# SETUP, OPERATING AND

# MAINTENANCE

# INSTRUCTIONS

# FOR PNEUMATIC

# CHEMICAL INJECTORS,

# SNAP ACTION RELAYS AND TIMERS

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# OPERATING INSTRUCTIONS
# TR2 TIMING RELAY

1. Connect a regulated air/gas supply of sufficient volume and pressure to stroke the pump or relay to which it is attached with a minimal pressure drop at the regulator, to the IN port on the timer.

   NOTE: IN port is the bottom port.

2. Connect the OUT port to the pump or relay being driven as close as feasible with no restrictions.

   NOTE: OUT port is the top port and is 180 degrees from the IN port.
   The port 90 degrees from the other two is always the exhaust.

3. Be sure the pressure is sufficient to stroke the pump against process line pressure.

   NOTE:
   A. Air pressure should be 5 PSI to 15 PSI above the minimum required to achieve injection. Insufficient pressure or volume at the timer will result in an erratic flow rate and/or intermittent stalling of timing relay.

   B. If a filter or silencer is used in the timing relay exhaust port, take care not to restrict exhaust flow as it may cause intermittent operation.

Timing relay is preset at factory for 0-50 strokes per minute at 50 PSI. Rate will change if timer is switched between two pumps of different air chamber sizes. Rate will also change if supply pressure is above (slower) or below (faster) then 50 PSI. The knob can be repositioned to yield the desired range at any supply pressure if needed without harming the operation in any way. Do not allow maximum rate to exceed that which is specified for the pump to which it is attached. TR2 timing relay requires periodic lubrication of seals on the piston. The usual time frame is 4 to 16 weeks depending on stroke rate being used, amount of moisture in supply air/gas, and possible presence of hydrocarbons in supply gas.

# MAINTENANCE PROCEDURE
# TR2 TIMING RELAY

1. Close air/gas supply valve.
2. Remove TR2-5 upper body.
3. Remove piston assembly.
4. Wipe residue from piston assembly and bores in TR2-8 lower body.
5. Lubricate TR2-8 and piston assembly liberally with a good quality silicone grease.
6. Reinstall piston assembly into lower body taking care not to damage seals.
7. Reinstall TR2-5 and open supply valve.

Entire operation takes only a few seconds and will insure longer, more trouble-free operation. Never use liquid type lubricators in supply line to the timer. Oil will clog the small passages in the metering valve and cause stalling of timing relay.

# TROUBLE SHOOTING
# TR2 TIMING RELAY

1. Problem: Constant air flow through exhaust.
   Possible Solutions: A. Check IN and OUT ports for proper connection.
   B. Check poppet valve TR2-15.
   C. Check lower seal TR2-12.

2. Problem: Relay cycles, but will not adjust properly.
   Possible Solutions: A. Replace teflon seal TR2-7.

3. Problem: Intermittent or sluggish operation.
   Possible Solutions: A. Inspect piston TR2-9 for any obstruction.
   B. Inspect and lubricate piston seals TR2-10, TR2-11, TR2-12 with 4024 grease.

4. Problem: Air flow through drain hole TR2.
   Possible Solutions: A. Inspect middle seal TR2-11 for damage.

# INSTALLATION INSTRUCTIONS FOR PISTON DISPLACEMENT PUMPS

1. Discard all red plastic closures.
2. Connect the suction check valve, to a gravity fed chemical source.
3. Connect the discharge check valve, to the process line.
4. Connect a regulated air or gas supply to the timing relay.
   Note: On pumps supplied with a SR2S snap action relay you must provide a second regulated air or gas supply.
5. Fill the oil reservoir with silicone oil provided. This must be done BEFORE start up pump.
6. Open the bleeder valve until chemical starts to flow then retighten.
7. Set regulator at 10 to 15 psi ABOVE the pressure required. Refer to discharge pressure graph on pump brochure.
8. Set cycle rate in strokes per minute. Refer to volume graph on pump brochure.

# PREVENTIVE MAINTENANCE PISTON DISPLACEMENT PUMPS

1. Check silicone oil periodically and refill when necessary. The chemical injector should not be operated without silicone oil, as damage may occur. (Note 1)

2. The longevity of the plunger seal depends upon the chemical being injected. The fluid should be clean and free of foreign matter to prevent damage to the seal and the injector's plunger assembly.

Note 1 -If injecting chemicals that cause the lubricant to foam, select an alternative lubricant that is compatible with the injected fluid. When a high level of purity of the injected chemical is essential, use distilled water or the injected chemical as the lubricant. Under some circumstances, the pumped fluid has good lubrication properties and no lubrication in the lubrication chamber is necessary. However, caution should be exercised.

# CORRECTIVE MAINTENANCE
# PISTON DISPLACEMENT PUMPS

NO PUMP DISCHARGE

| | |
|---|---|
| 1. Suction or discharge valves not seating | *Clean or replace. |
| 2. Pump vapor locked | *Open bleed plug and prime. |
| 3. Suction or discharge line plugged | *Check line for closed valve. |

PLUNGER NOT STROKING

| | |
|---|---|
| 1. Plunger stuck due to tight or dry seal | *If seal swollen, check its chemical compatibility, and replace.<br>*If dry, lubricate and fill reservoir. |
| 2. Plunger bottomed | *Readjust stroke length. |
| 3. Return spring broken | *Clean pump then replace pressure seal and spring. |
| 4. Insufficient supply pressure to permit pump to over come process line pressure | *Increase supply pressure. |
| 5. Discharge line plugged | *Clear line |
| 6. Supply of air to timer is insufficient (timer locked up and won't cycle) | *Install larger regulator and/or supply line, vent the supply side of the timer and try starting the pump at slowest speed. In crease speed slowly if timer starts to cycle. |
| 7. Air Chamber-piston blow by | *Check piston seal.<br>*Check air chamber surface . Aspirated dirt or sand through faceplate equalization hole can damage air chamber. Install a filter. |

SHORT SEAL LIFE

| | |
|---|---|
| 1. Nick, burr, or scratches on plunger | *Replace plunger. |
| 2. Seal or plunger materials not compatible with chemical being pumped | *Refer to compatibility charts, or contact your distributor. |
| 3. Chemical crystallizing on plunger and scoring seal | *Maintain visible lubricant level. |
| 4. Incorrect lubricant | *Use a lubricant which is compatible with chemical being pumped. |
| 5. Excessive air supply pressure. | *Check pump ratio and adjust air supply. |

# INSTALLATION INSTRUCTIONS FOR AIR DIAPHRAGM PUMPS

1. Discard all red plastic closures.
2. Connect the suction check valve, (bottom) to a gravity fed chemical source.
3. Connect the discharge check valve, (top) to the process line.
4. Connect a regulated air or gas supply (150 psi MAXIMUM) to the timing relay
5. Set regulator at 10 to 15 psi ABOVE the pressure required.
6. Set cycle rate in strokes per minute. Refer to volume graph on pump brochure.

CAUTION:

Do not use this pump with chemicals that become hazardous when aerated.
Check valves will not stop the flow of a gravity fed chemical supply. Install a shut off valve between pump and chemical supply.

# MAINTENCE AND TROUBLE SHOOTING FOR AIR DIAPHRAGM PUMPS

1. PROBLEM: No discharge from pump.
   POSSIBLE SOLUTIONS:
   A. Inspect suction and discharge lines for any obstructions.
   B. Inspect suction and discharge check valves.

2. PROBLEM: Pump not stroking.
   POSSIBLE SOLUTIONS:
   A. Supply pressure is insufficient 5-10 psi higher than process line pressure is required.
   B. Check return spring. Replace if broken.

3. PROBLEM: Short diaphragm life.
   POSSIBLE SOLUTIONS:
   A. Supply pressure is too high, (150 psi maximum).
   B. Chemical not compatible with diaphragm.

4. PROBLEM: Chemical in timer.
   POSSIBLE SOLUTIONS:
   A. Broken diaphragm. Replace diaphragm.

# OPERATING INSTRUCTIONS
# SR1S-SR2S SNAP ACTION RELAYS

1. The air or gas must be connected to the “in “ port on the side of the relay.
   A. Supply should always be regulated and of sufficient pressure and volume to achieve desired injection pressure at the pump with a minimal pressure drop at the regulator.
   B. SR2S relay should NEVER be fed by a regulator which also feeds a timing relay. Failure to comply will result in intermittent stallling of timing relay.
   C. We recommend installation of relay as close as possible to regulator supplying air/gas.

2. The out port(s) should be connected to the pump(s) driven utilizing piping of sufficient size to pass the required amount of air/gas during the EXHAUST (unpressured) stroke of the pump. We recommend this instillation be as close as feasible to the pump.

3. If silencers are used, take caution not to restrict the exhausting of air/gas from the pump. Restricting the exhaust ports will result in an inability to achieve maximum stroke rate and reducing output of the pump.

4. Port at the top of the relay should be connected to the timing mechanism of choice and as close as feasible to the timer. The pressure to this point should be sufficient to actuate relay and achieve proper seal of valve seats during operation. (Usually 1/2 to 3/4 of pressure to “in” port, but always at least 35psi).

# INSTALLATION INSTRUCTIONS FOR HYDRAULIC DIAPHRAGM PUMPS

1. Discard all red plastic closures.

2. Connect suction check valve, to a gravity fed chemical source.

3. Connect discharge check valve, to process line.

4. Connect a regulated air or gas supply (100 psi maximum) to the timing relay.

5. Fill oil reservoir with oil provided, until oil flows out of bleed hole.
   **This must be done BEFORE start up**

6. WITH METERING OPTION ONLY. Insure that the volume adjuster is screwed all the way in for maximum output at startup.
7. Open bleeder valve until chemical flows from bleed hole.

8. Set regulator at 10 to 15 psi ABOVE the pressure required. Reference discharge pressure graph on the pump brochure.

9. Set cycle rate in strokes per minute. Reverence volume graph on the pump brochure.

10. WITH METERING OPTION ONLY. Adjust output volume as needed.

CAUTION: Use only light hydraulic oil as provided with pump or repair kit.

# CORRECTIVE MAINTENANCE
# HYDRAULIC DIAPHRAGM PUMPS

NO PUMP DISCHARGE

| | |
|---|---|
| 1. Suction or discharge valves not seating | *Clean or replace. |
| 2. Pump vapor locked | *Open bleed plug and prime. |
| 3. Suction or discharge line plugged | *Check line for closed valve. |

PLUNGER NOT STROKING

| | |
|---|---|
| 1. Plunger bottomed | *Readjust stroke length. |
| 2. Return spring broken | *Clean pump then replace pressure seal and spring. |
| 3. Insufficient supply pressure to permit pump to over come process line pressure | *Increase supply pressure. |
| 4. Discharge line plugged | *Clear line |
| 5. Supply of air to timer is insufficient (timer locked up and won't cycle) | *Install larger regulator and/or supply line, vent the supply side of the timer and try starting the pump at slowest speed. In crease speed slowly if timer starts to cycle. |
| 6. Air Chamber-piston blow by | *Check piston seal.<br>*Check air chamber surface . Aspirated dirt or sand through faceplate equalization hole can damage air chamber. Install a filter. |

SHORT SEAL LIFE

| | |
|---|---|
| 1. Nick, burr, or scratches on plunger | *Replace plunger. |
| 2. Hydraulic Fluid contaminated and scoring seal. | *Check and/or replace hydraulic fluid. Dirt or foreign particals will reduce seal life. |
| 3. Excessive air supply pressure. | *Check pump ratio and adjust air supply. |

# REBUILDING INSTRUCTIONS FOR HYDRAULIC DIAPHRAGM PUMPS

1. Completely disassemble pump and clean parts.
2. Replace diaphragm return spring and spring cup.
3. Place diaphragm on pressure chamber with teflon side down. Place hydraulic chamber on assembly and install bolts. **CAUTION MODEL HD562 AND HD1062 ONLY** Be sure that the upper spring cup is in place. (Same as lower spring cup.)
4. Tighten bolts a little at a time in a crisscross manner to achieve a proper seal. **Torque bolts to 18 foot pounds**
5. WITH METERING OPTION ONLY. Reassemble volume adjuster and install in hydraulic chamber. Screw adjustment all the way in for maximum output at startup.
6. Install check valves with teflon tape to avoid galling and prevent leakage.
7. Fill hydraulic chamber with oil provided, to top of back-up ring. Use only light hydraulic oil.
8. Install pressure seal (spring down), back-up ring and body seal.
9. Carefully assemble spring chamber as to not disturb oil in hydraulic chamber.
10. Slip return spring onto piston-plunger assembly and slide the assembly onto pump and secure with air chamber and lock ring.
11. Install timer, pump is now ready for operation.
12. Reinstall pump and reconnect discharge line at this time.
13. To bleed pump loosen bleeder plug until chemical appears and retighten.
14. Now fill reservoir with oil provided.
15. Connect a regulated air/gas supply to the timer and set regulator 10-15 PSI above what is needed to achieve injection into your process line. This is very important for proper operation.
16. Now set stroke rate for proper flow.
16. Fine tune if needed, STANDARD PUMPS using the stroke adjuster on top of the air chamber.
    WITH METERING OPTION using the volume adjuster.

If you need any assistance, please contact your distributor or our plant for assistance.

## AIR / GAS USAGE
## SCF/DAY AT I STROKE PER MINUTE

SUPPLY PRESSURE

| PUMP MODEL | 25psi | 50psi | 75psi | 100psi | 125psi | 150psi |
|---|---|---|---|---|---|---|
| D10-XXX | .2 | .4 | .5 | .7 | .8 | 1.0 |
| D15-XXX | .7 | 1.1 | 1.6 | 2.0 | 2.4 | 2.8 |
| D25-XXX | 2.2 | 3.5 | 4.8 | 6.2 | 7.5 | 8.9 |
| D40-XXX | 9.2 | 14.9 | 20.7 | 26.4 | 32.2 | 37.9 |
| HD187 | 1.0 | 2.0 | 2.9 | 3.7 | 4.5 | 5.3 |
| HD312 | 3.9 | 6.4 | 8.9 | 11.3 | 13.8 | 16.2 |
| HD312-3K | 8.9 | 14.4 | 19.9 | 25.5 | 31.0 | 36.5 |
| HD312-5K | 15.7 | 25.6 | 35.4 | 45.3 | 55.1 | 64.9 |
| HD562 | 8.9 | 14.4 | 19.9 | 25.5 | 31.0 | 36.5 |
| HD562-3K | 15.7 | 25.6 | 35.4 | 45.3 | 55.1 | 64.9 |
| HD562-5K | 28.0 | 45.5 | 63.0 | 80.5 | 98.0 | 115.5 |
| HD1062 | 28.0 | 45.5 | 63.0 | 80.5 | 98.0 | 115.5 |
| HD1062-3K | 157.0 | 260.5 | 353.8 | 452.1 | 550.4 | 648.6 |
| HD2000 | 314.5 | 511.0 | 707.6 | 904.1 | 1100.7 | 1297.2 |
| 50 SERIES | 1.3 | 2.1 | 3.0 | 3.8 | 4.6 | 5.4 |
| 100 SERIES | 3.9 | 6.4 | 8.9 | 11.3 | 13.8 | 16.2 |
| 200 SERIES | 8.9 | 14.4 | 19.9 | 25.5 | 31.0 | 36.5 |
| 300 & 3000 SERIES | 15.7 | 25.6 | 35.4 | 45.3 | 55.1 | 64.9 |
| 400 & 4000 SERIES | 28.0 | 45.5 | 63.0 | 80.5 | 98.0 | 115.5 |
| 880 & 1255 SERIES | 209.1 | 342.0 | 456.1 | 559.4 | 655.5 | 746.1 |
| 5000 SERIES | 314.5 | 511 | 707.6 | 904.1 | 1100.7 | 1297.2 |
| 8000 SERIES | 693.0 | 1125.4 | 1558.2 | 1991.0 | 2424.0 | 2549.8 |

Table constant multiplied by stroke rate = SCFD

Example: D10-XXX operated at 50 psi (.4) multiplied by 20 strokes per minute = 8 SCFD

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Key to Rating

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| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Acetaldehyde | B | A | A | A | A | C | C | B | C |
| Acetate Solvents | B | A | A | A | A | C | C | C | C |
| Acetic Acid, 20% | B | A | A | A | A | A | C | A | C |
| Acetic Acid Concentrated to 150°F (66°C) | | B | A | A | A | C | C | | C |
| Acetic Acid Concentrated to 212°F (100°C) | C | B | A | A | A | C | C | | C |
| Acetic Anhydride | C | B | A | A | A | C | C | A | C |
| Acetone | B | A | A | A | A | C | C | B | C |
| Alum | C | C | B | A | A | A | A | A | A |
| Aluminum Chloride | C | C | C | B | A | A | A | A | A |
| Aluminum Nitrate | B | A | A | A | A | A | A | | |
| Aluminum Sulfate | C | C | B | A | A | A | A | A | A |
| Ammonia Anhydrous | A | A | A | A | A | | C | A | A |
| Ammonium Bicarbonate | A | A | A | A | A | A | A | | C |
| Ammonium Bisulfite | B | A | A | A | A | A | A | | |
| Ammonium Bifluoride | C | B | B | A | A | | A | | A |
| Ammonium Hydroxide | C | A | A | A | A | A | B | A | A |
| Ammonium Nitrate | B | A | A | A | A | A | | B | C |
| Ammonium Phosphate | C | B | A | A | A | A | A | A | |
| Ammonium Sulfate | C | B | B | B | A | A | A | A | C |
| Ammonium Sulfite | C | A | A | A | A | A | A | | |
| Amyl Acetate, Dry | A | A | A | A | A | C | C | C | C |
| Amyl Alcohol | A | A | A | A | A | B | A | A | B |
| Amyl Chloride | C | B | A | A | A | C | C | C | |
| Aniline Chloride | C | B | A | A | A | | B | | |
| Aniline Dyes | C | A | A | A | A | C | B | C | |
| Animal Fats and Oils | | A | A | A | A | A | A | C | A |
| Aqua Regia | C | C | C | C | A | | B | C | |
| Ascorbic Acid | C | A | A | A | A | | | | |
| Barium Chloride | C | C | C | B | A | A | A | A | A |
| Barium Sulfite | B | A | A | A | A | A | A | A | |
| Benzaldehyde | B | A | A | A | A | C | C | C | |
| Benzene | A | A | A | A | A | C | B | C | C |
| Benzene Sulfonic Acid 10% | C | B | B | A | A | A | A | C | C |
| Benzoic Acid | C | B | B | A | A | A | | C | A |

# Chemical Compatibility Chart

Key to Rating

A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blanck - No Data

| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Benzoyl Chloride | C | C | C | C | A | | B | | |
| Boric Acid | C | A | A | A | A | A | A | A | A |
| Bromine Anhydrous | C | C | C | B | A | C | A | C | C |
| Bromine Dilute | C | C | C | C | A | B | A | C | C |
| Bromine Trifluoride | C | C | B | B | A | | C | | C |
| Butadiene | C | A | A | A | A | | A | | C |
| Butane | B | A | A | A | A | A | A | A | A |
| Butyric Acid 20% | C | A | A | A | A | | C | A | A |
| Butyric Acid, Concentrated | C | B | B | B | A | | C | | A |
| Calcium Bisulfite | B | A | A | A | A | A | A | A | A |
| Calcium Carbonate | A | A | A | A | A | A | A | A | A |
| Calcium Chlorate | C | A | A | A | A | A | A | A | A |
| Calcium Chloride | C | B | B | A | A | A | A | A | A |
| Calcium Hydroxide | A | A | A | A | A | A | A | A | A |
| Calcium Hypochlorite | C | C | C | C | A | A | A | C | A |
| Calcium Nitrate | C | A | A | A | A | A | A | | |
| Calcium Sulfite | C | A | A | A | A | A | A | | |
| Calcium Sulfate | | A | A | A | A | A | A | C | |
| Camphor Alcohol Sol. | B | A | A | A | A | | | | |
| Carbon Disulfide | C | A | A | A | A | | A | C | |
| Carbon Tetrachloride, Dry | B | A | A | A | A | C | | C | |
| Carbon Tetrachloride, Wet | C | B | B | B | A | C | | C | C |
| Carbon Water Slurries | C | B | A | A | A | A | A | A | |
| Cesium, 260°F (127°C) | C | A | A | A | A | C | C | | |
| Chlorine, Anhydrous | A | A | A | A | A | | C | C | C |
| Chlorine Water | C | C | C | A | A | A | A | C | C |
| Chloroacetic Acid | C | C | C | C | A | | C | | C |
| Chlorobenzene | C | A | A | A | A | C | A | | B |
| Chloroform | B | A | A | A | A | C | A | | C |
| Chlorosulfonic Acid | C | B | B | B | A | C | C | C | B |
| Choline Chloride | A | A | A | A | | | | | |
| Chromic Acid to 150°F (66°C) | C | B | B | B | A | | | C | A |
| Citric Acid | C | B | B | A | A | A | A | A | A |
| Copper Chloride | C | C | C | C | A | A | A | A | A |

# Chemical Compatibility Chart

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| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Copper Fluoride | C | B | B | B | A | A | | | |
| Copper Nitrate | C | B | A | A | A | A | A | A | A |
| Copper Sulfate | B | A | A | A | A | A | A | A | A |
| Cottonseed Oil | A | A | A | A | A | A | A | | A |
| Creosols | A | A | A | A | A | C | C | C | A |
| Cyclohexane | B | A | A | A | A | C | A | C | A |
| Cyclohexanone | B | A | A | A | A | C | C | C | B |
| Dichlorethane, Dry | A | A | A | A | A | C | | C | C |
| Diethanolamine | A | A | A | A | A | C | C | | A |
| Diethyl Benzene | A | A | A | A | A | C | | | |
| Diethyl Ether | A | A | A | A | A | | C | | C |
| Diethyl Sulfate | C | B | B | A | A | | | | |
| Diethylene Glycol | B | A | A | A | A | | A | A | A |
| Dimethyl Amine | A | A | A | A | A | C | | | |
| Dimethyl Phthalate | A | A | A | A | A | C | C | | B |
| Ether | A | A | A | A | A | C | C | | C |
| Ethyl Acetate | A | A | A | A | A | C | C | C | C |
| Ethyl Alcohol | A | A | A | A | A | A | C | | A |
| Ethyl Benzene | A | A | A | A | A | | A | | C |
| Ethyl Bromide | C | C | C | C | A | C | | | |
| Ethyl Chloride | C | A | A | A | A | C | A | C | A |
| Ethyl Mercaptan | B | A | A | A | A | C | A | | C |
| Ethylene (Liquefied) | A | A | A | A | A | | | | |
| Ethlene Dichloride | C | A | A | A | A | | B | C | A |
| Ethylene Glycol | B | A | A | A | A | A | A | A | A |
| Ethylene Oxide | C | A | A | A | A | C | C | C | C |
| Fatty Acids | C | A | A | A | A | A | A | A | |
| Ferric Chloride | C | C | C | C | A | A | A | A | A |
| Ferric Nitrate | C | B | B | A | A | A | A | A | |
| Ferric Sulfate | C | C | B | C | A | A | A | A | A |
| Ferrous Chloride | C | C | C | C | A | A | A | A | |
| Ferrous Sulfate | C | C | C | C | A | A | A | A | |
| Filter Aid SlurriesB | A | A | A | A | A | A | A | | |
| Fluosilicic Acid | C | C | C | B | A | A | A | A | |

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Key to Rating

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| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Formaldehyde, 80°F (27°C), Rm. Temp | B | B | A | A | A | B | A | A | C |
| Formic Acid, 80°F (27°C) | C | B | A | A | A | B | B | C | A |
| Freons, 80°F (27°C) | B | A | A | A | A | | | C | C |
| Fuel Oil | A | A | A | A | A | A | A | C | A |
| Furfural | B | A | A | A | A | C | C | C | A |
| Furfural Alcohol | B | B | B | A | A | C | C | C | |
| Gallic Acid, 5% | C | B | B | B | A | A | A | B | |
| Gasoline | A | A | A | A | A | | A | C | B |
| Glucose | A | A | A | A | A | A | A | A | A |
| Glycerine | B | A | A | A | A | A | A | A | A |
| Heptane | B | A | A | A | A | C | A | B | C |
| n-Hexane | B | A | A | A | A | C | A | B | |
| Hydrazine, 35% and above | C | A | B | B | A | C | C | B | A |
| Hydrobromic Acid | C | C | C | C | A | B | A | C | A |
| Hydrochloric Acid, 37% | C | C | C | C | A | A | A | C | A |
| Hydrocyanic Acid | C | A | A | A | A | A | A | C | A |
| Hydrofluoric Acid to 48% | C | C | C | C | A | A | A | C | A |
| Hydrogen Chloride, Dry | A | A | A | A | A | | | | |
| Hydrogen Cyanide | B | A | A | A | A | A | | | |
| Hydrogen Fluoride-Anhydrous | C | C | C | C | A | | | C | A |
| Hydrogen Peroxide 50% | C | A | A | | A | | C | C | C |
| Hydrogen Peroxide, 90% | C | A | A | | A | C | C | C | C |
| Hydrogen Sulfide | C | B | B | B | A | A | | A | A |
| Hydroquinone | A | A | A | A | A | A | C | | |
| Hypo (Sodium Thiosulfate) | C | B | A | A | A | A | A | | |
| Iodine Solution, 5% | C | C | C | C | A | C | A | C | A |
| Isopropyl Alcohol | A | A | A | A | A | | A | A | A |
| Isopropyl Chloride, Dry | B | A | A | A | A | | | | C |
| Kerosene | A | A | A | A | A | A | A | C | B |
| Lactic Acid, 50% 80°F (27°C) | B | B | A | A | A | A | A | A | B |
| Lard Oil | A | A | A | A | A | | A | C | A |
| Lead Acetate | B | A | A | A | A | A | C | A | C |
| Lead-Tetraethyl | B | A | A | A | A | | | | |
| Magnesium Carbonate | A | A | A | A | A | A | A | A | |

# Chemical Compatibility Chart

Key to Rating

A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blanck - No Data

| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Magnesium Chloride | C | B | B | A | A | A | C | A | A |
| Magnesium Nitrate | A | A | A | A | A | A | A | A | A |
| Magnesium Sulfate | B | A | A | A | A | A | A | A | A |
| Maleic Acid-Dilute | C | B | A | A | A | A | A | C | A |
| Melamine Resins | C | B | B | B | A | | | C | C |
| Mercaptans | A | A | A | A | A | | A | C | C |
| Mercuric Chloride, Sol. | C | C | C | B | A | A | A | | A |
| Mercury | B | A | A | B | A | A | A | A | A |
| Methyl Alcohol | A | A | A | A | A | A | C | A | A |
| Methyl Celiosolve | A | A | A | A | A | | C | B | A |
| Methyl Formate | A | A | A | A | A | | C | | C |
| Methylene Chloride | B | A | A | A | A | C | C | C | C |
| Methyl Ethyl Ketone | A | A | A | A | A | C | C | C | C |
| Monochloroacetic Acid 70°F (21 °C) | C | B | B | B | A | A | | | |
| Morpholine | A | A | A | A | A | | C | | |
| Muriatic Acid | C | C | C | C | A | A | A | C | A |
| Mustard | C | B | A | A | A | A | | A | A |
| Naphtha | B | A | A | A | A | A | A | C | A |
| Naphthalene, Molten | A | A | A | A | C | C | A | C | C |
| Nickel Carbonyl, Solution | | B | A | A | A | | | | |
| Nickel Chloride, Solution | | B | B | B | A | A | A | A | A |
| Nickel Nitrate, Solution | | A | A | A | A | A | A | A | |
| Nickel Sulfate, Solution | | B | A | B | A | A | A | A | A |
| Nitric Acid to conc.-Rm. | | A | A | B | A | C | A | C | B |
| Nitric Acid, Red Fuming, Rm. | | A | A | B | A | C | C | C | B |
| Nitro Benzene to 212°F (100°C) | | B | A | A | A | C | B | C | A |
| Nitrous Acid, 5% | | A | A | A | A | | | | |
| Nitrogen Tetroxide | | A | A | A | A | | C | | |
| Nitrochlorobenzene | | | | A | A | C | A | | |
| Oleic Acid | | A | A | A | | A | B | B | A |
| Oleum-25% | | B | A | A | A | C | B | C | C |
| Olive Oil | A | A | A | A | A | A | A | C | A |
| Oxalic Acid | | B | B | A | A | A | A | B | A |
| Paraffin-Molten | A | A | A | A | A | | | | A |

# Chemical Compatibility Chart

Key to Rating

A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blanck - No Data

| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Paraldehyde | A | A | A | A | A | | | | |
| Pentane | A | A | A | A | A | | A | | A |
| Perfumes | A | A | A | A | A | | | | |
| Phenol-Molten | B | B | B | B | A | C | A | C | A |
| Phosgene | | A | A | A | A | C | | | |
| Phosphoric Acid, 60 | C | B | B | A | A | A | A | C | A |
| Free of HF | | | | | | | | | |
| Phosphoric Acid, 75% | C | B | B | A | A | A | A | C | A |
| Free of HF | | | | | | | | | |
| Phosphorous-Molten | | B | A | A | A | | | C | |
| Phosphorous Oxychloride | C | | | | A | | | | |
| Phosphorous Trichloride | C | A | A | A | A | | A | C | A |
| Pine Oil | A | A | A | A | A | | B | | |
| Phthalic Anhydride | | B | B | A | A | | | | B |
| Potassium Chromate | A | A | A | A | A | A | A | A | |
| Potassium Bromide | C | B | B | A | A | A | A | A | A |
| Potassium Carbonate | B | A | A | A | A | A | A | A | A |
| Potassium Chlorate | B | A | A | A | A | A | A | A | A |
| Potassium Chloride | C | B | B | A | A | A | A | A | A |
| Potassium Dichromate | B | A | A | A | A | A | A | | A |
| Potassium Ferrocyanide | B | A | B | A | A | A | A | | |
| Potassium Hydroxide | B | B | A | A | A | A | B | B | A |
| Potassium Iodide | C | B | B | | A | A | A | | |
| Potassium Nitrate | A | A | A | A | A | A | A | A | A |
| Potassium Permanganate | C | A | A | A | A | A | A | A | A |
| Potassium Sulfate | B | A | A | A | A | A | A | A | A |
| Propane | A | A | A | A | A | A | A | B | A |
| Propylene Dichloride, Dry | B | A | A | A | A | C | | C | |
| Propylene Glycol | A | A | A | A | A | | A | C | A |
| Propylene Oxide | A | A | A | A | A | | C | C | C |
| Pyrogallic Acid | B | A | A | A | A | | | | |
| Quinoline | | A | A | A | A | | | | |
| Silver Nitrate | | A | A | A | A | A | A | A | A |
| Sodium-Molten | | A | A | A | C | | | C | |

# Chemical Compatibility Chart

Key to Rating

A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blanck - No Data

| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Sodium-Potassium, NaK Alloy | | A | A | | C | | | | |
| Sodium Acetate | | B | A | A | A | A | C | B | C |
| Sodium Aluminate | B | A | A | A | A | A | B | A | A |
| Sodium Bicarbonate | B | A | A | A | A | A | A | A | A |
| Sodium Bichromate | B | A | A | A | A | A | A | | |
| Sodium Bifluoride Slurry | | A | A | A | | | C | | |
| Sodium Bisulfate | | B | A | A | A | A | A | A | A |
| Sodium Bisulfite | B | A | A | A | A | A | A | A | A |
| Sodium Borate | B | A | A | A | A | A | A | A | A |
| Sodium Bromide | C | B | B | A | A | A | A | A | |
| Sodium Carbonate | B | A | A | A | A | A | A | A | A |
| Sodium Chlorate | C | B | B | A | A | A | A | A | |
| Sodium Chloride | C | B | B | A | A | A | A | A | A |
| Sodium Chlorite | C | C | C | C | A | A | A | C | |
| Sodium Citrate | B | A | A | A | A | A | | | |
| Sodium Cyanide | B | A | A | A | A | A | A | A | C |
| Sodium Dichromate | A | A | A | A | A | B | A | B | |
| Sodium Ferricyanide, 5% | B | A | A | A | A | A | A | B | |
| Sodium Fluoride | C | C | B | B | A | A | A | C | |
| Sodium Hydroxide, 50% | A | A | A | A | A | A | B | B | A |
| Sodium Hydroxide, 73% | B | B | B | B | A | | C | B | A |
| Sodium Hypochlorite, 5% | C | C | C | C | A | A | A | C | B |
| Sodium Hypochlorite, 20% | C | C | C | C | A | A | B | C | A |
| Sodium Metaphosphate | B | A | A | A | A | A | A | B | A |
| Sodium Nitrate | B | A | A | A | A | A | A | A | C |
| Sodium Nitrite | | B | A | A | A | A | A | A | |
| Sodium Peroxide | C | A | A | A | A | | A | A | A |
| Sodium Silicate | B | A | A | A | A | A | A | A | A |
| Sodium Sulfate | A | A | A | A | A | A | A | A | A |
| Sodium Sulfite | | A | A | A | A | A | A | A | A |
| Sodium Thiosulfate (Hypo) | C | B | B | A | A | A | A | A | |
| Stannic Chloride | C | C | C | B | A | A | A | C | |
| Stannous Chloride | | B | A | A | A | A | A | A | |
| Stearic Acid | | A | A | A | A | A | A | B | A |

# Chemical Compatibility Chart

Key to Rating

A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blanck - No Data

| Corrosive Agent | Steel | 304 SS | 316 SS | C-20 | Teflon | PVC | Viton | Buna-N | Fluoraz |
|---|---|---|---|---|---|---|---|---|---|
| Styrene | | A | A | A | A | | C | C | |
| Sulfamic Acid | | | | B | A | | | B | |
| Sulfur-Molten | | A | A | A | A | | C | | B |
| Sulfur Chloride | | C | C | A | A | | C | C | C |
| Sulfur Dioxide, Dry | A | A | A | A | A | | | C | A |
| Sulfan | C | B | A | A | A | | C | | |
| Sulfur Trioxide | C | B | A | A | A | | C | | A |
| Sulfuric Acid below 93% | C | C | C | A | A | B | A | C | A |
| Sulfuric Acid-Commercial Concentrated | C | C | A | A | A | C | A | C | A |
| Sulfuric Acid, Fuming, 20% | | B | A | A | A | C | B | C | A |
| Sulfurous Acid | | B | B | A | A | A | A | | |
| Tannic Acid, 10% | | A | A | A | A | A | A | A | A |
| Tartaric Acid | | B | A | A | A | A | A | A | A |
| Thionyl Chloride | C | C | B | | A | C | | | |
| Titanium Dioxide Slurry | B | A | A | A | A | A | A | A | |
| Titanium Tetrachloride, Dry | A | A | A | A | A | | A | B | C |
| Toluene | A | A | A | A | A | C | B | C | C |
| Tributyl Phosphate | B | A | A | A | A | C | C | C | |
| Trichloroethylene, Dry | A | A | A | A | A | C | A | C | |
| Tricresyl Phosphate | B | A | A | A | A | C | B | C | A |
| Triethanolamine | | A | A | A | A | B | C | A | A |
| Trisodium Phosphate, Sol. | B | A | A | A | A | A | A | A | A |
| Tung Oil | A | A | A | A | A | | A | | |
| Turpentine | A | A | A | A | A | A | A | C | A |
| Urea Formaldehyde | A | A | A | A | A | | | | |
| Vegetable Oils | A | A | A | A | A | A | A | C | A |
| Uranium Nitrate | | A | A | A | A | | | | |
| Vinyl Acetate | | A | A | A | A | | C | C | |
| Vinylidene Chloride | | A | A | A | A | | | | A |
| Vinylidene Fluoride | B | A | A | A | A | | | | |
| Xylene | | A | A | A | A | C | C | C | C |
| Zinc Oxide Slurry | B | A | A | A | A | A | A | A | |
| Zinc Sulfate | B | A | A | A | A | A | A | A | A |
| Zinc Chromate | | A | A | A | A | A | A | | |