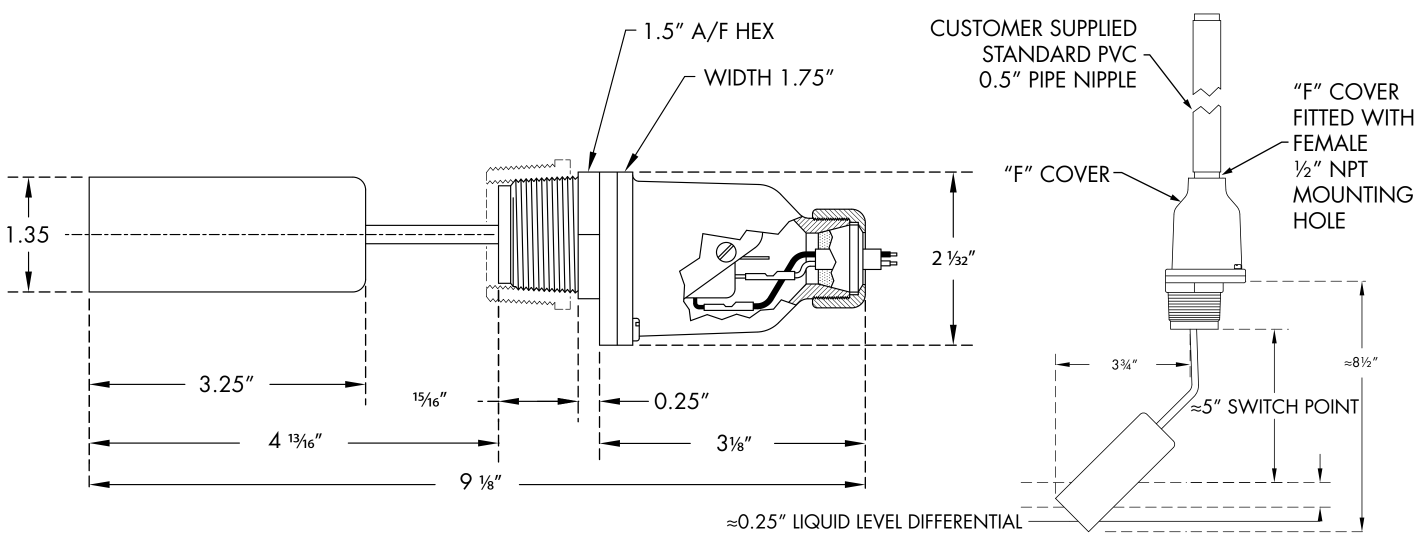
SAMPLE PART NUMBERS

OPTION 1: L-30N	/ A	OPTION 2: L-30N	/ F
BASE MODEL	☐	BASE MODEL	☐
GROMMET SIZE		½" FIPT	

FILTER BOOT



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 1¼" x ¼" x ½" 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.

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 (1724 kPa)**
Process Connection	**¼" NPT**
Electrical Switch	**SPNO or SPNC, 0.5A**
Enclosure	**NEMA 6P / IP 67**

TYPICAL USES

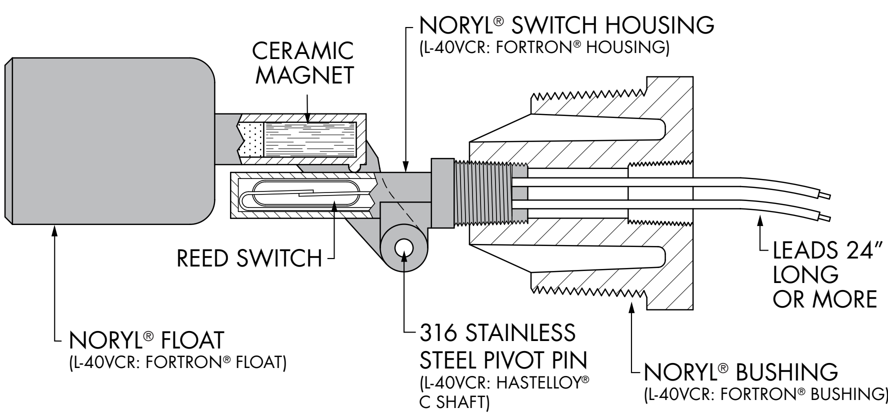
Water Level Control In:

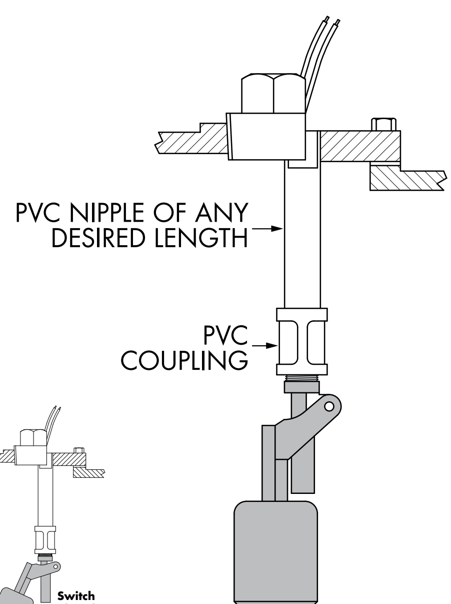
- Cooling Towers
- Washing Tanks
- Fountains
- Plating Tanks
- Fish Farms
- Aquariums
- Pools
- Ponds
- Water Features

≈ TYPICAL WORKING FLUIDS

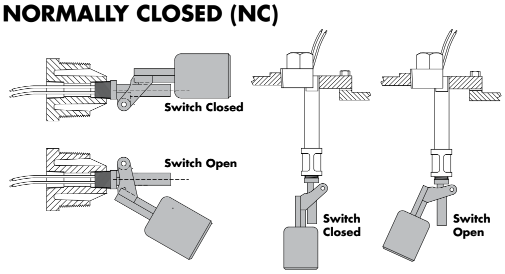
- Mild Acids
- Mild Bases
- Pure Water
- Process Water
- Seawater
- Filtered Sewage
- Contaminated Ground Water

PRODUCT DIAGRAM

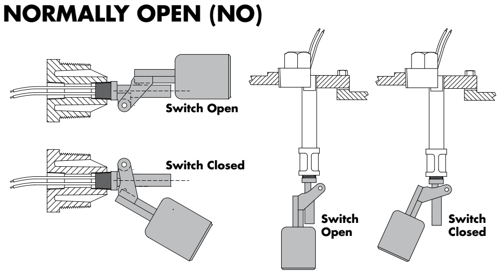




NORMALLY CLOSED (NC)



NORMALLY OPEN (NO)



WEIGHT: 5 oz.
142 g

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

MODEL L-40N L-40VCR

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

L-40N	**/ NO**	**/ 2FT**
BASE MODEL		
SWITCH OPERATION		
SPECIFY WIRE LENGTH IN FEET		

TECHNICAL SPECIFICATIONS

ELECTRICAL (REED) SWITCH CHARACTERISTICS

SPNO or SPNC
Contact Ratings:

AC Voltage (max. switching)	300VAC
DC Voltage (max. switching)	350VDC
Current (max. switching)	0.5A
Power (max) (VA, W)	50 watts

OPTIONAL: SPDT, 3 watt, 30VAC/VDC.

HYSTERESIS (Δ LIQUID LEVEL TO ACTIVATE/DEACTIVATE SWITCH)

≈ ⅜" (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®)

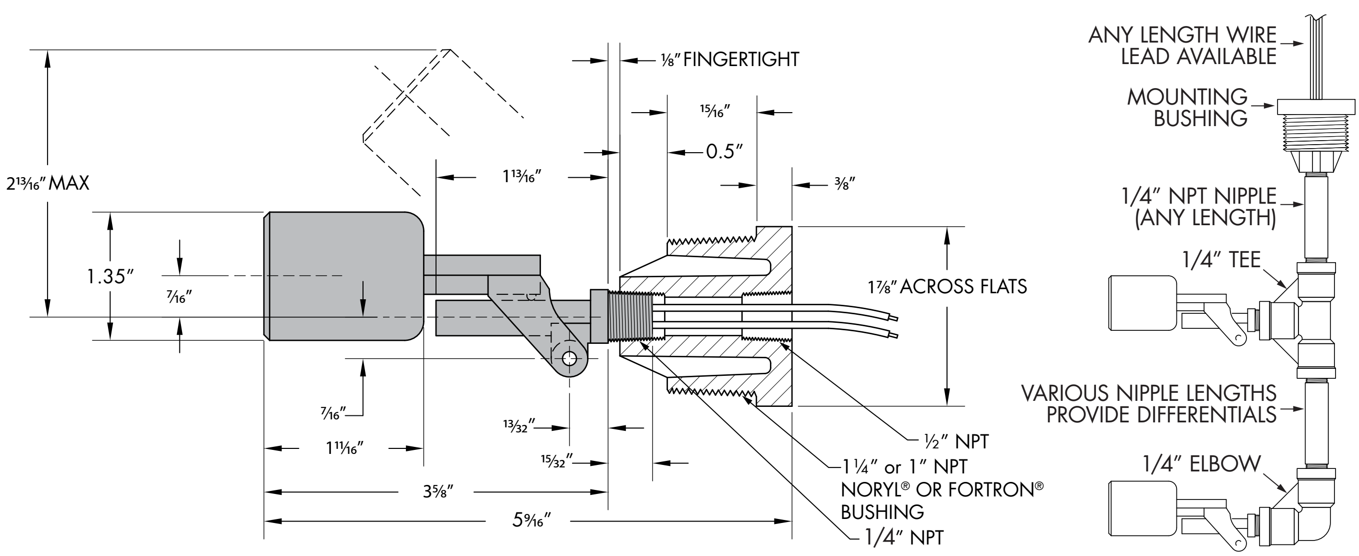
WORKING FLUID SPECIFIC GRAVITY:
Top Mount: 0.9 Side Mount: 0.7
WORKING PRESSURE: 250 psi max. continuous
WORKING TEMPERATURE: 200°F max. continuous.
WETTED MATERIALS: Body, Float and Bushing: Fortron® (PPS) (40% glass fibers); Pivot Pin: HASTELLOY® C

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. Steady state driving coil Volt/Amp rating should be 8VA or less.

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.

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.

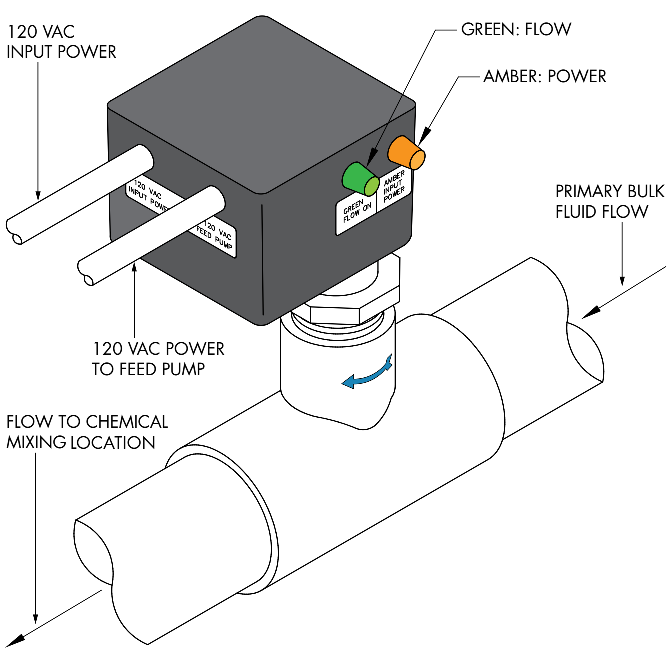
KEY FEATURES	
Working Temp	**180˚F (82˚C) Maximum**
Working Pressure	**250 psi (1724 kPa)**
Process Connection	**¾" NPT (½" Option Available)**
Electrical Switch	**SPNO**
Voltages	**120V & 240V**
Enclosure	**NEMA 6 / IP 67**

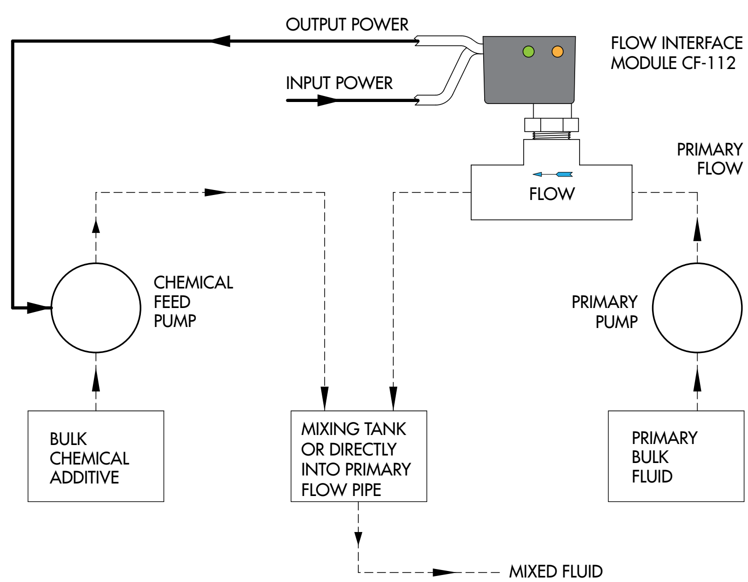
TYPICAL USES

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

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

PRODUCT DIAGRAM





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MODEL CF-112

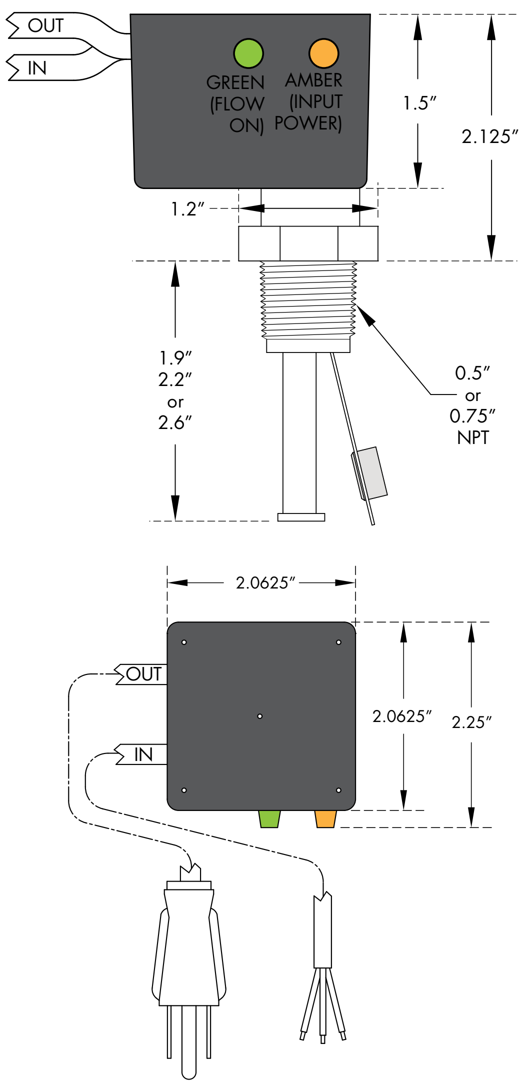
MODEL SELECTION CHART			
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%			
PRIMARY FLOW LINE SIZE	PRIMARY FLOW ON/OFF SET POINT (GPM)		CF-112N PART NUMBER
	ON	OFF	
¾"	0.9	0.8	CF-112N-.75
1"	1.1	1.0	CF-112N-1
1½"	2.8	2.5	CF-112N-1.5
2"	4.9	4.4	CF-112N-2
Note: Consult factory for larger pipes and lower ON/OFF switch set points.			

SAMPLE PART NUMBER

	CF-112N	**/1**	**/120**
BASE MODEL AND PART NUMBER	✓		
PIPE SIZE		✓	
VOLTAGE			✓

EXAMPLE: CF-112N/1"/240

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

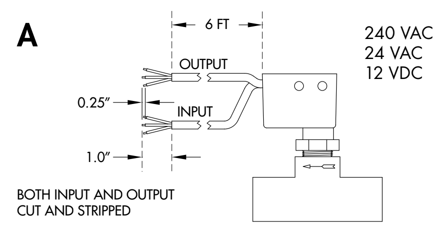
Feed pump motor maximum contact ratings.

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.

A



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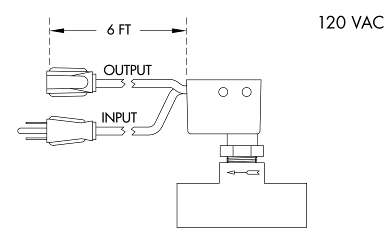


- Installation drawing and a numbered parts list is supplied with each unit.
- Special one-day delivery is available.

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 (1724 kPa)**
Process Connection	**¾" NPT (½" Option Available)**
Electrical Switch	**SPNO**
Voltages	**120V 50/60 Hz**
Enclosure	**NEMA 3R / IP 14**

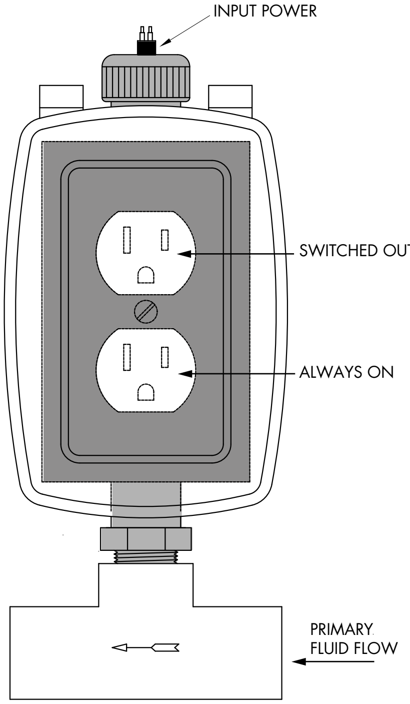
TYPICAL USES

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

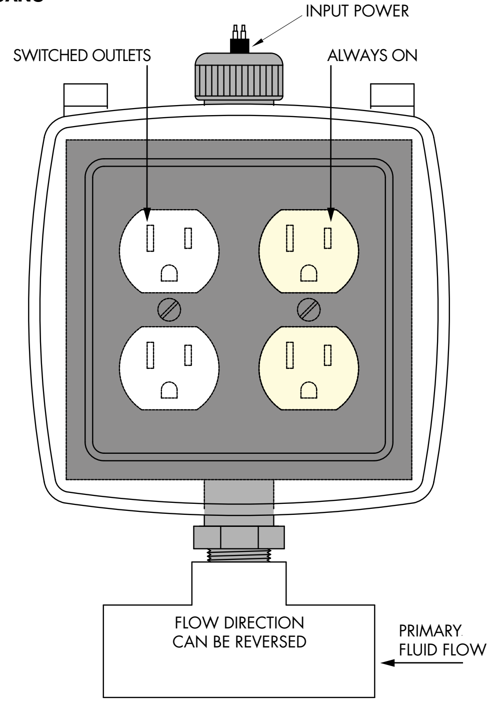
- Well Water
- Drinking Water
- Waste Fluid Processing
- Cooling Tower pH/orp Control
- Metal Plating Make Up Solutions
- Boiler Treatment Additives

PRODUCT DIAGRAM

1 GANG



2 GANG



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

MODEL SELECTION CHART		
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%		
PRIMARY FLOW LINE SIZE	**PRIMARY FLOW ON/OFF SET POINT (GPM)**	
	ON	**OFF**
¾"	0.9	0.8
1"	1.1	1.0
1½"	2.8	2.5
2"	4.9	4.4
Note: Consult factory for larger pipes and lower ON/OFF switch set points.		

SAMPLE PART NUMBER		
CF-12N	**-1G**	**/1**
BASE MODEL		
	1G OR 2G	
		PIPE SIZE

EXAMPLE: CF-12-1G/1"

WORKING PRESSURE
250 psi max. continuous

WORKING TEMPERATURE
180°F max. continuous.

SHOCK OPERATION
10g for 11ms with no contact open.

SHOCK LIMIT
10g

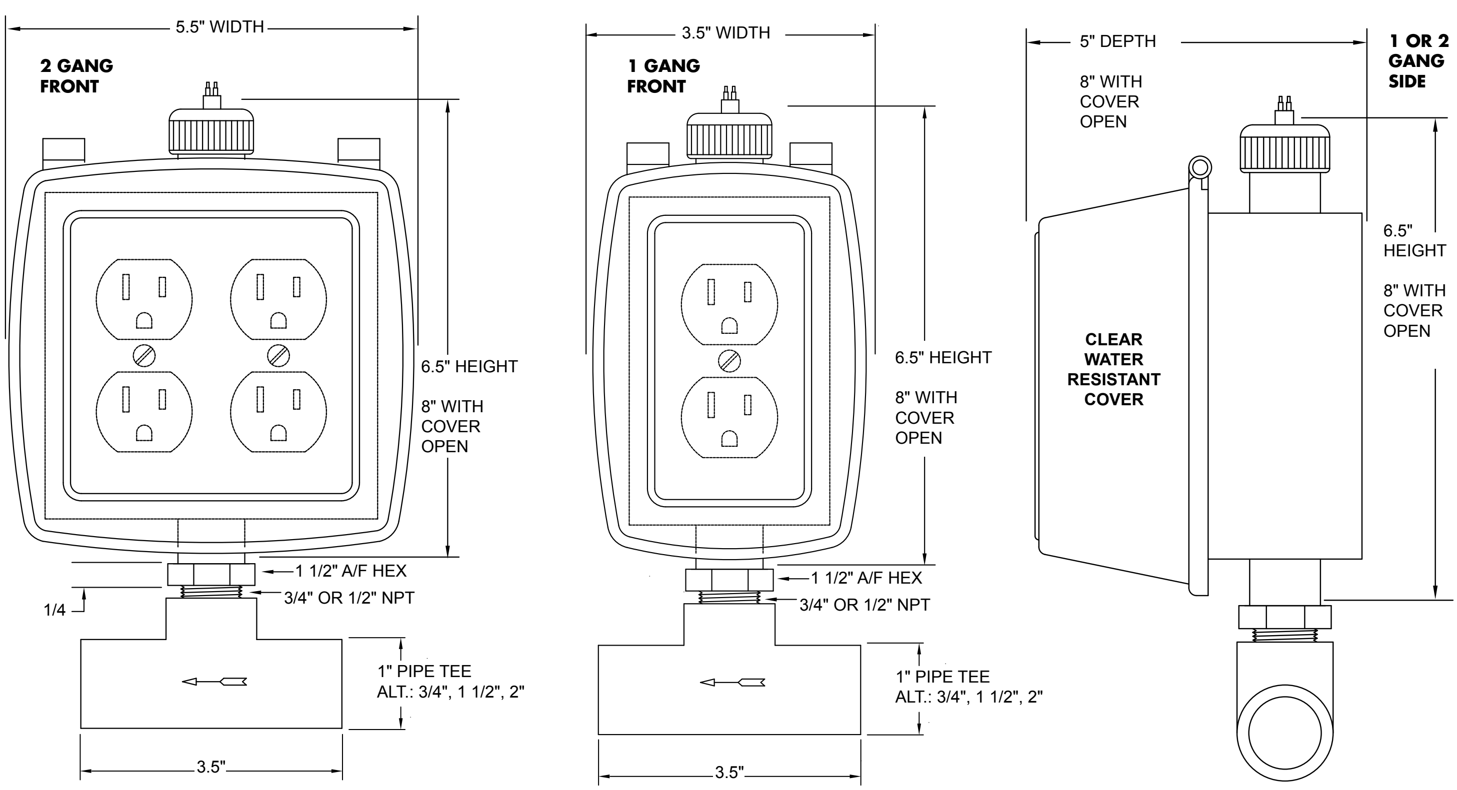
WETTED MATERIALS
Body and Bushing: Noryl® (PPO) (10% glass fibers)
PVC Tee

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 DIMENSIONS



- 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

NON-MAGNETIC

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

KEY FEATURES

Flow Range	**5 - 80 GPM (18–302 L/m)**
Working Temp	**180˚F (82˚C) Maximum**
Working Pressure	**50 psig (344 kPa) @ 180˚F**
Process Connection	**1" NPT**
Electrical Switch	**SPDT, ½hp 13A or Dry Circuit**
Enclosure	**NEMA 3R / IP 14**

TYPICAL USES

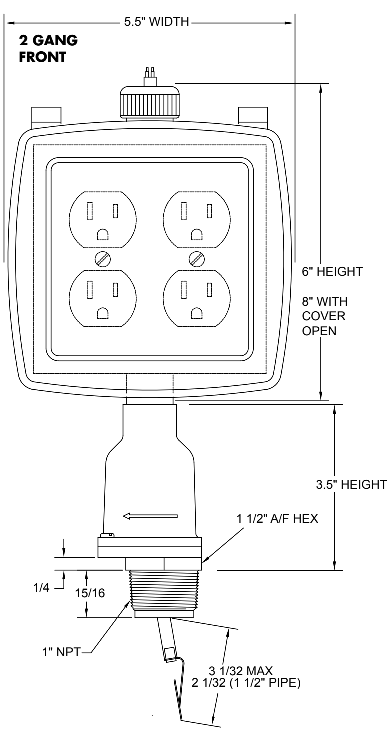
Monitoring fluid flow in:

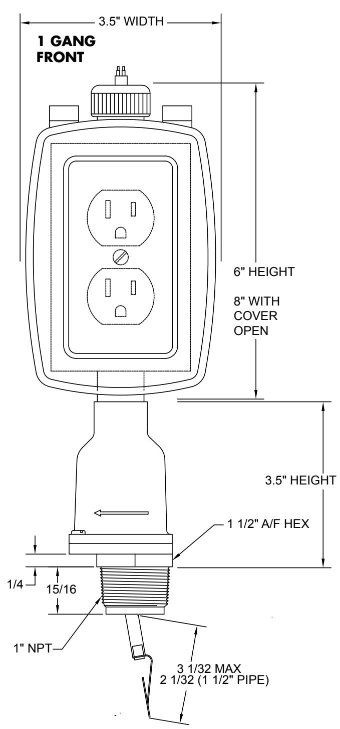
- Air Conditioning Systems
- Cooling in Data Centers
- Chillers
- Fluid Blending Systems
- Natural Gas
- Industrial Refrigeration Systems
- Pools and Spas
- Scrubbers
- Water Treatment Systems

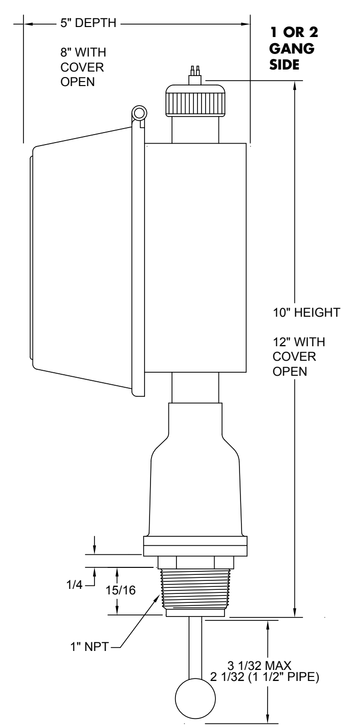
≋ TYPICAL WORKING FLUIDS

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

INSTALLATION DIMENSIONS







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

MODEL SELECTION CHART			
Flow Range (Water calibrated at 70°F / 21°C) Accuracy ±10%			
PIPE SIZE	**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 ½"	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

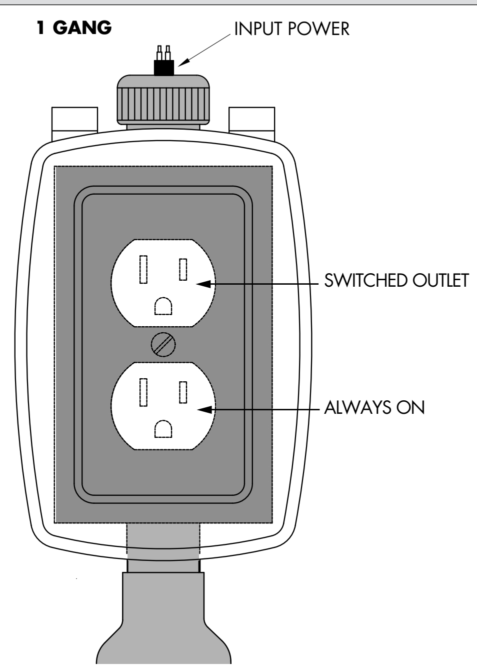
SPDT — 10,000,000 Operations Median
13A, ½ hp @ 125VAC
½A @ 125VDC
(tungsten lamp load)

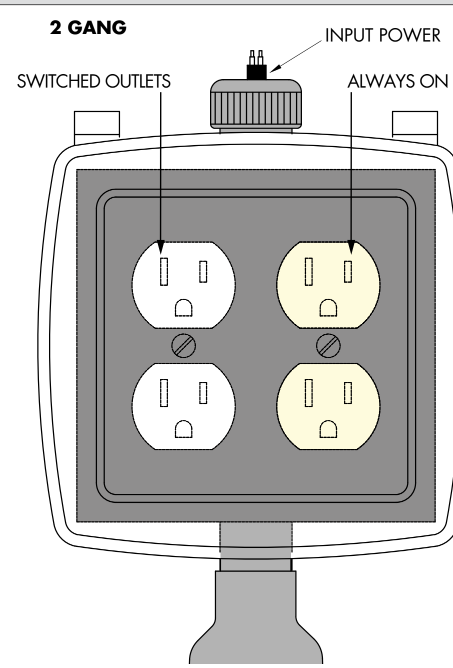
SAMPLE PART NUMBER

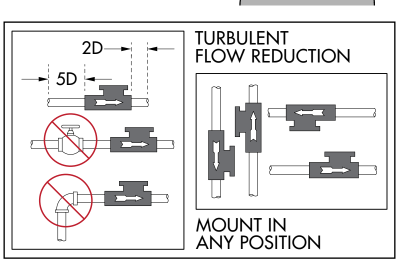
CF-8	-1G	/1	/2
BASE MODEL			
1G OR 2G			
SHAFT LENGTH			
PADDLE SIZE			

EXAMPLE: CF-8-1G/1/2

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 ½" 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 1½ (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.

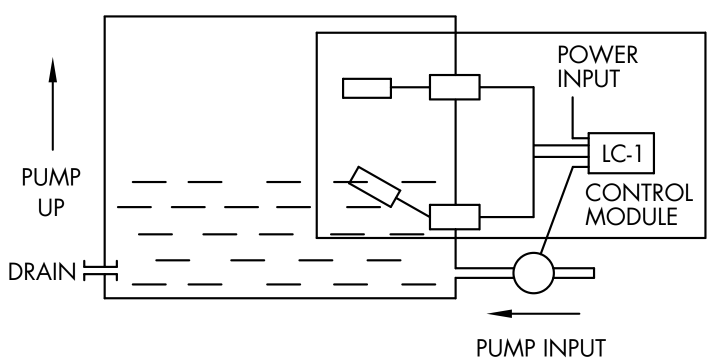
Each system is provided with a complete, descriptive parts list and an installation and wiring diagram for both level switches and control module.

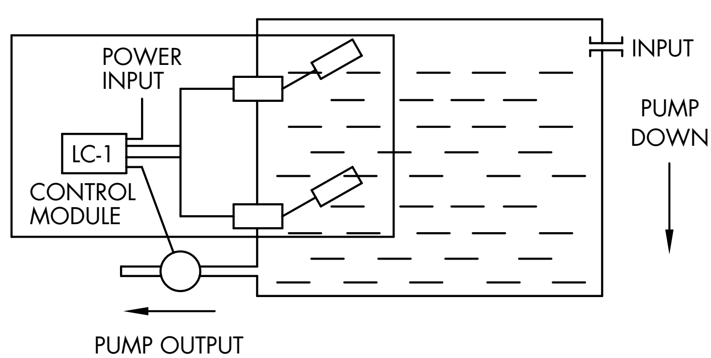
Maintenance and check out requires only a standard multimeter.

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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MODEL LC-1

SAMPLE PART NUMBER			
LC-1	/ L-5	/ 6FT	/ 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

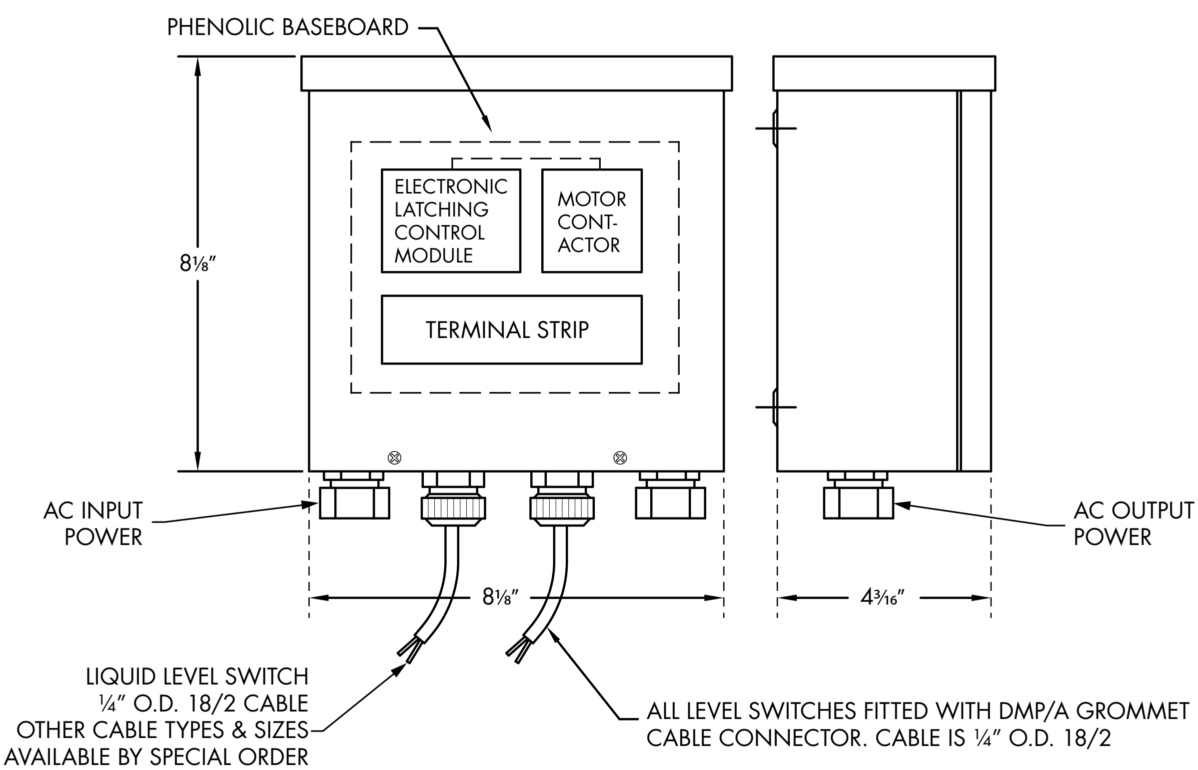
Type: DPST - Normally Open
Contact rating per pole:
Terminal Strip - 812 Series
Electrical Rating
Rated voltage - 1600 Volts RMS
Current rating - 30A
Wire Size
Will accommodate lugs for wire sizes AWG #14 to 12
Hardware
Screws and terminals - brass, nickel plated
Solder terminals - brass, hot-tinned
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 6 standard models.
3. Length of cable in feet between control module 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"
4. Operating Voltage.



- 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

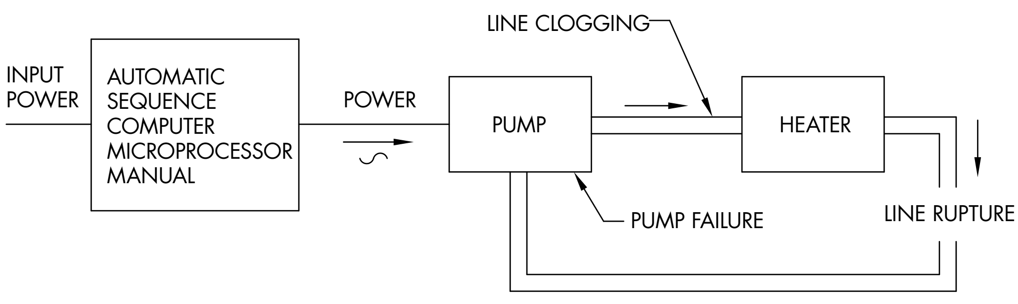
ADDITIONAL FEATURES:

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

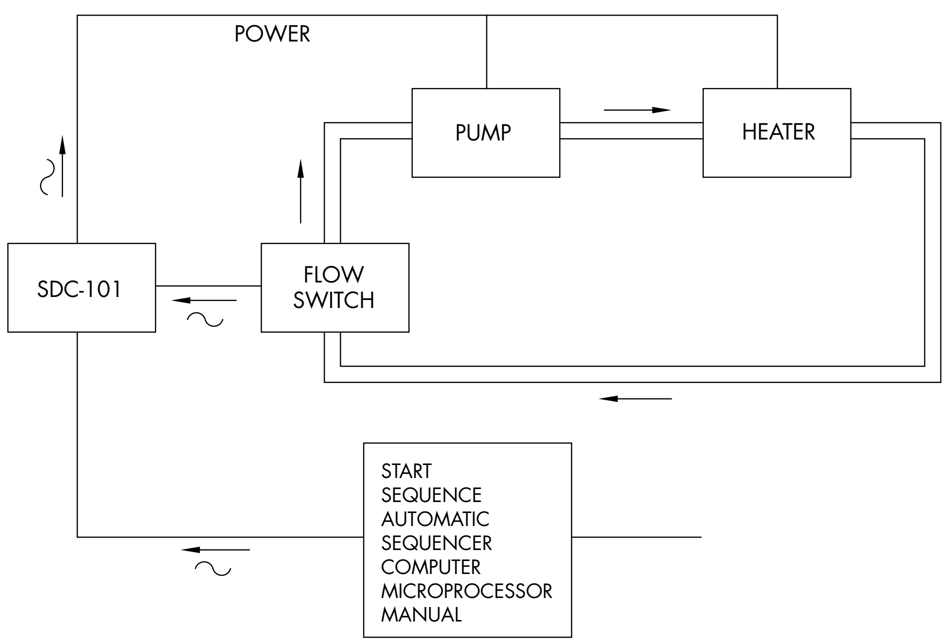
All components UL listed or recognized

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 straight-forward using an uncomplicated, standard multimeter.

Enclosure: NEMA 4 / IP 66.



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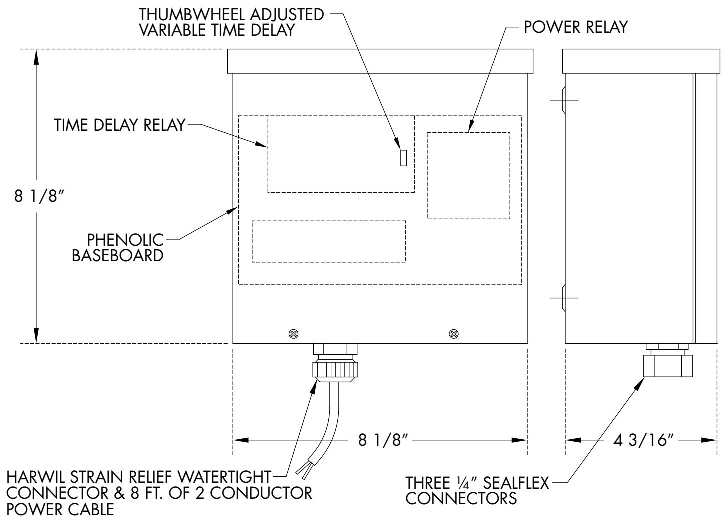
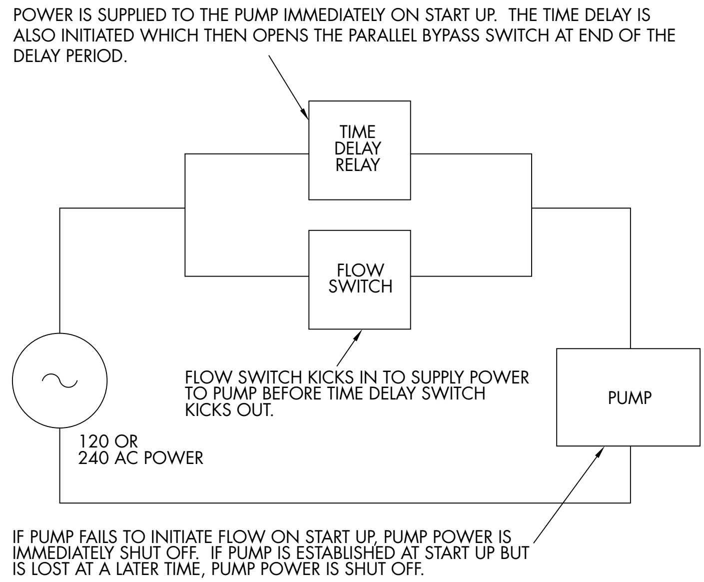
MODEL SDC-101

SPECIFICATIONS:

Control Box

Rain resistant type 3R - UL listed.





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, ½ hp @ 120/240VAC, 50/60 Hz
- Standard Time Cycle
- 1 to 180 sec., Continuously adjustable
- Ambient Operating Temp. Range -5˚ to 140˚F
- Termination - ¼" quick disconnect terminals

SWITCH PERFORMANCE DATA

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

- Harwil Fluid Flow or Liquid Level 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.

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 ¼" quick connect
- Maximum Ambient Temperature: 155˚

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).
- UL Recognized

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

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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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	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, Glacia[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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	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
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	*	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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	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	A	B	B	A	C
Copper Floborate	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 Gycol	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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	FORTRON	VITON	BUNA N	ETHYLENE PROPYLENE	EPOXY
Formic Acid6	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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	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																
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																
Jet Fuel (JP#, JP4, JP5)	A	A	A	*	*	A	*	A	A	D	D	A	A	A	D	A
K																
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																
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																
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
Mercurie 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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	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																
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																
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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	FORTRON	VITON	BUNA N	ETHYLENE PROPYLENE	EPOXY
Corn	A	A	B	*	*	B	*	*	*	*	A	*	A	A	C	A
Cotton Seed	A	A	B	*	*	B	*	A	A	*	A	A	A	A	C	A
Cresote[2]	A	A	A	*	*	*	*	*	*	*	D	*	A	A	D	A
Diesel Fuel (2D, 3D, 4D, 5D)	A	A	A	*	*	A	*	*	*	D	A	A	A	A	D	A
Fuel (1,2,3,5A, 5B, 6)	A	A	A	A	A	A	*	A	A	D	B	*	A	B	D	A
Oils (Cont.) Ginger	A	A	*	*	*	*	*	*	*	*	*	*	A	A	*	A
Hydraulic (See Hydraulic)																
Lemon	A	A	*	*	*	*	*	*	*	*	D	*	A	*	*	A
Linseed	A	A	A	*	*	A	*	A	*	*	A	*	A	A	D	A
Mineral	A	A	A	*	*	A	*	A	*	B	B	A	A	A	D	A
Olive	A	A	A	*	*	B	*	A	A	*	A	*	A	A	*	A
Orange	A	A	*	*	*	*	*	*	A	*	A	*	A	A	*	A
Palm	A	A	A	*	*	B	*	A	*	*	*	*	A	A	*	A
Peanut[3]	A	A	A	*	*	A	*	A	*	*	D	*	A	A	*	A
Peppermint[2]	A	A	*	*	*	A	*	*	*	*	D	*	A	D	*	A
Pine	A	A	A	*	*	D	*	A	A	*	*	*	A	A	*	A
Rape Seed	A	A	*	*	*	A	*	A	*	*	*	*	A	B	*	A
Rosin	A	A	A	*	*	*	*	*	*	*	A	*	A	A	*	A
Sesame Seed	A	A	A	*	*	A	*	A	*	*	*	*	A	A	*	A
Silicone	A	A	*	*	*	A	*	*	*	A	A	*	A	A	*	A
Soybean	A	A	A	*	*	B	*	A	*	*	A	*	A	A	*	A
Sperm	A	A	*	*	*	A	*	A	*	*	*	*	A	A	*	A
Tanning	A	A	*	*	*	*	*	*	*	*	*	*	A	A	*	A
Turbine	A	A	A	*	*	A	*	A	*	*	*	*	A	A	*	A
Oleic Acid	A	A	B	*	B	B	C	A	A	C	C	*	D	B	D	A
Oleum 25%	*	*	*	*	A	*	*	D	A	D	*	*	A	D	D	D
Oleum	*	A	B	*	*	C	C	D	A	*	D	*	A	C	D	A
Oxalic Acid (Cold)	A	B	C	C	B	B	C	A	A	C	A	*	A	B	A	A
P																
Paraffin	A	A	A	*	*	A	*	A	A	B	A	*	A	A	*	A
Pentane	C	C	A	*	B	A	*	*	A	D	*	*	A	A	D	A
Perchloroethylene[2]	A	A	A	*	*	C	*	*	A	D	D	A	A	C	D	A
Petrolatum	*	A	B	*	*	B	*	*	A	D	*	*	A	A	A	A
Phenol 10%	A	A	A	*	B	C	*	A	A	*	*	A	B	D	D	C
Phenol (Carbolic Acid)	A	A	B	C	A	B	D	A	A	C	B	A	A	D	D	B
Phosphoric Acid (to 40% Solution)	B	A	D	A	A	D	D	A	A	A	A	A	A	D	B	A
Phsophoric Acid (40-100% Solution)	C	B	D	B	A	D	D	A	A	A	A	A	A	D	B	C
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	*	*
Phsphoric 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 Antimony Plating 130°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B

	304 STAINLESS STEEL	316 STAINLESS STEEL	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	FORTRON	VITON	BUNA N	ETHYLENE PROPYLENE	EPOXY
Arsenic Plating 110°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B
Brass Plating Regular Brass Bath 100°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B
High Speed Brass Bath 110°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B
Bronze Plating Copper-Cadmium Bronze Bath R.T.	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B
Copper-Tin Bronze Bath 160°F	*	A	*	A	A	*	*	D	A	A	A	*	A	A	*	C
Platings (Cont.) Copper-Zinc Bronze Bath 100°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B
Cadmium Plating Cyanide Bath 90°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B
Fluoborate Bath 100°F	*	A	*	D	A	*	*	A	A	A	A	*	A	B	*	B
Chromium Plating Chromic-Sulfuric Bath 130°F	*	C	*	A	A	*	*	A	A	D	A	*	C	D	*	D
Fluosilicate Bath 95°F	*	C	*	C	A	*	*	A	A	D	A	*	C	D	*	D
Fluoride Bath 130°F	*	D	*	C	A	*	*	A	A	D	A	*	C	D	*	D
Black Chrome Bath 115°F	*	C	*	A	A	*	*	A	A	D	A	*	C	D	*	D
Barrel Chrome Bath 95°F	*	D	*	C	A	*	*	A	A	D	A	*	C	D	*	D
Copper Plating (Cyanide) Copper Strike Bath 120°F	A	A	*	*	*	*	*	*	*	*	*	*				
Rochelle Salt Bath 150°F	*	A	*	A	A	*	*	D	A	A	A	*	A	A	*	C
High Speed Bath 180°F	*	A	*	A	A	*	*	D	A	A	A	*	A	A	*	C
Copper Plating (Acid) Copper Sulfate Bath R.T.	*	D	*	A	A	*	*	A	A	A	A	*	A	A	*	D
Copper Fluoborate Bath 120°F	*	D	*	D	A	*	*	A	A	A	A	*	A	B	*	D
Copper (Misc.) Copper Pyrophosphate 140°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*	B
Copper (Electroless) 140°F	*	*	*	*	*	D	*	A	A	A	A	*	A	D	*	B
Gold Plating Cyanide 150°F	*	A	*	A	A	C	*	D	A	A	A	*	A	A	*	D
Neutral 75°F	*	C	*	A	A	*	*	A	A	A	A	*	A	A	*	A
Acid 75°F	*	C	*	A	A	*	*	A	A	A	A	*	A	A	*	A
Indium Sulfamate Plating R.T.	*	C	*	A	A	*	*	A	A	A	A	*	A	A	*	A
Iron Plating Ferrous Chloride Bath 190°F	*	D	*	A	D	*	*	D	A	A	C	*	A	B	*	D
Ferrous Sulfate Bath 150°F	*	C	*	A	A	*	*	D	A	A	A	*	A	A	*	D
Ferrous Am. Sulfate Bath 150°F	*	C	*	A	A	*	*	D	A	A	A	*	A	A	*	D
Sulfate-Chloride Bath 160°F	*	D	*	A	D	*	*	D	A	A	A	*	A	B	*	D
Fluoborate Bath 145°F	*	D	*	D	B	*	*	D	A	A	A	*	A	B	*	D
Sulfamate 140°F	*	D	*	A	B	*	*	A	A	A	A	*	A	A	*	A
Lead Fluoborate Plating	*	C	*	D	A	*	*	A	A	A	A	*	A	B	*	A
Nickel Plating Watts Type 115-160°F	*	C	*	A	A	*	*	D	A	A	A	*	A	A	*	D
High Chloride 130-160°F	*	C	*	A	A	*	*	D	A	A	A	*	A	A	*	D
Fluoborate 100-170°F	*	C	*	D	A	D	*	D	A	A	A	*	A	B	*	D
Sulfamate 100-140°F	*	C	*	A	A	*	*	A	A	A	A	*	A	A	*	A
Electroless 200°F	*	*	*	*	*	*	*	D	A	D	D	*	A	D	*	B
Rhodium Plating 120°F	*	D	*	D	D	*	*	A	A	A	A	*	A	A	*	A

	304 STAINLESS STEEL	316 STAINLESS STEEL	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	FORTRON	VITON	BUNA N	ETHYLENE PROPYLENE
Silver Plating 80-120°F	*	A	*	A	A	*	*	A	A	A	A	*	A	A	*
Tin-Fluoborate Plating 100°F	*	C	*	D	A	*	*	A	A	A	A	*	A	B	*
Tine-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 Fluoborate 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	A	B	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-Fluorobate Plating	*	A	D	A	A	D	*	A	A	A	A	C	B	B	*
100°F	A	A	D	*	*	D	*	*	A	*	*	*	*	*	*
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 Fluorobate 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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	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	A	A	A	*	*	B	*	A	A	A	*	*	A	A	*
(50%)	A	A	B	A	A	C	C	A	A	A	D	*	A	B	B
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	ALUMINUM	TITANIUM	HASTELLOY C	BRONZE	BRASS	PVC (TYPE 1)	TEFLON	NORYL	POLYPRPYLENE	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															
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
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