STERLCO TEMPERATURE CONTROL UNIT
SERVICE AND INSTRUCTION MANUAL
MODELS: M-8413, M-8423, M-8433

Engineered and Manufactured by INDUSTRIAL CONTROL DIVISION
STERLING, INC.
5200 West Clinton Avenue, P.O. Box 23435, Milwaukee, Wisconsin 53223-0435
Manufacturers of Temperature Control Equipment Since 1916

Please note that our address and phone information has changed. Please reference this page for updated contact information.

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Parts and Service Department

The ACS Customer Service Group will provide your company with genuine OEM quality parts manufactured to engineering design specifications, which will maximize your equipment's performance and efficiency. To assist in expediting your phone or fax order, please have the model and serial number of your unit when you contact us. A customer replacement parts list is included in this manual for your convenience. ACS welcomes inquiries on all your parts needs and is dedicated to providing excellent customer service.

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CIRCULATION

PUMP

The pump is a straight centrifugal type, bronze-fitted. It has a high output capacity with good discharge pressure and is well suited for the conditions under which the unit is designed to operate. The circulating capacity available to the user, outside the unit, is as stated below.

A special seal-flush system in the pump helps keep the seal clean, thereby extending seal life. The seal itself is the finest type available for this type of service and provides an excellent combination of long wearing ability, high abrasion resistance and heat resistance. For pump (only) ratings, please refer to page 4 of Bulletin #841. The following table is a listing of true unit capacities.

1/2 H.P.	15 GPM @ 20 PSI
3/4 H.P.	20 GPM @ 20 PSI
1 H.P.	30 GPM @ 25 PSI
1-1/2 H.P.	40 GPM @ 30 PSI
2 H.P.	50 GPM @ 30 PSI
3 H.P.	45 GPM @ 40 PSI
5 H.P.	60 GPM @ 50 PSI

COOLING

Cooling is accomplished by automatic release of the required amount of warm water from the system. This permits an equal amount of cool water to enter the system from the plant water supply. Naturally, the plant water supply temperature will govern the minimum operating temperature of the unit. The cool water enters the system immediately ahead of the pump which blends it with system water.

ELECTRICAL

The pump motors and the immersion heaters operate on three phase, full line voltage with the control circuit operating at 115 V. single phase. The control circuit voltage is provided by a single phase transformer wired across two legs of the three phase power supply. The 115 V. control circuit is fuse-protected. Magnetic motor starters with overload protection

are used for the pump motors. If a motor overload condition should occur, the motor starter overload protection will trip. This condition will be indicated on the controller by the pump rotation light illuminating, the safety thermo light flashing, and the pump run light still illuminated. The controller will discontinue the control function.

AUTOMATIC VENT

This feature permits quick and complete purge of air from your system before the unit is started. The "VENT" actuates the solenoid valve which permits the flow of trapped air and water out through the drain, insuring that the unit is properly filled and primed prior to start-up.

PRESSURE SWITCH

The Pressure Switch is built into each unit to insure that the unit will not start until the water supply has been turned "ON" and the unit subjected to water supply pressure. This is intended to provide a strong measure of protection for the pump seal and the heater so that they will not be damaged through operation without water. The pressure switch itself is set at approximately 10 PSI prior to leaving Sterling. If the pressure switch is not satisfied, the unit will not operate, and the "water pressure" pilot will light.

SAFETY THERMOSTAT

The safety thermostat is mounted on the side of the heater tank as a protection against over-heating. The safety thermostat is electrically connected to the "M-2" controller. If an over-heating condition existed, the controller would flash the safety thermo light and discontinue the control function.

MODEL: M-8400 Series

INSTALLATION

ELECTRICAL:

These units are supplied for three phase operation for a selected voltage. Caution must be taken to provide a correctly sized power supply to the unit. Refer to unit nameplate for proper voltage and amperage requirements. These units must be securely grounded. Electrical connections and service should only be made with the power disconnected, and only by a qualified electrician.

WATER SUPPLY

It is very important that the water supply to the unit meet certain requirements. We recommend a full sized line, equal to the pipe size of our water supply connection and without restricting fittings. Usable pressure should be in excess of 20 PSI (1.4 kg/cm^2) and preferably 25 PSI (1.75 kg/cm^2) at the unit, if the unit is expected to operate at temperatures up to 250° F. If your unit has a maximum operating temperature of 300° F. the water pressure must be maintained at 65 PSI (4.57 kg/cm^2) or above. This minimum pressure is necessary to keep the process water from flashing to steam at the pump inlet, where pressure is the lowest in the system. The pressure switch inside the unit will keep the unit from running until the unit has been subjected to a minimum water supply pressure.

The water supply line should be open to the unit whenever the unit is running. While a certain minimum supply pressure is necessary, as stated above, supply pressures over 75 PSI (5.27 kg/cm^2) will serve no useful purpose and may tend to shorten the life of the unit. If your water pressure is excessively high, it is recommended that a combination regulator/relief be installed in the supply line with the relief valve downstream from the regulator and set slightly higher than the regulator. Hard or corrosive water can build layers of scale or lime on the surfaces of the unit, slowing down water flow and causing control problems and eventual damage to the equipment. Since the corrective maintenance and downtime caused by bad water are costly, it is very worthwhile to treat that water. In general, we have found that people with good water seldom buy parts. Industrial water treatment to neutralize these conditions is relatively inexpensive and in many cases is truly a wise investment.

PROCESS CONNECTIONS:

Connection lines and connectors between the Temperature Control Unit and the process should be selected by the customer to suit the needs and requirements of the application.

1) If your unit has a maximum operating temperature of 250° F., the connection lines and connectors should have a service rating of at least 250° F. and 150 PSIG.

2) If your unit has a maximum operating temperature of 300° F., the connection lines and connectors should have a service rating of at least 300° F. and 150 PSIG.

These connection lines and connectors should be inspected frequently to ensure that the original service rating has not been reduced by age and/or deterioration.

MODEL: M-8400 Series

DESCRIPTION

The Sterl-Tronic Temperature Control Unit is designed to circulate water through your process and to precisely, automatically, and reliably maintain this water at the selected temperature. The operating range of the Sterl-Tronic unit is from supply water temperature up to 250° F. (121° C.) max. The unit is well suited for use with a city water supply, water from portable or central chillers, towers or with well water.

Performance is assured through the matched performance of the unique Sterlco Digital Controllers, and the Sterlco Water Circulating System. The two systems are properly integrated so as to achieve most accurate control, along with efficient use of electricity and water.

The digital controller has several important features in addition to it's primary function as a thermostat. Simultaneous digital display of set temperature and actual water temperature in large numerals will give the user the opportunity to monitor performance at a glance. The automatic purge will assure positive vent of air prior to start-up. The controller will tell you if the water supply has not been turned on and will notify you if the motor phasing (rotation) is incorrect. It provides you the opportunity to program high and low temperature limits so that you might be advised if conditions cause the water temperature to exceed those limits. The controller normally indicates the delivery (to your process) water temperature. However, you may read the return (from process) water temperature by simply touching the return temperature control. In similar fashion the difference between Delivery and Return (ΔT) can also be displayed by a touch of the control.

The relatively small total amount of water, rapidly recirculated by the Sterl-Tronic, provides assurances of a close and uniform temperature relationship between the delivery and return lines of the unit. The high rate of recirculation, combined with the large immersion heater and large cooling capacity, gives the unit exceptionally fast response in bringing the process to temperature, and in making changes of settings when necessary.

WATER HEATING

Heating of the water is accomplished through the specially designed 3 phase low watt density electrical immersion heater, and controlled by the main digital thermostat. The standard heater has a copper sheath for best application of heat. Stainless heaters are offered as options.

These models can be supplied with 4-1/2 KW, 9 KW, 12 KW, 18 KW, or 24 KW low watt density immersion heaters, depending upon the heating needs of your process. All are built to provide "full" or "partial" heat as required by the controller.

OPERATION

After the electrical and water connections have been made, the following steps should be taken to place the unit into operation.

1. Open the water supply line to allow your cold water to enter the unit and circulating system. The "drain" line should be open so that venting and cooling can take place.

2. Push the start switch to "ON". The unit will go into the automatic vent sequence for a short while to expell all entrapped air. During the venting sequence, the pump will start automatically and the pump run light will illuminate.

3. If the electric power supply is incorrectly phased, the motor will momentarily run backward and the "Pump Rotation" light will show. The controller will not operate with incorrect rotation. Correct phasing of your electric power supply should be made at this time, if required.

4. If your system is unusually large, you may wish to conduct additional venting. This can be accomplished by turning off the unit shortly before the end of the one (1) minute vent cycle. Turn the unit back on and the unit will repeat the vent cycle. When the vent cycle is complete, the controller will not repeat the vent cycle unless it has been turned off for 10 minutes. A thorough purge of air is essential in giving the pump a good prime and of assuring best flow and best temperature control.

5. To set for your desired temperature, press and hold the "Program Process" panel which is in the upper left corner of the controller. The pilot light should illuminate. While holding this panel, the up or down arrow panels should be touched as necessary to bring your setting into the "Set Point" display. The display will advance slowly at first and then increase. As you near the desired set point, release the arrow panel and then repress to reach desired set point. The unit is now programmed to achieve your desired temperature, and will heat or cool as necessary to achieve that temperature. Actual water temperature will show in the "Temperature" display window.

6. The type of cooling required is selectable by a switch located above the OFF/ON switch.

"PULSE" cooling is intended to be used as follows:

a. When the process is mainly heating.

b. When it is desired to have a light cooling cycle.

"FULL" cooling is intended to be used as follows:

a. Large volume systems.

b. Heavy cooling loads.

c. Controlling at low temperatures - Typical (80° F.)

7. If the cooling select switch is in pulse cool mode, the controller will automatically select the proper HI/LO heat requirement. If the cooling select switch is in full cool mode, heat selection is switched to manual control and you may select high or low heat by touching the "HEAT" panel in the lower right of the controller.

8. If you wish to program high and low temperature alarms, the method is much the same as used to program the control temperature. By touching and holding the "PROGRAM HI ALARM" you can use the up and down arrows to bring your maximum temperature to display in the "Set Temperature" window. Touching and holding the "PROGRAM LOW ALARM" will allow you to program the low alarm in the same manner.

If you do not wish to use the alarms, we would suggest that you set the high alarm for approximately 250° F. (121° C.) and the low alarm for approximately 50° F. (10° C.) to avoid nuisance flashing of the alarm pilot lights.

With the alarms programmed for your acceptable span of water temperature, you will be notified by means of a flashing pilot if the actual water temperature deviates outside these limits. Our pilots can be connected by the user to additional alarm signals such as horns or large flashers, as long as the power drawn on 115 volts is 250 watts or less.

9. If you wish to know the return temperature, press and hold the "RETURN TEMPERATURE" panel. As long as the panel is held, the return water temperature will show in the temperature window.

10. If you wish to know the temperature difference (ΔT) between the Delivery and Return Water Temperatures, press and hold the (ΔT) Temperature Difference panel. The temperature difference will show in the temperature window.

11. If you wish to cool the unit down quickly without changing your set-point, press and hold the down arrow panel. For direct mix units (8400) this procedure may also be used for additional venting.

12. To varify that all LED's (lights) are functioning, press and hold up arrow.

DRAINING

If your Sterl-Tronic is to be taken out of service for a long time, or it will be exposed to freezing, it should be thoroughly drained. Drain plugs are provided at the base of the heater tank and water supply and drain lines.

OPERATION OF ONE ZONE ONLY OF DUAL OR TRIPLE ZONE UNITS:

When one zone of a dual or triple zone unit is to be operated while the other remains idle, it is necessary to run a by-pass line from the delivery to the return line of the idle zone.

PREVENTATIVE MAINTENANCE:

EVERY 6 MONTHS: DISCONNECT ALL POWER PRIOR TO SERVICING!

Inspect all electrical connections for secure attachment and for safe and secure ground connections. Inspect the power cable, especially at entrance point to the unit. This inspection should be made by a qualified electrician!

MODEL: M-8000 SERIES

TROUBLESHOOTING

ALL ELECTRICAL TROUBLESHOOTING MUST BE DONE BY A QUALIFIED ELECTRICIAN

TEMPERATURE FLUCTUATIONS Alternate Overheating and Overcooling.

While the user might be inclined to believe the trouble to be in the controller, this fluctuation can most always be traced to poor water flow, resulting from one or more of the following conditions.

1. Small connectors or small water passages. Slow water flow will create a long reaction time which causes overheating and overcooling.

2. Very long connecting lines or long serpentine flow of water in and out of the mold in series rather than in parallel. Refer to the page on installation.

3. Blocked water line in the mold. New molds sometimes contain metal chips or other foreign particles inside the water lines. Old molds sometimes contain lime or rust accumulations.

4. Quick disconnect fitting with check valves. (A source of very serious obstruction.) The check valves should be removed.

5. Lime buildup in the piping or fittings.

NOTE: The unit itself can be checked out for normal control by the use of a short 3/4" or 1/2" line connected directly from the delivery to the return line. This will provide a condition of very good flow and will establish whether the blockage is in the unit or the piping. This connection line should meet all the requirements of the "Process Connections" stated earlier.

RAPID CYCLING FROM HEAT TO COOL

This condition is traceable to the same causes as the temperature fluctuations indicated above.

UNABLE TO HEAT PROPERLY

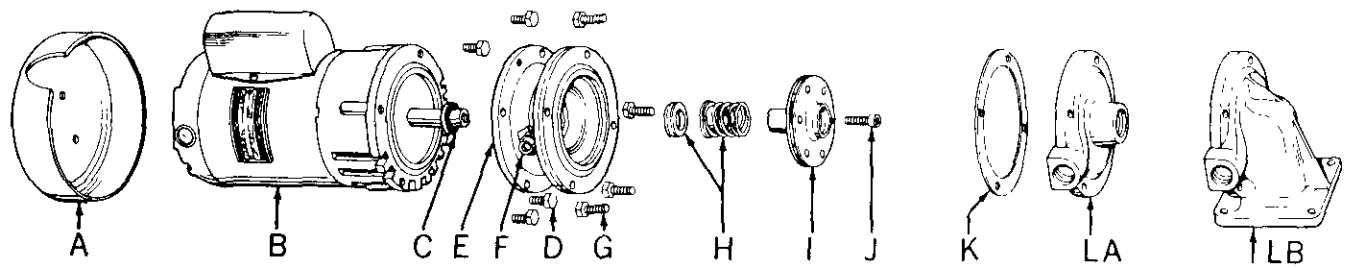
When the temperature will not rise above a certain temperature, the cause will generally be traced to continuous loss of water from the system (allowing cooling water to enter). This can be checked by observing the drain. Under some conditions it is possible to have the solenoid valve close on a particle of grit which, of course, will allow the valve to continuously leak. This solenoid valve can be flushed out easily by having the operator adjust the "set point" up and down scale several times to open and close the solenoid. If it continues to leak, the unit should be stopped and the electric power and water turned off and the solenoid valve should be taken apart and cleaned or replaced, as required.

Another cause would be traceable to a leaking hose or fitting somewhere in the system. It is also possible that the immersion heater might be inoperative or defective. Most any qualified electrician can check this out readily. Heater terminals are readily accessible for checking.

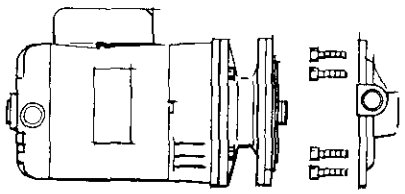
REPLACING ROTARY SEAL ASSEMBLY ON STERLCO PUMP AND MOTOR

PARTS

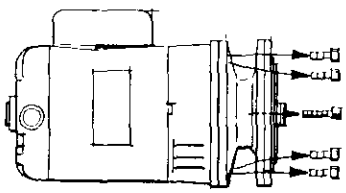
A. Drip Cover
B. Motor
C. Water Slinger
D. Motor Screws
E. Bracket
F. Prime Cock
G. Pump Screws
H. Rotary Seal Assembly
I. Impeller
J. Impeller Screw
K. Housing Gasket
L. Volute - A or B



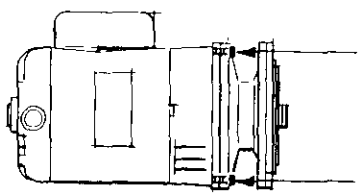
Step No. 1 — Dis-assembling (Removal of old seal assembly)



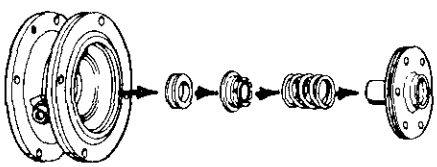
a) Remove volute from motor bracket and impeller assembly by removing pump screws.



b) Remove impeller screw and motor screws. (Note: opposite end of motor shaft is fitted with screw driver slot to hold shaft securely while impeller screw is being removed. Drip cover must be removed to get at screwdriver slot).



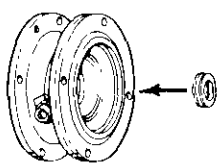
c) Insert two of the pump screws into the two **threaded holes** in the bracket. Tighten them slowly and evenly to force the impeller and bracket off the shaft. **Do not pry the impeller or bracket!**



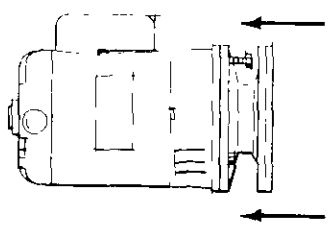
d) Remove old seal parts from impeller hub and bracket. Be sure water slinger is in place.

e) Clean impeller hub thoroughly . . . remove all loose particles of dirt, grease, etc. Use fine emery cloth if necessary. Also clean the recess in the bracket so the new seat will fit perfectly. Remove all particles and dirt on gasket surfaces of the two castings

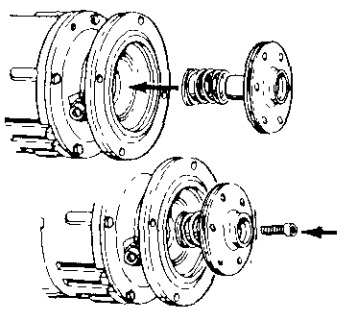
Step No. 2 — Re-assembly (Installation of new seal assembly)



f) Coat outside edge of new seat with 3% detergent solution and slip it into the bracket Press into bracket with thumbs or wooden dowel. Handle seat carefully so seating surfaces are not scratched or chipped . be sure it is **squarely** seated

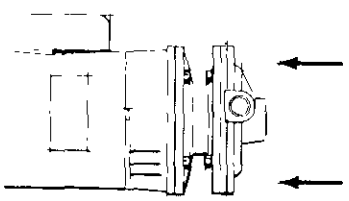


g) Remount bracket on motor.



h) Lubricate impeller hub 3% detergent solution . . slip new bellows and spring onto impeller hub. Be sure bellows slides freely on impeller hub

i) Replace impeller on motor shaft extension and secure with impeller screw. Hold shaft with screw driver slot while tightening screw



j) Replace volute onto bracket, using new housing gasket. Use one gasket for condensate pump and for temperature control units. Secure with pump screws. Be certain gasket is seated properly.

NOTE: When ordering parts please indicate pump model number and serial number.

STERLING, INC. 5200 W. Clinton Ave., Milwaukee, Wisconsin 53223

HEATER BURN OUT

A direct visual indication of heater burn out is the presence of scorched or discolored paint on the heater tank. In most cases, the water level inside the tank at the time of burn out can be determined because the paint on the exterior of the tank below the water level will not be scorched. Causes of heater burn out are generally traceable to:

1. The unit not being filled with water and purged of air prior to start-up.

2. A faulty heater (tank discoloration not always present).

3. A plugged system or badly obstructed flow.

PUMPS AND SEALS

Before leaving our factory, each unit is operated for a considerable period of time and calibrated. After this test, the unit is drained and blown out with warm air to remove most of the water from the piping systems. If the unit is allowed to stand idle for a longtime before being installed in your factory, the housing gasket at the pump can dry out and will possibly leak when the unit is started. In many cases these gaskets will soon swell and form a tight seal, while in other cases it may be necessary for you to tighten the pump screws to stop a leaking condition.

It is possible to have the pump seal surface separate slightly because of rough handling or considerable vibration during transit from our plant to yours. This, of course, would cause a leak at the pump seal when the pump is started, but in most cases the surface will mate again after the pump is allowed to run for short periods of time. If they do not mate, you might find it necessary to open the pump and free the seal by hand. It is seldom necessary to install a replacement seal in a new unit unless the seal has been damaged because the unit has been started without water.

Our pump seals should give a long period of service life. There are conditions, of course, which tend to shorten the seal life - such as presence of grit,operation of the unit without water, sustained high water temperatures or the presence of certain chemicals in the water. Our pump seal assembly has been developed to resist abrasive particles which we find present in many water systems. It is also fitted with high temperature flexible components for a maximum amount of heat resistance. These same components remain flexible even at low temperatures. Thus, the standard seal has a fine combination of heat resistance and wear resistance.

Installation & Maintenance Instructions

2-WAY DIRECT-ACTING SOLENOID VALVES
NORMALLY OPEN OR NORMALLY CLOSED OPERATION
BRASS OR STAINLESS STEEL CONSTRUCTION – 1/8", 1/4", OR 3/8" NPT

SERIES
8262
8263

Form No.V5256R8

IMPORTANT: See separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Causes of Improper Operation, and Coil or Solenoid Replacement.

DESCRIPTION

Series 8262 and 8263 valves are 2-way direct-acting general service solenoid valves. Valves bodies are of rugged brass or stainless steel. Series 8262 or 8263 valves may be provided with a general purpose or explosionproof solenoid enclosure. Series 8262 and 8263 valves with suffix "P" in the catalog number are designed for dry inert gas and non-lubricated air service.

OPERATION

Normally Open: Valve is open when solenoid is de-energized; closed when is energized.

Normally Closed: Valve is closed when solenoid is de-energized; open when energized.

IMPORTANT: No minimum operating pressure required.

Manual Operation

Manual operator allows manual operation when desired or during an electrical power outage. Depending upon basic valve construction, three types of manual operators are available:

Push Type Manual Operator

To engage push type manual operator, push stem at base of valve body upward as far as possible. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, release stem. Manual operator will return to original position.

Screw Type Manual Operator

To engage screw type manual operator, rotate stem at base of the valve body clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage, rotate stem counterclockwise until it hits a stop.

⚠ **CAUTION: For valve to operate electrically, manual operator stem must be fully rotated counterclockwise.**

Stem/Lever Type Manual Operator

To engage manual operator, turn stem/lever clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, turn stem/lever counterclockwise until it hits a stop.

⚠ **CAUTION: For valve to operate electrically, manual operator stem/lever must be fully rotated counterclockwise.**

Flow Metering Devices

Valves with suffix "M" in catalog number are provided with a metering device for flow control. Turn stem to right to reduce flow; left to increase flow.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Note: Inlet port will either be marked "1" or "IN". Outlet port will be marked "2" or "OUT".

Future Service Considerations.

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous,noncombustible fluid after disassembly and reassembly.

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to charts below. Check catalog number, coil prefix, suffix, and watt rating on nameplate to determine the maximum temperatures.

Wattage	Catalog Number Coil Prefix	Coil Class	Max. Ambient Temp. °F	Max. Fluid Temp. °F
6, 10.5, 12.4	none, DA or S	A	77	180
6,10.5 12.4	DF, FT or SF	F	125	180
6,10.5, 12.4	HT	H	140	180
9,10.7	none, DP or SP	F	77	180
9.7	none, FT or HT	A, F or H	77	120
11.2	none, FT or HT	A, F or H	77	150
16.7	none, DP or SP	F	77	200
17.1	none, KP SP or SD	F	125	180
17.1	HB, KB SS or SV	H	140	180

Catalog Nos.8262B200 and 8262 C200 AC construction only and Catalog Nos.8262B214 and 8262 D200 AC and DC construction are limited to 140°F fluid temperature.

Valves with Suffix V or W that are designed for AC service and normally closed operation are for use with No. 2 and 4 fuel oil service. These valves have the same maximum temperatures per the above table except Suffix W valves are limited to a maximum fluid temperature of 140°F.

Listed below are valves with Suffix V in the catalog number that are acceptable for higher temperatures.

Catalog Number Coil Prefix	Max. Ambient Temp.°F	Max. Fluid Temp.°F
FT8262, HB8262 FT8263, HB8263 8262G, 8263G	125	250*
HT or HB 8262G HT or HB 8263G	140	250

*The only exception is the 8262G and 8263G series (Class F coil) at 50 Hertz rated 11.1 and 17.1 watts are limited to 210°F fluid temperature.

Positioning

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

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STERLING, INC.
PARTS LIST A & C
STERLCO PUMP 1/2 & 3/4 HP

ITEM	PART NO.	DESCRIPTION
C	542-10404-00	Water Slinger
E	615-13341-01	Bracket
H	081-00024	Rotary Seal Assembly
I	695-18409-00	Impeller, Standard Brass, 1/2 HP
I	695-18409-03	Impeller, Standard Brass, 3/4 HP
J	001-06850	Impeller Screw
K	545-00001	Housing Gasket
LA	615-14921-00	Volute
LB	614-14951-00	Housing
B	720-09170	Motor 1/2 HP 3/60/230-460V TEFC
B	720-09167	Motor 1/2 HP 3/60/230-460V Open
B	720-09168	Motor 3/4 HP 3/60/230-460V Open
B	720-09190	Motor 3/4 HP 3/60/230-460V TEFC

MOTOR, IMPELLER, SEAL ASSEMBLY

695-00007-03	1/2 HP 3/60/230-460V Open
695-00007-24	1/2 HP 3/60/230-460V TEFC
695-00030-03	3/4 HP 3/60/230-460V Open
695-00030-10	3/4 HP 3/60/230-460V TEFC

Sterling part numbers apply to non-special motors. Consult Parts List in your unit manual for specific motor requirements.

695-00019-04	BRASS - MOTOR, IMPELLLER, SEAL ASSEMBLY
605-00052-05	BRASS - COMPLETE PUMP/MOTOR ASSEMBLY
615-13341-03	BRASS - BRACKET
615-00016	BRASS - VOLUTE

STERLING, INC., 5200 West Clinton Avenue, Milwaukee, Wisconsin 53223-0435
Phone: (414) 354-0970 Telex: 2-6805 P.O. Box 23435

Valves with suffix "P" in the catalog number must be mounted with the solenoid vertical and upright.

Mounting

Refer to Figure 2 for mounting dimensions.

Piping

Connect piping or tubing to valve according to markings on valve body. Inlet port will either be marked "1" or "IN". Outlet port will be marked "2" or "OUT". Wipe the pipe threads clean of cutting oils. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

IMPORTANT: To protect the solenoid valve, install a strainer or filter suitable for the service involved, in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601 and 8602 for strainers.

MAINTENANCE

⚠ WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power, depressurize valve, and vent fluid to a safe area before servicing the valve.

NOTE: It is not necessary to remove the valve from the pipeline for repairs.

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to open or close. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the valve as free from dirt and foreign material as possible.
- While in service, the valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve (see Maintenance) and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

1. Disassemble valve using exploded views for identification of parts.
2. Remove solenoid, see separate instructions.
3. Unscrew solenoid base sub–assembly or valve bonnet with special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order No. K218948. Remove core assembly, core spring, and solenoid base gasket from valve body. For normal maintenance on Series 8263 valves it is not necessary to remove valve seat. See Figure 1 for metering or manual operator constructions.
4. For normally open construction (Figure 3) remove end cap, or manual operator, (not shown) end cap gasket, disc holder spring, and disc holder assembly.
5. All parts are now accessible to clean or replace. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Reassembly

1. Use exploded views for identification, orientation and placement of parts.
2. Lubricate all gaskets with DOW CORNING® 111 Compound lubricant or an equivalent high–grade silicone grease.
3. For normally open construction (Figure 3), install disc holder assembly, disc holder spring, end cap gasket and end cap or manual operator. For valves with 1/8" NPT, torque end cap or manual operator to 90 ± 10 in–lbs [10,2 ± 1,1 Nm]. For all other valves torque end cap or manual operator to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].
4. For Series 8263 apply a small amount of LOCTITE® PST® pipe sealant to threads of valve seat (if removed). Follow manufacturers instructions for application of pipe sealant. Then install valve seat and torque to 75 ± 10 in–lbs [8,5 ± 1,1 Nm].
5. Replace solenoid base gasket, core assembly with core spring and solenoid base sub–assembly or plugnut/core tube sub–assembly and valve bonnet. Note: For core assemblies with internal type core springs, install wide end of core spring in core assembly first, closed end of core spring protrudes from top of core assembly.
6. For 1/8" NPT valve constructions, Torque valve bonnet to 90 ± 10 in–lbs [10,2 ± 1,1 Nm]. Torque solenoid base sub–assembly to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].
7. Install solenoid, see separate solenoid instructions. Then make electrical hookup to solenoid.

⚠ WARNING: To prevent the possibility of personal injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

8. Restore line pressure and electrical power supply to valve.
9. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic *click* signifies the solenoid is operating.

ORDERING INFORMATION FOR ASCO REBUILD KITS

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.

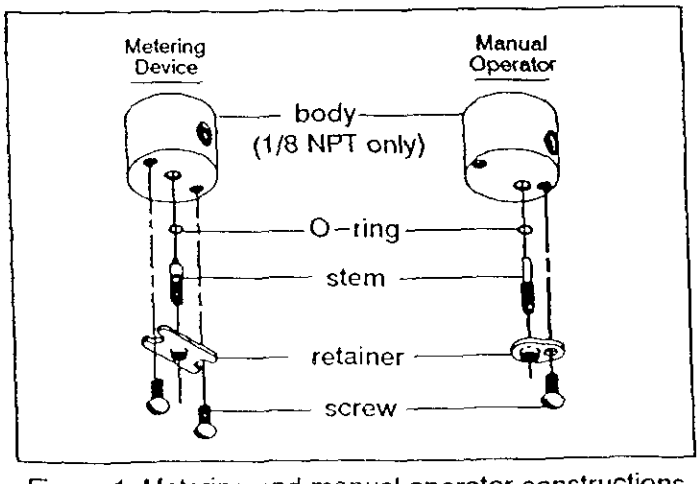
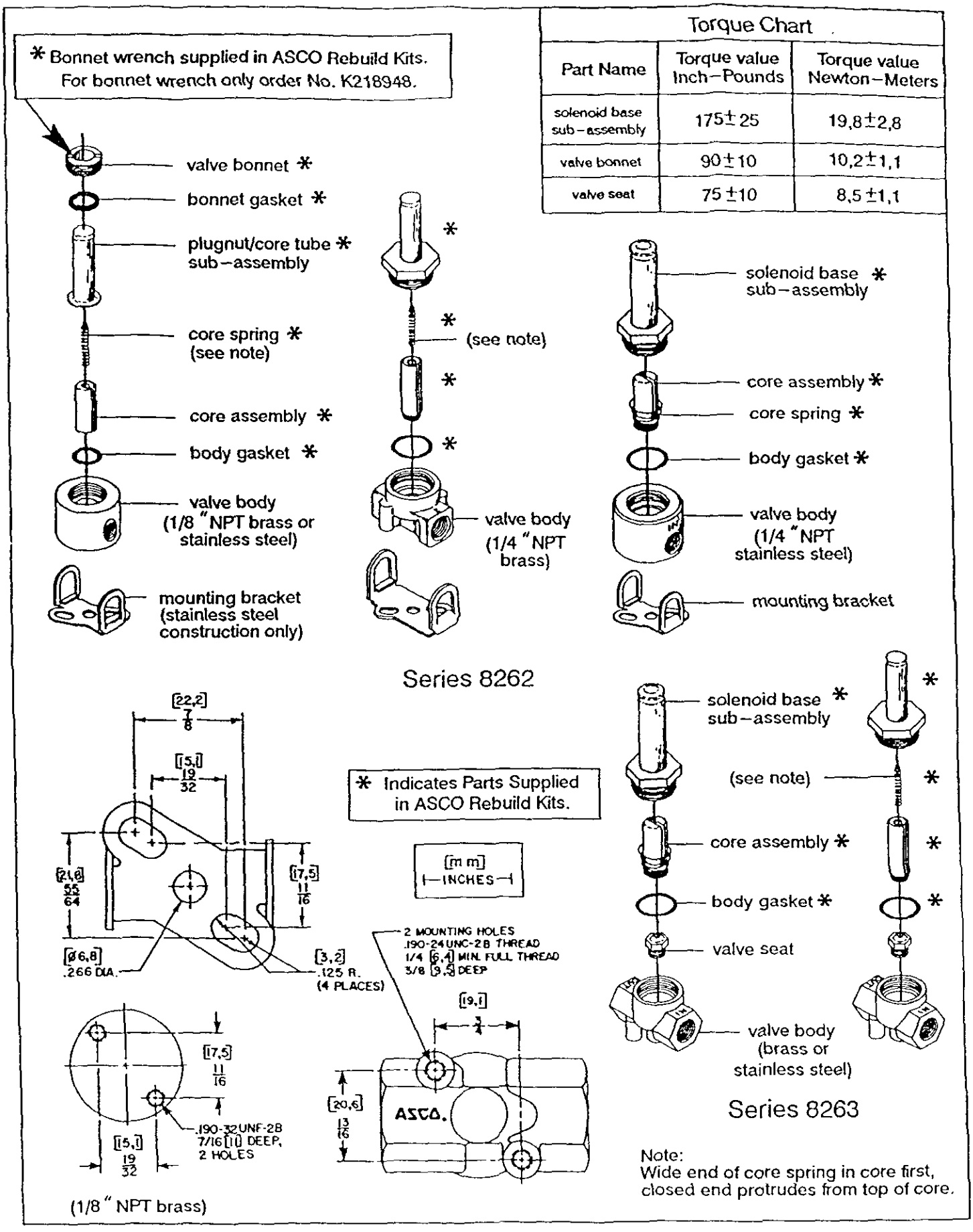


Figure 1. Metering and manual operator constructions.



Torque Chart		
Part Name	Torque value Inch-Pounds	Torque value Newton-Meters
solenoid base sub-assembly	175±25	19,8±2,8
valve bonnet	90±10	10,2±1,1
valve seat	75±10	8,5±1,1

Figure 2. Series 8262 and 8263, normally closed construction.

Disassembly and Reassembly of Stem /Lever Type Manual Operator (Refer to Figure 3)

NOTE: There are two stem/lever manual operator constructions. They are identified by the location of the core spring as *internal* or *external* spring construction.

1. Unscrew solenoid base sub–assembly from manual operator body.
2. Unscrew manual operator body from valve body. Then remove body gasket and stem retainer.
3. Slip stem/spacer sub–assembly with stem gasket from manual operator body. Remove core assembly with core spring from center of manual operator body.
4. All parts are now accessible for cleaning or replacement. Lubricate gaskets per ***Valve Reassembly*** step 2.
5. Position core assembly with core spring into base of manual operator body. Then install stem/spacer sub–assembly into manual operator body to engage with core assembly.
6. Reinstall stem retainer on body and stem/spacer sub–assembly.

IMPORTANT: The spacer on the stem/spacer sub–assembly must be *inside* of the stem retainer for *internal* spring construction and *outside* the stem retainer for *external* spring construction.

7. Replace body gasket and install manual operator assembly in valve body. Torque manual operator body to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].
8. Replace solenoid base gasket and solenoid base sub–assembly. Torque solenoid base sub–assembly to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].
9. Check manual operator for proper operation. Turn stem clockwise and counterclockwise; stem should turn freely without binding.

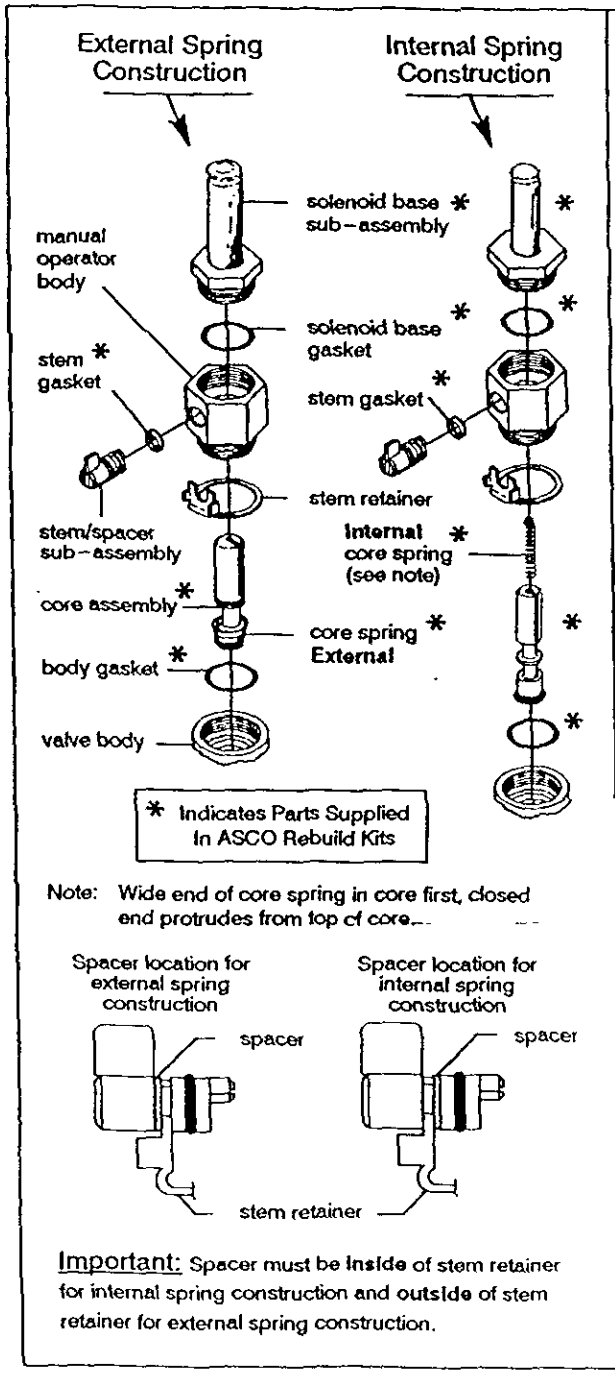


Figure 3. Stem/lever type manual operators

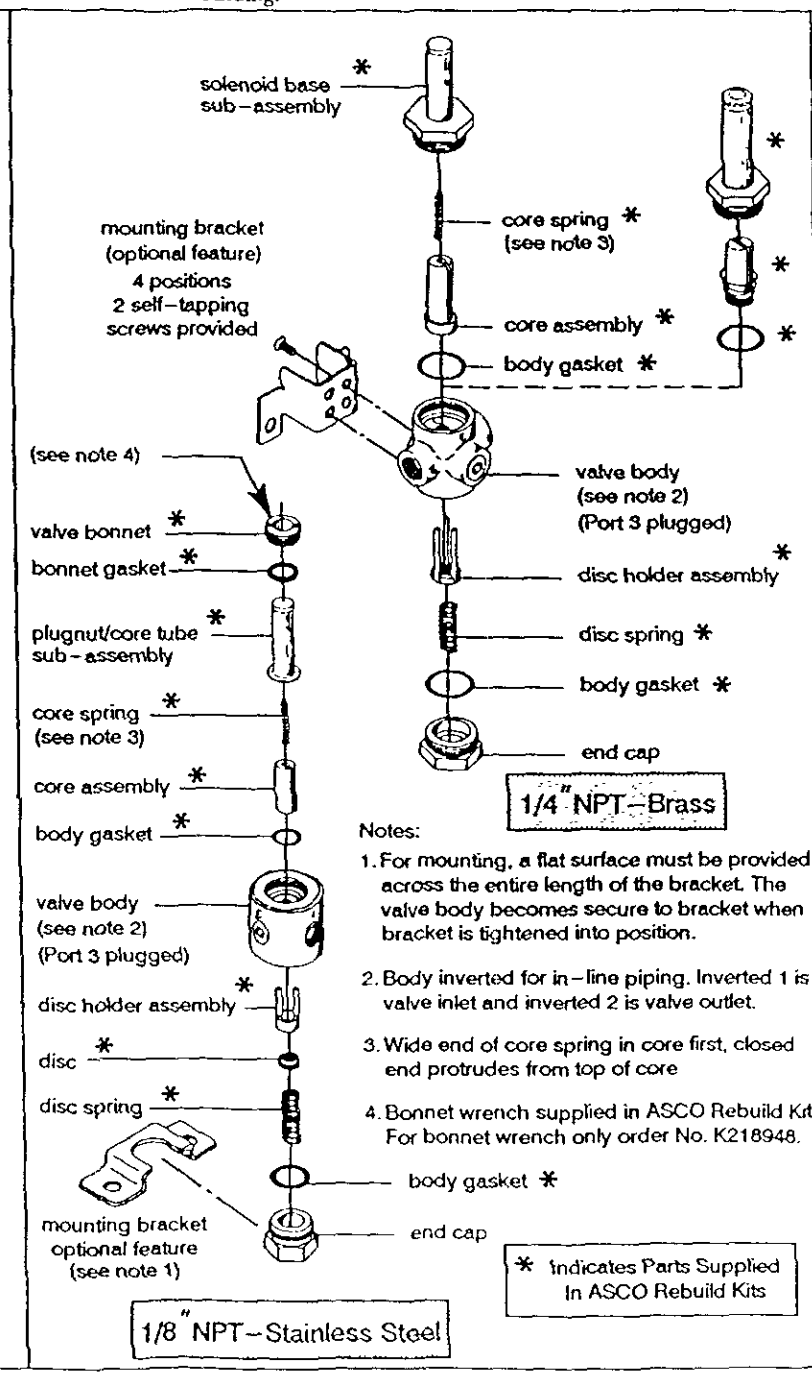


Figure 4. Series 8262, normally open construction.

Installation & Maintenance Instructions

ASCO Red-Hat II™

OPEN–FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES
8003G
8202G

Form No.V6584R4

—SERVICE NOTICE—

ASCO® solenoid valves with design change letter "G" in the catalog number *(example: 8210G 1)* have an epoxy encapsulated ASCO® Red Hat II® solenoid. This solenoid replaces some of the solenoids with metal enclosures and open–frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

DESCRIPTION

Catalog numbers 8003G and 8202G are epoxy encapsulated pull–type solenoids. The green solenoid with lead wires and 1/2" conduit connection is designed to meet Enclosure Type 1–General Purpose, Type 2–Dripproof, Types 3 and 3S–Raintight, and Types 4 and 4X–Watertight. The black solenoid on catalog numbers prefixed "EF" is designed to meet Enclosure Types 3 and 3S–Raintight, Types 4 and 4X–Watertight, Types 6 and 6P–Submersible, Type 7 (A, B, C, & D) Explosionproof Class I, Division 1 Groups A, B, C, & D and Type 9 (E, F, & G)–Dust–Ignitionproof Class II, Division 1 Groups E, F, & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class "H" solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole, 0.38 or 0.63 minimum full thread.

Catalog numbers 8202G1, 8202G3, 8202G5 and 8202G7 are epoxy encapsulated push–type, reverse–acting solenoids having the same enclosure types as previously stated for Catalog numbers 8003G1 and 8003G2

Series 8003G and 8202G solenoids are available in:

- **Open–Frame Construction:** The green solenoid may be supplied with 1/4" spade, screw, or DIN terminals. (Refer to Figure 4)
- **Panel Mounted Construction:** These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. Refer to Figure 1 and section on *Installation of Panel Mounted Solenoid.*

Optional Features For Type 1 – General Purpose Construction Only

- **Junction Box:** This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4" spade or screw terminals may have a junction box. The junction box provides a 1/2" conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No.K236–034:** Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

Series 8003G – When the solenoid is energized, the core is drawn into the solenoid base sub–assembly. **IMPORTANT: When the solenoid is de–energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC Construction is 11 ounces, and 5 ounces for DC construction.**

Series 8202G – When the solenoid is energized, the disc holder assembly seats against the orifice. When the solenoid is de–energized, the disc holder assembly returns. **IMPORTANT: Initial return force for the disc or disc holder assembly, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force is 1 pound, 5 ounces.**

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

⚠ WARNING: To prevent the possibility of electrical shock from the accessibility of live parts, install the open–frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

⚠ CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165° C. On valves used for steam service or when a class "H" solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180°C. See nameplate/retainer for service.

NOTE: These solenoids have an internal non–resetable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust–ignitionproof enclosures (Types 7 & 9).

***IMPORTANT:* To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601, and 8602 for strainers.**

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature. NOTE: For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Temperature Limitations For Series 8003G or 8202G Solenoids for use on Valves Rated at 10.1, 11.6, 17.1, or 22.6 Watts

Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp. ° F
10.1 & 17.1	None, FB, KF, KP SC, SD, SF, & SP.	F	125
10.1 & 17.1	HB, HT, KB, KH, SS, ST, SU,	H	140
11.6 & 22.6	None, FB,KF, KP, SC, SD, SF, & SP.	F	104
11 6 & 22.6	HP, HT, KB, KH, SS, ST, SU, & SV	H	104

† Minimum ambient temperature –40° F (–40° C)

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub–assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2" conduit connection. To facilitate wiring, the solenoid may be rotated 360°. For the watertight and

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explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

Additional Wiring Instructions For Optional Features:

- **Open–Frame solenoid with 1/4" spade terminals.**

For solenoids supplied with screw terminal connections use #12–18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to 10 ± 2 in–lbs [1,0 ± 1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10–32 machine screw. Torque grounding screw to 15 – 20 in–lbs [1,7 – 2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15 – 20 in–lbs [1,7 – 2,3 Nm] with a 5/32" hex key wrench.

- **Junction Box**

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2" conduit connection. Connect #12–18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

- **DIN Plug Connector Kit No.K236–034**

1. The open–frame solenoid is provided with DIN terminals to accommodate the plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12–18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire–end sleeves is also recommended for these socket terminals. Maximum length of wire–end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer, and connector cover.

NOTE: Connector housing may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5 ± 1 in–lbs [0,6 ± 1,1 Nm].

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it may be necessary to change the complete solenoid including the core and solenoid base sub–assembly, not just the solenoid. Consult ASCO.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid.

Installation of Panel Mounted Solenoid (See Figure 1)

1. Disassemble solenoid following instruction under *Solenoid Replacement* then proceed.
2. Install solenoid base sub–assembly through customer panel.
3. Position spring washer on opposite side of panel over solenoid base sub–assembly.
4. Replace solenoid, nameplate/retainer and red cap.
5. Make electrical hookup, see *Wiring* section.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

⚠ WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open–circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned–Out Solenoid:** Check for open–circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage

Solenoid Replacement

1. Disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid. For 3–way construction, piping or tubing must be removed from pipe adapter.

2. Disassemble solenoids with optional features as follows:

- **Spade or Screw Terminals**

  Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

- **Junction Box**

  Remove conduit and socket head screw (use 5/32" hex key wrench) from center of junction box. Disconnect junction box from solenoid.

- **DIN Plug Connector**

  Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32" hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub–assembly. For 3–way construction with pipe adapter (Figure 3), remove pipe adapter, nameplate and solenoid. Omit steps 4 and 5.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade between solenoid and nameplate/retainer. Pry up slightly and push to remove

NOTE: Series 8202G solenoids have a spacer between the nameplate/retainer and solenoid.

5. Remove solenoid from solenoid base sub–assembly.
6. Reassemble in reverse order of disassembly. Use exploded views for identification and placement of parts.
7. Torque pipe adapter to 90 inch–pounds maximum [10,2 Nm maximum]. Then make up piping or tubing to pipe adapter on solenoid.

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove spring washer form solenoid base sub–assembly. For 3–way construction, remove plugnut gasket.
3. Unscrew solenoid base sub–assembly from valve body
4. Remove internal solenoid parts for cleaning or replacement. Use exploded views for identification and placement of parts.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Torque solenoid base sub–assembly and adapter to 175±25 in–lbs [19,8±2,8 Nm].

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid Also specify voltage and frequency.

Torque Chart

Part Name	Torque Value in Inch–Pounds	Torque Value In Newton–Meters
solenoid base sub–assembly/adapt-	175 ± 25	19,8 ± 2,8
pipe adapter	90 maximum	10,2 maximum

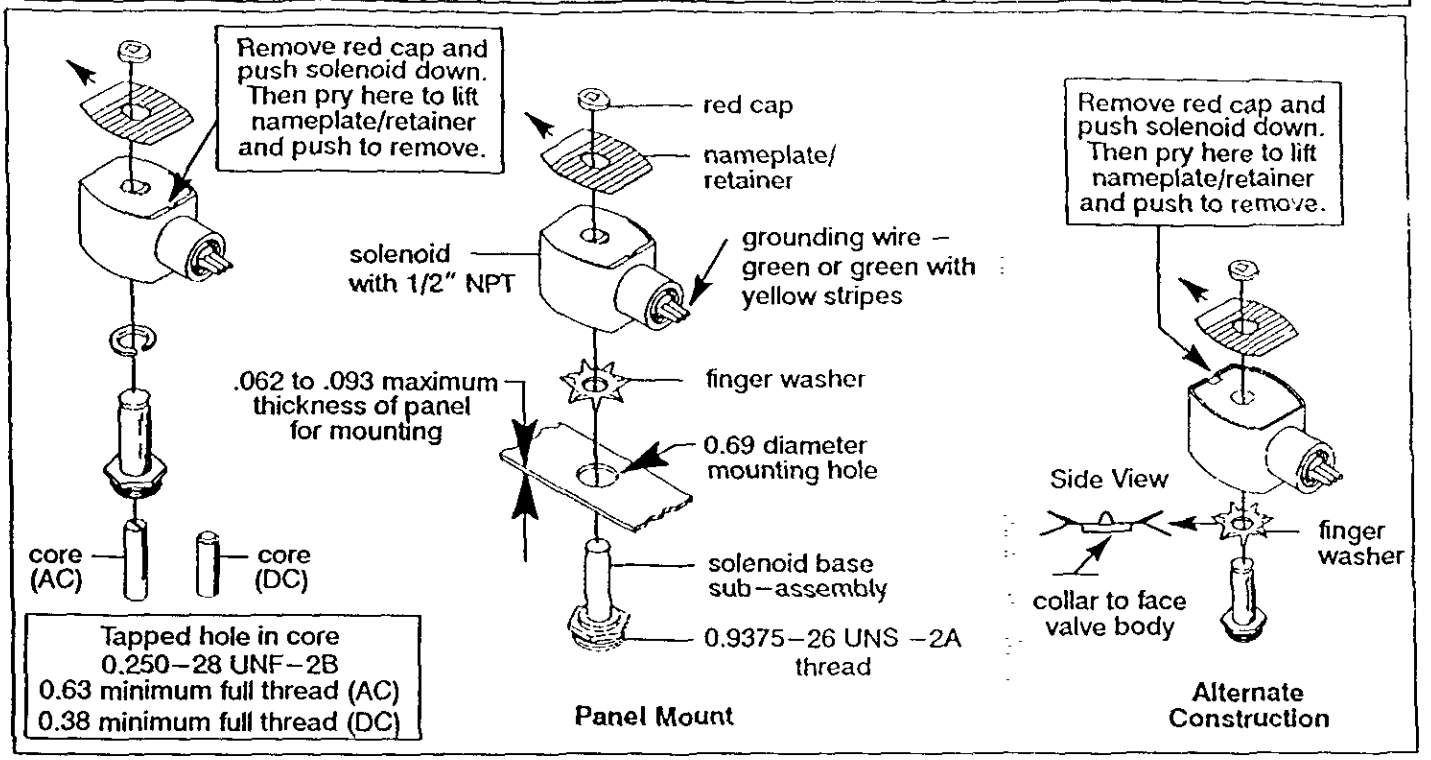

Figure 1. Series 8003G solenoids

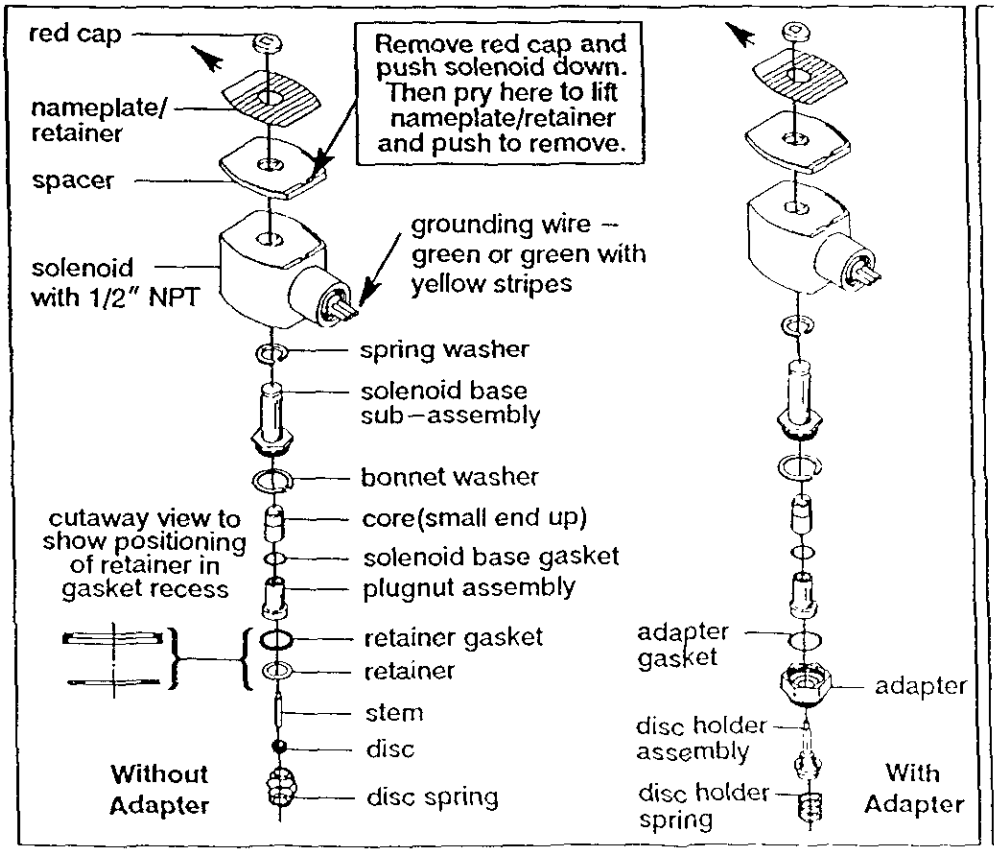

Figure 2. Series 8202G solenoids

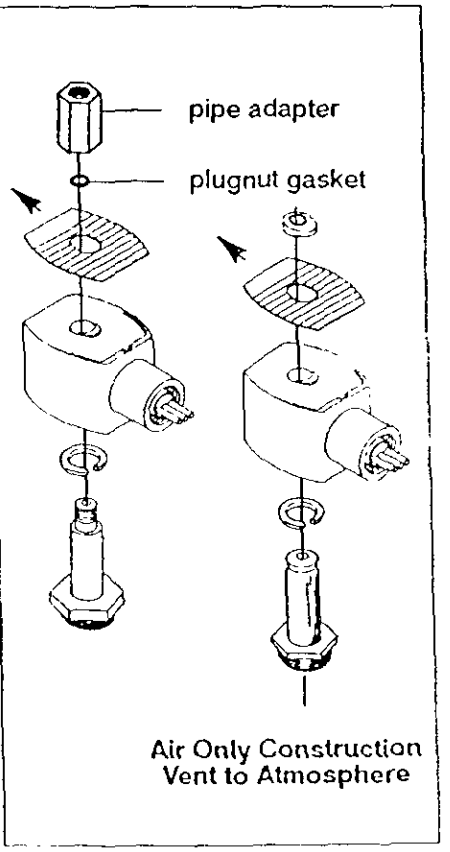

Figure 3. 3–Way Construction

Torque Chart

Part Name	Torque Value In Inch–Pounds	Torque Value In Newton–Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 – 20	1,7 – 2,3
center screw	5 ± 1	0,6 ± 0,1

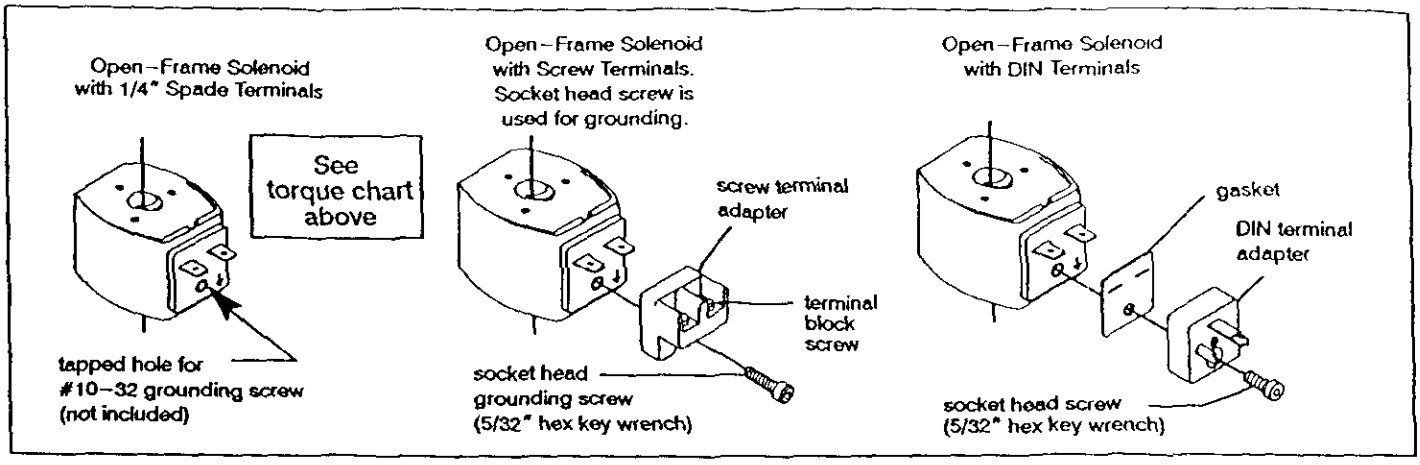

Figure 4. Open–frame solenoids

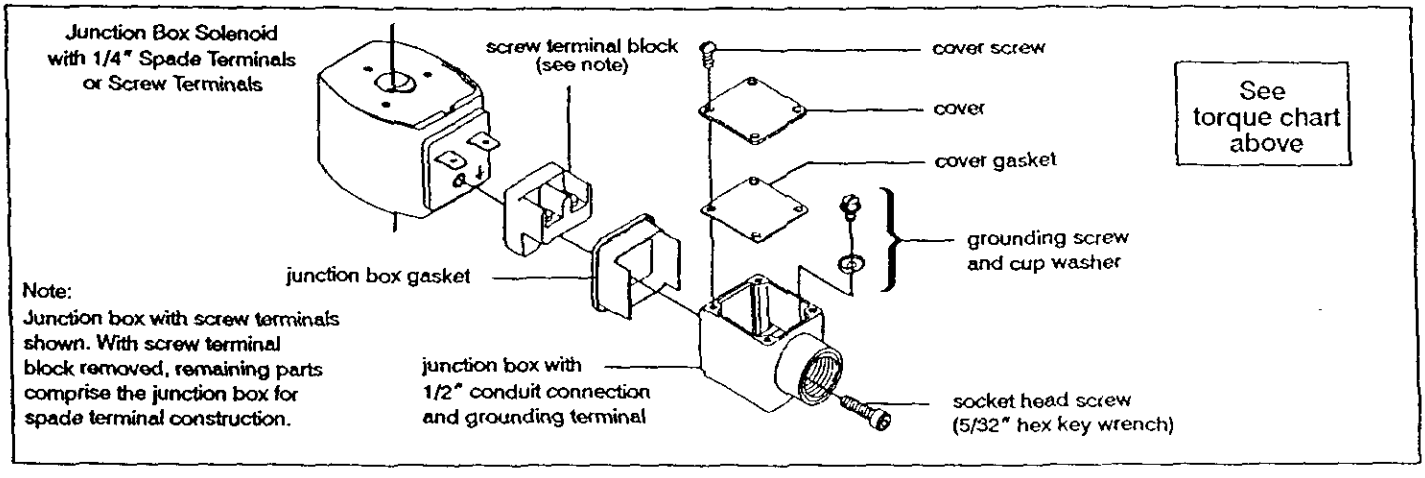

Figure 5. Junction box (optional feature)

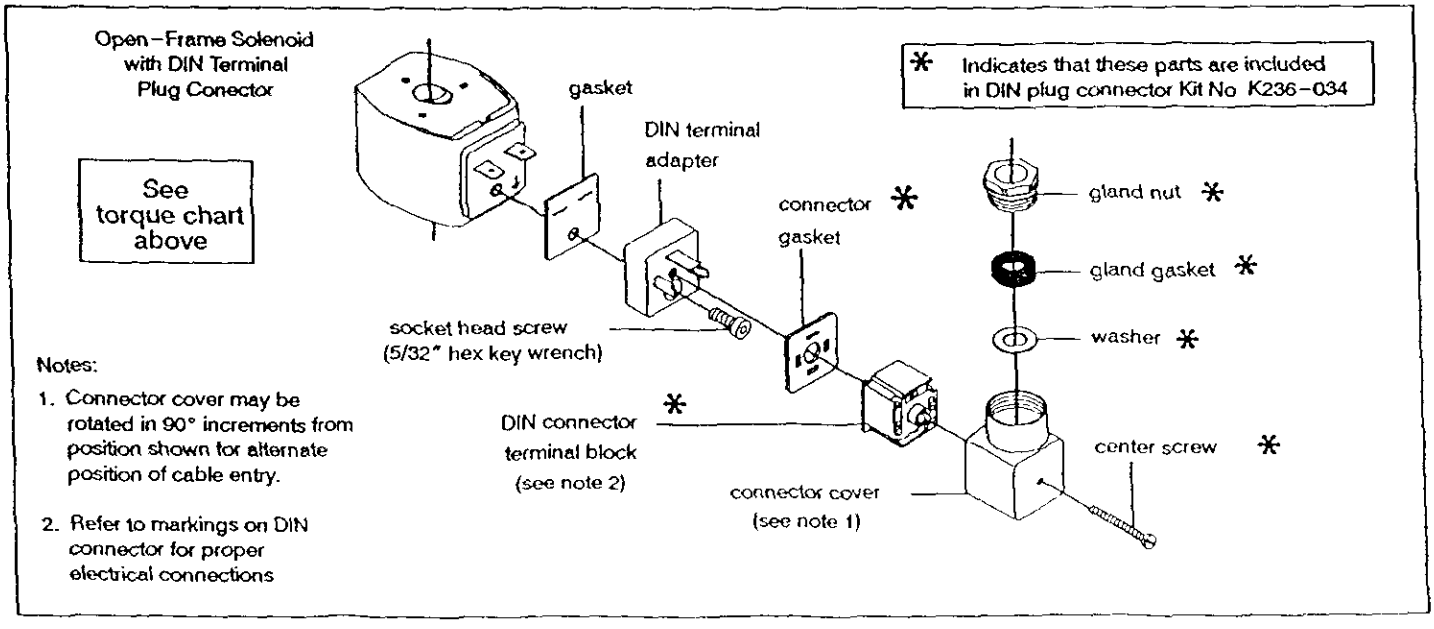

Figure 6. DIN plug connector kit No. K236–034 (optional feature)

ASCO Valves Automatic Switch Co. 50–60 Hanover Road Florham Park New Jersey 07932

GENERAL ELECTRIC
OVERLOAD HEATERS

CAUTION NOTE! MAKE SELECTION THIS TABLE ONLY! USE N.P. AMPS + AMP = FULL LOAD AMPS

MAGNETIC STARTERS

EMA SIZES 00, 0 AND 1

Max. Motor Full-Load Amps. C	Heater Catalog Number
0.45	CR123C0.54A
0.49	CR123C0.60A
0.53	CR123C0.66A
0.59	CR123C0.71A
0.65	CR123C0.78A
0.76	CR123C0.87A
0.84	CR123C0.97A
0.93	CR123C1.09A
1.04	CR123C1.18A
1.15	CR123C1.31A
1.27	CR123C1.46A
1.39	CR123C1.63A
1.55	CR123C1.84A
1.73	CR123C1.96A
1.89	CR123C2.20A
2.05	CR123C2.39A
2.28	CR123C2.68A
2.47	CR123C3.01A
2.79	CR123C3.26A
3.31	CR123C3.56A
3.70	CR123C3.79A
4.06	CR123C4.19A
4.47	CR123C4.66A
4.95	CR123C5.26A
5.49	CR123C5.92A
5.91	CR123C6.30A
6.47	CR123C6.95A
7.20	CR123C7.76A
8.22	CR123C8.67A
8.72	CR123C9.55A
9.67	CR123C10.4B
10.4	CR123C11.3B
11.0	CR123C12.5B
12.4	CR123C13.7B
13.2	CR123C15.1B
15.4	CR123C16.5B
17.1	CR123C18.0B
18.1	CR123C19.8B
20.0	CR123C21.4B
21.5	CR123C22.8B
22.5	CR123C25.0B
23.9	CR123C27.3B
26.3	CR123C30.3B
27.0	CR123C33.0B

EMA SIZE 2

Max. Motor Full-Load Amps. C	Heater Catalog Number
5.85	CR123C6.30A
6.47	CR123C6.95A
7.35	CR123C7.76A
8.06	CR123C8.67A
9.03	CR123C9.55A
9.61	CR123C10.4B
10.5	CR123C11.3B
11.6	CR123C12.5B
12.5	CR123C13.7B
13.6	CR123C15.1B
16.7	CR123C16.3B

MANUAL STARTERS

Maximum Motors Full-load Amp	Heater Cat. No. CR123
.48	H0.55A
.53	H0.61A
.58	H0.67A
.65	H0.74A
.71	H0.82A
.78	H0.90A
.86	H0.99A
.95	H1.08A
1.04	H1.20A
1.14	H1.32A
1.25	H1.44A
1.37	H1.56A
1.49	H1.72A
1.63	H1.86A
1.78	H2.05A
1.95	H2.24A
2.13	H2.45A
2.32	H2.67A
2.53	H2.91A
2.76	H3.17A
3.01	H3.46A
3.27	H3.77A
3.56	H4.10A
3.88	H4.46A
4.22	H4.86A
4.60	H5.29A
5.00	H5.75A
5.43	H6.25A
5.90	H6.80A
6.41	H7.39A
6.96	H8.02A
7.60	H8.73A
8.25	H9.50A
8.95	H10.3B
9.75	H11.2B
10.6	H12.2B
11.4	H13.2B
12.5	H14.4B
13.6	H15.7B
14.8	H17.1B
16.0	H18.6B

"MOTOR STARTER HEATER ELEMENT (OVERLOAD) SELECTION CHART"

NOTE! 1. MOTOR W/SERVICE FACTOR HIGHER THAN 1.0: If the full load current value shown on the motor nameplate is between the listed "Full Load Amps," select the "Heater Type No." with the higher value.

2. MOTORS W/1.0 SERVICE FACTOR: [illegible] Type No." [illegible]

GE Instructions

NEMA Size 00, 0, & 1 — CR305, CR306, CR309 Magnetic Contactors, Starters, & Reversers

Caution: *Before installing in a nuclear application, determine that the product is intended for such use.*

Warning: *Disconnect power before installing or servicing.*

Description

GE 300-Line full-voltage motor starters include a magnetic contactor and a three-leg block overload relay, providing motor protection against running and stalled motor overloads. The overload relay is provided with a yellow trip indicator located to the right of the reset arm, and is visible when the overload relay is tripped.

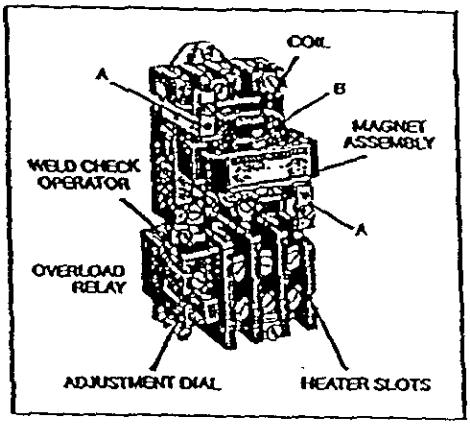

Figure 1. Typical 300-Line magnetic starter.

Ratings–600 V Maximum

Starter Maximum Current Rating	Contactor Maximum Current Rating	AC Volts	Maximum Hp For AC Motors	
			Single-phase	Poly-phase
Size 00				
9 ampere (open and enclosed)	10 ampere (open) 9 ampere (enclosed)	115 200 230 460–575	½ — 1 —	— 1½ 1½ 2
Size 0				
18 ampere (open and enclosed)	20 ampere (open) 18 ampere (enclosed)	115 200 230 460–575	1 — 2 —	— 3 3 5
Size 1				
27 ampere (open and enclosed)	30 ampere (open) 27 ampere (enclosed)	115 200 230 460–575	2 — 3 —	— 7½ 7½ 10

Motor branch circuit and control circuit overcurrent protection should be supplied in accordance with the National Electrical Code. CR305 contactors are suitable for use on a circuit capable of delivering not more than 5,000 RMS symmetrical amperes, 600 volts maximum when protected by H, J, K1, K5, RK1, RK5 class fuses, or a circuit breaker having an interrupting rating not less than 5,000 RMS symmetrical amperes.

Installation

Before connecting controller to power supply:

1. Remove all packing.
2. Clean magnet mating surfaces of any dirt or foreign matter.
3. Select and install heaters in accordance with heater table.
4. Operate movable magnet and operating arm by pressing on the nameplate to assure free movement.
5. Mount on a sturdy vertical support.
6. Make the electrical connections.
7. The starter overload relay may be reset manually by depressing and releasing the reset arm.

Coil Replacement

1. Remove power from device.
2. Press against coil while pulling up slightly on coil retainers (A–Figure 1) and move retainers away from coil.
3. Withdraw magnet assembly, coil, molded cover, and movable arm from device.
4. Withdraw spring clip (B–Figure 1) and remove armature from movable arm.
5. Remove coil from magnet.
6. Replace coil.
7. Reassemble device by reversing procedure.

Contact Replacement

1. Perform steps 1 through 5 under *Coil Replacement*.
2. Remove magnet from molded cover and movable arm.
3. Remove return spring from center of movable arm.
4. Remove molded cover from movable arm.
5. Depress and slide movable contact and spring from movable arm.
6. Remove screws holding stationary contacts in place and remove stationary contacts.
7. Reassemble device by reversing procedure.

Note: For starters with one or more normally closed contacts, perform steps 1 and 2 shown under *Coil Replacement*. Withdraw spring clip (B–Figure 1) and remove armature, coil, and magnet from device. Remove return spring from center of movable arm. Remove molded cover and stationary contacts before lifting movable arm from device.

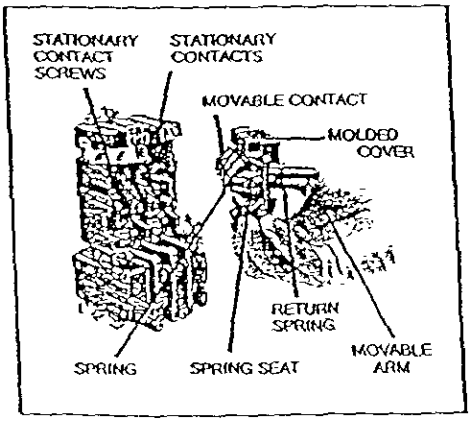

Figure 2.

Normally Closed Contacts

The contacts may be converted from normally open to normally closed with no additional parts. Perform steps 1 through 4 shown under *Coil Replacement*. Lift coil and magnet from movable arm. Remove return spring from center of movable arm. Depress movable contact spring and spring seat against movable contact and rotate these parts ½ turn without removing them from window. Remove the stationary contacts to install the movable arm in the device. Install the stationary contacts so that their silver pads face the movable contact silver pads.

Reassemble the device. To change contacts from normally closed to normally open position, reverse the above procedure.

Check For Welded Contacts In Overload Relay

With power disconnected, disconnect the control wiring from the relay terminals. Place a ball set or no. 0 [illegible]

Instructions For
25, 30, 40, 50, & 60
Full-load Ampere Forms

Magnetic Contactors

Definite Purpose

CR353AB, AC, AD, FE, & FF Series

Caution: Before installing in a nuclear application, determine that the product is intended for such use.

Warning: Disconnect power before installing or servicing.

Features

- Designed to control air conditioning and resistance heating loads.
- Universal mounting base allows easy replacement of other manufacturers devices.
- Molded, enclosed coil structures.
- UL recognized and CSA certified.

Installation

1. Disconnect power from source.
2. Remove all packing material from the contactor.
3. If a control transformer is used, determine that the coil VA listed in the coil data table is compatible with the capacity of the control transformer.
4. Verify that the power pole ratings equal or exceed those of the contactor being replaced.
5. Assemble coil terminal tabs if needed (See Figure 2), 50 and 60 ampere forms only.
6. Mount the contactor on a vertical panel.
7. Make all electrical connections.

Power Pole Ratings

Base Catalog Number Product Family	Volts AC	1-Phase, 2-Pole or 3-Phase, 3-Pole		Resistive Amperes Per Pole
		Full-load Amperes	Locked Rotor Amperes	
CR353AB—	240 480 600	25	150 125 100	35
CR353AC—	240 480 600	30	180 150 120	40
CR353AD—	240 480 600	40	240 200 160	50
CR353FE—	240 480 600	50	300 250 200	62
CR353FF—	240 480 600	60	360 300 240	75

Coil Data; 25, 30, & 40 Full-load Amperes

Contactor	Coil Cat. No.	Volts	Hertz	Nominal Inrush VA	Nominal Sealed VA
CR353AB, AC, AD	5S-B20A	110/120	60 50	77 87	10 12.5
	5S-B20B	208/240	60 50	77 87	10 12.5
	5S-B20C	416/480	60 50	77 87	10 12.5
	5S-B20F	277	60 50	77 87	10 12.5
	5S-B20H	24①	60 50	77 87	10 12.5
	5S-B19H	24②	60 50	60 68	7 7.4

① 4- or 5-pole forms only. ② 2- or 3-pole forms only.

Coil Data; 50 & 60 Full-load Amperes

Contactor	Coil Cat. No.	Volts	Hertz	Nominal Inrush VA	Nominal Sealed VA
CR353FE, FF	5S-B23A	110/120	60 50	100 119	11 14
	5S-B23B	208/240	60 50	100 119	11 14
	5S-B23C	440/480 380/416	60 50	100 119	11 14
	5S-B23F	277	60	100	11
	5S-B23H	24	60 50	90 107	11 14

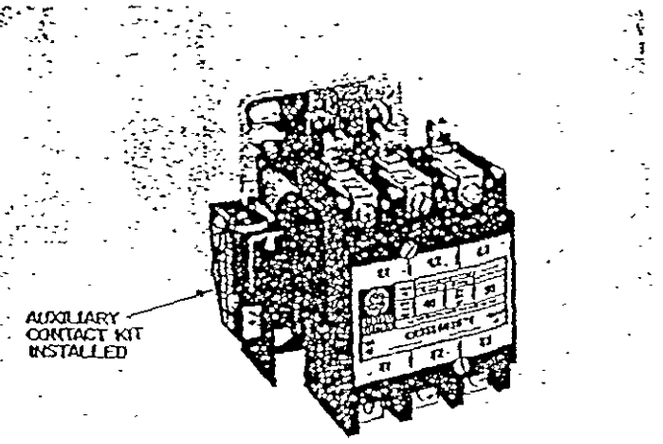

Figure 1. Typical CR353AD 40 FL ampere contactor.

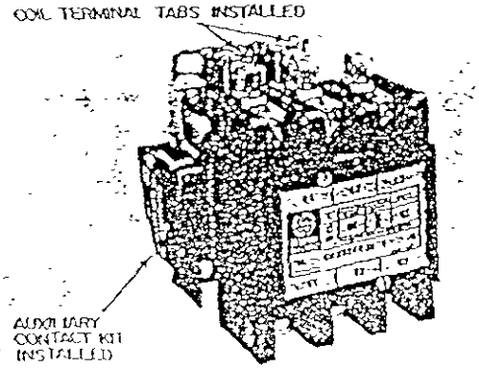

Figure 2. Typical CR353FE 50 FL ampere contactor.

GENERAL ELECTRIC