

Delta T Systems, Inc.

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INSTRUCTION & SERVICE MANUAL



DO NOT DISCARD!

**IMPORTANT INFORMATION INCLUDING
REPLACEMENT PARTS**

IMPORTANT SAFETY INFORMATION



Warning !!!

COMPLIANCE AND RECOGNITION OF THE FOLLOWING PRECAUTIONS ARE THE SOLE RESPONSIBILITY OF THE USER OF THIS EQUIPMENT.

Warning !!!

DO NOT OPERATE OR SERVICE THIS EQUIPMENT UNTIL YOU HAVE READ AND UNDERSTAND THE MANUAL SUPPLIED WITH THIS EQUIPMENT.

Warning !!!

THIS EQUIPMENT CONTAINS DANGEROUSLY HOT FLUID AND COMPONENTS WHICH COULD CAUSE SEVERE INJURY OR DEATH!!!

Caution !!!



Caution !!!

ONLY QUALIFIED PERSONNEL SHOULD INSTALL, USE, OR SERVICE THIS EQUIPMENT.

INSTALL AND GROUND EQUIPMENT PER NEC CODE AND LOCAL REQUIREMENTS.

Warning !!!

DO NOT OPERATE OR ALLOW EQUIPMENT TO RUN UNATTENDED!!

Caution !!!

DO NOT OPERATE EQUIPMENT WITHOUT COVERS.

Caution !!!

UNRESTRICTED FLOW OF FLUIDS TO DRAIN SERVICE MUST BE PROVIDED.

Warning !!!



Warning !!!

COOL EQUIPMENT DOWN TO MINIMUM TEMPERATURE OF 125 DEGREES FAHRENHEIT. SHUT OFF AND RELIEVE INTERNAL PRESSURE FROM AIR AND FLUID SUPPLY SERVICES BEFORE DISCONNECTING OR SERVICING THIS EQUIPMENT.

DISCONNECT AND LOCK OUT INPUT POWER BEFORE SERVICING THIS EQUIPMENT.

Warning !!!

CONTROL POWER SWITCHES DO NOT REMOVE POWER FROM ALL TERMINALS. TURN OFF OR DISCONNECT MAIN POWER TO UNIT WHEN NOT IN USE!

Warning !!!

SHUT OFF EQUIPMENT USING MAIN ELECTRICAL DISCONNECT.

ATTENTION!

Please note before starting unit:

The controller provided with your Delta T Temperature Control Unit has already been fully programmed. Any attempts to re-set the values may cause a malfunction of the unit's operation.



Mold Purge Procedure for Delta T Water Unit

- Turn unit off
- Turn water off
- Press and hold vent button for a few seconds to de-pressurize the unit
- Hook up regulated air line to mold purge fitting
- Press and hold purge button to purge water from the unit and process

1. SAFETY CONSIDERATIONS

The Delta T Temperature Control Unit is designed to provide safe and reliable operation when installed and operated within design specifications, following national and local safety codes.

To avoid possible personal injury or equipment damage when installing, operating or maintaining this equipment, use good judgment and follow these safe practices:

- Follow all SAFETY CODES
- Wear SAFETY GLASSES and WORK GLOVES
- Do not come in contact with dangerously hot fluid and piping.
- Operate this equipment within design specifications.
- OPEN, TAG AND LOCK ALL DISCONNECTS before working on equipment
It is a good idea to remove the fuses and carry them with you.
- Make sure the temperature control unit is properly GROUNDED before switching power on.
- When welding or brazing in or around this equipment be sure VENTILATION is ADEQUATE. PROTECT adjacent materials from flame or sparks by shielding with sheet metal. An approved FIRE EXTINGUISHER should be close at hand and ready for use if needed.
- Do not operate without COVERS.
- Do not jump or bypass any electrical safety control.
- Do not restore power until all tools, test equipment, etc. has been removed and the panels replaced.
- Only PROPERLY TRAINED personnel familiar with the information within this manual should work on this equipment.

Caution! Never operate or leave any industrial equipment running unattended.

2. GENERAL INFORMATION

2.1 Introduction

Delta T portable temperature control equipment provides reliable, accurate temperatures up to 250° F. (optional 300° F.). (See equipment specs.) They are available in sizes from 4-1/2 KW to 108W and are self-contained, fully assembled and ready to use.

A properly installed, operated and maintained unit will provide many years of reliable operation. To get the most satisfaction from your new portable temperature control unit, please read and follow the instructions in this manual.

2.2 Models Covered

This manual provides operation, installation and maintenance instructions for Delta T Water Temperature Control Units.

Model numbers can be found on the unit's NAME PLATE. ***Please have the MODEL NUMBER and SERIAL NUMBER*** available if you need to contact Delta T Systems.

3. INSTALLATION

WARNING: ELECTRICAL SHOCK HAZARD

3.1 Electrical Connections

Check identification plate to make certain your electrical service conforms to unit specifications and amperage draw.

Have a QUALIFIED ELECTRICIAN bring properly sized power leads and ground from a fused disconnect to the unit. Make certain the disconnect switch is sized according to the National Electrical Code recommendations.

- Electrical connections must comply with all applicable electrical codes.
- The temperature control unit MUST BE GROUNDED in accordance with NEC Article 250.

WARNING: Use proper temperature and pressure rated piping and hose for external connections to the unit. Maximum design service rating is 250° F and 150 PSI **OR** optional 300° F and 150 PSI.

INSTALLATION (CONT.):

3.2 Water Supply

Your Delta T temperature control unit is designed to operate using MOST water sources available, however, service life is greatly diminished by hard or corrosive water. These water sources cause control problems that eventually damage your equipment.

It is highly recommended that you have a treated water source available for this equipment.

3.3 Water Pressure

Ideal water pressure would range from 25 to 45 PSI. A pressure switch is located on the "water supply" line in the unit and is designed to prevent operation unless minimum water pressure is established. The water supply line MUST be open at all times whenever the control unit is running.

CAUTION: DO NOT install check valves in the water supply line.

Excessively high water pressure can be reduced by installing a regulator/relief valve in the supply lines. The relief valve should be downstream and set slightly higher than the regulator.

4. CIRCULATION

4.1 Circulation of Fluid in the System

Water is circulated through the system by a centrifugal pump. Delivery and return manifolds may be used to direct flow through various areas of the process. Most units are of the "direct injection" type but some units will have a heat exchanger installed for cooling purposes.

Other units might have a reservoir tank. Please check your flow schematic for complete details.

Upon Start-up of a new or reconnected unit, the pump and motor should always be checked for proper rotation.

IMPORTANT: USING SMALL DIAMETER LINES RESTRICTS FLOW AND HEAT TRANSFER

5. OPERATION

Your Delta T unit has been engineered to provide accurate temperature control, along with quick response times and faster, more uniform heating and cooling.

With the electrical and water supply connections properly made and the pump checked for proper rotation:

1) PRESS the "VENT" button on the control panel and HOLD it in for at least (60) seconds. Water enters into the control unit through the water supply line. When the solenoid valve opens, water enters the pump, goes through the heater tank and out of the control unit through the delivery line. Once circulated through the process, water re-enters the control unit through the return line where entrapped air and a portion of water is passed through the solenoid valve and out to drain. The manual vent process should be continued after starting the unit to ensure all air is purged from the process.

NOTE: Some units are equipped with an automatic vent feature, in which case, the above step is performed automatically. Please check your unit. The auto vent time sequence may need to be increased for large capacity processes.

"ON - OFF" SWITCH:

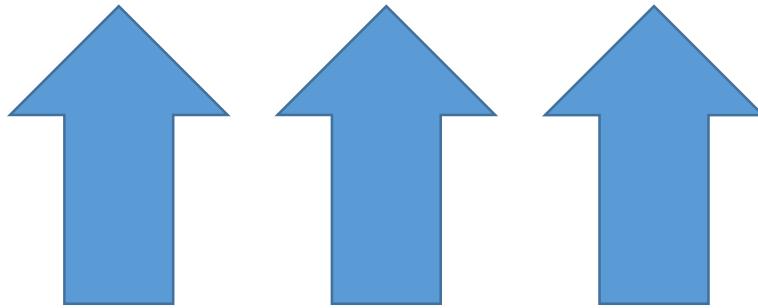
When the switch is positioned to "**ON**" the unit is energized and supplies power to all controller functions. When the switch is in the "**OFF**" position, power to the unit controls is de-energized. The "**VENT**" switch and primary circuit remain energized.

SET TEMPERATURE:

Process temperature is maintained by the controller in the unit and is determined by set point temperature. Refer to the specific controller operation bulletin for setting the required process temperature and other features.

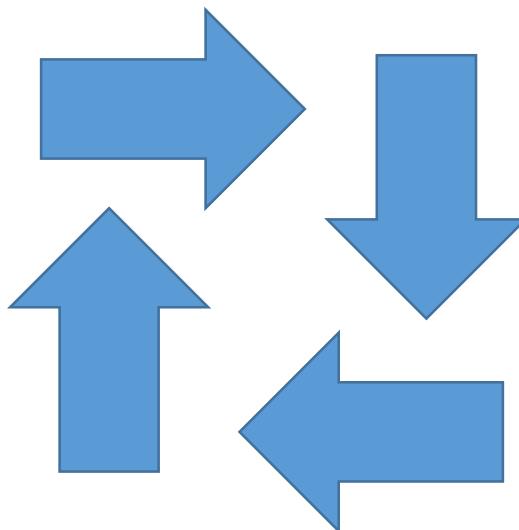
UNIT SHUTDOWN:

Prior to removing a control unit from operation, the unit should be cooled down to a minimum temperature of 125° Fahrenheit, and the water supply to the control unit should be shut off. Depress the "**VENT**" switch for several seconds to relieve internal pressures. Removal from service should only be made by qualified maintenance personal. **TURN OFF OR DISCONNECT MAIN POWER TO UNIT WHEN NOT IN USE!**



Automatic Vent:

This feature quickly and completely purges air from the system upon start-up. The “vent” energizes the solenoid valve which permits trapped air and water to flow out through the drain. The “Vent” timer is adjustable but should NOT be adjusted below 60 seconds.



Pump Rotation:

This feature senses incorrect pump rotation caused by incorrect electrical phasing. If the “Rotation” light illuminates on the control panel, adjustment to the incoming wiring is necessary for correct rotation.

OPERATION (CONT.):

WARNING!

NEVER attempt to remove a control unit from operation before the water pressure and electrical connections have been properly shut off. Severe personal injury or death could result if system pressure is not relieved of water pressure and electrical connections are not disconnected and locked out prior to removal or servicing.

DRAINING: If your control unit is to be removed from service for an extended period of time, it should be thoroughly drained. Drain plugs are provided within the control unit at key locations for this purpose.

NOTE: Storage or shipping of units in areas with freezing temperatures may result in damage to the unit if the unit is not thoroughly drained.

6. CONTROLLER OPERATION

See specific bulletin file for your controller in the manual.

7. TROUBLESHOOTING

| <u>SYMPTOM</u> | <u>PROBABLE CAUSE</u> |
|--------------------------|---|
| Temperature fluctuations | 1.) Small connectors, passages, hoses. 2.) Blocked water lines with foreign particles, lime, scale or rust accumulations. |
| Rapid cycling | Refer to temperature fluctuations. |
| Unable to heat correctly | 1.) Loose or leaking connections or fittings. 2.) Solenoid valve hung open or dirty. 3.) Faulty or inoperative heater. 4.) Wrong pump rotation. |
| Unable to cool | 1.) Closed water supply. 2.) Water not flowing to drain. 3.) Faulty solenoid valve. 4.) Plugged heat exchanger. 5.) High drain back pressure. |
| Unit will not run at all | 1.) Closed water supply. 2.) Check net pressure available. 3.) Check power supply and fuses. |

8. ROUTINE MAINTENANCE

Periodic inspection of the following equipment must be made to maintain OPTIMUM performance of your Delta T Temperature Control unit. Prior to inspection, the unit should be cooled down to a minimum temperature of 125° Fahrenheit, and the water supply to the unit should be shut off. Depress the "VENT" switch for several seconds to relieve internal pressures. **DISCONNECT MAIN POWER TO UNIT.** Inspection should only be made by qualified maintenance personnel.

MOTOR:

- 1.) Clean out the motor air intake grill of dust, etc.
- 2.) Check the nuts and bolts that attach the pump to the motor and tighten if necessary.

SOLENOID VALVE:

- 1.) Check and clean out plunger area periodically. Replace it when necessary.

WIRING:

- 1.) Check to make certain that all electrical wiring is tight and secure. This should be done by a qualified electrician.

Installation instruction

Attention: To prevent electrical shock, disconnect from power source before installing or servicing. Install in suitable enclosure. Keep free from contaminants.

Montageanleitung

Achtung: Vor Installations- oder Servicearbeiten Stromversorgung unterbrechen, um Unfälle zu vermeiden. Die Geräte müssen in einem passenden Gehäuse eingebaut und gegen Verschmutzung geschützt werden.

Instruction de montage

Attention: Avant le montage et la mise en service, couper l'alimentation secteur afin d'éviter tout accident. Prévoir une mise en coffret ou armoire appropriée. Protéger le produit contre les environnements agressifs.

Istruzione per il montaggio

Attenzione: Per prevenire infortuni, togliere tensione prima dell'installazione o manutenzione. Installare in custodia idonea. Tenere lontano da contaminanti.

Instrucción de montaje

Atención: Desconectar la alimentación eléctrica antes de realizar el montaje y la puesta en servicio, con el objeto de evitar accidentes. Instalado en una caja o armario apropiado. Proteger el producto de los ambientes agresivos.



KTA7-25/32S...

KTB7-25/32S...

KTC7-25/32S...

KTA7-25/32H...

KTB7-25/32H...

KTC7-25/32H...



IEC 60947-1,-2,-4-1

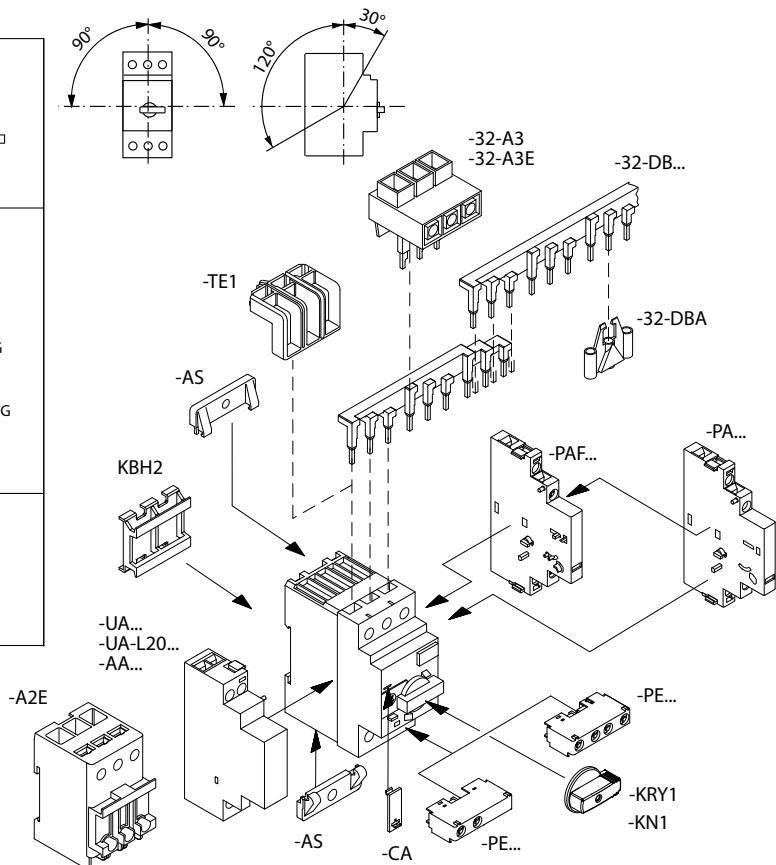
EN 60947-1,-2,-4-1

EN 60079-14

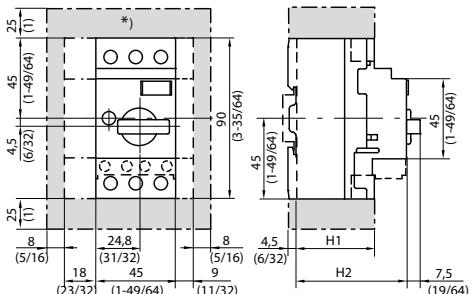
UL 508

CSA C22.2 No. 14

| | |
|---|--------------------|
| L1 L2 L3 1 3 5 2 4 6 T1 T2 T3 | |
| 1 x 1...6 mm ² 2 x 1...4 mm ² | 1, 3, 5 2, 4, 6 |
| 2 x 1...6 mm ² | |
| 2 x No. 16...8 AWG | |
| 2 x 1...6 mm ² 2 x No. 16...10 AWG 9mm | |
| Use 75°C Cu wire only | |
| 2...2,5 Nm 18...22 lb-in | |
| No. 3 | Pozidriv No. 2 |



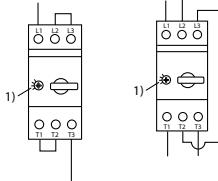
| | |
|--------------------|--------------------|
| KTA/B/C7-25/32S... | KTA/B/C7-25/32H... |
| H1 44 (1-47/64) | 54 (2-1/8) |
| H2 62 (2-7/16) | 72 (2-53/64) |



*) Minimum distance to grounded parts or walls

Minimaler Abstand gegen geerdete Teile oder Wände
Distance minimale envers pièces mises à terre ou parois
Distanza minima per pezzi a massa o pareti
Distancia mínima a chasis o paredes

Wiring Diagrams for 1- or 2-Phase Application



For 1- or 2-Phase Motor Application

- Set to 105% of motor current.
Stellen Sie 105% des Motorstromes ein.
Régler à 105% de la valeur du courant moteur.
Regolare a 105% della corrente del motore.
Ajustar a 105% de la corriente del motor.

For UL Control Transformer Protection

- The device is to be installed only on the load side of branch circuit protection.
- Set the current adjustment not more than the rated input current of the control transformer.
- Use only in the specific supply voltage system as marked on the device.

Motor Protection / Circuit Breaker

This device meets the requirements of IEC 60947-2 as a circuit breaker.

It is cULus listed (UL and CSA approved) as:

- A Manual Motor Controller with optional approvals for Group Motor, Motor Disconnect and Tap Conductor Protection.
- A Manual, Self-Protected Combination Motor Controller (Construction Typ E).

All installations, commissioning and maintenance must be carried out by qualified personnel, taking local regulations into account.

KTB7-25/32S/H do not provide thermal protection for themselves nor for downstream components. A separate protective device against thermal overload must be installed, e.g. an O/L relay as part of a starter combination.

KTB7-25/32S/H beinhalten weder für sich selbst noch nachfolgende Teile thermischen Schutz. Gegen thermischen Überlast muss ein externes Schutzorgan installiert sein, z.B. ein Überlastrelais als Teil einer Starterkombination.

KTB7-25/32S/H ne sont pas autoprotégés et ne comportent aucune protection contre les surcharges thermiques. Il faut donc prévoir des organes de protection externes comme par exemple des relais thermiques ou électroniques dans les ensembles démarreurs moteurs.

KTB7-25/32S/H non prevedono alcun tipo di protezione termica, né per se stessi né per i componenti a valle. Pertanto sarà necessario installare un dispositivo di protezione termica separato, quale ad esempio un relè di sovraccarico integrato nel gruppo di avviamento.

KTB7-25/32S/H carecen de protección térmica propia y para los componentes subsiguientes. Se debe instalar por separado un dispositivo de protección para sobrecargas térmicas, como por ejemplo, un relé de sobrecarga que forme parte de un arrancador de combinación.



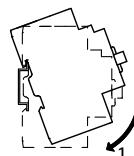
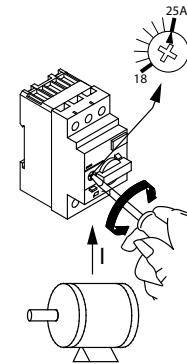
Warning:
Do not set outside scale !

Warnung:
Nicht ausserhalb Skala einstellen !

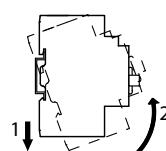
Attention:
Défense d'ajuster le courant en dehors de la plage indiquée !

Attenzione:
E vietato di regolare la corrente fuori dal campo di taratura !

Atención:
!Prohibido de regular la corriente fuera del campo de la escala !



| | |
|-----------------------------------|--------------------|
| -32-A3 | -32-A3E |
| 1 x 2.5...25 mm ² | 1 x No. 14...4 AWG |
| 1 x 2.5...25 mm ² | 1 x No. 14...4 AWG |
| 1 x 2.5...25 mm ² | 1 x No. 14...4 AWG |
| 1 x 2.5...25 mm ² | 1 x No. 14...4 AWG |
| 12mm | |
| Use 75°C Cu wire only | |
| 3...3.5 Nm 27...31 lb-in | |
| 0.8 mm X 5.5 mm Pozidriv No. 2 | |



Series CA7 Contactors

Rugged, space saving and modular...
Sprecher + Schuh's newest contactor for applications up to 75HP @ 460V



Over 100 years of design experience has produced Sprecher + Schuh's seventh generation contactor line. The CA7 represents the most modern and flexible power contactor available today, meeting the highest industrial application requirements.

Big performance in a small package

A wide selection of eleven contactors in four frame sizes covers the entire CA7 horsepower range (up to 75HP @ 460/575V). Six of the contactors are only 45mm wide, an extremely small footprint for such rugged performance. A number of design features account for this efficiency, including high contact pressure and "bounce-free" contacts, allowing the devices to handle the high starting currents typical of modern motors.

Type 1 and Type 2 Coordination

Whether you're designing motor circuits for use in North America, Europe or any other part of the world, all CA7 contactors have been designed and tested with respect to Type 1 and Type 2 short circuit coordination. Find out more in the CA7 Technical Information section in this chapter.

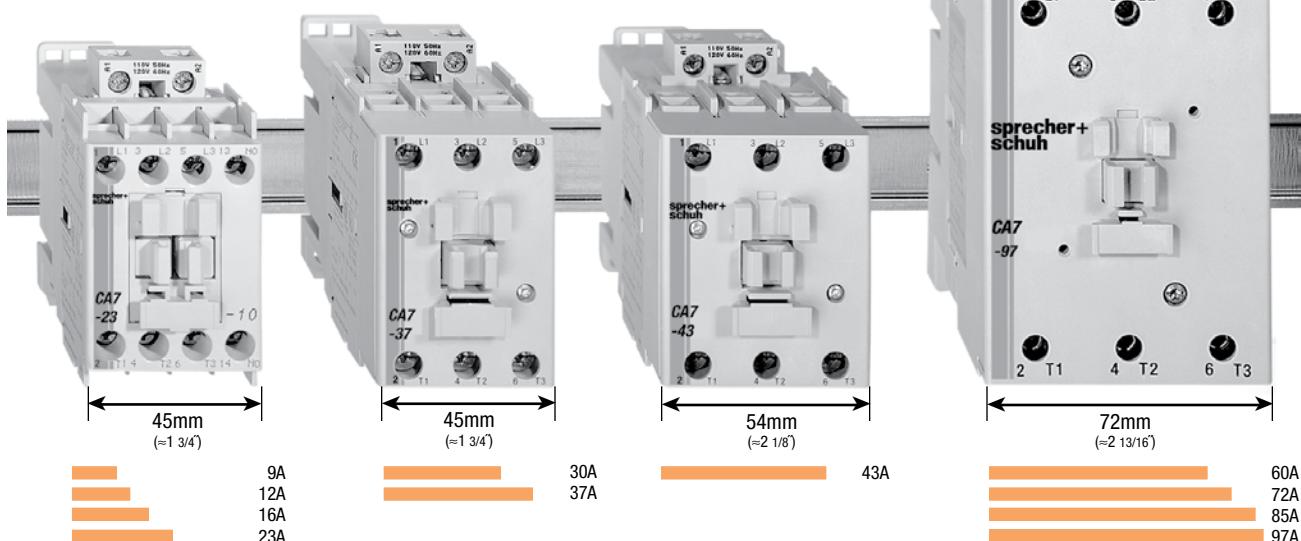
Advanced safety and reliability features

The entire CA7 line features mechanically linked contacts, sometimes referred to as "positively guided contacts" or "force guided contacts". If a main power pole welds, adequate clearances exist ($\geq 0.3\text{mm}$) to ensure that the auxiliary contacts do not change state when coil power is removed and the device tries to open. This is a requirement in safety circuits per IEC 60947-5-1.

Reliability is further assured by "cross-stamped" auxiliary contacts, which provide multi-point reliability in low current, low voltage applications.

Advantages of Electronic DC Coil

CA7-9E through CA7-43E are provided with DC coils that dramatically decrease wattage consumption during pull-in. This allows the use of smaller power supplies. The electronic DC coil design brings the height of the contactor back down to the same size as the AC version. Select CA7 contactors are also available with a two-winding DC coil that reduces the size of the contactor as well as the hold-in values.



Modular accessories are common to all devices

All accessories are interchangeable among all CA7 contactors and CS7 control relays. This minimizes inventory requirements and maximizes flexibility. Top and side mount auxiliary contacts are available depending on your application. A mechanical interlock with two built-in NC auxiliaries also provides electrical interlocking if desired. Pneumatic and electronic timers, surge suppressors and electronic interface modules provide solutions for even the most complex applications.



Special use contactors for specialized applications

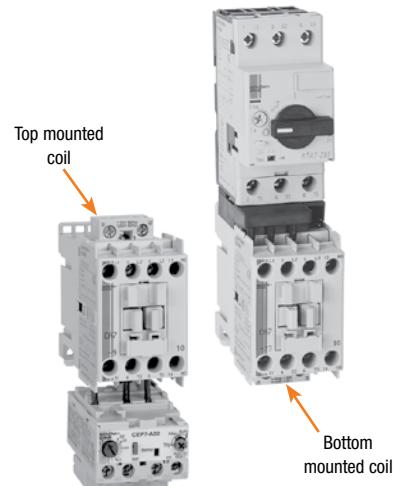
The CA7 line has been expanded to include a number of contactors designed and labeled for specific industrial applications. In all cases, these devices are UL and CSA approved for these specialized uses.

Lighting contactors

The CAL7 contactor can be used to control a wide variety of lighting loads. These contactors are well suited to handle the high inrush currents typical of this application as well as other non-motor (resistive) loads. Both mechanically held and electrically held models are available for lighting load applications up to 20A, 30A and 60A.

Reversible coil provides total flexibility

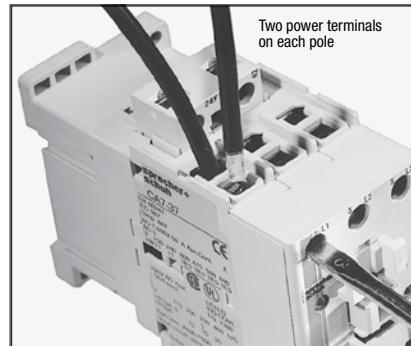
When shipped, both coil connections are normally located at the top of the contactor in preparation for mounting an overload relay at the bottom. For multi-starter panels, however, the coil can be reversed, which provides space to close-couple a KT7 Motor Circuit Controller on the top of the contactor. CA7 contactors can either be ordered with the coil reversed or may be easily reversed in the field.



Reversible coils are standard on all CA7 contactors

Dual power terminals speed wiring

CA7-30 through 97 contactors are designed with two power terminals for all three poles. This simplifies power wiring of interconnected contactors in reversing, reduced voltage and two-speed applications. Preformed power wiring connectors are also available for virtually instantaneous wiring in these labor intensive applications. Simplified wiring means less labor and less cost.



Dual power terminals assure hassle-free wiring in complex control schemes

NEMA Labeled Contactors

CAN7 contactors are UL Listed and rated in accordance with the requirements of NEMA standards publication ICS-2. These contactors are NEMA compliant and are labeled accordingly.



Sprecher + Schuh's expanded CA7 line includes contactors designed and labeled for specific industrial applications

Non-Reversing, Three Pole Contactors With AC Coil, Series CA7 (Open type only) ①

| I _e [A] ① | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | Auxiliary Contacts per Contactor | | Open Type | | | |
|-------------------------|------|---|----------------|------|------|-------------------|-------|-------|-------|--|-------|-------------|-------------|---|-------------------|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | |
| AC-3 | AC-1 | 230V | 400V / 415V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC | | |
| 9 | 32 | 3 | 4 | 4 | 4 | 1/2 | 1 1/2 | 2 | 2 | 5 | 7-1/2 | 1 0 | 0 1 | CA7-9-10-* CA7-9-01-* | 120 |
| 12 | 32 | 4 | 5.5 | 5.5 | 5.5 | 1/2 | 2 | 3 | 3 | 7-1/2 | 10 | 1 0 | 0 1 | CA7-12-10-* CA7-12-01-* | 155 |
| 16 | 32 | 5.5 | 7.5 | 7.5 | 7.5 | 1 | 3 | 5 | 5 | 10 | 15 | 1 0 | 0 1 | CA7-16-10-* CA7-16-01-* | 174 |
| 23 | 32 | 7.5 | 11 | 13 | 10 | 2 | 3 | 5 | 7-1/2 | 15 | 15 | 1 0 | 0 1 | CA7-23-10-* CA7-23-01-* | 193 |
| 30 | 65 | 10 | 15 | 15 | 15 | 2 | 5 | 7-1/2 | 10 | 20 | 25 | 0 1 0 | 0 0 1 | CA7-30-00-* CA7-30-10-* CA7-30-01-* | 222 244 244 |
| 37 | 65 | 11 | 18.5/ 20 | 20 | 18.5 | 3 | 5 | 10 | 10 | 25 | 30 | 0 1 0 | 0 0 1 | CA7-37-00-* CA7-37-10-* CA7-37-01-* | 266 288 288 |
| 43 | 85 | 13 | 22 | 25 | 22 | 3 | 7-1/2 | 10 | 15 | 30 | 30 | 0 1 0 | 0 0 1 | CA7-43-00-* CA7-43-10-* CA7-43-01-* | 286 308 308 |
| 60 | 100 | 18.5 | 32 | 37 | 32 | 5 | 10 | 15 | 20 | 40 | 50 | 0 1 0 | 0 0 1 | CA7-60-00-* CA7-60-10-* CA7-60-01-* | 350 372 372 |
| 72 | 100 | 22 | 40 | 45 | 40 | 5 | 15 | 20 | 25 | 50 | 60 | 0 1 0 | 0 0 1 | CA7-72-00-* CA7-72-10-* CA7-72-01-* | 403 425 425 |
| 85 | 100 | 25 | 45 | 55 | 45 | 7-1/2 | 15 | 25 | 30 | 60 | 60 | 0 1 0 | 0 0 1 | CA7-85-00-* CA7-85-10-* CA7-85-01-* | 460 482 482 |
| 97 | 130 | 30 | 55 | 55 | 55 | 10 | 20 | 30 | 30 | 75 | 75 | 0 1 0 | 0 0 1 | CA7-97-00-* CA7-97-10-* CA7-97-01-* | 577 599 599 |


CA7-9-10 contactor

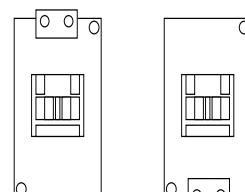
CA7-43-00 contactor

CA7-60-00 contactor
Coil Codes ②

| AC Coil Code | Voltage Range | |
|-----------------|---------------|-----------|
| | 50 Hz | 60 Hz |
| 24Z | 24V | 24V |
| 120 | 110V | 120V |
| 208 | ~ | 208V |
| 220W | 200V-220V | 208V-240V |
| 240 | 220V | 240V |
| 277 | 240V | 277V |
| 380 | 380V-400V | 440V |
| 480 | 440V | 480V |
| 600 | 550v | 600V |

Coil Terminal Position

All CA7 contactors are stocked and delivered with the coil terminals located on the line side (top) of the contactor. This is the typical configuration when using the contactor with an overload relay. When the contactor is used with the KT7 Motor Circuit Controller, the coil must be reversed, so that the coil terminals are located at the load side (bottom) of the contactor. CA7 coils can easily be reversed in the field, however, they are also available for order with the coils reversed from the factory. Contact your Sprecher+Schuh representative for more information about ordering CA7 contactors with reversed coils.


All CA7 contactors come with reversible coils.
Ordering Instructions

| | |
|----------------------------|---------------------------------|
| Specify Catalog Number | See Coil Codes on this page. |
| Replace (*) with Coil Code | |

① AC1 Resistive Ratings and UL/CSA Continuous Current Ratings may be increased by the use of Lug Kits or Paralleling Links. See CA7 Accessories section for applicable information.

② Other voltages available, see page A56. Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.

Non-Reversing, Four Pole Contactors With AC Coil, Series CA7 (Open type only)

| I _e [A] | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | Contact Configuration, Main Pole | | Open Type | | Catalog Number | Price | | | | |
|--------------------|------|---|---------|------|------|-------------------|-------|------|-------|----------------------------------|-------|-----------|----|----------------|-------|--|--|--|--|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | | | | | |
| | | 400V | 400V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | | | | | | | | |
| AC-3 | AC-1 | 230V | 415V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC | | | | | | |
| 9 | 32 | 3 | 4 | 4 | 4 | 1/2 | 1 1/2 | 2 | 2 | 5 | 7-1/2 | 4 | 0 | CA7-9-M40-* | 120 | | | | |
| | | | | | | | | | | | | 3 | 1 | CA7-9-M31-* | 132 | | | | |
| | | | | | | | | | | | | 2 | 2 | CA7-9-M22-* | 132 | | | | |
| 12 | 32 | 4 | 5.5 | 5.5 | 5.5 | 1/2 | 2 | 3 | 3 | 7-1/2 | 10 | 4 | 0 | CA7-12-M40-* | 157 | | | | |
| | | | | | | | | | | | | 3 | 1 | CA7-12-M31-* | 167 | | | | |
| | | | | | | | | | | | | 2 | 2 | CA7-12-M22-* | 167 | | | | |
| 16 | 32 | 5.5 | 7.5 | 7.5 | 7.5 | 1 | 3 | 5 | 5 | 10 | 15 | 4 | 0 | CA7-16-M40-* | 176 | | | | |
| | | | | | | | | | | | | 3 | 1 | CA7-16-M31-* | 186 | | | | |
| | | | | | | | | | | | | 2 | 2 | CA7-16-M22-* | 186 | | | | |
| 23 | 32 | 7.5 | 11 | 13 | 10 | 2 | 3 | 5 | 7-1/2 | 15 | 15 | 4 | 0 | CA7-23-M40-* | 194 | | | | |
| | | | | | | | | | | | | 3 | 1 | CA7-23-M31-* | 206 | | | | |
| | | | | | | | | | | | | 2 | 2 | CA7-23-M22-* | 206 | | | | |
| 37 | 75 | 11 | 18.5 | 20 | 18.5 | 3 | 5 | 10 | 10 | 25 | 30 | 4 | 0 | CA7-40-M40-* | 385 | | | | |
| 37 | 75 | 11 | 18.5/20 | 18.5 | 7.5 | 3 | 5 | 10 | 10 | 25 | 15 | 2 | 2 | CA7-40-M22-* | 385 | | | | |
| 85 | 130 | 25 | 45 | 55 | 45 | 7-1/2 | 15 | 25 | 30 | 60 | 50 | 4 | 0 | CA7-90-M40-* | 657 | | | | |
| 85 | 130 | 25 | 45 | 55 | 18.5 | 7-1/2 | 15 | 25 | 30 | 50 | 20 | 2 | 2 | CA7-90-M22-* | 657 | | | | |


CA7-23-M22-120 contactor
A
Contactors
CA7
Coil Codes ①

| AC Coil Code | Voltage Range | |
|-----------------|---------------|-----------|
| | 50 Hz | 60 Hz |
| 24Z | 24V | 24V |
| 120 | 110V | 120V |
| 208 | ~ | 208V |
| 220W | 200V-220V | 208V-240V |
| 240 | 220V | 240V |
| 277 | 240V | 277V |
| 380 | 380V-400V | 440V |
| 480 | 440V | 480V |
| 600 | 550V | 600V |

Ordering Instructions

| | |
|----------------------------|---------------------------------|
| Specify Catalog Number | |
| Replace (*) with Coil Code | See Coil Codes on this page. |

① Other voltages available, see page A56. Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.

Discount Schedule A-1
A33

Non-Reversing, Three Pole Contactors With Electronic DC Coil, Series CA7 (Open type only) ①②③

A
Contactors

CA7

| I _e [A] ① | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | | Auxiliary Contacts per Contactor | Open Type | | | | |
|-------------------------|------|---|---------------|------|------|-------------------|-------|-------|-------|-------|--|-------------|-------------|--|-------------------|--|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | | |
| | | 230V | 400V/ 415V | 500V | 690V | 1 0 | | 3 0 | | | | | | | | |
| AC-3 | AC-1 | | | | | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC | Catalog Number | Price | |
| 9 | 32 | 3 | 4 | 4 | 4 | 1/2 | 1 1/2 | 2 | 2 | 5 | 7-1/2 | 1 0 | 0 1 | CA7-9E-10-* CA7-9E-01-* | 197 | |
| 12 | 32 | 4 | 5.5 | 5.5 | 5.5 | 1/2 | 2 | 3 | 3 | 7-1/2 | 10 | 1 0 | 0 1 | CA7-12E-10-* CA7-12E-01-* | 242 | |
| 16 | 32 | 5.5 | 7.5 | 7.5 | 7.5 | 1 | 3 | 5 | 5 | 10 | 15 | 1 0 | 0 1 | CA7-16E-10-* CA7-16E-01-* | 267 | |
| 23 | 32 | 7.5 | 11 | 13 | 10 | 2 | 3 | 5 | 7-1/2 | 15 | 15 | 1 0 | 0 1 | CA7-23E-10-* CA7-23E-01-* | 292 | |
| 30 | 65 | 10 | 15 | 15 | 15 | 2 | 5 | 7-1/2 | 10 | 20 | 25 | 0 1 0 | 0 0 1 | CA7-30E-00-* CA7-30E-10-* CA7-30E-01-* | 332 354 354 | |
| 37 | 65 | 11 | 18.5/ 20 | 20 | 18.5 | 3 | 5 | 10 | 10 | 25 | 30 | 0 1 0 | 0 0 1 | CA7-37E-00-* CA7-37E-10-* CA7-37E-01-* | 392 414 414 | |
| 43 | 85 | 13 | 22 | 25 | 22 | 3 | 7-1/2 | 10 | 15 | 30 | 30 | 0 1 0 | 0 0 1 | CA7-43E-00-* CA7-43E-10-* CA7-43E-01-* | 455 475 475 | |

Description

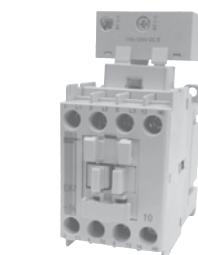
Low Consumption Electronic DC coils have extremely low inrush which allows the use of smaller power supplies. CA7-9E...43E has internal surge suppression. See page A68 for more information.

This new design results in:

- Lighter, lower depth
- More energy efficient contactors
- Easier wiring
- Uniform panel appearance.

Applications

Direct control from PLC:
The low power consumption contactor designed to control motors and other loads is especially aligned to the specific requirement of electronic control circuits. The low power consumption of 1.7 allows direct control through PLC's without the need for interposing relays. Power dissipation is greatly reduced limiting the heat effect in control panels.



CA7-16E-10-110E contactor ④



CA7-23E-10-24E contactor



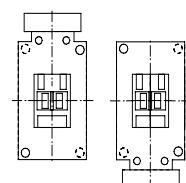
CA7-37E-00-24E contactor

Coil Codes ②④

| DC Coil Codes | Voltage |
|---------------|----------|
| 12E | 12V |
| 24E | 24V |
| 48E | 48-72V |
| 110E | 110-125V |
| 220E | 220-250V |

Coil Terminal Position

All CA7 contactors are stocked and delivered with the coil terminals located on the line side (top) of the contactor. This is the typical configuration when using the contactor with an overload relay. When the contactor is used with the KT7 Motor Circuit Controller, the coil must be reversed, so that the coil terminals are located at the load side (bottom) of the contactor. CA7 coils can easily be reversed in the field, however, they are also available for order with the coils reversed from the factory. Contact your Sprecher+Schuh representative for more information about ordering CA7 contactors with reversed coils.



All CA7 contactors come with reversible coils.
(48V DC shown)

① AC1 Resistive Ratings and UL/CSA Continuous Current Ratings may be increased by the use of Lug Kits or Paralleling Links. See CA7 Accessories section for applicable information.

② CA7-9E...43E with electronic coils are not interchangeable with non-electronic DC or AC coils.

③ See page A47 for limitations on adding auxiliaries to Electronic DC Coil contacts.

④ Voltages of 48V DC and greater are supplied with backpack module standard. See page A85.

Non-Reversing, Four Pole Contactors With Electronic DC Coil, Series CA7 (Open type only) ①②

| I _e [A] | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | | | Contact Configuration, Main Pole | | Open Type | | | |
|--------------------|------|---|---------|------|------|-------------------|-------|------|-------|-------|-------|----------------------------------|----|----------------|-------|--|--|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | | | |
| | | | 400V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC | | | | |
| AC-3 | AC-1 | 230V | 415V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC | Catalog Number | Price | | |
| 9 | 32 | 3 | 4 | 4 | 4 | 1/2 | 1 1/2 | 2 | 2 | 5 | 7-1/2 | 4 | 0 | CA7-9E-M40-* | 198 | | |
| | | | | | | | | | | | | 3 | 1 | CA7-9E-M31-* | 210 | | |
| | | | | | | | | | | | | 2 | 2 | CA7-9E-M22-* | 210 | | |
| 12 | 32 | 1 | 5.5 | 5.5 | 5.5 | 1/2 | 2 | 3 | 3 | 7-1/2 | 10 | 4 | 0 | CA7-12E-M40-* | 240 | | |
| | | | | | | | | | | | | 3 | 1 | CA7-12E-M31-* | 252 | | |
| | | | | | | | | | | | | 2 | 2 | CA7-12E-M22-* | 252 | | |
| 16 | 32 | 5.5 | 7.5 | 7.5 | 7.5 | 1 | 3 | 5 | 5 | 10 | 15 | 4 | 0 | CA7-16E-M40-* | 264 | | |
| | | | | | | | | | | | | 3 | 1 | CA7-16E-M31-* | 277 | | |
| | | | | | | | | | | | | 2 | 2 | CA7-16E-M22-* | 277 | | |
| 23 | 32 | 7.5 | 11 | 13 | 10 | 2 | 3 | 5 | 7-1/2 | 15 | 15 | 4 | 0 | CA7-23E-M40-* | 290 | | |
| | | | | | | | | | | | | 3 | 1 | CA7-23E-M31-* | 302 | | |
| | | | | | | | | | | | | 2 | 2 | CA7-23E-M22-* | 302 | | |
| 37 | 75 | 11 | 18.5 | 20 | 18.5 | 3 | 5 | 10 | 10 | 25 | 30 | 4 | 0 | CA7-40E-M40-* | 520 | | |
| 37 | 75 | 11 | 18.5/20 | 18.5 | 7.5 | 3 | 5 | 10 | 10 | 25 | 15 | 2 | 2 | CA7-40E-M22-* | 535 | | |

Description

Low Consumption Electronic DC coils have extremely low inrush which allows the use of smaller power supplies. CA7-9E...43E have internal surge suppression. See page A68 for more information.

This design results in:

- Lighter, lower depth
- More energy efficient contactors
- Easier wiring
- Uniform panel appearance

Applications

Direct control from PLC:

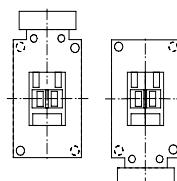
The low power consumption contactor designed to control motors and other loads is especially aligned to the specific requirement of electronic control circuits. The low power consumption of 1.7 allows direct control through PLC's without the need for interposing relays. Power dissipation is greatly reduced limiting the heat effect in control panels.

Coil Codes ①③

| DC Coil Codes | Voltage |
|---------------|----------|
| 12E | 12V |
| 24E | 24V |
| 48E | 48-72V |
| 110E | 110-125V |
| 220E | 220-250V |

Coil Terminal Position

All CA7 contactors are stocked and delivered with the coil terminals located on the line side (top) of the contactor. This is the typical configuration when using the contactor with an overload relay. When the contactor is used with the KT7 Motor Circuit Controller, the coil must be reversed, so that the coil terminals are located at the load side (bottom) of the contactor. CA7 coils can easily be reversed in the field, however, they are also available for order with the coils reversed from the factory. Contact your Sprecher+Schuh representative for more information about ordering CA7 contactors with reversed coils.



All CA7 contactors come with reversible coils.
(48V DC shown)

① CA7-9E...43E with electronic coils are not interchangeable with non-electronic DC or AC coils

② See pages A47 for limitations on adding auxiliaries to Electronic DC Coil contacts.

③ Voltages of 48V DC and greater are supplied with backpack module standard. See page A85.

Non-Reversing, Three Pole Contactors With Two Winding DC Coil, Series CA7 (Open type only) ①

| I _e [A] | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | | | Auxiliary Contacts per Contactor ① | | Open Type | | | |
|--------------------|------|---|---------------|------|------|-------------------|------|------|------|------|------|---------------------------------------|----|--------------|--------------|-----|--|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | | | |
| | | | 400V/ 230V | 415V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC | | | |
| AC-3 | AC-1 | 230V | 400V/ 230V | 415V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | 0 | 0 | CA7-60D-00-* | 475 | |
| 60 | 100 | 18.5 | 32 | 37 | 32 | 5 | 10 | 15 | 20 | 40 | 50 | 0 | 1 | CA7-60D-10-* | 497 | | |
| | | | | | | | | | | | | 0 | 1 | CA7-60D-01-* | 497 | | |
| 72 | 100 | 22 | 40 | 45 | 40 | 5 | 15 | 20 | 25 | 50 | 60 | 0 | 0 | CA7-72D-00-* | 530 | | |
| | | | | | | | | | | | | 0 | 1 | CA7-72D-10-* | 552 | | |
| | | | | | | | | | | | | 0 | 1 | CA7-72D-01-* | 552 | | |
| 85 | 100 | 25 | 45 | 55 | 45 | 7-1/2 | 15 | 25 | 30 | 60 | 60 | 0 | 0 | CA7-85D-00-* | 590 | | |
| | | | | | | | | | | | | 0 | 1 | CA7-85D-10-* | 612 | | |
| | | | | | | | | | | | | 0 | 1 | CA7-85D-01-* | 612 | | |
| 97 | 130 | 30 | 55 | 55 | 55 | 10 | 20 | 30 | 30 | 75 | 75 | 0 | 0 | CA7-97D-00-* | 757 | | |
| | | | | | | | | | | | | 1 | 0 | CA7-97D-10-* | 779 | | |
| | | | | | | | | | | | | 0 | 1 | CA7-97D-01-* | 779 | | |



CA7-60D Contactor

Description:

Contactors with two winding DC coils have very low hold-in values and share the same dimensions with AC contactors. See page A57 for more information. See page A84 for dimensional information.

Non-Reversing, Four Pole Contactors With Two Winding DC Coil, Series CA7 (Open type only) ①

| I _e [A] | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | | | Contact Configuration Main Pole | | Auxiliary Contacts per Contactor | | Open Type | | |
|--------------------|------|---|---------------|------|------|-------------------|------|------|------|------|------|------------------------------------|----|----------------------------------|----|---------------|---------------|-----|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | | | | |
| | | | 415V/ 230V | 400V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC | NO | NC | | |
| AC-3 | AC-1 | 230V | 400V/ 230V | 415V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | 4 | 0 | 0 | 0 | CA7-90D-M40-* | 781 |
| 85 | 130 | 25 | 45 | 55 | 45 | 7-1/2 | 15 | 25 | 30 | 60 | 50 | 2 | 2 | 0 | 0 | CA7-90D-M22-* | 781 | |

Coil Codes ②③④

| DC Coil Code | Voltage |
|--------------|---------|
| 24DD | 24V |
| 110DD | 110V |

① CA7-60D...CA7-97D have an internal auxiliary contact to transition from the start winding to the run winding.

② Coils include an integrated diode surge suppressor.

③ Other coil voltages are available, see page A57. Contact your Sprecher + Schuh Sales Representative to determine which coil voltages may be stocked. *Non-standard coil voltages (non-stock) must be ordered and installed separately as renewal parts.*

④ The coil codes shown are the most commonly stocked items. Contact your Sprecher + Schuh representative to determine if other voltages, i.e., 12DD, 48DD, 220DD are on-hand or can be specially ordered in quantities.

Ordering Instructions

| | |
|----------------------------|---------------------------------|
| Specify Catalog Number | See Coil Codes on this page. |
| Replace (*) with Coil Code | |

Reversing, Three Pole Contactors With AC Coil, Series CAU7 (Open type only)

| I _e [A] | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | | | Auxiliary Contacts per Contactor | Open Type | Catalog Number | Price | | | | |
|--------------------|------|---|-------------|------|------|-------------------|-------|-------|-------|-------|-------|----------------------------------|-----------|----------------|-------|--|--|--|--|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | | | | | |
| | | 230V | 400V | 500V | 690V | 1 Ø | | 3 Ø | | | | | | | | | | | |
| AC-3 | AC-1 | | | | | 115V | 230V | 200V | 230V | 460V | 575V | | | NO | NC ③ | | | | |
| 9 | 32 | 3 | 4 | 4 | 4 | 1/2 | 1 1/2 | 2 | 2 | 5 | 7-1/2 | 1 | 1 | CAU7-9-22-* | 338 | | | | |
| 12 | 32 | 4 | 5.5 | 5.5 | 5.5 | 1/2 | 2 | 3 | 3 | 7-1/2 | 10 | 1 | 1 | CAU7-12-22-* | 409 | | | | |
| 16 | 32 | 5.5 | 7.5 | 7.5 | 7.5 | 1 | 3 | 5 | 5 | 10 | 15 | 1 | 1 | CAU7-16-22-* | 451 | | | | |
| 23 | 32 | 7.5 | 11 | 13 | 10 | 2 | 3 | 5 | 7-1/2 | 15 | 15 | 1 | 1 | CAU7-23-22-* | 491 | | | | |
| 30 | 65 | 10 | 15 | 15 | 15 | 2 | 5 | 7-1/2 | 10 | 20 | 25 | 0 | 1 | CAU7-30-02-* | 553 | | | | |
| | | | | | | | | | | | | 1 ④ | 1 | CAU7-30-22-* | 597 | | | | |
| 37 | 65 | 11 | 18.5/ 20 | 20 | 8.5 | 3 | 5 | 10 | 10 | 25 | 30 | 0 | 1 | CAU7-37-02-* | 640 | | | | |
| | | | | | | | | | | | | 1 ④ | 1 | CAU7-37-22-* | 684 | | | | |
| 43 | 85 | 13 | 22 | 25 | 22 | 3 | 7-1/2 | 10 | 15 | 30 | 30 | 0 | 1 | CAU7-43-02-* | 710 | | | | |
| | | | | | | | | | | | | 1 ④ | 1 | CAU7-43-22-* | 754 | | | | |
| 60 | 100 | 18.5 | 32 | 37 | 32 | 5 | 10 | 15 | 20 | 40 | 50 | 0 | 1 | CAU7-60-02-* | 895 | | | | |
| | | | | | | | | | | | | 1 ④ | 1 | CAU7-60-22-* | 939 | | | | |
| 72 | 100 | 22 | 40 | 45 | 40 | 5 | 15 | 20 | 25 | 50 | 60 | 0 | 1 | CAU7-72-02-* | 1010 | | | | |
| | | | | | | | | | | | | 1 ④ | 1 | CAU7-72-22-* | 1054 | | | | |
| 85 | 100 | 25 | 45 | 55 | 45 | 7-1/2 | 15 | 25 | 30 | 60 | 60 | 0 | 1 | CAU7-85-02-* | 1125 | | | | |
| | | | | | | | | | | | | 1 ④ | 1 | CAU7-85-22-* | 1169 | | | | |
| 97 | 130 | 30 | 55 | 55 | 55 | 10 | 20 | 30 | 30 | 75 | 75 | 0 | 1 | CAU7-97-02-* | 1410 | | | | |
| | | | | | | | | | | | | 1 ④ | 1 | CAU7-97-22-* | 1454 | | | | |



CAU7-9-22-120 reversing contactor



CAU7-43-22-120 reversing contactor

Includes:

- Line side coil terminations
- Mechanical and electrical Interlock ③
- Reversing power wiring ① (using Power Wiring Kit Cat.# CAUT7-PW...)
- Control wiring available; see footnote ②

Coil Codes ⑤

| AC Coil Code | Voltage Range | |
|--------------|---------------|-------------|
| | 50 Hz | 60 Hz |
| 24Z | 24V | 24V |
| 120 | 110V | 120V |
| 208 | ~ | 208V |
| 220W | 200V-220V | 208V - 240V |
| 240 | 220V | 240V |
| 277 | 240V | 277V |
| 380 | 380V-400V | 440V |
| 480 | 440V | 480V |
| 600 | 550V | 600V |

① For Reversing Contactors *without* power wiring add suffix “-LW” to catalog number and deduct the following amount:

CAU7-9...23 deduct \$10

CAU7-30...37 deduct \$12

CAU7-43 deduct \$22

CAU7-60...97 without power wiring not available

Ex: CAU7-9-22-* becomes CAU7-9-22-***-LW**.

② For control wiring, add suffix **-CW** to catalog number and add \$20.

Example: CAU7-9-22-* becomes CAU7-9-22-***-CW**.

③ The NC auxiliary contacts are supplied as part of the mechanical interlock (Cat.# CM7-02) and are used to electrically interlock the contactors.

④ The NO auxiliary contacts supplied are side mounted. Top mount NO auxiliary contacts must be special ordered. Contact your Sprecher+Schuh representative.

⑤ Other voltages available, see page A56. *Nonstandard coil voltages not listed here must be ordered and installed separately as renewal parts.*

Ordering Instructions

| | |
|----------------------------|---------------------------------|
| Specify Catalog Number | See Coil Codes on this page. |
| Replace (*) with Coil Code | |

Reversing, Three Pole Contactors With Electronic DC Coil, Series CAU7 (Open type only) ⑤⑥

| I _e [A] | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | Auxiliary Contacts per Contactor | Open Type | | | | | | |
|--------------------|------|---|------|------|-------------|-------------------|------|------|-------|--|-----------|-------|-------|----------------|-------|--------------------------------|------|
| | | kW (50 Hz) | | | | UL/CSA HP (60 Hz) | | | | | | | | | | | |
| | | 230V | 400V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC ③ | Catalog Number | Price | | |
| AC-3 | AC-1 | 9 | 32 | 3 | 4 | 4 | 4 | 1/2 | 1 1/2 | 2 | 2 | 5 | 7-1/2 | 1 | 1 | CAU7-9E-22-* | 484 |
| 12 | 32 | 12 | 32 | 4 | 5.5 | 5.5 | 5.5 | 1/2 | 2 | 3 | 3 | 7-1/2 | 10 | 1 | 1 | CAU7-12E-22-* | 597 |
| 16 | 32 | 16 | 32 | 5.5 | 7.5 | 7.5 | 7.5 | 1 | 3 | 5 | 5 | 10 | 15 | 1 | 1 | CAU7-16E-22-* | 629 |
| 23 | 32 | 23 | 32 | 7.5 | 11 | 13 | 10 | 2 | 3 | 5 | 7-1/2 | 15 | 15 | 1 | 1 | CAU7-23E-22-* | 679 |
| 30 | 65 | 30 | 65 | 10 | 15 | 15 | 15 | 2 | 5 | 7-1/2 | 10 | 20 | 25 | 0 | 1 | CAU7-30E-02-* | 780 |
| 37 | 65 | 37 | 65 | 11 | 18.5/ 20 | 20 | 8.5 | 3 | 5 | 10 | 10 | 25 | 30 | 0 | 1 | CAU7-37E-02-* | 971 |
| 43 | 85 | 43 | 85 | 13 | 22 | 25 | 22 | 3 | 7-1/2 | 10 | 15 | 30 | 30 | 0 | 1 | CAU7-43E-02-* | 1050 |
| | | | | | | | | | | | | | | 1 ④ | 1 | CAU7-43E-22-* CAU7-37E-22-* | 1090 |



CAU7-9E-22-24E Reversing contactor



CAU7-37E-22-24E Reversing contactor

Description

Low Consumption Electronic DC coils have extremely low inrush which allows the use of smaller power supplies. CAU7-9E...43E have internal surge suppression. See page A68 for more information.

This new design results in:

- Lighter, lower depth
- More energy efficient contactors
- Easier wiring
- Uniform panel appearance

Applications

Direct control from PLC:

The low power consumption contactor designed to control motors and other loads is especially aligned to the specific requirement of electronic control circuits. The low power consumption of 1.7 allows direct control through PLC's without the need for interposing relays. Power dissipation is greatly reduced limiting the heat effect in control panels.

Includes:

- Line side coil terminations
- Mechanical and electrical Interlock ③
- Reversing power wiring ① (using Power Wiring Kit Cat.# CAUT7-PW...)
- Control wiring available; see footnote ②
- CAU7-9E...43E has internal surge suppression.

Coil Codes ⑥⑦

| DC Coil Codes | Voltage |
|---------------|----------|
| 12E | 12V |
| 24E | 24V |
| 48E | 48-72V |
| 110E | 110-125V |
| 220E | 220-250V |

① For Reversing Contactors *without* power wiring add suffix “-LW” to catalog number and deduct the following amount:

CAU7-9E...23E deduct \$10

CAU7-30E...37E deduct \$12

Ex: CAU7-9E-22-24E becomes CAU7-9E-22-24E-LW.

② For control wiring, add suffix -CW to catalog number and add \$20.

Example: CAU7-9E-22-24E becomes CAU7-9E-22-24E-CW.

③ The NC auxiliary contacts are supplied as part of the mechanical interlock (Cat.# CM7-02) and are used to electrically interlock the contactors.

④ The NO auxiliary contacts supplied are side mounted. Top mount NO auxiliary contacts must be special ordered. Contact your Sprecher+Schuh representative.

⑤ CAU7-9E...43E with electronic coils are not interchangeable with non-electronic DC or AC coils.

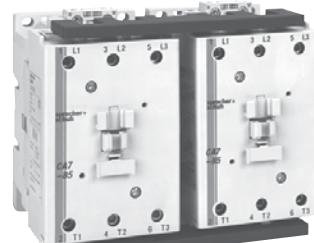
⑥ See pages A47 for limitations on adding auxiliaries to Electronic DC Coil contacts.

⑦ Voltages of 48V DC and greater are supplied with backpack module standard. See page A85.

Reversing, Three Pole Contactors With DC Coil, Series CAU7 (Open type only)

| I _e [A] | | Ratings for Switching AC Motors (AC2 / AC3 / AC4) | | | | | | | | | Auxiliary Contacts per Contactor | | Open Type Catalog Number | Price | |
|--------------------|------|---|------|------|-------------------|-------|------|------|------|------|----------------------------------|-----|--------------------------|---------------|------|
| | | kW (50 Hz) | | | UL/CSA HP (60 Hz) | | | | | | | | | | |
| | | | 400V | | | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC ② | | |
| AC-3 | AC-1 | 230V | 415V | 500V | 690V | 115V | 230V | 200V | 230V | 460V | 575V | NO | NC ② | | |
| 60 | 100 | 18.5 | 32 | 37 | 32 | 5 | 10 | 15 | 20 | 40 | 50 | 0 | 1 | CAU7-60D-02-* | 1115 |
| | | | | | | | | | | | | 1 ③ | 1 | CAU7-60D-22-* | 1159 |
| 72 | 100 | 22 | 40 | 45 | 40 | 5 | 15 | 20 | 25 | 50 | 60 | 0 | 1 | CAU7-72D-02-* | 1240 |
| | | | | | | | | | | | | 1 ③ | 1 | CAU7-72D-22-* | 1284 |
| 85 | 100 | 25 | 45 | 55 | 45 | 7-1/2 | 15 | 25 | 30 | 60 | 60 | 0 | 1 | CAU7-85D-02-* | 1360 |
| | | | | | | | | | | | | 1 ③ | 1 | CAU7-85D-22-* | 1410 |
| 97 | 130 | 30 | 55 | 55 | 55 | 10 | 20 | 30 | 30 | 75 | 75 | 0 | 1 | CAU7-97D-02-* | 1745 |
| | | | | | | | | | | | | 1 ③ | 1 | CAU7-97D-22-* | 1789 |

NOTE: DC and AC coils are not interchangeable. CA7-60D...97D contactors have a two winding, 3-lead coil with built-in late break auxiliary contact and coil suppression. Refer to dimensions starting on page A86.



CAU7-85D Reversing (Typical)

Includes:

- DC operating mechanism
- Line side coil terminations
- Mechanical and electrical Interlock ②
- Reversing power wiring
- Control wiring available; see footnote ①

Coil Codes ④⑤

| DC Coil Code | Voltage |
|--------------|---------|
| 12DD | 12V |
| 24DD | 24V |
| 48DD | 48V |
| 110DD | 110V |
| 220DD | 220V |

- ① For control wiring, add suffix **-CW** to catalog number and add \$20. Example: CAU7-60D-22-* becomes CAU7-60D-22-***-CW**.
- ② The NC auxiliary contacts are supplied as part of the mechanical interlock (Cat.# CM7-02) and are used to electrically interlock the contactors.
- ③ The NO auxiliary contacts supplied are side mounted. Top mount NO auxiliary contacts must be special ordered. Contact your Sprecher+Schuh representative.
- ④ Other voltages available, see page A57. *Non-standard coil voltages not listed here must be ordered and installed separately as renewal parts.*
- ⑤ Coils for CAU7-60D...97D reversing contactors include an integrated diode surge suppressor.

Ordering Instructions

| | |
|----------------------------|------------------------------|
| Specify Catalog Number | See Coil Codes on this page. |
| Replace (*) with Coil Code | |

RZ7-FE Electronic Timing Relays

**The economical choice
for most industrial
timing applications**



Sprecher + Schuh's RZ7-FE electronic timing relays offer seven popular output functions in an economical package. This series is especially designed for applications where a high quality, yet basic timing relay is required. Timing formats include ON-delay, OFF-delay, Wye-Delta and four other choices. All models are multi-time relays, meaning that various time ranges (from 0.05 seconds to 10 hours) can be selected from the face of the relay.

Solid state accuracy and reliability

Except for their hard silver contacts, all RZ7-FE timing relays are built with solid state surface mounted electronics and are accurate to within one percent. Their ruggedness and accuracy is due to the thorough testing of function, timing characteristics and surge voltage strength performed on *each device* prior to shipment.

In addition, RZ7-FE relays function reliably from 15% under rated operating voltage to 10% over rated operating voltage (AC). Voltage tolerance is even greater in DC applications.

Universal voltage capability

All RZ7-FE timing relays operate with multiple supply voltages ranging from 24VAC or DC to 240VAC. Universal voltage capability means smaller inventories and more flexibility.

Choose from two different output contacts

New to the RZ7-FE series is the choice between one normally open (NO) contact or one single pole double throw (SPDT) contact. The new SPDT version can be used either normally open or normally closed. This version has several technical advantages such as shorter impulse duration requirements and a faster recovery time.



The RZ7-FEM multifunction timing relay combines all functions in one device.



Multiple functions in one relay

The RZ7-FEM relay combines four of the most popular timing functions into one device. Six timing ranges are included that are individually selectable from 0.05 seconds to 10 hours. This multifunction relay reduces inventories and is ideal for maintaining remote installations where stocking several different timing relays would not be practical.

Many safety and convenience features

- Each relay is equipped with an LED that indicates output status conditions.
- Finger and back of hand protection to IP40.
- Terminals are captive and supplied in the open position.
- All RZ7's can be surface mounted, rail mounted, or mounted directly on our family of CA7/CS7 devices.
- RZ7 relays can be mounted in any plane.
- Terminals, setting knob and LED's are all accessible from the front of the unit.
- RZ7-FE Timing Relays are very compact, measuring approximately 1" x 3" x 3".

Quick Selection Guide

| Single Function Timing Relays | | | | |
|-------------------------------|--|------------------------------------|--|--|
| RZ7-FE | A | 1 | T | U22 |
| Type | Function | Contacts | Time Ranges | Supply Voltages |
| | | <i>Functions A, B, D & F</i> | T 0.05s...10 hours ① | U22 24VAC or DC 110...240V 50/60Hz A1/A2 |
| | A On-Delay B Off-Delay D One Shot / Watchdog E Fleeting Off-Delay ② F Symmetric flasher starting with a pulse L Impulse Converter ② | 1 One normally open contact | | |
| | <i>All Functions:</i> 3 One single pole double contact | T 0.05s...10 hours ① | U23 24...48VDC 24...240V 50/60Hz A1/A2 | |

| Multi-Function Timing Relays | | | | |
|------------------------------|---|---|------------------------------------|--|
| RZ7-FE | M | 1 | T | U22 |
| Type | Function | Contacts | Time Ranges | Supply Voltages |
| | | 1 One normally open contact | T 0.05s...10 hours ① | U22 24VAC or DC 110...240V 50/60Hz A1/A2 |
| | M Multi-function <i>Four single functions</i> - On-delay - Off-delay - One shot - Symmetric flasher starting with a pulse | 3 One single pole double contact | T 0.05s...10 hours ① | U23 24...48VDC 24...240V 50/60Hz A1/A2 |

| Special Function Timing Relays | | | | |
|--------------------------------|---------------------------------|---|--------------------------------------|---|
| RZ7-FE | Y | 2 | Q | U23 |
| Type | Function | Contacts | Time Ranges | Supply Voltages |
| | Y Wye-Delta Timing Relay | 2 Two normally open contacts (one side common) | Q 0.15s...10 minutes ① | U23 24...48VDC 24...240V 50/60Hz A1/A2 A1/A2 |

① Multi-time setting range. See appropriate catalog page for specific time settings.

② Not available in RZ7-FEx1 model.

RZ7-FE Timing Relays – Single Function, One Pole

| Functional Description | Functional Diagram | Terminal Arrangement | Type | Catalog Number | Price |
|--|--------------------|----------------------|--|----------------|-------|
| ON-Delay Timing Relay (A) When supply voltage is applied, output contact(s) change state after time delay t . | | | <ul style="list-style-type: none"> One NO contact Multi-timing range (from 0.05s to 10h) ^② Supply voltage selected via wiring terminals A1, A2 Bicolored LED indicator | RZ7-FEA1TU22 | 84 |
| | | | <ul style="list-style-type: none"> One SPDT contact Multi-timing range (from 0.05s to 10h) ^② "Universal" terminals accept all appropriate supply voltages Bicolored LED indicator | RZ7-FEA3TU23 | 90 |
| OFF-Delay Timing Relay (B) When control contact B1 closes, the output contact changes state immediately. When control contact B1 opens, the output contact changes state after time delay t . Constant supply voltage required on terminals A1/A2 or A3/A2. Note: Control pulse duration minimum 250ms for RZ7-FEB1TU22; 50ms (AC) and 30ms (DC) for RZ7-FEB3TU23. | | | <ul style="list-style-type: none"> One NO contact Multi-timing range (from 0.05s to 10h) ^② Supply voltage selected via wiring terminals A1, A2 Bicolored LED indicator | RZ7-FEB1TU22 | 90 |
| | | | <ul style="list-style-type: none"> One SPDT contact Multi-timing range (from 0.05s to 10h) ^② "Universal" terminals accept all appropriate supply voltages Bicolored LED indicator | RZ7-FEB3TU23 | 97 |
| One Shot Relay / Watchdog (D) When supply voltage is applied, the output contact changes state for time period t . | | | <ul style="list-style-type: none"> One NO contact Multi-timing range (from 0.05s to 10h) ^② Supply voltage selected via wiring terminals A1, A2 Bicolored LED indicator | RZ7-FED1TU22 | 84 |
| | | | <ul style="list-style-type: none"> One SPDT contact Multi-timing range (from 0.05s to 10h) ^② "Universal" terminals accept all appropriate supply voltages Bicolored LED indicator | RZ7-FED3TU23 | 90 |

Supply Voltage

The last three digits in the catalog number represent the supply voltage range the relay will accept:

- | | | |
|------------|----------------------------------|---------|
| U22 | 24V AC or DC | (A1/A2) |
| | 110...240V 50/60Hz | (A1/A2) |
| U23 | 24...48VDC and 24...240V 50/60Hz | (A1/A2) |

Timing Range Codes

| RZ7-FE |
|---------------|
| 0.05...1 sec |
| 0.5...10 sec |
| 0.05...1 min |
| 0.5...10 min |
| 0.05...1 hour |
| 0.5...10 hour |



RZ7-FE timing relay

Bicolored LED

1 SPDT or 1 N.O. Contact Timers

- LED U = Green: Supply voltage available
- LED Relay = Red: Output is energized
- OFF: No color

- For timing control, a voltage other than the supply voltage can also be used.
- Timing range is screwdriver selectable from the faceplate.

RZ7-FE Timing Relays – Single Function, One Pole

| Functional Description | Functional Diagram | Terminal Arrangement | Type | Catalog Number | Price |
|--|--|----------------------|--|----------------|-------|
| Symmetric Flasher Starting With A Pulse (F) When supply voltage is applied, the output contact changes state immediately and then repeatedly changes after every time period t , continuing until supply voltage is removed. | | | <ul style="list-style-type: none"> One NO contact Multi-timing range (from 0.05s to 10h) ^② Supply voltage selected via wiring terminals A1, A2 Bicolored LED indicator | RZ7-FEF1TU22 | 84 |
| | | | <ul style="list-style-type: none"> One SPDT contact Multi-timing range (from 0.05s to 10h) ^② "Universal" terminals accept all appropriate supply voltages Bicolored LED indicator | RZ7-FEF3TU23 | 90 |
| Fleeting OFF-Delay Timing Relay (E) When control contact B1 is pulsed, the output contact changes state for time period t . | <p>Note: Control pulse duration minimum 50ms (AC) - 30ms (DC).</p> | | <ul style="list-style-type: none"> One SPDT contact Multi-timing range (from 0.05s to 10h) ^② "Universal" terminals accept all appropriate supply voltages Bicolored LED indicator | RZ7-FEE3TU23 | 97 |
| Impulse Converter (L) When a pulse is applied to control contact B1, the output contact changes state immediately for time period t . Pulses received during timing period t have no further effect. | <p>Note: The period t is not dependent on the length of the control pulse. Control pulse duration minimum 50ms (AC) - 30ms (DC).</p> | | <ul style="list-style-type: none"> One SPDT contact Multi-timing range (from 0.05s to 10h) ^② "Universal" terminals accept all appropriate supply voltages Bicolored LED indicator | RZ7-FEL3TU23 | 97 |

RZ7-FE Timing Relays – Special Function, One Pole

| Functional Description | Functional Diagram | Terminal Arrangement | Type | Catalog Number | Price |
|---|--------------------|----------------------|---|----------------|-------|
| Wye-Delta Timing Relay (Y) When supply voltage is applied, output contact Y closes for time period t . After time period t , plus a fixed time period t_u (50...65ms) output contact Δ closes. | | | <ul style="list-style-type: none"> Two single pole NO contacts (one side common) Multi-timing range (from 0.15s to 10m) ^② "Universal" terminals accept all appropriate supply voltages LED indicator | RZ7-FEY2QU23 | 121 |

Supply Voltage

The last three digits in the catalog number represent the supply voltage range the relay will accept:

- | | | |
|------------|----------------------------------|---------|
| U22 | 24V AC or DC | (A1/A2) |
| | 110...240V 50/60Hz | (A1/A2) |
| U23 | 24...48VDC and 24...240V 50/60Hz | (A1/A2) |

Bicolored LED

1 SPDT or 1 N.O. Contact Timers

- LED U = Green: Supply voltage available
- LED Relay = Red: Output is energized
- OFF: No color

Timing Range Codes

| RZ7-FE with NO or SPDT contact | RZ7-FEY with two NO contacts |
|-----------------------------------|---------------------------------|
| 0.05...1 sec | 0.15...3 sec |
| 0.5...10 sec | 0.5...10 sec |
| 0.05...1 min | 0.05...1 min |
| 0.5...10 min | 0.5...10 min |
| 0.05...1 hour | |
| 0.5...10 hour | |

Single Color LED

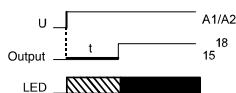
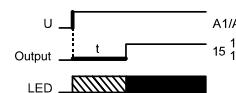
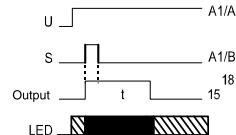
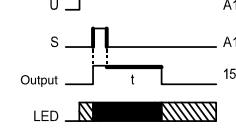
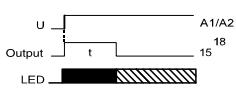
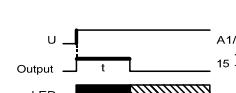
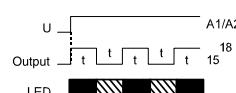
2 N.O. with Common

- ON = Green: Output is energized
- OFF = No Color

- ① For timing control, a voltage other than the supply voltage can also be used.
- ② Timing range is screwdriver selectable from the faceplate.

RZ7-FE Timing Relays – Multi-Function, One Pole

| RZ7-FEM Multi-function Relay | Functional Description | Type | Catalog Number | Price |
|--|---|---------------------|----------------|-------|
| <p>Multi-Function Relay (M) The RZ7-FEM multifunction relay combines <i>four</i> timing functions in one device. Each timing function and timing range is selectable from the face of the relay with a screwdriver actuated knob. The RZ7-FEM offers the following timing functions:</p> <p>On-Delay Off-Delay One Shot/Watchdog Symmetric Flasher Starting With a Pulse</p> <p>The RZ7-FEM3 offers one single pole double throw contact that can be used as either a normally open or normally closed contact.</p> | <ul style="list-style-type: none"> • One NO contact • Multi-timing range (from 0.05s to 10h) ^❶ • Supply voltage selected via wiring terminals A1, A2 • Bicolored LED indicator | RZ7-FEM1TU22 | 114 | |
| | | | | |

(A) On-Delay

1 N.O. (SPST)

1 C/O (SPDT)
(B) Off-Delay

1 N.O. (SPST)

1 C/O (SPDT)
(D) One Shot

1 N.O. (SPST)

1 C/O (SPDT)
(F) Flasher (Repeat Cycle Starting with Pulse)

1 N.O. (SPST)

1 C/O (SPDT)
Supply Voltage

The last three digits in the catalog number represent the supply voltage range the relay will accept:

U22 24V AC or DC

(A1/A2)

110...240V 50/60Hz

(A1/A2)

U23 24...48VDC and 24V...240V 50/60Hz

(A1/A2)

Bicolored LED

1 SPDT or 1 N.O. Contact Timers

LED U = Green: Supply voltage available

LED Relay = Red: Output is energized

OFF: No color

Timing Range Codes

| RZ7-FEM with one NO or SPDT contact |
|-------------------------------------|
| 0.05...1 sec |
| 0.5...10 sec |
| 0.05...1 min |
| 0.5...10 min |
| 0.05...1 hour |
| 0.5...10 hour |

- ❶ For timing control, a voltage other than the supply voltage can also be used.
❷ Timing range is screwdriver selectable from the faceplate.

Accessories

| Accessory | Description | Catalog Number | Price |
|-----------|---|----------------|--------------|
| | Setting Knob With Scale - For time setting without tools. | RZ7-FSK | 8.50 |
| | Panel Mounting Adaptor - For surface mounting RZ7-FS/FE timing relays. | RZ7-FSA ② | 6.75 |
| | DIN-rail - 2 meter lengths (\approx 6' 6") Top Hat, low profile (price per rail) Top Hat, high profile (price per rail) | 3F 3AF | See page A54 |

Marking Systems

| Component | Description | Pkg. Qty. | Catalog Number | Price Each |
|-----------|---|-----------|----------------|--------------|
| | Label Sheet - 1 sheet with 105 self-adhesive paper labels each, 6 x 17mm | 1 | CA7-FMS | See page A54 |
| | Marking Tag Sheet - 1 sheet with 160 perforated paper labels each, 6 x 17mm. To be used with transparent cover. | 1 | CA7-FMP | |
| | Transparent Cover - To be used with Marking Tag Sheets. | 100 ① | CA7-FMC | |
| | Tag Carrier - For marking with Series V7 Clip-on Tags. | 100 ① | CA7-FMA2 | |

- ① Minimum order quantity is one package of 100. Price each x 100 = total price.
 ② Previously catalog number 26.506.221-01.

Technical Data

| | RZ7-FE With NO Contact | RZ7-FE With SPDT Contact |
|--|--|--|
| Setting Accuracy | ±5% of the time range final value (t_{max}) | |
| Repeatability | ±1% of the time range final value (t_{max}) | |
| Tolerance | by voltage: ±0.01%/%ΔU by temperature: ±0.25%/°C | by voltage: ±0.001%/%ΔU by temperature: ±0.025%/°C |
| Supply | | |
| Supply Voltage | 24 AC or DC and 110...240VAC, 50/60Hz | 24...48VDC and 24...240VAC, 50/60 Hz |
| Voltage Tolerance | -15%/+20% (DC), -15%/+10% (AC) | |
| Power Consumption | 0.5W at 24VDC, 9VA at 240VAC | 0.5W at 24VDC, 5VA at 240VAC |
| Timer Energized | 100% | |
| Recovery Time | 250ms | 100ms |
| Voltage Isolation | - | ≤30ms without reset (supply voltage) |
| Cable length (supply voltage control) | max. 100 meters (300 ft.) | max. 250 meters (750 ft.) |
| Pulse Control (B1) | | |
| Impulse Duration | ≥250ms | ≥50ms (AC), ≥30ms (DC) |
| Input Voltage | | supply voltage range |
| Input Current | | 1mA |
| Cable Length | | max. 250 meters without parallel load between B1 and A2 max. 50 meters with load (<3 kΩ) between B1 and A2 |
| Outputs | | |
| Contact Type | 1N.O. contact | 1 Form C-SPDT contact |
| Switching Capacity | Voltage: Current: Power: according to IEC 947-5-1: according to UL508: | 250VAC 5A (Resistive, AC1) 1250VA 1A/250VAC (inductive load, AC14) 1A/24VDC (inductive load, DC13) 1A/300VAC (D300) 6A gL (fast blow fuse) |
| Short Circuit Resistance | | |
| Dielectric Withstand Voltage (contact to coil) | | 4000V |
| Life | mechanical: electrical operations: | 20 million operations 0.4 Mil. at 1A/250VAC, cosφ = 1 0.4 Mil. at 0.5A/250VAC, cosφ = 0.4 0.4 Mil. at 1A/24VDC, resistive |
| State Indicator | 1 LED | 1 bicolored LED (Supply = green; Relay = red) |
| General Characteristics | | |
| Insulation Characteristics | | 2 KVAC/50Hz test voltage according to VDE 0435 and 4kV 1.2/50μs surge voltage according to IEC 947-1 between all inputs and outputs |
| EMC Interference Immunity | The following requirements are fulfilled: Surge capacity of the supply voltage according to IEC 1000-4-5: Level 3 (A1-A2) 110...240VAC, according to IEC 1000-4-5: Level 2 (A1-A2) 24V AC/DC. Burst according to IEC 1000-4-4: Level 3. ESD discharge according to IEC 1000-4-2: Level 3. | The following requirements are fulfilled: Surge capacity of the supply voltage according to IEC 1000-4-5: Level 3. Burst according to IEC 1000-4-4: Level 3. ESD discharge according to IEC 1000-4-2: Level 3. |
| EMC/Emission | | electromagnetic fields according to EN 55 022: Class B |
| Safe Isolation | | according to VDE 106, Part 101 |
| Climatic Withstand | | 56 cycles (24h) at 25...40°C and 95% relative humidity according to IEC 68-2-30 and IEC 68-2-3 |
| Vibration Resistance | | 4g in 3 axis at 10...500Hz, test FC according to IEC 68-2-6 |
| Shock Resistance | | 50g according to IEC 68-2-7 |
| Protection Class | | Enclosure: IP40 Terminal: IP20 |
| Weight | | 60g |
| Approvals/Standards | | UL, C-UL, CE |
| Ambient Temperature | Open: Enclosed: Storage: | -25°C...+60°C -25°C...+45°C -40°C...+85°C |
| Standard | | EN 60947-1, EN 60947-5-1, EN 50081-1, IEC 947, UL 508, CSA 22.2 |

Technical Data (continued)

| | RZ7-FE With NO Contact | RZ7-FE With SPDT Contact |
|--|--|---|
| General Characteristics (continued) | | |
| Connections | Screw terminals: Rated tightening torque: Wire size: Finger protection: | M3 for Pozidrive No: 1, Phillips and slotted screws No: 2, suitable for power screwdriver 0.8Nm (max. 1.0Nm) [8.8 lb-in] Cross-sections of 1 x 0.5mm ² ...2 x 1.5mm ² (solid) or 2 x 1.5mm ² (stranded with sleeve) AWG 20...14 |
| Mounting | | according to VDE 0106 Snap-on mounting on 35mm DIN-rail Side mounting on CA7 contactors and CS7 relays (with dovetail joint) Screw fixing by Panel Mount and two screws (M4) - [surface mounting in any position] |
| Disposal | | Synthetic materials without dioxin according to EC/EFTA-Notification No: 93/0141/D Electrical contacts contain cadmium |

RZ7 Relative Scale Setting Knob

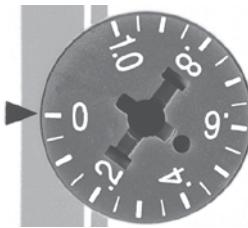
Series RZ7 Timing Relays have a "relative scale" setting knob numbered 0 to 1.0. Think about this as 0 to 100% of the relay's built-in time range.

Example: To set an RZ7-FE timing relay (with a 0.05 to 1 minute range) to activate after 25 seconds:

- 1) Divide the desired activation time (25 seconds) by the maximum time limit of the relay (60 seconds).

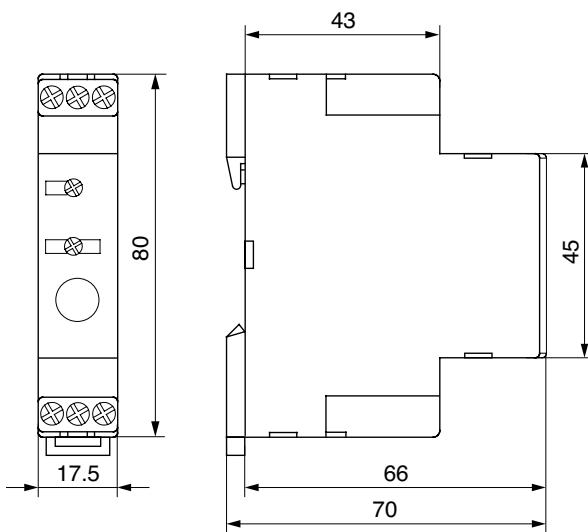
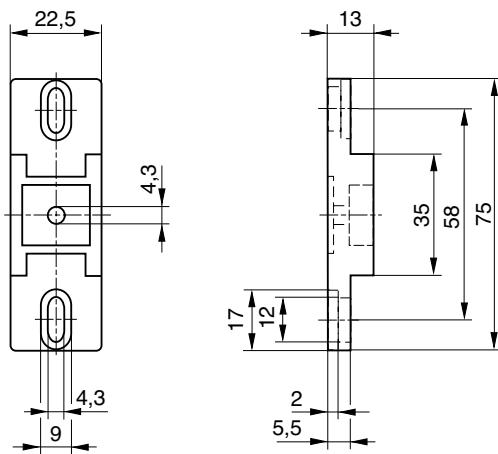
$$25 \div 60 = .416$$

- 2) Rotate the setting knob to just past the .4 mark



Series RZ7-FE Timing Relays (one and two pole)

Dimensions are in millimeters (inches). Dimensions not intended for manufacturing purposes.


Panel Mount Adaptor (26.506.221-01)


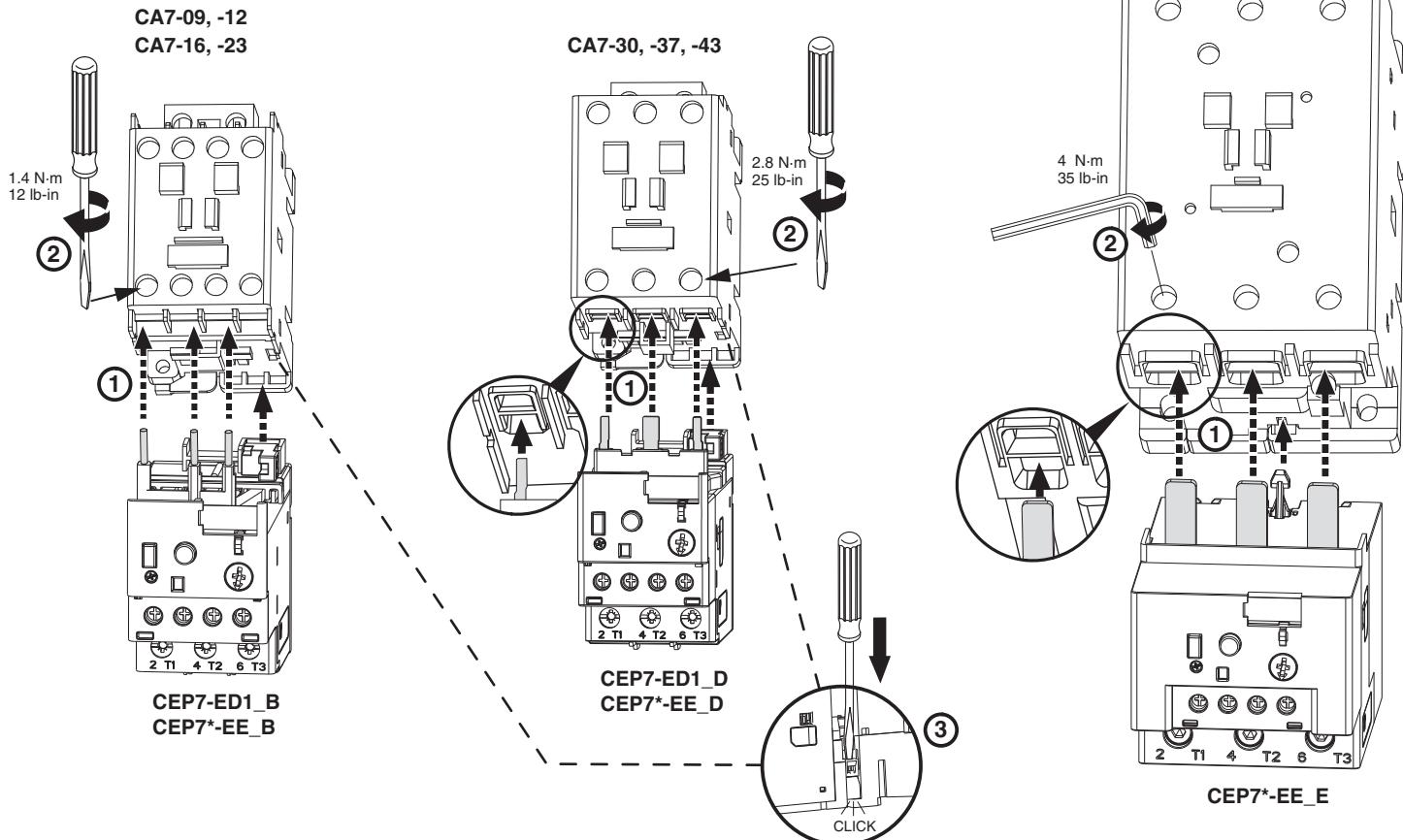
sprecher+ schuh CEP7 Overload Relay Application and Installation
Application et installation du relais de surcharge CEP7
Überlastrelais CEP7, Anwendung und Installation
Aplicación e instalación del relé de sobrecarga, CEP7
CEP7 Aplicação e Instalação do Relé de Sobrecarga
Applicazione ed installazione dei relè termici CEP7
ブレティンCEP7 過負荷继電器の応用と取付け
CEP7 过载继电器的使用与安装
(Cat CEP7-ED1__ , CEP7*-EE__)

Installation
Instalación
Instalação
Installazione
取付け方法
安装

| | |
|----------------------|---|
| WARNING | To prevent electrical shock, disconnect from power source before installing or servicing. Install in suitable enclosure. Keep free from contaminants. (Follow NFPA70E requirements) |
| AVERTISSEMENT | Avant le montage et la mise en service, couper l'alimentation secteur pour éviter toute décharge. Prévoir une mise en coffret ou armoire appropriée. Protéger le produit contre les environnements agressifs. (Vous devez respecter la norme NFPA70E). |
| WARNUNG | Vor Installations- oder Servicearbeiten Stromversorgung zur Vermeidung von elektrischen Unfällen trennen. Die Geräte müssen in einem passenden Gehäuse eingebaut und gegen Verschmutzung geschützt werden. (Befolgen Sie die Anforderungen nach NFPA70E). |
| ADVERTENCIA | Desconéctese de la corriente eléctrica, antes de la instalación o del servicio, a fin de impedir sacudidas eléctricas. Instálelo en una caja apropiada. Manténgalo libre de contaminantes. (Cumpla con los requisitos NFPA70E) |
| ATENÇÃO | Para evitar choques, desconectar da corrente elétrica antes de fazer a instalação ou a manutenção. Instalar em caixa apropriada. Manter livre de contaminantes. (Cumpra as exigências da norma NFPA70E) |
| AVVERTENZA | Per prevenire infortuni, togliere tensione prima dell'installazione o manutenzione. Installare in custodia idonea. Tenere lontano da contaminanti. (Seguire i requisiti NFPA70E) |
| 警告 | 感電事故防止のため、取付けまたは修理の際は電源から取り外してください。適切なケース内に取付けてください。 また、汚染物質がないことを確認してください。(NFPA70Eの要件に従ってください) |
| 警告 | 为了防止触电，在安装或维修之前必须先切断电源。安装在合适的设备箱内。防止接触污染物。(符合NFPA70E要求) |

CEP7-E__ = 3 Ø
CEP7S-E__ = 1 Ø

CA7-60, -72, -85, -97



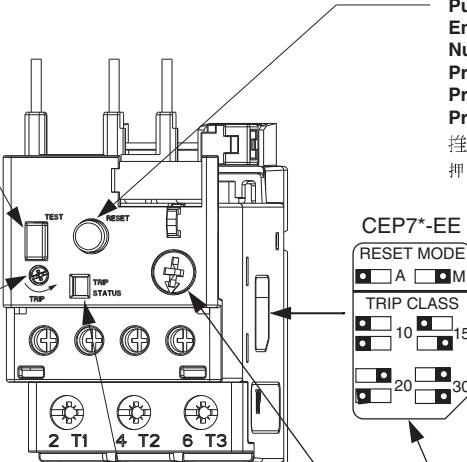
Features Caractéristiques Leistungsmerkmale Características

Características Funzioni の特長 继电器的特性

- Push To Test**
Enfoncer pour tester
Testschalter
Presione para probar
Pressione para testar
Spingere per provare

押してテストします。
按下键钮进行测试
- Rotate to Manually Trip**
Faire pivoter pour déclencher manuellement
Für manuelle Auslösung drehen
Rotar para disparar manualmente
Gire para disparar manualmente
Ruotare per intervenire manualmente

旋转进行手动设置
回転すると手動トリップします。



Push to Reset
Enfoncer pour réinitialiser
Nullstellschalter
Presione para reiniciar
Pressione para religar
Premere per reimpostare
推进并重新设置
押してリセットします。

A = Automatic/Manual Reset Mode
A = Mode de réinitialisation automatique/manual
A = Automatische/Manuelle Nullstellung
A = Modo de reinicio automático/manual
A = Modo de religação automática/manual
A = Modalità reimpostazione automatica/Manuale
自动和手动模式
A = 自動/手動リセットモード

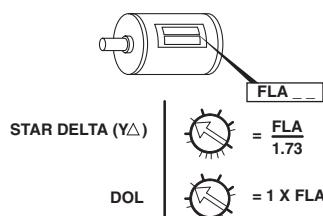
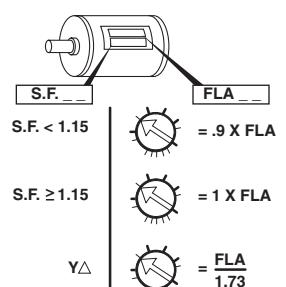
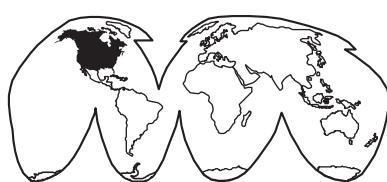
M = Manual Reset Mode
M = Mode de réinitialisation manuel
M = Manuelle Nullstellung
M = Modo de reinicio manual
M = Modo de religação manual
M = Modalità reimpostazione manuale
手动模式
M = 手動リセットモード

Selectable Trip Class
Classe de déclenchement sélectionnable
Wählbare Auslösestufen
Clase de disparo seleccionable
Seleção da classe de disparo
Classe di intervento selezionabile
選択可能なトリップ種類
可选用的跳闸等级

- Trip Indicator Window**
Yellow indicator not visible: Not Tripped.
Yellow indicator visible: Tripped.
- Fenêtre d'indicateur de déclenchement**
Indicateur jaune non visible : pas de déclenchement
Indicateur jaune visible : déclenchement
- Auslösungsanzeigefenster**
Gelbe Anzeige nicht sichtbar: keine Auslösung
Gelbe Anzeige sichtbar: Auslösung
- Ventana indicadora de disparo**
Indicador amarillo no visible: No disparado
Indicador amarillo visible: Disparado

- Visor de disparo**
Se o indicador amarelo não estiver visível: não disparado
Se o indicador amarelo estiver visível: disparado
- Finestra indicatrice di intervento.**
Indicatore giallo non visibile: non scattato.
Indicatore giallo visibile: scattato.
- トリップ表示ウインドウ**
黄色インジケータが表示されていない場合：トリップなし
黄色インジケータが表示されている場合：トリップ済み
- 跳闸指示窗**
黄色标记未显示: 没有跳闸
黄色标记显示: 已跳闸

- To adjust trip current, turn dial until the desired current is aligned with the ▲ pointer. Trip rating is 120% of dial setting.
- Pour régler l'intensité de déclenchement, tournez le cadran jusqu'à ce que le pointeur ▲ soit sur l'intensité voulue. La valeur nominale de déclenchement est de 120% du réglage cadran.
- Zur Einstellung des Auslösestroms drehen Sie den Schalter, bis der Zeiger ▲ auf die gewünschte Stromstärke zeigt. Der zur Auslösung erforderliche Nennstrom beträgt 120% des eingestellten Wertes.
- Para ajustar la corriente del disparo, gire el dial hasta que la corriente deseada esté alineada con la marca ▲. La capacidad nominal del disparo es el 120% del posicionamiento del dial.
- Para regular a corrente de disparo, gire o disco mostrador até que a corrente desejada esteja alinhada com o indicador ▲. A classe de disparo corresponde a 120% da marcação no mostrador.
- Per regolare la corrente di intervento, ruotare il regolatore fin quando la corrente desiderata non è allineata con il puntatore ▲. Il valore nominale di intervento corrisponde al 120% dell'impostazione del regolatore.
- トリップ電流を調整するには、所定の電流の目盛りが▲印に来るまでダイヤルを回してください。トリップ定格は、ダイヤル設定値の120%です。
- 若欲调节跳闸电流设定，可转动刻度盘，使所需的设定值对准▲箭头。跳闸电流额定值是刻度盘显示值的120%。



**WARNING****AVERTISSEMENT**

Do not use automatic reset mode in applications where unexpected automatic restart of the motor can cause injury to persons or damage to equipment.

N'utilisez pas le mode Remise à zéro automatique dans les applications où un redémarrage automatique inattendu du moteur pourrait provoquer des blessures personnelles ou des dégâts matériels.

WARNUNG

Der automatische Rücksetzmodus darf nicht in Anwendungen verwendet werden, in denen der unerwartete Neustart des Motors zu Personen- oder Sachschäden führen kann.

ADVERTENCIA

No use el modo de reseteo automático en aplicaciones donde el rearranque repentino del motor pueda causar lesiones personales o daño al equipo.

ATENÇÃO

Não utilize o modo de reajuste automático em aplicações nas quais o reinício automático e inesperado do motor possa causar ferimentos às pessoas ou danos ao equipamento.

AVVERTENZA

Non usare la modalità di ripristino automatico in applicazioni dove il riavviamento automatico improvviso del motore può provocare infortuni o danni all'apparecchiatura.

警告

モーターの予期しない自動再スタートによって負傷や機器の破損をまねく恐れのあるような応用では、自動リセット・モードを使用しないでください。

警告

在马达突然自动再起动可能导致人员伤害或设备损坏的地方，切勿采用自动复原模式。

Contact Status**Etat des contacts****Kontaktstatus****Estado del contacto****Situação de contato****Stato dei contatti**

接触状态

接触状态

| Normal | | Test | Tripped |
|-----------------------|--------|-----------------------|-----------------------|
| 95 | — — 96 | Closed | Open |
| 97 | — — 98 | Open | Closed |
| 97 95 + — ○ ○ | | 97 95 + — ○ ○ | 97 95 + — ○ ○ |
| 98 | 96 | 98 96 | 98 96 |

Wiring Diagram - 3 Phase Full Voltage DOL Starter

Schéma de câblage - Pleine tension triphasée Démarreur DOL (direct en ligne)

Verkabelungsschema - 3-phäsiges Vollspannungs-DOL-Motoranlasser

Diagrama de cableado - Arrancador DOL (directo en línea) trifásico de voltaje pleno

Diagrama de circuito - Dispositivo de partida DOL, trifásico, de máxima tensão

Schema elettrico - Avviatore diretto trifase a tensione piena

配線図 - 3相全電圧DOL始動器

配线图 - 三相全电压DOL起动器

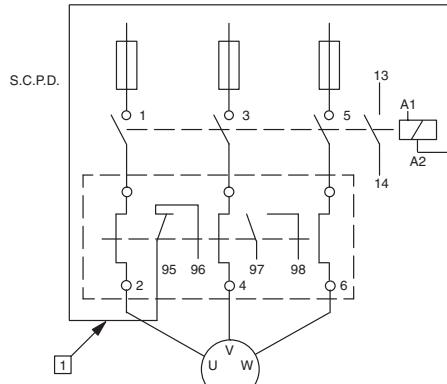
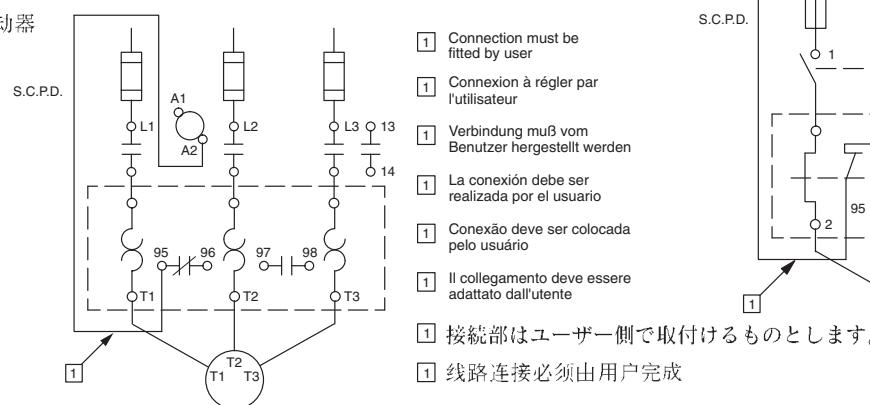
**Wiring Diagram - 1 Phase Full Voltage DOL Starter (CEP7S-E____)**

Schéma de câblage - Pleine tension monophasée Démarreur DOL (direct en ligne)

Verkabelungsschema - 1-phäsiges Vollspannungs-DOL-Motoranlasser

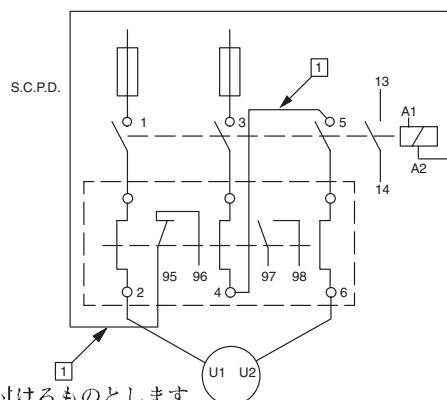
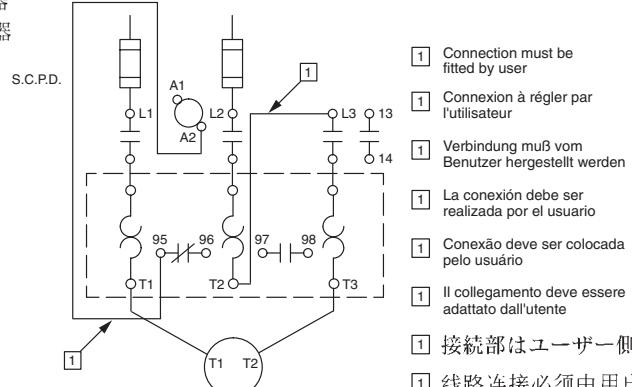
Diagrama de cableado - Arrancador DOL (directo en línea) monofásico de voltaje pleno

Diagrama de circuito - Dispositivo de partida DOL, monofásico, de máxima tensão

Schema elettrico - Avviatore diretto monofase a tensione piena

配線図 - 1相全電圧DOL始動器

配线图 - 单相全压DOL起动器



Main Connections
Raccordements Principale
Hauptanschlüsse
Collegamenti Principale
Coneções principais
Conexiones Principales

主体连接
主接続

Rated Insulation Voltage (Ui): 690V AC
Rated Operational Voltage (Ue) IEC/UL: 690V AC/600V AC
Rated Operating Frequency: 50 / 60 Hz

| Terminal Screw | CEP7-ED1_B * | | CEP7-ED1_D * | |
|----------------|--------------|--------------------------------------|--------------|--------------------------------------|
| | CEP7-EE_B * | | CEP7-EE_D * | |
| | 1x | 2.5 ... 16 mm ² 2.5 Nm | 1x | 2.5 ... 16 mm ² 2.5 Nm |
| | 2x | 2.5 ... 10 mm ² 3.4 Nm | 2x | 2.5 ... 10 mm ² 3.4 Nm |
| | 1x | 2.5 ... 25 mm ² 2.5 Nm | 1x | 2.5 ... 25 mm ² 2.5 Nm |
| | 2x | 2.5 ... 16 mm ² 3.4 Nm | 2x | 2.5 ... 16 mm ² 3.4 Nm |
| | 1x | 14... 6 AWG 22 lb-in | 1x | 14... 6 AWG 22 lb-in |
| | 2x | 12...6 AWG 30 lb-in | 2x | 12...6 AWG 30 lb-in |
| | | #2 | #2 | -- |
| | | 1 x 6 mm | 1 x 6 mm | -- |
| | | -- | -- | 4 mm |

* FOR MULTIPLE CONDUCTOR APPLICATIONS THE SAME SIZE AND STYLE WIRE MUST BE USED.
POUR LES APPLICATIONS A CONDUCTEURS MULTIPLES, UTILISEZ UN CABLE DE MEME TAILLE ET DE MEME STYLE.
BEI VERWENDUNG MEHRERER LEITER MUSS DIESELBE DRAHTSTÄRKE UND DRAHTART VERWENDET WERDEN.
PER PIÙ CONDUTTORI È NECESSARIO UTILIZZARE LE STESE DIMENSIONI E TIPI DI CAVO.
PARA CONDUTORES DIVERSOS, UTILIZE O MESMO TIPO E TAMANHO DE FIO.
EN APLICACIONES CON MÚLTIPLES CONDUCTORES DEBE UTILIZARSE CABLE DEL MISMO TAMAÑO Y ESTILO.
複数の導体を使用する場合は、同じサイズおよび型のワイヤを使用することが必要です
对于多种导线应用，必须使用大小和样式都相同的线缆。

Control Connections
Bornes de Commande
Steueranschlüsse
Morsetti di Commando
Coneções de controle
Conexiones de Control

控制连接
制御接続

Rated Insulation Voltage (Ui): 690V AC
Rated Operational Voltage (Ue) IEC/UL: 690V AC/600V AC
Rated Operating Current (Ie): B600 N.O. / N.C.

| Terminal Screw | M3 | |
|----------------|----|---|
| | 1x | 0.5 ... 2.5 mm ² 0.55 Nm |
| | 2x | 0.2 ... 0.75 mm ² 0.55 Nm |
| | 1x | 0.5 ... 4 mm ² 0.55 Nm |
| | 2x | 0.2 ... 1.5 mm ² 0.55 Nm |
| | 1x | 24 ... 10 AWG 5 lb-in |
| | 2x | 22 ... 16 AWG 5 lb-in |
| | | #1 |
| | | 0.6 x 3.5 mm |

Trip Curve

Courbe de déclenchement

Auslösekurve

Curva del disparo

Curva de disparo

Curva di intervento

トリップ曲線

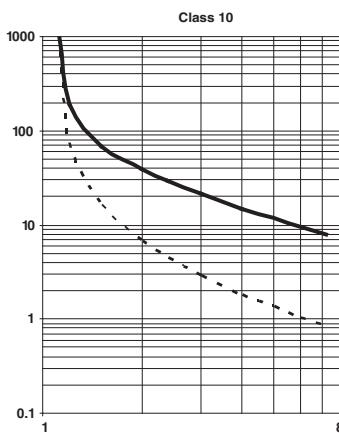
跳闸曲线

COLD START
DEMARRAGE A FROID
KALTSTART
ARRANQUE EN FRIO

PARTIDA À FRIA
AVVIAMENTO A FREDDO
冷始動
冷态起动

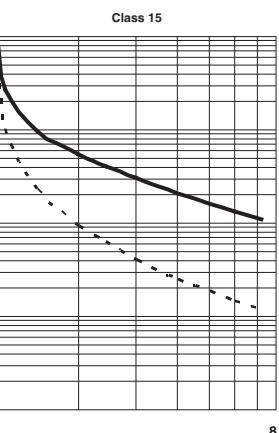
HOT START
DEMARRAGE A CHAUD
WARMSTART
ARRANQUE EN CALIENTE

PARTIDA À QUENTE
AVVIAMENTO A CALDO
熱始動
热态起动



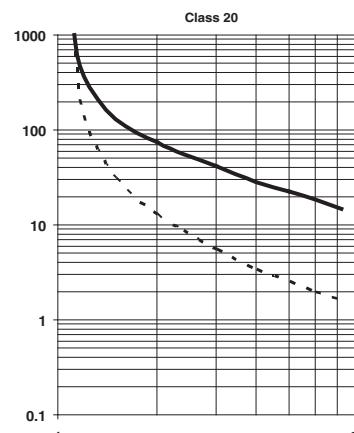
Multiple of FLA

Intensités pleine charge multiples



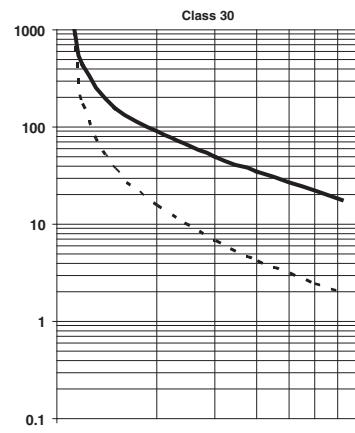
Múltiplo de FLA

Vielfache des FLA-Wertes



Intensités pleine charge multiples

Multiplo di Max amp.



FLA 倍率

满载电流安培(FLA)的倍数

Short Circuit Ratings

Table 1 Standard Fault Short Circuit Ratings per UL508 and CSA 22.2 No. 14

| Cat. No. | Max. available fault current (kA) | Max. voltage (V) | S.C.P.D. |
|---|-----------------------------------|------------------|----------------------------------|
| ED1AB, ED1BB, EEBB, ED1CB, ED1DB, ED1EB, ED1ED, ED1FD, EECB, EEDB, EEEB, EEDD, EEFD, EEPB, EERB, EESB, EEFD, EEEFE, EEEG, EEEU, EEEV | 1 | 600 | Suitable for use with fuses only |
| CEP7, CEP7S | 5 | | Not restricted to fusing only |
| EEEE, EEEFE, EEEG, EEEU, EEEV | 10 | | |
| | | | |

Table 3 Short Circuit Ratings per EN 60947-4-1

| E1 Plus Cat. No. | Prospective S.C. current, Ir (kA) | Conditional S.C. current, Iq (kA) | Max. voltage (V) | S.C.P.D. |
|---|-----------------------------------|-----------------------------------|------------------|----------------------------------|
| ED1AB, ED1BB, EEBB, ED1CB, ED1DB, EECB, EEDB, EEPB, EERB | 1 | 100 | 690 | Suitable for use with fuses only |
| CEP7, CEP7S | 1 | | | |
| ED1EB, EEEB, ED1ED, EEED, EEEE, EEEFE, EESB, EEGD, EEEU, EEEV | 3 | | | Not restricted to fusing only |
| EEEE, EEEFE, EEEG, EEEU, EEEV | 5 | | | |

Table 5 Overload relay only, High fault short circuit ratings per UL508 and CSA 22.2 No. 14

| Cat. No. | Max. available fault current (kA) | Max. voltage (V) | UL class RK1 fuse (A) |
|--|-----------------------------------|------------------|-----------------------|
| ED1CB, ED1DB, ED1EB, EECB, EEDB, EEEB | 100 | 600 | 60 |
| CEP7, CEP7S | | | 100 |
| ED1ED, ED1FD, EEED, EEFD, EEEE, EEEFE, EESB | | | 200 |
| EEEE, EEEFE, EEEG | | | |

Fuse Selection Table Class gL/gG and Class aM Fusing

| Motor [kW] | 1500 rpm [A] | Recommended Fuse | | Contactor | | ED/EE O/L Relay | |
|---------------|-----------------|------------------|-------------------|-----------|---------------------|-----------------|---------------------|
| | | Type | Rated Current [A] | Type | Thermal Setting [A] | Type | Thermal Setting [A] |
| 0.06 | 0.24 | Class gL/gG | 2 | CA7-09 | CEP7-ED1AB | 0.10 - 0.50 | |
| 0.09 | 0.33 | Class gL/gG | 2 | CA7-09 | CEP7-ED1AB | 0.10 - 0.50 | |
| 0.12 | 0.43 | Class gL/gG | 2 | CA7-09 | CEP7-ED1AB | 0.10 - 0.50 | |
| 0.18 | 0.61 | Class gL/gG | 2 | CA7-09 | CEP7-ED1BB | 0.20 - 1.0 | |
| 0.25 | 0.8 | Class gL/gG | 4 | CA7-09 | CEP7-ED1BB | 0.20 - 1.0 | |
| 0.37 | 1.1 | Class gL/gG | 4 | CA7-09 | CEP7-ED1CB | 1.0 - 5.0 | |
| 0.55 | 1.5 | Class gL/gG | 6 | CA7-09 | CEP7-ED1CB | 1.0 - 5.0 | |
| 0.75 | 1.9 | Class gL/gG | 6 | CA7-09 | CEP7-ED1CB | 1.0 - 5.0 | |
| 1.1 | 2.7 | Class gL/gG | 10 | CA7-09 | CEP7-ED1CB | 1.0 - 5.0 | |
| 1.5 | 3.5 | Class gL/gG | 10 | CA7-09 | CEP7-ED1CB | 1.0 - 5.0 | |
| 2.2 | 5.0 | Class gL/gG | 16 | CA7-09 | CEP7-ED1DB | 3.2 - 16 | |
| 3 | 6.6 | Class gL/gG | 20 | CA7-09 | CEP7-ED1DB | 3.2 - 16 | |
| 4 | 8.5 | Class gL/gG | 25 | CA7-09 | CEP7-ED1DB | 3.2 - 16 | |
| 5.5 | 11 | Class gL/gG | 32 | CA7-12 | CEP7-ED1DB | 3.2 - 16 | |
| 7.5 | 15 | Class gL/gG | 40 | CA7-23 | CEP7-ED1DB | 3.2 - 16 | |
| 10 | 20 | Class gL/gG | 50 | CA7-30 | CEP7-EEED | 5.4 - 27 | |
| 11 | 22 | Class gL/gG | 63 | CA7-30 | CEP7-EEED | 5.4 - 27 | |
| 15 | 29 | Class gL/gG | 80 | CA7-30 | CEP7-EEFD | 9 - 45 | |
| 18.5 | 36 | Class gL/gG | 80 | CA7-37 | CEP7-EEFD | 9 - 45 | |
| 22 | 41 | Class gL/gG | 100 | CA7-43 | CEP7-EEFD | 9 - 45 | |
| 30 | 56 | Class gL/gG | 125 | CA7-60 | CEP7-EEGE | 18 - 90 | |
| 37 | 68 | Class gL/gG | 160 | CA7-72 | CEP7-EEGE | 18 - 90 | |
| 45 | 81 | Class gL/gG | 160 | CA7-85 | CEP7-EEGE | 18 - 90 | |

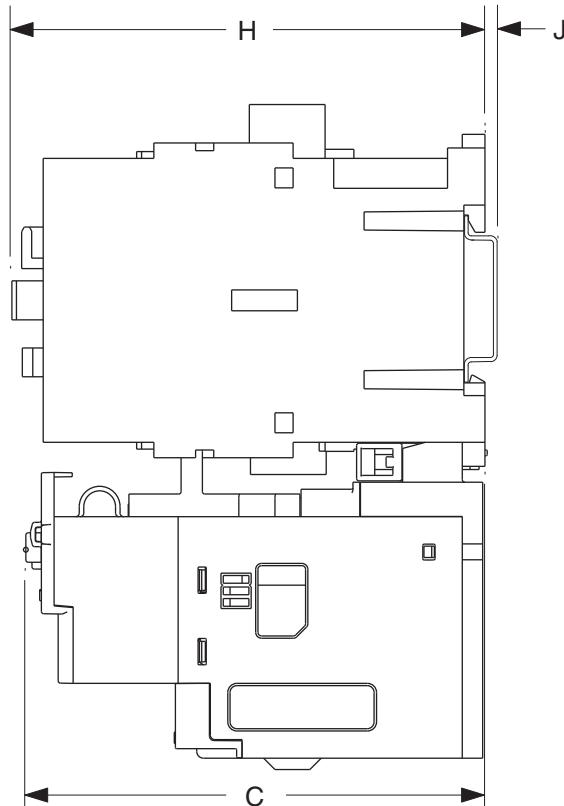
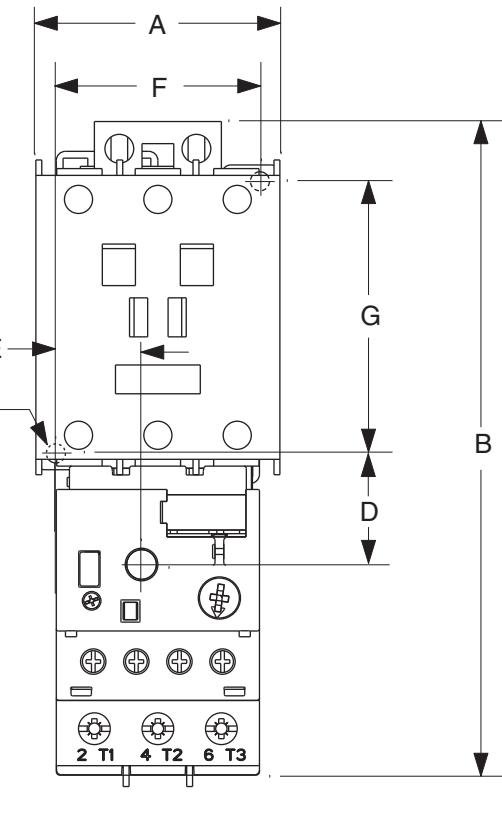
Table 2 Type I and Type II Fuse Coordination with CA7 contactors per EN 60947-4-1

| E1 Plus Cat. No. | Contactor Cat. No. | Max. starter FLC (A) | Prospective S.C. current, Ir (kA) | Conditional S.C. current, Iq (kA) | Max. voltage (V) | Type I Max. Class J or CC fuse (A) | Type II Max. Class J or CC fuse (A) |
|----------------------------|--------------------|----------------------|-----------------------------------|-----------------------------------|------------------|------------------------------------|-------------------------------------|
| ED1AB, EEBB | CA7-09 | 0.5 | 100 | 600 | 100 | 3 | 3 |
| ED1BB, EEBB | CA7-09 | 1 | | | | | |
| ED1CB, ED1DB, EECB, EEDB | CA7-09 | 9 | | | | | |
| ED1CB, ED1DB, EECB, EEDB | CA7-12 | 12 | | | | | |
| ED1CB, ED1DB, EECB, EEDB | CA7-16 | 16 | | | | | |
| ED1CB, ED1DB, EECB, EEDB | CA7-23 | 23 | | | | | |
| ED1CB, ED1DB, EECB, EEDB | CA7-23 | 23 | | | | | |
| ED1EB, EEEB | CA7-12 | 12 | | | | | |
| ED1EB, EEEB | CA7-16 | 16 | | | | | |
| ED1EB, EEEB | CA7-23 | 23 | | | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-30 | 30 | 100 | 600 | 100 | 40 | 40 |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-37 | 37 | | | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-43 | 43 | | | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-60 | 60 | | | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-72 | 72 | | | | | |
| EEEE, EEEFE | CA7-85 | 85 | 100 | 600 | 100 | 150 | 150 |
| EEEE, EEEFE | CA7-85 | 85 | | | | | |
| EEEE, EEEFE | CA7-97 | 97 | | | | | |
| EEGE | CA7-72 | 72 | 100 | 600 | 100 | 100 | 100 |
| EEGE | CA7-85 | 85 | | | | | |

| E1 Plus Cat. No. | Contactor Cat. No. | Max. starter FLC (A) | Max. available fault current (kA) | Max. voltage (V) | Max. UL Class J or CC fuse, CSA HRCI-J (A) |
|---------------------------------------|--------------------|----------------------|-----------------------------------|------------------|--|
| ED1AB, EEBB | CA7-09 | 0.5 | 100 | 600 | 3 |
| ED1BB, EEBB | CA7-09 | 1 | | | |
| ED1CB, ED1DB, ED1EB, EECB, EEDB, EEEB | CA7-09 | 9 | | | |
| ED1CB, ED1DB, ED1EB, EECB, EEDB, EEEB | CA7-12 | 12 | | | |
| ED1CB, ED1DB, ED1EB, EECB, EEDB, EEEB | CA7-16 | 16 | | | |
| ED1CB, ED1DB, ED1EB, EECB, EEDB, EEEB | CA7-23 | 23 | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-30 | 30 | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-37 | 37 | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-43 | 43 | | | |
| ED1ED, ED1FD, EEEED, EEEFD | CA7-60 | 60 | | | |
| EEEE, EEEFE, EEEG | CA7-72 | 72 | 100 | 600 | 100 |
| EEEE, EEEFE, EEEG | CA7-85 | 85 | | | |
| EEEE, EEEFE, EEEG | CA7-97 | 97 | | | |

CEP7-EEED or CEP7-EEFD with CA7-30, CA7-37 or CA7-43 contactor: 480V/65kA; 600V/30kA when protected by Allen-Bradley 140U-H6C3 followed by suffixes CB rated 50A max.

| Motor | Recommended Fuse | Contactor | ED/EE O/L Relay |
|-------|------------------|-----------|-----------------|
| 0.06 | 0.24 | Class aM | 1 |
| 0.09 | 0.33 | Class aM | 1 |
| 0.12 | 0.43 | Class aM | 1 |
| 0.18 | 0.61 | Class aM | 2 |
| 0.25 | 0.8 | Class aM | 2 |
| 0.37 | 1.1 | Class aM | 2 |
| 0.55 | 1.5 | Class aM | 2 |
| 0.75 | 1.9 | Class aM | 4 |
| 1.1 | 2.7 | Class aM | 4 |
| 1.5 | 3.5 | Class aM | 4 |
| 2.2 | 5.0 | Class aM | 6 |
| 3 | 6.6 | Class aM | 8 |
| 4 | 8.5 | Class aM | 10 |
| 5.5 | 11 | Class aM | 12 |
| 7.5 | 15 | Class aM | 16 |
| 10 | 20 | Class aM | 25 |
| 11 | 22 | Class aM | 25 |
| 15 | 29 | Class aM | 32 |
| 18.5 | 36 | Class aM | 40 |
| 22 | 41 | Class aM | 50 |
| 30 | 56 | Class aM | 63 |
| 37 | 68 | Class aM | 80 |
| 45 | 81 | Class aM | 100 |



| CONTACTOR CAT. NO. | CAT. NO. | | A | B | C | D | E | F | G | H | J | K |
|-----------------------------|----------------------------|------------|--------------|-----------------|-----------------|---------------|---------------|--------------|---------------|----------------|------------|--------------|
| CA7-09, -C12, -C16, -C23 | CEP7--ED1_B, CEP7*-EE_B | mm (in) | 45 (1.76) | 146.6 (5.77) | 85.2 (3.35) | 24.5 (.96) | 13.9 (.55) | 35 (1.38) | 60 (2.36) | 86.5 (3.40) | 2 (.08) | 4.5 (.17) |
| CA7-30, -37 | CEP7-ED1_D, CEP7*-EE_D | mm (in) | 45 (1.76) | 146.6 (5.77) | 101.2 (3.98) | 24.5 (.96) | 13.9 (.55) | 35 (1.38) | 60 (2.36) | 104 (4.09) | 2 (.08) | 4.5 (.17) |
| CA7-43 | | mm (in) | 54 (2.12) | 146.6 (5.77) | 101.2 (3.98) | 24.5 (.96) | 18.4 (.74) | 45 (1.77) | 60 (2.36) | 104 (4.09) | 2 (.08) | 4.5 (.17) |
| CA7-60, -72, -85, -97 | CEP7*-EE_E | mm (in) | 72 (2.83) | 192 (7.57) | 120.4 (4.74) | 29 (1.14) | 23.8 (.94) | 55 (2.16) | 100 (3.94) | 126 (4.94) | 2 (.08) | 5.4 (.21) |

Accessories

Accessoires
Zubehör
Accesarios
Acessórios
Accessori
付属品
附件

| | For Use With | Cat. No. |
|---------------------------|------------------------------------|----------|
| DIN Rail/Panel Adapter | CEP7-ED1_B, CEP7*-EE_B | CEP7-EPB |
| | CEP7-ED1_D, CEP7*-EE_D | CEP7-EPD |
| | CEP7*-EE_E | CEP7-EPE |
| Current Adjustment Shield | CEP7-ED1 (all), CEP7*-EE (all), | CEP7-BC8 |
| External Reset Adapter | CEP7-ED1 (all), CEP7*-EE (all) | CEP7-ERA |

SCOT MOTORPUMP™

J56 & JM FRAME
STRAIGHT CENTRIFUGAL
304 STAINLESS STEEL PUMP NO. 230, 231, 232, 236

● INSTALLATION ● OPERATION ● MAINTENANCE INCLUDES MECHANICAL SEAL REPLACEMENT

Check pump for shortage and damage immediately upon arrival. Note damage or shortage on freight bill (bill of lading); immediately file claim with carrier.

EXTERIOR — Pay particular attention to conduit box, external hardware and accessories. Touch up abrasions or scratches with approved paint.

INTERNAL — If extensive or serious external damage is noted, if impeller is damaged (look in ports), or if shaft binds or sticks, disassemble as required to permit internal inspection.

HANDLING

Handle with care. Dropping or jarring can seriously damage motor bearings or break pump parts. Lift with device having capacity for pump weight, and use lifting hooks or eye bolts (if provided) or rig double sling around motor frame and pump casing. Do not use sling through pump motor adapter nor around suction and discharge flanges.

INSTALLATION

Location — Pump location should provide the following:

1. Install as close to suction supply as possible.
2. Shortest and most direct suction pipe practical. Suction lift must not exceed limit for pump. NPSH available must equal or exceed pump requirement.
3. Suction port below pumping level to provide priming.
4. Room for inspection and maintenance.
5. Correct power supply to motor; all wiring should meet National Electrical and Local Codes and Regulations.
6. If outdoors, protection from the elements, freezing and water damage due to flooding.

Piping — Suction and discharge gauges are useful to check pump operation and are excellent trouble indicators. Install gauges in the lines if pump ports do not have gauge taps. Observe these precautions when installing piping:

1. Support close to, but independently of pump.

2. Use the next larger pump size for suction and discharge.
3. Keep as straight as possible. Avoid bends and fittings.
4. Remove burrs, sharp edges, ream pipe cuts, and make joints air-tight.
5. Don't spring pipe to make connections. Strain must not be transmitted to pump.
6. Allow for pipe expansion with hot fluids; expansion joints are not recommended.

Suction — Size and install suction piping to keep pressure loss at minimum and to provide correct NPSH by observing the following:

1. The suction pipe should be equal in size or preferably one size larger than the suction connection of the pump. If pipe is larger than the pump suction, an eccentric pipe reducer should be used at the pump.
2. Pipe should slope upward to pump, even for horizontal run.
3. Use 45-degree or long-sweep 90-degree elbows.
4. A valve in the suction is necessary only on positive suction head installation and must not be used to throttle the pump. The suction valve should be installed for maintenance purposes only.

Discharge — Pumps permit discharge port location at two positions, 30 degrees apart. Change by removing cover bolts, rotate casing, and replace bolts. Do not slice O-ring. Scot does not recommend bottom vertical, 3:00 or 9:00 discharge positions due to erratic pump performance. Ensure there is adequate clearance with selected position between wall or tank, motor conduit box, and grease fittings. Casing may extend beyond base or feet.

1. Short discharge lines may be the same size as the discharge port. Long runs require a pipe larger than the discharge port.
2. Long horizontal runs require a grade as even as possible. Avoid high spots and loops. Trapped air will throttle flow and may result in erratic pumping.
3. Install check and gate valves in discharge line; check valve (if used) between pump and gate valve.

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OPERATION

Pre-Start — Before initial start of the pump, check as follows:

1. The rotation must be checked upon installation. Close, then break the contacts quickly and observe the rotation of the exposed portion of the rotating parts. Rotation must agree with the rotation arrow on the motor. For all pumps, the standard rotation is counterclockwise when viewed from the suction end. Motor wiring is easily changed in the field. Observe the wiring diagram on the inside of the terminal box cover, or on the motor nameplate.
2. Check voltage, phase and frequency of line circuit with motor nameplate.
3. Check suction and discharge piping and pressure gauges for proper operation.
4. Assure that pump is full of liquid (primed).

Priming — If pump is installed with a positive head on the suction, prime by opening suction valve and allowing liquid to enter the casing, at the same time venting all air out of the top of the casing.

If pump is installed with a suction lift, priming must be done by other methods, such as foot valves, ejectors, or by manually filling casing and suction line.

CAUTION - DO NOT RUN PUMP DRY. Serious damage may result if started dry.

Starting — Proceed as follows to start pump:

1. Close drain valves and valve in discharge line.
2. Open fully all valves in the suction line.
3. Prime the pump. If pump does not prime properly, or loses prime during start-up, shut down and correct condition before repeating procedure.
4. For pumps moving high temperature liquids, open warm-up valve to circulate liquid for preheating. Close valve after pump has warmed up.
5. Start the motor (pump).
6. When pump is operating at full speed, open discharge valve slowly.

Running — Periodically inspect pump while running, but especially after first start and following repair.

1. Check pump and piping for leaks. Repair immediately.
2. Record pressure gauge readings for future reference.
3. Record voltage, amperage per phase, and kW (if an indicating wattmeter is available).
4. Adjust pump output capacity with discharge valve. DO NOT throttle suction line.

Freezing Protection — Protect pumps shut down during freezing conditions by one of the following methods:

1. Drain pump; remove all liquid from the casing.
2. Keep fluid moving in pump and insulate or heat the pump to prevent freezing. If heated, do not let temperature go above 100 to 150 degrees F.
3. Fill pump completely with antifreeze solution.

Temperature — Total temperature, not the rise, is the measure of safe operation for a motor. If temperature by thermometer exceeds limits for insulation class, investigate and change operating conditions.

Labeled Motors — It is imperative for repair of a motor with Underwriters' Laboratories label that original clearances be held; that all plugs, screws, other hardware be fastened securely, and that parts replacements be exact duplicates or approved equals. Violation of any of the above invalidates Underwriters' label.

Lubrication — Pumps should require no maintenance, other than the motor bearings, according to the following instructions:

DOUBLE SHIELDED. When double shielded prelubricated bearings are furnished, no lubrication is required for the life of the bearings. Inspect bearings periodically to determine the condition of the grease and replace the bearings if necessary.

SINGLE SHIELDED W/GREASE FITTING PROVISIONS. When single shield bearings are furnished, periodic inspection, cleaning and relubrication is required. See motor manufacturer's specific instructions for lubrication.

MECHANICAL SEAL REPLACEMENT

J56 FRAME MOTOR, PUMP NO. 230, 231, 232

A.) Disassembly:

1. Turn off power.
2. Close suction and discharge valves.
3. Drain pump.
4. Remove bolts holding base to foundation
5. Remove pipe connections from suction and discharge.
6. Remove pump from system.
7. Remove case.
8. Insert a screwdriver in one of the impeller waterway passages and back off the impeller nut as shown in Figure 1.



9. Remove motor shaft end cap. Insert a screwdriver in slot of motor shaft. While holding shaft against rotation, unscrew impeller from shaft by turning counterclockwise when facing impeller (Figure 2).
10. Pry off rotating member of mechanical seal from motor shaft by using (2) screwdrivers. Be careful not to damage the pump cover. See Figure 3.

MAINTENANCE

Cleaning — Remove oil, dust, dirt, water, chemicals from exterior or motor and pump. Keep motor air inlet and outlet open. Blow out interior of open motors with clean compressed air at low pressure. Regularly drain moisture from TEFC motors.

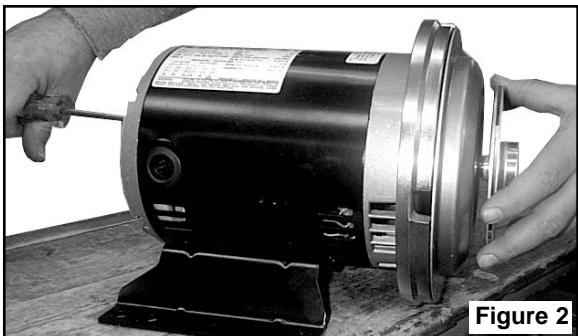


Figure 2

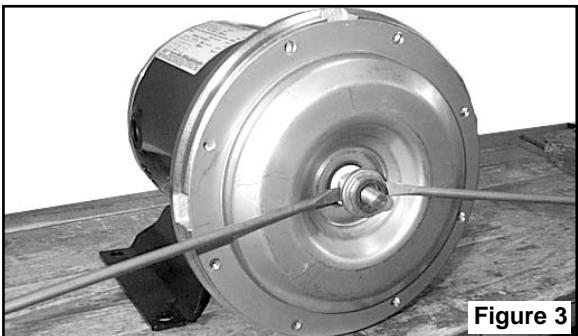


Figure 3

11. Remove pump cover from cast iron disc. (There is no hardware used to attach cover to disc.) Place cover on a flat surface with convex side down. Push out stationary member of mechanical seal. It is not necessary to remove the cast iron disc from the motor to replace the seal.
- B. Reassembly:**

CAUTION: The mechanical seal is a precision product and should be handled accordingly. Use care when handling lapped running surfaces of the mechanical seal to ensure they remain clean and are free of chips or scratches.

1. Clean gasket and flange faces, seal seat cavity and shaft, in particular shaft shoulder fitting against impeller.
2. Position the stationary seat with the silver dot down (away from you) and the lapped face (shiny side) facing you. Lubricate the seal seat cavity of the cover and the rubber cup or O-ring of stationary seal seat with the lubricating fluid that comes with the mechanical seal or repair kit. Press the stationary seat in seal seat cavity in the cover squarely and evenly using a arbor press (if possible) and the cardboard disc supplied with the seal. Be certain that the lapped face (shiny side) is facing you.
3. Position the cover so that the convex side with the lapped seal seat is facing you. Place the cover on the motor disc and align the holes in the disc with the holes in the cover. (Note: There isn't any hardware required to attach the cover to the motor disc.)
4. Apply the lubricating fluid that comes with the mechanical seal or repair kit to the motor shaft and the rubber bellows of the rotary seal. Slide the seal head on the shaft, press the rubber drive band on the rotary head until the lapped face on the head seats firmly against the lapped face of the stationary seat. Install seal spring on head and seal spring retainer on spring. Do not chip or scratch faces during installation. Take extra

- care to make sure the lapped faces are clean.
5. Hold shaft against rotation as described in paragraph 8 of disassembly procedure, and thread impeller on shaft until it is tight against the shaft shoulder. The impeller will compress the seal spring to the proper length assuring correct pressure on lapped faces.
 6. Replace D-washer and impeller nut holding impeller against rotation as indicated in paragraph 7 of disassembly procedure (2 & 3 HP 1PH, and all 3PH motors only).
 7. Remove any burrs caused by screwdriver on the vane of impeller in waterway passage.
 8. Install O-Ring on cover. Be sure that any damaged O-ring is replaced.
 9. Place pump casing against pump cover. Ensure that impeller eye is centered in pump case and position case, cover and motor disc so that the holes line up. Install socket head cap screws through the case and cover, and thread into the motor disc. Tighten all cap screws alternately and evenly until finger tight.
 10. Finish tightening the cap screws alternately and evenly to approximately 6 ft. lbs. torque. Note: It is imperative that the screws be tightened alternately and evenly, as this action centers the cover in the casing, assuring proper alignment. Binding of the impeller in the case may occur if the case is not positioned properly and/or the cap screws are not tightened as indicated.
 11. Replace hold-down bolts.
 12. Check for free rotation after assembly is completed.
 13. Replace motor shaft end cap.
 14. Seal all drain openings using pipe sealant on threads.
 15. Reprime before starting. Do not start until pump is completely filled with water.

MECHANICAL SEAL REPLACEMENT

JM FRAME MOTOR, PUMP NO. 236

A.) Disassembly:

1. Turn off power.
2. Close suction and discharge valves.
3. Drain pump.
4. Remove bolts holding down pump to mounting plate.
5. Remove pipe connections from suction and discharge.
6. Remove pump from system.
7. Remove case.
8. Insert a screwdriver in one of the impeller waterway passages, as shown in Figure 4, and back off the impeller retaining assembly with a socket wrench.

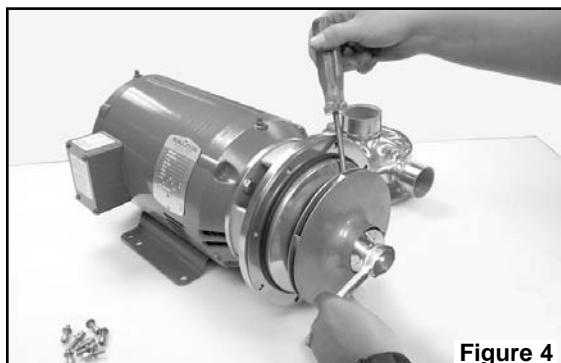


Figure 4

9. Remove impeller from shaft, being careful not to lose the impeller key, spring and gasket. If impeller is difficult to remove, it may be necessary to use a bearing puller to remove.
10. Pry off rotating member of mechanical seal from sleeve by using two (2) screwdrivers. Be careful not to damage the pump cover. See Figure 5.



Figure 5

11. Remove pump cover from cast iron disc. (There isn't any hardware used to attach cover to disc. Place cover on flat surface with convex side down, and push out stationary member of mechanical seal. It is not necessary to remove cast iron disc from motor to replace seal.)
12. Inspect shaft sleeve. If damaged or worn, remove from shaft and replace.

B.) Reassembly:

CAUTION: The mechanical seal is a precision product and should be handled accordingly. Use care when handling lapped running surfaces of the mechanical seal to ensure they remain clean and are free of chips or scratches.

1. Clean gasket and flange faces, seal seat cavity, shaft sleeve, and motor shaft.
2. Position cover so that the convex side is facing you. Position the stationary seat with the silver-dot down (away from you) and the lapped face (shiny side) facing you. Lubricate the seal seat cavity of the cover and the rubber cup or O-ring of seal seat with the lubricating fluid that comes with the mechanical seal or repair kit. Press the stationary seat in seal seat cavity of the cover squarely and evenly using a arbor press (if possible) and the cardboard disc supplied with the seal. Be certain that the lapped face (shiny side) is facing you.
3. Install the flinger on the motor shaft until it bottoms on the motor shaft.
4. Slide the shaft O-ring on the motor shaft until it is tight against the flinger. Make sure that the shaft O-ring does not get damaged during this procedure.
5. Position the cover so that the convex side with

the lapped seal seat is facing you. Place the cover on the motor disc and align the holes in the disc with holes in the cover. (There isn't any hardware required to attach cover to motor disc.)

6. Apply the lubricating fluid that comes with the mechanical seal or repair kit to the motor sleeve and the rubber bellows of the rotary seal. Slide the seal head on the shaft sleeve, press the rubber drive band on the rotary head until the lapped face on the head seats firmly against the lapped face of the stationary seat. Do not chip or scratch faces during installation. Take extra care to make sure the lapped faces are clean.
7. Install the seal spring on the seal head and retainer on spring.
8. Place key in key seat. Line up keyway in impeller with key on motor shaft, and slide impeller on motor shaft. Be certain that the key is positioned in the keyway of the motor and impeller. Slightly compress seal spring with impeller and hold impeller while installing impeller retaining assembly in motor shaft.
9. Insert a screwdriver in a waterway passage of the impeller holding it against rotation as discussed in paragraph 7 of the disassembly instructions.
10. Remove any burrs caused by screwdriver on the vane of impeller in waterway passage.
11. Install O-Ring on cover. Be sure that any damaged O-ring is replaced.
12. Place pump casing against pump cover. Ensure that impeller eye is centered in pump case and position case, cover and motor disc so that the holes line up. Install socket head cap screws through the case and cover, and thread into the motor disc. Tighten all cap screws alternately and evenly until finger tight.
13. Finish tightening the cap screws alternately and evenly to approximately 6 ft. lbs. torque. Note: It is imperative that the screws be tightened alternately and evenly, as this action centers the cover in the casing, assuring proper alignment. Binding of the impeller in the case may occur if the case is not positioned properly and/or the cap screws are not tightened as listed above.
14. Replace hold-down bolts.
15. Check for free rotation after assembly is completed.
16. Close all drain openings, using pipe sealant on threads.
17. Reprime before starting. Do not start unit until pump is completely filled with water.

The approved lubricating fluid for seal installation is included with the mechanical seal or repair kit. DO NOT USE OTHER LUBRICATING LIQUIDS!

PRESSURE AND TEMPERATURE LIMITATION — STANDARD FITTED PUMPS

| PUMP NO. | PRESSURE | | TEMPERATURE | |
|------------|----------|----------|----------------|-----------------------------------|
| | STANDARD | OPTIONAL | STANDARD | OPTIONAL |
| ALL MODELS | 175 PSI | 175 PSI | WATER 212°F | WATER 240°F GLYCOL 250°F |

CAUTION

DO NOT ALLOW EITHER THE DISCHARGE PRESSURE OR THE TEMPERATURE OF THE LIQUID TO EXCEED THE LIMITATIONS LISTED ABOVE.

SCOT MOTORPUMP™

J56 & C56 FRAME
STRAIGHT CENTRIFUGAL
5/8", TYPE 6, 6A AND 21 SEAL

● INSTALLATION ● OPERATION ● MAINTENANCE INCLUDES MECHANICAL SEAL REPLACEMENT

Check pump for shortage and damage immediately upon arrival. Note damage or shortage on freight bill (bill of lading); immediately file claim with carrier.

EXTERIOR — Pay particular attention to conduit box, external hardware and accessories. Touch up abrasions or scratches with approved paint.

INTERNAL — If extensive or serious external damage is noted, if impeller is damaged (look in ports), or if shaft binds or sticks, disassemble as required to permit internal inspection.

HANDLING

Handle with care. Dropping or jarring can seriously damage motor bearings or break pump parts. Lift with device having capacity for pump weight, and use lifting hooks or eye bolts (if provided) or rig double sling around motor frame and pump casing. Do not use sling through pump motor adapter nor around suction and discharge flanges.

INSTALLATION

Location — Pump location should provide the following:

1. Install as close to suction supply as possible.
2. Shortest and most direct suction pipe practical. Suction lift must not exceed limit for pump. NPSH available must equal or exceed pump requirement.
3. Suction port below pumping level to provide priming.
4. Room for inspection and maintenance.
5. Correct power supply to motor; all wiring should meet National Electrical and Local Codes and Regulations.
6. If outdoors, protection from the elements, freezing and water damage due to flooding.

Piping — Suction and discharge gauges are useful to check pump operation and are excellent trouble indicators. Install gauges in the lines if pump ports do not have gauge taps. Observe these precautions when installing piping:

1. Support close to, but independently of pump.
2. Use the next larger pump size for suction and discharge.
3. Keep as straight as possible. Avoid bends and fittings.
4. Remove burrs, sharp edges, ream pipe cuts, and make joints air-tight.
5. Don't spring pipe to make connections. Strain must not be transmitted to pump.
6. Allow for pipe expansion with hot fluids; expansion joints are not recommended.

Suction — Size and install suction piping to keep pressure loss at minimum and to provide correct NPSH by observing the following:

1. The suction pipe should be equal in size or preferably one size larger than the suction connection of the pump. If pipe is larger than the pump suction, an eccentric pipe reducer should be used at the pump.
2. Pipe should slope upward to pump, even for horizontal run.
3. Use 45-degree or long-sweep 90-degree elbows.
4. A valve in the suction is necessary only on positive suction head installation and must not be used to throttle the pump. The suction valve should be installed for maintenance purposes only.

• Cedarburg, WI 53012

SCOT DIVISION OF ARDOX CORP. — HOME OFFICE
• P.O. Box 286

• 262-377-7000

• FAX 262-377-7330

INSTALLATION, CONT.

Discharge — Pumps permit discharge port location at any of four positions, 90 degrees apart. Change by removing cover bolts, rotate casing, and replace bolts. Do not slice O-ring or tear fibre gasket. Scot does not recommend bottom vertical discharge due to erratic pump performance. Ensure there is adequate clearance with selected position between wall or tank, motor conduit box, and grease fittings. Casing may extend beyond base or feet.

1. Short discharge lines may be the same size as the discharge port. Long runs require a pipe larger than the discharge port.
2. Long horizontal runs require a grade as even as possible. Avoid high spots and loops. Trapped air will throttle flow and may result in erratic pumping.
3. Install check and gate valves in discharge line; check valve (if used) between pump and gate valve.

OPERATION

Pre-Start — Before initial start of the pump, check as follows:

1. The rotation must be checked upon installation. Close, then break the contacts quickly and observe the rotation of the exposed portion of the rotating parts. Rotation must agree with the rotation arrow on the motor. For all pumps, the standard rotation is counterclockwise when viewed from the suction end. Motor wiring is easily changed in the field. Observe the wiring diagram on the inside of the terminal box cover, or on the motor nameplate.
2. Check voltage, phase and frequency of line circuit with motor nameplate.
3. Check suction and discharge piping and pressure gauges for proper operation.
4. Assure that pump is full of liquid (primed).

Priming — If pump is installed with a positive head on the suction, prime by opening suction valve and allowing liquid to enter the casing, at the same time venting all air out of the top of the casing.

If pump is installed with a suction lift, priming must be done by other methods, such as foot valves, ejectors, or by manually filling casing and suction line.

CAUTION - DO NOT RUN PUMP DRY. Serious damage may result if started dry.

Starting — Proceed as follows to start pump:

1. Close drain valves and valve in discharge line.
2. Open fully all valves in the suction line.
3. Prime the pump. If pump does not prime properly, or loses prime during start-up, shut down and correct condition before repeating procedure.
4. For pumps moving high temperature liquids, open warm-up valve to circulate liquid for preheating. Close valve after pump has warmed up.
5. Start the motor (pump).

6. When pump is operating at full speed, open discharge valve slowly.

Running — Periodically inspect pump while running, but especially after first start and following repair.

1. Check pump and piping for leaks. Repair immediately.
2. Record pressure gauge readings for future reference.
3. Record voltage, amperage per phase, and kW (if an indicating wattmeter is available).
4. Adjust pump output capacity with discharge valve. DO NOT throttle suction line.

Freezing Protection — Protect pumps shut down during freezing conditions by one of the following methods:

1. Drain pump; remove all liquid from the casing.
2. Keep fluid moving in pump and insulate or heat the pump to prevent freezing. If heated, do not let temperature go above 100 to 150 degrees F.
3. Fill pump completely with antifreeze solution.

MAINTENANCE

Cleaning — Remove oil, dust, dirt, water, chemicals from exterior or motor and pump. Keep motor air inlet and outlet open. Blow out interior of open motors with clean compressed air at low pressure. Regularly drain moisture from TEFC motors.

Temperature — Total temperature, not the rise, is the measure of safe operation for a motor. If temperature by thermometer exceeds limits for insulation class, investigate and change operating conditions.

Labeled Motors — It is imperative for repair of a motor with Underwriters' Laboratories label that original clearances be held; that all plugs, screws, other hardware be fastened securely, and that parts replacements be exact duplicates or approved equals. Violation of any of the above invalidates Underwriters' label.

Lubrication — Pumps should require no maintenance, other than the motor bearings, according to the following instructions:

DOUBLE SHIELDED. When double shielded prelubricated bearings are furnished, no lubrication is required for the life of the bearings. Inspect bearings periodically to determine the condition of the grease and replace the bearings if necessary.

SINGLE SHIELDED W/GREASE FITTING PROVISIONS. When single shield bearings are furnished, periodic inspection, cleaning and relubrication is required. See motor manufacturer's specific instructions for lubrication.

MECHANICAL SEAL REPLACEMENT

J56 FRAME MOTOR

A.) Disassembly:

1. Turn off power.
2. Close suction and discharge valves.
3. Drain pump.
4. Remove bolts holding base to foundation
5. Remove casing bolts.
6. Remove motor and rotating element from casing, leaving casing and piping undisturbed.
7. Insert a screwdriver in one of the impeller waterway passages and back off the impeller nut as shown in Figure 1.
8. Remove motor shaft end cap. Insert a screwdriver in slot of motor shaft. While holding shaft against rotation, unscrew impeller from shaft by turning counterclockwise when facing impeller (Figure 2).
9. Pry off rotating member of mechanical seal from motor or stub shaft by using two (2) screwdrivers. (Figure 3)
10. Remove bolts holding adapter to motor and take off adapter.
11. Place adapter on a flat surface with case rabbet facing down, and push out stationary part of mechanical seal.

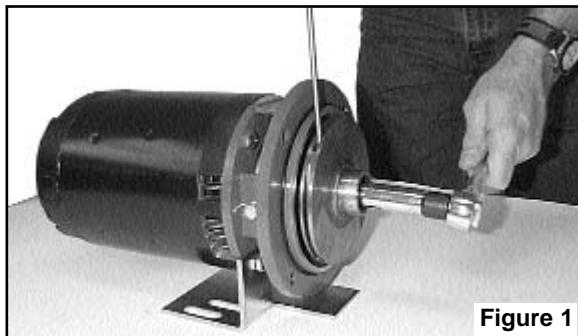


Figure 1

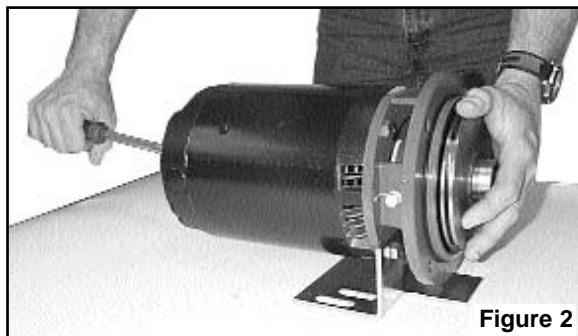


Figure 2

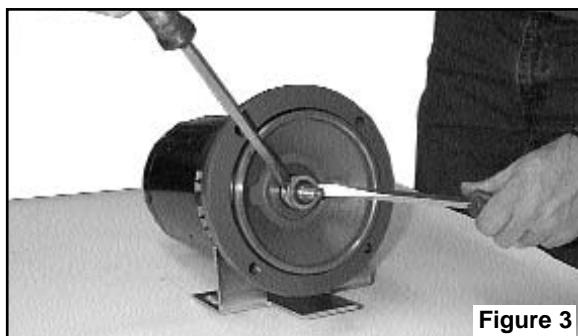


Figure 3

B.) Reassembly:

1. Clean gasket and flange faces, seal seat cavity and shaft, in particular shaft shoulder fitting against impeller.
2. Position the stationary seat with the silver dot down (away from you) and the lapped face (shiny side) facing you. Lubricate the seal seat cavity of the adapter and the rubber cup or O-ring of stationary seal seat with the lubricating fluid that comes with the mechanical seal or repair kit. Press the stationary seat in seal seat cavity of the adapter squarely and evenly using a arbor press (if possible) and the cardboard disc supplied with the seal. Be certain that the lapped face (shiny side) is facing you.
3. Remount the adapter on motor, making sure the motor shaft does not dislocate or chip the stationary seat of the seal.
4. Apply the lubricating fluid that comes with the mechanical seal or repair kit to the motor shaft and the rubber bellows of the rotary seal. Slide the seal head on the shaft, press the rubber drive band on the rotary head until the lapped face on the head seats firmly against the lapped face of the stationary seat. Do not chip or scratch faces during installation. Take extra care to make sure the lapped faces are clean. Install spring on seal head (only applies to Type 21 seal).
5. Hold shaft against rotation as described in paragraph 8 of disassembly procedure, and thread impeller on shaft until it is tight against the shaft shoulder. The impeller will compress the seal spring to the proper length assuring correct pressure on lapped faces.
6. Replace D-washer and impeller nut holding impeller against rotation as indicated in paragraph 7 of disassembly procedure (2 & 3 HP 1PH, and all 3PH motors only).
7. Remove any burrs caused by screwdriver on the vane of impeller in waterway passage.
8. Replace motor and rotating element in casing. Be sure that any damaged O-ring or gasket is replaced.
9. Tighten casing bolts alternately and evenly.
10. Replace hold-down bolts.
11. Check for free rotation after assembly is completed.
12. Replace motor shaft end cap.
13. Seal all drain openings using pipe sealant on threads.
14. Reprime before starting. Do not start until pump is completely filled with water.

MECHANICAL SEAL REPLACEMENT

C56 FRAME MOTOR, TYPE 6A SEAL

A.) Disassembly:

1. Follow paragraphs 1 - 6 of instructions for Mechanical Seal Replacement J56 frame.
2. Insert wrench between openings in adapter and place on flats of stub shaft. While holding shaft against rotation, remove the impeller retaining assembly using a 7/16 socket (Figure 4).

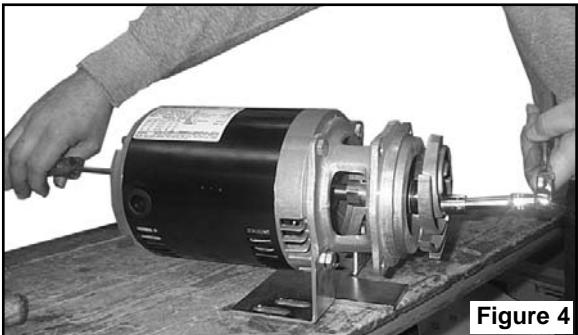


Figure 4

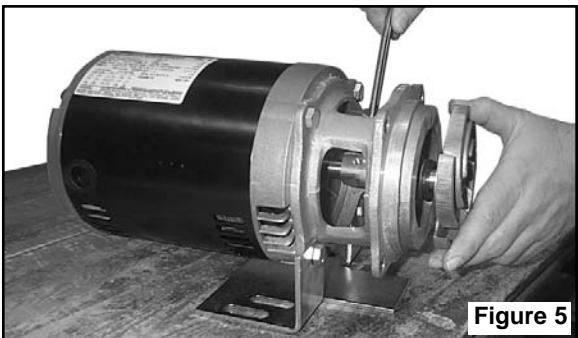


Figure 5

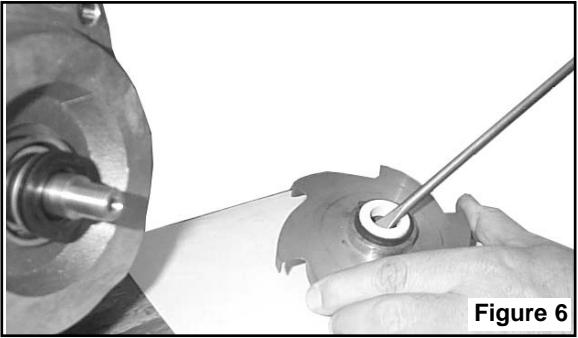


Figure 6

3. Leave the wrench on flats of stub shaft and unscrew the impeller by turning counterclockwise when facing the impeller (Figure 5).
4. The seal can now be removed from the impeller (Figure 6).
5. Remove cap screws holding adapter to the motor and remove adapter.
6. Place adapter on a flat surface with adapter rabbet facing down, and push out the mechanical seal head.

A.) Reassembly:

CAUTION: The mechanical seal is a precision product and should be handled

accordingly. Use care when handling lapped running surfaces of the mechanical seal to ensure they remain clean and are free of chips or scratches.

1. Clean gasket and flange faces, seal seat cavity, seal head bore and shaft, in particular shaft shoulder fitting against impeller.
2. Lubricate the seal seat cavity of the impeller and the rubber cup or O-ring of seal seat with the lubricating fluid that comes with the mechanical seal or repair kit. Press the stationary seat in seal seat cavity or the impeller squarely and evenly using a arbor press (if possible) and the cardboard disc supplied with the seal. Be certain that the lapped face (shiny side) is facing you.
3. Apply pipe sealant on outside of the stainless portion of the seal head to ease head into adapter. Press in the adapter on the stainless lip using a 3" long piece of 1 1/4" PVC pipe.
4. Hold shaft against rotation as discussed in paragraph 3 of disassembly procedure, and thread impeller on shaft until it is tight against the shaft shoulder. The impeller will compress the seal assuring proper pressure on the lapped faces.
5. Replace impeller retaining assembly holding impeller against rotation as indicated in paragraph 3 of disassembly procedure. (2 & 3 HP, 1PH and all 3PH motors only.)
6. Replace motor and rotating element in casing. Be sure that any damaged gasket is replaced.
7. Tighten case bolts alternately and evenly.
8. Replace hold-down bolts.
9. Check for free rotation after assembly is completed.
10. Seal all drain openings using pipe sealant on threads.
11. Reprime before starting. Do not start unit until pump is completely filled with water.

The approved lubricating fluid for seal installation is included with the mechanical seal or repair kit. DO NOT USE OTHER LUBRICATING LIQUIDS!

WE RECOMMEND STOCKING A SPARE MECHANICAL SEAL OR REPAIR KIT TO ELIMINATE DOWN TIME.

PRESSURE AND TEMPERATURE LIMITATION STANDARD FITTED PUMPS

| PUMP NO. | PRESSURE STANDARD | PRESSURE OPTIONAL | TEMPERATURE STANDARD | TEMPERATURE OPTIONAL |
|----------------------------------|-------------------|-------------------|----------------------|----------------------|
| 69 | 75 PSI | N/A | 220°F | 275°F |
| 51, 61, 74 | 75 PSI | 150 PSI | 220°F | 275°F |
| 77, 77, 78, 79, 82 | 75 PSI | N/A | 220°F | 275°F |
| 11, 12, 13, 16, 27, 60, 125, 126 | 75 PSI | 150 PSI | 220°F | 275°F |
| 62 | 165 PSI | 165 PSI | 220°F | 275°F |
| ALL OTHERS | 175 PSI | 175 PSI | 220°F | 275°F |
| N/A-NOT AVAILABLE | | | | |

CAUTION

DO NOT ALLOW EITHER THE DISCHARGE PRESSURE OR THE TEMPERATURE OF THE LIQUID TO EXCEED THE LIMITATIONS LISTED ABOVE.

SCOT MOTORPUMP™

C56 & JM FRAME
STRAIGHT CENTRIFUGAL
1.50" & 1.75" TYPE 21 MECHANICAL SEALS

● INSTALLATION ● OPERATION ● MAINTENANCE INCLUDES MECHANICAL SEAL REPLACEMENT

INSPECTION

Check pump for shortage and damage immediately upon arrival. Note damage or shortage on freight bill (bill of lading); immediately file claim with carrier.

EXTERIOR — Pay particular attention to conduit box, external hardware and accessories. Touch up abrasions or scratches with approved paint.

INTERNAL — If extensive or serious external damage is noted, if impeller is damaged (look in ports), or if shaft binds or sticks, disassemble as required to permit internal inspection.

HANDLING

Handle with care. Dropping or jarring can seriously damage motor bearings or break pump parts. Lift with device having capacity for pump weight, and use lifting hooks or eye bolts (if provided) or rig double sling around motor frame and pump casing. Do not use sling through pump motor adapter nor around suction and discharge flanges.

INSTALLATION

Location — Pump location should provide the following:

1. Install as close to suction supply as possible.
2. Shortest and most direct suction pipe practical. Suction lift must not exceed limit for pump. NPSH available must equal or exceed pump requirement.
3. Suction port below pumping level to provide priming.
4. Room for inspection and maintenance.
5. Correct power supply to motor; all wiring should meet National Electrical and Local Codes and Regulations.
6. If outdoors, protection from the elements, freezing and water damage due to flooding.

Piping — Suction and discharge gauges are useful to check pump operation and are excellent trouble indicators. Install gauges in the lines if pump ports do not have gauge taps. Observe these precautions when installing piping:

1. Support close to, but independently of pump.
2. Use the next larger pump size for suction and discharge.
3. Keep as straight as possible. Avoid bends and fittings.
4. Remove burrs, sharp edges, ream pipe cuts, and make joints air-tight.
5. Don't spring pipe to make connections. Strain must not be transmitted to pump.
6. Allow for pipe expansion with hot fluids; expansion joints are not recommended.

Suction — Size and install suction piping to keep pressure loss at minimum and to provide correct NPSH by observing the following:

1. The suction pipe should be equal in size or preferably one size larger than the suction connection of the pump. If pipe is larger than the pump suction, an eccentric pipe reducer should be used at the pump.
2. Pipe should slope upward to pump, even for horizontal run.
3. Use 45-degree or long-sweep 90-degree elbows.
4. A valve in the suction is necessary only on positive suction head installation and must not be used to throttle the pump. The suction valve should be installed for maintenance purposes only.

Discharge — Pumps permit discharge port location at any of four positions, 90 degrees apart. Change by removing cover bolts, rotate casing, and replace bolts. Do not slice O-ring or tear fibre gasket. Scot does not recommend bottom vertical discharge due to erratic pump performance. Ensure there is adequate clearance with selected position between wall or tank, motor conduit box, and grease fittings. Casing may extend beyond base or feet.

1. Short discharge lines may be the same size as the discharge port. Long runs require a pipe larger than the discharge port.
2. Long horizontal runs require a grade as even as possible. Avoid high spots and loops. Trapped air will throttle flow and may result in erratic pumping.

INSTALLATION, CONT.

3. Install check and gate valves in discharge line; check valve (if used) between pump and gate valve.

OPERATION

Pre-Start — Before initial start of the pump, check as follows:

1. The rotation must be checked upon installation. Close, then break the contacts quickly and observe the rotation of the exposed portion of the rotating parts. Rotation must agree with the rotation arrow on the motor. For all pumps, the standard rotation is counterclockwise when viewed from the suction end. Motor wiring is easily changed in the field. Observe the wiring diagram on the inside of the terminal box cover, or on the motor nameplate.
2. Check voltage, phase and frequency of line circuit with motor nameplate.
3. Check suction and discharge piping and pressure gauges for proper operation.
4. Assure that pump is full of liquid (primed).

Priming — If pump is installed with a positive head on the suction, prime by opening suction valve and allowing liquid to enter the casing, at the same time venting all air out of the top of the casing.

If pump is installed with a suction lift, priming must be done by other methods, such as foot valves, ejectors, or by manually filling casing and suction line.

CAUTION - DO NOT RUN PUMP DRY HOPING IT WILL SELF-PRIME. Serious damage may result if started dry.

Starting — Proceed as follows to start pump:

1. Close drain valves and valve in discharge line.
2. Open fully all valves in the suction line.
3. Prime the pump. If pump does not prime properly, or loses prime during start-up, shut down and correct condition before repeating procedure.
4. For pumps moving high temperature liquids, open warm-up valve to circulate liquid for preheating. Close valve after pump has warmed up.
5. Start the motor (pump).
6. When pump is operating at full speed, open discharge valve slowly.

Running — Periodically inspect pump while running, but especially after first start and following repair.

1. Check pump and piping for leaks.
Repair immediately.
2. Record pressure gauge readings for future reference.
3. Record voltage, amperage per phase, and kW (if an indicating wattmeter is available).
4. Adjust pump output capacity with discharge valve.
DO NOT throttle suction line.

Freezing Protection — Protect pumps shut down during freezing conditions by one of the following methods:

1. Drain pump; remove all liquid from the casing.
2. Keep fluid moving in pump and insulate or heat the pump to prevent freezing. If heated, do not let temperature go above 100 to 150 degrees F.
3. Fill pump completely with antifreeze solution.

MAINTENANCE

Cleaning — Remove oil, dust, dirt, water, chemicals from exterior or motor and pump. Keep motor air inlet and outlet open. Blow out interior of open motors with clean compressed air at low pressure. Regularly drain moisture from TEFC motors.

Temperature — Total temperature, not the rise, is the measure of safe operation for a motor. If temperature by thermometer exceeds limits for insulation class, investigate and change operating conditions.

Labeled Motors — It is imperative for repair of a motor with Underwriters' Laboratories label that original clearances be held; that all plugs, screws, other hardware be fastened securely, and that parts replacements be exact duplicates or approved equals. Violation of any of the above invalidates Underwriters' label.

Lubrication — Pumps should require no maintenance, other than the motor bearings, according to the following instructions:

DOUBLE SHIELDED. When double shielded prelubricated bearings are furnished, no lubrication is required for the life of the bearings. Inspect bearings periodically to determine the condition of the grease and replace the bearings if necessary.

SINGLE SHIELDED W/GREASE FITTING PROVISIONS. When single shielded bearings are furnished, periodic inspection, cleaning and relubrication is required. See motor manufacturer's specific instructions for lubrication.

MECHANICAL SEAL REPLACEMENT

JM FRAME MOTOR

A.) Disassembly:

1. Turn off power.
2. Close suction and discharge valves.
3. Drain pump.
4. Remove bolts holding base to foundation
5. Remove casing bolts.
6. Remove motor and rotating element from casing, leaving casing and piping undisturbed.
7. Insert a screwdriver in one of the impeller waterway passages and back off the impeller retaining assembly with a socket wrench, as shown in Figure 1.



Figure 1

8. Remove impeller from shaft, being careful not to lose the impeller key, spring and seal retainer. If impeller is difficult to remove, it may be necessary to use a bearing puller to pull off impeller.
9. Pry off rotating member of mechanical seal from sleeve by using two (2) screwdrivers. (Figure 2)

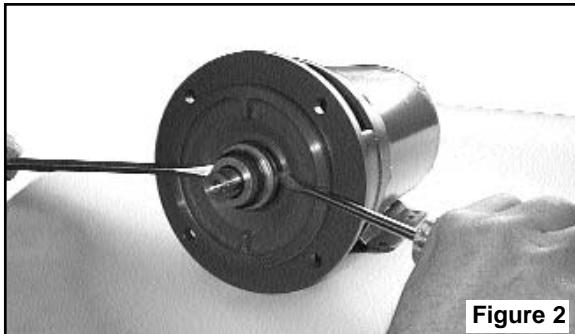


Figure 2

10. Remove bolts holding adapter to motor and take off adapter.
11. Place adapter on a flat surface with case rabbet facing down, and push out stationary part of mechanical seal.
12. Inspect the shaft sleeve, shaft O-ring and flinger. If damaged or worn, remove and replace with a new one.

B.) Reassembly:

CAUTION: The mechanical seal is a precision product and should be handled accordingly. Use care when handling the lapped running surfaces of the mechanical seal to ensure they remain clean and free of chips or scratches.

1. Clean gasket and flange faces, seal seat cavity, shaft sleeve, and motor shaft.
2. Position the stationary seat with the silver dot down (away from you) and the lapped face (shiny side) facing you. Lubricate the seal seat cavity of the adapter and the rubber cup or O-ring of seal seat with the lubricating fluid that comes with the mechanical seal or repair kit. Press the stationary seat in seal seat cavity of the adapter squarely and evenly using a arbor press (if possible) and the cardboard disc supplied with the seal. Be certain that the lapped face (shiny side) is facing you.
3. Install the flinger on the motor shaft until it bottoms on the motor shaft.
4. Slide the shaft O-ring on the motor shaft until it is tight against the flinger. Make sure that the shaft O-ring does not get damaged during this procedure.
5. Position shaft sleeve chamfer towards motor and slide on motor shaft.
6. With motor preferably in vertical position, remount the adapter on motor, making sure the motor shaft does not dislocate or chip the stationery seat of the seal.
7. Apply the lubricating fluid that comes with the mechanical seal or repair kit to the shaft sleeve and the rubber bellows of the rotary seal. Slide the seal head on the sleeve; press the rubber drive band on the rotary head until the lapped face on the head seats firmly against the lapped face of the

stationary seat. Do not chip or scratch faces during installation. Take extra care to make sure the lapped faces are clean. Install seal spring on seal head and retainer on spring.

8. Place key in key seat. Line up keyway in impeller with key on motor shaft, and slide impeller on motor shaft. Be certain that the key is positioned in the keyway of the motor and impeller. Slightly compress seal spring with impeller and hold impeller while installing impeller retaining assembly in motor shaft.
9. Insert a screwdriver in a waterway passage of the impeller holding it against rotation and tighten the retaining assembly as discussed in paragraph 7 of disassembly instructions. The impeller will compress the seal spring to the proper length assuring the correct pressure on the lapped surfaces.
10. Remove any burrs caused by screwdriver on the vane of impeller in waterway passage.
11. Slide motor and rotating element in casing. Be sure that any damaged O-ring or gasket is replaced.
12. Tighten casing bolts alternately and evenly.
13. Replace hold-down bolts.
14. Check for free rotation after assembly is completed.
15. Seal all drain openings using pipe sealant on threads.
16. Reprime before starting. Do not start until pump is completely filled with water.

MECHANICAL SEAL REPLACEMENT

C56 FRAME MOTOR

A.) Disassembly:

1. Refer to "JM FRAME" Disassembly, Notes 1-11.
12. Inspect the stub shaft. If damaged or worn, replace with a new one; removal:
 - A.) Drive pin from stub shaft and remove pin.
 - B.) Loosen set screws
 - C.) Remove stub shaft from motor shaft.

Assembly:

For motors with drilled hole:

- A.) Slide stub shaft on motor shaft. Line up set screws in stub shaft with motor keyway, and drilled hole in stub shaft with drilled hole in motor shaft.
- B.) Tighten set screws
- C.) Insert #12 drill in pilot hole of stub and motor shaft. Drill out opposite side of stub shaft.
- D.) Install pin

For motors without a drilled hole in the motor shaft:

- A.) Slide stub shaft on motor shaft. Line up set screws in stub shaft with keyway in motor shaft.
- B.) Position stub 3 3/32" from Motor C face. See Figure 1.
- C.) Tighten set screws
- D.) Insert #12 drill in stub shaft pilot hole and drill completely through motor shaft

and opposite side of stub shaft. See

Figure 2.

E.) Install pin

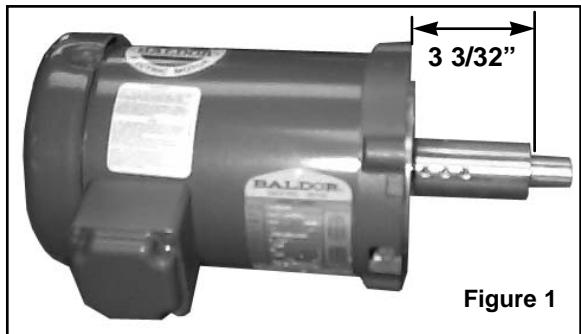


Figure 1

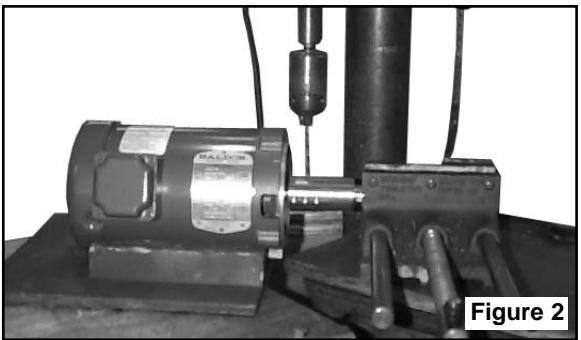


Figure 2

B.) Reassembly:

CAUTION: The mechanical seal is a precision product and should be handled accordingly. Use care when handling the lapped running surfaces of the mechanical seal to ensure they remain clean and free of chips or scratches.

1. Clean gasket and flange faces, seal seat cavity, and stub shaft.
2. Lubricate the seal seat cavity of the adapter and the rubber cup or O-ring of seal seat with the lubricating fluid that comes with the mechanical seal or repair kit. Press the stationary seat in seal seat cavity of the adapter squarely and evenly using a arbor press (if possible) and the cardboard disc supplied with the seal. Be certain that the lapped face (shiny side) is facing you.
3. With motor preferably in vertical position, remount the adapter on motor, making sure the stub shaft does not dislocate or chip the stationery seat of the seal.
4. Apply the lubricating fluid that comes with the mechanical seal or repair kit to the stub

shaft and the rubber bellows of the rotary seal. Slide the seal head on the stub; press the rubber drive band on the rotary head until the lapped face on the head seats firmly against the lapped face of the stationary seat. Do not chip or scratch faces during installation. Take extra care to make sure the lapped faces are clean. Install seal spring on seal head and retainer on spring.

5. Place key in key seat. Line up keyway in impeller with key on stub shaft, and slide impeller on stub shaft. Be certain that the key is positioned in the keyway of the stub and impeller. Slightly compress seal spring with impeller and hold impeller while installing impeller retaining assembly in stub shaft.
6. Insert a screwdriver in a waterway passage of the impeller holding it against rotation and tighten the retaining assembly as discussed in paragraph 7 of disassembly instructions for JM shaft. The impeller will compress the seal spring to the proper length assuring the correct pressure on the lapped surfaces.
7. Remove any burrs caused by screwdriver on the vane of impeller in waterway passage.
8. Slide motor and rotating element in casing. Be sure that any damaged O-ring or gasket is replaced.
9. Tighten casing bolts alternately and evenly.
10. Replace hold-down bolts.
11. Check for free rotation after assembly is completed.
12. Seal all drain openings using pipe sealant on threads.
13. Reprime before starting. Do not start until pump is completely filled with water.

The approved lubricating fluid for seal installation is included with the mechanical seal or repair kit. DO NOT USE OTHER LUBRICATING LIQUIDS!

WE RECOMMEND STOCKING A SPARE MECHANICAL SEAL OR REPAIR KIT TO ELIMINATE DOWN TIME.

**PRESSURE AND TEMPERATURE LIMITATION
STANDARD FITTED PUMPS**

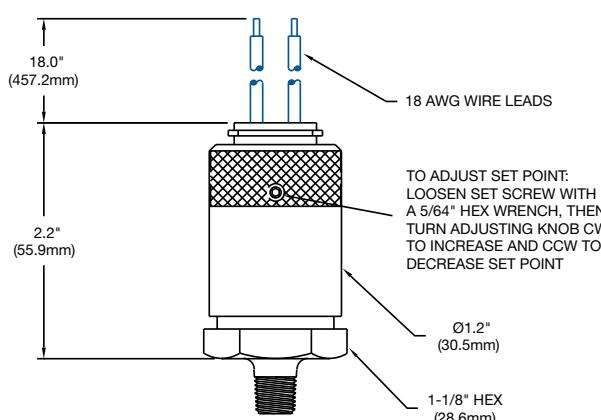
| PUMP NO. | PRESSURE STANDARD | PRESSURE OPTIONAL | TEMPERATURE STANDARD | TEMPERATURE OPTIONAL |
|----------------------------------|-------------------|-------------------|----------------------|----------------------|
| 69 | 75 PSI | N/A | 220°F | 275°F |
| 51, 61, 74 | 75 PSI | 150 PSI | 220°F | 275°F |
| 77, 82 | 75 PSI | N/A | 220°F | 275°F |
| 11, 12, 13, 16, 27, 60, 125, 126 | 75 PSI | 150 PSI | 220°F | 275°F |
| 62 | 165 PSI | 165 PSI | 220°F | 275°F |
| ALL OTHERS | 175 PSI | 175 PSI | 220°F | 275°F |
| N/A-NOT AVAILABLE | | | | |

CAUTION

DO NOT ALLOW EITHER THE DISCHARGE PRESSURE OR THE TEMPERATURE OF THE LIQUID TO EXCEED THE LIMITATIONS LISTED ABOVE.



(See Electrical Options Below)



Shown with HM electrical option

cRus **CE** **RoHS**

Features

- Long-life elastomer diaphragm
- High-quality snap-action switch
- Field adjustable
- Compact design
- Easily customized
- Quick delivery
- NEMA 4, 13

Operating Specifications

| | | |
|-----------------------------------|---|--------------------------|
| Set Point Range | 3 — 120 PSI | (.21 — 8.3 Bar) |
| Set Point Tolerance | ±1 PSI or 5% | (.07 Bar) |
| Maximum Operating Pressure | 250 PSI | (17 Bar) |
| Proof Pressure | 750 PSI | (51 Bar) |
| Differential | 10 — 20% | |
| Current Rating | 3 A @ 125 VAC | 2 A @ 30 VDC (Resistive) |
| Media Connection | Standard: Brass (<i>Optional: Aluminum, Nickel Plating, Delrin, 303 SS, 316 SS</i>) | |
| Circuit Form | SPST-NO, SPST-NC or SPDT | |
| Electrical Connection | See Order Chart Below for Options | |
| Diaphragm Material | Buna N | |
| Cycle Life | 1 Million | |

How to Order (Example: Part Number: CJ - 1B3 - 60J / WL)

| CJ | | - | 1 | B | 3 | - | 6 | 0 | J | / | WL |
|---|-----------|----|----------------|---|---|---|---|---|---|---|----|
| Media Connection | | | | | | | | | | | |
| 1 1/4" NPT Male | A SPST-NO | 1 | 3 — 10 PSI | | | | | | | | |
| 2 1/8" NPT Male | B SPST-NC | 2 | 6 — 30 PSI | | | | | | | | |
| 6 7/16" SAE O-Ring (-4) | C SPDT | 3 | 20 — 120 PSI | | | | | | | | |
| 12 M10 x 1 SAE J2244-3 | | 4* | 100 — 400 PSI | | | | | | | | |
| 17 1/4" BSPP Male | | 5* | 500 — 1500 PSI | | | | | | | | |
| 28 1/8" BSPP Male | | | | | | | | | | | |
| * Not yet UL recognized | | | | | | | | | | | |
| Circuit Form | | | | | | | | | | | |
| Range | | | | | | | | | | | |
| Desired Set Point | | | | | | | | | | | |
| Set Point Direction | | | | | | | | | | | |
| Electrical Options | | | | | | | | | | | |
| WL Wire Leads 18" | | | | | | | | | | | |
| WP Weather Pack | | | | | | | | | | | |
| HM 9.4mm DIN | | | | | | | | | | | |
| MP Metri-Pack | | | | | | | | | | | |
| AU Gold Plate/Alloy for low currents | | | | | | | | | | | |

For more **media connections**,
see pages 23-24.

For all available **optional configurations**,
see page 22.

For more **electrical connections**,
see page 7.

FWL-2 Pressure-Only Relief Valve

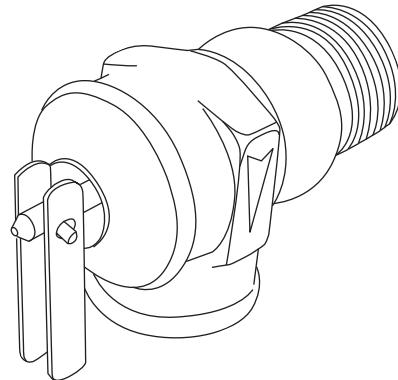
DESCRIPTION

The Cash Acme FWL-2 is a pressure only relief valve designed specifically for the protection of hot water supply systems where over-pressure conditions are likely to occur as a result of thermal expansion.

Completely automatic, the FWL-2 reseats after pressure relief. The valve may be installed directly on the tank or in a tee and is appropriate for either side (hot or cold) of the water heater.

The **Cash Acme FWL-2** is compact and economical. It is available in 1/2" and 3/4" sizes with a male inlet and female outlet. The standard factory relief settings for 1/2" and 3/4" are 75, 125 or 150 psi.

The **Cash Acme FWL-2** is fitted with a bronze body and has brass and stainless steel internal parts, a silicone seat disc and a stainless steel pressure spring.



FEATURES AND BENEFITS

Specifically for the protection of hot water supply systems:

Offers protection from over-pressure conditions that are likely to occur as a result of thermal expansion.

Compact and economical:

Saves space and money!

Every valve is tested for performance prior to shipping:

Specify and install with confidence!

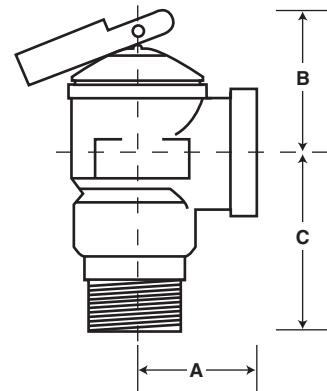
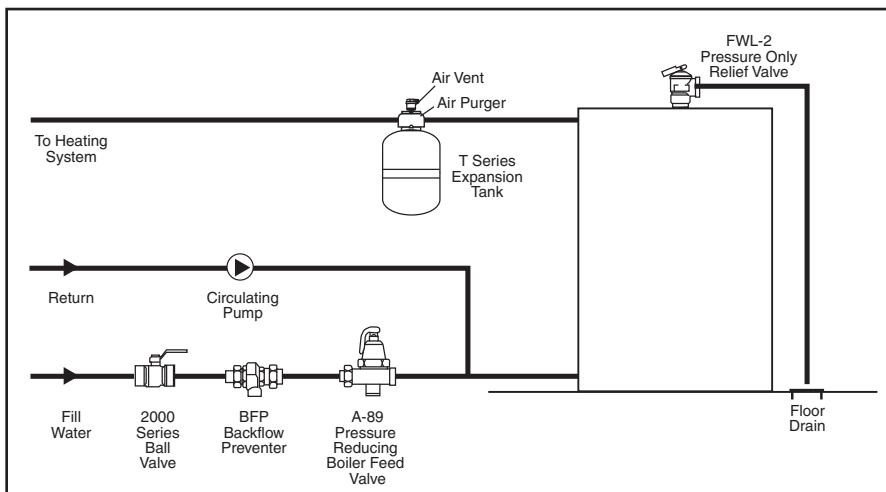
SPECIFICATION

A pressure only relief valve shall be installed to protect the system. The valve shall be ASME listed* and CGA design certified per ANSI Z21.22 and CSA 4.4. The valve shall be a **Cash Acme FWL-2 Pressure-Only Relief Valve**.

*3/4" only.

FWL-2 Pressure-Only Relief Valve

TYPICAL INSTALLATION



| Dimensions | A | B | C |
|------------|--------|---------|----------|
| 1/2" | 1-1/8" | 1-9/16" | 1-13/16" |
| 3/4" | 1-1/4" | 1 9/16" | 1-13/16" |

SPECIFICATION DATA

Performance:

Set pressures 75, 125 and 150 psi
 Service Water

Materials:

Body Bronze
 Internal Parts Brass and stainless steel
 Seat Disc Silicone
 Pressure Spring Stainless steel

CONNECTIONS

Threaded (NPT) Male inlet and female outlet

CERTIFICATIONS

The **Cash Acme FWL-2** is design certified per **ANSI Z21.22** and **CSA 4.4** and is listed by **CSA**. (1/2" size rated to 15,000 btu/hr. and 3/4" size rated to 200,000 btu/hr.)

The **Cash Acme 3/4" FWL-2 Relief Valve** is **ASME listed** and rated at 125 psi and 150 psi rated at 500,000 btu/hr.

Note: Sizes with 75 psi set pressure are not rated.



HOW TO TROUBLESHOOT ASCO® Red-Hat® and Red-Hat II® Solenoid Valves

Because there are so many potential reasons for solenoid valves to malfunction, they are often thought to be complex, trouble-prone devices. Actually, they are quite simple and very reliable. Many of the problems originate outside the valves themselves, while others are caused by misapplication or improper installation.

Troubleshooting should begin with a check of the voltage and pressure input. The problem may be caused by an inoperative control relay or a fluctuating pressure regulator. If voltage and pressure check out, look to the valve. The main reasons a direct-acting solenoid valve fails to operate include:

- Low or no voltage
- Burned-out solenoid
- Pressure higher than the valve's rating
- Foreign matter in the valve
- Binding core or damaged core tube

To operate properly, a solenoid valve core must move within the core tube and contact the plugnut when the coil is energized. You should hear a sharp metallic click at energization. Absence of the click usually indicates an electrical problem. For most valves, voltage applied to the coil must be at least 85% of the nameplate voltage rating.

If the valve coil is receiving the proper voltage, absence of a click may mean that the line pressure is higher than the valve's rating. Check that next.

If line pressure is OK, foreign matter may be preventing the core from moving in the core tube. Core movement can also be restricted if the top of the

core has been peened over by millions of operations, if the disc is swollen or cut, or if the core itself has been damaged.

A pilot-operated valve might fail to operate when energized even though a click has been heard. A no-flow condition may be caused by:

- Insufficient pressure drop across the valve
- Ruptured diaphragm or damaged piston ring
- Plugged or restricted pilot orifice

Both pilot-operated and direct-acting valves can fail to operate when de-energized because of:

- Faulty control circuit
- Scale or other foreign matter in the valve
- Binding core or damaged core tube
- Broken spring

Pilot-operated valves may also malfunction when de-energized due to:

- Plugged bleed orifice
- Damaged pilot seat or disc
- Damaged diaphragm or piston
- Insufficient pressure drop across the valve

Excessive solenoid noise (hum or chatter) can be caused by:

- Low voltage
- Faulty relay or improper electrical control signal
- Loose solenoid parts
- Foreign matter on core or plugnut face
- Worn core or plugnut face
- Damaged spring
- Excessive system pressure

When troubleshooting 4 way valves controlling cylinders, it is important to follow the instructions provided with the valve. Some 4 way valves require an oil-mist lubricator for proper operation. Pilot-activated 4 way valves normally require full-size piping for pressure inlet and exhaust. In some of these valves, restrictive speed control devices should be installed in the cylinder connections.

Because faulty cylinder operation is often caused by the cylinder itself, it should be checked for:

- Misalignment between the piston rod and connected load
- Lack of lubrication
- Worn and leaking piston cups which allow fluid to exhaust through the valve
- Foreign matter in the speed controls
- System overloading, low line pressure, or undersized hoses or fittings

If the problem does not appear to be in the cylinder, the valve should be checked.

TROUBLESHOOTING GUIDE

| Problem | Possible Cause | Probable Solution |
|---|--|---|
| Valve will not operate when valve circuit is energized (direct-acting valve) | Low voltage or no voltage to solenoid coil | Check voltage at coil; for most valves, voltage should be at least 85 percent of nameplate rating. |
| | Burned out coil | See "Coil Failure" below. |
| | Excessive foreign matter jamming core in core tube | Clean valve; install strainer close to valve inlet. |
| | Binding core or damaged core tube | Replace parts. |
| | Excessive fluid pressure | Reduced pressure to valve nameplate pressure rating or install suitable valve. |
| Valve will not operate when valve circuit is energized (pilot-operated valve) | Same causes and solutions as for direct-acting valve, plus: | |
| | Low pressure drop across valve | Valve might be oversized; replace valve with one having a smaller orifice. Increase pressure, if possible. |
| | Ruptured diaphragm or piston ring | Replace damaged parts. |
| | Plugged or restricted pilot orifice | Clean valve and pilot orifice. |
| Valve will not close or shift when valve circuit is de-energized (direct-acting valve) | Coil not de-energized | Check electrical control circuit. |
| | Excessive foreign matter jamming core in core tube | Clean valve; install strainer close to valve inlet. |
| | Damaged disc or seat causing internal leakage | Replace with new parts. |
| | Binding core or damaged core tube | |
| | Damaged spring | Replace with new spring. Never elongate or shorten spring. |
| Valve will not close or shift when valve circuit is de-energized (pilot-operated valve) | Same causes and solutions as for direct-acting valve, plus: | |
| | Plugged bleed orifice | Clean orifice. |
| | Damaged pilot seat or pilot disc | Replace with new parts. |
| | Damaged diaphragm or piston | |
| | Damaged pilot spring | Replace with new spring. Never elongate or shorten spring. |
| Wire drawing | Insufficient pressure drop across the valve | Valve might be oversized; replace valve with one having a smaller orifice. Increase pressure, if possible. |
| | Dirt or foreign matter is lodged on seat | Replace valve body or install new valve; install suitable strainer close to inlet of valve. |
| Coil failure * | Overvoltage | Check voltage at coil; voltage must conform to nameplate rating. |
| | Damaged core or core tube causing inrush current to be drawn continuously | Check for damaged core and core tube, or damaged spring. Check for scale or foreign matter on the core or inside the core tube. Clean thoroughly and replace any damaged parts. |
| | Excessive foreign matter jamming core in core tube and causing inrush current to be drawn continuously | |
| | Excessive fluid pressure causing inrush current to be drawn continuously | Reduce pressure or install suitable valve. |
| | Excessive ambient or fluid temperature | Class A coils are limited to ambient temperatures of 77° F. For temperature up to 167° F, use Class F coils; for temperatures up to 212° F, use Class H. |
| | Missing solenoid parts | Install missing solenoid housing and other metal parts or properly install incorrectly assembled metal parts. The housing and other metal parts form part of the magnetic circuit and are required to provide the impedance needed to limit current draw. |
| | Moisture inside solenoid enclosure | Waterproof the entrance conduit to prevent entry of moisture. If valve is mounted outdoors, check to see that enclosure is weatherproof and that gaskets are in good condition; use appropriate sealant where required. If general-purpose enclosure is used in a damp or humid atmosphere, use watertight, molded coils. |

* In Red-Hat II Explosionproof solenoids, a binding core, high-input voltage, or excessive ambient or fluid temperature may cause the solenoid's non-resettable thermal fuse to open. If this occurs, the solenoid must be replaced.

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.V5256R9

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 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 "I" 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.



MM

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Page 1 of 4

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 "I" 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 death, serious 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 death, serious 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.

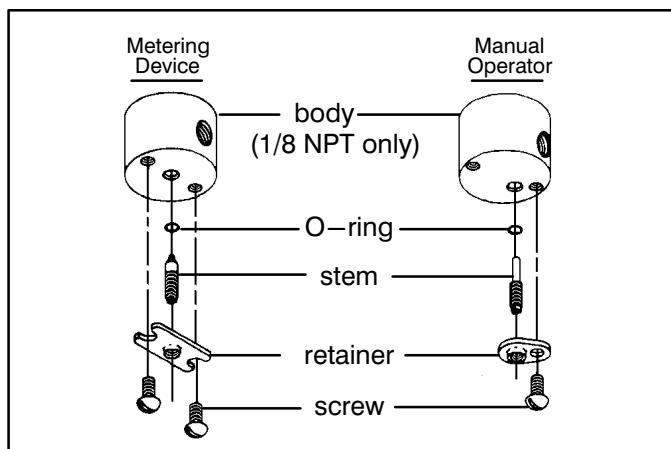


Figure 1. Metering and manual operator constructions.

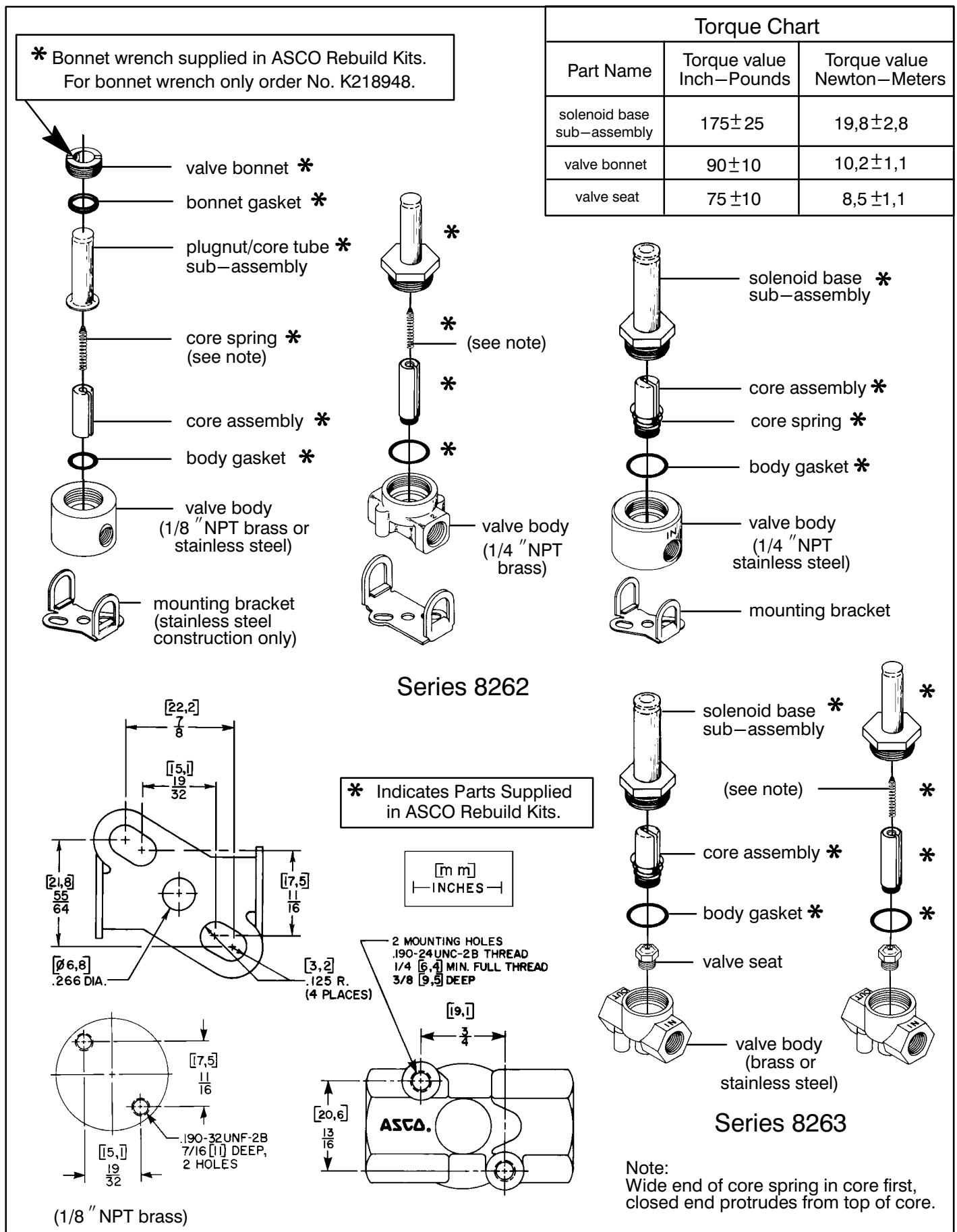


Figure 2. Series 8262 and 8263, normally closed construction.

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.

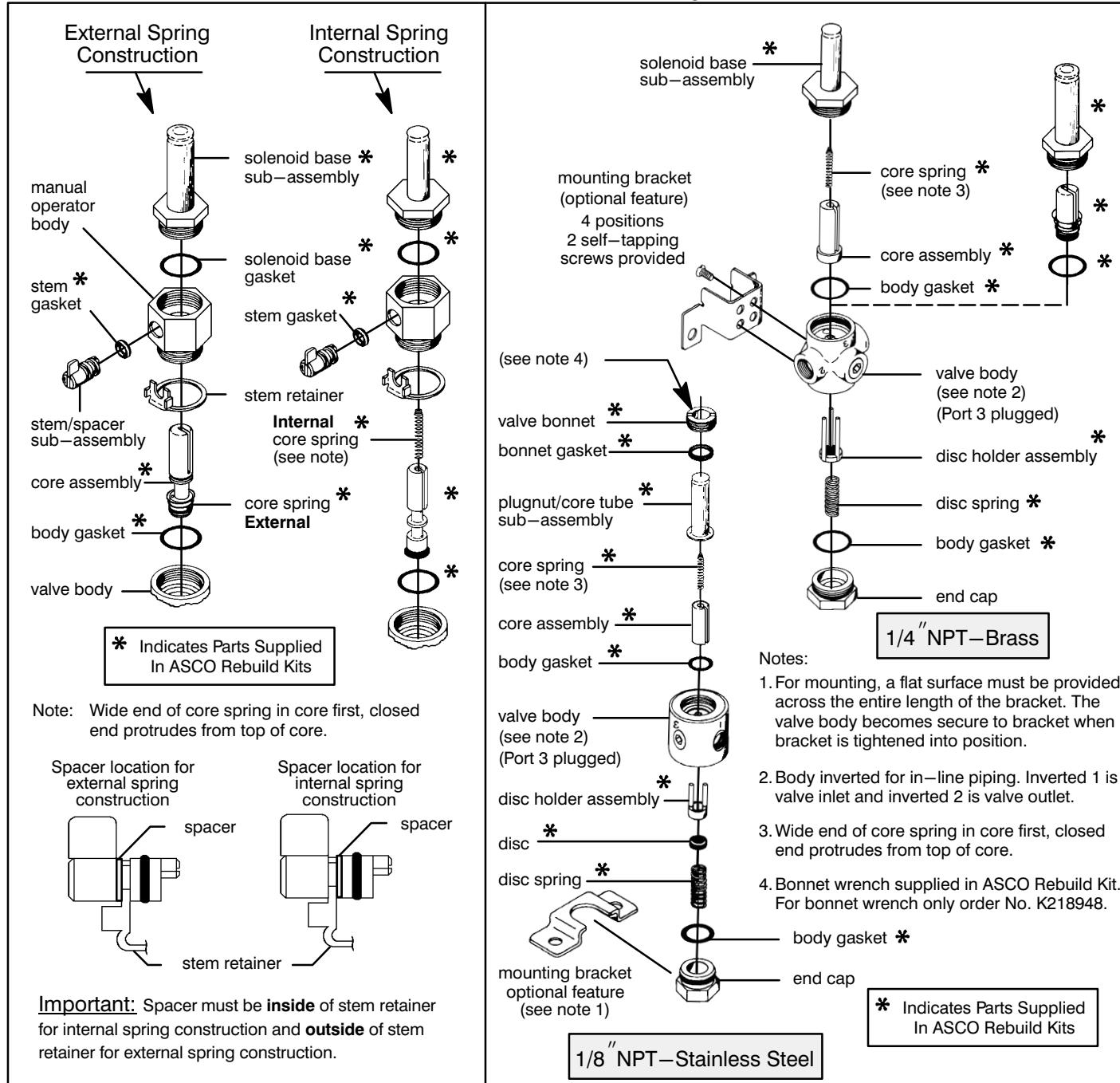


Figure 3. Stem/lever type manual operators

Figure 4. Series 8262, normally open construction.

Installation & Maintenance Instructions

2-WAY DIRECT-ACTING SOLENOID VALVES
REVISION "H" & "R"

NORMALLY OPEN OR NORMALLY CLOSED OPERATION
BRASS OR STAINLESS STEEL CONSTRUCTION – 1/8", 1/4", OR 3/8" PIPE THREADS

SERIES

8262

8263

I&M No.V9575R3
(Section 1 of 2)

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 watertight/explosionproof solenoid enclosure.

OPERATION

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

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

IMPORTANT: No minimum operating pressure required.

Manual Operation (Valves with Suffix MS)

Manual operator allows manual operation when desired or during an electrical power outage.

To engage manual operator, rotate stem on the side of the body clockwise until it hits a stop, approximately 90° from its original position. Do NOT rotate beyond stops. Do NOT apply excessive force beyond stops. Valve will now be in the same position as when the solenoid is energized. To disengage, rotate stem counterclockwise until it hits a stop, approximately 90° from its original position. Do NOT rotate beyond stops. Do NOT apply excessive force beyond stops.

MS option is not available on valves that have a pressure rating greater than 750 PSI.

⚠ CAUTION: Do NOT rotate beyond 90° stops. Do NOT apply excessive force beyond stops. Rotating beyond the 90° stops could result to equipment damage.

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

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". (see Figure 1)

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 the following tables. Use catalog number, coil prefix, suffix, and watt rating on nameplate to identify the maximum ambient and fluid temperatures.

NOTE: The following Temperature Limitations Tables do not apply to Magnetic Latch Valves: Catalog Numbers 8262A610 to 8262A627; 8263A615 to 8263A618, and 8263A624 to 8263A627. See separate Instruction Manual.

Max. Ambient Temperature Limitations for AC and DC Coil Valves, Catalog Numbers 8262H/R & 8263H/R

| Prefix ^① | Coil Class | Wattage Ratings | | | Max. Ambient Temperature | |
|---------------------|------------|-----------------|-------------|------------|--------------------------|------------------|
| | | AC 60 Hz | AC 50 Hz | DC | (°C) | (°F) |
| EF, EV | FT | 6.1, 10.1 | 8.1, 10.1 | — | — | 52 |
| EF, EV | FB | 9.1, 17.1 | 11.1, 17.1 | — | — | 125 |
| | FT | 6.1, 10.1 | 8.1, 10.1 | — | — | 55 |
| | FB | 9.1, 17.1 | 11.1, 17.1 | — | — | 131 |
| | HT | — | — | 10.6, 11.6 | — | — |
| | HB | — | — | 22.6, 18.6 | — | — |
| EF, EV | HT | — | — | 10.6, 11.6 | 40 ^② | 104 ^② |
| EF, EV | HB | — | — | 22.6, 18.6 | — | — |
| | HT | 6.1, 10.1 | 8.1, 10.1 | — | — | — |
| | HB | 9.1, 17.1 | 11.1, 17.1 | — | — | — |
| EF, EV | HT | 6.1, 10.1 | 8.1, 10.1 | — | — | 60 |
| EF, EV | HB | 9.1, 17.1 | 11.1, 17.1 | — | — | — |
| | — | 2 | 2 | 2 | — | 140 |

Max. Fluid Temperature Limitations for AC and DC Coil Valves, Catalog Numbers 8262H/R & 8263H/R

| Valve Elastomer/ Suffix | Coil Class | Wattage Ratings | | | Max. Fluid Temperature (Air, Water & Oil) | |
|----------------------------|-------------------------|-------------------------------|--------------------------------|---------------------------------|--|------------------|
| | | AC 60 Hz | AC 50 Hz | DC | (°C) | (°F) |
| UR/None ^④ | | | | | 60 | 140 |
| NBR/None ^④ | | | | | 82 | 180 |
| CR/J | FT, FB, HT, HB | 6.1, 10.1, 9.1, 17.1, 2 | 8.1, 10.1, 11.1, 17.1, 2 | 10.6, 11.6, 18.6, 22.6, 2 | 75 | 167 |
| Lt-Nitrile/A | | | | | 99 | 210 |
| EPDM/E | | | | | | |
| | FT | 6.1, 10.1 | 8.1, 10.1 | — | | |
| | FB | 9.1, 17.1 | 11.1, 17.1 | — | | |
| | HT with EF EV prefix | 6.1, 10.1 | 8.1, 10.1 | 10.6, 11.6 | 99 ^③ | 210 ^③ |
| | HB with EF EV prefix | 9.1, 17.1 | 11.1, 17.1 | 18.6, 22.6 | | |
| | HT | 6.1, 10.1 | 8.1, 10.1 | 10.6, 11.6 | | |
| | HB | 9.1, 17.1 | 11.1, 17.1 | 18.6, 22.6 | 121 ^③ | 250 ^③ |
| | — | 2 | 2 | 2 | | |

^①=EF, EV data applies to Explosionproof coils only.

^②=DC solenoid valves can be operated at maximum ambient temperature of 55°C / 131°F with reduced pressure ratings. See page 5 of 5, Section 2 of 2 for maximum operating pressure differential.

^③=Solenoid coils with prefix EF & EV are limited to a maximum fluid temperature of 99°C/210°F.

^④=Urethane (UR) elastomer applies to catalog numbers 8262H096, 8262H106, 8262H173, 8262H180, 8262H079, 8262H089, 8262H099, 8262H107, 8262H200, 8262H175, 8262H176, 8262H181, 8262H214, 8262R107 & 8262R181 only. Catalog numbers other than those listed above, with no material suffix, use NBR elastomer.

Positioning

These valves are 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.

Mounting

Two (2) M5 threaded holes are provided in the valve body for mounting. (See Figure 1)

Optional mounting bracket can be obtained with valve as Suffix MB or separately as a kit.

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 death, serious 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.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up, or other conditions that could impede solenoid valve shifting are possible. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- 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

- 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 (see Figures 2, 3 & 4)

- Disassemble valve using exploded views for identification of parts.
- Remove solenoid, see separate instructions.
- Unscrew solenoid base sub-assembly with wrench. Remove core assembly, core spring, and solenoid base gasket from valve body.

- For normally open construction (Figure 4) remove spring, and disc holder assembly.

- All parts are now accessible to clean or replace. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Reassembly

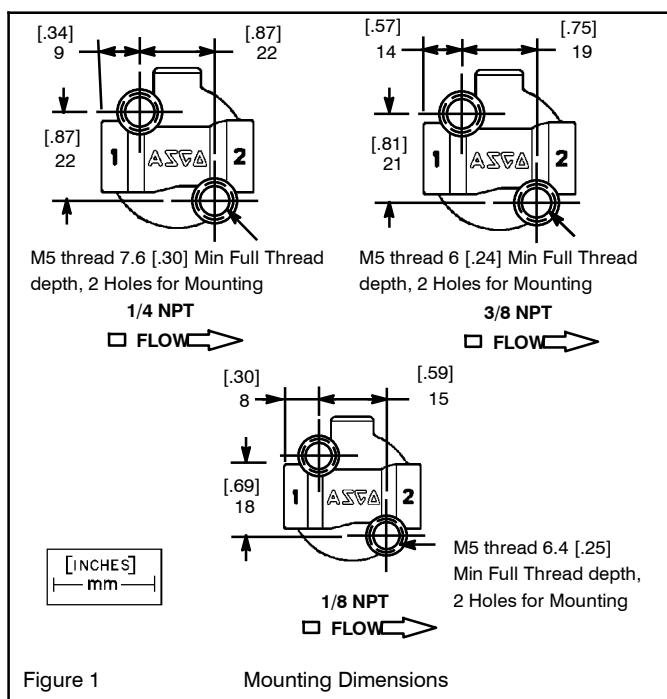
- Use exploded views for identification, orientation and placement of parts.
- Lubricate all gaskets with DOW CORNING® 200 Compound lubricant or an equivalent high-grade silicone oil.
- For normally open construction (Figure 4), install disc holder assembly and disc holder spring.
- Replace solenoid base gasket, core assembly with core spring and solenoid base sub-assembly. 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. (see Figure 2)
- Torque solenoid base sub-assembly to 175 ± 25 in-lbs [19.8 \pm 2.8 Nm].
- Install solenoid. See separate solenoid instructions. Then make electrical hookup to solenoid.

⚠ WARNING: To prevent the possibility of death, serious 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.

- Restore line pressure and electrical power supply to valve.
- 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

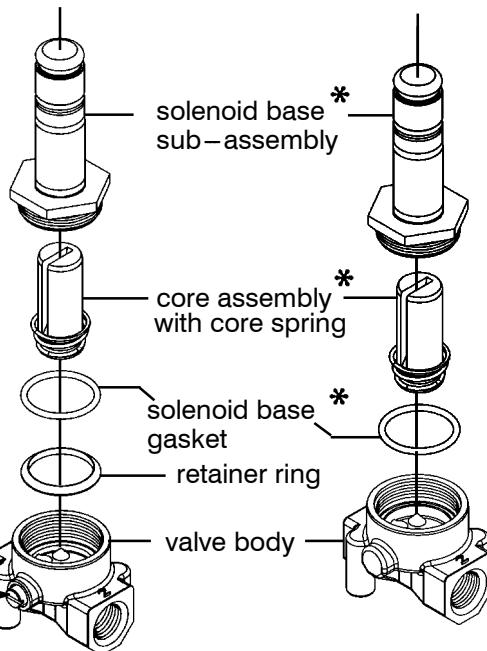
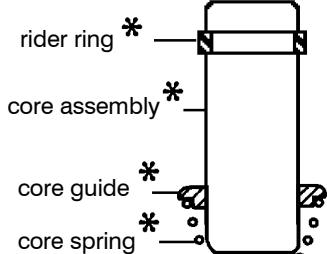
Parts marked with an asterisk (*) in the exploded views in Figure 2 & 3 are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the quantity of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.



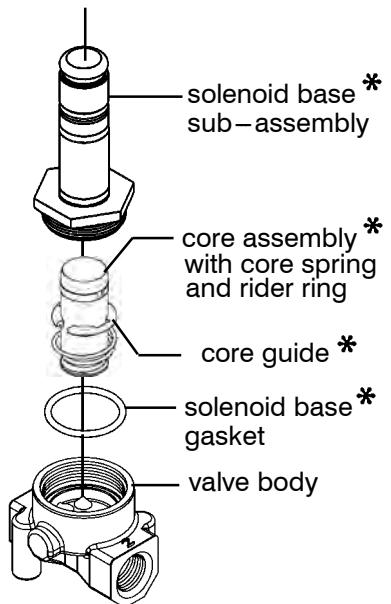
Partial cutaway view showing positioning of rider ring, core guide, and core spring on core assembly.

Torque Chart

| Part Name | Torque value Inch-Pounds | Torque value Newton-Meters |
|----------------------------|-----------------------------|-------------------------------|
| solenoid base sub-assembly | 175 ± 25 | $19,8 \pm 2,8$ |



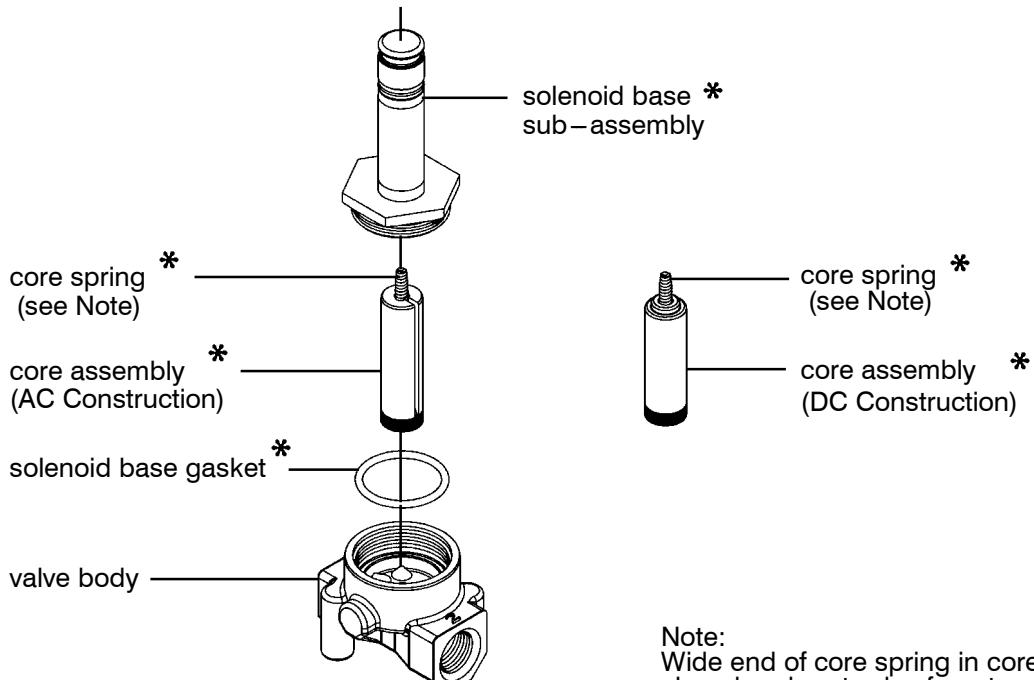
With Manual Operator



Suffix "P"

External Spring Construction

* Indicates Parts Supplied in ASCO Rebuild Kits.



Internal Spring Construction

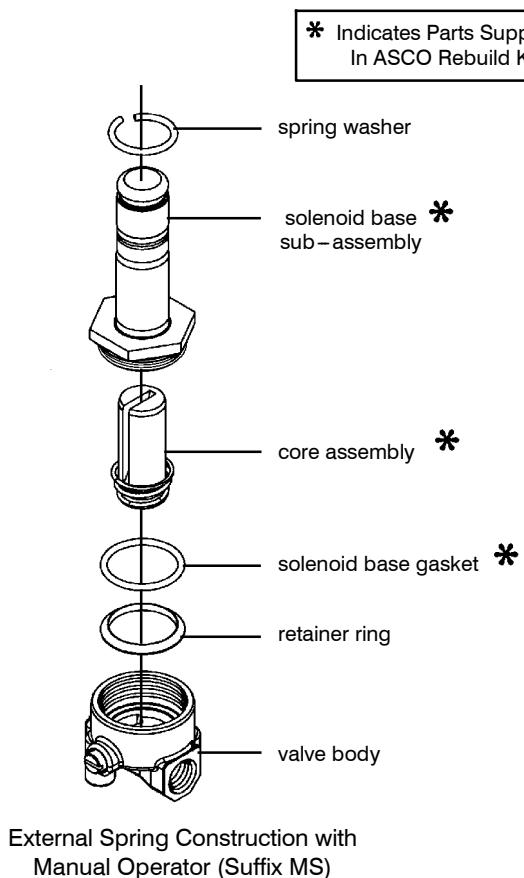
Note:
Wide end of core spring in core first,
closed end protrudes from top of core.

Figure 2. Normally Closed Construction

Disassembly and Reassembly of Manual Operator (Refer to Figure 3)

1. Position core assembly with core spring attached into base of manual operator body.
2. Insure retaining ring is properly located in valve body.

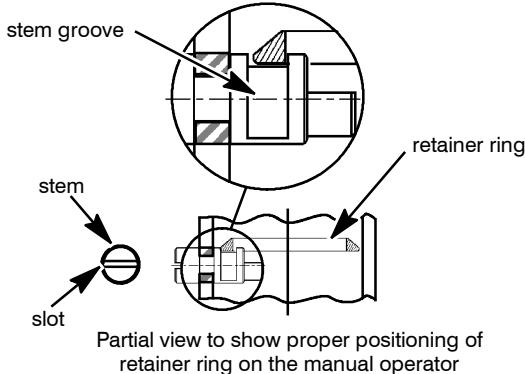
3. Replace solenoid base gasket and solenoid base sub-assembly into valve body. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm].
4. Check manual operator for proper operation. Turn stem clockwise and counterclockwise; stem should turn freely without binding.



External Spring Construction with
Manual Operator (Suffix MS)

IMPORTANT

Flat portion of stem must face upwards when reinstalled into body and retainer must be installed with flat side down to engage the groove in stem.

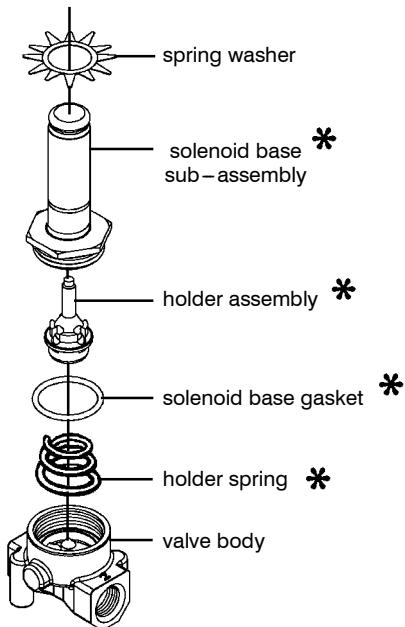


Partial view to show proper positioning of
retainer ring on the manual operator

Notes:

1. Position manual operator at 0° (slot in the stem is in horizontal position).
2. Reinstall retainer ring on body and lock retainer into the stem groove for proper engagement.
3. Position core assembly with core spring into base of valve body.
4. Replace solenoid base gasket in valve body. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm]
5. Check operation of manual operator

Figure 3. manual operator



| Torque Chart | | |
|----------------------------|-----------------------------|-------------------------------|
| Part Name | Torque value inch-pounds | Torque value Newton-Meters |
| solenoid base sub-assembly | 175 ± 25 | $19,8 \pm 2,8$ |

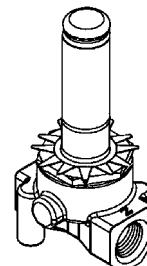


Figure 4. Series 8262 & 8263, normally open constructions

Installation & Maintenance Instructions

2-WAY DIRECT-ACTING SOLENOID VALVES

REVISION "H" & "R"

NORMALLY OPEN OR NORMALLY CLOSED OPERATION

BRASS OR STAINLESS STEEL CONSTRUCTION - 1/8", 1/4", OR 3/8" PIPE THREADS

SERIES

8262

8263

I&M No.V9575R3
(Section 2 of 2)

NOTICE: See Installation and Maintenance Instructions, I&M No. V9575R3 – Section 1 of 2 for detailed instructions.

MAXIMUM OPERATING PRESSURE DIFFERENTIAL FOR DC VALVES ONLY

| Maximum Operating Pressure Differential For Catalog Numbers 8262H & 8263H DC Valves | | | | | | |
|---|-------------------------|-------------|-------------------------|---------------------|-------------|-------------------|
| | At Maximum 40°C Ambient | | At Maximum 55°C Ambient | | | |
| | Air-Inert Gas [PSI] | Water [PSI] | Oil [PSI] 300 ssu | Air-Inert Gas [PSI] | Water [PSI] | Oil [PSI] 300 ssu |
| 8262H001 | 750 | 640 | 550 | 750 | 600 | 500 |
| 8262H002 | 130 | 110 | 95 | 120 | 100 | 90 |
| 8262H006 | 130 | 110 | 95 | 120 | 100 | 90 |
| 8262H007 | 130 | 110 | 90 | 120 | 100 | 85 |
| 8262H011 | 295 | 210 | 205 | 285 | 200 | 195 |
| 8262H012 | 750 | 640 | 550 | 750 | 600 | 500 |
| 8262H013 | 38 | 33 | 31 | 35 | 30 | 28 |
| 8262H014 | 235 | 160 | 160 | 215 | 150 | 145 |
| 8262H015 | 235 | 160 | 160 | 215 | 150 | 145 |
| 8262H016 | 165 | 130 | 130 | 155 | 120 | 120 |
| 8262H019 | 750 | 640 | 550 | 750 | 600 | 500 |
| 8262H020 | 235 | 160 | 160 | 215 | 150 | 145 |
| 8262H021 | 295 | 210 | 205 | 285 | 200 | 195 |
| 8262H022 | 130 | 110 | 90 | 120 | 100 | 85 |
| 8262H023 | 165 | 130 | 120 | 155 | 120 | 115 |
| 8262H036 | 38 | 33 | 31 | 35 | 30 | 28 |
| 8262H038 | 27 | 23 | 21 | 24 | 22 | 20 |
| 8262H079 | 965 | 745 | 720 | 920 | 700 | 675 |
| 8262H080 | 750 | 640 | 550 | 750 | 600 | 500 |
| 8262H086 | 235 | 160 | 160 | 215 | 150 | 145 |
| 8262H089 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| 8262H090 | 27 | 23 | 21 | 24 | 22 | 20 |
| 8262H096 | 750 | 620 | 565 | 700 | 565 | 530 |
| 8262H099 | 1170 | 1145 | 945 | 1000 | 965 | 855 |
| 8262H105 | 275 | 275 | 235 | 250 | 250 | 225 |
| 8262H106 | 750 | 620 | 530 | 700 | 565 | 495 |
| 8262H107 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| 8262H108 | 290 | 290 | 270 | 240 | 240 | 225 |
| 8262H109 | 610 | 410 | 410 | 600 | 410 | 400 |
| 8262H110 | 275 | 275 | 235 | 250 | 250 | 225 |
| 8262H111 | 72 | 60 | 55 | 67 | 53 | 52 |
| 8262H112 | 135 | 135 | 135 | 115 | 115 | 115 |
| 8262H113 | 95 | 75 | 75 | 85 | 72 | 70 |
| 8262H114 | 70 | 70 | 70 | 65 | 65 | 65 |
| 8262H174 | 275 | 275 | 235 | 250 | 250 | 225 |
| 8262H176 | 2000 | 2000 | 1725 | 1900 | 1900 | 1700 |
| 8262H177 | 290 | 290 | 270 | 240 | 240 | 255 |
| 8262H178 | 610 | 410 | 410 | 600 | 410 | 400 |

| Maximum Operating Pressure Differential For Catalog Numbers 8262H & 8263H DC Valves | | | | | | |
|---|-------------------------|-------------|-------------------|-------------------------|-------------|-------------------|
| | At Maximum 40°C Ambient | | | At Maximum 55°C Ambient | | |
| | Air-Inert Gas [PSI] | Water [PSI] | Oil [PSI] 300 ssu | Air-Inert Gas [PSI] | Water [PSI] | Oil [PSI] 300 ssu |
| 8262H180 | 750 | 620 | 530 | 700 | 565 | 495 |
| 8262H181 | 2000 | 2000 | 1725 | 1900 | 1900 | 1700 |
| 8262H182 | 290 | 290 | 270 | 240 | 240 | 225 |
| 8262H183 | 610 | 410 | 410 | 600 | 410 | 400 |
| 8262H185 | 275 | 275 | 235 | 250 | 250 | 225 |
| 8262H186 | 72 | 60 | 55 | 67 | 53 | 52 |
| 8262H187 | 135 | 135 | 135 | 115 | 115 | 115 |
| 8262H188 | 70 | 70 | 70 | 65 | 65 | 65 |
| 8262H200 | 1170 | 1145 | 945 | 1000 | 965 | 855 |
| 8262H202 | 65 | 63 | 63 | 55 | 54 | 54 |
| 8262H208 | 35 | 35 | 35 | 30 | 30 | 30 |
| 8262H210 | 25 | 25 | 22 | 22 | 22 | 20 |
| 8262H212 | 53 | 50 | 47 | 48 | 46 | 44 |
| 8262H214 | 1170 | 1145 | 945 | 1000 | 965 | 855 |
| 8262H230 | 53 | 50 | 47 | 48 | 46 | 44 |
| 8262H232 | 130 | 125 | 115 | 110 | 105 | 100 |
| 8262H277 | 610 | 410 | 410 | 600 | 410 | 400 |
| 8263H002 | 130 | 110 | 80 | 120 | 100 | 76 |
| 8263H003 | 165 | 130 | 110 | 155 | 120 | 105 |
| 8263H054 | 27 | 23 | 21 | 24 | 22 | 20 |
| 8263H115 | 275 | 275 | 160 | 250 | 250 | 150 |
| 8263H116 | 72 | 60 | 55 | 67 | 53 | 52 |
| 8263H117 | 95 | 75 | 75 | 85 | 72 | 70 |
| 8263H118 | 135 | 135 | 100 | 115 | 115 | 90 |
| 8263H119 | 38 | 33 | 31 | 35 | 30 | 28 |
| 8263H124 | 35 | 35 | 35 | 30 | 30 | 30 |
| 8263H191 | 275 | 275 | 160 | 250 | 250 | 150 |
| 8263H192 | 72 | 60 | 55 | 67 | 53 | 52 |
| 8263H193 | 135 | 135 | 100 | 115 | 115 | 90 |
| 8263H194 | 38 | 33 | 31 | 35 | 30 | 28 |
| 8263H196 | 27 | 23 | 21 | 24 | 22 | 20 |
| 8263H200 | 65 | 63 | 50 | 55 | 54 | 44 |
| 8263H206 | 70 | 70 | 70 | 65 | 65 | 65 |
| 8263H210 | 53 | 50 | 47 | 48 | 46 | 44 |
| 8263H232 | 130 | 125 | 85 | 110 | 105 | 75 |
| 8263H330 | 130 | 110 | 80 | 120 | 100 | 75 |
| 8263H332 | 70 | 70 | 70 | 65 | 65 | 65 |
| 8263H333 | 53 | 50 | 47 | 48 | 46 | 44 |

NOTES:

1. Suffix T (PTFE) valve maximum operating pressure differential is reduced by 25%.
2. Suffix MS valves are limited to maximum 750 PSI rating.

Installation & Maintenance Instructions

2-WAY INTERNAL PILOT-OPERATED SOLENOID VALVES
NORMALLY CLOSED OPERATION — SOFT CLOSING
3/8", 1/2", OR 3/4" NPT — 9/16" OR 3/4" ORIFICE

SERIES

8221

Form No.V6489R1

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

DESCRIPTION

Series 8221 valves are 2-way normally closed, internal pilot-operated solenoid valves designed for soft closing. Valves are made of forged brass with internal parts of brass or stainless steel and elastomers of Buna N or ethylene propylene depending upon service requirements. Valves may be provided with a general purpose or explosionproof/watertight solenoid enclosure.

OPERATION

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

IMPORTANT: Minimum operating pressure differential required is 5 psi. Valve will remain open down to 3 psi differential.

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.

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 chart. Check catalog number prefix and suffix on nameplate to determine the maximum temperatures. See example following chart.

| Construction AC or DC | Catalog Number Prefix | Catalog Number Suffix | Maximum Temperature °F | |
|--------------------------|-----------------------------|-----------------------------|---------------------------|-------|
| | | | Ambient | Fluid |
| AC | None | None | 125 | 180 |
| | HT | None | 140 | 180 |
| | None | HW | 125 | 210 |
| | HT | HW | 140 | 210 |
| DC | None, or HT | None | 104 | 150 |

EXAMPLES: For Catalog No. HT8221G3, AC construction the maximum ambient temperature is 140° F with a maximum fluid temperature of 180°F. For Catalog No. 8221G1HW, AC construction the maximum ambient temperature is 125° F with a maximum fluid temperature of 210°F.

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.

Piping

Connect piping to valve according to markings on valve body.

▲ CAUTION: Valves with suffix "HW" in the catalog number are equipped with ethylene propylene elastomers which can be attacked by oils and greases. 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

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

▲ 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.

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 ensure 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 and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

Note: Refer to Figure 1 for AC construction and Figure 2 for DC construction.

1. Disassemble valve in an orderly fashion using exploded views for identification of parts.
2. Remove solenoid, see separate instructions.
3. Unscrew solenoid base sub-assembly and remove core assembly, core spring and bonnet gasket.
4. Remove bonnet screws and valve bonnet from valve body. Then remove the following parts: piston spring, lip seal, support, piston, disc, snubber, body gasket, bleed gasket, flow control, and pilot gasket.
5. All parts are now accessible to clean or replace. Replace worn or damaged parts with a complete ASCO Rebuild Kit.

Valve Reassembly

1. Reassemble valve using exploded views for identification and placement of parts.
2. Lubricate the disc and all gaskets with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease.
3. Position flow control in valve body with concave end outward; facing valve bonnet.
4. Position bleed gasket, pilot gasket, and body gasket in valve body.
5. Preassemble snubber, disc and piston to form piston assembly. Install snubber into recessed side of disc and press this assembly into the piston.

6. Position lip seal, flanged end up, onto piston. Position support in valve body and install piston with snubber, disc, and lip seal into support.

⚠ WARNING: To prevent the possibility of personal injury or property damage, the valve bonnet and valve body must be in proper alignment. When assembling, be sure that either the letters **MB (if present) on the valve bonnet line up with **IN** on the valve body, or that the word **OUT** (where applicable) lines up with **OUT** on the valve body. Both **MB** and the word **OUT** may be present on the same valve bonnet.**

7. Replace piston spring, valve bonnet, and bonnet screws. Torque bonnet screws in a crisscross manner to 95 ± 10 in-lbs [$10,7 \pm 1,1$ Nm].
 8. Replace solenoid base gasket, core assembly, core spring, and solenoid base sub-assembly.
- Note: For AC construction, position wide end of core spring in core first, closed end protrudes from top of core.
9. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [$19,8 \pm 2,8$ Nm].
 10. 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.

11. Restore line pressure and electrical power supply to valve.
12. After maintenance is completed, operate the valve a few times to be sure of proper operation.

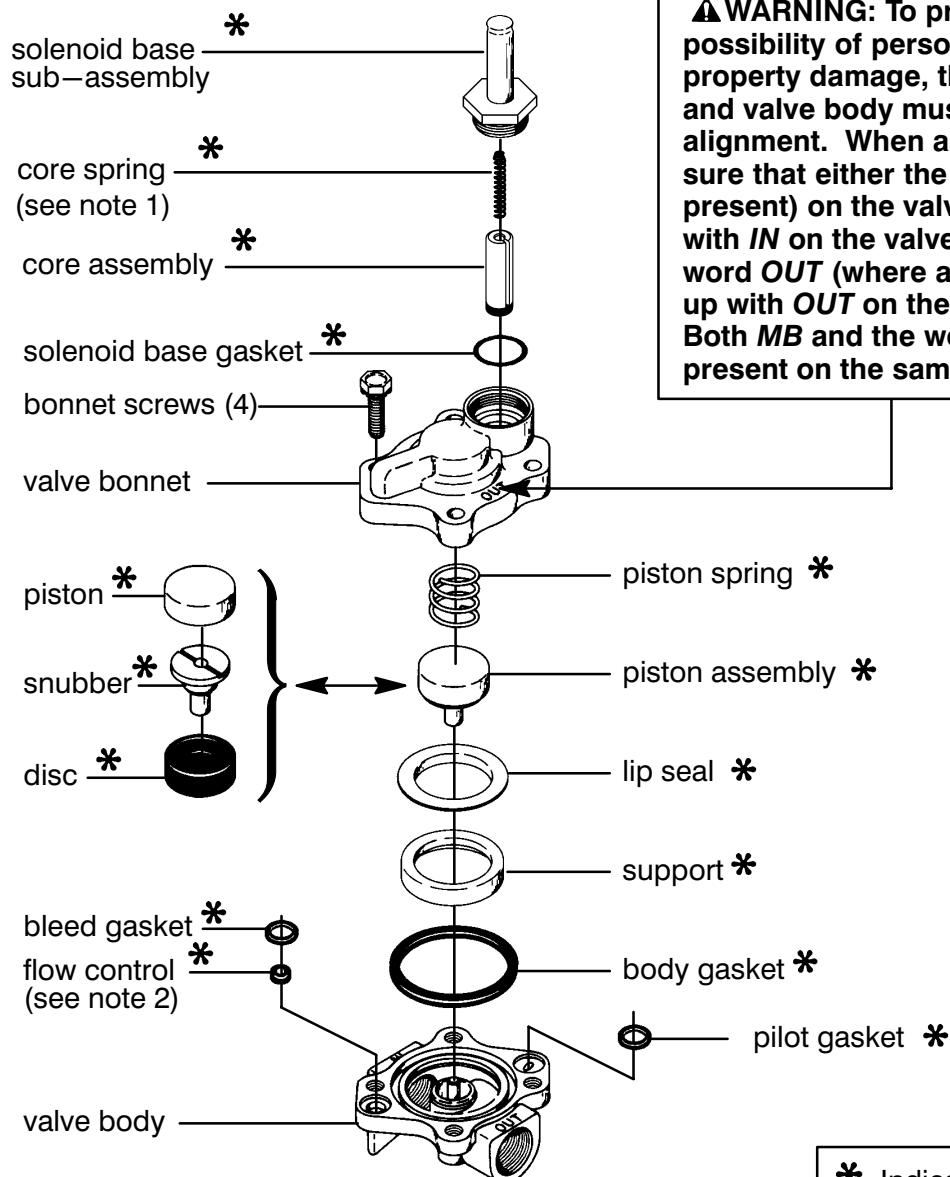
ORDERING INFORMATION

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.

Torque Chart

| Part Name | Torque Value In-lbs | Torque Value Nm |
|----------------------------|---------------------|-----------------|
| solenoid base sub-assembly | 175 ± 25 | 19,8 ± 2,8 |
| bonnet screws | 95 ± 10 | 10,7 ± 1,1 |



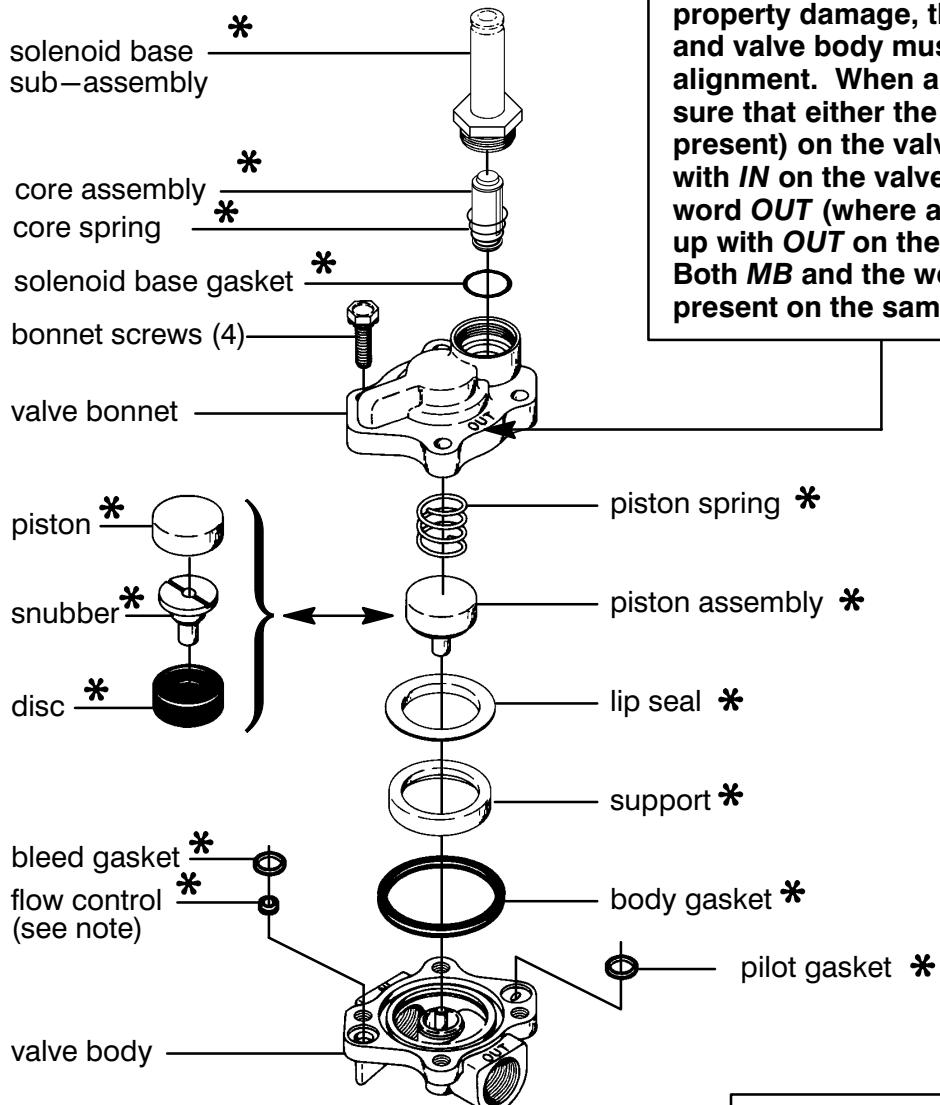
Notes:

1. Wide end of core spring in core first
closed end protrudes from top of core.
2. Concave end of flow control to
face valve bonnet.

Figure 1. Series 8221 valve without solenoid, AC construction shown.

Torque Chart

| Part Name | Torque Value In-lbs | Torque Value Nm |
|----------------------------|---------------------|-----------------|
| solenoid base sub-assembly | 175 ± 25 | 19,8 ± 2,8 |
| bonnet screws | 95 ± 10 | 10,7 ± 1,1 |



⚠ WARNING: To prevent the possibility of personal injury or property damage, the valve bonnet and valve body must be in proper alignment. When assembling , be sure that either the letters **MB** (if present) on the valve bonnet line up with **IN** on the valve body, or that the word **OUT** (where applicable) lines up with **OUT** on the valve body. Both **MB** and the word **OUT** may be present on the same valve bonnet.

* Indicates Parts Supplied In ASCO Rebuild Kits

Note:

Concave end of flow control to face valve bonnet.

Figure 2. Series 8221 valve without solenoid, DC construction shown.

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Pre Installation

- Check to make sure that heater received is the same as that ordered.
- Elements may come in contact with each other during shipment. Minor adjustments to elements may be required prior to installation to separate them. Extensive bending of elements should be avoided since dielectric strength between coil and sheath may be compromised.
- Watlow heaters are built to comply with UL and CSA dielectric requirements, it may be necessary due to atmospheric conditions / humidity, to perform a dielectric test prior to startup. (Refer to **megohm test** under **Installation** section)

Safety

Electric heaters are inherently dangerous!! Care should be taken to read and completely understand the Installation and Maintenance manual before installing and wiring the heater. Any installation and maintenance performed on the heater shall be done by a qualified electrician, in accordance with the "National Electric Code" and other electrical codes as they apply. It is the users responsibility to ensure that the heater being used is properly selected and installed in the application.



The Caution Symbol (exclamation point) alerts you to a "**CAUTION**", a safety or functional hazard which could affect your equipment or its performance.



The warning symbol (lightning bolt) alerts you to a "**WARNING**", a safety hazard which could affect you and the equipment

Installation

Proper heater selection and installation will result in efficient heat transfer, safe operation, and long heater life.

1. Megohm precheck

During shipping and/or storage, the possibility of moisture absorption by the insulation material within the element is possible. To ensure proper megohm values a minimum 500 VDC megohm meter (Megger) should be used to ensure that the megohm reading between the heater terminal and the heater sheath is more than 10 megohms when the unit is at room temperature.

If several units are interconnected, the megohm of the heater is obtained by taking the reading and dividing by the number of interconnected elements. This reading should be greater than 10 megohms.

If a low megohm value exists, two alternative methods can be used to remedy the situation. The best method is to remove all terminal hardware including thermostat if provided, and bake out the heater at no higher than 250°F (120°C) overnight or until an acceptable reading is reached. The second method is to energize the unit at low voltage in air until the megohm is at an acceptable reading. Care should be taken to prevent the heater sheath from exceeding 750°F (398°C) for Incoloy® and steel elements and 400°F (204°C) for copper elements.

2. Protection of heater elements from over temperature

The use of temperature controls to regulate heating process and prevent heater over temperature is highly recommended to ensure safe heater operation. It is the users responsibility to ensure safety of the installation.

WARNING: Install high temperature control protection in systems where an over temperature fault condition could present a fire hazard or other hazard. Failure to install temperature control



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protection where a potential hazard exists could result in damage to equipment and property, and injury to personnel.

Failure of components in a temperature control loop, such as the sensor, heater control relay or main temperature control, can result in damage to a product in process, a melt down of a heater, and / or damaging fire.

To protect against this possibility, over temperature protection must be provided to interrupt or remove power from the heater circuit. **A bulb and capillary thermostat is not recommended for this function since it may not respond quickly enough to adequately protect the heater. In cases where the thermostat bulb gets too hot before the system is turned off, the thermostat bulb could rupture. This could result in the thermostat remaining in the "ON" condition since there is insufficient fluid to move contacts apart.** We recommend the temperature protection have appropriate third party approval, and be applied in the classification for which it was tested and approved.

In order to help prevent premature failure and a potentially hazardous condition in cases where consequences of failure may be severe, use an appropriate third party approved liquid level protection device. The liquid level should be such that the entire heater is fully submerged with enough liquid above the heater to adequately dissipate heat from itself as under normal operating conditions. Consult your local authorized sales representative for specific recommendations for your application.

3. Terminal Enclosures

Terminal enclosures should be selected to be compatible with the environment in which the heater will be located. It is the users responsibility to determine the need for correct rating of the electrical housing. This should be based on appropriate national and local electrical codes. Failure to use a compatible enclosure could result in heater damage and personnel danger.

Standard terminal enclosures are designed for general purpose use and are rated NEMA 1. These enclosures should be applied where there will be no danger of spilled liquids, dampness, dirt, and gaseous conditions. Enclosures for wet or hazardous locations are also available, but must be installed at the factory.

Although enclosures are supplied over the terminals, units should be located in an area that will minimize the chance of being hit by falling or moving objects. The terminals must be protected at all times from moisture or vapor.

In hazardous locations, (as defined in NFPA 70 NEC, Article 501) explosion resistant housings must be used.

In order to maintain termination integrity, the terminal enclosure should be kept below 400°F (204°C).

4. Orientation / Mounting

Watlow flange immersion heaters incorporate a standard ANSI flange for universal mounting in tanks equipped with the same size mounting flange. A suitable gasket and mounting bolts are required for installation but are not provided with the heater. The correct gasket material should be based on the material being heated and the process temperature.

Heater orientation is important in order to ensure efficient heat transfer and safe operation. Care should be taken to allow enough room for heater expansion without compromising heat transfer. When installing the heater through the header on the tank, care should be taken to avoid bending the elements. If possible elements should be inspected to ensure that they are not touching. Failure to do so could result in shorter heater life due to higher heater temperatures.

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The location of an immersion heater in a process is of prime importance. To take advantage of natural convection, the unit should be located as low as possible; similar to the position in Figure 1.

Consideration should also be given to sludge build-up in the bottom of the tank and the need for heater removal (replacement or maintenance). Location of the heater in the sludge area will cause premature failure and lower heat transfer efficiency.

If heater is being installed in customer supplied circulation tank, a Tubular Circulation I&M manual should be obtained from the factory to ensure safe installation of heater in tank. Failure to do this could result in premature heater failure due to improper fluid flow over elements

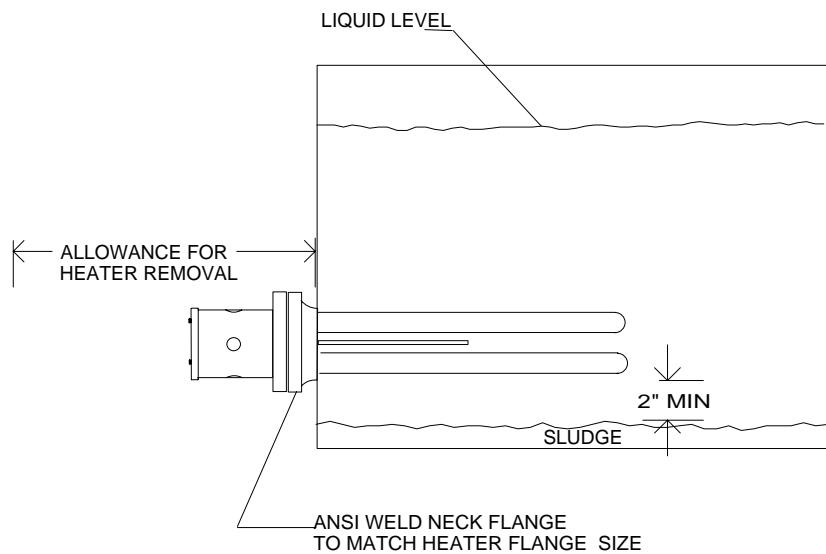
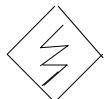


Figure # 1

DANGER: HAZARD OF FIRE. Electric heaters are capable of developing high temperatures so extreme care should be taken to locate heaters in safe environments. Mounting heaters in atmospheres containing combustible gases and vapors should be avoided. According to article 501 of the NEC, the maximum surface temperature of the heater shall not exceed 80 % of the auto-ignition of the surrounding atmosphere when the heater is continuously energized. Care should also be taken to keep combustible materials far enough away to be free of the effects of high temperatures.

5. Wiring

WARNING; HAZARD OF ELECTRIC SHOCK. Any installation involving electric heaters must be grounded to earth to eliminate shock hazard.



Electrical wiring to the heaters must be installed in accordance with the National Electric Code and any state and local electrical code by qualified personnel.

Consult wiring diagram supplied with the unit for correct feeder wires connections. If one is not supplied, the factory should be consulted for the appropriate wiring diagram. Feeder wire should be properly selected based on amperage, electrical power rating, ambient temperature, and type of environment. Feeder wire should also be housed in either rigid or flexible conduit which carries the same classification as the heater enclosure. It is the users responsibility to properly size and install feeder wire.

Feeder wire line connections may be made directly to stud terminals or box type compression fittings. Box type compression fittings will accept a #4 AWG maximum wire while stud terminals will accept a #10 ring connector(T&B, Amp, etc.). It is essential that these connections be tight. Stud terminals should be tightened to a maximum torque of 20 in-lbs while the bottom nut is supported. Ground connection (color coded "green") is supplied inside the housing for ground wire.

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Line voltage must be equal to or less than rating stamped on the heater assembly. Some units are supplied as dual voltage . Example: 240V / 480V, check wiring diagram supplied with the unit to make sure which scheme was used. In most cases (unless specified by customer) units are wired for the higher voltage.

Thermostats can be supplied with flange heaters. Consult the wiring diagram supplied with the heater for the suggested wiring of thermostats. For safe operation of thermostats, consult Installation and Maintenance manual for thermostats that is attached.

Thermostats should not be used as an "OFF" device; the use of a disconnect switch or circuit breaker is recommended. The disconnect switch will allow isolation of the heater when maintenance of the heater is required.

Start Up

Before energizing the heater the following items should have been checked with the heater power disconnected:

1. Immersed section of heater is completely covered by liquid
2. Electrical termination is tight and wiring is per wiring diagram supplied with heater
3. Proper disconnecting means and fusing have been installed
4. The voltage rating of the heater is the same as that being applied
5. Megohm is within acceptable limits
6. Proper temperature controls and safety limiting devices are in place
7. Heater is securely installed in tank header and no leaks are visible

After applying power to the heater make sure that the system is being controlled properly before leaving it to run unattended. Failure to do this could result in overheating resulting in personnel danger and fire.

Troubleshooting

| PROBLEM | Cause / Correction |
|--|---|
| No power available to heater | Check disconnect switch to ensure it is in the "ON" position and that fuses are not blown. Replace fuses if they are blown |
| Fuses blowing | Check heater electrical rating. Applied voltage may be wrong Check fuse rating. Fuses should be at least 25% more than full load amperage. Disconnect heater power source. Check the heater resistance to ground. This should be no less than 1 Megohm. Refer to Megohm checking. |
| Not enough power | Check line voltage to ensure it is within specification Check full line current if voltage is correct. If line current is lower, the heater may be wired wrong or has open elements |
| Fluid not heating to desired temperature | Not enough Kw Too much heat loss |
| High limit tripping / alarm | Not enough fluid flow Too much Kw |

WATLOW IND. WATROD Flange Heater Installation & Maintenance Manual

I&M NUMBER: 316-42-8-1

Date: 6/11/2008

Page: 5

Rev: 2.00

Line voltage higher than designed / allowable



Preventative Maintenance

CAUTION: HAZARD OF ELECTRIC SHOCK. TURN ALL POWER TO HEATER OFF, USE APPROPRIATE DISCONNECT LOCKOUTS AND ALLOW SYSTEM/HEATER TO COOL BEFORE PERFORMING ANY MAINTENANCE

Check line connections to make sure they are tight, free of oxide build-up, and that no dust or dirt build-up is present. Retighten to 20 in-lbs as necessary.

Check enclosure (inside) for rust, dirt or dust. Remove rust if present, with steel wool (or equal) and thoroughly blow clean with dry, oil-free air.

If enclosure is moisture resistant, check condition of cover gasket. A replacement can be obtained from the factory.

Liquid immersed units should be removed from tank and checked periodically for scale build-up. Clean as required. Scale can cause high sheath temperature and result in inefficiency and shortened life.

Thermal cycling may cause sealed joints to relax causing a leak. Tightening of heater plug should stop leak.

Inspect flange gasket and replace if necessary

Replacement Parts

Reference the flange heater part number on the nameplate when ordering replacement parts.
Recommended spare parts would be : a Flange Heater and thermostat (if supplied).

Contact your local Watlow distributor for ordering replacement parts. Check the Yellow Pages under "Electrical Heating Elements" in the largest industrial area nearest you.

Warranty

Watlow warrants its products against defects in material and workmanship for 12 months from the date of delivery for custom products and 18 months for stock products providing such products are properly applied, used and maintained. Watlow does not warrant any product against damage from corrosion, contamination, misapplication, improper specification or operating conditions beyond our control. The terms of this warranty are the exclusive terms available to any person. No person has authority to bind the Company to representation or warranty other than this warranty. Watlow is not liable for incidental or consequential damages resulting from use of the product whether a claim for such damages is based upon warranty, contract, negligence or other fault. Should any product fail under these warranty conditions it will be repaired or replaced at no charge. Advanced authorization must be obtained within 30 days of failure.

Return Policy

1. Call Watlow Industries at 573-221-2816, for a Return Material Authorization (RMA) number before returning any item for repair or replacement. The following information is needed to process a returned heater expeditiously:

- | | |
|---|--|
| <ul style="list-style-type: none">• Customer name• Contact Name• Part number• Quantity | <ul style="list-style-type: none">• Customer account number• Phone Number• P.O. number |
|---|--|

Delta T Systems, Inc.

2171 Highway 175
Richfield, WI 53076
800-733-4204 | 262-628-0332 (fax)
www.deltatsys.com



Replacement Parts for Accent Units

CONTROLLERS

| Part Number | Description |
|--------------|---|
| 324-00049-00 | Athena 18C (1/8 din) Controller |
| 324-00057-00 | Athena 18C (1/8 din) Controller with 4-20mA remote setpoint |
| 324-00087-00 | Omron E5CN (1/16 din) Controller |
| 324-00128-00 | Omron E5EN-N (1/8 din) Controller |
| 324-00187-00 | Omron E5CC (1/16 din) Controller |
| 324-00186-00 | Omron E5EC (1/8 din) Controller |
| 324-00141-00 | Eurotherm 3216 Controller with auto vent |

ELECTRICAL

| Part Number | Description |
|--------------|--|
| 301-00015-00 | T/C "J" Type Sensor |
| 304-00032-00 | Transformer - Control 100 VA (208 Voltage) |
| 304-00037-00 | Transformer – Control 100 VA |
| 304-00041-00 | Transformer - Control 100 VA (575 Voltage) |
| 315-00009-01 | Pilot Light (Red) |
| 315-00010-01 | Pilot Light (Amber) |
| 317-00028-00 | Switch (On/Off) |
| 317-00029-00 | Switch (Vent) |
| 324-00002-00 | Safety Thermostat (250°F) |
| 325-00228-00 | Control Fuse TRM 1.25 |
| 329-00011-00 | Mercury Contactor |
| 329-00036-00 | Mechanical Contactor |

HEATERS

| Part Number | Description |
|--------------|--|
| 322-00025-01 | 9 KW (3/60/460) |
| 322-00025-02 | 9 KW (3/60/230) |
| 322-00025-03 | 9 KW (3/60/208) |
| 322-00025-04 | 9 KW (3/60/600 - for 575 Voltage) |
| 322-00025-05 | 12 KW (3/60/208) |
| 322-00025-17 | 12 KW (3/60/230) |
| 322-00025-18 | 12 KW 3/60/460) |
| 422-00060-08 | Heater Gasket for 12 KW heater tank – 3" |

MOTOR

| Part Number | Description |
|-----------------|----------------------------------|
| 326-00072-00 | Motor Starter |
| CONSULT FACTORY | Motor Circuit Interrupter |
| CONSULT FACTOR | Motor Starter (Sprecher & Schuh) |

MOTOR ONLY

| Part Number | Description |
|--------------|-----------------------------|
| 320-00101-07 | 3/4 HP (3/60/208 - 230/460) |
| 320-00102-07 | 1 HP (3/60/208 - 230/460) |
| 320-00103-07 | 1.5 HP (3/60/208 - 230/460) |
| 320-00104-07 | 2 HP (3/60/208 - 230/460) |
| 320-00105-07 | 3 HP (3/60/208 - 230/460) |
| 320-00158-00 | 3/4 HP (3/60/575) |

PUMP & MOTOR ASSEMBLY

| Part Number | Description |
|--------------|-----------------------------|
| 005-00078-00 | 3/4 HP (3/60/208 - 230/460) |
| 005-00079-00 | 1 HP (3/60/208 - 230/460) |
| 005-00080-00 | 1.5 HP (3/60/208 - 230/460) |
| 005-00081-00 | 2 HP (3/60/208-230/460) |
| 005-00082-00 | 3 HP (3/60/208-230/460) |

PUMP PARTS

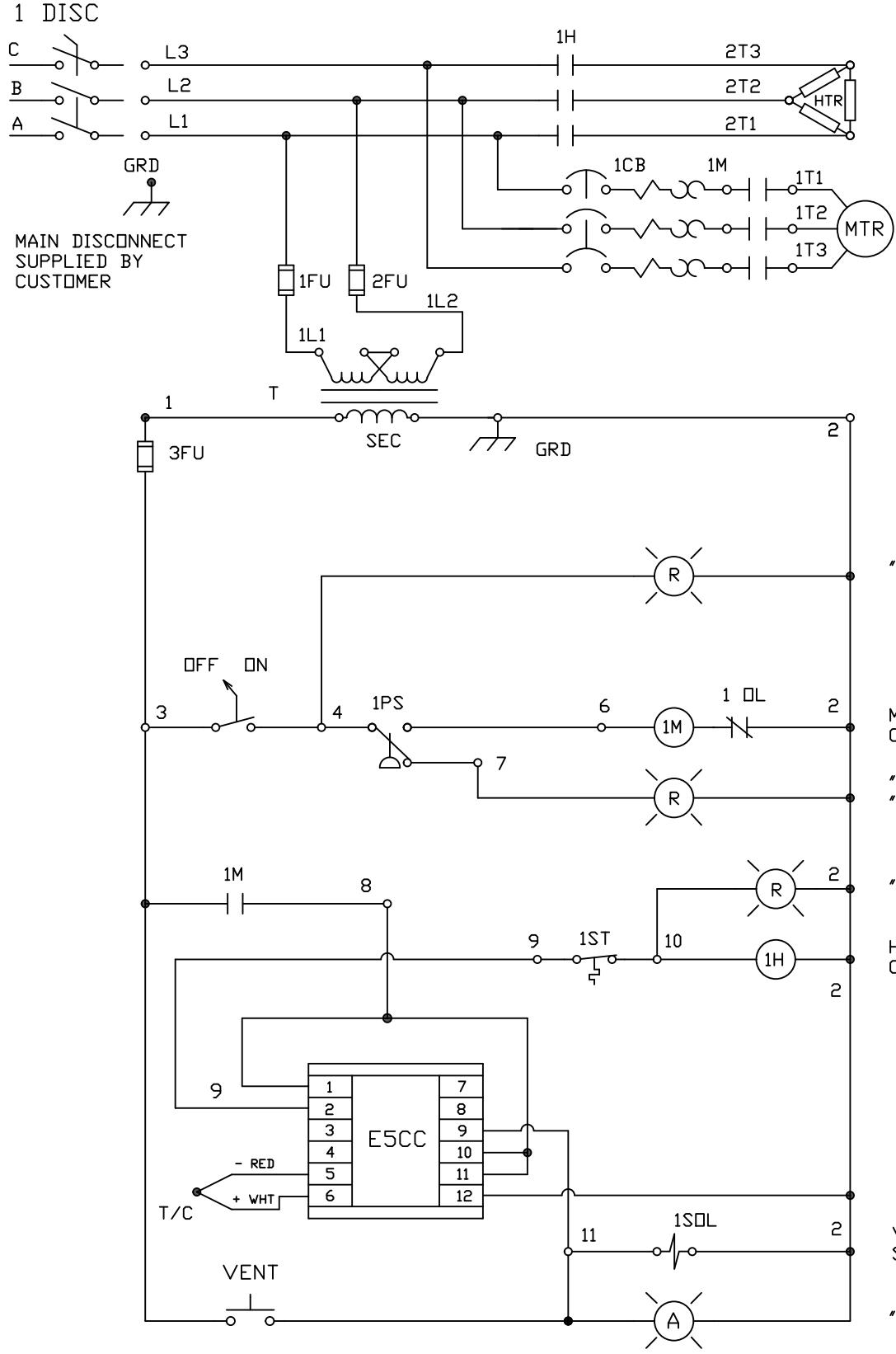
| Part Number | Description |
|--------------|--------------------------------|
| 108-00001-00 | Rotary Seal – 5/8" |
| 202-00002-00 | Pump O-Ring |
| 202-00003-01 | Impeller Nut |
| 202-00004-00 | D-Washer |
| 202-00082-00 | Impeller (1 HP) |
| 202-00083-00 | Impeller (1-1/2 HP) |
| 202-00055-00 | Impeller (2 HP) |
| 202-00081-00 | Impeller (3/4 HP) |
| 202-00127-00 | Impeller 3 HP, stainless steel |
| 202-00114-00 | Special "carbide/carbon" seal |
| 442-00004-00 | Flinger |

MISCELLANEOUS

| Part Number | Description |
|--------------|--|
| 004-00001-00 | Pressure Relief Valve (3/4" – 150PSI) |
| 007-00031-01 | Pressure Gauge 1-1/2" |
| 210-00005-00 | Solenoid Valve Repair Kit - 1/4" "G" Series |
| 332-00074-00 | Solenoid Valve - 1/4" w/ 9/32" orifice (120V) coil |
| 332-00076-00 | Solenoid Valve - 1/4" w/ 5/32" orifice (120V) Coil |
| 210-00041-00 | Solenoid Valve Repair Kit - 1/4" w/ 9/32" orifice "H" Series |
| 333-00018-00 | Pressure Switch |

PLEASE GIVE MODEL AND SERIAL NUMBER WHEN ORDERING PARTS.

PART NUMBERS ARE ONLY LISTED AS A GUIDE



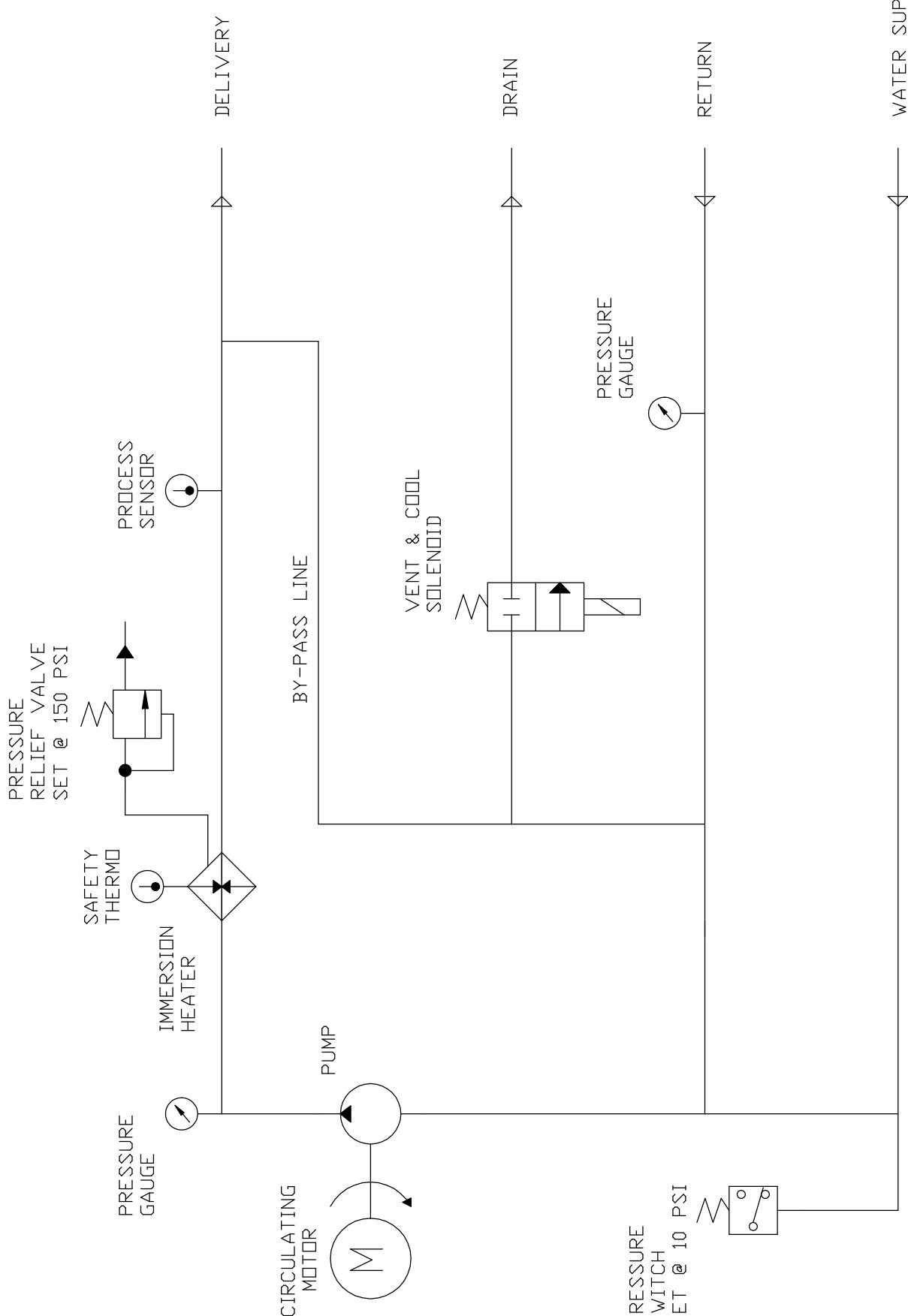
DELTA T SYSTEMS, INC.
RICHFIELD, WI

ELEMENTARY DIAGRAM
TITLE
DWG No.
A482-01960

DR.
D.S.
DATE
3/10/16

SCALE
NONE

DWG No.
A482-01960



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DELTA T LIMITED WARRANTY

This Delta T product (except for expandable parts) is warranted to be free of defects in material and workmanship for a period of one year from the date of purchase from Delta T Systems or a Delta T authorized distributor by the original purchaser. Expendable parts are warranted to be free from defects in workmanship and materials for a period of 90 days from the date of the original purchase. Should any trouble develop with this product during the warranty period, you must immediately notify Delta T Systems, Inc. in order to obtain an authorization for repair or replacement of the product. Notification should be made to Delta T Systems headquarters located on 2171 Highway 175 in Richfield, Wisconsin 53076. If inspected by Delta T Systems shows the trouble is caused by defective workmanship or material, Delta T Systems will repair (or, at our option, replace) the product without charge.

This warranty does not apply where:

- Repairs have been made or attempted by others;
- Repairs are required because of normal wear and tear;
- The product has been in any manner abused, misused, damaged or improperly maintained, or not installed, operated and/or maintained in accordance with the Delta T operations manual provided to the purchaser; or
- Alterations have been made to the product or the product has been used with parts not approved by Delta T.

Delta T System's sole liability shall be to repair or replace any product returned to Delta T Systems, Inc. for evaluation which is determined to contain defective materials or workmanship. Delta T Systems, Inc. shall not be liable for any damages of any kind from any cause whatsoever beyond the price of the defective Delta T product, nor shall Delta T Systems, Inc. be liable for any labor or freight charges incurred in the evaluation/repair/replacement of the product.

IN NO EVENT SHALL DELTA T SYSTEMS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES FROM THE SALE OR USE OF THE PRODUCT. THIS DISCLAIMER APPLIES BOTH DURING AND AFTER THE TERM OF THE WARRANTY. Some states do not allow the exclusion of limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

DELTA T SYSTEMS DISCLAIMS LIABILITY FOR ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF "MERCHANTABILITY" AND "FITNESS FOR A PARTICULAR PURPOSE" Some states do not permit disclaimers of implied warranties, so the above disclaimer may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.