APV AMERICAS

AN INVENSYS COMPANY

INSTRUCTION MANUAL

Order No. 32510

120 CU. FT. FOOD BLENDER

Serial Numbers:
#K2731 & K2732

QUALITY CHEF

Apache Stainless Equipment Corp.
Reference Numbers:
M11932A & M11932B

When requesting information about your machine, always state serial number, name of machine, model number, and any other pertinent information, which may be applicable.

Keep this manual in a safe place for future reference.

Table of Contents

APV Crepaco Offices

Manufacturing Facility

100 S. CP Ave.
Lake Mills, WI 53551
Tel: (414) 648-8311
Fax: (414) 648-1457

Factory Direct Service Parts Sales, Toll Free (800) 358-4100

Regional Sales Offices

Central Region

Chicago Sales Office
9525 West Bryn Mawr Ave.
Rosemont, IL 60018
Tel: (847) 678-4300
Fax: (847) 678-5037

Columbus Sales Office
6663 Huntley Rd.
Suite L
Columbus, OH 43229
Tel: (614) 846-8503
Fax: (614) 846-4932

Minneapolis Sales Office
4226 Park Glen Rd.
St. Louis Park, MN 55416
Tel: (612) 927-4910
Fax: (612) 927-6895

Sales & Service Office
1050 Remington Road - 1M
Schaumburg, IL 60173
Tel: (847) 310-1313
Fax: (847) 310-6969

Industrial Sales Group
9525 West Bryn Mawr Ave.
Rosemont, IL 60018
Tel: (847) 678-4300
Fax: (847) 678-5037

Western Region

California Sales Office
16641 Valley View Ave.
Cerritos, CA 90703
Tel: (562) 926-9700
Fax: (562) 926-1179

Seattle Sales Office
1138 Industry Drive
Seattle, WA 98188
Tel: (206) 575-8900
Fax: (206) 575-1221

Sacramento Sales Office
9767-H Business Park Drive
Suite H
Sacramento, CA 95827
Tel: (916) 361-2900
Fax: (916) 361-9399

Southern Region

Dallas Sales Office
P.O.Box 166199
2920 Skyway Circle N.
Irving, TX 75038
Tel: (972) 257-3455
Fax: (972) 594-1339

Eastern Region

New Jersey Sales Office
330 Franklin Tumpike
Mahwah, NJ 07430
Tel: (201) 529-5959
Fax: (201) 529-2676

Atlanta Sales Office
2252 Northwest Parkway
Suite B
Marietta, GA 30067
Tel: (770) 956-9110
Fax: (770) 956-8993

Buffalo Sales Office
182 Wales Avenue
Tonawanda, NY 14150
Tel: (716) 692-3000
Fax: (716) 692-6416

Introduction

Congratulations, you are the owner of a quality built item of APV Crepaco. This equipment was manufactured by the skilled personnel of a company which has served the needs of the dairy, food, and process industries for more than 100 years.

The purpose of this manual is to provide instructions for the safe installation, operation, and maintenance of your APV Crepaco equipment.

Read and understand the entire manual before removing from the crate and installing the equipment.

APV Crepaco is committed to provide quality equipment and customer satisfaction. We have a unique network of sales and service support throughout the world, which are listed on the following pages. Note the office nearest you. Should you have any questions concerning any information contained in this manual, contact the nearest office or our Lake Mills, Wisconsin office for assistance.

APV Crepaco Offices

APV Contracting Offices

Beverage Sector
9525 West Bryn Mawr Ave.
Rosemont, IL 60018
Tel: (847) 678-4300
Fax: (847) 678-3019

Dairy Sector
16601 Valley View Ave.
Cerritos, CA 90703
Tel: (562) 926-4200
Fax: (562) 926-4450

Food Sector
9525 West Bryn Mawr Ave.
Rosemont, IL 60018
Tel: (847) 678-4300
Fax: (847) 678-3019

Pharmaceutical & Healthcare
9525 West Bryn Mawr Ave.
Rosemont, IL 60018
Tel: (847) 678-4300
Fax: (847) 678-3019

Canada

APV Canada, Inc.
Central Region - Toronto
30 Whitmore Rd.
Woodbridge, Ont. L4L 7Z4
Tel: (905) 850-1852
Fax: (905) 850-1863

APV Canada, Inc.
Eastern Region - Montreal
6555 Cote De Liesse
Montreal, Quebec H4T 1E6
Tel: (514) 737-0006
Fax: (514) 737- 1310

APV Canada, Inc.
Western Region - Vancouver
Unit #10-8075 Enterprise Street
Burnaby, B.C. V5A 1V5
Tel: (604) 420-4344
Fax: (604) 420-2419

International

APV Crepaco (Far East) Inc.
Asami Bldg., 12 F
Minami Shinagawa 2-4-7
Shinagawa-ku, Tokyo 140, Japan
Tel: (81) 3 347-42171
Fax: (81) 3 347-42180

APV de Mexico
Periferico Sur 4225-106
Colonia Jarines en la Montana
CP 14210, Mexico, D.F., Mexico
Tel: 52(5)-644-2439
Fax: 52(5)-644-2730

APV Crepaco Service GmbH
Spinnereistrasse 11
D-88239 Wangen/Allgau
Germany
Tel: (49) 7522-80024
Fax: (49) 7522-80010

South America

APV Latin America
9525 West Bryn Mawr Ave.
Rosemont, IL 60018
Tel: (847) 678-4300
Fax: (847) 678-4407

APV South America
Rua Joao Daprat, 231
Caixa Postal 5111
Sao Bernardo do Campo - SP
CEP 09740-030
Brazil
Tel: (55) 11 457-9222
Fax: (55) 11 457-9393

STANDARD WARRANTY

Obligations of Seller

During the warranty period, Seller shall repair, or at Seller's option, replace parts determined by Seller to be defective in material or workmanship. The warranty period is one (1) year from the date of delivery to Buyer F.O.B. point of manufacture. The foregoing shall be the sole obligation of Seller under this warranty with respect to the equipment and other property included in this Agreement. With respect to equipment, materials, parts and accessories manufactured by others, Seller's sole obligation shall be to use reasonable efforts to obtain for Buyer the full benefit of the manufacturers' warranties.

Warranty Exclusions

Repair or replacement of parts required because of misuse, improper care or storage, negligence, alteration, accident, use of incompatible supplies or lack of specified maintenance are excluded from Seller's warranty obligations.

DISCLAIMER OF WARRANTIES

THE FOREGOING WARRANTY EXPRESSIONS ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND EXISTENCE OF ANY SUCH OTHER WARRANTY IS HEREBY DENIED.

Limitation of Liability and Remedies

The liability of Seller for breach of any warranty obligation hereunder is limited to:

1. The repair or replacement of the equipment on which the liability is based; or,

2. At Sellers option, the refund to Buyer of the amount paid by Buyer to Seller for said equipment.

All other liability of Seller with respect to this Agreement, or from the manufacture, installation, maintenance, repair or use of any equipment covered by or furnished under this Agreement, whether in contract or in tort, or otherwise, is limited to the amount paid by Buyer to Seller pursuant to the terms hereon: SELLER SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER. THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.

Breach

Any breach by Seller with respect to any items or unit of equipment shall be deemed a breach with respect to that item or unit only.

Infringement

Seller will not be liable for the infringement of any patent by the Buyer's use of any equipment or materials delivered hereunder.

POLICY REGARDING AVAILABILITY OF SERVICE PARTS

APV Crepaco will attempt to remain in a position to supply replaceable service parts during the normal life of any item of APV Crepaco equipment. This will be contingent upon availability of tools, material, and facilities of our own as well as of our suppliers.

After expiration of this period, supply of service parts will be limited to available stock of completed parts. If unable to supply the service part, drawings will be furnished when available to permit local manufacturing, if desired.

APV Crepaco reserves the right to improve, change or modify the construction of its equipment or any parts thereof without incurring any obligation to provide like changes to equipment previously sold.

A Word About APV Crepaco Service Parts

We want to raise your awareness to the problem associated with purchase of parts not manufactured to the high quality specifications of APV Crepaco.

In addition to our high quality, APV Crepaco parts are manufactured to meet regulatory agency authorizations, approvals and certification (3-A Sanitary Standards, USDA, ASME, BISSC and OSHA). Where applicable, materials used in construction of APV parts conform to FDA regulations.

WARNING

PARTS NOT MANUFACTURED TO OUR SPECIFICATIONS MAY CAUSE DAMAGES TO YOUR APV CREPACO EQUIPMENT AND VOID ALL WARRANTIES. USE OF PARTS THAT DO NOT MEET APV CREPACO SPECIFICATIONS MAY CAUSE PROPERTY DAMAGES AND SERIOUS BODILY INJURY.

Types of equipment include, but are not limited to, rotary pumps, centrifugal pumps, homogenizers, ice cream freezers, scrape surface heat exchangers, plate heat exchangers, ingredient feeders, process tanks and contact plate freezers.

We bring this potentially serious problem to your attention in order to safeguard your best interest and those of your employees.

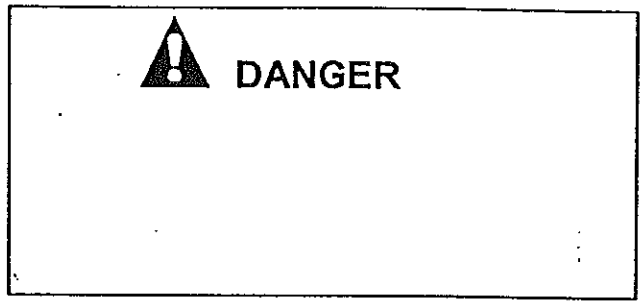
If you have any questions, please feel free to call 1-800-358-4100 or your local APV Crepaco Regional Sales Office.

Safety Information

Definitions

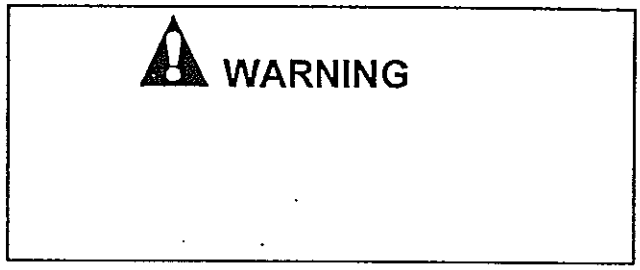
DANGER

An immediate hazard with a possibility of severe personal injury or death if instructions, including recommended precautions, are not followed.



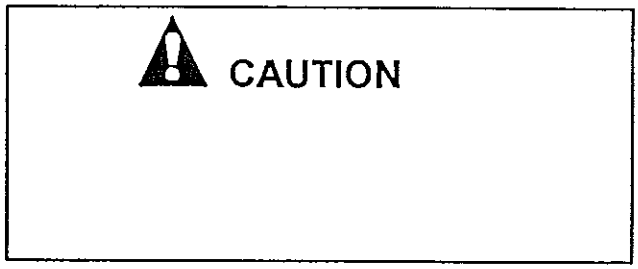
WARNING

Hazards or unsafe practices which could result in severe personal injury or death if instructions, including recommended precautions, are not followed.



CAUTION

Possible hazards or unsafe practices which could result in minor injury or damage to product or property if instructions, including recommended precautions, are not followed.



Lock Out

A positive means of securing the main electrical disconnect in the Off position, where only the person involved in the maintenance procedure has possession of the key.

Safety Information

The following information supplements the preceding GENERAL SAFETY INSTRUCTIONS and provides specific safety information on hazardous conditions which are inherent in the unit.

Safe installation, operation, and maintenance requires proper training of all personnel and their supervisors.

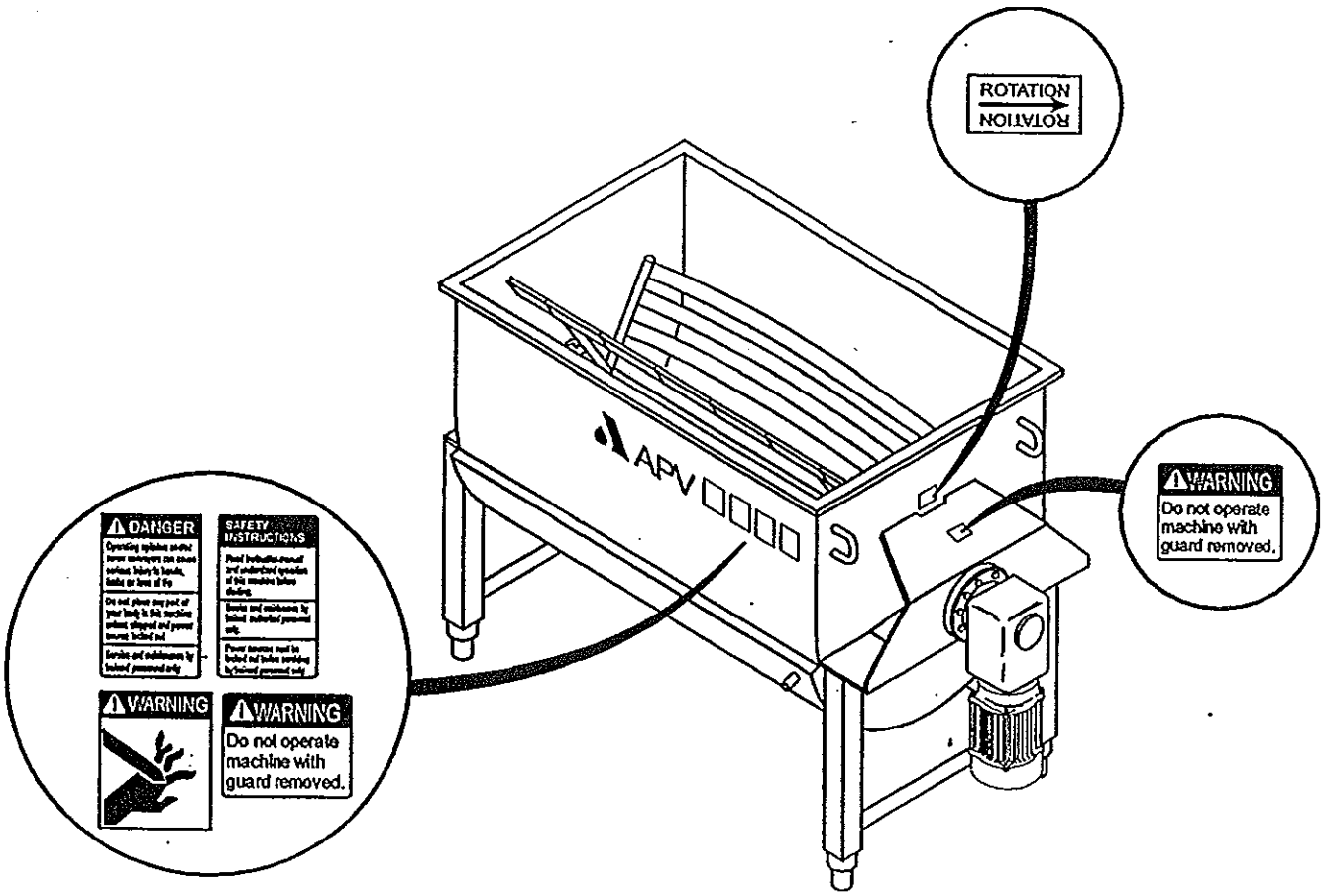
Our objective in providing instructions and warnings is to identify each area of potential hazards and its level of severity and to guide each worker for safe operation, service, and maintenance procedures.

APV Crepaco equipment is designed to provide minimum operator access to hazardous areas while providing adequate access for service by trained personnel.

Hazardous areas are provided with guards. Various types of fasteners may be used for the guards depending on how frequently routine access is required. Regardless of the type of fastener used, the mere existence of a guard should alert the worker to the presence of a hazard. Never operate or test run the equipment with a guard removed, unless under the supervision of properly trained and authorized personnel. Then use extreme caution to avoid the hazard.

Safety Decal Location

The following illustrations show the typical location of the safety information decals attached to the unit. If any decal is removed or becomes unreadable, replace it immediately with a new decal.



Typical Safety Decal Location

Safety Information

Safety Decals

The wording of the safety decals is shown below. If any decal is removed or becomes unreadable, replace immediately with a new decal.

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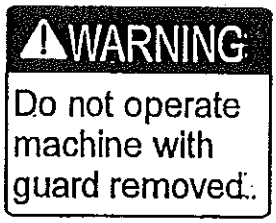

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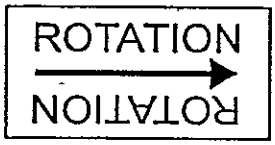

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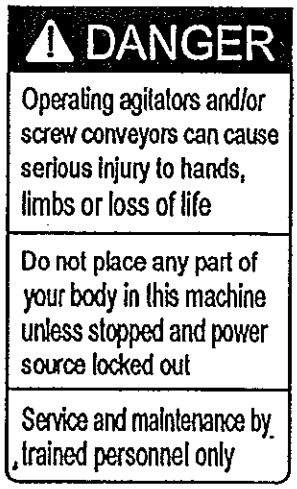

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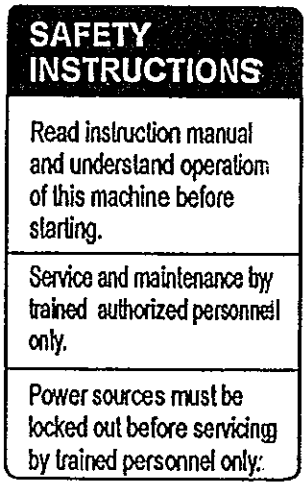

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Safety Decals

Safety Information

DANGER

Electrical Hazard

DANGER

ALWAYS turn off the electrical power supply and Lock Out, using a locking device for which only the person doing the work has the key, before performing service or maintenance.

The unit is normally powered by an electric motor and may have other electronic controls and devices. This creates a hazard of electrical shock which could cause severe injury or even loss of life.

To minimize the risk of this hazard:

1. All electric/electronic installation must comply with all applicable codes and standards including those established by the Occupational Safety and Health Administration (OSHA).
2. All electric/electronic installation, maintenance, and service must be performed by trained and authorized electricians only.
3. Install a main power disconnect On-Off switch that can be locked in the power Off position and have the key removed. This will allow maintenance or service to be performed with no possibility of the power being accidentally turned on.
4. Thoroughly read the motor manufacturer's instructions before making installation.
5. Install an emergency shutoff switch within easy reach of the operator.
6. Make the installation suitable for a wet environment, including:
   a. Protection from flooding. Do not install in an area which could fill with water to a level which would contact the motor.
   b. Protection of all electrical connections within a sealed junction box.
   c. Proper grounding.

DANGER

Mechanical Hazard

DANGER

ALWAYS turn off the electrical power supply and Lock Out, using a locking device for which only the person doing the work has the key, before performing service or maintenance.

The unit has mechanical drive components. All of these components are guarded and/or enclosed. However, it is necessary to remove the guards/enclosures to perform routine maintenance, cleaning, or service procedures. These components are powered by electric motors which may start unexpectedly from a remote control signal. Should the unit start unexpectedly during these procedures, severe injury or even loss of life could result.

To minimize the risk of this hazard:

1. Only trained and authorized mechanics should perform maintenance or service work on the unit.
2. Install an emergency shutoff switch within easy reach of the operator.

Safety Information

WARNING

Cleaning/Sanitizing Chemical Hazard

DANGER

Always turn off the electrical power supply and Lock Out, using a locking device for which only the person doing the work has the key, before performing service or maintenance.

To properly clean and sanitize the unit for use with food products it may be necessary to use chemical solutions. Many of the commonly used chemical solutions could cause severe injury to personnel if contacted. The hazard is especially severe for eyes, skin, or inhalation.

To minimize the risk of this hazard:

1. Thoroughly train all personnel working with cleaning/sanitizing chemicals in their safe handling and disposal following use as required by OSHA's "Hazardous Materials Standard."

Additional precautions are required during the use of cleaning or sanitizing chemical solutions to minimize the risk of personnel contact which could cause an injury.

2. When using manual cleaning methods:
   a. Turn off the power source and Lock Out before disassembling the unit.
   b. Equip all personnel using cleaning/sanitizing solutions with protective clothing including eye protection.
   c. Thoroughly train all personnel using cleaning/sanitizing in their safe handling and disposal after use.
   d. Never use toxic and/or flammable solvents for cleaning.

WARNING

High Temperature Hazard

WARNING

Some applications of the unit use steam or high temperature fluids in optional heat exchange zones for heating the contents. These high temperature heat exchange media create a hazard of burns.

When hot products are being processed, or when high temperature cleaning/sanitizing solutions are used, they create a hazard of burns.

To minimize the risk of this hazard:

1. All installation, maintenance, and service of piping, valves, and other controls must be performed by trained and authorized plumbers only. This applies to service media piping, process piping, and cleaning/sanitizing piping.
2. All plumbing installation must comply with all applicable codes and standards including those established by OSHA.
3. All high temperature lines must be labeled, leak free, and insulated or otherwise protected from direct contact.
4. Never disconnect any lines or fittings until the line is not under pressure and the fluid inside is not hot or otherwise harmful.
5. Operating personnel must be authorized and trained.

Important Cautions

CAUTION

Nitric Acid

Nitric acid can attack and degrade nitrile rubber (also known as Buna-N). When nitric acid does attack nitrile, it oxidizes the rubber surface, leaving that surface soft and checked. The degraded rubber is easily eroded away by product or cleaning chemicals and produces a black smear when contacted.

Nitrile rubber is the most commonly used rubber for gaskets and seals in the food industry. The damage done to the rubber by the cleaning acids can be avoided or minimized by using the following recommendations.

- Maximum recommended concentration is 1% (by weight).
- Maximum recommended solution temperature is 140 F.
- Exposure time should not exceed 30 minutes per clean up.

Precautions must be taken to be sure that the concentration does not exceed the maximum. For example, solutions must be completely diluted and mixed before admitting to the system. Acid solution must be thoroughly rinsed from the system following use.

CAUTION

NEVER use steel wool or a wire brush to clean stainless steel surfaces. Small particles of iron may rub off onto the surface and cause corrosion pits. Use nonmetallic scrub pads for stubborn soil.

CAUTION

Beware of Sanitizing Solutions

Sanitizing solutions are extremely corrosive, especially those which contain halogen compounds (chlorine, bromine, iodine). Solutions of these chemicals, will attack the surface of the unit.

To prevent serious damage:

1. DO NOT sanitize the unit sooner than 15 minutes immediately prior to starting production.
2. DO NOT leave sanitizing solutions in prolonged contact with any surface-product contact or exterior. As droplets dry out they become more concentrated and will cause corrosion pitting.

General Information

Components and Services Furnished by the Customer

Installation

The installation and start up of this equipment is solely the responsibility of the purchaser unless specifically provided for in the purchase agreement or in a separate contract.

Piping

All piping is to be supplied and installed by the purchaser. Piping must be well supported near the unit and in line with connection fittings so that no strain is put on the fittings. The use of large diameter lines and wide sweep elbows is recommended to keep discharge pressures to a minimum level.

Utilities

All services for water, vacuum, electricity, air, and other connections needed for operation are to be provided by the purchaser.

Sanitary Design

APV Crepaco equipment is designed and constructed to meet the requirements of the 3-A Sanitary Standards for cleanability of dairy processing equipment.

Meeting these standard requires, in part, that materials of construction in product contact areas be stainless steel or other materials approved for food contact. All product contact surfaces must be smooth, free-draining, and accessible for cleaning. The mechanical product components must be easy to disassemble for cleaning and/or inspection for cleanliness. The outer construction must prevent outside contaminants from draining or dripping into the product area.

General Information

Receiving and Inspection

1. APV Crepaco equipment is run tested or inspected prior to shipment. When leaving the factory, it is well crated for normal transportation procedures. APV Crepaco cannot, however, guarantee safe arrival. Therefore, upon receipt of this equipment, check the received items against the packing list for damage or missing parts. Check the packing material thoroughly for small parts.

2. Visually inspect for damage or loss. Damage or loss should be reported immediately to the delivery carrier while present. Following the immediate notification of the lost or damaged parts, a detailed description including quantity, description of the loss or damage, and a cash value should be claimed against the carrier with respect to the guidelines set forth by the responsible carrier's policies. APV Crepaco's responsibility terminates F.O.B. point of manufacture unless otherwise specified per the General Terms and Conditions of Sale as published by APV Crepaco and amended from time to time. Contact APV Crepaco Aftermarket Sales if shipping information is required for handling claims.

3. In the case of damage or loss to the equipment, APV Crepaco may perform three major functions:

   a. **Manufacturer Function** - APV Crepaco manufactures quality equipment and stands behind the APV Crepaco Standard Warranty. Refer to the Standard Warranty.

   b. **Assessor Function** - APV Crepaco offers assessment services for filing claims. The APV Crepaco assessor will accurately determine the extent of the damage (or loss), and cost of repairs to the equipment. Reimbursement for this service will be agreed upon prior to the assessment.

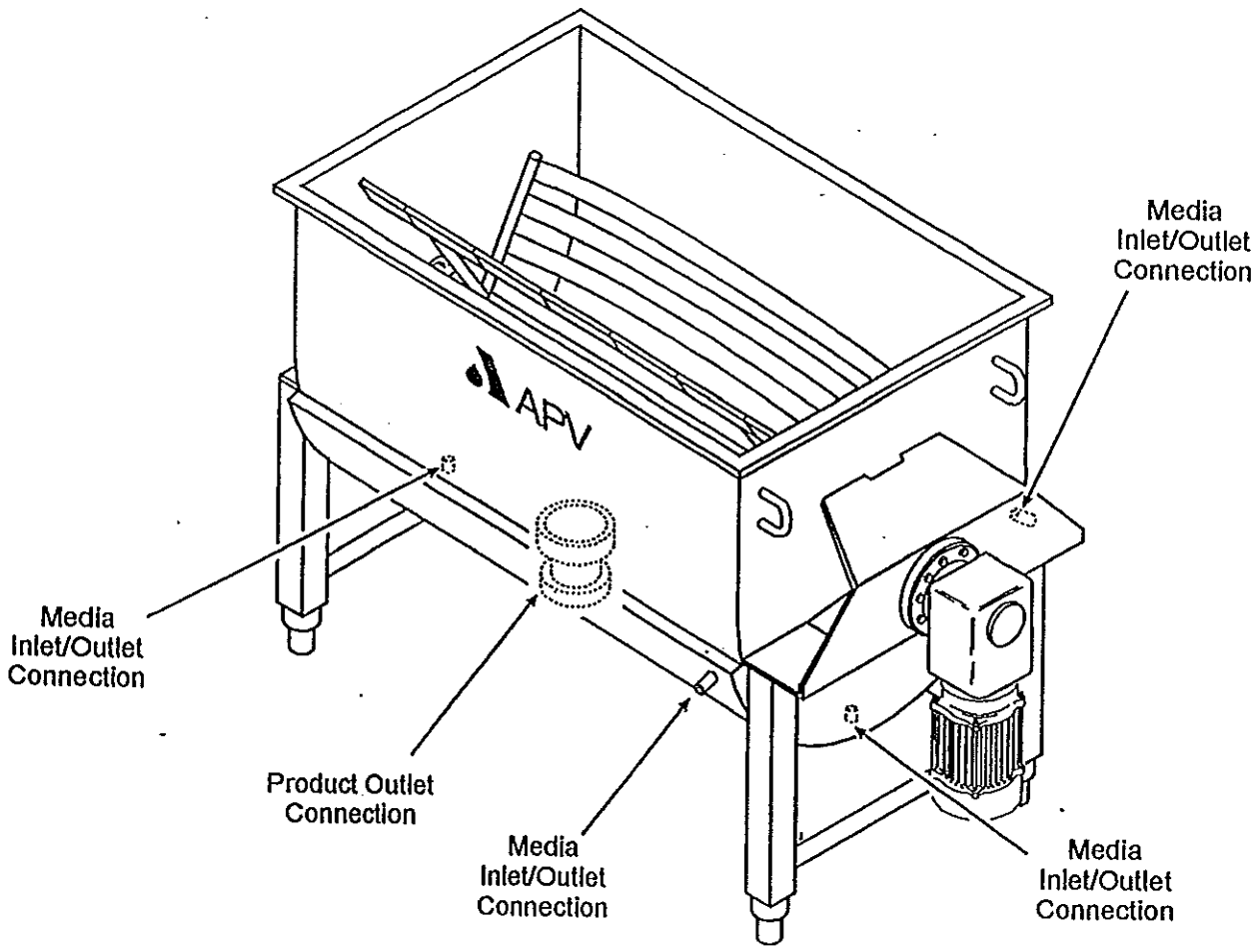
   c. **Repair House Function** - APV Crepaco offers services for repairing the damage(s) or replacement of loss(es) to the equipment. APV Crepaco has the option to alter the Standard Warranty on refurbished or replacement parts. The cost of this service will be dependent upon the assessment that is made.

Installation

Selecting Unit Location

When installing the unit, consider these items before locating:

1. Install the unit in a location with good lighting and clearance around it for maintenance and operation.
2. Locate with consideration for required service connections. Keep service supply lines as short and direct as possible for optimum operating efficiency.
3. Locate close to associated process equipment to minimize piping between equipment and minimize pressure build up through lines.
4. Locate near floor drains with a hose station nearby.



Product and Media Connection Locations

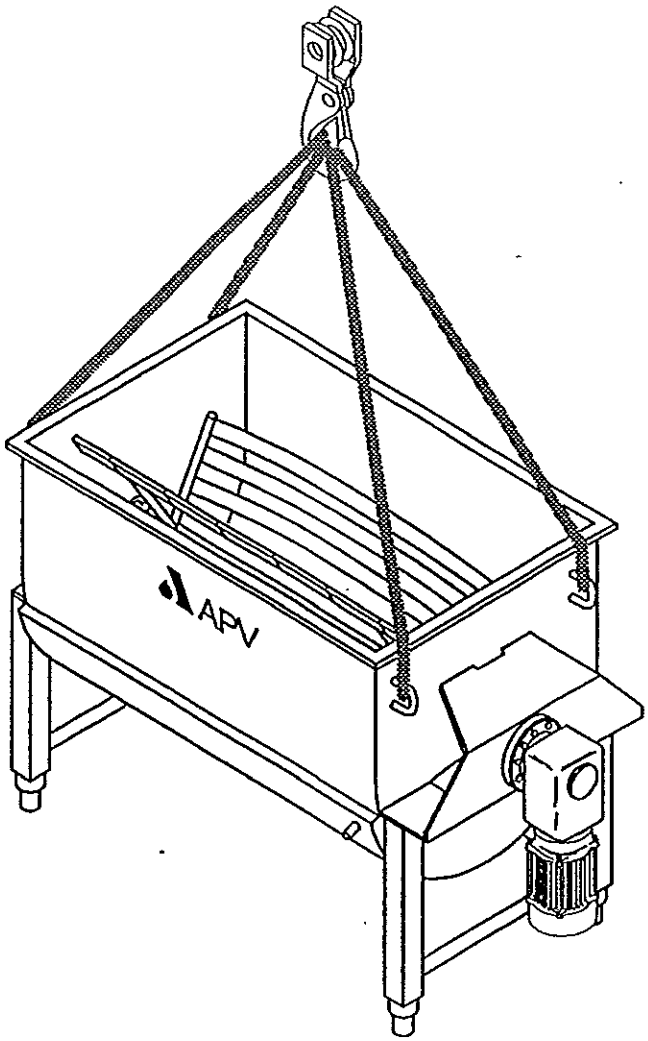
Installation

Uncrating

WARNING

If the lifting equipment slips or breaks, severe injury may result. Make sure lifting equipment is rated for the weight of the unit. Only trained personnel should operate the lifting equipment.

1. Move the unit to the plant installation site.
2. Remove the crating from the unit, then raise the unit by lifting at the proper locations.
3. Slowly raise the unit, just enough to remove the skid from underneath.
4. Remove the skid.
5. Lower the unit to the required position.
6. Adjust all of the adjustable feet so that the unit is level and all of the feet are firmly against the floor.



Lifting Equipment Lift Points

Installation

Electrical Connections

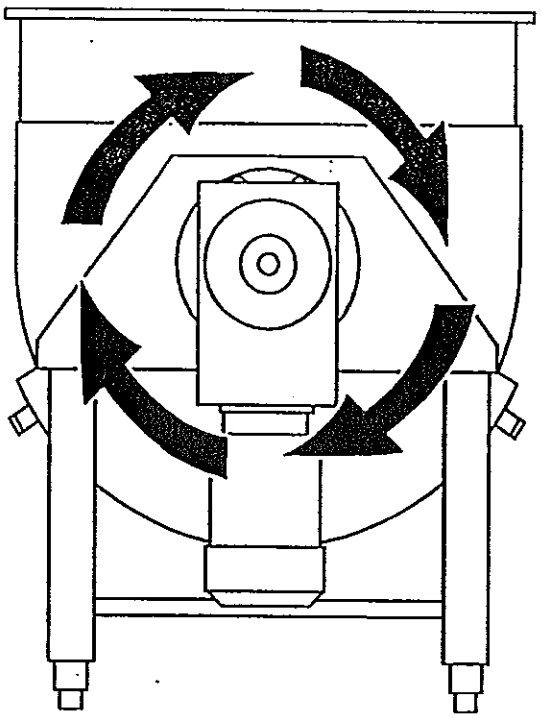
DANGER

ALWAYS turn off the electrical power supply and Lock Out, using a locking device for which only the person doing the work has the key, before performing service or maintenance.

DANGER

A quick shutoff switch should be installed near the unit for safety.

1. All electrical components should be placed away from excessive moisture conditions if possible. Consider all areas that will be hosed or steam sprayed.
2. Make necessary electrical connections to the electric drive motors. An experienced electrician should perform this task per nameplate specifications.
3. When the electrical connections have been made, the motor should be jogged to check the agitator rotation. The correct rotation is shown below.



Correct Agitator Rotation

Installation

Heat Exchange Surface

1. The unit is equipped with a heat exchange surface to allow for heating of the product while it is being transferred through the unit.

2. If steam is the media used, make the inlet connection at the side of the unit and the outlet connection at the bottom of the unit to allow for proper condensation drainage.

A pressure relief valve should be installed as close as possible to the steam inlet connections. The valves should be rated at 5 psi less than the maximum allowable working pressure of the steam inlets.

Steam Heating Requirements

Steam requirements will vary depending upon the product being heated, the range of heating, etc.

1. A pressure regulator must be installed to limit the maximum working pressure to 75 psig.

2. A properly sized relief valve, set at less than the heat exchange surface rating, must be installed to protect from over pressurizing.

Piping Connections

WARNING

Incorrect or careless plumbing installation could cause leaks of high temperature steam or fluids or exposure of high temperature surfaces. Contact with the high temperature fluids or surfaces could cause severe burns. All installation of service piping, valves, and other controls must be performed by trained and authorized plumbers only. All plumbing installation must comply with all applicable codes and standards including those established by OSHA.

CAUTION

Independently support and align all process piping attached to the unit. Do not support piping from fittings. Make sure that the piping support is located at a distance of at least 10 times the pipe diameter from the connection to the unit, or use an expansion joint to permit thermal expansion of the piping and the unit.

CAUTION

Failure to protect against excess pressure may cause damage to the unit. Install a pressure relief valve at the steam inlet connection. Locate the relief valve between the media shutoff valve and the heat exchange surface. Set the valve to relieve at a pressure equal to or less than the maximum rated pressure shown on the information plate attached to the unit.

1. All connections and lines are to be installed in accordance with local regulatory agencies and for volume and pressure as required in this system.

2. Piping and plumbing must be well supported to prevent strain on the fittings.

3. Check all plumbing for leaks before operating with product.

Heat Exchange Media Piping

All piping, for heat exchange media is to be supplied and installed by the customer. This includes any valves and pumps, cleaning solutions, or heating media that are routed to and from the unit. Any special valves or fittings, to be supplied with the unit by APV Crepaco factory, will be noted on the General Assembly Drawing.

Piping, valves, pumps, etc. may be purchased separately through the APV Crepaco sales office serving you.

Unit Preparation

Initial Hand Cleaning

WARNING

Direct contact with cleaning and sanitizing solutions may cause chemical or high temperature burns. Equip all personnel performing cleaning/sanitizing operations with protective clothing (including eye protection). Thoroughly train these personnel in the safe handling and disposal of the chemical and high temperature solutions they are using. See the Cleaning/Sanitizing Chemical Hazard section.

CAUTION

Before processing product, hand clean all product contact surfaces to remove all traces of protective coating that were applied during manufacturing.

1. Use a solution of potable water and alkaline dairy cleaning compound. DO NOT use water which is high in iron, salt, or sulfur. Alkaline dairy cleaners should contain a wetting agent and polyphosphate to suit water hardness. Consult your chemical supplier for specific recommendations.
2. Scrub all interior surfaces with a brush until protective coating is entirely removed.
3. After washing thoroughly, rinse away all traces of cleaning solution with potable water and allow to drain. Allow to air dry. DO NOT allow cleaners to remain on the surface for more that 15 minutes.
4. Clean the exterior surfaces with a mild detergent solution and brush. Rinse with clear water.
5. Sanitize immediately prior to processing.

Passivation

WARNING

Passivating solution is a strong chemical solution which must be used with extreme care. Only personnel thoroughly trained in the handling and disposal of these chemicals should perform these procedures.

WARNING

Nitric acid is an oxidizing agent that must be used with extreme care. Vapors are hazardous and contact of the acid with the skin can cause severe burns. Passivation should be performed in a well ventilated area and away from workers not properly protected from accidental contact with the acid solution. Disposal of used solution must be handled according to Local, State, and Federal regulations.

Passivation is the treatment of stainless steel with strong oxidizing chemicals. This procedure chemically cleans the surface to remove any free iron or rust that may be embedded. It also improves the continuity of the oxide film which gives stainless steel its corrosion resistance. Passivation is performed as a final cleaning operation on interior surfaces only after all fabrication operations have been completed. Prior to passivation, the interior surfaces should be cleaned using detergent to remove any dirt or oil film which may be present.

1. Units manufactured from stainless steel are not passivated at the factory.
2. When field fabrication procedures are performed which may disturb the oxide film or embed iron impurities, then field passivation is recommended to prevent surface corrosion or pitting. The passivation procedure steps must be carefully followed.

Unit Preparation

3. Units must be passivated by swabbing all internal product contact surfaces with an acid solution.

   a. The maximum solution strength is 20% commercial nitric acid (specific gravity 1.42) mixed with 80% water.

   b. The temperature of the solution must be maintained at 130 to 140 F during the treatment.

   c. The swabbing must be done for a minimum of 30 minutes.

Other components in the solution circuit may not be sufficiently resistant to a passivation solution of this strength.

4. Immediately after passivation, remove the acid solution from the unit and dispose of it. Contact your local sanitation and environmental protection authorities for disposal instructions.

5. Rinse with clean, hot water at 130 F for a minimum of five minutes with sufficient pressure and flow rate to thoroughly rinse all internal product contact surfaces. Allow the rinse water to discharge from the unit and dispose of it according to Local, State, and Federal regulations.

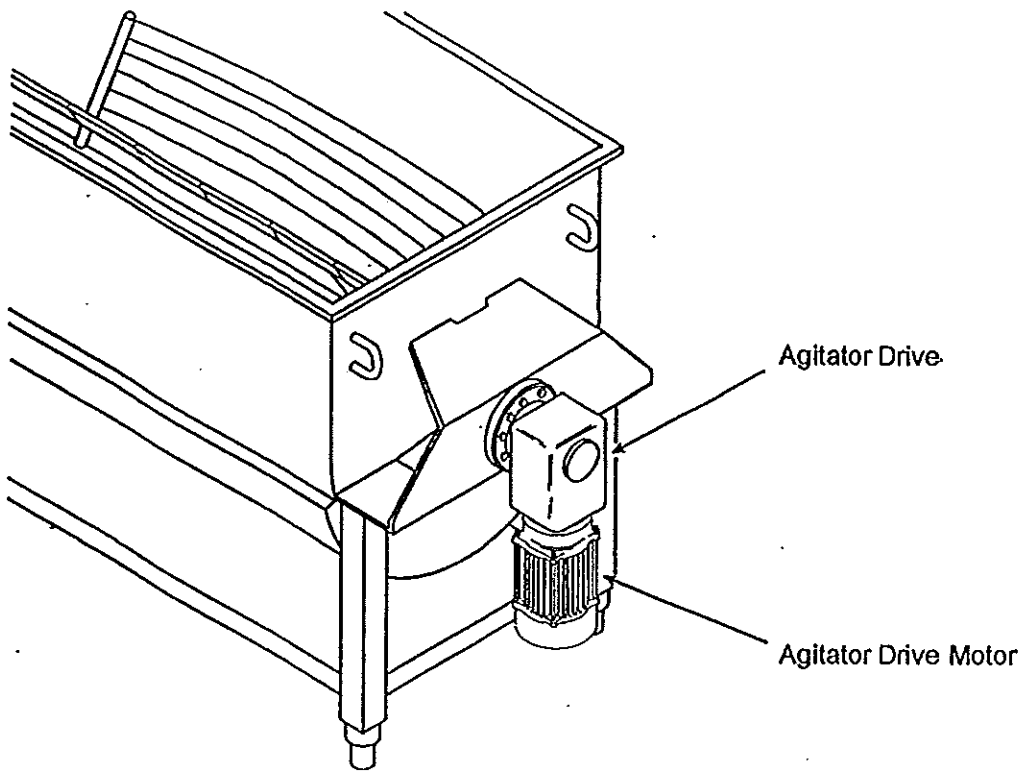
6. Any spillage or splashing of the passivation solution onto the unit's exterior must be immediately rinsed off with warm water to avoid chemical action and possible spotty appearance.

Agitator Drive Lubrication Check

The agitator drive is filled with oil at the factory. However, prior to operation remove the fill plug and check the oil level to make sure it is full per manufacturer's recommendations.

Agitator Drive Motor

Grease the agitator drive motor per manufacturer's recommendations.



Agitator Drive and Drive Motor

Cleaning and Sanitizing

DANGER

ALWAYS turn off the electrical power supply and Lock Out, using a locking device for which only the person doing the work has the key, before performing service or maintenance.

WARNING

Using unclean or unsanitary equipment could produce contaminated food products. Always clean and sanitize equipment before producing product for human consumption. See Cleaning/Sanitizing Chemical Hazard in the Safety Information section.

WARNING

Many of the chemical solutions used for cleaning and sanitizing are corrosive. Do not use higher than recommended concentrations, or longer then recommended exposure times with cleaning/sanitizing solutions. Always rinse thoroughly immediately following the use of chemical solutions. As droplets dry out they become more concentrated and more corrosive. See Cleaning/Sanitizing Chemical Hazard in the Safety Information section.

WARNING

Direct contact with cleaning and sanitizing solutions may cause chemical or high temperature burns. Equip all personnel performing cleaning/sanitizing operations with protective clothing (including eye protection). Thoroughly train these personnel in the safe handling and disposal of the chemical and high temperature solutions they are using. See Cleaning/Sanitizing Chemical Hazard in the Safety Information section.

Cleaning and sanitizing of equipment is necessary on a routine basis whenever processing food products. The frequency of cleaning and the chemicals and procedures used will vary depending on the product(s) and process(es). It is the responsibility of the user to establish procedures which are suitable for the product and process.

Users should develop a well defined cleaning and sanitizing program. This program must take into consideration all applicable laws, regulations, and standards relative to the protection of public health and the safe use and disposal of chemicals. See Cleaning/Sanitizing Chemical Hazard in the Safety Information section.

The following information is presented as general guidelines only. For additional help contact your local health authority and a reputable supplier of cleaning and sanitizing chemicals for the food processing industry. You may also contact your local APV Crepaco sales representative for recommendations.

Cleaning and Sanitizing

Definitions

Rinse

The purpose of rinsing is to remove excess residual product and reduce the load required for detergent removal. At the end of washing, rinsing removes residual chemical solutions. Without the rinse, the chemicals could be corrosive or react unfavorably with other chemical solutions.

Use a rinse water temperature which readily removes the excess product or residual chemical solutions. Generally, this means warm water near 100 F. Use potable water for final rinse.

Rinsing immediately after processing, before product dries, is recommended.

Detergent Solution

CAUTION

Beware of nitric acid in detergent solutions. Nitric acid in detergents may be damaging to stainless steel and to rubber gaskets and seals.

Consult your chemical supplier to determine if any nitric acid is being used.

The customer has the responsibility of using chemical solutions compatible with the grades of stainless steel used in unit construction. Select a reputable supplier of cleaning chemicals (APV Crepaco will assist you, if desired). The supplier will recommend the type of chemical, concentration, and temperature your conditions require. The type of soil (residual product) to be cleaned from the surface will determine that selection.

Difficult to remove (burned-on) soil may require two kinds of detergent solutions. First, a chlorinated caustic solution, followed by an acid cleaner.

When using alkaline detergents used to remove burned-on soil, a useful guide is to use a temperature of solution slightly higher than the processing temperature.

Acid Rinse

CAUTION

Acid rinses used incorrectly can cause corrosion. Use only a very diluted solution of a type of acid that is recommended for use on the type of stainless steel used for your unit.

Do not use acid rinse unless the unit is clear of all residual detergent solution. Combining various chemicals may create a more corrosive effect.

A low concentration of a mild acid in the final rinse water is an optional procedure used to prevent residual film. APV Crepaco recommends 200 ppm (parts per million) of a phosphoric acid preparation.

Sanitizing

Sanitizing is used to kill bacteria on product contact surfaces of the unit. When using chemical solutions, sanitizing should be performed no earlier than 15 minutes prior to processing product. The chemicals commonly used for sanitizing (chlorine or iodine containing compounds) are extremely corrosive.

Solution strength and exposure time must be closely regulated.

Whenever possible, the use of hot water is recommended for sanitizing to avoid the corrosive effect of chemical solutions.

Methods for Cleaning and Sanitizing

General Procedure

The general sequence of steps for cleaning and sanitizing includes the following steps:

1. Rinse - Preliminary removal of excess residual product.
2. Wash - Use of detergent solution to remove residual product.
3. Rinse - Removal of residual detergent solution.
4. Sanitize - Treatment with heat or chemical solution prior to product processing to kill bacteria.

Cleaning and Sanitizing

Hand Cleaning

DANGER

When operating, the agitator can cause severe injury or loss of life for anyone inside the unit. Incorrect installation of the electric motor or controls may create an electric shock hazard which could cause severe injury or loss of life. The use of water, especially when sprayed from hand held hoses, increases the risk. ALWAYS turn off the electrical power supply and Lock Out, using a locking device for which only the person doing the work has the key, before performing service or maintenance.

CAUTION

Using the wrong cleaning tools will damage product contact surfaces. Never use steel wool or a wire brush. Use a nonmetallic brush.

Hand cleaning means that the application of rinses, detergents, and sanitizers is done by hand. For example, rinse water may be sprayed on with a hose and detergent solution may be scrubbed over surfaces with a brush or a scrub pad. Sanitizing solution may be applied by swabbing.

Cleaning and Inspection of Front and Rear Shaft Seal Areas

After CIP cleaning, check O-rings and seal areas for product residue. Wash out seal area at least once a week or as needed.

As seal is disassembled, inspect O-rings and seal surfaces for wear or deterioration and replace if necessary.

Cleaning the Heat Exchange Jacket

Occasional build-up of lime or foreign matter inside of the heat exchange jacket may slow heating time. Remove build-up to restore efficiency.

1. Prepare a solution of one part "Chlorodine", or equivalent de-limer, to 1-1/2 parts of warm water. Circulate the solution through the full jacket for 30 minutes.
2. **Immediately drain out all of the cleaning solution.**
3. Follow with a solution of 1-1/4 lb.. of Tri-Sodium Phosphate to 10 U.S. gallons of water. Circulate through the full jacket for 10 minutes.
4. Drain out solution and restore normal media flow.
5. Frequency of this treatment will be determined by the condition of local water supply.

Cleaning and Sanitizing

Sanitizing

WARNING

Direct contact with cleaning and sanitizing solutions may cause chemical or high temperature burns. Equip all personnel performing cleaning/sanitizing operations with protective clothing (including eye protection). Thoroughly train these personnel in the safe handling and disposal of the chemical and high temperature solutions they are using. See Cleaning/Sanitizing Chemical Hazard in the Safety Information section.

1. Sanitizing should be performed not more than 15 minutes prior to using processing equipment. Sanitizing solutions can be very corrosive to stainless steel, especially when their concentrations are increased by drying on the unit.

2. Sanitizing should be performed by recirculating a chemical solution containing 100 ppm chlorine concentration at a temperature of 75 to 90 F for a period not to exceed three minutes. Consult the local health department for the ppm of the sanitizing solution required in your area.

3. Rinsing must be done within a period of not less than 5 minutes after sanitizing. This will ensure effective bactericidal action without corrosive effects to the unit surface.

Theory of Operation

Product Flow

The purpose of the unit is to raise the temperature and/or viscosity of a product that is being transferred through it. The product is also mixed by the agitator while passing through the unit.

Product is normally added through the top of the hopper. Heating media is supplied to the media inlet connections. Once the product has entered the unit, it absorbs heat from the heating media that is being circulated through the heat exchange surface.

Scraper blades mounted on the agitator rotate within the unit. The scraper blades constantly scrape the product from the hopper walls. This prevents product build-up on the hopper walls and enhances the mixing of the product as it travels through the unit.

When the product has reached its proper temperature or viscosity, it leaves the hopper through the product outlet connection.

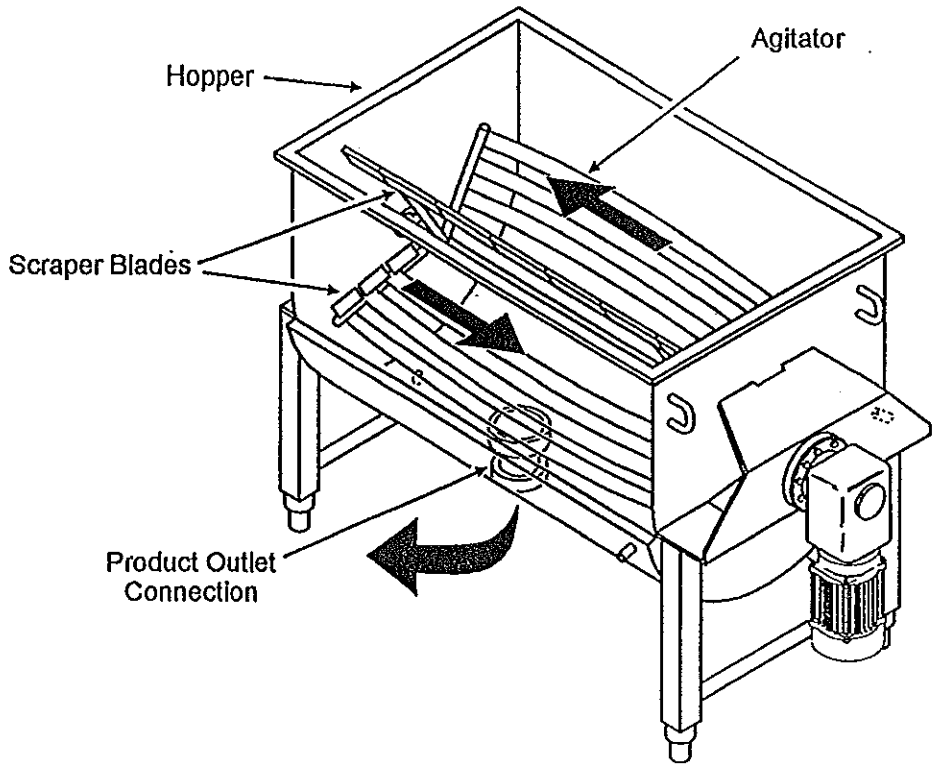
The unit has a multi-blade agitator driven by a fixed speed, reversible electric motor.

The time required for the complete blending can be controlled by a pre-set timer which operates as follows:

When the required blending time is completed, the agitator is stopped. An in-plant signal activates the control circuit, starting the agitator and starting the product discharge pump. Thus, the product is discharged into the downstream processing equipment.

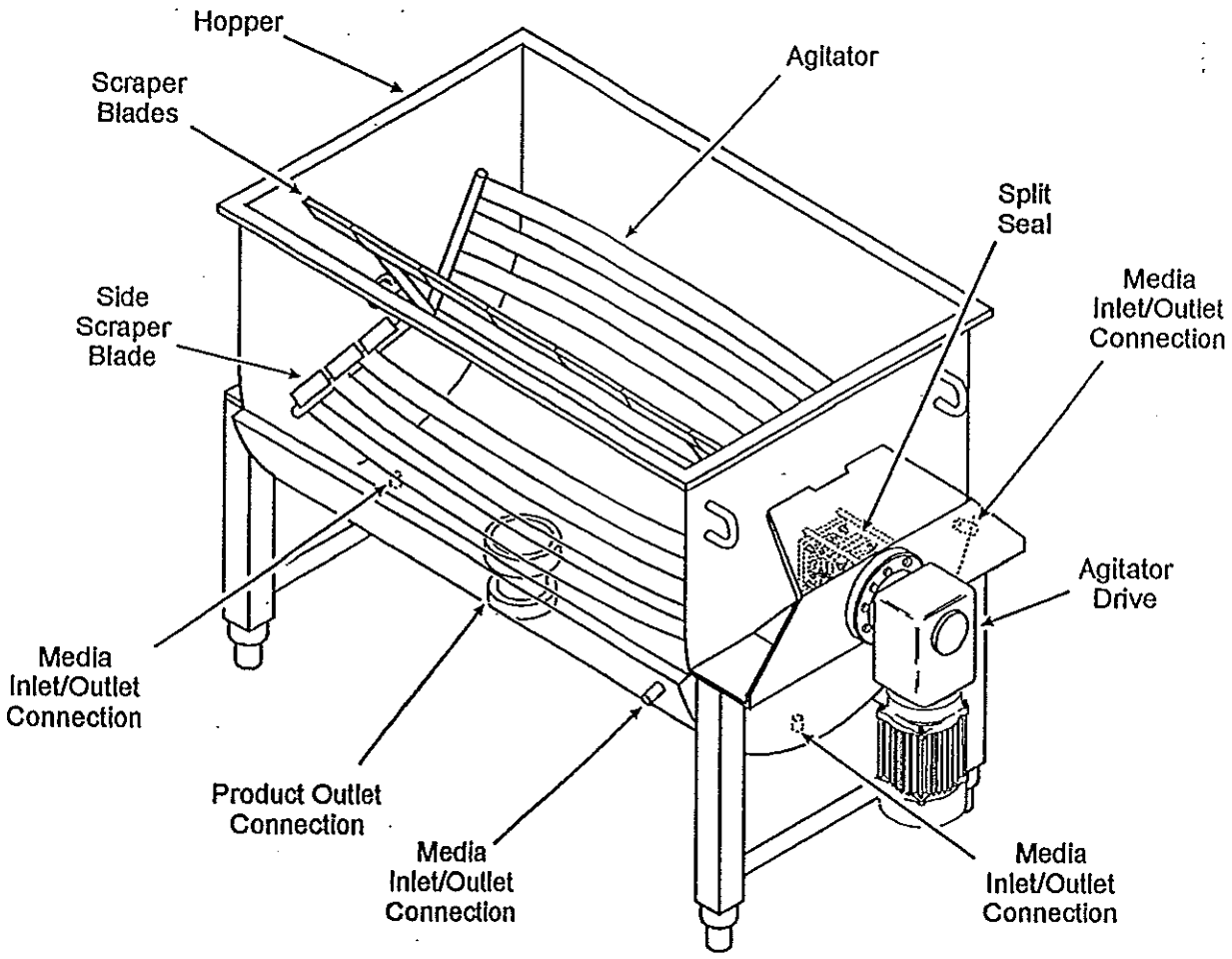
When an indicator probe located in the processing equipment is activated by the product, the agitator is stopped and the product discharge pump is stopped.

The previous sequence is repeated throughout the processing of the unit contents so that the product cannot be over-blended.



Product and Media Flow During Normal Operation

Theory of Operation



Typical Component Location

Operation

WARNING

Contact with high temperature lines or controls can cause severe burns. Incorrect installation or malfunctioning controls may cause a hazard of high temperature surfaces. Use caution when working with, or in the area of, high temperature media lines or controls.

CAUTION

Always operate the agitator when the media is flowing through the exchange surface.

Start Up

1. Fill the unit with the product.
2. Start the agitator drive.
3. Start the flow of media through the heat exchange surface.

Shutdown

1. Stop the flow of media through the heat exchange surface.
2. Stop the agitator drive.
3. Drain the unit of product.

After Shutdown is Complete

Clean and sanitize (refer to Cleaning and Sanitizing section).

Operating Tips

CAUTION

Any leaks in the piping system should be stopped to prevent air entrainment. When leaks occur, the system should be shut down and the procedure for purging air should be implemented again.

This procedure will prevent what is known as a hammering effect (snap-crackle noise) of the heat exchanger and rupture of the system.

1. Control product heating by opening and closing the valves in the media supply lines.
2. Operate the agitators to maintain a maximum and even rate of heat transfer.
3. When using high temperature for heating, the following precautions will minimize product burn-on:
   a. Maintain the product level above the heat exchange zone in the sidewall.
   b. Use the lowest feasible media temperature.
   c. Always operate the agitator during heating.
4. The mechanical energy used in mixing will add heat to the product during extended mixing times.

Maintenance

DANGER

Maintenance personnel will be exposed to hazardous areas of the unit while performing the recommended procedures in this manual. Individual hazard areas are described in the front of this manual. In addition, DANGER and WARNING statements appear where appropriate throughout the manual. Instruct all maintenance personnel of these hazards and the recommended procedures before they perform any maintenance. All maintenance must be performed by trained and authorized maintenance personnel only.

Agitator Drive

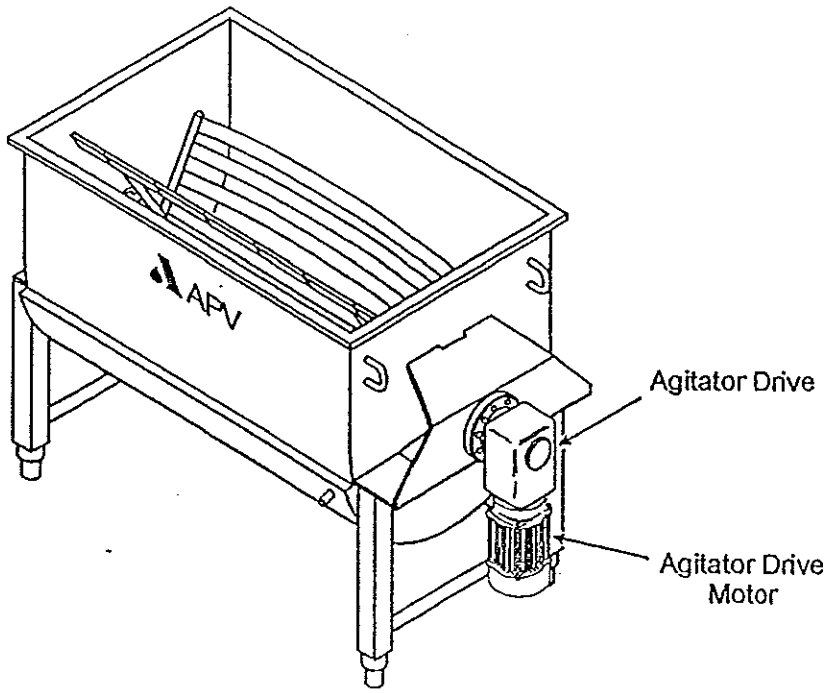
If the agitator drive is in need of service, it should be performed by qualified personnel using the manufacturer's recommended procedures.

DANGER

ALWAYS turn off the electrical power supply and Lock Out, using a locking device for which only the person doing the work has the key, before performing service or maintenance.

Agitator Drive Motor

Grease the agitator drive motor per manufacturer's recommendations. If the agitator drive motor is in need of service, it should be performed by qualified personnel using the manufacturer's recommended procedures.



Drive Location

Maintenance

Agitator Bearing

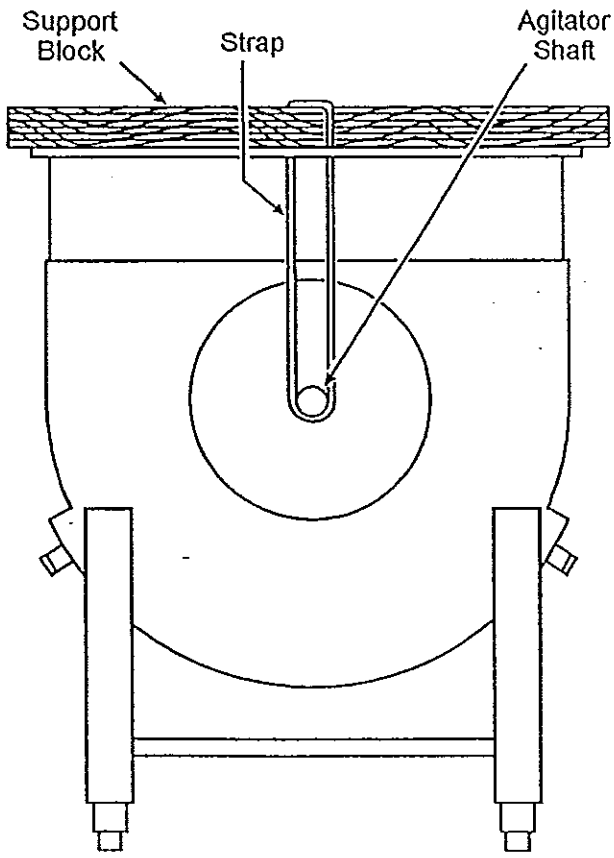
Removal

1. Remove the split seal per instructions in the Split Seal Removal in the Maintenance section.
2. Support the agitator with a strap(s) at each end of the shaft, to prevent the agitator from dropping down and damaging the agitator of the unit's body when the bearing is removed.
3. Loosen and remove the hex head cap screws and lock washers.
4. Loosen and remove the hex nuts and lock washers.
5. Carefully remove the bearing.

Installation

Use APV Crepaco sanitary lubricant where lubrication is indicated.

1. Slide the bearing over the agitator shaft and into the opening in the unit.
2. Replace the hex head cap screws and lock washers.
3. Replace the hex nuts and lock washers. Tighten.



Agitator Bearing Removal and Installation

*Some blender specifications may call for the Chesterton-type Split Seals –
Please see Chesterton 442M Insert.

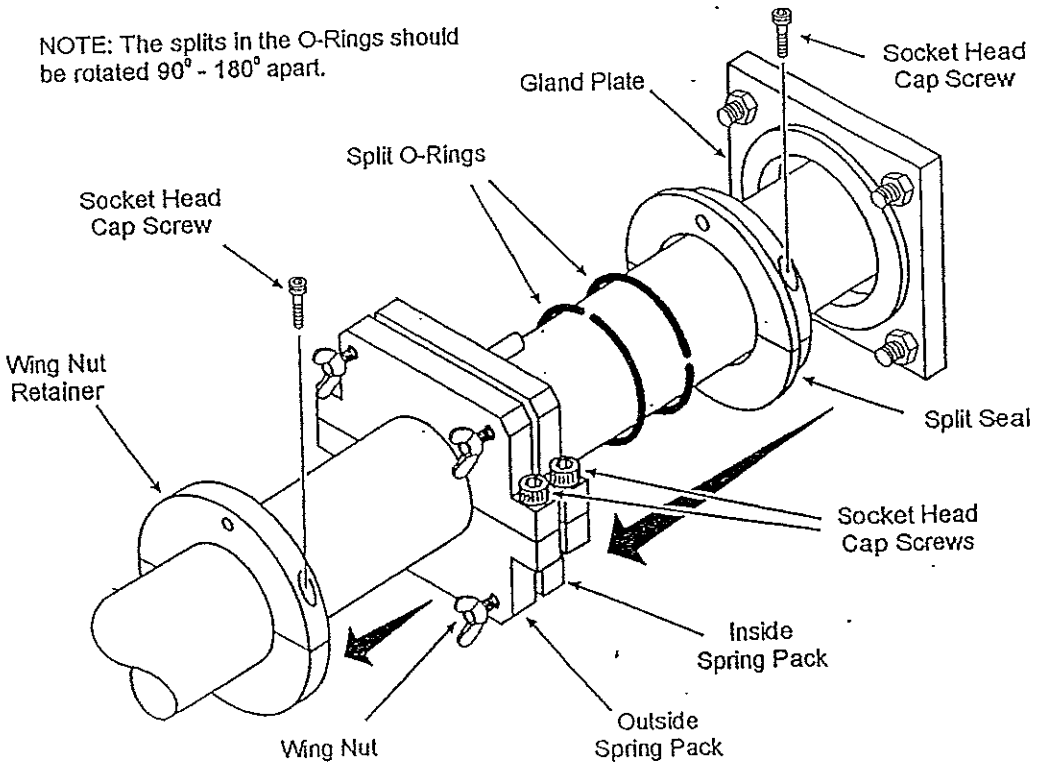
Maintenance

Split Seals

Removal

1. Loosen the socket head cap screws in the wing nut retainer.
2. Slide the wing nut retainer away from the outside spring pack.
3. Turn the wing nuts clockwise until they are finger tight and flush with the outside spring pack.
4. Loosen the socket head cap screws in the outside spring pack.
5. Slide both the inside and outside spring packs away from the split seal.
6. Pull the split seal (with O-rings) away from the gland plate so there is approximately 2 in. between the split seal and the gland plate. This requires uniform pressure and may also require the split seal to be wiggled during this step.
7. Push the split seal forward towards the gland plate. The O-rings should pop out of the split seal.
8. Manually clean and inspect split seal components for any signs of leakage or wear. Replace components as necessary.

It is not necessary to split seal, unless the entire split seal is going to be replaced.



Split Seal Removal

*Some blender specifications may call for the Chesterton-type Split Seals – Please see Chesterton 442M Insert.

Maintenance

Installation

Use APV Crepaco sanitary lubricant where lubrication is indicated.

1. Slide the split seal up tight to the gland plate.

2. Lubricate the O-rings. Using a **blunt instrument**, push one O-ring into the grove on the back face of the split seal. (A hex or Allen wrench with a T-handle works well for this.) After the first O-ring is in place, install the second O-ring the same way as the first.

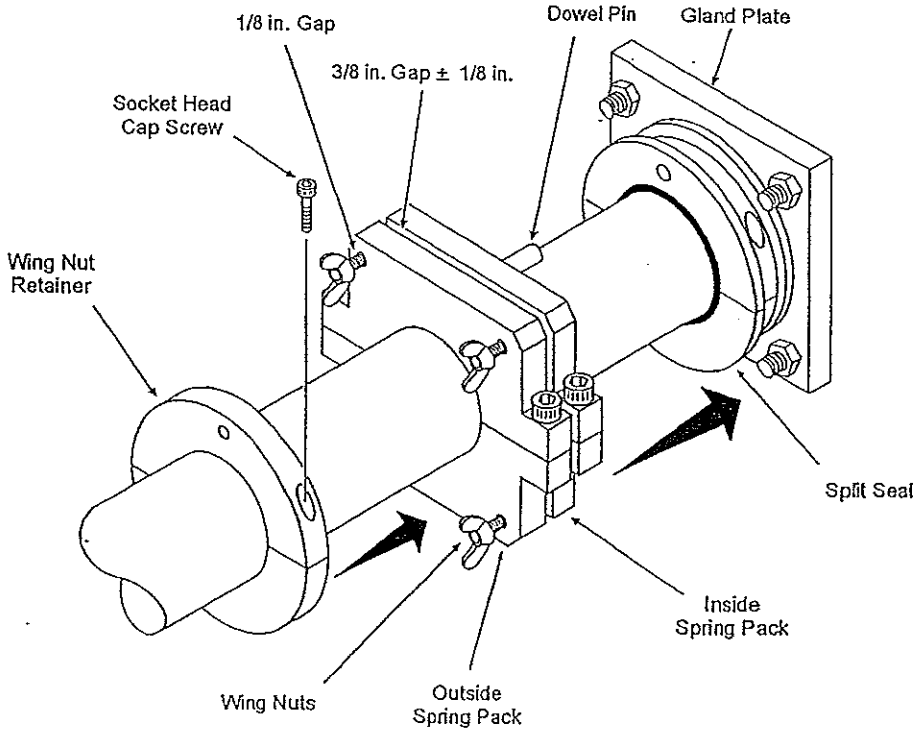
3. Slide the spring pack up against the split seal to seat the O-rings. Make sure the dowel pin on the spring pack is aligned with the hole in the split seal.

   Make sure the wing nuts on the spring pack are adjusted for proper pressure. There must be a 3/8 in. gap ± 1/8 in. between the inside and outside spring pack.

4. Tighten the socket head cap screws in the outside spring pack.

5. Loosen all four wing nuts so there is a minimum of 1/8 of an inch between the outside spring pack and the wing nuts. This will "load pressure" against the split seal.

6. Slide the wing nut retainer up against the outside spring pack. Make sure all wing nut heads clear the wing nut retainer and are loose. Tighten the socket head cap screws in the wing nut retainer.



Split Seal Installation

Maintenance

Agitator Scraper Blades

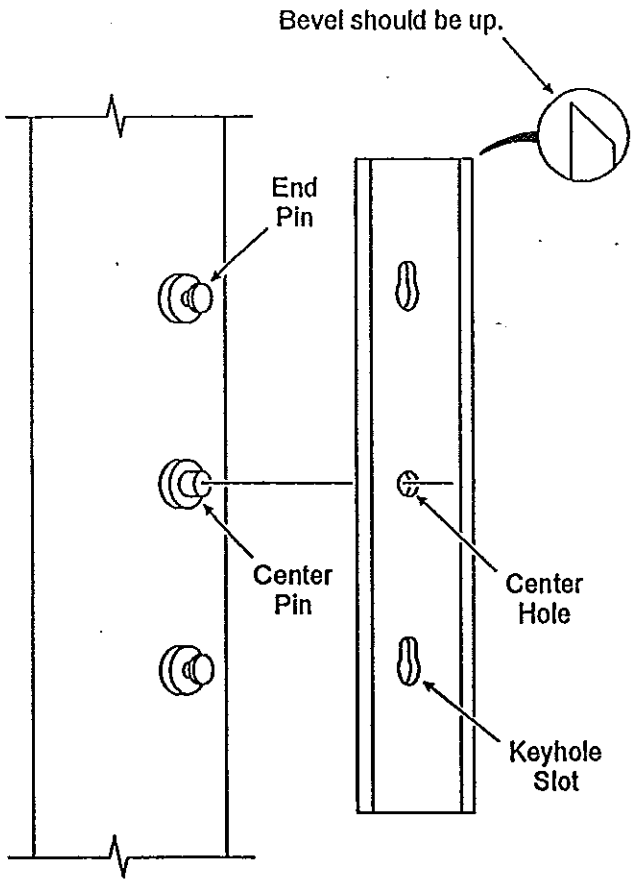
Check for wear. If the blades no longer contact with the sides of the unit, replace the blades.

Removal

1. Lift the blade up at the center until the center hole is free from the pin.
2. Slide the blade along the slots until the blade is free.

Installation

1. Place the keyhole slots in the blade over the end pins.
2. Force the blade down and slide it until the center hole of the blade goes down over the center pin.



Scraper Blade Removal and Installation

Fahrenheit to Celsius Conversion Table

F=(1.8 x C) + 32

C=(F-32) x .556

Fahrenheit	Celsius	Fahrenheit	Celsius	Fahrenheit	Celsius	Fahrenheit	Celsius	Fahrenheit	Celsius
-30.0	-34.5	29.0	-1.7	88.0	31.1	147.0	63.9	206.0	96.7
-29.0	-33.9	30.0	-1.1	89.0	31.7	148.0	64.5	207.0	97.3
-28.0	-33.4	31.0	-0.6	90.0	32.2	149.0	65.1	208.0	97.9
-27.0	-32.8	32.0	0.0	91.0	32.8	150.0	65.6	209.0	98.4
-26.0	-32.2	33.0	0.6	92.0	33.4	151.0	66.2	210.0	99.0
-25.0	-31.7	34.0	1.1	93.0	33.9	152.0	66.7	211.0	99.5
-24.0	-31.1	35.0	1.7	94.0	34.5	153.0	67.3	212.0	100.1
-23.0	-30.6	36.0	2.2	95.0	35.0	154.0	67.8	213.0	100.6
-22.0	-30.0	37.0	2.8	96.0	35.6	155.0	68.4	214.0	101.2
-21.0	-29.5	38.0	3.3	97.0	36.1	156.0	68.9	215.0	101.7
-20.0	-28.9	39.0	3.9	98.0	36.7	157.0	69.5	216.0	102.3
-19.0	-28.4	40.0	4.4	99.0	37.3	158.0	70.1	217.0	102.9
-18.0	-27.8	41.0	5.0	100.0	37.8	159.0	70.6	218.0	103.4
-17.0	-27.2	42.0	5.6	101.0	38.4	160.0	71.2	219.0	104.0
-16.0	-26.7	43.0	6.1	102.0	38.9	161.0	71.7	220.0	104.5
-15.0	-26.1	44.0	6.7	103.0	39.5	162.0	72.3	221.0	105.1
-14.0	-25.6	45.0	7.2	104.0	40.0	163.0	72.8	222.0	105.6
-13.0	-25.0	46.0	7.8	105.0	40.6	164.0	73.4	223.0	106.2
-12.0	-24.5	47.0	8.3	106.0	41.1	165.0	73.9	224.0	106.8
-11.0	-23.9	48.0	8.9	107.0	41.7	166.0	74.5	225.0	107.3
-10.0	-23.4	49.0	9.5	108.0	42.3	167.0	75.1	226.0	107.9
-9.0	-22.8	50.0	10.0	109.0	42.8	168.0	75.6	227.0	108.4
-8.0	-22.2	51.0	10.6	110.0	43.4	169.0	76.2	228.0	109.0
-7.0	-21.8	52.0	11.1	111.0	43.9	170.0	76.7	229.0	109.5
-6.0	-21.1	53.0	11.7	112.0	44.5	171.0	77.3	230.0	110.1
-5.0	-20.6	54.0	12.2	113.0	45.0	172.0	77.8	231.0	110.6
-4.0	-20.0	55.0	12.8	114.0	45.6	173.0	78.4	232.0	111.2
-3.0	-19.5	56.0	13.3	115.0	46.1	174.0	79.0	233.0	111.8
-2.0	-18.9	57.0	13.9	116.0	46.7	175.0	79.5	234.0	112.3
-1.0	-18.3	58.0	14.5	117.0	47.3	176.0	80.1	235.0	112.9
0.0	-17.8	59.0	15.0	118.0	47.8	177.0	80.6	236.0	113.4
1.0	-17.2	60.0	15.6	119.0	48.4	178.0	81.2	237.0	114.0
2.0	-16.7	61.0	16.1	120.0	48.9	179.0	81.7	238.0	114.5
3.0	-16.1	62.0	16.7	121.0	49.5	180.0	82.3	239.0	115.1
4.0	-15.6	63.0	17.2	122.0	50.0	181.0	82.8	240.0	115.6
5.0	-15.0	64.0	17.8	123.0	50.6	182.0	83.4	241.0	116.2
6.0	-14.5	65.0	18.3	124.0	51.2	183.0	84.0	242.0	116.8
7.0	-13.9	66.0	18.9	125.0	51.7	184.0	84.5	243.0	117.3
8.0	-13.3	67.0	19.5	126.0	52.3	185.0	85.1	244.0	117.9
9.0	-12.8	68.0	20.0	127.0	52.8	186.0	85.6	245.0	118.4
10.0	-12.2	69.0	20.6	128.0	53.4	187.0	86.2	246.0	119.0
11.0	-11.7	70.0	21.1	129.0	53.9	188.0	86.7	247.0	119.5
12.0	-11.1	71.0	21.7	130.0	54.5	189.0	87.3	248.0	120.1
13.0	-10.6	72.0	22.2	131.0	55.0	190.0	87.8	249.0	120.7
14.0	-10.0	73.0	22.8	132.0	55.6	191.0	88.4	250.0	121.2
15.0	-9.5	74.0	23.4	133.0	56.2	192.0	89.0		
16.0	-8.9	75.0	23.9	134.0	56.7	193.0	89.5		
17.0	-8.3	76.0	24.5	135.0	57.3	194.0	90.1		
18.0	-7.8	77.0	25.0	136.0	57.8	195.0	90.6		
19.0	-7.2	78.0	25.6	137.0	58.4	196.0	91.2		
20.0	-6.7	79.0	26.1	138.0	58.9	197.0	91.7		
21.0	-6.1	80.0	26.7	139.0	59.5	198.0	92.3		
22.0	-5.6	81.0	27.2	140.0	60.0	199.0	92.9		
23.0	-5.0	82.0	27.8	141.0	60.6	200.0	93.4		
24.0	-4.4	83.0	28.4	142.0	61.2	201.0	94.0		
25.0	-3.9	84.0	28.9	143.0	61.7	202.0	94.5		
26.0	-3.3	85.0	29.5	144.0	62.3	203.0	95.1		
27.0	-2.8	86.0	30.0	145.0	62.8	204.0	95.6		
28.0	-2.2	87.0	30.6	146.0	63.4	205.0	96.2		

Foot Pounds (ft-lb) to Newton Meters (N·M) Conversion Table

1 ft-lb = 1.3355818 N·M (Newton Meter)

ft-lb	N·M	ft-lb	N·M
1	1.35	51	69.16
2	2.71	52	70.51
3	4.07	53	71.87
4	5.42	54	73.22
5	6.78	55	74.58
6	8.14	56	75.94
7	9.49	57	77.29
8	10.85	58	78.65
9	12.20	59	80.00
10	13.56	60	81.36
11	14.92	61	82.72
12	16.27	62	84.07
13	17.63	63	85.43
14	18.98	64	86.78
15	20.34	65	88.14
16	21.70	66	89.50
17	23.05	67	90.85
18	24.41	68	92.21
19	25.76	69	93.56
20	27.12	70	94.92
21	28.48	71	96.28
22	29.83	72	97.63
23	31.19	73	98.99
24	32.54	74	100.34
25	33.90	75	101.70
26	35.26	76	103.06
27	36.61	77	104.41
28	37.97	78	105.77
29	39.32	79	107.12
30	40.68	80	108.48
31	42.04	81	109.84
32	43.39	82	111.19
33	44.75	83	112.55
34	46.10	84	113.90
35	47.46	85	115.26
36	48.82	86	116.62
37	50.17	87	117.97
38	51.53	88	119.33
39	52.88	89	120.68
40	54.24	90	122.04
41	55.60	91	123.40
42	56.95	92	124.75
43	58.31	93	126.11
44	59.66	94	127.46
45	61.02	95	128.82
46	62.38	96	130.18
47	63.73	97	131.53
48	65.09	98	132.89
49	66.44	99	134.24
50	67.80	100	135.60

US Fluid Ounces to Liters Conversion Table

1 Ounce = .02957 Liters

Ounces	Liters	Ounces	Liters
1	0.030	51	1.530
2	0.060	52	1.560
3	0.090	53	1.590
4	0.120	54	1.620
5	0.150	55	1.650
6	0.180	56	1.680
7	0.210	57	1.710
8	0.240	58	1.740
9	0.270	59	1.770
10	0.300	60	1.800
11	0.330	61	1.830
12	0.360	62	1.860
13	0.390	63	1.890
14	0.420	64	1.920
15	0.450	65	1.950
16	0.480	66	1.980
17	0.510	67	2.010
18	0.540	68	2.040
19	0.570	69	2.070
20	0.600	70	2.100
21	0.630	71	2.130
22	0.660	72	2.160
23	0.690	73	2.190
24	0.720	74	2.220
25	0.750	75	2.250
26	0.780	76	2.280
27	0.810	77	2.310
28	0.840	78	2.340
29	0.870	79	2.370
30	0.900	80	2.400
31	0.930	81	2.430
32	0.960	82	2.460
33	0.990	83	2.490
34	1.020	84	2.520
35	1.050	85	2.550
36	1.080	86	2.580
37	1.110	87	2.610
38	1.140	88	2.640
39	1.170	89	2.670
40	1.200	90	2.700
41	1.230	91	2.730
42	1.260	92	2.760
43	1.290	93	2.790
44	1.320	94	2.820
45	1.350	95	2.850
46	1.380	96	2.880
47	1.410	97	2.910
48	1.440	98	2.940
49	1.470	99	2.970
50	1.500	100	3.000

Inches to Millimeters Conversion Table

1 inch = 25.4 mm

in.	mm	In.	mm
0:10	2.54	11.25	285.75
0.15	3.81	11.50	292.10
0.20	5.08	11.75	298.45
0.25	6.35	12.00	304.80
0.30	7.62	12.25	311.15
0.35	8.89	12.50	317.50
0.40	10.16	12.75	323.85
0.45	11.43	13.00	330.20
0.50	12.70	13.25	336.55
0.55	13.97	13.50	342.90
0.60	15.24	13.75	349.25
0.65	16.51	14.00	355.60
0.70	17.78	14.25	361.95
0.75	19.05	14.50	368.30
0.80	20.32	14.75	374.65
0.85	21.59	15.00	381.00
0.90	22.86	15.25	387.35
0.95	24.13	15.50	393.70
1.00	25.40	15.75	400.05
1.25	31.75	16.00	406.40
1.50	38.10	16.25	412.75
1.75	44.45	16.50	419.10
2.00	50.80	16.75	425.45
2.25	57.15	17.00	431.80
2.50	63.50	17.25	438.15
2.75	69.85	17.50	444.50
3.00	76.20	17.75	450.85
3.25	82.55	18.00	457.20
3.50	88.90	18.25	463.55
3.75	95.25	18.50	469.90
4.00	101.60	18.75	476.25
4.25	107.95	19.00	482.60
4.50	114.30	19.25	488.95
4.75	120.65	19.50	495.30
5.00	127.00	19.75	501.65
5.25	133.35	20.00	508.00
5.50	139.70	20.25	514.35
5.75	146.05	20.50	520.70
6.00	152.40	20.75	527.05
6.25	158.75	21.00	533.40
6.50	165.10	21.25	539.75
6.75	171.45		
7.00	177.80		
7.25	184.15		
7.50	190.50		
7.75	196.85		
8.00	203.20		
8.25	209.55		
8.50	215.90		
8.75	222.25		
9.00	228.60		
9.25	234.95		
9.50	241.30		
9.75	247.65		
10.00	254.00		
10.25	260.35		
10.50	266.70		
10.75	273.05		
11.00	279.40		

Inches to Centimeters Conversion Table

1 inch = 2.54 cm

in.	cm	In.	cm	in.	cm
0.25	0.635	54.00	137.160	113.00	287.020
0.50	1.270	55.00	139.700	114.00	289.560
0.75	1.905	56.00	142.240	115.00	292.100
1.00	2.540	57.00	144.780	116.00	294.640
1.25	3.175	58.00	147.320	117.00	297.180
1.50	3.810	59.00	149.860	118.00	299.720
1.75	4.445	60.00	152.400	119.00	302.260
2.00	5.080	61.00	154.940	120.00	304.800
3.00	7.620	62.00	157.480	121.00	307.340
4.00	10.160	63.00	160.020	122.00	309.880
5.00	12.700	64.00	162.560	123.00	312.420
6.00	15.240	65.00	165.100	124.00	314.960
7.00	17.780	66.00	167.640	125.00	317.500
8.00	20.320	67.00	170.180	126.00	320.040
9.00	22.860	68.00	172.720	127.00	322.580
10.00	25.400	69.00	175.260	128.00	325.120
11.00	27.940	70.00	177.800	129.00	327.660
12.00	30.480	71.00	180.340	130.00	330.200
13.00	33.020	72.00	182.880	131.00	332.740
14.00	35.560	73.00	185.420	132.00	335.280
15.00	38.100	74.00	187.960	133.00	337.820
16.00	40.640	75.00	190.500	134.00	340.360
17.00	43.180	76.00	193.040	135.00	342.900
18.00	45.720	77.00	195.580	136.00	345.440
19.00	48.260	78.00	198.120	137.00	347.980
20.00	50.800	79.00	200.660	138.00	350.520
21.00	53.340	80.00	203.200	139.00	353.060
22.00	55.880	81.00	205.740	140.00	355.600
23.00	58.420	82.00	208.280	141.00	358.140
24.00	60.960	83.00	210.820	142.00	360.680
25.00	63.500	84.00	213.360	143.00	363.220
26.00	66.040	85.00	215.900	144.00	365.760
27.00	68.580	86.00	218.440	145.00	368.300
28.00	71.120	87.00	220.980	146.00	370.840
29.00	73.660	88.00	223.520	147.00	373.380
30.00	76.200	89.00	226.060	148.00	375.920
31.00	78.740	90.00	228.600	149.00	378.460
32.00	81.280	91.00	231.140	150.00	381.000
33.00	83.820	92.00	233.680	151.00	383.540
34.00	86.360	93.00	236.220	152.00	386.080
35.00	88.900	94.00	238.760	153.00	388.620
36.00	91.440	95.00	241.300	154.00	391.160
37.00	93.980	96.00	243.840	155.00	393.700
38.00	96.520	97.00	246.380	156.00	396.240
39.00	99.060	98.00	248.920	157.00	398.780
40.00	101.600	99.00	251.460	158.00	401.320
41.00	104.140	100.00	254.000	159.00	403.860
42.00	106.680	101.00	256.540	160.00	406.400
43.00	109.220	102.00	259.080	161.00	408.940
44.00	111.760	103.00	261.620	162.00	411.480
45.00	114.300	104.00	264.160	163.00	414.020
46.00	116.840	105.00	266.700	164.00	416.560
47.00	119.380	106.00	269.240	165.00	419.100
48.00	121.920	107.00	271.780	166.00	421.640
49.00	124.460	108.00	274.320	167.00	424.180
50.00	127.000	109.00	276.860	168.00	426.720
51.00	129.540	110.00	279.400	169.00	429.260
52.00	132.080	111.00	281.940	170.00	431.800
53.00	134.620	112.00	284.480	171.00	434.340

Gallons to Liters Conversion Table

1 Gallon = 3.785 Liters

Gallons	Liters	Gallons	Liters
1	3.785	420	1589.700
2	7.570	430	1627.550
3	11.355	440	1665.400
4	15.140	450	1703.250
5	18.925	460	1741.100
6	22.710	470	1778.950
7	26.495	480	1816.800
8	30.280	490	1854.650
9	34.065	500	1892.500
10	37.850	510	1930.350
20	75.700	520	1968.200
30	113.550	530	2006.050
40	151.400	540	2043.900
50	189.250	550	2081.750
60	227.100	560	2119.600
70	264.950	570	2157.450
80	302.800	580	2195.300
90	340.650	590	2233.150
100	378.500	600	2271.000
110	416.350	610	2308.850
120	454.200	620	2346.000
130	492.050	630	2384.550
140	529.900	640	2422.400
150	567.750	650	2460.250
160	605.600	660	2498.100
170	643.450	670	2535.950
180	681.300	680	2573.800
190	719.150	690	2611.650
200	757.000	700	2649.500
210	794.850	710	2687.350
220	832.700	720	2725.200
230	870.550	730	2763.050
240	908.400	740	2800.900
250	946.250	750	2838.750
260	984.100	760	2876.600
270	1021.950	770	2914.450
280	1059.800	780	2952.300
290	1097.650	790	2990.150
300	1135.500	800	3028.000
310	1173.350	810	3065.850
320	1211.200	820	3103.700
330	1249.050	830	3141.550
340	1286.900	840	3179.400
350	1324.750	850	3217.250
360	1362.600	860	3255.100
370	1400.450	870	3292.950
380	1438.300	880	3330.800
390	1476.150	890	3368.650
400	1514.000	900	3406.500
410	1551.850		

Quarts to Liters Conversion Table

1 Quart = .946 Liters

Quarts	Liters	Quarts	Liters
1	0.946	51	48.246
2	1.892	52	49.192
3	2.838	53	50.138
4	3.784	54	51.084
5	4.730	55	52.030
6	5.676	56	52.976
7	6.622	57	53.922
8	7.568	58	54.868
9	8.514	59	55.814
10	9.460	60	56.760
11	10.406	61	57.706
12	11.352	62	58.652
13	12.298	63	59.598
14	13.244	64	60.544
15	14.190	65	61.490
16	15.136	66	62.436
17	16.082	67	63.382
18	17.028	68	64.328
19	17.974	69	65.274
20	18.920	70	66.220
21	19.866	71	67.166
22	20.812	72	68.112
23	21.758	73	69.058
24	22.704	74	70.004
25	23.650	75	70.950
26	24.596	76	71.896
27	25.542	77	72.842
28	26.488	78	73.788
29	27.434	79	74.734
30	28.380	80	75.680
31	29.326	81	76.626
32	30.272	82	77.572
33	31.218	83	78.518
34	32.164	84	79.464
35	33.110	85	80.410
36	34.056	86	81.356
37	35.002	87	82.302
38	35.948	88	83.248
39	36.894	89	84.194
40	37.840	90	85.140
41	38.786	91	86.086
42	39.732	92	87.032
43	40.678	93	87.978
44	41.624	94	88.924
45	42.570	95	89.870
46	43.516	96	90.816
47	44.462	97	91.762
48	45.408	98	92.708
49	46.354	99	93.654
50	47.300	100	94.600

Pounds per Square Inch Gauge(PSIG) to Bar Conversion Table

1 PSIG = 0.069 Bar

PSIG	Bar	PSIG	Bar	PSIG	Bar	PSIG	Bar	PSIG	Bar
1	0.069	58	4.002	115	7.935	172	11.868	228	15.732
2	0.138	59	4.071	116	8.004	173	11.937	229	15.801
3	0.207	60	4.140	117	8.073	174	12.006	230	15.870
4	0.276	61	4.209	118	8.142	175	12.075	231	15.939
5	0.345	62	4.278	119	8.211	176	12.144	232	16.008
6	0.414	63	4.347	120	8.280	177	12.213	233	16.077
7	0.483	64	4.416	121	8.349	178	12.282	234	16.146
8	0.552	65	4.485	122	8.418	179	12.351	235	16.215
9	0.621	66	4.554	123	8.487	180	12.420	236	16.284
10	0.690	67	4.623	124	8.556	181	12.489	237	16.353
11	0.759	68	4.692	125	8.625	182	12.558	238	16.422
12	0.828	69	4.761	126	8.694	183	12.627	239	16.491
13	0.897	70	4.830	127	8.763	184	12.696	240	16.560
14	0.966	71	4.899	128	8.832	185	12.765	241	16.629
15	1.035	72	4.968	129	8.901	186	12.834	242	16.698
16	1.104	73	5.037	130	8.970	187	12.903	243	16.767
17	1.173	74	5.106	131	9.039	188	12.972	244	16.836
18	1.242	75	5.175	132	9.108	189	13.041	245	16.905
19	1.311	76	5.244	133	9.177	190	13.110	246	16.974
20	1.380	77	5.313	134	9.246	191	13.179	247	17.043
21	1.449	78	5.382	135	9.315	192	13.248	248	17.112
22	1.518	79	5.451	136	9.384	193	13.317	249	17.181
23	1.587	80	5.520	137	9.453	194	13.386	250	17.250
24	1.656	81	5.589	138	9.522	195	13.455	251	17.319
25	1.725	82	5.658	139	9.591	196	13.524	252	17.388
26	1.794	83	5.727	140	9.660	197	13.594	253	17.457
27	1.863	84	5.796	141	9.729	198	13.662	254	17.526
28	1.932	85	5.865	142	9.798	199	13.731	255	17.595
29	2.001	86	5.934	143	9.867	200	13.800	256	17.664
30	2.070	87	6.003	144	9.936	201	13.869	257	17.733
31	2.139	88	6.072	145	10.005	202	13.938	258	17.802
32	2.208	89	6.141	146	10.074	203	14.007	259	17.871
33	2.277	90	6.210	147	10.143	204	14.076	260	17.940
34	2.346	91	6.279	148	10.212	205	14.145	261	18.009
35	2.415	92	6.348	149	10.281	206	14.214	262	18.078
36	2.484	93	6.417	150	10.350	207	14.283	263	18.147
37	2.553	94	6.486	151	10.419	208	14.352	264	18.216
38	2.622	95	6.555	152	10.488	209	14.421	265	18.285
39	2.691	96	6.624	153	10.557	210	14.490	266	18.354
40	2.760	97	6.693	154	10.626	211	14.559	267	18.423
41	2.829	98	6.762	155	10.695	212	14.628	268	18.492
42	2.898	99	6.831	156	10.764	213	14.697	269	18.561
43	2.967	100	6.900	157	10.833	214	14.766	270	18.630
44	3.036	101	6.969	158	10.902	215	14.835	271	18.699
45	3.105	102	7.038	159	10.971	216	14.904	272	18.768
46	3.174	103	7.107	160	11.040	217	14.973	273	18.837
47	3.243	104	7.176	161	11.109	218	15.042	274	18.906
48	3.312	105	7.245	162	11.178	219	15.111	275	18.975
49	3.381	106	7.314	163	11.247	220	15.180	276	19.044
50	3.450	107	7.383	164	11.316	221	15.249	277	19.113
51	3.519	108	7.452	165	11.385	222	15.318	278	19.182
52	3.588	109	7.521	166	11.454	223	15.387	279	19.251
53	3.657	110	7.590	167	11.523	224	15.456	280	19.320
54	3.726	111	7.659	168	11.592	225	15.525	281	19.389
55	3.795	112	7.728	169	11.661	226	15.594	282	19.458
56	3.864	113	7.797	170	11.730	227	15.663	283	19.527
57	3.933	114	7.866	171	11.799	228	15.732	284	19.596

Wire Size Conversion Table

Wire Gauge	Diameter of Wire in Inches	Diameter of Wire in mm	Resistance at 77 F (Ohms per 1000 ft.)
0000	.4600	11.684	000.0500
000	.4097	10.404	000.0630
00	.3648	9.266	000.0795
0	.3248	8.250	000.1002
1	.2893	7.349	000.1264
2	.2576	6.543	000.1593
3	.2294	5.827	000.2009
4	.2043	5.190	000.2533
6	.1620	4.115	000.4028
8	.1284	3.262	000.6405
10	.1018	2.586	001.0180
12	.0808	2.053	001.6190
14	.0640	1.626	002.5750
16	.0508	1.291	004.0940
18	.0403	1.024	006.5100
20	.0319	0.811	010.3500
22	.0254	0.646	016.4600
24	.0201	0.511	026.1700
26	.0159	0.404	041.6200
28	.0126	0.320	066.1700
30	.0100	0.254	105.2000
32	.0080	0.204	167.3000
34	.0063	0.160	266.0000
36	.0050	0.127	423.0000
38	.0040	0.102	672.6000
40	.0031	0.079	1069.0000
42	.0025	0.064	1701.0000
44	.0020	0.051	2703.0000
46	.0016	0.041	4299.0000
48	.0012	0.031	6836.0000
50	.0010	0.026	10870.0000

Feet to Meters Conversion Table

1 Foot = 0.3048 Meter

Feet	Meters
1	0.3048
2	0.6096
3	0.9144
4	1.2190
5	1.5240
6	1.8288
7	2.1336
8	2.4384
9	2.7432
10	3.0480
11	3.3528
12	3.6576
13	3.9624
14	4.2672
15	4.5720
16	4.8768
17	5.1816
18	5.4864
19	5.7912
20	6.0960
21	6.4008
22	6.7056
23	7.0104
24	7.3152
25	7.6200
100	30.4800
1000	304.8000
2000	609.6000

Viscosity Conversion Table

When Specific Gravity is 1		When Specific Gravity is other than 1											
Read Directly Across		Find CKS, Then Multiply CKS x SG = CPS	Find Stokes, Then Multiply Stoke x SG = Poise										
CPS	Poise	CKS	Stoke	Saybolt Universal (SSU)	Seconds Engler	Degrees Engler	Dupont Parlin #7	Dupont Parlin #10	Dupont Parlin #15	Dupont Parlin #20	Krebs Units	Mac-Michael	Pratt & Lambert F
1	.01	1	.01	31	54	1.0	20		4.2				
2	.02	2	.02	34	57	1.1	23		4.3				
4	.04	4	.04	38	61	1.3	24		4.4				
7	.07	7	.07	47	75	1.6	26		4.6				
10	.10	10	.10	60	94	1.9	28	11	4.7				
15	.15	15	.15	80	125	2.5	30	12	4.9				
20	.20	20	.20	100	170	3.0	32	13	5.0			125	
25	.24	25	.24	130	190	4.1	37	14	5.1			139	
30	.30	30	.30	160	210	4.9	43	15	5.4			151	
40	.40	40	.40	210	300	6.0	50	16	5.7			177	
50	.50	50	.50	260	350	7.5	57	17	6.0		30	201	
60	.60	60	.60	320	450	9.1	63	18	6.3	3.1	33	230	
70	.70	70	.70	370	525	10.5	68	20	6.8	3.2	35	260	
80	.80	80	.80	430	600	12.4	73	22	7.5	3.3	37	290	7.3
90	.90	90	.90	480	875	14.0	78	23	7.7	3.4	38	315	7.8
100	1.0	100	1.0	530	750	15.3	81	25	8.0	3.5	40	335	8.3
120	1.2	120	1.2	580	900	16.1	90	30	8.3	3.6	43	380	8.9
140	1.4	140	1.4	690	1050	20.0	106	32	8.9	3.9	46	415	9.8
160	1.6	160	1.6	790	1200	23.0	120	37	9.7	4.1	48	465	10.8
180	1.8	180	1.8	900	1350	26.3	135	41	10.7	4.3	50	520	11.9
200	2.0	200	2.0	1000	1500	29.2	149	43	11.5	4.5	52	570	12.5
220	2.2	220	2.2	1100	1650	32.2		45	12.2	4.8	54	610	13.0
240	2.4	240	2.4	1200	1800	35.0		49	13.0	5.0	56	660	14.2
260	2.6	260	2.6	1280	1950	37.7		53	13.7	5.3	58	700	15.1
280	2.8	280	2.8	1380	2100	40.5		58	14.4	5.6	59	750	15.6
300	3.0	300	3.0	1475	2250	43.0		64	15.0	5.9	60	800	16.7
320	3.2	320	3.2	1530	2400	44.7		66	15.5	6.1		825	17.3
340	3.4	340	3.4	1630	2550	47.5		70	16.4	6.4		875	18.5
360	3.6	360	3.6	1730	2700	50.3		74	17.3	6.7	62	925	19.6
380	3.8	380	3.8	1850	2850	54.0		79	18.2	7.0		980	21.0
400	4.0	400	4.0	1950	3000	57.0		84	19.1	7.3	64	1035	22.1
420	4.2	420	4.2	2050	3150	59.9		88	20.0	7.6		1070	23.2
440	4.4	440	4.4	2160	3300	63.6		93	21.0	8.0		1125	24.4
460	4.6	460	4.6	2270	3450	67.0		100	22.0	8.5	65	1180	26.7
480	4.8	480	4.8	2380	3600	69.5		104	23.0	8.9	67	1240	27.0
500	5.0	500	5.0	2480	3750	73.1		107	23.9	9.2	68	1290	28.1
550	5.5	550	5.5	2660	4125	78.0		115	26.3	9.7	69	1385	30.1
600	6.0	600	6.0	2900	4500	85.0		126	28.5	10.6	71	1510	32.8
700	7.0	700	7.0	3380	5250	95.0		145	31.9	12.1	74	1760	38.2
800	8.0	800	8.0	3880	6000	110		168	36.4	13.9	77	2020	44.4
900	9.0	900	9.0	4300	8750	125		185	40.0	15.5	81	2240	48.6
1000	10.0	1000	10.0	4600	7500	135		198	43.0	16.8	85	2395	52.0

Viscosity Conversion Table (Continued)

When Specific Gravity is 1		When Specific Gravity is other than 1											
Read Directly Across		Find CKS, Then Multiply CKS x SG = CPS	Find Stokes, Then Multiply Stoke x SG = Poise										
CPS	Poise	CKS	Stoke	Saybolt Universal (SSU)	Seconds Engler	Decrees Engler	Dupont Parlin #7	Dupont Parlin #10	Dupont Parlin #15	Dupont Parlin #20	Krebs Units	Mac-Michael	Pratt & Lambert F
1100	11	1100	11	5200	8250	151		224	48.0	18.7	88	2710	58.1
1200	12	1200	12	5620	9000	164		242	53.2	20.2	92	2930	63.6
1300	13	1300	13	6100	9750	177		262	58.0	22.0	95	3180	69.0
1400	14	1400	14	6480	10350	188		280	61.6	23.2	96	3370	73.4
1500	15	1500	15	7000	11100	203		300	69.0	25.0	98	3650	79.3
1600	16	1600	16	7500	11850	217		322	72.0	26.7	100	3900	85.0
1700	17	1700	17	8000	12600	233		344	76.0	28.5	101	4180	90.5
1800	18	1800	18	8500	13300	248		366	81.0	30.0		4420	96.2
1900	19	1900	19	9000	13900	263		387	86.0	31.8		4830	102.0
2000	20	2000	20	9400	14600	275		405	90.0	33.0	103	4900	106.2
2100	21	2100	21	9850	15300	287		433	94.5	34.7		5120	111.3
2200	22	2200	22	10,300	16100	300		453	99.0	36.0		5360	116.6
2300	23	2300	23	10,750	16800	314		473	105.7	38.0	105	5600	124
2400	24	2400	24	11,200	17500	325		493	110.3	39.5	109	5840	127
2500	25	2500	25	11,600	18250	339		510	114	40.8	114	6040	131
3000	30	3000	30	14,500	21800	425		638	142	51.0	121	7550	165
3500	35	3500	35	16,500	25200	485		725	164	57.0	129	8600	187
4000	40	4000	40	18,500	28800	540		814	186	64.5	133	9640	210
4500	45	4500	45	21,000	32400	615		924	214	73.5	136	10920	238
5000	50	5000	50	23,500	36000	690			239	82.0		12220	267
5500	55	5500	55	26,000	39600	765			265	90.6		13510	295
6000	60	6000	60	28,000	43100	820			285	97.5		14570	318
6500	65	6500	65	30,000	46000	885			306	104		15610	340
7000	70	7000	70	32,500	49600	960			331	113		16900	369
7500	75	7500	75	35,000	53200	1035			356	122		18200	397
8000	80	8000	80	37,000	56800	1095			377	129		19250	420
8500	85	8500	85	39,500	60300	1175			402	138		20600	449
9000	90	9000	90	41,080	63900	1220			417	143		21350	465
9500	95	9500	95	43,000	67400	1280			433	150		22400	488
10,000	100	10,000	100	46,500		1385			464	162		24200	527
15,000	150	15,000	150	69,400	106000					242			
20,000	200	20,000	200	92,500	140000					322			
30,000	300	30,000	300	138,500	210000					483			
40,000	400	40,000	400	185,000	276000					645			
50,000	500	50,000	500	231,000	345000					805			
60,000	600	60,000	600	277,500	414000					957			
70,000	700	70,000	700	323,500	484000					1127			
80,000	800	80,000	800	370,000	550000					1290			
90,000	900	90,000	900	415,500	620000					1445			
100,000	1000	100,000	1100	462,000	689000					1810			
125,000	1250	125,000	1250	578,000	850000					2010			
150,000	1500	150,000	1500	694,000						2420			
175,000	1750	175,000	1750	810,000						2820			
200,000	2000	200,000	2000	925,000						3220			

Able Technology
401 So. 4th Street
Wausau , Wi. 54402
1-800-683-8080

Per A.W. Chesterton Engineering Department the proper way for your customer to determine their flush needs is to call the engineering department at 1-978-469-6100 . The information which is required to determine the flush properly is as follows:

1.) What face material is being used in the seal ? Silicone Carbide, Carbon, or Ceramic.
2.) What is the pressure available for the flush ?
3.) What is the temperature of the flush fluid ?
4.) What is the temperature of the product ?
5.) What is the pressure of the product ?
6.) What is the seal size ? Shaft size ?
7.) What RPM is the equipment running at ?
8.) Is there a bushing in the bottom of the stuffing box ?

If you wanted to provide the customer with a " normal" flush used in a split seal application it would be 1.5 gallons per minute. If the product is "clean" in nature a flush probably isn't needed at all. This amount is what our specialists have been using in the field for years. If there is a "Spiral Trac bushing or another type of bushing in the bottom of the box, the flush could be reduce to as little as .30 to .50 gallons per minute.

CHESTERTON®
THE NEW STANDARD FOR RELIABILITY

A.W. CHESTERTON CO. SEALING DEVICES PUMP SYSTEMS TECHNICAL PRODUCTS
MIDDLESEX INDUSTRIAL PARK/225 FALLON ROAD/P.O. BOX 9101/STONEHAM, MA 02180-9101 USA/TEL: (781) 438-7000/TELEX: 94-9417/FAX: (781) 438-8971

Dear Chesterton Customer:

Thank you for buying a Chesterton Mechanical Seal. We believe you have bought the finest sealing device on the market today.

By purchasing this seal, you are now part of the A.W.Chesterton Company's Exchange Seal Program or Repair Program (this includes seals returned for analysis). It is necessary that any hazardous residues contained on the return seal be properly identified before we can handle it. In order to participate in this program, certain OSHA Hazard Communication Standard requirements must be followed when you return the seal:

A. Non-Hazardous Material

If the material that the seal has been sealing is nonhazardous, check off the nonhazardous box on the enclosed label. Complete the certification section of part 3 and fill in the information requested in part 1. Attach the label to each container you place the seal in.

SHIP ONLY 1 SEAL PER LABELED BOX OR CONTAINER

B. Hazardous Material

1. You, the USER, have the choice of cleaning/decontaminating the seal, thus reducing your time and paper work. If you choose this option, you must disassemble the seal, decontaminate it, package all the parts and attach a label. Check off the box on the enclosed label as Non-Hazardous and sign your name in the space provided and print in your company name and address.
2. If you wish to return the seal in the "as is" condition, mark all sections of the enclosed label that are appropriate, and write in the chemical name or identifier, as well as your company name and address. Attach the Material Safety Data Sheet (MSDS) for material the seal was in contact with. The chemical name or identifier must match the MSDS that you will supply with the returned seal. Place the seal INSIDE a plastic bag and seal before packing. We would appreciate it if the seal was in a reasonably clean condition when returned.
3. ATTACH THE LABEL TO THE CONTAINER YOU PLACE THE SEAL IN.
4. SHIP ONLY 1 SEAL PER LABELED BOX OR CONTAINER.

   You may use the original Chesterton Box or any other box to place your seal in, and attach the label to this box.

   Many boxed/labeled seals can be put in 1 shipping container.

Please note that all seals returned to the Chesterton Company should be *reasonably clean of excessive amounts of external residues.*

Thank you again for buying a Chesterton Product and we look forward to serving you in the future.

These materials will not be accepted in the Exchange/Repair Programs unless the seal is disassembled and cleaned/decontaminated.

A. Radioactive Materials***
B. Biohazards, Level 2,3,4
C. Toxics: Polychlorinated Biphenyl (PCB'S), Dichlorodiphenyltrichloroethane (DDT), and DIOXIN.
D. Any chemical material referenced in the Dept. of Transportation (DOT) Hazardous Materials Table 49 CFR 172.101, Column 3, (Hazard Class) marked "Forbidden" or Poison A, C & D
E. Explosive Material (including Azides)

***Radioactive materials will not be accepted even if decontaminated or cleaned.

LABEL:

Section 1: FILL THESE SECTIONS OUT FOR ALL SEALS.
a. Fill out Company Name, address, telephone number.

Section 2: FILL THIS SECTION OUT FOR HAZARDOUS SEALS.
a. Check off Hazardous;
b. Check MSDS for material that was in contact with seal, check off matching Hazards;
c. Check off if MSDS is enclosed, sent separately or sent previously;
d. Write in chemical/identity name, making sure it matches name on MSDS sheet.

Section 3: FILL OUT THIS SECTION IF THE SEAL HAS NOT BEEN EXPOSED TO ANY HAZARDOUS MATERIAL OR THE SEAL HAS BEEN DISASSEMBLED, CLEANED/ DECONTAMINATED.

a. Check off Non-Hazardous;
b. Fill in the use of seal (material seal was in contact with);
c. Sign your name;
d. Print or type your name;
e. Fill in your title or position.

If you have questions about these procedures, call your distributor or

A.W CHESTERTON COMPANY
Corporate Environmental Health and Safety Department
(781) 438-7000

442M™ SPLIT MIXER SEAL

3½" SIZE

SEAL PREPARATION

Remove the old sealing device such as packing, packing gland, or mechanical seal and prepare the equipment for installation.

A. Shaft or Sleeve

1. The seal will be placed outside the stuffing box with a slight extension into the stuffing box. Sleeve wear inside the stuffing box should have no effect on seal performance.
2. The portion of the shaft (sleeve) which will be used is:

   1/8" (3.2 mm) inside to 9/16" (14.3 mm) outside the stuffing box for sizes up to 2.50" (60 mm).

   1/4" (6.4 mm) inside to 9/16" (14.3 mm) outside the stuffing box for sizes up to 4.75" (120 mm).

   3/16" (4.8 mm) inside to 1 1/16" (26.9 mm) outside the stuffing box for sizes up to 7.75" (195 mm).

   Remove all burrs and scratches in this area and polish if necessary to achieve a 32 microinch (0.8 microns) AA finish.
3. ***Make sure the shaft or sleeve diameter is within .002" (0.05 mm) of nominal.***

   Example: A 1.75" (50 mm) shaft should not be larger than 1.752" (50.05 mm) or smaller than 1.748" (49.95 mm).
4. Use a dial indicator to measure the shaft runout just outside the stuffing box. ***Readings should not exceed***

   .090" TIR for sizes up to 2.50"
   (2.3 mm TIR for sizes up to 60 mm)

   .150" TIR for sizes up to 7.50"
   (3.8 mm TIR for sizes up to 190 mm

   Record Data:

Shaft Size	*Shaft Runout (TIR)*

5. If practical, place the dial indicator tip on the end of the shaft sleeve or on a step in the shaft (sleeve) to measure end play. Alternately push and pull the shaft in the axial direction. If the bearings are in good condition, end play should not exceed .005" (0.13 mm) TIR.

B. Stuffing Box or Seal Chamber

1. Remove existing stuffing box studs. Hex or socket head bolts will be used. The required length is:

   2 3/8" to 2 1/2" for sizes up to 2.50"; (60 mm to 63.5 mm for sizes up to 60 mm).

   2 3/4" to 2 7/8" for sizes up to 4.75"; (70 mm to 73 mm for sizes up to 120 mm).

   4 3/8" to 4 1/2" for sizes up to 7.50"; (111 mm to 114 mm for sizes up to 190 mm).

   If the mouth of the stuffing box protrudes beyond the stud/bolt mounting surface, add the protrusion length to the bolt lengths listed above.
2. The stuffing box face must be flat and smooth enough to seal a gasket; maximum 125 microinches (3.2 microns) AA.
3. If practical, attach the dial indicator base to the shaft and slowly rotate the shaft and indicator to measure the runout of the stuffing box. Misalignment of the stuffing box relative to the shaft should not exceed .003" TIR per inch (0.003 mm TIR per millimeter) of shaft diameter.
4. Split case pumps may have a step on the stuffing box face where the case halves meet. The stuffing box gasket will accommodate a maximum step of .010" (0.25 mm) if the gland is kept perpendicular to the shaft. If the step is larger than .010" (0.25 mm), the surface must be machined flat and perpendicular to the shaft. CHESTERTON Metal Repair System can be used to restore a damaged or corroded stuffing box face.

SEAL PREPARATION

Preparation

Please read these instructions and make sure you understand them before installing the seal.

Installation is easy provided the parts are handled and installed carefully. Make sure your hands are clean. Any dirt particles placed on the seal faces or splits during handling may cause seal failure. Prepare a clean work surface on which to place parts during assembly/disassembly.

Prepare the Seal for Installation (1-5)

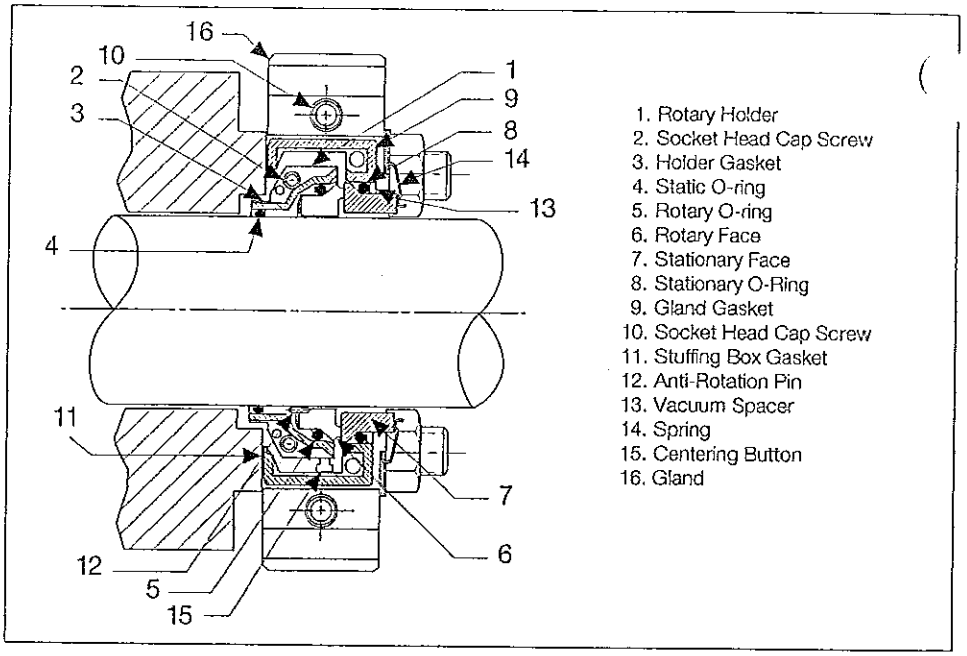
1. Disengage the socket head cap screws from one half of the gland. With the gland in a horizontal position, springs up, separate the halves and place them on the clean work surface.
2. You now have access to the rotary holder. Disengage the two socket head cap screws from one half of the rotary holder and place the holder halves on the clean work surface.
3. Remove the rotary and stationary seal faces from their packages and place on the clean work surface.
4. Make sure that the gland gaskets, holder gaskets, stuffing box gasket, (no grease) and static o-ring are properly greased and seated in their grooves. Note the gold mark on one end of each half of the cut static o-ring. Assure that the o-ring is placed in the rotary holder such that the two gold marks mate at one joint. ***Do not glue the gland or holder gaskets in place.***
5. Snap open the ball and socket joint of the o-rings by pulling at the seam. (NOTE: The rotary o-ring is slightly longer and is marked with a purple dot.) ***Do not apply grease to the balls and sockets of the o-rings.***

NOTE: The socket head cap screws can be installed from either side of the holder or gland halves.

CAUTION: The gland, holder, and face halves are matched pairs; mixing components from different seals will result in seal failure.

CAUTION: Do not glue the ball and socket joints.

NOTE: Handle parts carefully. Greasy fingerprints on seal faces or misaligned face splits may cause leakage.



1. Rotary Holder
2. Socket Head Cap Screw
3. Holder Gasket
4. Static O-ring
5. Rotary O-ring
6. Rotary Face
7. Stationary Face
8. Stationary O-Ring
9. Gland Gasket
10. Socket Head Cap Screw
11. Stuffing Box Gasket
12. Anti-Rotation Pin
13. Vacuum Spacer
14. Spring
15. Centering Button
16. Gland

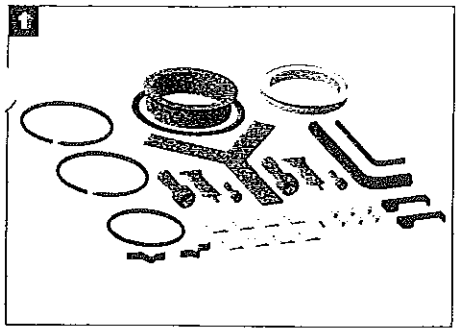
SCREW AND BOLT TORQUE

SEAL SIZE	HOLDER CAP SCREWS*	GLAND CAP SCREWS**	STUFFING BOX BOLTS**
up to 2.50" (60 mm)	40 in-lbf (4.5 Nm)	125 - 175 in-lbf (14-20 Nm)	20 - 30 ft-lbf (27-40 Nm)
up to 4.75" (120 mm)	100 in-lbf (11.3 Nm)	150 - 200 in-lbf (17-23 Nm)	25 - 35 ft-lbf (34-48 Nm)
up to 7.50" (190 mm)	325 in-lbf (36.8 Nm)	200 - 300 in-lbf (23-34 Nm)	30 -40 ft-lbf (40-54 Nm)

* Recommended maximum. ** Typical values.
Torque necessary to seat stuffing box gasket varies with bolt size and gasket sealing surfaces.

CAUTIONS

These instructions are general in nature. It is assumed that the installer is familiar with seals and certainly with the requirements of their plant for the successful use of mechanical seals. If in doubt, get assistance from someone in the plant who is familiar with seals or delay the installation until a seal representative is available. All necessary auxiliary arrangements for successful operation (heating, cooling, flushing) as well as safety devices must be employed. These decisions are to be made by the user. The chemical listing is intended as a general reference for this seal only. The decision to use this seal or any other Chesterton seal in a particular service is the customer's responsibility.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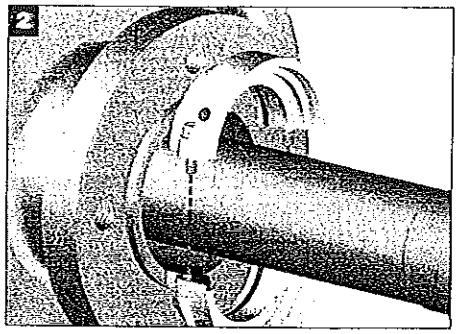
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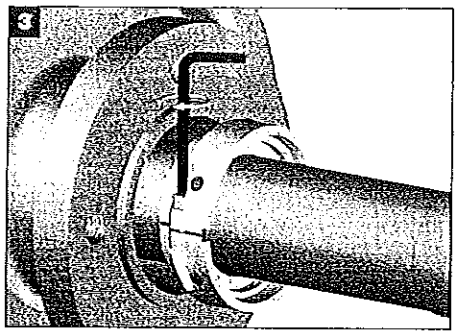
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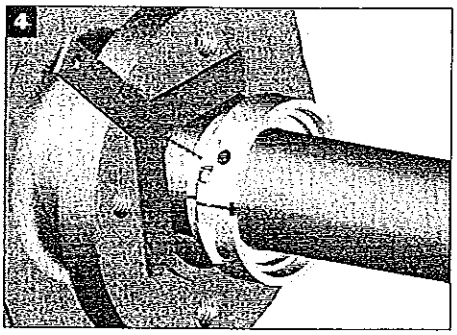
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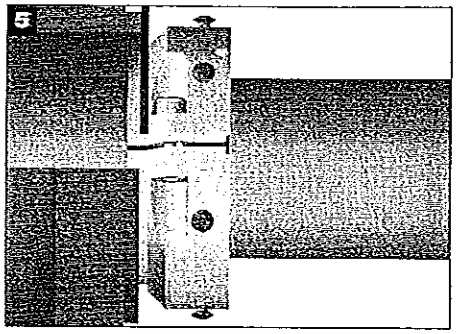
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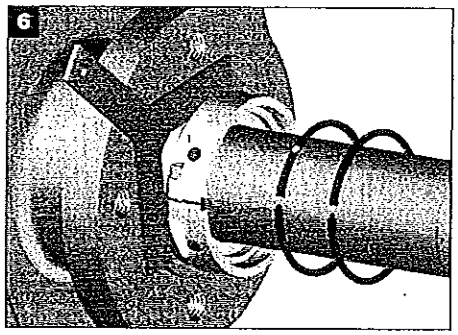
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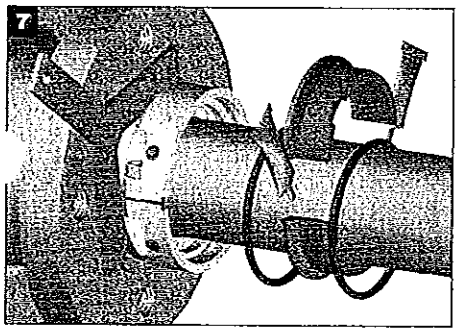
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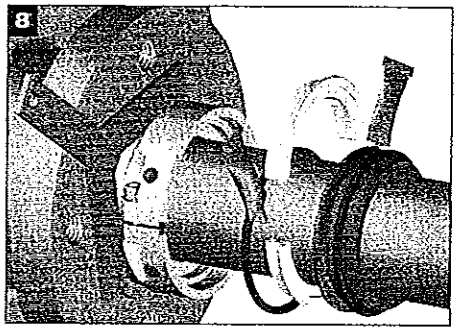
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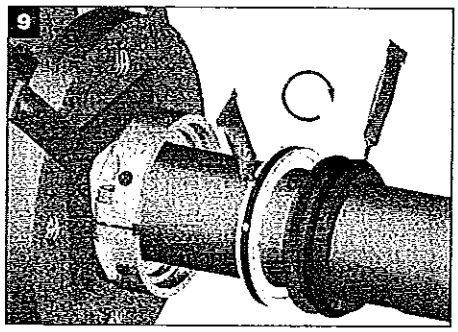
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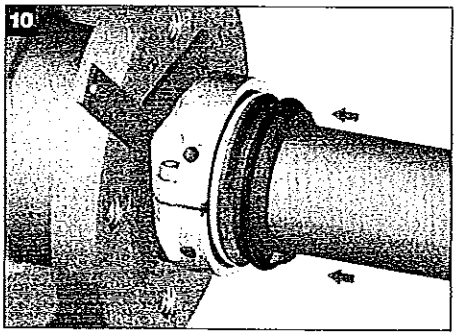
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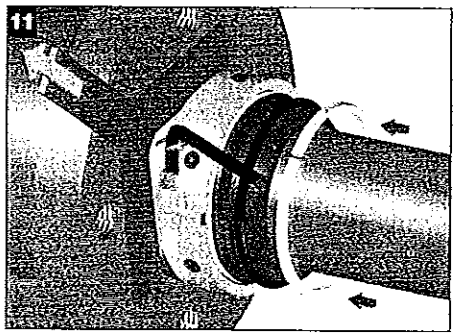
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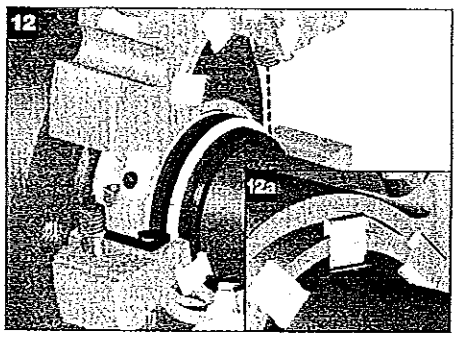
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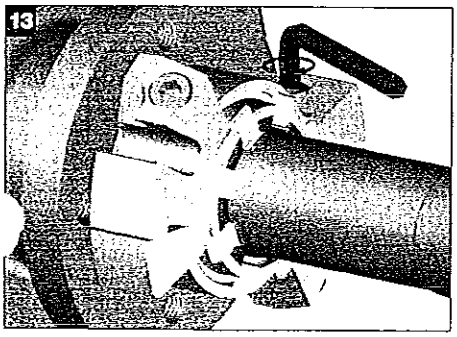
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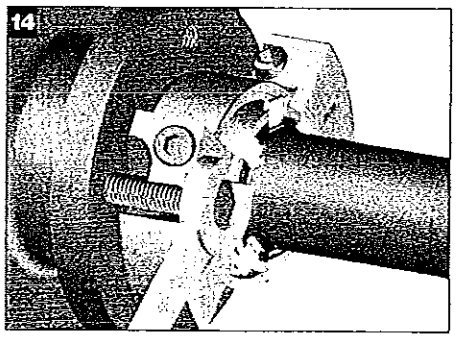
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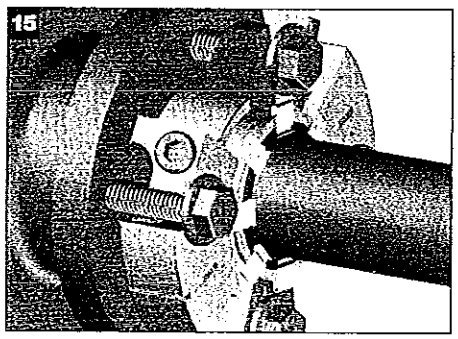

15

EQUIPMENT START UP

1. Rotate the shaft by hand to ensure no metal-to-metal contact within the seal. A slight drag may be found due to the seal faces but the shaft should rotate freely.
2. Attach appropriate plumbing to the seal. Take all necessary precautions and follow normal safety procedures before starting the equipment.
3. Depending on how carefully the seal components were handled during installation, split seals may drip on startup. For example, greasy fingerprints on the faces or misaligned face splits may cause leakage. This type of leakage usually decreases and stops over a period of time as a carbon face wears in or leak paths are clogged. However, leakage greater than 60 drops per minute should be investigated immediately. If the leakage remains steady, check o-rings and gaskets for proper installation and check the faces for chips, scratches, and proper alignment.

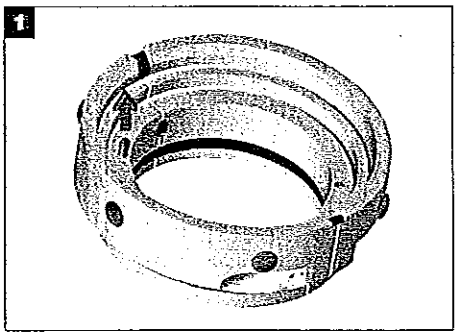
SEAL REBUILD

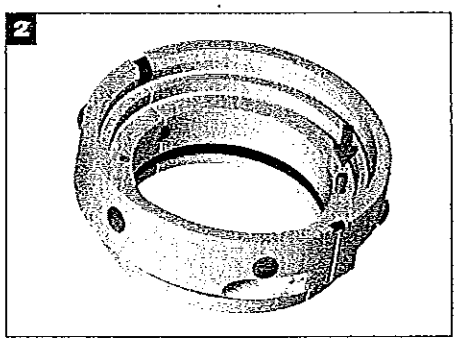
1. Only the gland and rotary holder are reused.

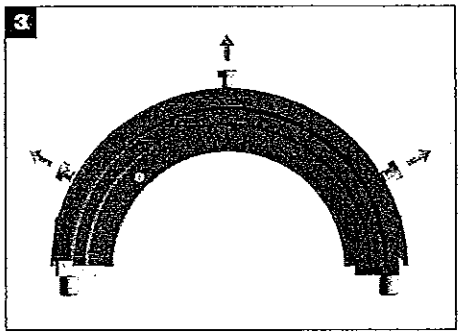
   CAUTION: The gland, holder, and face halves are matched pairs; do not mix halves from different seals since this will cause seal failure.
2. The following tools may be required for rebuild:
   - Vise grips (remove drive pin)
   - Arbor press (replace drive pin)
   - Blunt thin lever (remove buttons)
   - Rubber mallet (replace buttons and springs)
   - Channel lock pliers (remove springs)
   - Isopropyl alcohol/actone (clean gasket surface)
3. Disassemble the seal, noting the condition of the parts. Analyze the cause of failure and correct the problem, if possible, before reinstalling the seal.
4. Rebuild of the rotary holder is optional if the shaft o-ring, holder gaskets and drive pin are in good condition.

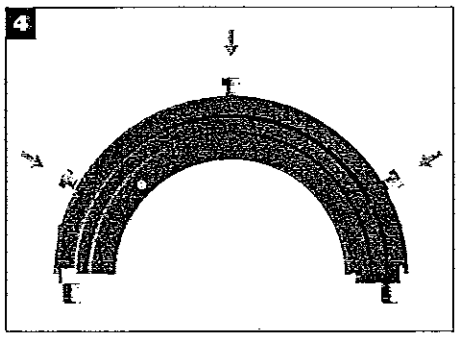
Seal Size	Drive Pin Protrusion
up to 2 1/2" (60 mm)	0.188" (4.8 mm)
up to 4 3/4" (120 mm)	0.290" (7.4 mm)
up to 7 1/2" (190 mm)	0.435" (11 mm)

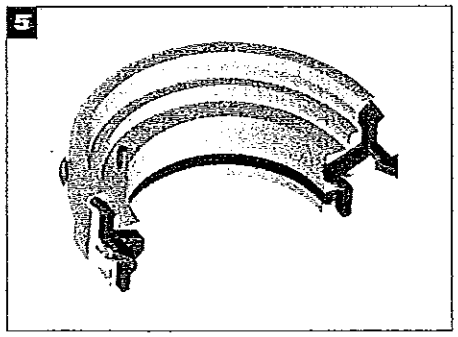
5. Replacement of springs is optional. Do not replace if springs are in good condition. To install the springs obstructed by the gland, you may use a hex key as a spacer. Ensure all springs are properly seated, and parallel to the back of the gland.
6. Remove the stuffing box gasket from the gland face and remove the adhesive residue with isopropyl alcohol or acetone. After peeling off the protective backing, seat the gasket halves in the gland recess, about 1/8" to 1/4" (3 mm - 6.3 mm) from the gland splits. ***Be careful not to wrinkle the gasket as you install it.***

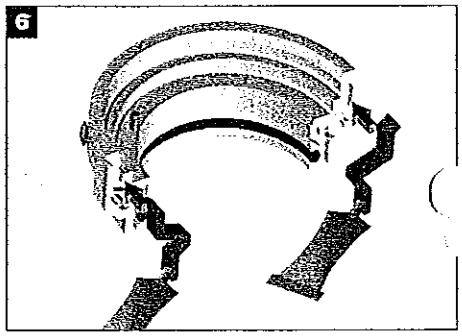












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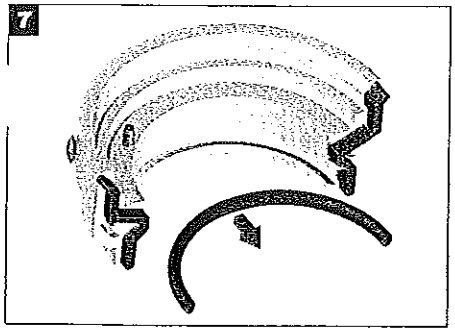

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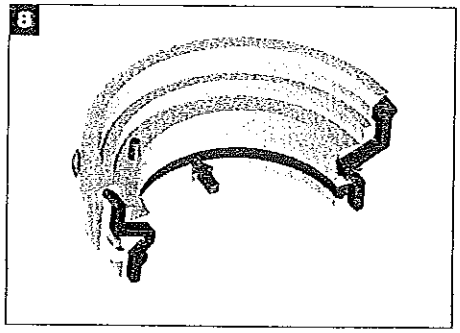

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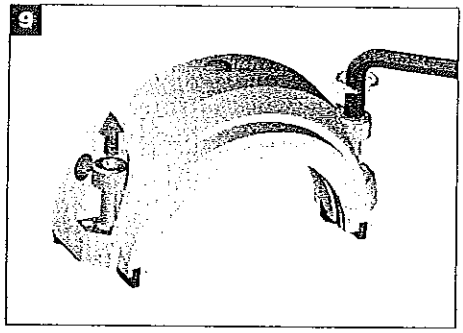

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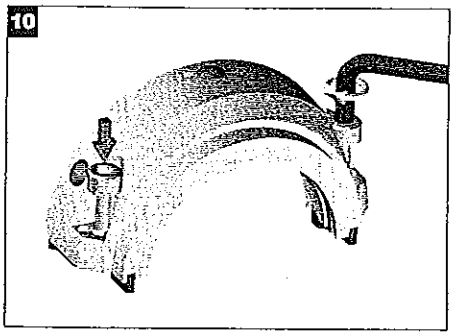

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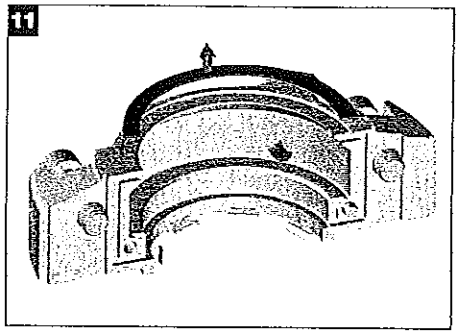

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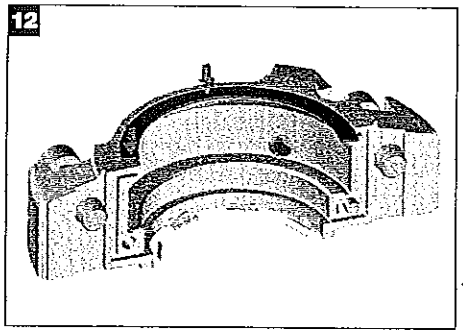

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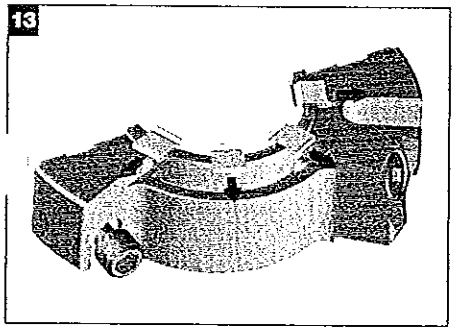

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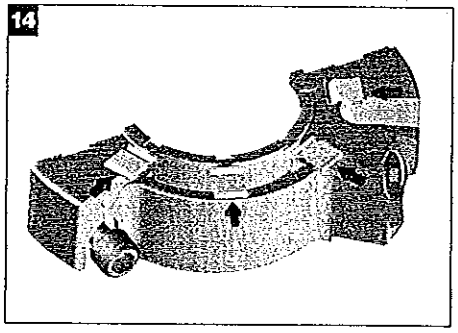

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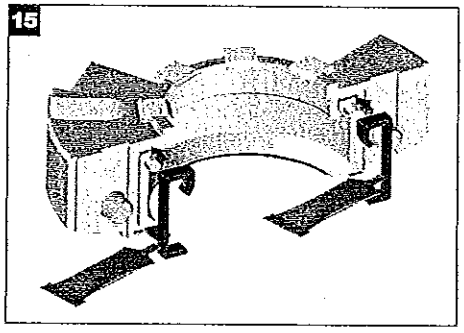

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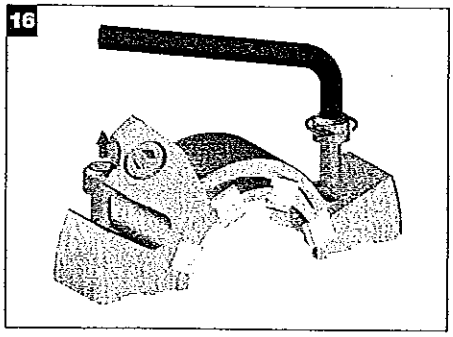

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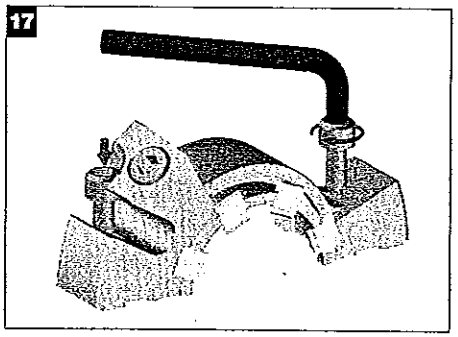

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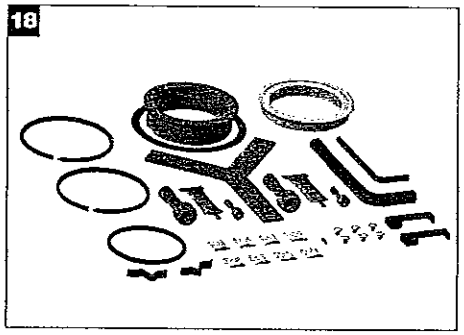
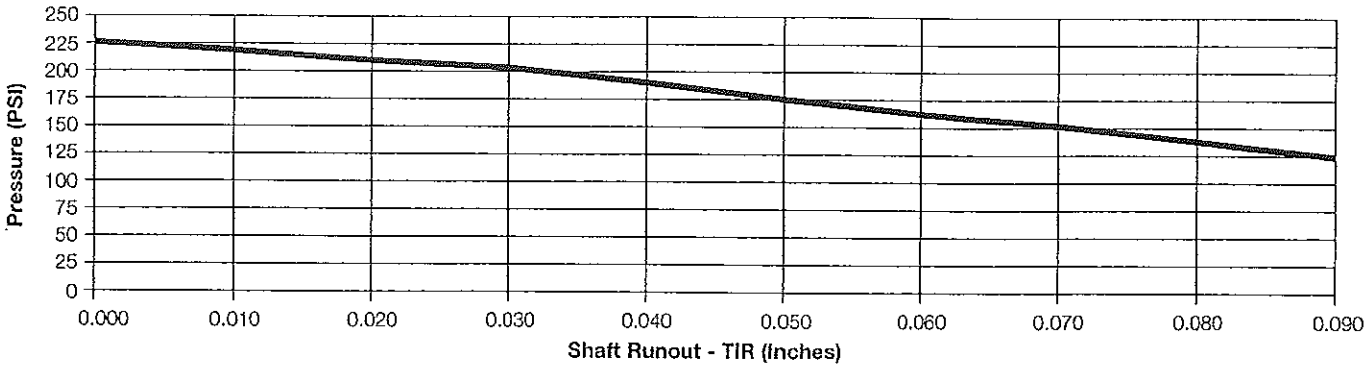
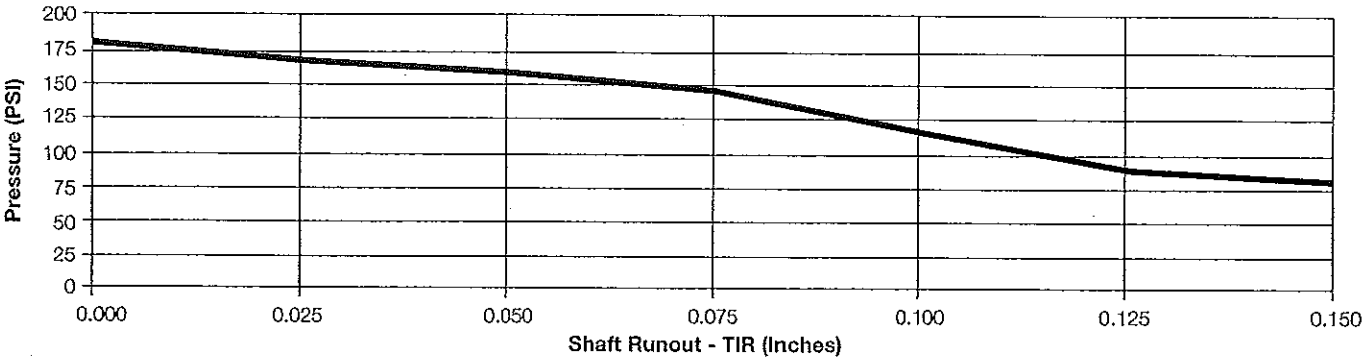


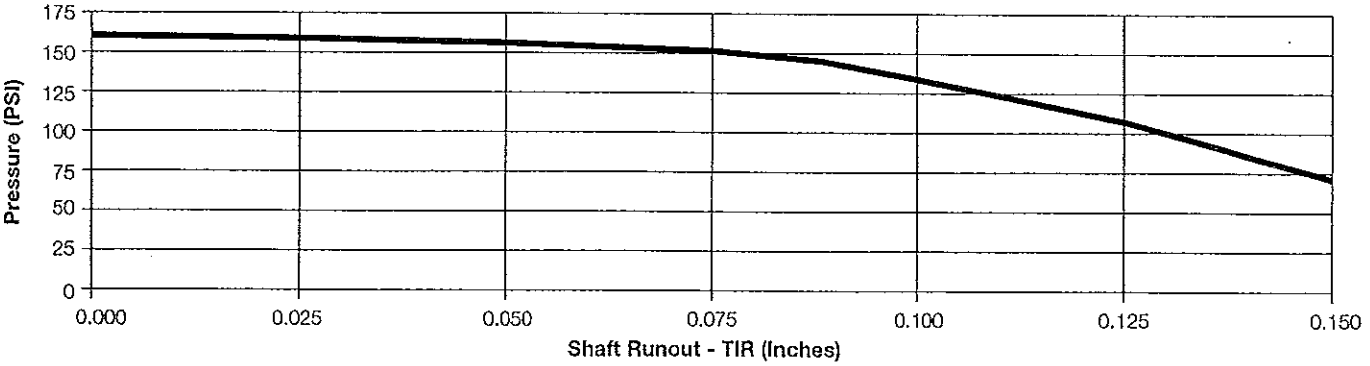
Radial Motion vs. Pressure Capability
Shaft Sizes: 1.500" to 2.500" (38 mm to 60 mm)

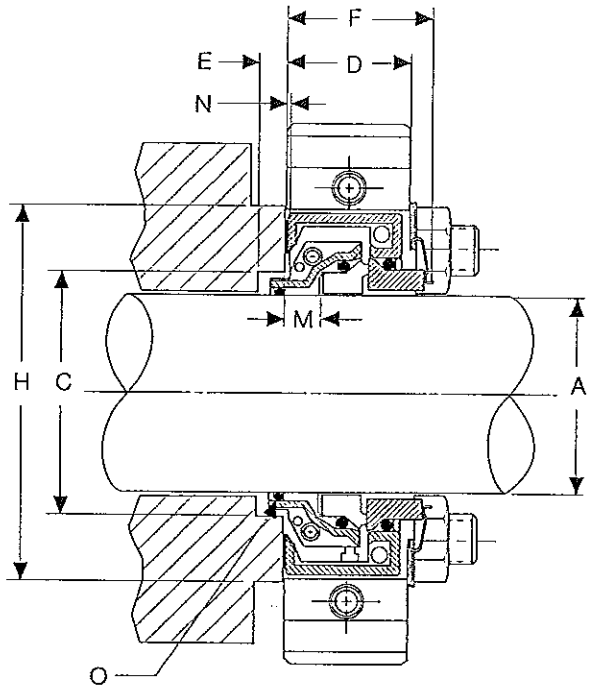


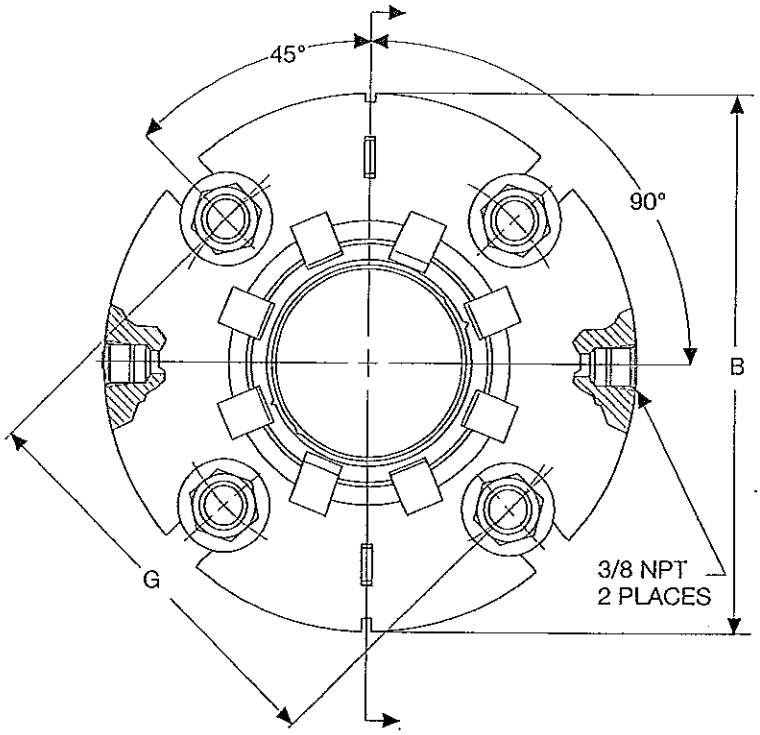
Radial Motion vs. Pressure Capability
Shaft Sizes: 2.625" to 4.750" (65 mm to 120 mm)



Radial Motion vs. Pressure Capability
Shaft Sizes: 4.875" to 7.500" (125 mm to 190 mm)







KEY

A – Shaft Size
B – Maximum Gland Diameter
C – Min./Max. Stuffing Box Diameter
D – Gland Length
E – Minimum Stuffing Box Depth
F – Outboard Space Required
G – Minimum Bolt Circle by Bolt Size
H – Minimum Stuffing Box Face OD
M – Holder ID from Box
N – Installation Dimension
O – Shaft O-ring Number

DIMENSIONAL DATA (INCH)

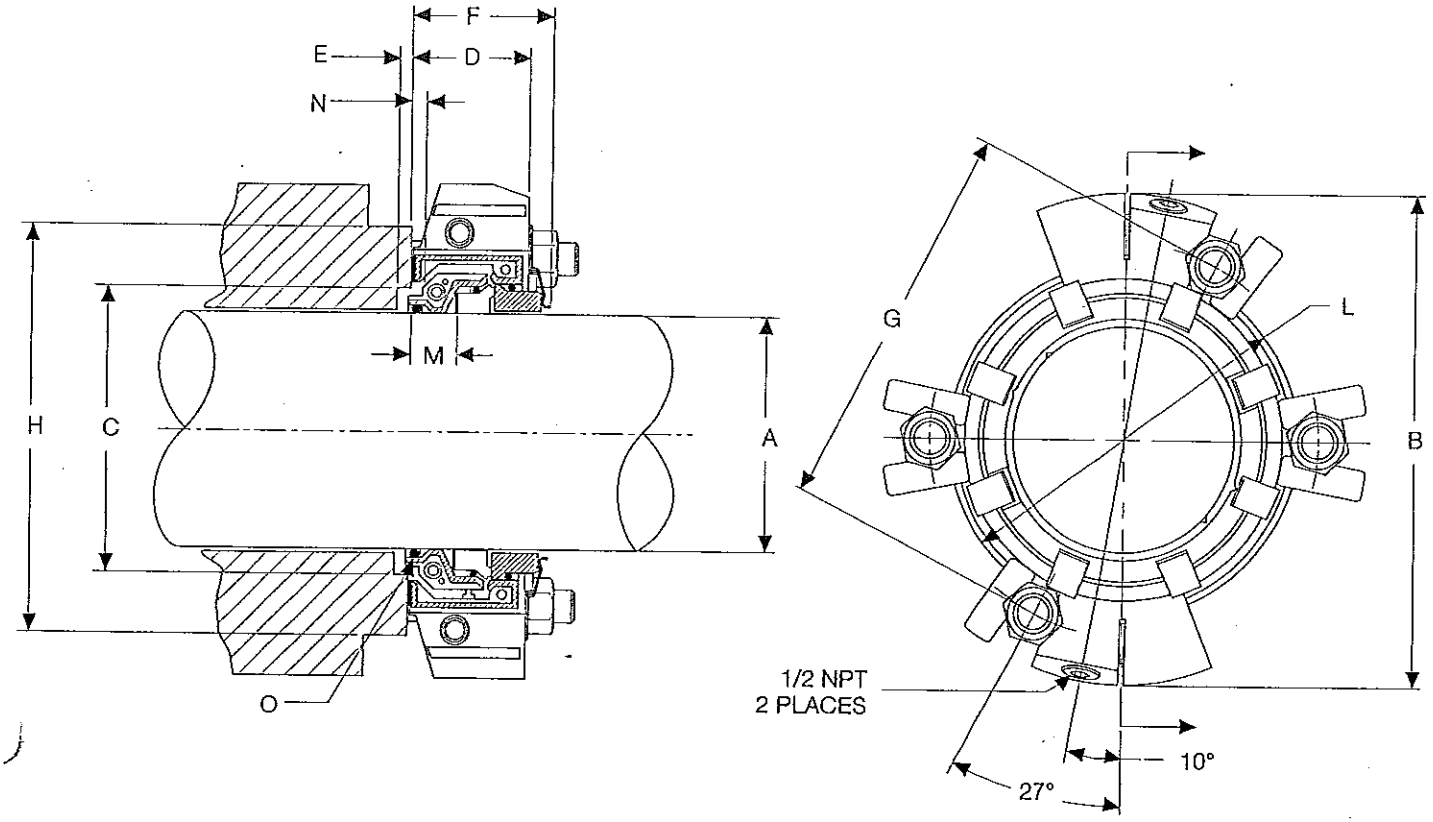
Shaft Sizes: 1.500" to 4.750"

DASH SIZE	A	B	C		D	E	F	G MIN				H	M	N	O
		MAX	MIN	MAX		MIN		3/8"	1/2"	5/8"	3/4"	MIN			O-RI
-12	1.500	5.28	2.11	2.66	1.48	0.17	1.78	3.60	3.73			2.91	0.53	0.094	223
-13	1.625	5.41	2.24	2.77	1.48	0.17	1.78	3.70	3.82			3.00	0.53	0.094	224
-14	1.750	5.53	2.36	2.89	1.48	0.17	1.78	3.82	3.94			3.12	0.53	0.094	225
-15	1.875	5.66	2.49	3.02	1.48	0.17	1.78	3.95	4.07			3.25	0.53	0.094	226
-16	2.000	5.78	2.61	3.16	1.48	0.17	1.78	4.10	4.23	4.35		3.40	0.53	0.094	227
-17	2.125	5.91	2.74	3.28	1.48	0.17	1.78	4.23	4.36	4.48		3.53	0.53	0.094	228
-18	2.250	6.03	2.86	3.42	1.48	0.17	1.78	4.35	4.48	4.60		3.65	0.53	0.094	229
-19	2.375	6.16	2.99	3.71	1.48	0.17	1.78	4.70	4.83	4.95		4.00	0.53	0.094	230
-20	2.500	6.28	3.11	3.71	1.48	0.17	1.78	4.70	4.83	4.95		4.00	0.53	0.094	231
-21	2.625	8.03	3.46	4.53	1.84	0.26	2.24	5.73	5.86	5.98		5.03	0.53	0.094	232
-22	2.750	8.03	3.46	4.53	1.84	0.26	2.24	5.73	5.86	5.98		5.03	0.53	0.094	233
-23	2.875	8.28	3.71	4.78	1.84	0.26	2.24	5.98	6.11	6.23		5.28	0.53	0.094	234
-24	3.000	8.28	3.71	4.78	1.84	0.26	2.24	5.98	6.11	6.23		5.28	0.53	0.094	235
-25	3.125	8.53	3.96	5.03	1.84	0.26	2.24	6.23	6.35	6.48	6.60	5.53	0.53	0.094	236
-26	3.250	8.53	3.96	5.03	1.84	0.26	2.24	6.23	6.35	6.48	6.60	5.53	0.53	0.094	237
-27	3.375	8.78	4.21	5.28	1.84	0.26	2.24	6.48	6.60	6.73	6.85	5.78	0.53	0.094	238
-28	3.500	8.78	4.21	5.28	1.84	0.26	2.24	6.48	6.60	6.73	6.85	5.78	0.53	0.094	239
-29	3.625	9.03	4.46	5.53	1.84	0.26	2.24	6.73	6.85	6.98	7.10	6.03	0.53	0.094	240
-30	3.750	9.03	4.46	5.53	1.84	0.26	2.24	6.73	6.85	6.98	7.10	6.03	0.53	0.094	241
-31	3.875	9.28	4.71	5.78	1.84	0.26	2.24	6.98	7.10	7.23	7.35	6.28	0.53	0.094	242
-32	4.000	9.28	4.71	5.78	1.84	0.26	2.24	6.98	7.10	7.23	7.35	6.28	0.53	0.094	243
-33	4.125	9.53	4.96	6.03	1.84	0.26	2.24	7.23	7.35	7.48	7.60	6.53	0.53	0.094	244
-34	4.250	9.53	4.96	6.03	1.84	0.26	2.24	7.23	7.35	7.48	7.60	6.53	0.53	0.094	245
-35	4.375	9.78	5.21	6.28	1.84	0.26	2.24	7.48	7.60	7.73	7.85	6.78	0.53	0.094	246
-36	4.500	9.78	5.21	6.28	1.84	0.26	2.24	7.48	7.60	7.73	7.85	6.78	0.53	0.094	247
-37	4.625	10.03	5.46	6.28	1.84	0.26	2.24	7.48	7.60	7.73	7.85	6.78	0.53	0.094	248
-38	4.750	10.03	5.46	6.28	1.84	0.26	2.24	7.48	7.60	7.73	7.85	6.78	0.53	0.094	249

DIMENSIONAL DATA (METRIC)

Shaft Sizes: 38 mm to 120 mm

DASH SIZE	A	B	C		D	E	F	G MIN						H	M	N	O
		MAX	MIN	MAX		MIN		8 mm	10 mm	12 mm	14 mm	16 mm	18 mm	MIN			O-RING
38 mm	38.0	134.1	53.6	67.4	37.6	4.3	45.2	90.6	92.6	94.6				73.8	13.5	2.4	223
40 mm	40.0	137.3	56.8	70.2	37.6	4.3	45.2	93.0	95.0	97.0				76.2	13.5	2.4	223
43 mm	43.0	140.5	60.0	73.4	37.6	4.3	45.2	96.1	98.1	100.1				79.2	13.5	2.4	224
45 mm	45.0	140.5	60.0	73.4	37.6	4.3	45.2	96.1	98.1	100.1				79.2	13.5	2.4	225
48 mm	48.0	143.6	63.1	76.6	37.6	4.3	45.2	99.4	101.4	103.4				82.6	13.5	2.4	226
50 mm	50.0	146.8	66.3	80.3	37.6	4.3	45.2	104.5	106.5	108.5	110.5			86.4	13.5	2.4	226
55 mm	55.0	150.0	69.5	83.3	37.6	4.3	45.2	107.8	109.8	111.8	113.8			89.7	13.5	2.4	228
60 mm	60.0	156.3	75.8	94.1	37.6	4.3	45.2	119.7	121.7	123.7	125.7			101.6	13.5	2.4	230
65 mm	65.0	204.1	87.9	115.1	46.7	6.6	56.9	145.9	147.9	149.9	151.9			127.8	13.5	2.4	231
70 mm	70.0	204.1	87.9	115.1	46.7	6.6	56.9	145.9	147.9	149.9	151.9			127.8	13.5	2.4	233
75 mm	75.0	210.4	94.2	121.4	46.7	6.6	56.9	152.2	154.2	156.2	158.2			134.1	13.5	2.4	234
80 mm	80.0	216.8	100.6	127.8	46.7	6.6	56.9	157.6	159.6	161.6	163.6	165.6	167.6	140.5	13.5	2.4	236
85 mm	85.0	223.1	106.9	134.1	46.7	6.6	56.9	164.0	166.0	168.0	170.0	172.0	174.0	146.8	13.5	2.4	237
90 mm	90.0	223.1	106.9	134.1	46.7	6.6	56.9	164.0	166.0	168.0	170.0	172.0	174.0	146.8	13.5	2.4	239
95 mm	95.0	229.5	113.3	140.5	46.7	6.6	56.9	170.3	172.3	174.3	176.3	178.3	180.3	153.2	13.5	2.4	241
100 mm	100.0	235.8	119.6	146.8	46.7	6.6	56.9	176.7	178.7	180.7	182.7	184.7	186.7	159.5	13.5	2.4	242
110 mm	110.0	248.5	132.3	159.5	46.7	6.6	56.9	189.4	191.4	193.4	195.4	197.4	199.4	172.2	13.5	2.4	245
115 mm	115.0	248.5	132.3	159.5	46.7	6.6	56.9	189.4	191.4	193.4	195.4	197.4	199.4	172.2	13.5	2.4	247
120 mm	120.0	254.9	138.7	159.5	46.7	6.6	56.9	189.4	191.4	193.4	195.4	197.4	199.4	172.2	13.5	2.4	248



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L – Gland Hub OD
M – Holder ID from Box
N – Installation Dimension
O – Shaft O-ring Number

DIMENSIONAL DATA (INCH)

Shaft Sizes: 4.875" to 7.500"

DASH	A	B	C		D	E	F	G MIN			H	L	M	N	O
SIZE		MAX	MIN	MAX		MIN		5/8"	3/4"	7/8"	MIN	MAX			O-RI
-39	4.875	11.53	5.93	7.15	2.91	0.29	3.45	8.63	8.75	8.88	7.75	7.99	1.03	0.188	353
-40	5.000	11.53	6.05	7.15	2.91	0.29	3.45	8.63	8.75	8.88	7.75	7.99	1.03	0.188	354
-41	5.125	11.78	6.18	7.40	2.91	0.29	3.45	8.88	9.00	9.13	8.00	8.24	1.03	0.188	355
-42	5.250	11.78	6.30	7.40	2.91	0.29	3.45	8.88	9.00	9.13	8.00	8.24	1.03	0.188	356
-43	5.375	12.03	6.43	7.65	2.91	0.29	3.45	9.13	9.25	9.38	8.25	8.49	1.03	0.188	357
-44	5.500	12.03	6.55	7.65	2.91	0.29	3.45	9.13	9.25	9.38	8.25	8.49	1.03	0.188	358
-45	5.625	12.28	6.68	7.90	2.91	0.29	3.45	9.38	9.50	9.63	8.50	8.74	1.03	0.188	359
-46	5.750	12.28	6.80	7.90	2.91	0.29	3.45	9.38	9.50	9.63	8.50	8.74	1.03	0.188	360
-47	5.875	12.53	6.93	8.15	2.91	0.29	3.45	9.63	9.75	9.88	8.75	8.99	1.03	0.188	361
-48	6.000	12.53	7.05	8.15	2.91	0.29	3.45	9.63	9.75	9.88	8.75	8.99	1.03	0.188	362
-49	6.125	12.78	7.18	8.40	2.91	0.29	3.45	9.88	10.00	10.13	9.00	9.25	1.03	0.188	362
-50	6.250	12.78	7.30	8.40	2.91	0.29	3.45	9.88	10.00	10.13	9.00	9.25	1.03	0.188	363
-51	6.375	13.03	7.43	8.65	2.91	0.29	3.45	10.13	10.25	10.38	9.25	9.50	1.03	0.188	363
-52	6.500	13.03	7.55	8.65	2.91	0.29	3.45	10.13	10.25	10.38	9.25	9.50	1.03	0.188	364
-53	6.625	13.29	7.68	8.90	2.91	0.29	3.45	10.38	10.50	10.63	9.50	9.75	1.03	0.188	364
-54	6.750	13.29	7.80	8.90	2.91	0.29	3.45	10.38	10.50	10.63	9.50	9.75	1.03	0.188	365
-55	6.875	13.54	7.93	9.15	2.91	0.29	3.45	10.63	10.75	10.88	9.75	10.00	1.03	0.188	365
-56	7.000	13.54	8.05	9.15	2.91	0.29	3.45	10.63	10.75	10.88	9.75	10.00	1.03	0.188	366
-57	7.125	13.79	8.18	9.40	2.91	0.29	3.45	10.88	11.00	11.13	10.00	10.25	1.03	0.188	366
-58	7.250	13.79	8.30	9.40	2.91	0.29	3.45	10.88	11.00	11.13	10.00	10.25	1.03	0.188	367
-59	7.375	14.04	8.43	9.65	2.91	0.29	3.45	11.13	11.25	11.38	10.25	10.50	1.03	0.188	367
-60	7.500	14.04	8.55	9.65	2.91	0.29	3.45	11.13	11.25	11.38	10.25	10.50	1.03	0.188	368

DIMENSIONAL DATA (METRIC)

Shaft Sizes: 125 mm to 190 mm

DASH	A	B	C		D	E	F	G MIN			H	L	M	N	O
SIZE		MAX	MIN	MAX		MIN		18 mm	20 mm	22 mm	MIN	MAX			O-RI
125 mm	125.0	292.8	153.7	181.6	73.9	7.4	87.6	221.4	223.4	225.4	196.9	202.9	26.2	4.8	354
130 mm	130.0	299.2	156.8	188.0	73.9	7.4	87.6	227.8	229.8	231.8	203.2	209.3	26.2	4.8	355
135 mm	135.0	305.6	163.2	194.3	73.9	7.4	87.6	234.1	236.1	238.1	209.6	215.7	26.2	4.8	356
140 mm	140.0	305.6	166.4	194.3	73.9	7.4	87.6	234.1	236.1	238.1	209.6	215.7	26.2	4.8	358
145 mm	145.0	312.0	172.7	200.7	73.9	7.4	87.6	240.5	242.5	244.5	215.9	222.1	26.2	4.8	359
150 mm	150.0	318.3	179.1	207.0	73.9	7.4	87.6	246.8	248.8	250.8	222.3	228.4	26.2	4.8	361
155 mm	155.0	324.7	182.2	213.4	73.9	7.4	87.6	253.2	255.2	257.2	228.6	234.8	26.2	4.8	362
160 mm	160.0	331.1	188.6	219.7	73.9	7.4	87.6	259.5	261.5	263.5	235.0	241.2	26.2	4.8	363
165 mm	165.0	331.1	191.8	219.7	73.9	7.4	87.6	259.5	261.5	263.5	235.0	241.2	26.2	4.8	364
170 mm	170.0	337.5	198.1	226.1	73.9	7.4	87.6	265.9	267.9	269.9	241.3	247.6	26.2	4.8	364
175 mm	175.0	343.9	201.3	232.4	73.9	7.4	87.6	272.2	274.2	276.2	247.7	254.0	26.2	4.8	365
180 mm	180.0	350.2	207.6	238.8	73.9	7.4	87.6	278.6	280.6	282.6	254.0	260.4	26.2	4.8	366
185 mm	185.0	350.2	210.8	238.8	73.9	7.4	87.6	278.6	280.6	282.6	254.0	260.4	26.2	4.8	367
190 mm	190.0	356.6	217.2	245.1	73.9	7.4	87.6	284.9	286.9	288.9	260.4	266.8	26.2	4.8	368

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ISO 9001 CERTIFIED

FORM NO. 072957 REV. 2

PRINTED IN USA 12/98

SENTROL INDUSTRIAL
THE SAFETY INTERLOCK COMPANY

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T , OR 97062
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800-247-9447

Part Numbers

- [x] 391-CT-06K
- [ ] 391-CT-12K
- [ ] 391-DT-06K
- [ ] 391-DT-12K
- [ ] _____

391

ELECTRICAL SPECIFICATIONS

Part Number	391-CT-06K 391-CT-12K	391-DT-06K 391-DT-12K
Contact Configuration	N.O.	N.O.
Maximum Load Rating		
AC	2.5 VA	150 VA
DC	2.5 W	NA
Maximum Switching Volts		
AC	30 V (@ 0.083 A)	120 V
DC	30 V (@ 0.083 A)	NA
Maximum Switching Current		
AC	0.18 A (@ 13.8 V)	1.25 A[1]
DC	0.18 A (@ 13.8 V)	NA
Nominal Contact Resistance	0.5 Ohms	NA
Nominal Maximum Sense Range[2]	0.8" (2 cm)	0.8" (2 cm)
Nominal Minimum Sense Range [2]	0.1" (0.25 cm)	0.1" (0.25 cm)
(As measured on a non-ferrous surface.)		
Nominal Break Range[2]	1.2" (3 cm)	1.2" (3 cm)

1 39(" can withstand inrush surge up to 4 amps.

2 ity of ferrous materials usually reduces sense range — typically by 50%. e shape of the material and type of material can cause a wide diversity of effects. Testing is required to determine actual sense range for specific applications.

Warning: All electrical ratings are individual maximums. Exceeding any one specification (including inrush) may result in switch failure. In selecting a part number, the transient surges from coils, contactors, motors, solenoids and tungsten loads must be considered.

GENERAL SPECIFICATIONS

Enclosure	Stainless steel
Electrical Configuration	Normally open
Temperature Range	-40°F to 180°F (-40°C to 80°C)
Environmental	Hermetically Sealed Contact Switch Sealed in Polyurethane
Response Time	-CT: 1 msec; -DT: 10 msec
Lead Type	18/2 SJTOW-A
Agency Approval	UL Recognized CSA Certified

For additional options and alternate specifications, consult factory.

GUARDSWITCH™ LEVEL III

Safety Interlock Switch

INSTALLATION INSTRUCTIONS

MOUNTING

1. Position the switch and actuator magnet so the labels are reading in the same direction (see Figure 1).
2. Mount the switch on the stationary frame of the machine and mount the actuator magnet on the moveable guard, door or gate. To determine the optimum sense range which typically is 0.1" (0.25 cm) to 0.8" (2 cm), attach an ohmmeter to the black and white wires.

   The meter should read "Infinity" with the actuator magnet away from the switch. Bring the actuator magnet toward the switch until the meter reads 0 ohms. Mark this point and bring the actuator magnet closer to the switch until the meter again reads "Infinity." Mark this point and position the actuator magnet between the two marks. Align the actuator magnet with the switch so the labels read in the same direction.

* (For DT models, which incorporate a triac, the meter will read some resistance when the switch is "on," and the direct current (DC) from the meter may cause the switch to latch in the "on" state until the meter is disconnected.)

   See Figure 2 for recommended mounting configurations.

3. Mounting on a ferrous material will effect the sense range a minimum of 50%. However, a 1/4" non-ferrous spacer positioned under the magnet and/or switch should restore most of the lost sensor range.
4. For best protection against operator defeat, mount with non-removable screws, bolts or nuts.
5. Particular care must be taken to determine the actual load of the switch circuit. Surges from coils, motors, contactors, solenoids and tungsten filaments must be considered. Transient protection, such as back-to-back zener diodes (TransZorb®) or an RC network, is recommended for such loads to ensure that maximum ratings of the switch are not exceeded.
6. When mounting the switch on an ungrounded machine, ground the switch housing by connecting your ground lead to one of the switch mounting screws.

FIGURE 1

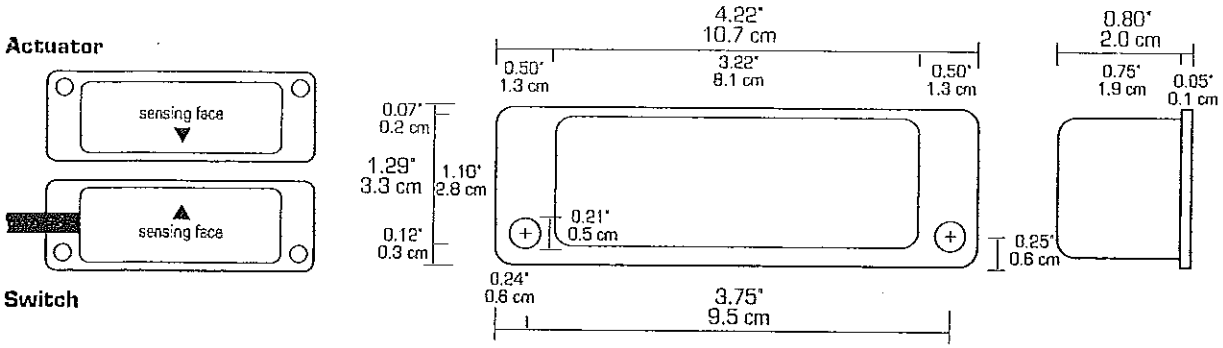
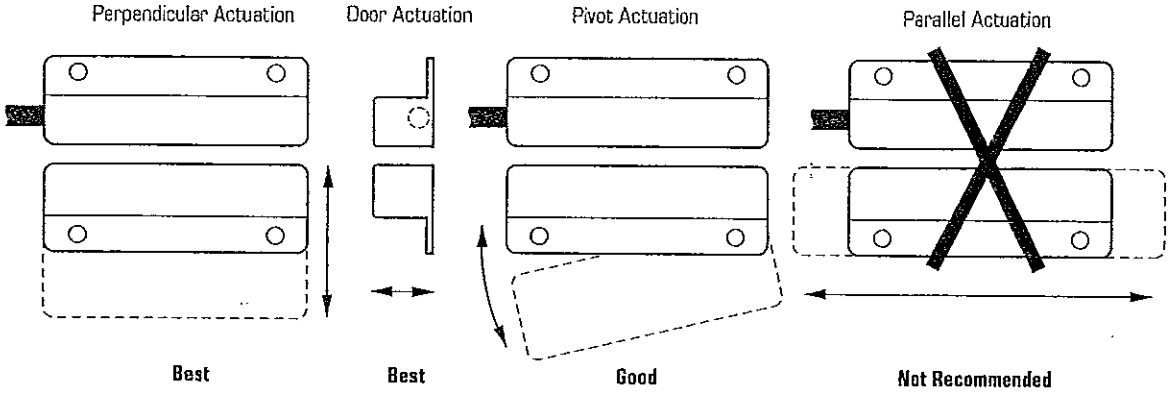


FIGURE 2. MOUNTING CONFIGURATIONS

The interlock switch and actuator magnet should be mounted in only three configurations for actuation:



Two configurations are appropriate for safety interlock applications. The parallel actuation can result in on/off/on signal if the magnet passes by the switch rather than coming to rest in proximity to it. This is NOT a recommended configuration for safety interlock applications.

ORDERING INFORMATION

Part Number	Electrical Config.	Lead Type	Housing	Sense Range (min to max)
391-CT-06K	N.O.	6' (1.8 m) AWG 18/2 SJTOW-A	Seamless 304 Stainless Steel	0.1" (0.25 cm) to 0.8" (2.0 cm)
391-CT-12K	N.O.	12' (3.6 m) AWG 18/2 SJTOW-A	Seamless 304 Stainless Steel	0.1" (0.25 cm) to 0.8" (2.0 cm)
391-DT-06K	N.O.	6' (1.8 m) AWG 18/2 SJTOW-A	Seamless 304 Stainless Steel	0.1" (0.25 cm) to 0.8" (2.0 cm)
391-DT-12K	N.O.	12' (3.6 m) AWG 18/2 SJTOW-A	Seamless 304 Stainless Steel	0.1" (0.25 cm) to 0.8" (2.0 cm)

For additional options and alternate specifications, consult factory.

SI-2061-09/95
11512 Rev. B
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