

## **Wilo SCP Base Mounted Split Case Pumps**

### **Installation and operating instructions**

## 1 General

### 1.1 Description

The SCP (Split Case) Series centrifugal pumps are frame mounted pumps which feature: high efficiency, rugged construction, compact design, foot mounted volute, center drop out coupler, and regreasable bearings. These features, along with the horizontal split case, make installation, operation, and service easy to perform.

### 1.2 Pump Application

The standard SCP (Split Case) Series centrifugal pump's bronze-fitted construction makes it ideal for service in the following applications: unheated domestic and fresh water, boiler feed water, condensate, hydronic cooling or heating, pressure boosting, geothermal exchange, chillers, general pumping and benign liquids.

For other applications contact your local Wilo representative.

### 1.3 Operational Limits

Unless special provisions have been made for your pump by Wilo, the operational limits for SCP (Split Case) Series Pumps are as follows:

#### Maximum Working Pressure,

Listed on pump nameplate:

175 psi (12 bar) standard

400 psi (27 bar) available upon request

### 1.4 Seal Operating Limits

Standard Mechanical Seals

pH Limitations: 7–11

Temperature Range: –20 to +250°F [–4 to +120°C]

For use on closed or open systems which are relatively free of dirt and/or other abrasive particles.

### 1.5 Pump Identification

Wilo pumps are designated by a series of numbers such as SCP (SCP 6x5x12½HA-ODP-4-50-326T-460v-P). The pump nameplate gives identification and rating information as identified in Figure 1. Permanent records for this pump are kept by the serial number and therefore must be used with all correspondence and spare parts orders.

WILLO					
P-Type	Pump Type	S/N Machine Number			
M-Type	Motor Type				
U	Rated Voltage	Q	Pump Flow	M	Impeller Diameter
I	Rated Current	H	Pump Head	OTSE	N/A
1st	N/A	Cos	Cosing PH1	TPF	Temp. of pumped Fluid
P	Rated Power	SF	Service Factor	Σ	Max Submersion
F	Frequency	1sf	N/A	IP	Protection Class
MFY	Year of Manufacture	N	Speed	MC	Motor Wiring
<div style="display: flex; justify-content: space-between;"> <span>Made by WILLO</span> <span>WILLO USA LLC 1230 N. 25th Ave. Melrose Park, IL 60140</span> </div>					

Figure 1 – Nameplate

## 2 Safety Instructions



### Safety Instructions

This safety alert symbol will be used in this manual and on the pump safety instruction decals to draw attention to safety related instructions. When used the safety alert symbol means ATTENTION, BECOME ALERT, YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.

### 2.1 Instruction Decals

Your SCP (Split Case) Series pump should have the following safety instruction decals displayed. If the decals are missing or illegible contact your local Wilo representative for a replacement.

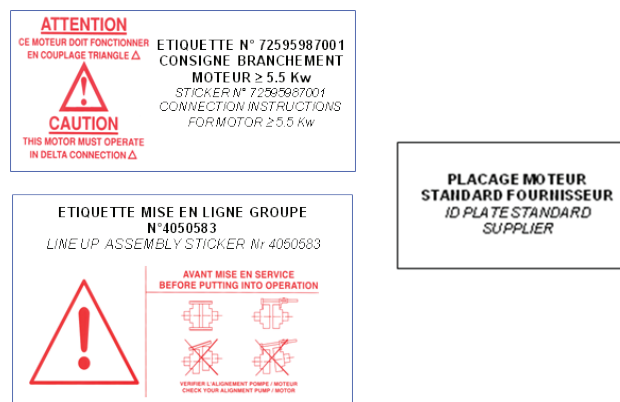


Figure 2 – Decals

### 2.2 Additional Safety Requirements

- Electrical connections are to be made by qualified Electrician in accordance with all national, state and local codes.
- Motor must have properly sized starter with properly sized heaters to provide overload and under-voltage protection.
- If pump, motor or piping are operating at extremely high or low temperatures, guarding or insulation is required.
- The maximum working pressure of the pump is listed on the pump nameplate. Do not exceed this pressure!

### 2.3 Electrical Safety



### WARNING: Electrical Shock Hazard Imminently Hazardous Situation!

Electrical connections are to be made by a qualified electrician in accordance with all applicable codes, ordinances, and good practices. Failure to follow these instructions could result in serious personal injury or death, or property damage.



**WARNING: Electrical Overload Hazard**  
Potentially Hazardous Situation!

Three phase motors must have properly sized heaters to provide overload and undervoltage protection. Single phase motors have built-in overload protectors. Failure to follow these instructions could result in serious personal injury or death, or property damage.

2.4 Thermal Safety



**WARNING: Extreme Temperature Hazard**  
Potentially Hazardous Situation!

If pump, motor, or piping are operating at extremely high or low temperatures, guarding or insulation is required. Failure to follow these instructions could result in serious personal injury or death, or property damage.

2.5 Mechanical Safety



**WARNING: Unexpected Startup Hazard**  
Potentially Hazardous Situation!

If pump, motor, or piping are operating at extremely high or low temperatures, guarding or insulation is required. Failure to follow these instructions could result in serious personal injury or death, or property damage.



**WARNING: Excessive System Pressure Hazard**  
Potentially Hazardous Situation!

The maximum working pressure of the pump is listed on the nameplate. Do not exceed this pressure! Do not use air to hydrotest pump. Failure to follow these instructions could result in serious personal injury or death, or property damage.



**WARNING: Excessive Pressure Hazard – Volumetric Expansion**  
Potentially Hazardous Situation!

The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and release of high temperature fluids. This will be prevented by installing properly sized and located compression tanks and pressure relief valves. Failure to follow these instructions could result in serious personal injury or death, or property damage.

### 3 Pump Location

Locate the pump so there is sufficient room for inspection, maintenance and service. If the use of a hoist or tackle is needed, allow ample head room.



**WARNING: Falling Objects Hazard**  
Imminently Hazardous Situation!

Eyebolts or lifting lugs, if provided, are for lifting only the components to which they are attached. Failure to follow these instructions could result in serious personal injury or death, or property damage.

If lifting base pump is required, use a nylon string, chain, or wire rope, hitch around both suction and discharge flanges. If lifting of the entire pump is required, do so with slings placed under the base rails as shown.

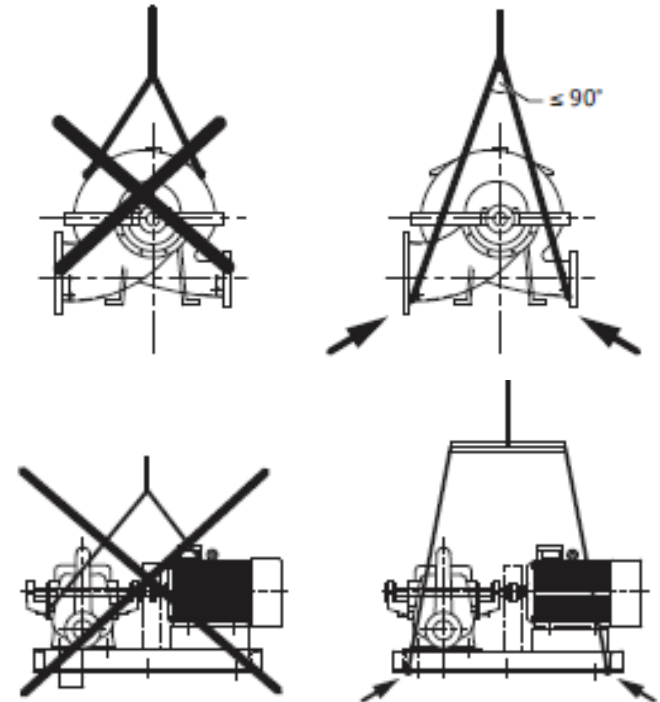


Figure 3 – Lifting Unit

The best pump location for sound and vibration absorption is on a concrete floor with subsoil underneath. If the pump location is overhead, special precautions should be undertaken to reduce possible sound transmission. Consult a sound specialist.

If the pump is not on a closed system, it should be placed as near as possible to the source of the liquid supply, and located to permit installation with the fewest number of bends or elbows in the suction pipe.

The installation must be evaluated to determine that the Net Positive Suction Head Available (NPSHA) meets or exceeds the Net Positive Suction Head Required (NPSHR), as stated by the pump performance curve.

**IMPORTANT**

Do not install and operate Wilo Pumps, Triple Duty Valves, Suction Diffusers, etc., in closed systems unless the system is constructed with properly sized safety devices and control devices. Such devices include the use of properly sized and located pressure relief valves, compression tanks, pressure controls, temperature controls, and flow controls as appropriate. If the system does not include these devices, consult the responsible engineer or architect before making pumps operational.

### 4 Purpose of Manual

This manual is furnished to acquaint you with some of the practical ways to install, operate, and maintain this pump. Read it completely before doing any work on your unit and keep it handy for future reference. Equipment cannot operate well without proper care. To keep this unit at top efficiency,

Follow the recommended installation and servicing procedures outlined in this manual.

## 5 Warranty

Should your pump ever need servicing, please contact Wilo at 1-866-WILO-USA.

## 6 Pump Identification

All pumps are designated by Serial Number, Pump Series, and Size. This information is stamped on an identification plate which is mounted on the pump. Refer to pump the identification in specific instruction section of this manual for detailed information.

## 7 Receiving Pump

Check pump for shortages and damage immediately upon arrival. (An absolute must.) Prompt reporting to the carrier's agent with notations made on the freight bill, will expedite satisfactory adjustment by the carrier.

Pumps and drivers normally are shipped from the factory mounted and painted with primer and one finish coat. Couplings may be either completely assembled or have the coupling hubs mounted on the shafts and the connecting members removed. When the connecting members are removed, they will be packaged in a separate container and shipped with the pump or attached to the base plate.

Shafts are in alignment when the unit is shipped; however, due to shipping, the pumps may arrive misaligned and, therefore, alignment must be performed during installation. Wilo has determined that proper and correct alignment can only be made by accepted installation practices. Refer to the following paragraphs on "FOUNDATION", "BASE PLATE SETTING", "GROUTING PROCEDURE" and "ALIGNMENT PROCEDURE".

## 8 Temporary Storage

If the pump is not to be installed and operated soon after arrival, store it in a clean, dry place having slow, moderate changes in ambient temperature. Rotate the shaft periodically to coat the bearings with lubricant and to retard oxidation, corrosion, and to reduce the possibility of false brinelling of the bearings.

## 9 Location

The pump should be installed as near the suction supply as possible, but no less than five suction diameters with the shortest and most direct suction pipe practical. The total dynamic suction lift (static lift plus friction losses in suction line) should not exceed the limits for which the pump was sold.

The pump must be primed before starting. Whenever possible, the pump should be located below the fluid level to facilitate priming and assure a steady flow of liquid. This condition provides a positive suction head on the pump. It is also possible to prime the pump by pressurizing the suction vessel.

When installing the pump, consider its relative location in relation to the system to assure that sufficient Net Positive Suction Head (NPSH) at pump suction is provided. Available NPSH (NPSHA) must always equal or exceed the required NPSH (NPSHR) of the pump.

The pump should be installed with sufficient accessibility for inspection and maintenance. A clear space with ample head room should be allowed for the use of an overhead crane or hoist sufficiently strong to lift the unit.

**NOTE:** Allow sufficient space to be able to dismantle pump without disturbing the pump inlet and discharge piping.

Select a dry place above the floor level wherever possible. Take care to prevent pump from freezing during cold weather when not in operation. Should the possibility of freezing exist during a shut-down period, the pump should be completely drained, and all passages and pockets where liquid might collect should be blown out with compressed air. Make sure there is a suitable power source available for the pump driver. If motor driven, electrical characteristics should be identical to those shown on motor data plate.

## 10 Foundation

The foundation for your pump must be sufficiently rigid to absorb any vibration and stress encountered during pump operation. A raised foundation of concrete is preferable for most floor mounted pumps. The raised foundation assures a satisfactory base, protects against flooding, simplifies moisture drainage, and facilitates cleanliness.

The foundation should be poured without interruption to within  $\frac{1}{2}$ " to  $1\frac{1}{2}$ " [13-38mm] of the finished height. The top surface of the foundation should be well scored and grooved before the concrete sets; this provides a bonding surface for the grout.

Foundation bolts should be set in concrete as shown in Figure 4. An optional 4 inch [102mm] long tube around the bolts at the top of the concrete will allow some flexibility in bolt alignment to match the holes in the base plate. Allow enough bolt length for grout, shims, lower base plate flange, nuts and washers. The foundation should be allowed to cure for several days before the base plate is shimmed and grouted.

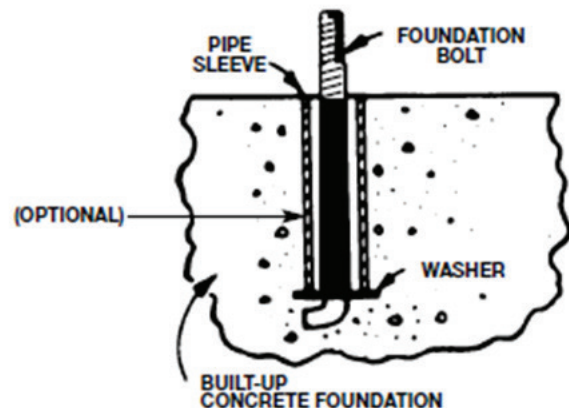


Figure 4 - Foundation

## 11 Base Plate Setting (Before Piping)

**NOTE:** This procedure assumes that a concrete foundation has been prepared with anchor or hold down bolts extending upward ready to receive unit. It must be understood that pump and motor have been mounted and rough aligned at the factory. If the motor is to be field mounted, Wilo cannot assume responsibility for final alignment.

- Use blocks and shims under base for support at anchor bolts and midway between bolts, to position base approximately 1" [25mm] above the concrete foundation, with studs extending through holes in the base plate.
- By adding or removing shims under the base, level and plumb the pump shaft and flanges. The base plate does not have to be level.
- Draw anchor nuts tight against base, and observe pump and motor shafts or coupling hubs for alignment. (Temporarily remove coupling guard for checking alignment.)
- If alignment needs improvement, add shims or wedges at appropriate positions under base, so that retightening of anchor nuts will shift shafts into closer alignment. Repeat this procedure until a temporary alignment is reached.
- NOTE: Temporary alignment is defined as that which is mutually agreed upon by pump contractor and the accepting facility (final operator). Final alignment procedures are covered under "Alignment Procedures."
- Check to make sure the piping can be aligned to the pump flanges without placing pipe strain on either flange.
- Grout in base plate completely (See "Grouting Procedure") and allow grout to dry thoroughly before attaching piping to pump. (24 hours is sufficient time with approved grouting procedure.)

## 12 Grouting Procedure

Grout compensates for uneven foundation, distributes weight of unit, and prevents shifting and vibration. Use an approved, non-shrinking grout, after setting and leveling unit (See figure 5).

- Build strong form around the foundation to contain grout.
- Soak top of concrete foundation thoroughly, then remove surface water.
- Base plate should be completely filled with grout.
- After the grout has thoroughly hardened, check the foundation bolts and tighten if necessary.
- Check the alignment after the foundation bolts are tightened.
- Approximately 14 days after the grout has been poured or when the grout has thoroughly dried, apply an oil base paint to the exposed edges of the grout to prevent air and moisture from coming in contact with the grout.

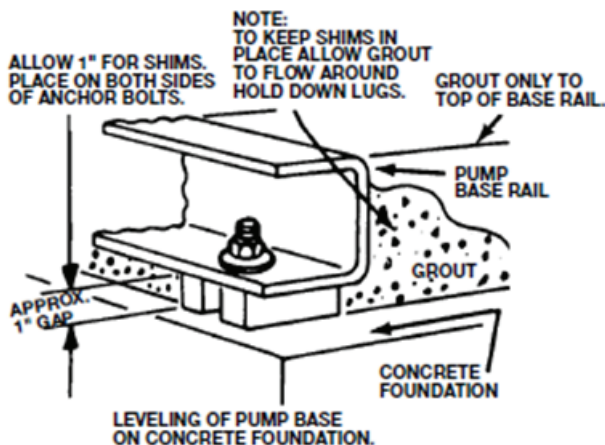


Figure 5 – Setting Base Plate and Grouting

## 13 Coupling Guard Removal / Installation



### WARNING: Unexpected Start-Up Hazard Potentially Hazardous Situation!

Disconnect and lock out power before servicing. Failure to follow these instructions could result in serious personal injury or death and property damage.

### 13.1 Removal

- Remove the screws, clips, and washers holding the coupler guard halves together.
- Remove the upper and lower coupler guard halves from the coupler guard support plate assembled to the drive end (inboard) of the pump.

### 13.2 Installation

- Check coupler alignment before proceeding. Correct if necessary, see pages 6 & 7 for acceptable tolerances.
- Attach the upper and lower coupler guard halves onto the groove in the coupler guard support plate.
- Attach the existing screws and washers to the upper coupler guard half.
- Attach the clip onto the lower coupler guard half.
- Fasten coupler guard hardware, see Figure 6..

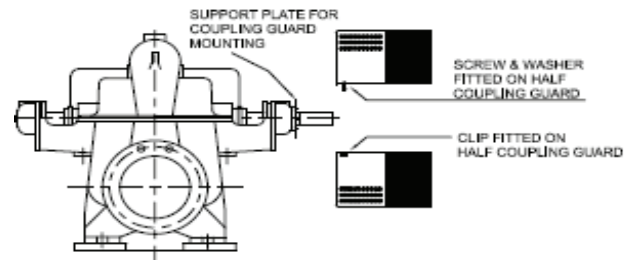


Figure 6 – Coupler Guard Installation

### 13.2 Replacement of Coupler Guard

- New replacement coupler halves will be longer than the existing ones.
- Check the required guard length from the coupler guard support plate to the motor face.
- Mark the length on the guard halves.
- Cut the guard halves at the grooves.
- Check coupler alignment before proceeding. Correct if necessary.
- Attach the upper and lower coupler guard halves onto the groove in the coupler guard support plate.
- Attach the existing screws and washers to the upper coupler guard half.
- Attach the clip onto the lower coupler guard half.
- Fasten coupler guard hardware.

## 14 Alignment Procedure

NOTE: A 'flexible coupling' will only compensate for small amounts of misalignment. Permissible misalignment will vary with the make of coupling. Consult coupling manufacturer's data for specific tolerances.

Allowances are to be made for thermal expansion during cold alignment, so that the coupling will be aligned at operating temperature. In all cases, a coupling must be in alignment for continuous operation. Even though the coupling may be lubricated, misalignment causes excessive wear, vibration, and bearing loads that result in premature bearing failure and ultimate seizing of the pump. Misalignment can be angular, parallel, or a combination of these, and in the horizontal and vertical planes. Final alignment should be made by moving and shimming the pump or motor on the base plate, until the coupling hubs are within the recommended tolerances measured in total run-out. All measurements should be taken with the pump and motor foot bolts tightened. The shaft of sleeve bearing motors should be in the center of its mechanical float.

NOTE: Proper alignment is essential for correct pump operation. This should be performed after base plate has been properly set and grout has dried thoroughly according to instructions. Final alignment should be made by shimming driver only. Alignment should be made at operating temperatures.



### **WARNING: Unexpected Start-up Hazard** Potentially Hazardous Situation!

Disconnect and lock out power before servicing. Failure to follow these instructions could result in serious personal injury or death and property damage.

#### 14.1 Initial Alignment of the Flexible Coupling (See figure 7)

The pump and driver were accurately aligned at the factory. However, it is impossible to maintain this alignment during shipping and handling. Therefore it will be necessary for you to realign the pump and driver. Flexible couplings are not universal joints. They should not be used to compensate for misalignment of the pump and motor shafts. Their function is to transmit power from the driver to the pump while compensating for thermal expansion and shaft end movement. The coupling faces should be far enough apart so that they do not make contact when the motor shaft is forced to the limit of the bearing clearance toward the pump shaft.

In order to properly align the coupling, you will need a taper gauge or set of feeler gauges, and a straight edge.

There are two types of misalignment encountered with flexible couplings: angular misalignment, in which the shafts are not parallel, and parallel misalignment where the shafts are parallel but not on the same axis.

#### To check angular alignment:

- Insert a feeler gauge or taper gauge at any four places 90° apart around the coupling halves.
- Insert shims under the driver feet until the same reading is obtained at all four checkpoints.
- The pump and driver will then be in angular alignment.

#### To check parallel alignment:

- A straight edge should be held against the edges of the coupling halves at any four places 90° apart around the coupling.
- The straight edge should be parallel to the pump and driver shafts at all times.
- Insert shims until the straight edge lies flat against both coupling halves at all four checkpoints.
- The pump and driver will then be in proper parallel alignment.

**IMPORTANT:** Apply Loctite®243 to pump and/or motor mounting screen to prevent loosening during operation.

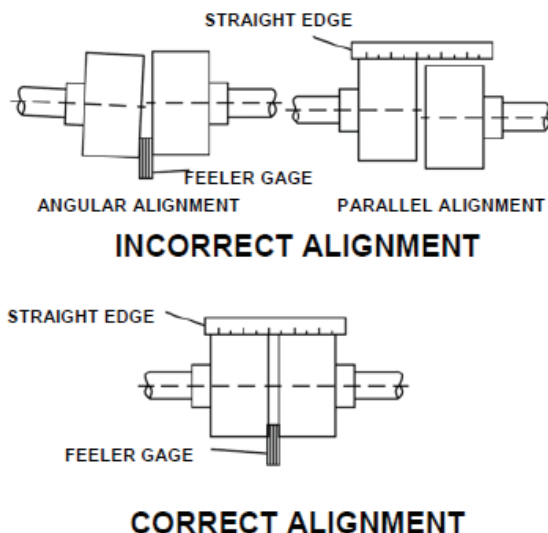


Figure 7 - Checking Alignment (Straight Edge Method)

#### 14.2 For Fine Alignment, 3500 RPM OPERATION, For Other Coupler Types (See figure 8)

A dial indicator should be used when greater alignment accuracy is required. Use the following alignment tolerances unless specified otherwise by the coupling manufacturer. On sleeve type couplings make sure there is at least 1/8 inch [3mm] end clearance between the sleeve and the two coupling halves.

#### To check angular misalignment:

- Mount the dial indicator base to the coupling half and position the dial indicator button on the front or rear face of the opposite coupling half.
- Set the dial to zero, rotate both coupling halves together, making sure the indicator button always indicates off the same spot.
- Misalignment values within 0.004 inches [.10mm] TIR per inch [25mm] of coupler radius is permissible.

#### To check parallel misalignment:

- Mount the dial indicator base to one coupling half, or shaft and position the dial indicator button on the outside diameter of the opposite coupling half.
- Set the dial to zero, rotate both coupling halves together, making sure the indicator button always indicates off the same spot.
- Misalignment values within 0.004 inches [.10mm] TIR is permissible.



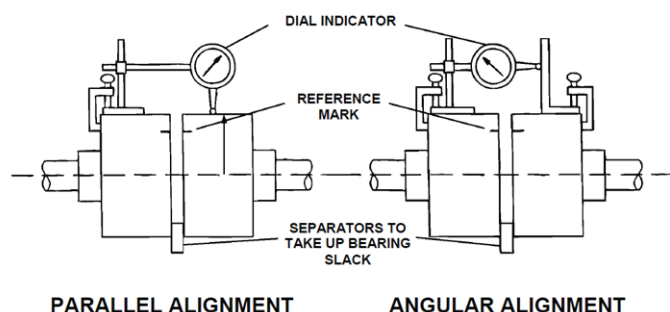


Figure 8 – Checking Alignment (Dial Indicator Method)

**NOTE:** Final alignment cannot be accomplished until the pump has been operated initially for a sufficient length of time to attain operating temperature. When normal operating temperature has been attained, secure the pump to re-check alignment and compensate for temperature accordingly.

**IMPORTANT:** Apply Loctite®243 to pump and/or motor mounting screws to prevent loosening during operation



**WARNING: Rotating Components Hazard**  
Potentially Hazardous Situation!

Do not operate pump without all guards in place. Failure to follow these instructions could result in serious personal injury or death and property damage.

## 15 Suction and Discharge Piping General Precautions

When installing the pump piping, be sure to observe the following precautions:

- Piping should always be run to the pump. Do not move pump to pipe, as this could make final alignment impossible.
- Both the suction and discharge piping should be supported independently near the pump and properly aligned, so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe hangers or other supports at necessary intervals to provide support. When expansion joints are used in the piping system, they must be installed beyond the piping supports closest to the pump. Tie bolts should be used with expansion joints to prevent pipe strain. Do not install expansion joints next to the pump or in any way that would cause a strain on the pump resulting from system pressure changes. It is usually advisable to increase the size of both suction and discharge pipes at the pump connections to decrease the loss of head from friction.
- Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use 45-degree or long sweep 90-degree fittings to decrease friction losses.
- Make sure that all piping joints are air-tight.
- Where flanged joints are used, assure that inside diameters match properly.
- Remove burrs and sharp edges when making up joints.
- Do not “spring” piping when making any connections.
- Provide for pipe expansion when hot fluids are to be pumped.

### 15.1 Suction Piping Precautions and Recommendations

When installing the suction piping, observe the following precautions (See figure 9).

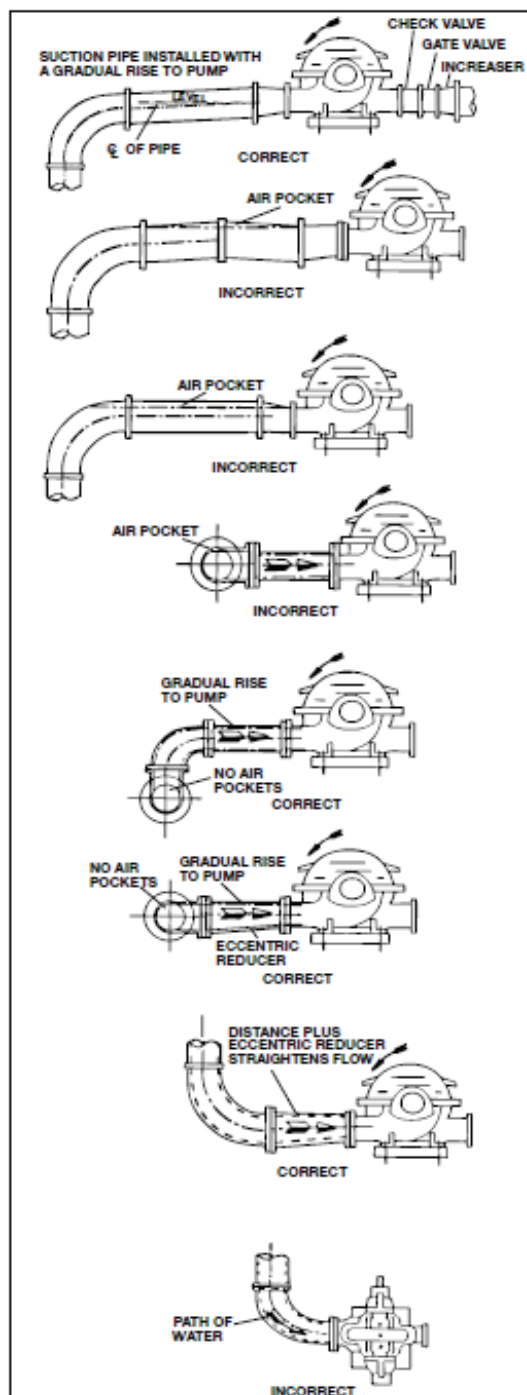


Figure 9 – Suction Piping Installation (Pipe Supports Not Shown )

The sizing and installation of the suction piping is extremely important. It must be selected and installed so that pressure losses are minimized and sufficient liquid will flow into the pump when started and operated. Many NPSH (Net Positive Suction Head) problems can be attributed directly to improper suction piping systems.

Friction losses caused by undersized suction piping can increase the fluid's velocity into the pump. As recommended by the Hydraulic Institute Standard ANSI/HI 1.1-1.5-1994, suction pipe velocity should not exceed the velocity in the pump suction nozzle. In some situations pipe velocity may need to be further reduced to satisfy pump NPSH requirements and to control suction line losses. Pipe friction can be reduced by using pipes that are one to two sizes larger than the pump suction nozzle in order to maintain pipe velocities less than 5 feet [1.5m] /second.

When reducing piping size to pump inlet, use concentric reducers to enhance laminar flow.

Suction piping should be five diameters of straight pipe length or longer, as direct as possible, and never smaller in diameter than the pump suction opening. If the suction pipe is 5 diameters in length, the pipe diameter can be the same size as the suction opening. If longer suction pipe is required, pipes should be one or two sizes larger than the opening depending on piping length.

Suction piping for horizontal double suction pumps should not be installed with an elbow close to the suction flange of the pump except when the suction elbow is in the vertical plane. A suction pipe of the same size as the suction nozzle approaching at any angle other than straight up or straight down must have the elbow located 10 pipe diameters from the suction flange of the pump. Vertical mounted pumps and other space limitations require special piping.

There is always an uneven turbulent flow around an elbow and when it is in a position other than the vertical it causes more liquid to enter one side of the impeller than the other (See figure 10). This results in high unequalized thrust loads that will overheat the bearings and cause rapid wear in addition to affecting hydraulic performance.

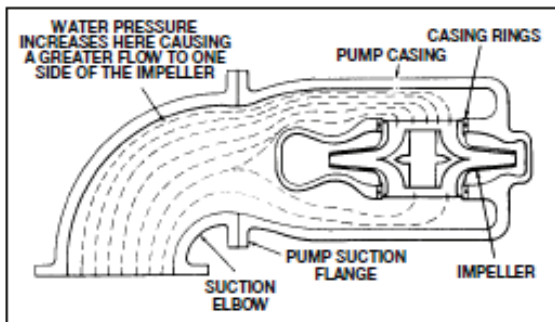


Figure 10 – Unbalanced loading of a double suction impeller due to uneven flow around an elbow adjacent to the pump

When operating on a suction lift, the suction pipe should slope upward to the pump nozzle. A horizontal suction line must have a gradual rise to the pump. Any high point in the pipe will become filled with air and thus prevent proper operation of the pump. When reducing the piping to the suction opening diameter use an eccentric reducer with the eccentric side down to avoid air pockets.

**NOTE:** When operating on suction lift never use a straight taper reducer in a horizontal suction line, as it tends to form an air pocket in the top of the reducer and the pipe.

To facilitate cleaning the pump liquid passage without dismantling pump, use a short section of pipe (spool piece) so designed that it can be readily dropped out of the line, and can be installed adjacent to the suction flange. With this arrangement, any matter clogging the impeller is accessible by removing the nozzle (or pipe section).

#### 15.2 Valves in Suction Piping Precautions and Recommendations

When installing valves in the suction piping, observe the following precautions:

- If the pump is operating under static suction lift conditions, a foot valve may be installed in the suction line to avoid the necessity of priming each time the pump is started. This valve should be of the flapper type, rather than the multiple spring type, sized to avoid excessive friction in the suction line. (Under all other conditions, a check valve, if used, should be installed in the discharge line.) (See “VALVES IN DISCHARGE PIPING”)
- When foot valves are used, or where there are other possibilities of “water hammer,” close the discharge valve slowly before shutting down the pump.

- Where two or more pumps are connected to the same suction line, install gate valves so that any pump can be isolated from the line. Gate valves should be installed on the suction side of all pumps with a positive pressure for maintenance purposes. Install gate valves with stems horizontal to avoid air pockets. Globe valves should not be used, particularly where NPSH is critical.
- The pump must never be throttled by the use of a valve on the suction side of the pump. Suction valves should be used only to isolate the pump for maintenance purposes, and should always be installed in positions to avoid air pockets.
- A pump drain valve should be installed in the suction piping between the isolation valve and the pump.

#### 15.3 Discharge Piping Precautions and Recommendations

If the discharge piping is short, the pipe diameter can be the same as the discharge opening. If the piping is long, pipe diameter should be one or two sizes larger than the discharge opening. On long horizontal runs, it is desirable to maintain as even a grade as possible. Avoid high spots or loops, which will collect air and throttle the system or lead to erratic pumping.

#### 15.4 Valves in Discharge Piping Precautions and Recommendations

A triple duty (3-D) valve should be installed in the discharge. The triple duty valve placed on the pump protects the pump from excessive back pressure, and prevents liquid from running back through the pump in case of power failure.

### 16 Pressure Gauges Precautions and Recommendations

Properly sized pressure gauges should be installed in both the suction and discharge nozzles in the gauge taps. The gauges will enable the operator to easily observe the operation of the pump, and also determine if the pump is operating in conformance with the performance curve. If cavitation, vapor binding, or other unstable operation should occur, excessively fluctuating discharge pressure will be noted.

#### 17 Pump Insulation Precautions and Recommendations

On chilled water applications most pumps are insulated. As part of this practice, the pump bearing housings should not be insulated since this would tend to “trap” heat inside the housing. This could lead to increased bearing temperatures and premature bearing failures.

### 18 Mechanical Seals Precautions and Recommendations

#### 18.1 Mechanical Seals

Mechanical seals are preferred over packing on most applications because of better sealing qualities and longer serviceability. Leakage is eliminated when a seal is properly installed, and normal life is much greater than that of packing on similar applications.

Pumps containing single mechanical seals normally utilize the pumped liquid to lubricate the seal faces. This method is preferred when the pumped liquid is neither abrasive nor corrosive.



## 18.1 Cartridge Seals

Follow the appropriate lubrication directions for mechanical seals given in this section. Most cartridge seals provide flushing connections on their glands. Use the cartridge seal gland flushing taps (if provided) for your seal water connections instead of the stuffing box tap. The quench taps on the glands (if present) are normally only used in chemical applications. Consult seal manufacturer's literature for more detailed information.

# 19 Operation

## 19.1 Pre-Start Checks

Before Initial start of the pump, make the following inspections

- Check alignment between pump and motor. (p.6,7)
- Check all connections to motor and starting device
- Check voltage, phase, and frequency on motor nameplate with line circuit.
- Check suction and discharge piping and pressure gauges for proper operation.
- Turn pump shaft by hand to assure that it rotates freely.
- Inspect that pump bearings are properly lubricated.
- Assure that coupling is properly lubricated, if required, see coupling manufacturer's IOM for instructions.
- Assure that pump is full of liquid ('PRIMING') and all valves are properly set and operational, with the discharge valve closed, and the suction valve open.
- Check rotation. Be sure that the drive operates in the direction indicated by the arrow on the pump casing as serious damage can result if the pump is operated with incorrect rotation.
- Check rotation each time the motor leads have been disconnected.



### **WARNING: Rotating Components Hazard** Potentially Hazardous Situation!

Do not operate pump without all guards in place. Failure to follow these instructions could result in serious personal injury or death and property damage.



### **CAUTION: Seal Damage Hazard**

Do not run pump dry, seal damage may occur. Failure to follow these instructions could result in property damage and/or personal injury.

## 19.2 Priming

If the pump is installed with a positive head on the suction, it can be primed by opening the suction and vent valve and allowing the liquid to enter the casing.

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



### **WARNING: Rotating Components Hazard** Potentially Hazardous Situation!

Do not operate pump without all guards in place. Failure to follow these instructions could result in serious personal injury or death and property damage.

## 19.3 Starting

- Close drain valves and valve in discharge line.
- Open fully all valves in the suction line.
- Prime the pump.
- NOTE: If the pump does not prime properly, or loses prime during start-up, it should be shut down and the condition corrected before the procedure is repeated.
- When the pump is operating at full speed, open the discharge valve slowly. This should be done promptly after start-up to prevent damage to pump by operating at zero flow.

## 19.4 Operating Check

- Check the pump and piping to assure that there are no leaks.
- Check and record pressure gauge readings for future reference.
- Check and record voltage, amperage per phase, and power (kW) if a wattmeter is available.
- Check bearings for lubrication and temperature. Normal temperature is 180°F [82°C] maximum.
- Make all pump output adjustments with the discharge line.



### **CAUTION: Cavitation Damage Hazard**

Do not throttle the suction line to adjust the pump output. Failure to follow these instructions could result in property damage.

## 19.5 Freezing Protection

Pumps that are shut down during freezing conditions should be protected by one of the following methods.

- Drain the pump; remove all liquids from the casing.
- Keep fluid moving in the pump and insulate or heat the pump to prevent freezing.



### **CAUTION: Bearing/Seal Damage Hazard**

Do not let heated pump temperature rise above 200°F [93°C]. Failure to follow these instructions could result in property damage and/or moderate personal injury.

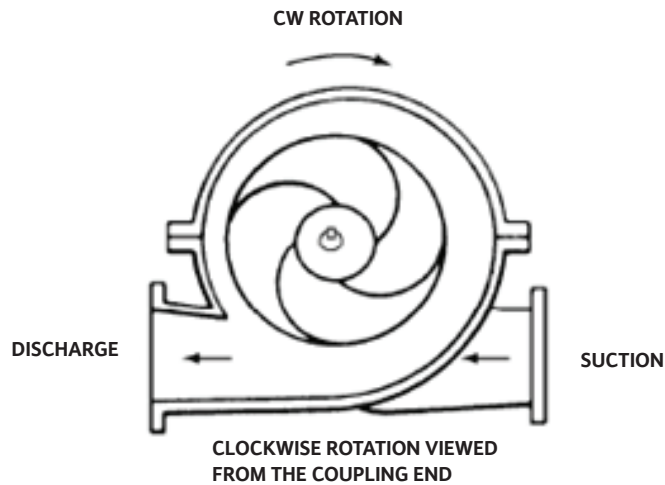
## 19.6 Rotation (See Figure 11)

All pumps are supplied with clockwise rotation.



**WARNING: Rotating Components Hazard**  
Potentially Hazardous Situation!

Do not operate pump without all guards in place. Failure to follow these instructions could result in serious personal injury or death and property damage.



## 19.7 Trouble Shooting

Between regular maintenance inspections, be alert for signs of motor or pump trouble. Common symptoms are listed below. Correct any trouble immediately and AVOID COSTLY REPAIR AND SHUTDOWN.

Figure 11 – Correct Relationship of Impeller and Casing

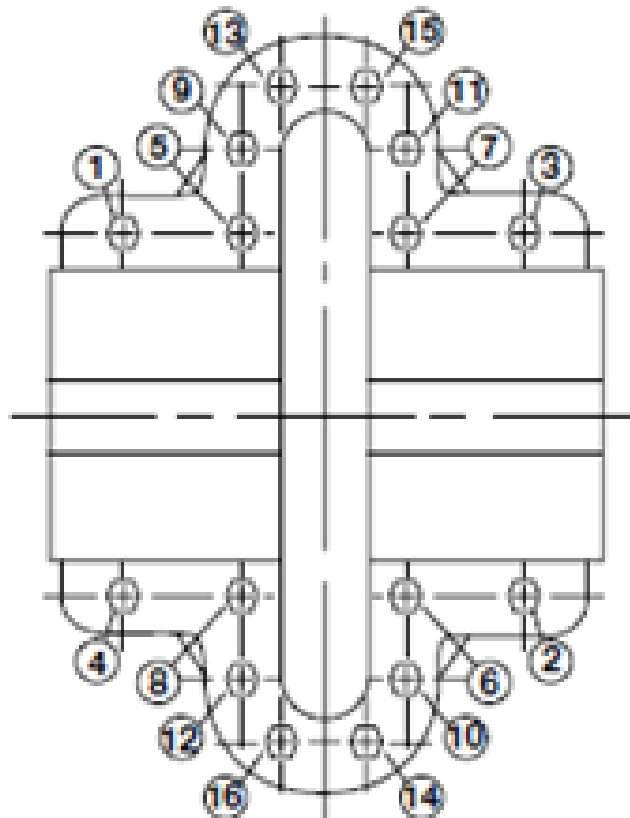


Figure 12 – Correct Tightening Sequence of Main Joint Hardware

## 20 Maintenance

### 20.1 General Maintenance

Operating conditions vary so widely that to recommend one schedule of preventive maintenance for all centrifugal pumps is not possible. Yet some sort of regular inspection must be planned and followed. Keep a permanent record of the periodic inspections and maintenance performed on the pump. Following a routine maintenance procedure will keep the pump in proper working condition and prevent costly breakdown.

Symptoms	Possible cause of trouble and remedies (number defined in troubleshooting charts below)
Pump does not deliver water	1,2,3,4,6,11,14,16,17,22,23
Insufficient capacity delivered	2,3,4,5,6,7,8,9,10,11,14,17,20,22,23,29,30,31
Insufficient pressure developed	5,14,16,17,20,22,29,30,31
Pump loses prime after starting	2,3,5,6,7,8,11,12,13
Pump requires excessive power	15,16,17,18,19,20,23,24,26,27,29,33,34,37
Stuffing box leaks excessively	12,13,24,26,32,33,34,35,36,38,39,40
Pump vibrates or it is noisy	2,3,4,9,10,11,21,23,24,25,26,27,28,30,35,41,42,43,44,45,46,47
Bearings have short life	24,26,27,28,35,36,41,42,43,44,45,46,47
Pump overheats and seizes	1,4,21,22,24,27,28,35,36,41

**Table 1 – Trouble Shooting Chart**

Causes		Remedies
1	Pump not primed	Ensure that casing is fully filled and water comes out of air cock
2	Pump or suction pipe not completely filled with liquid	Check leaking foot valve in case of negative suction
3	Suction lift too high	Reduce by lowering pump elevation or increase water level
4	Insufficient margin between pressure and vapor pressure	Check that NPSH available is at least 3.5 feet more than NPSH required
5	Excessive amount of air in liquid	Check the reasons and eliminate. Gas gets entrapped in liquid. Air may be entering through suction joints.
6	Air pocket in suction line	Ensure pipe fully filled and there is no bend for negative suction
7	Air leaks into suction line	Tighten pipe joints with solution
8	Air leaks into pump through stuffing boxes	Ensure stuffing box sealing
9	Foot valve too small or leaking	Replace/Attend
10	Foot valve partially clogged	Clean
11	Inlet of suction pipe insufficiently submerged	Ensure adequate submergence such that foot valve is not exposed
12	Water seal pipe clogged	Clean or change
13	Logging ring is improperly located in stuffing box, preventing sealing fluid from entering to form seal	Position logging ring centrally under sealing holes of stuffing box
14	Speed too low	Check motor RPM, supply frequency. Motor nameplate speed should be as specified on pump nameplate
15	Speed too high	Check motor RPM and supply frequency
16	Incorrect direction of rotation	Check correct direction of rotation for motor before coupling to motor
17	Total head of system higher than design head of pump	Check the causes and refer to Wilo. Measure with pressure gauge
18	Total head of system lower than design head of pump	Check the causes and refer to Wilo. Measure with pressure gauge
19	Specific gravity of liquid different from design	Refer to Wilo
20	Viscosity of liquid different from design	Refer to Wilo
21	Operation at very low capacity	Check the causes and refer to Wilo. Operate pump at rated duty
22	Parallel operation of pumps unsuitable for such operation	Refer to Wilo with characteristic curves of pump
23	Foreign matter in impeller	Open and clean
24	Misalignment	Check with dial gauge should be within limits and without undue pipe stresses
25	Foundations not rigid	Check vibration on baseplate, check for cavities, voids, or incomplete fills
26	Shaft bent	Dismantle and check. Replace shaft.

Causes		Remedies
27	Rotating part rubbing on stationary part	Incorrect assembly, correct the assembly
28	Bearing worn	Check lubrication, shaft run out, alignment, replace if required
29	Wear ring worn	Replace
30	Impeller damaged	Replace
31	Casing gasket defective, permitting internal leakage	Replace
32	Shaft or shaft sleeves work or scored at packing	Replace
33	Packing improperly installed	Use correct grade and size of packing
34	Type of packing incorrect for operating conditions	Use correct grade and size of packing
35	Shaft running out of center because of worn bearings or misalignment	Rectify
36	Rotor out of balance, causing vibration	Balance the rotor
37	Gland too tight, resulting in no flow of liquid to lubricate packing	Adjust gland. Ensure sealing water flow
38	Cooling liquid not being provided to water-cooled stuffing boxes	Provide
39	Excessive clearance at bottom of stuffing box between shaft and casing, causing packing to be forced into the pump	Check pumps assembly
40	Dirt or grit in sealing, liquid leading to scoring of shaft or shaft sleeve	Provide clean liquid for flushing
41	Excessive thrust caused by mechanical failure inside pump or by failure of hydraulic balancing device, if any (in case of multistage pump)	Check pump operation and assembly
42	Excessive grease or oil in antifriction bearing housing or lack of cooling, causing excessive bearing temperature	Attend
43	Lack of lubrication	Provide proper lubrication
44	Improper installation of antifriction bearings (damage, incorrect assembly of stacked bearings (damage, incorrect assembly of stacked bearings, use of unmatched bearings as a pair etc.)	Rectify or replace bearing
45	Dirt in bearings	Investigate the cause and clean bearing
46	Rusting of bearings from water in housing	Arrest water ingress
47	Excessive cooling of water – cooled bearing, resulting in condensation of atmospheric moisture in bearing housing.	Reduce cooling water flow

**Table 1 – Troubleshooting Chart**

One of the best rules to follow in the proper maintenance of the centrifugal pump is to keep a record of actual operating hours. Then, after a predetermined period of operation has elapsed, the pump should be given a thorough inspection. The length of this operating period will vary with different applications, and can only be determined from experience. New equipment, however, should be examined after a relatively short period of operation. The next inspection period can be lengthened somewhat. This system can be followed until a maximum period of operation is reached which should be considered the operating schedule between inspections.

## 20.2 General Maintenance of Flooded Pumps



### **WARNING: Unexpected Startup Hazard** Potentially Hazardous Situation!

Disconnect and lockout power before servicing. Failure to follow these instructions could result in serious personal injury, death or property damage.



### **WARNING: Electrical Shock Hazard** Potentially Hazardous Situation!

Electrical connections are to be made by a qualified electrician in accordance with all applicable codes, ordinances, and good practices. Failure to follow these instructions could result in serious personal injury, death, or property damage.

The servicing of centrifugal pumps after a flooded condition is a compara-

tively simple matter under normal conditions.

Bearings are a primary concern on pumping units. First, dismantle the frame, clean and inspect the bearings for any rusted or badly worn surfaces. If bearings are free from rust and wear, reassemble and relubricate them with one of the recommended lubricants. (p. 13)

Depending on the length of time the pump has remained in the flooded area, it is unlikely that bearing replacement is necessary; however, in the event that rust or worn surfaces appear, it may be necessary to replace the bearings.

Next, inspect the stuffing box area, and clean out any foreign matter that might clog the box. Packing that appears to be worn, or no longer regulates leakage properly should be replaced. Mechanical seals should be cleaned and thoroughly flushed.

Couplings should be dismantled and thoroughly cleaned. Lubricate the coupling with one of the coupling manufacturer's recommended lubricants where required.

## 21 Lubrication

### 21.1 Grease Lubrication of Bearings

Grease lubricated ball bearings are packed with grease at the factory and ordinarily will require no attention before starting, provided the pump has been stored in a clean, dry place prior to its first operation. The bearings should be watched the first hour or so after the pump has been started to see that they are operating properly. A lithium based NLGI-2 grade grease should be used for lubricating bearings

where the ambient temperature is above -20°F. Grease lubricated bearings are packed at the factory with **Shell Alvania No. 2**. Other recommended greases are Texaco Multifak No. 2 and Mobilux No. 2 grease.

Greases made from animal or vegetable oils are not recommended due to the danger of deterioration and forming of acid. Do not use graphite. Use of an ISO VG 100 mineral base oil with rust and oxidation inhibitors is recommended.

In greasing anti-friction bearings, the use of high pressure equipment is not only unnecessary, but is actually undesirable unless used with great care. High pressure may damage the bearings or seals, cause unnecessary loss of grease, create a danger of overheating due to overgreasing, and produce unsightly conditions around the bearing. Excess grease is the most common cause of overheating. Adequate lubrication is assured if the level of grease is maintained at about the capacity of the bearing and 1/3 to 1/2 of the cavity between the bearing and grease fitting. Any greater amount will, as a rule, be discharged by the seal or vent and be wasted.

The importance of proper lubrication cannot be over emphasized. Lubrication frequency depends upon the speed, size and type of bearing, and operating temperature or environmental conditions. Generally, the smaller the bearing and faster the speed, the more frequent the interval for relubrication with grease. It is recommended that a certain amount of grease be added at intervals of three to six months to replace the small quantity of grease lost between grease flushing intervals. For average bearing housing designs, one (1) ounce of grease will be sufficient at these intervals. For larger or smaller bearing housings this amount may have to be adjusted.

Unfortunately, there is not a grease available which will not harden over time and become less suitable for its purpose due to oxidation. It is good practice to remove all the old grease about once a year and thoroughly clean the bearings. This should be done during major overhauls. After gaining experience with each individual pump and its operating characteristics, the relubrication and flushing intervals may be adjusted accordingly. Keep good records and add grease at regular intervals. Then adjustments can be made after the first overhaul, if necessary.

## 21.2 Periodic Addition of Grease

Grease lubricated ball bearings are packed with grease at the factory. Store the pump in a clean, dry place prior to its first operation.

If one is uncertain about the amount of grease in a bearing at relubrication intervals, the safe rule is to add grease while the pump is stopped to avoid overloading. Remember, a ball or roller bearing in most applications is assured of adequate lubrication if the level of grease is maintained at about the capacity of the bearing and 1/3 and 1/2 of the cavity between the bearing and grease fitting. Any greater amount will, as a rule, be discharged by the seals or vent and be wasted. Excess grease is the most common cause of overheating of the bearings. Remove vent plugs for the first 24 hours of operation after regreasing.

## 21.3 Bearing Temperature

Normally the maximum desirable operating temperature for ball bearings is 180°F [82°C]. Special designs may have higher limits. Should the temperature of the bearing frame rise above the limit, the pump should be shut down to determine the cause. Check with an accurate temperature measuring device to be sure.

## 21.4 Oil Lubrication of Bearings

**NOTE:** Oil lubrication on Split Case Series pumps is not standard.

After the pump has been installed, flush the housing to remove dirt, grit, and other impurities that may have entered the bearing housing during shipment or installation. Then refill the housing with proper lubricant.

A Mobil Oil, DTE Medium, or equal, meeting the following specification will

provide satisfactory lubrication. Similar oils can be furnished by all major oil companies. It is the responsibility of the oil vendor to supply a suitable lubricant.

- Saybolt viscosity at 100°F [38°C].....215 SSU-240 SSU
- Saybolt viscosity at 210°F [99°C].....49 SSU
- Viscosity index, minimum.....95
- API gravity.....28-33
- Pour point, maximum.....+20°F [-7°C]
- Flash point, minimum.....400°F [200°C]
- Additives.....Rust & Oxidation inhibitors
- ISO viscosity.....46

**NOTE:** Oils from different suppliers should not be mixed. Engine oils are not recommended.

The oil should be a non-foaming, well refined, good grade, straight cut, filtered mineral oil. It must be free from water, sediment, resin, soaps, acid and fillers of any kind.

In installations with moderate temperature changes, low humidity, and a clean atmosphere, the oil should be changed after approximately 1000 hours of operation. The oil should be inspected at this time to determine the operating period before the next oil change. Oil change periods may be increased up to 2000-4000 hours based on an 8000 hour year. Check the oil frequently for moisture, dirt, or signs of "breakdown," especially during the first 1000 hours.

Do not over oil; this causes the bearings to run hot. The maximum desirable bearing housing operating temperature for all ball bearings is 180°F [83°C]. Should the temperature of the bearing frame exceed 180°F [83°C] (measured by thermometer) shut down pump to determine the cause.

## 21.5 Coupling Lubrication

Flexible, rubber element type couplings (Lovejoy Jaw Type, Wood's Sure-Flex or Falk Wrap Flex coupling for instance). There is no rubbing action of metal against rubber to cause wear. Couplings are not affected by abrasives, dirt, or moisture. This eliminates the need for lubrication or maintenance, and provides clean and quiet performance.

If other type of couplings are used, follow maintenance instructions of coupling manufacturer.

## 22 Mechanical Seal Information

General instructions for operation of the various mechanical sealing arrangements are included below. It is not feasible to include detailed instructions for all mechanical seals in this booklet because of the almost unlimited number of possible combinations and arrangements. Instead, seal manufacturer's instructions will be included as a separate supplement to this book, where required.

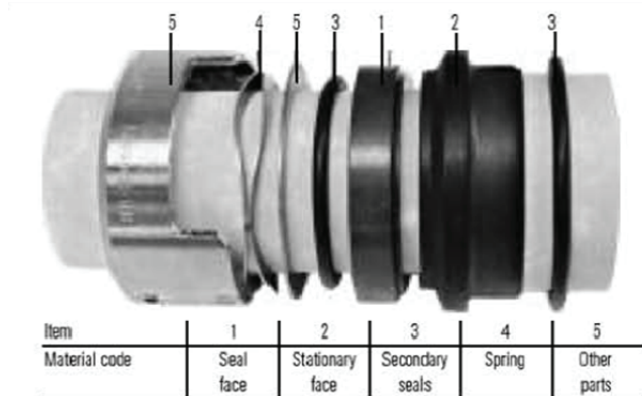
- Mechanical seals are precision products and should be treated with care. Use special care when handling seals. Clean oil and clean parts are essential to prevent scratching the finely lapped sealing faces. Even light scratches on these faces could result in leaky seals.
- Normally, mechanical seals require no adjustment or maintenance except routine replacement of worn or broken parts.
- A mechanical seal which has been used should not be put back into service until the sealing faces have been replaced or relapped. (Relapping is generally economical only in seals two inches [50mm] in size and above.)



Four important rules which should always be followed for optimum seal life are:

- 1. Keep the seal faces as clean as possible.
- 2. Keep the seal as cool as possible.
- 3. Assure that the seal always has proper lubrication.
- 4. If seal is lubricated with filtered fluid, clean filter frequently.

Figure 13 – Typical Mechanical Seal



23      Cleaning without Dismantling Pump

A short section of pipe so designed that it can be readily dropped out of the line can be installed adjacent to the suction flange. With this arrangement, any matter clogging the impeller is accessible by removing the pipe section. If the pump cannot be freed of clogging after the above methods have been tried, dismantle the unit as previously described to locate the trouble.

24      Disassembly Instructions

The procedure outlined in this section covers the dismantling and reassembly of the SCP (Split Case) Series pump with mechanical seals on sleeves. When working on the pump, use accepted mechanical practices to avoid unnecessary damage to parts. Check clearances and conditions of parts when pump is dismantled and replace if necessary. Steps should usually be taken to restore impeller and neck ring clearance when it exceeds three times the original clearance.

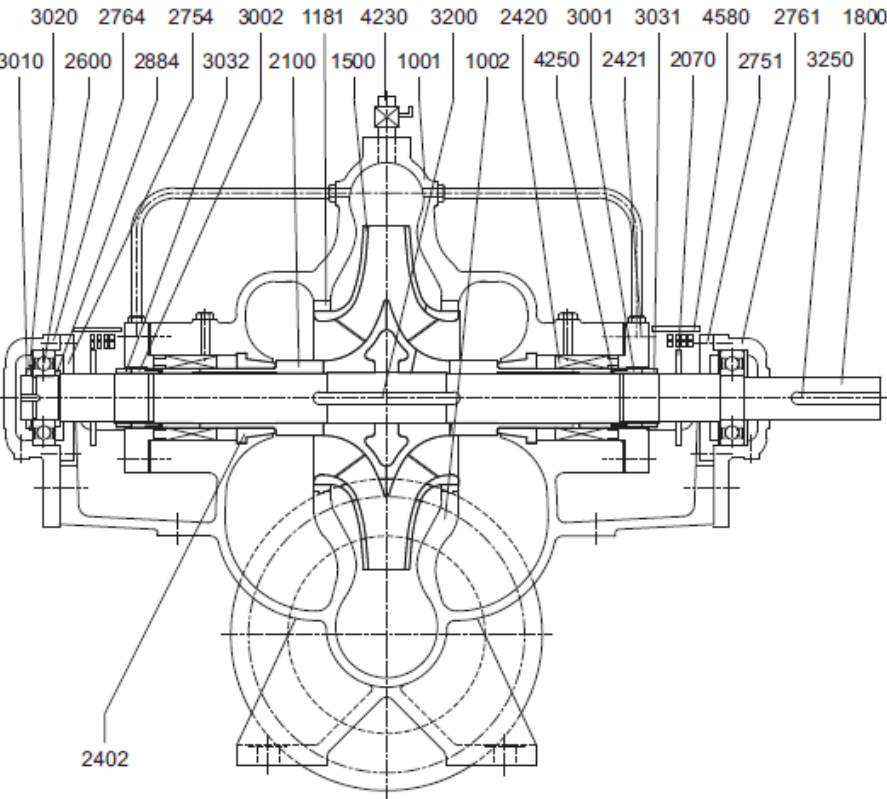


Figure 14 – Exploded View of SCP (Split Case) Series Pump

Fig. 24 Cross Section (Standard one-stage pump with mechanical seal)	
1001	Casing top half
1002	Casing bottom half
1181	Neck Ring
1500	Impeller
1800	Shaft
2070	Water deflector
2100	Shaft sleeve
2402	Stuffing box bush
2420	Mechanical seal (balanced)
2421	Gland plate (mechanical seal cover)
2600	Deep groove ball bearing
2751	Bearing and cover (drive side)
2754	Bearing end cover (non-drive side)
2761	Bearing housing (drive side)
2764	Bearing housing (non-drive side)
2884	Thrust collar
3001	Cowl nut (l.h.)
3002	Cowl nut (r.h.)
3010	Lock Nut
3020	Locking washer
3031	Sleeve nut (l.h.)
3032	Sleeve nut (r.h.)
3200	Impeller key
3250	Coupling key
4230	Air vent cock
4250	O-ring
4580	Guard

## 24.1 Recommended Tools and Instruments

- Chain pulley block
- Wire rope
- Set of eye bolts
- Set of Open-ended spanner wrenches
- Set of Allen keys
- Set of feeler gauges
- Drill & drill bits
- Bearing puller
- Bearing induction heater
- Loctite ® 577 used on pipe plugs
- Calibrated Vernier Caliper
- Calibrated Micrometer
- Calibrated torque wrench

## 24.2 Service Instructions for Replacement of Mechanical Seals on Sleeves



### **WARNING: Electrical Shock Hazard** Potentially Hazardous Situation!

Disconnect and lock out power before servicing. Failure to follow these instructions could result in serious injury, death, or property damage.

1. Close valves on suction and discharge sides of pump. (If no valves have been installed, it will be necessary to drain the system.)



### **CAUTION: Extreme Temperature Hazard**

Allow pump temperatures to reach acceptable levels before proceeding. Open drain valve, do not proceed until liquid stops coming out of drain valve. If liquid does not stop flowing from drain valve, isolation valves are not sealing and should be repaired before proceeding. After liquid stops flowing from drain valve, leave drain valve open and continue. Remove the drain plug located on the bottom of the pump housing. Do not reinstall plug or close drain valve until reassembly is completed. Failure to follow these instructions could result in property damage and/or moderate personal injury.

2. Remove coupler guard (Refer to the following paragraph "COUPLING GUARD REMOVAL / INSTALLATION") and disconnect coupler.
  3. Remove the gland guards.
  4. Disconnect and remove water sealing tubing.
  5. Remove the alignment pin from the bearing housing.
  6. Remove both sets of bearing housing fasteners.
  7. Remove the bearing end cover and fasteners from the non-drive end (out-board end).
  8. Remove the bearing end cover and fasteners from the drive end (inboard end).
- NOTE: Before removal ensure that the coupling guard and coupler have been removed.
9. Remove bearing housings from the drive side and the non-drive side.
  10. Remove the shaft lock nut and the lock washer from the non-drive side.

11. Remove the bearing from the non-drive side using a bearing puller device.
12. Remove the bearing from the drive side using a bearing puller device.
13. Remove the thrust collar from the non-drive.
14. Remove the bearing end cover and water deflector from the non-drive end.

15. Remove the bearing end cover and water deflector from the drive side.
16. Remove the gland plate, nuts and studs from both sides.
17. Remove the stationary component of the mechanical seals from both gland plates.
18. Remove the o-rings from both gland plates.
19. Remove the casing guide pins.
20. Remove the casing fasteners.
21. Slightly tighten the jacking screw on either side of the casing top half to release the casing halves.



Picture 1 – Casing Halves



### **CAUTION: Excessive Pressure Hazard**

Make certain the internal pressure is relieved before continuing. Failure to follow these instructions could result in serious injury, death, or property damage.

22. To remove the rotating component of the balanced mechanical seal, loosen the setscrews.
23. Lift the rotating assembly out of the casing bottom half and place on a working table or bench.



Picture 2 – Rotating Assembly

24. Remove the neck rings and the stuffing box bushes.
  25. Remove the left and right hand threaded cowl (sleeve) nuts and the shaft sleeve o-rings.
  26. Remove the shaft sleeves (2100) and the impeller (1500)
- NOTE: External heat may be required for removing the impeller and shaft sleeves. Apply heat uniformly to the impeller and/or shaft sleeve to loosen them from the shaft. DO NOT HEAT ABOVE 300°F [149°C].

IMPORTANT: The correct position for the impeller must be established as marked on the shaft prior to dismantling.



### **CAUTION: Extreme Temperature and/or Flying Debris Hazard**

Eye protection and gloves required. Failure to follow these instructions could result in property damage and/or moderate personal injury.

## 25 Necessary Replacement of Hydraulic Components

The following components must always be replaced when the pump is disassembled:

- Impeller
- Bearings
- Gaskets
- O-rings
- Neck Rings
- Mechanical seals
- Stuffing box bushes

NOTE: Examine the following components for wear or damage and also, measure clearance/tolerance. If found excessive, then immediately replace the following components.

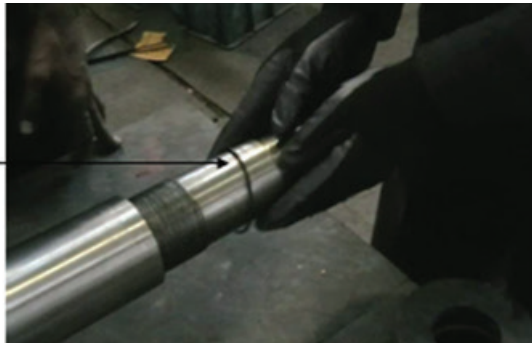
- Casing Neck Ring
- Shaft Sleeve
- Impeller
- Stuffing box bushes
- Bearings
- Mechanical seal faces

## 27 Assembly Instructions

All bearings, o-rings, seals and gaskets must be replaced with new parts during assembly.

NOTE: All reusable parts should be cleaned of all foreign matter before reassembling. The main casing gaskets can be made using the upper or lower half as a template. Lay the gasket material on the casing joint. Trim the gasket by lightly tapping with a ball peen hammer so that it is flush with the inside edges of the casing.

1. Assemble the impeller key in the shaft key slot.
2. Check the impeller and casing to determine the correct relationship (See figure 11).
3. Assemble the shaft, with impeller key, into the impeller.
4. Apply a liberal amount of molybdenum disulphide powder or spray to the shaft and the shaft sleeve threads. This is to prevent galling between the components
5. Slide the shaft sleeve onto the shaft and align properly with the shaft key.
6. Place the sleeve o-ring onto the shaft against the end of the sleeve.



Picture 3 – O-ring Installation

NOTE: Follow steps 7 thru 9 for a pump with clockwise rotation.

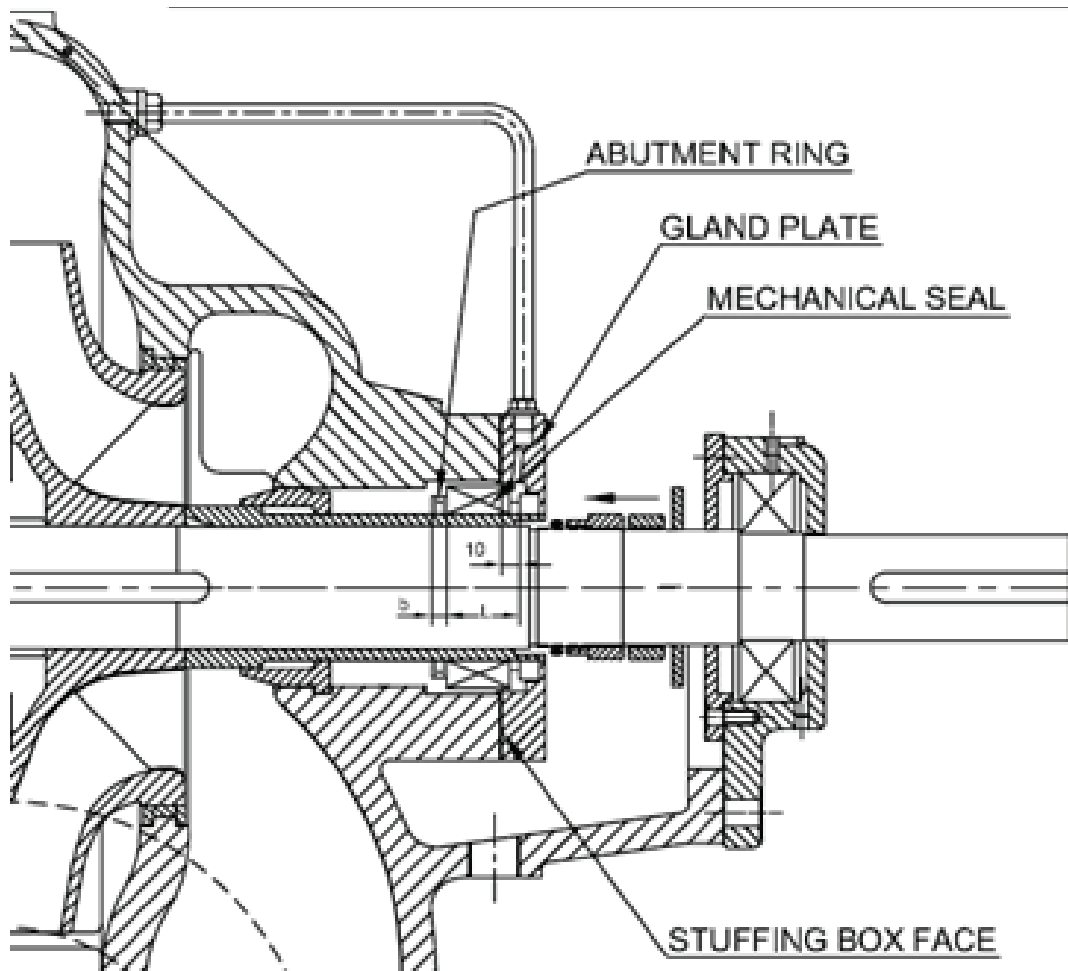
7. Assemble the cowl nut, Right Hand threaded on the non-drive side (outboard end). Keep the cowl nut loose.
8. Assemble the sleeve nut, Right Hand threaded on the non-drive side (outboard end). Keep the sleeve nut loose.

9. Repeat steps 5 thru 8 for drive side (inboard end) shaft sleeve (2100), sleeve o-ring, cowl nut, Left Hand threaded and sleeve nut, Left Hand threaded.
10. Install the (2) neck rings onto the impeller.



Picture 4 – Neck Ring Installation

11. Install the (2) stuffing box bushes.
12. Clean the gasket surfaces of the casing top and bottom halves. Apply Scotch 3M-77 spray adhesive or equivalent to the casing bottom half.
13. Within one minute of spraying, set the .25 mm thick black joint paper or similar untrimmed gasket material and locate on flange of bottom half casing.
14. Trim the gaskets flush with the lower casing bores, if this has not been done as yet.
15. Place the rotating assembly into the casing bottom half and check for correct rotation, freeness of components and that the impeller is centered properly within the casing volute passage and is aligned to the mark on the shaft.
16. Tighten the sleeve and cowl nuts on both ends of the shaft.
17. Install new rotating component of the mechanical seal over the shaft sleeve on the non-drive end. See dimensions in Table 2 per given pump size.
18. Install new rotating component of the mechanical seal over the shaft sleeve on the drive end. See dimensions in Table 2 per given pump size.
19. After positioning of the rotating component of the balanced mechanical tighten the setscrews.
20. Lower the casing top half into place using the casing guide pins and install casing main fasteners.
21. Install gland plate studs.
22. Install new gland plates with new o-rings and hand tighten the fasteners.
23. Install the water deflector and the bearing end covers to both the drive and non-drive ends.
24. Install the thrust collar to the non-drive end.
25. Heat the ball bearing, using either a dry heat (induction heater) or a 10 to 15% soluble oil and water solution. IMPORTANT: Do not exceed 275°F [135°C].
26. Using gloves, press the heated bearing onto the shaft against bearing end cover on the non-drive side.
27. Using gloves, press the heated bearing onto the shaft against bearing end cover on the drive side.
28. Install and secure the locknut and lock washer on the non-drive end of the shaft.
29. Bend at least (1) tab or 'finger' of the lock washer so it engages the slot in the locknut.
30. Coat the inside of the non-drive side bearing housing with grease and slide into place over bearing.
31. Tighten the fasteners on bearing end cover on the non-drive side.
32. Coat the inside of the drive side bearing housing with grease and slide into place over bearing.
33. Tighten the fasteners on bearing end cover on the drive side.
34. Align the non-drive and drive end bearing housings to the casing lower half and insert the steady pin.
35. Tighten the fasteners.
36. Place casing guide pin.
37. Tighten the casing fasteners, following torquing pattern as shown in (Figure 12) .
38. Rotate the shaft by hand to assure that it turns smoothly and is free



Mechanical Seal Setting Dimensions			
Pump Size	"L" Dimension	"b" dimension	Total Distance from Stuffing box face to abutment ring
SCP 3 x 2 x 13 HA	27.5 [699]	8 [203]	25.5 [648]
SCP 4 x 3 x 7 1/2 HA	30 [762]	7.5 [191]	27.5 [699]
SCP 4 x 3 x 9 HA	30 [762]	7.5 [191]	27.5 [699]
SCP 4 x 3 x 13 HA	30 [762]	7.5 [191]	27.5 [699]
SCP 5 x 4 x 10 1/2 HA	30 [762]	7.5 [191]	27.5 [699]
SCP 5 x 4 x 11 HA	30 [762]	7.5 [191]	27.5 [699]
SCP 5 x 4 x 14 HA	30 [762]	7.5 [191]	27.5 [699]
SCP 6 x 5 x 12 1/2 HA	30.5 [775]	8 [203]	28.5 [724]
SCP 6 x 5 x 11 HA	30.5 [775]	8 [203]	28.5 [724]
SCP 8 x 6 x 11 HA	30.5 [775]	8 [203]	28.5 [724]
SCP 8 x 8 x 12 HA	38 [965]	8 [203]	28.5 [724]
SCP 10 x 8 x 12 1/2 HA	38 [965]	8 [203]	28.5 [724]
SCP 12 x 10 x 13 HA	40 [1016]	10 [254]	40 [1016]
SCP 14 x 12 x 13 HA	40 [1016]	10 [254]	40 [1016]

Dimensions in inches [mm]

NOTE: Only stock pump models shown.

Table 2 – Mechanical Seal Setting Dimensions

from rubbing or binding.

NOTE: Torque values are essential in obtaining proper gasket compression so no leakage will occur at the main joint. (p.18)

39. Install coupler and align.

40. Install couple guard. See Coupler Guard Removal/Installation Section.

41. Open isolation valves, inspect pump for leaks, if not leaking return pump to service.

## 28 Ordering Parts

The pumps covered by this manual have been designed and built with certain replaceable wearing parts. The recommended inventory of spare parts depends upon the installation and the importance of continued operation.

For critical service requiring a minimum of "down time" a complete or a

"quick change" rotating element is recommended.

For normal service, with repairs to be made in the field, the following parts are recommended for stock.

Parts should be ordered as far in advance of their use as possible since circumstances beyond the control of the company may reduce existing stock. Not all parts are stocked and must be manufactured for each order. To facilitate rapid handling of your order for spare parts, be sure to include the following information:

- Serial number of the pump.
- Article / part number of the part.
- Quantity of each part.
- Name / description of the part.
- Material desired. (Parts will be furnished in original materials unless specified as a material change. All material substitutions should be discussed with the factory.)

Torque values are as noted unless otherwise specified.

Table 3 – Torque Requirements Chart

NOTE: Reapply Loctite®243 to pump and/or motor mounting screws to prevent loosening during operation.

## 29 Fastener Torque Requirements (See Table 3)

## 30 Dealer Servicing

If trouble occurs that cannot be rectified, contact your local Wilo Representative. He/she will need the following information in order to give you assistance.


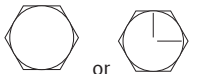



- Complete nameplate data of pump and motor.
- Suction and discharge pipe pressure gauge readings.
- Ampere draw of the motor.
- A sketch of the pumping hook-up and piping.

## 30 Motor

For motor issues, consult the Motor Instruction, Operation and Maintenance Manual.





Capscrew Torque (Foot-Pound)

Capscrew Diameter

Head Marking	Capscrew Type	¼	5/16	3/8	7/16	½	5/8	¾	7/8	1	1¼
	SAE Grade 2	6	13	25	38	60	120	730	210	300	375
 or 	Brass Stainless Steel	4	10	17	27	42	83	130	200	300	375
	SAE Grade 5	10	20	35	60	90	180	325	525	800	1000
	SAE Grade 8	13	28	46	75	115	225	370	590	395	1300

Capscrew Torque (Newton-Meter)

Capscrew Diameter

Head Marking	Capscrew Type	M6	M8	M10	M12	M14	M16	M18	M20	M24	M27	M30
 4.6	ISO 4.6	8	14	33	60	100	150	165	245	320	410	550
 8.8	ISO 8.8	9	22	44	75	120	185	240	300	500	600	725
 10.9	ISO 10.9	12	28	51	98	145	225	295	390	600	800	930
 12.9	ISO 12.9	14	32	60	105	165	250	375	475	800	1000	1200





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