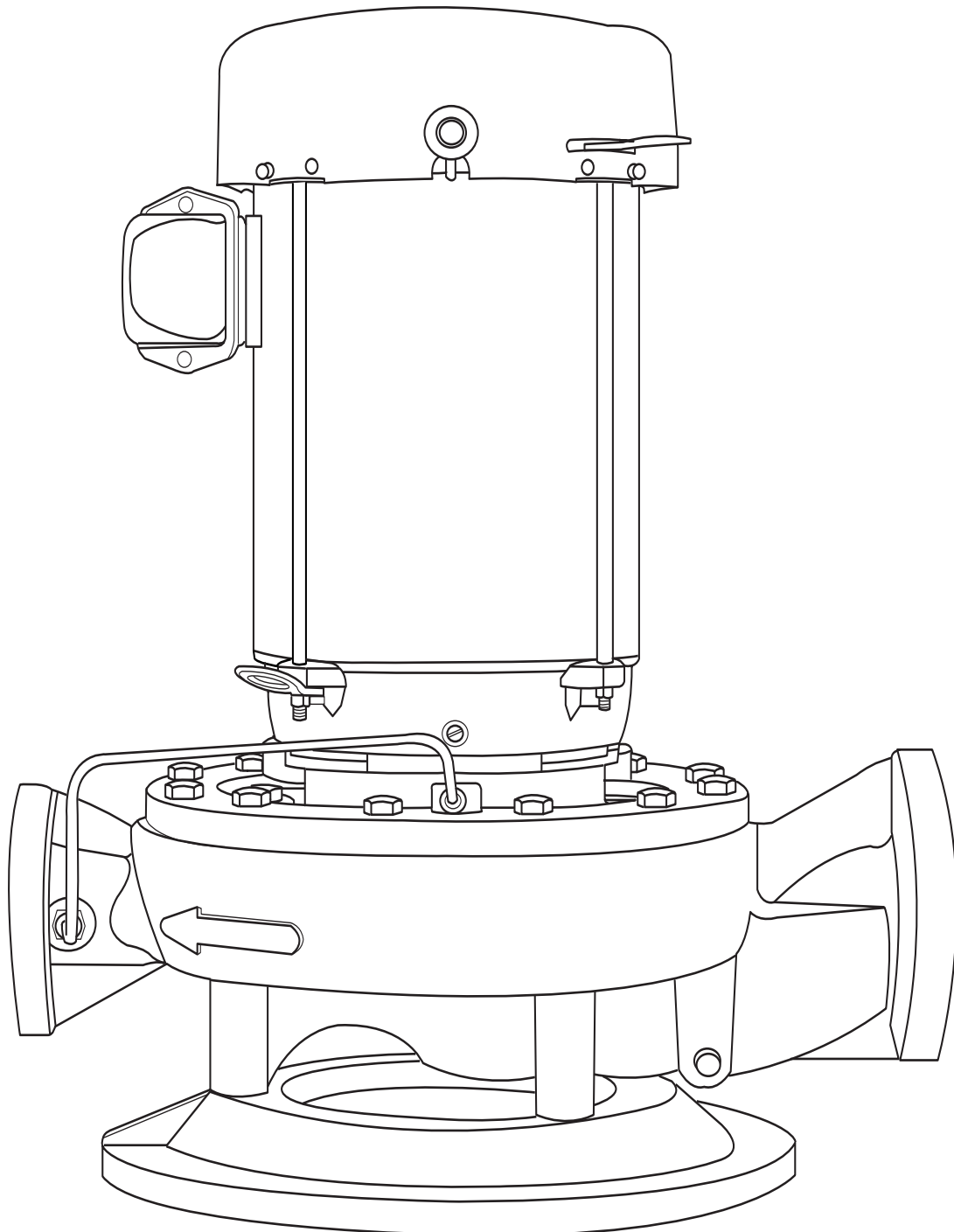


INSTRUCTION MANUAL MC-1.2.22
SERIES CNV206/CNV236
INLINE CENTRIFUGAL
PROCESS PUMPS

INSTALLATION, OPERATION
AND MAINTENANCE
MANUAL



Dean Pump Division



DO NOT OPERATE PUMP BEFORE READING THIS MANUAL

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STANDARD, INLINE, SINGLE STAGE, OPEN IMPELLER, CENTRIFUGAL PROCESS PUMPS

TYPES CNV206, CNV236

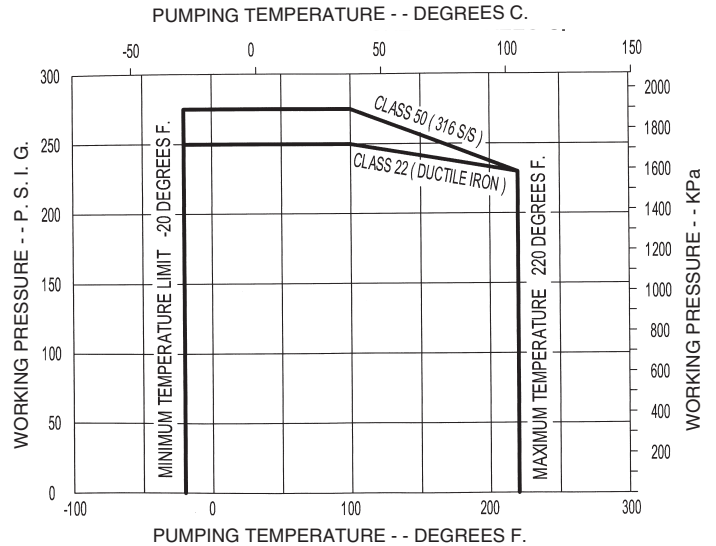
INLINE, SINGLE STAGE, OPEN IMPELLER, CENTRIFUGAL PROCESS PUMPS TYPES CNV206, CNV236

MECHANICAL DESIGN SPECIFICATIONS

Direction of Rotation from Motor End ----- CW
 Bearings in Motor ----- Ball Type
 Bearing Lubrication ----- Grease
 Casing Thickness, Minimum ----- 5/16"
 Flanges - A.N.S.I. Class:
 Ductile Iron (CL 22), 316 S/S (CL 50) ----- 150
 Facing ----- FF
 Finish ----- 125 Ra
 Impeller Balance ----- Single Plane Dynamic Balance
 Allowable Pump Suction Pressure ----- 100 psig
 (2 year minimum thrust bearing life)

	CNV206	CNV236
Horsepower Rating - max. rated		
Driver HP not to exceed @ 1750 rpm	5 HP	25 HP
@ 3500 rpm	10 HP	50 HP
Max. Hydrostatic Test Pressure		
Ductile Iron (CL 22), and 316 S/S (CL 50)	430 psig	430 psig

ALLOWABLE WORKING PRESSURE VS PUMPING TEMPERATURE



All pumps contain a seal face flushing connection in the stuffing box and internal seal circulating piping as standard.

STANDARD MATERIALS OF CONSTRUCTION

PART NO.	PART NAME	CLASS 22	CLASS 50
3	Impeller	Cast Iron (1)	316 S/S (11)
4	Impeller Key	Steel (4)	Steel (4)
5	Casing	Ductile Iron (5)	316 S/S (11)
5A	Casing Drain Plug	Steel (4)	316 S/S (2)
5D	Casing Capscrew	Steel (12)	Steel (12)
7	Adapter Cradle	Cast Iron (1)	Cast Iron (1)
10	Shaft Sleeve	316 S/S (2)	316 S/S (2)
10K	Shaft Sleeve Key	Steel (4)	Steel (4)
12	Impeller Bolt	Steel (12)	316 S/S (2)
12A	Impeller Washer	Steel (4)	316 S/S (2)

PART NO.	PART NAME	CLASS 22	CLASS 50
18	Splash Collar	Rubber (7)	Rubber (7)
22	Casing Back Cover	Cast Iron (1)	316 S/S (11)
37	Clearance Shim	Steel	Steel
56	Casing Foot - Optional	Cast Iron (1)	Cast Iron (1)
77	Casing Gasket	Fiber (10)	Fiber (10)
77A	Gasket - Impeller/Sleeve	Fiber (10)	Fiber (10)
77B	Gasket - Impeller/Washer	Fiber (10)	Fiber (10)
77C	Gasket - Impeller/Bolt	Teflon (9)	Teflon (9)
95A	Mechanical Seal Stationary	Optional	Optional
95B	Mechical Seal Rotary	Optional	Optional

MATERIAL SPECIFICATION:

- (1) Cast Iron
- (2) AISI 316 S/S
- (4) AISI 1020 Steel
- (5) Ductile Iron ASTM A395
- (7) Buna "N" Rubber
- (9) Glass Filled Teflon™ of E. I. DuPont Co.
- (10) Aramid Fiber Sheet
- (11) 316 S/S - ASTM A744, Grade CF-8M
- (12) ASTM A449

Specifications are subject to change without notice

PRODUCT INSPECTION AND TEST

The Products of Dean Pump Division are subject to thorough and rigorous quality control and inspection procedures throughout the whole of the manufacturing process to assure proper operation in full conformity with established performance standards. On completion of inspection, each unit is oiled, sealed against the entrance of dirt, and tagged with a

signed certificate of inspection prior to shipment. Each pump when shipped is ready to perform the service for which it was designed with minimum maintenance and expense if properly installed and operated in accordance with the instructions furnished.

DEAN PRODUCT WARRANTY

We warrant to the purchaser from us of Dean Pump products and parts of our own manufacture (Dean Products) that the Dean Products are free under rated use and service from defects in design, material and workmanship for a period of one (1) year from the date of installation, but not to exceed eighteen (18) months from the date of shipment by us. This warranty does not cover (I) any loss or damage resulting from wear, corrosion, abrasion or deterioration due to normal use in rated service; (II) replacement of service items such as bearings and mechanical seals; (III) products or parts manufactured by others but furnished by us which, if defective, shall be repaired or replaced only to the extent of the original manufacturer's warranty; (IV) any loss or damage to, or defects in, any Dean Products resulting from the misuse or improper storage, installation, or operation thereof; or (V) any loss or damages to, or defects in, any Dean Products resulting from any alteration or modification thereof not expressly authorized and approved by us in writing. We

shall not be liable, directly or indirectly, under any circumstances for consequential or incidental damages, including, but not limited, to: (I) any loss of business or profits; and (II) labor, material or other charges, claims, losses or damages incurred or suffered from, in connection with or in consequence of the working upon, alteration, or repair of any defective Dean Products by persons or firms other than us. Our liability for breach of warranty hereunder is limited solely to the repair in our factory or the replacement F.O.B. our factory, as the case may be, of any Dean Products which shall have been determined by us, after notice to us and inspection by us within the warranty period, to be so defective when shipped by us. THIS WARRANTY AND THE LIABILITY SET FORTH HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER LIABILITIES AND WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE.

WARNING

HAZARDOUS SITUATIONS MAY OCCUR UNLESS THIS EQUIPMENT IS APPLIED, INSTALLED, OPERATED, AND MAINTAINED BY THOROUGHLY QUALIFIED PERSONNEL IN STRICT ACCORDANCE WITH THE INSTRUCTION MANUAL AND ALL APPLICABLE DRAWINGS AND CODES.

Read the instruction manual completely before installing, filling, operating, or maintaining this equipment.

Obtain, read and heed the MSDS (Material Safety Data Sheet) for the fluids being handled before attempting to fill, operate or maintain this equipment. Obtain instructions from the Safety Engineer responsible for your facility before performing any work on the pumping equipment and systems.

Proper storage while not in use and proper installation and startup are essential for successful pump operation. Misuse or improper storage, installation or operation of pumps may result in serious loss or damage. Dean Pump Division is not responsible for any loss or damage resulting from causes beyond its control, and is not liable for charges for work performed or materials furnished to repair such loss or damage.

All installation, operation, and maintenance must be done by thoroughly qualified personnel in strict accordance with this manual and must comply with all local, state and Federal codes. Only Dean authorized service parts must be used in the repair of these pumps.

RECEIVING PUMP

When the pump is received from the transportation company it should be promptly inspected for damage and such damage noted on the bill of lading before it is signed. Claims for shipping damage must be filed against the carrier.

Care must be exercised in unloading and handling the pump.

STORAGE

Pumps must be properly covered and protected against moisture, dirt, and physical damage during storage prior to installation and operation.

If prolonged storage is anticipated, do the following:

- 1) Seal the suction opening of the pump with a blind flange, gasket, and bolts.
- 2) Position the pump on its side so that the motor shaft is horizontal, the suction flange is down, and the discharge flange is up.
- 3) Fill through the discharge opening of the pump a corrosion inhibiting liquid that is also compatible with the liquid that will later be pumped. Evaluation of compatibility must include consideration of the temperature at which the system will later operate. Be sure to also vent air from any auxiliary piping connection to the pump and fill it with the same inhibitor.
- 4) When the pump is completely filled, seal the discharge opening with a blind flange, gasket, and bolts.
- 5) Apply a heavy protective coating to any exposed metal surfaces. A rust preventive must be used to protect all steel and iron parts.
- 6) Rotate the motor shaft "by hand" each month. Wear heavy gloves when rotating the shaft, to protect your hands. It will most likely be necessary to remove the motor fan cover to gain access to the motor fan to rotate the shaft.

When you are ready to place the pump in service;

- 1) Drain the storage liquid from the pump and any auxiliary piping. Draining can be through the casing drain connection, the auxiliary piping, the suction flanged connection, and the discharge flanged connection.
- 2) Remove and discard the blind suction flange, gasket, and bolts. Remove and discard the blind discharge flange, gasket, and bolts.
- 3) Flush all remains of the storage liquid from the pump and the auxiliary piping. Use a flush liquid that is

compatible with the liquid to be pumped. Evaluation of compatibility must include consideration of the temperature at which the system will later operate.

- 4) Discard the storage liquid and the flush liquid. Be sure to comply with governmental regulations in any disposal.

WARNING:

Be sure that there is nothing remaining in the pump or piping that could react with the liquid that will be pumped or that would have an excessive vapor pressure at the system operating temperature. For example, solvent residue left in the pump, when exposed to the operating temperature of the system, could create a vapor pressure in excess of the

capability of the system to retain it, therefore causing an explosion that could prove fatal.

- 5) Replace all pipe plugs and tighten them. Tighten any and all auxiliary piping connections that may have been loosened.
- 6) Remove the "storage" protective coatings from the external surfaces of the pump.

Pumps must also be protected from moisture, dirt, and physical damage, during and after installation while the system is being completed. Pumps "stored" as installed in the piping system must be completely checked for proper installation prior to start-up.

INSTALLATION

Always wear the appropriate protective apparel when working on or around the pumping equipment. Safety glasses with side shields, heavy work gloves (use insulated work gloves when handling hot items), steel-toed shoes, hard hat, and any other protective gear as needed for protection. One example of other gear would be breathing apparatus when working near toxic materials. Use lifting devices, manufactured expressly for the purpose of lifting, to move the pumping machinery. Do not attempt to lift the assembly or its components manually. Use only devices with lifting capabilities in excess of the weight of the unit being lifted. Inspect straps, chains, hooks, etc. for damage and lifting capability before use. Lift only at the center of gravity.

Personal injury, death, and/or equipment damage could occur if good lifting practices are not used.

APPLICATION AND REAPPLICATION

At the time of installation, the equipment received should have already been selected for the service required. You must read the paperwork for the installation and check the serial number of the pump to assure that you are installing the correct pump into the service for which it was selected.

Many pumps look identical from the outside but can be made of different materials and/or be constructed differently

inside. Personal injury, death, equipment damage, product (pumpage) damage, and/or product loss could occur if the incorrect pump is installed.

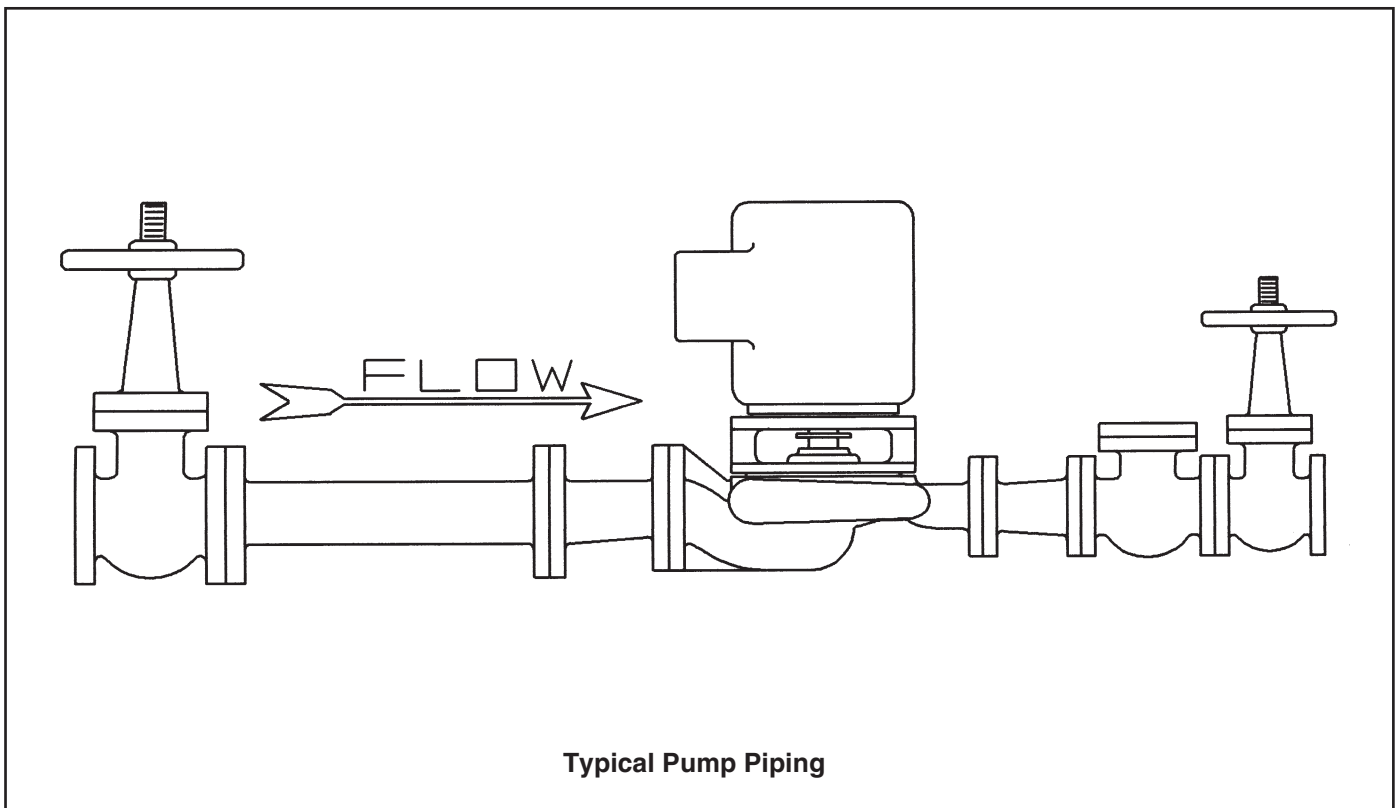
Do not transfer an existing pump to any other service conditions until you have thoroughly reviewed the pump construction, materials, sizing, sealing, pressure containing capability, head/capacity capability, and temperature capability with respect to the required service. Consult your Dean Pump sales engineer with all the service requirements and a full description of the existing pump (including the serial number), seal, and sub-systems so that we can assist you in a successful reapplication.

PUMP MOUNTING

It is recommended that CNV206 Series and CNV236 Series pumps be mounted with the motor vertically upright. Other positions are possible if adequate support is provided.

A pump support base for vertically upright mounting is required in accordance with this tabulation:

Pump Size	Use Base Above HP
1 x 1-1/2 x 6 CNV206 Series	Base not required
1-1/2 x 3 x 6 CNV206 Series	Base not required
All CNV236 Series	15



When a pump support base is not used, adequate pipe supports must be provided for the piping at locations close on either side of the pump.

The foundation for the pump support base need not be elaborate. Four hold down bolt holes are provided in each base and the foundation should include four studs to match these holes. The support base should be seated in a thin layer of grout to assure even support.

SUCTION AND DISCHARGE PIPING

Suction and discharge nozzle sizes of Dean pumps are selected for proper performance of the pumping unit and are not intended to determine the suction and discharge pipe sizes. Pipe sizes must be determined by the user based on the system requirements.

Suction piping should have a minimum friction loss and thus should be as short and straight as possible with a pipe diameter as large as economically feasible for the flow rate handled. Suction piping should never be smaller in diameter than the suction nozzle size. When the suction piping is larger than the suction nozzle size an eccentric reducer is required at the suction flange and must be installed with the taper located on the underside to eliminate air or vapor pockets. The section of piping attached to the suction flange of the pump should be straight for a length of eight pipe diameters or more.

Discharge piping may be the same size as, larger, or smaller than the discharge nozzle as the system flow may demand.

In new installations or rebuilt systems, dirt, pipe scale, welding slag, and general construction debris may get into the piping. It is important to prevent this material from entering the pump and damaging pump parts, or mechanical seal faces. Mechanical seal parts are especially subject to damage even by very small particles. To prevent damage, a strainer or filter installed in the suction line is recommended. Commercially available strainers or filters as recommended by their manufacturers can do an excellent

job. In addition, special filtering and mechanical seal flushing guards may be required. Consult your Dean representative. Suction line screens or strainers may usually be removed when, after several days of use, no dirt has been collected and the system is clean.

Remember that screens and filters in the suction line are restricting devices which reduce the net positive suction head (NPSH) available to the pump and should be considered at the time the system is designed.

Install "new" gaskets, of the correct material for the service, and the correct size per ASME B16.20 or ASME B16.21 at the suction and the discharge flanges of the pump. Use only new gaskets. Connect the suction and discharge piping without forcing the piping into position. The pipe flanges must line up with the pump flanges "freely".

WARNING:

Strain caused by "forcing", improper flange bolting, and/or misalignment may cause failure of the pumping unit, flanges, piping and/or fluid (pumpage) release which could cause personal injury, death, and/or damage to this and/or other equipment.

Install a "new" bolt, of the correct size per ASME/ANSI B16.5 and the correct material per ASME/ANSI B16.5, in every bolt hole. Tighten all bolts evenly. Use only new uncorroded fasteners.

Connect all other (auxiliary) piping necessary for safe and successful operation of the equipment in the specific service conditions of the application.

WARNING:

Make sure that all piping is installed into its correct connection. Installation of a pipe into an incorrect location could result in an explosion and personal injury or death as well as damage to this and/or other equipment.

Install pressure relief valves in any cavities that could be subjected to pressures in excess of the allowable working pressure. Explosion, personal injury, death, and/or damage to this and/or other equipment may occur if pressure exceeds allowable.

MOTOR BEARING LUBRICATION

Pump motor bearings are properly lubricated for nominal service conditions when the unit is shipped from the factory, dependent upon motor style, motor size, and motor manufacturer, the bearings may be "sealed for life" or "regreasable".

If the motor is of the "regreasable" type, the grease inlet and outlet connections will be closed with pipe plugs. When you need to regrease the motor bearings, remove the two pipe plugs for each bearing and insert a grease fitting in the inlet hole. Use a low pressure grease gun to inject the proper grade of new grease. The grease cavity should be filled no more than three fourths (3/4) full. Overlubrication may cause early bearing failure. Run the motor until it has warmed up and then

remove the grease fitting and replace the pipe plugs.

The proper grease lubricant depends on the ambient temperature, the pumping temperature, and the atmospheric contamination at each pump installation. Specific lubricants, lubrication schedule, and lubrication instructions must be obtained by the customer from his local lubrication specialist.

In general, for reasonable ambient and contamination free atmosphere, a high quality lithium #2 grease will usually give satisfactory performance at the pumping temperature of these pumps.

STARTING THE PUMP

It is important that a pump should never be subjected to thermal or pressure shock. The liquid should therefore be allowed to flow into the casing slowly. A centrifugal pump should never be started until all the parts are up to the temperature of the liquid to be pumped.

FILLING

WARNING:

Before filling the pump with liquid, check to see that all possible leak locations are sealed. See that the point where the pump shaft enters the pressure containing cavity is sealed. This sealing is accomplished with a mechanical face seal. See that all of the connections into the pressure containing cavity

are sealed or connected to a related piping system that also has all possible leak paths sealed. Use a wrench on all bolted joints to apply torque to assure that all gaskets are sealed in a tight joint. Check to see that all threaded pipe connections are also tight enough to seal the liquid pressure that will be applied when the system is started.

When the source of liquid supplied to the pump is below atmospheric pressure or located below the pump, the pump must be primed prior to start up. The priming may be accomplished in any of several ways, three of which are listed.

1) An exhauster may be connected to the discharge piping between the pump and the discharge shut-off valve. With the

discharge shut-off valve closed and the suction valve open, the air can be exhausted from the pump and piping.

2) With a foot valve installed in the suction piping, the pump may be filled with liquid introduced somewhere above the pump in the discharge line. The seal chamber should be vented to allow complete filling. A foot valve may create extensive losses and should be taken into consideration in calculating the available NPSH.

3) A vacuum pump (preferably a wet vacuum pump) may be used for evacuating air from the pump and piping. The vacuum pump should be connected as is the exhauster covered in No. 1.

When the source of liquid supplied to the pump is above atmospheric pressure or above the pump centerline, the pump may be filled by venting through a bleed off line to atmosphere or back to the pump suction source.

It is most important to check the direction of rotation of the pump before allowing the pump to come up to speed. To check rotation direction, push the starting button and instantly push the stop button. This will allow the motor to turn over a few revolutions and the direction of rotation to be observed. A direction of rotation arrow is shown on the pump casing. If rotation is incorrect, change the wiring connections and recheck rotation. ***Operating the pump in reverse rotation may cause extensive damage.***

OPERATING

WARNING:

Before starting the unit, see that all personnel are a safe distance away from all possible hazards, that all sub-systems are connected and operating, that all debris has been removed, and that the pump is full of liquid.

Do not operate this pump at shut-off (no flow) as an explosion

may result. This can occur with any liquid, even "cold water". Personal injury, death, equipment damage, and/or loss of product (pumpage) is likely to occur. If your system is operated where it is possible for all outlets of the discharge from the pump to be closed while the pump is still operating, a modification of the system needs to be made to assure a continual flow of pumpage through the pump. NOTE: Some people have a belief that a bypass line from the discharge side of the pump to the suction side of the pump will relieve this problem, this is "NOT TRUE"; DO NOT ATTEMPT THIS.

WARNING:

Do not operate a pump at a low flow condition, unless provision has been made to prevent dangerous heat build up within the pump casing. The liquid in the pump will heat up and this may result in high pressure in the pump in a short time. Such pressure may result in a rupture of the pressure-containing parts and cause severe hazard to personnel and/or damage to the system.

A centrifugal pump should never be run without liquid in the casing. Extensive damage may result, particularly to the mechanical seal. Vent the pump seal chamber through the seal connection to provide lubrication to the mechanical seal faces.

A centrifugal pump should be started with the suction valve open and the discharge valve opened a slight amount.

As soon as the pump is up to speed, the discharge valve must be opened slowly. A centrifugal pump cannot be operated with discharge valve closed without heating up dangerously. During the first several minutes of operating. Watch the pump carefully for overheating, vibration, and other abnormal conditions. If trouble develops, stop pump at once and correct the problem.

PUMP START UP CHECK LIST

These points must be checked after pump installation and before starting up the pump.

- 1) Read instruction manual thoroughly and understand it.
- 2) Review pump order head sheet for the service rating of the pump and any special features.
- 3) Check all piping connections making certain that they are both tight and in the proper location.
- 4) If a pump support base is being used, make sure that it has been installed properly.
- 5) Lock out, and tag, the electrical supply to the motor. Remove the motor fan cover. Rotate the motor shaft, by hand, to be sure that there is no binding or rubbing within the pump or the motor. Correct any difficulties at once.

Replace and secure the motor fan cover.

- 6) Check to see that the motor bearings have been properly lubricated.
- 7) Check the electrical connections to the motor. Unlock and remove tag from the electrical supply to the motor.
- 8) "Bump" the motor starting button to check motor rotation. Operating the pump in reverse rotation may cause extensive damage. If the rotation is not correct, lock out and tag the electrical supply. Reconnect the wiring for proper rotation. Unlock and remove tag from the electrical supply to the motor. Go through the above procedure again to check the motor rotation.
- 9) Remove all dirt, waste, tools, and construction debris from the area around the pumping unit.

SPARE PARTS

To avoid prolonged down time and facilitate rapid repair of damaged pump parts, Dean recommends that the pump user maintain a minimum stock of spare parts. If the pump service is critical or the pump parts are of special materials, spare parts stock is even more important to the user. Such spares inventory may extend from a spare mechanical seal or seal parts through complete casing backcover-impeller-motor assemblies prepared for immediate insertion in the pump casing. Consult your Dean representative who will assist you in selecting your spares stock.

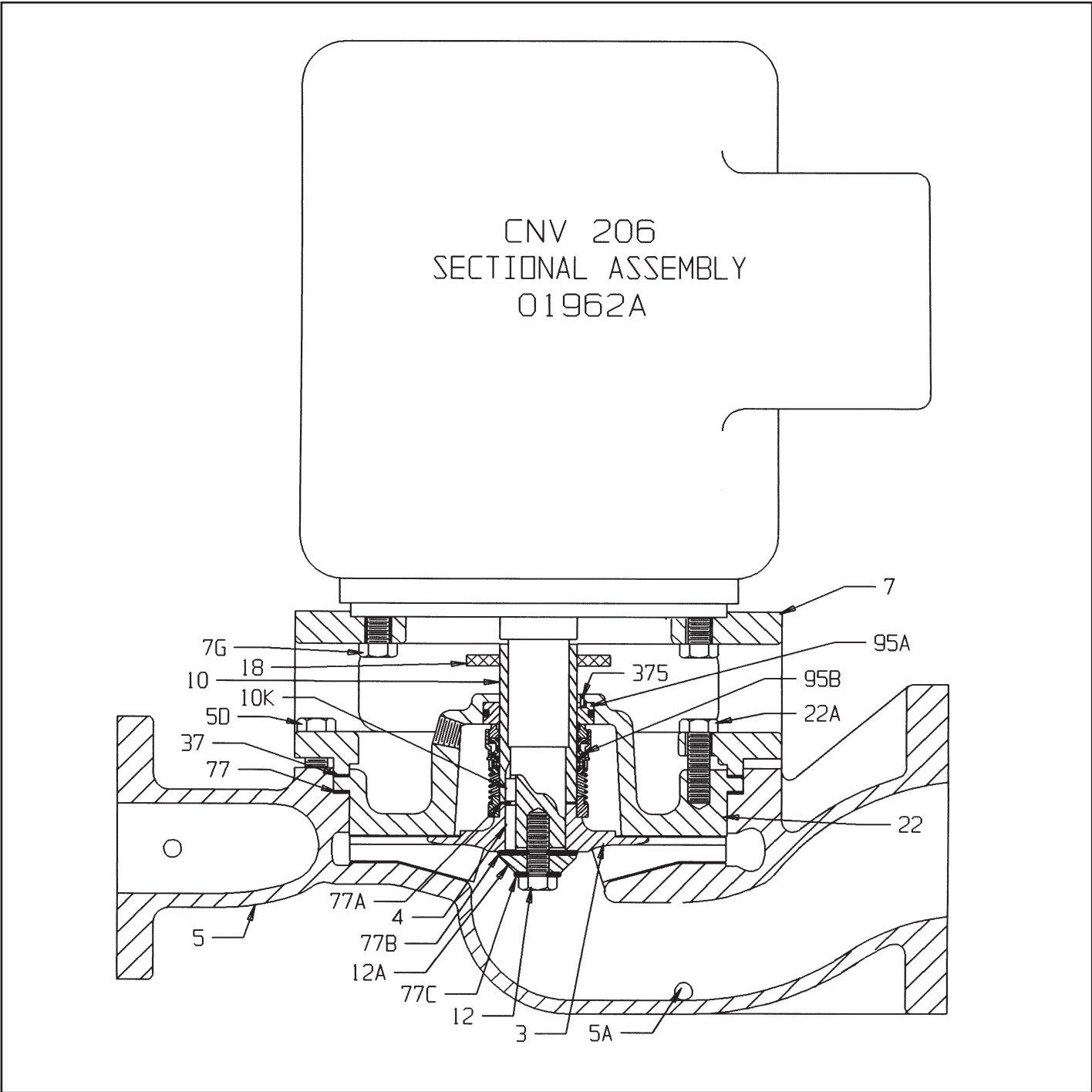
ORDERING SPARE PARTS

Spare part orders will be handled with a minimum delay if the

following information is furnished by the customer with the order:

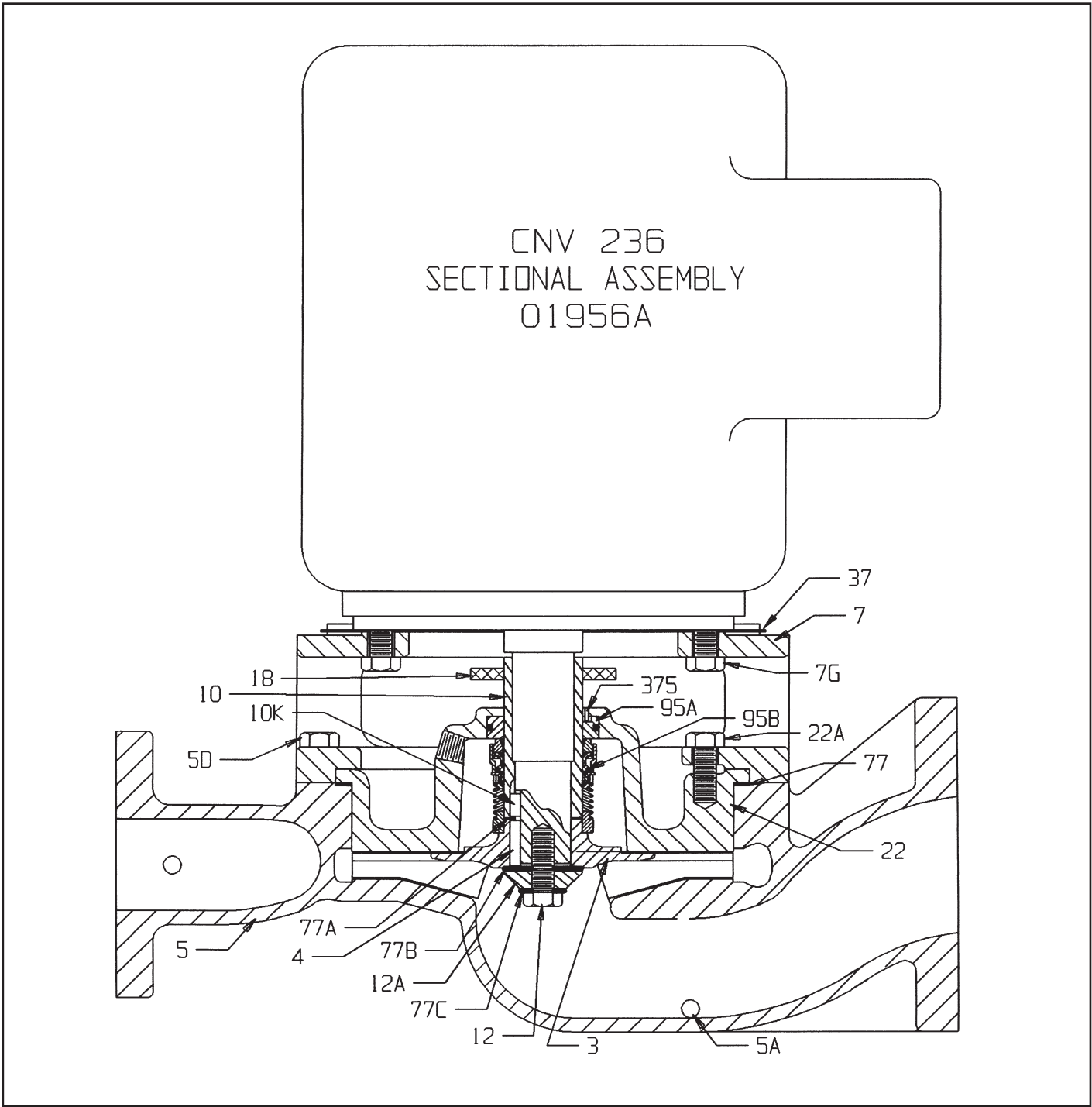
- 1) Give the pump serial number and size. These may be found on the pump name plate. The serial number is also stamped on the suction flange of the pump.
- 2) Give the part name, part number, and material of part. These should agree with the standard parts list.
- 3) Give the quantity of each part required.
- 4) Give complete shipping instructions.

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PART NO.	PART NAME	PART NO.	PART NAME	PART NO.	PART NAME	PART NO.	PART NAME
3	Impeller	7G	Adapter Cradle Capscrew	22	Casing Back Cover	77A	Gasket - Impeller/Sleeve
4	Impeller Key	10	Shaft Sleeve	22A	Casing Back Cover Screw	77B	Gasket - Impeller/Washer
5	Casing	10K	Shaft Sleeve Key	37	Clearance Shim	77C	Gasket - Impeller Bolt
5A	Casing Drain Plug	12	Impeller Bolt	56	Casing Foot - Optional	95A	Mechanical Seal Stationary
5D	Casing Capscrew	12A	Impeller Washer	56A	Casing Foot Capscrew	95B	Mechanical Seal Rotary
7	Adapter Cradle	18	Splash Collar	77	Casing Gasket	375	Seat Lock Pin

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DISASSEMBLY AND ASSEMBLY PROCEDURES

WARNING:

Work must be performed only by thoroughly trained and qualified personnel to assure quality repair and to reduce the possibilities of injury to personnel and/or damage to equipment. If you do not have personnel who are capable of safe quality repair of this equipment, we advise you to return the equipment to DEAN PUMP to be repaired.

When it is necessary to open the pump and/or the pumping system, the fluid will be exposed to the atmosphere and personnel in the area. For the safety of all involved, the risk of exposure of personnel to the hazards of the pumpage can be reduced by flushing the entire system with a compatible, nontoxic, non-hazardous, stable liquid before opening the pump or the system. In all cases, where the system is flushed or not, use the utmost care around the pumpage and the, pumping system.

Always wear the appropriate protective apparel when working on or around the pumping equipment. Safety glasses with side shields, heavy work gloves (use insulated work gloves when handling hot items), steel-toed shoes, hard hat, and any other protective gear as needed for protection. One example of other gear would be breathing apparatus when working near toxic materials.

Use only top quality tools.

- a) Stop the pump. Turn off the power supply (electricity, steam, etc.) to the pump driver (motor, turbine, engine, etc.) and lock the switching device so that it can not be restarted. Tag the switching device so that no one will attempt to restart the unit.
- b) Disconnect the electrical wiring and the conduit from the electric motor at the conduit box of the motor. We strongly suggest that you mark the motor leads and the power supply leads to assure that they will be reconnected in the same way so that the motor rotation will be correct when the pump is restarted.
- c) Close the suction and discharge valves completely to isolate the pump from the system. Lock the valves in the closed position and tag them so that no one will attempt to open them.
- d) Turn off, lock out, and tag all sub-systems and auxiliary equipment and auxiliary supply lines to isolate the pumping unit from any and all power, energy, and/or fluids.

WARNING:

Do not attempt to perform any work on the unit until you are confident that the pump and its contents have been stabilized at ambient temperature, and atmospheric pressure.

Put on protective wear to protect human tissue from attack by the fluids contained in the pump and any sub-systems, and from any vapors or fumes that could possibly be released from these fluids. This could mean breathing apparatus face shields, heavy long sleeve rubber gloves, rubber apron, hood, and possibly more, dependent, of course, on the properties of the fluids involved and the installed drain and vent piping arrangement. Personal injury and/or death can occur if adequate precautions are not taken with regard to the fluid, the installation and the possibilities of the release of fluid, vapors, and/or fumes.

- e) Carefully bleed off any pressure remaining in the pump. Pressure remaining in the pump will be dependent upon the pressure in the system when the pump was stopped; the quality, type, and condition of the isolation valves; the thermal expansion values of the fluid and the

pump material; and the change in the vapor pressure of the fluid between the temperature at the time the isolation valves were closed and the ambient temperature. Bleeding must be through a valved drain line piped to a closed container mounted lower than the pump. The container must be arranged with a relief passage to some point where pressure and fumes will not be harmful to personnel. The container must also have a level device so that determination can be made that sufficient fluid has been drained to empty the pump cavity and the volume of fluid that was contained in the run of suction and discharge pipe between the isolation valves and the pump. After the initial rush of fluid from the pump relieves the pressure, the drain valve can be opened further to speed the draining operation. When fluid quits running into the drain tank, gauge the volume to see if it is sufficient to have fully drained the contents of the pump and the suction and discharge pipes between the isolation valves.

- f) Now drain any small piping, that contains the fluid pumped, from all low points into the same container used to drain the pump. Do not drain any other fluids (different than the pumpage) into this container as they may not be compatible. Personal injury, death, and/or equipment damage could occur.

WARNING:

Even though it might appear that the cavity being drained has completely drained, be extremely careful about opening the system and/or opening the pump. If something solid in the pumpage moves to the vicinity of the drain connection, it could seal-off the drain and maintain pressure in the cavity thought to have been drained. It is also possible that the isolation valves are not sealing and therefore allowing liquid to flow from the system into the pump. Personal injury, death and/or equipment damage may occur if great caution is not exercised.

- g) Because of the above possibility, when you loosen the gasketed joint at the back of the casing (5), loosen the casing capscrews (5D) only one full turn, and then use jack screws in the flange of the adapter cradle (7) to break the gasket seal. If fluid and/or pressure remains in the pump it will spray out now. Use extreme caution, wearing protective gear, to avoid injury. Do not proceed with disassembly until leakage ceases completely. If leakage does not cease, the isolation valves may not be sealing.

WARNING:

When you open the pump, the fluid will be exposed to the atmosphere and personnel in the area. For the safety of all involved, the risk of exposure can be reduced by flushing the cavity that was just drained with a compatible, non-toxic, non-hazardous, stable liquid, before disassembling the pump.

- h) Remove any auxiliary piping that is attached to the pump.
- i) Remove the casing capscrews (5D) and using a mechanical lifting apparatus lift the rotating unit from the casing (5).
- j) Flush the wetted parts, now exposed, with a compatible, non-toxic, non-hazardous, stable liquid.
- k) Remove the gasket from the face of the casing (5) or the casing back cover (22) dependent on which one the gasket may have adhered to. Exercise care not to damage the pump sealing surfaces. The type of gasket and material of construction will vary with service requirements. Attack by prying and

then, if necessary, layering off the old gasket with a sharp scraper, attempting to remove it in the largest possible pieces. Wear heavy leather, long sleeve work gloves when using the scraper. Wet the gasket before and during the scraping operation to reduce the possibility of fibers becoming airborne. Wear a respirator during this operation and until all debris has been disposed of in a plastic bag. Remove all of the gasket material down to clean metal surfaces on both parts that contacted the gasket. Place all of the gasket residue in a plastic bag, seal the bag and dispose.

l) The casing backcover-impeller-motor assembly of the pump can now be moved to a more convenient location for further disassembly. Use mechanical lifting equipment to move assemblies and components.

DISASSEMBLY PROCEDURE

To further dismantle the pump, perform the following steps in the sequence shown:

WARNING:

Use only high quality tools.

Flush parts as disassembled to remove hazardous residue from the pumpage and/or sub-system fluids.

Wear protective equipment as advised at the beginning of this section.

Use mechanical lifting equipment to lift assemblies and components.

Do not apply heat to parts to assist in disassembly. Explosion could occur causing personal injury, death, and/or damage to equipment.

Do not attempt to drill, saw or otherwise cut parts to remove them. Explosion and/or fuming could occur causing personal injury, death, and/or equipment damage.

Do not hammer on any parts. Personal injury and/or damage to equipment may occur.

a) The unit may be laid on its side (shaft in a horizontal position) to afford easy access. Remove the impeller bolt (12), impeller bolt gasket (77C), impeller washer (12A), and the impeller washer gasket (77B). Discard the gaskets (77C and 77B). The impeller may now be slid off the motor shaft. Remove the impeller key (4) from the shaft keyway.

b) Remove the two casing back cover screws (22A). Pull the casing back cover (22) out of the adapter cradle (7) and off of the shaft. This will also pull the mechanical seal rotary (95B), the mechanical seal stationary (95A), the shaft sleeve (10), the impeller/sleeve gasket (77A), the shaft sleeve key (10K), and possibly the splash collar (18) off the shaft.

c) If the pump is a CNV206, remove the clearance shims (37) from the casing back cover (22).

d) Remove the impeller/sleeve gasket (77A) and the shaft sleeve key (10K) from the shaft sleeve (10).

e) Pull the shaft sleeve (10) and the mechanical seal rotary (95B) as an assembly from the open side of the casing back cover (22). If the splash collar (18) was on the shaft sleeve (10), it will be pulled off of the shaft sleeve (10) during this operation. Depending upon the type of mechanical seal selected for the service required, the splash collar may be mounted upon the shaft sleeve (10) or on the shaft. If the splash collar (18) is mounted on the shaft, pull it off now.

f) Remove the mechanical seal stationary (95A) from the casing back cover (22).

g) Remove the seat lock pin (375) from the casing back cover

(22). Use a drive pin punch, with a 3/64" punch end, and drive from the motor side of the casing back cover (22). Be careful to not damage the casing back cover (22).

h) Remove the mechanical seal rotary (95B) from the shaft sleeve (10). Refer to the mechanical seal drawing that was furnished with the pump. Some types of mechanical seals are retained with radial and/or axial screws.

i) Remove the four adapter cradle capscrews (7) and remove the adapter cradle (7) from the motor.

j) If the pump is a CNV236, remove the four clearance shim (37) stacks from the face of the adapter cradle (7) and/or the face of the motor.

k) Clean and inspect all parts.

REASSEMBLY PROCEDURE

WARNING:

Use only high quality tools.

Wear protective equipment as advised at the beginning of this section.

Use mechanical lifting equipment to lift assemblies and components.

Do not hammer on any parts. Personal injury and/or damage to equipment may occur.

Do not attempt to manufacture parts or modify Dean Pump parts in any manner. Death, personal injury, and/or damage to equipment may occur. Replace all gaskets, seals, bearings, and lubricants. Motor bearings must be replaced by a motor service shop. Replace all parts that have worn, corroded, eroded, or otherwise deteriorated.

Use only Dean Pump Division of Met-Pro Corporation parts.

To reassemble the pump, perform the following steps:

a) Clean all parts thoroughly.

b) Place the adapter cradle (7) onto the motor pilot fit after assuring that the fits are clean. Replace the adapter cradle capscrews (7G) and tighten them to the following torque value.

3/8" capscrew - torque to 20 Ft. Lb.

1/2" capscrew - torque to 45 Ft. Lb.

5/8" capscrew - torque to 70 Ft. Lb.

c) Drive a new seat lock pin (375) into the casing back cover (22) from the impeller side of the casing back cover (22). Be careful to not damage the casing back cover (22). Drive until the length of the pin (375) exposed to the inside of the casing back cover (22) is 1/32" less than the depth of the corresponding notch in the mechanical seal stationary (95A).

If you did not remove the original seat lock pin (375), be sure to check the exposed length, as directed above, with respect to the notch in your new mechanical seal stationary (95A).

d) Install the mechanical seal stationary (95A) into the casing back cover (22).

Mechanical seal stationarys (95A) are of two types, depending on the service of the pump. The stationary may be of rectangular cross section grooved for an "O" ring or it may be of L-shaped cross-section used with a Teflon or grafoil mounting ring.

To position the "O" ring mounted stationary, lubricate the bore of the casing back cover (22). Place the "O" ring in the groove of the stationary and carefully slide the stationary into position in the casing back cover (22). Be most careful not to damage the "O" ring. Make sure that the

lapped face of the stationary is toward the open side of the casing back cover (22).

To position the Teflon or grafoil mounted stationary, lubricate the bore of the casing back cover (22). Carefully slide the Teflon or grafoil mounting ring into position in the casing back cover (22) lubricate the outer diameters of the stationary and then slide it into place. The slot (or pin) in the stationary must index with the drive pin (or slot) in the casing back cover (22).

e) Carefully guide the casing back cover (22) over the center of the motor shaft and pilot it into the adapter cradle (7). Retain these parts together by installing the two casing back cover screws (22A) and tightening them.

f) Slide the shaft sleeve (10) into position on the motor shaft.

g) Place the impeller/sleeve gasket (77A) carefully over the shaft and into position against the face of the shaft sleeve (10).

h) Carefully slide the impeller (3) onto the shaft and against the impeller/sleeve gasket (77A). Place the impeller washer (12A) onto the impeller bolt (12) and then screw it into the end of the motor shaft. Tighten the impeller bolt (12).

i) Carefully measure the distance between the impeller (3) and the face of the casing back cover (22), using a feeler gauge. Subtract 0.010" from this measurement to obtain the thickness of the required clearance shims (37).

j) Remove the impeller bolt (12), impeller washer (12A), impeller (3), impeller/sleeve gasket (77A), shaft sleeve (10), casing back cover screws (22A), and carefully remove the casing back cover (22).

k) If the pump is a CNV236 go to step p).

l) Place a new set of clearance shims (37), of total thickness equal to the value determined in i) above, over the pilot fit of the casing back cover (22). See clearance shim (37) location on CNV206 Sectional Assembly 01962A.

m) Place the splash collar (18) over the motor shaft and close to the face of the motor.

n) Carefully slide the casing back cover (22) over the center of the motor shaft and pilot it into the adapter cradle (7), capturing the clearance shims (37) between the adapter cradle (7) and the casing back cover (22). Install the two casing back cover screws and tighten them to 10 Ft. Lb. of torque.

o) Go to step t).

p) Loosen the adapter cradle capscrews (7G) two or three full turns. Insert four sets of clearance shims (37) between the adapter cradle (7) and the motor. One set to be inserted at each of the adapter cradle capscrews (7G). See clearance shim (37) location on CNV236 Sectional Assembly 01956A. Each set of clearance shims (37) must be of total thickness equal to the value determined in i) above.

q) Tighten the adapter cradle capscrews (7G) being careful to maintain the clearance shims (37) in their proper locations and assuring that the pilot fits of the adapter cradle (7) and the motor are aligned. Torque the adapter cradle capscrews to the following value.

3/8" capscrews - torque to 20 Ft. Lb.

1/2" capscrews - torque to 45 Ft. Lb.

5/8" capscrews - torque to 70 Ft. Lb.

r) Place the splash collar (18) over the motor shaft and close to the face of the motor.

s) Carefully slide the casing back cover (22) over the center of the motor shaft and pilot it into the adapter cradle (7). Install the two casing back cover screws (22A) and tighten them to 20 Ft. Lb. of torque.

t) Recheck the clearance between the impeller (3) and the casing back cover (22) using a feeler gauge. The clearance at the nearest blade of the impeller (3) must be between 0.008" and 0.012". If not, change the clearance shims to obtain this value.

u) Refer to the mechanical seal drawing supplied with this pump to find the mounting location and arrangement for the seal that is being installed. Lubricate the outer diameter of the shaft sleeve (10). Orient the mechanical seal rotary (95B) with respect to the shaft sleeve (10) as shown on the seal drawing. Slide the rotary (95B) onto the shaft sleeve (10) being careful to not scratch the sleeve and to not damage the elastomer/seal that seals the rotary (95B) to the sleeve (10). Position the rotary (95B) with respect to the impeller (3) end of the shaft sleeve (10) at the dimension shown on the mechanical seal drawing. If the rotary (95B) being installed has radially positioned setscrews, securely set these using a tightening pattern of gradually tightening alternate screws. Recheck the rotary (95B) location with respect to the end of the shaft sleeve.

v) Carefully slide the shaft sleeve (10) onto the motor shaft. As the sleeve (10) starts to protrude through the casing back cover, center the splash collar (18) with the sleeve (10) and force it onto the sleeve (10). Continue to slide the sleeve (10) onto the shaft until the mechanical seal rotary (95B) contacts the mechanical seal stationary (95A).

w) Rotate the shaft sleeve (10) on the motor shaft until the keyways in both align with each other. Slide the shaft sleeve key (10K) into the keyway between the shaft sleeve (10) and the motor shaft. Slide the impeller/sleeve gasket (77A) over the motor shaft and against the face of the shaft sleeve (10).

x) Place the impeller key (4) into the keyway of the motor shaft. Align the keyway of the impeller (3) with the impeller key (4), and slide the impeller (3) over the motor shaft and against the impeller/sleeve gasket (77A).

y) Place the impeller bolt gasket (77C), the impeller washer (12A), and the impeller/washer gasket (77B), on to the impeller bolt (12). Thread the impeller bolt (12) assembly into the end of the motor shaft and torque the bolt (12) to the following value.

3/8" bolt - 20 Ft. Lb.

1/2" bolt - 45 Ft.Lb.

z) Rotate the motor shaft by turning the impeller (3) by hand (wear heavy gloves) to be certain that there is no internal interference.

aa) The rotating assembly is now ready to be returned to the installation site for final assembly.

ab) Place a new casing gasket (77) into the recess in the casing (5). Use a mechanical lifting apparatus to lower the rotating assembly into the casing (5). Install the casing capscrews (50) and tighten them to the following values.

1/2" capscrews - 50 Ft. Lb.

5/8" capscrews - 75 Ft.Lb.

ac) Remove the motor fan cover and rotate the motor shaft by turning the motor fan by hand (wear heavy gloves) to be certain that there is no internal interference. Replace the motor fan cover and fasten it securely in place.

ad) Reinstall all auxiliary piping, systems and equipment.

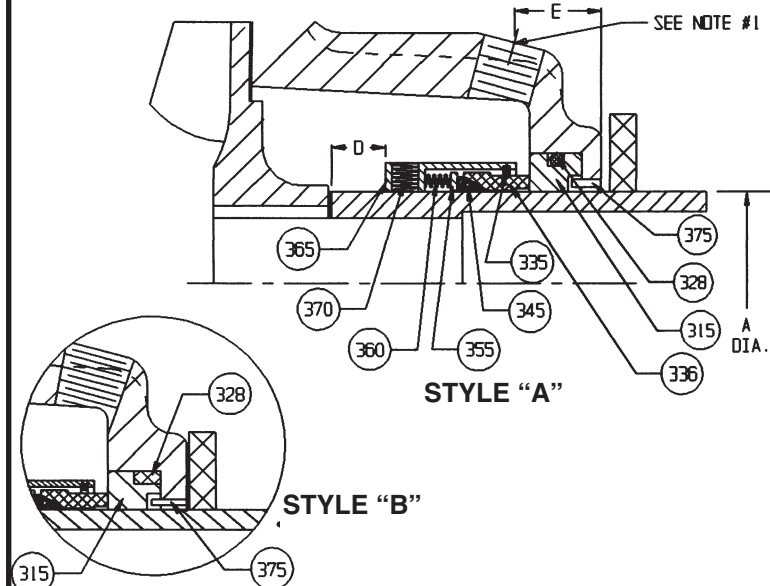
ae) Check to see that all openings have been sealed before filling the pump with liquid.

af) Reconnect the electrical wiring and conduit.

ag) Follow the instructions under "STARTING THE PUMP" and "PUMP START UP CHECKLIST".

TYPICAL MECHANICAL SEALS

MOTOR FRAME	IMPELLER DIA.	A			D			E			ALLOW. STUFF. BOX PRESS			PART NAME	PART NO.	MATERIALS		
		ALL	6	8 1/2	11 1/2	6	8 1/2	11 1/2	1150 RPM	1750 RPM	3500 RPM	CL 22	CL 50			SPECIAL		
143JM, 145JM	1 3/8	33/64	45/64	45/64	25/32	1	7/8	250	250	240	STATIONARY SEAT	315	NIRESSIST, CERAMIC, TUNG. CARBIDE, SILICON CARBIDE					
182JM, 184JM	1 3/8	33/64	45/64	45/64	25/32	1	7/8	250	250	240	SEAT RING ^{STYLE A}	328	VITON					
213JM, 215KM	1 3/8	33/64	45/64	45/64	25/32	1	7/8	250	250	240	SEAT RING ^{STYLE B}	328	TEFLON					
254JM, 256JM	1 3/4		25/64	1 7/64		1	1	250	250	140	SNAP RING	335	316 S/S					
284JM, 286JM	1 3/4		25/64	1 7/64		1	1	250	250	140	ROTAT. FACE	336	CARBON					
324JM, 326JM	1 3/4		25/64	1 7/64		1	1	250	250	140	SHAFT PACK	345	TEFLON					
364JM, 365JM	2 1/8			51/64			1	250	250	110	DISC	355	316S/S					

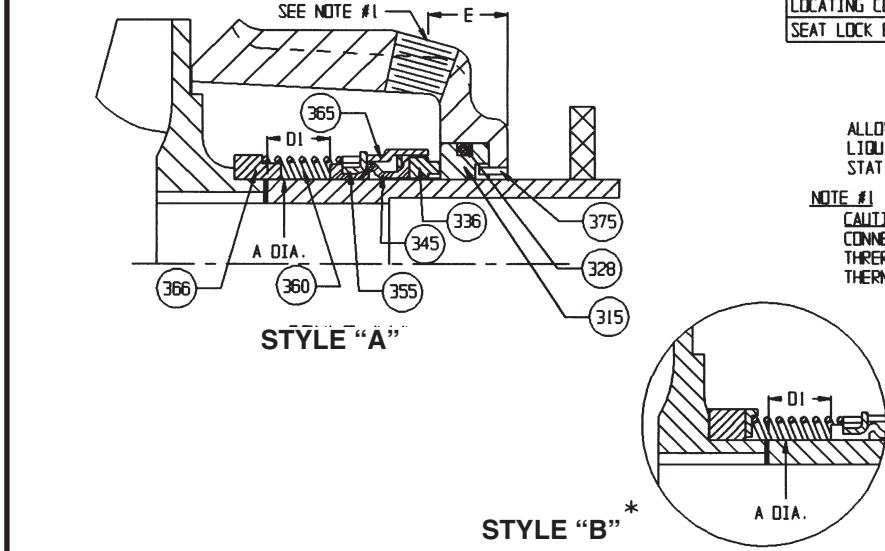


ALLOWABLE PRESSURES BASED ON NON-LUBRICATING LIQUIDS AND NIRESSIST OR CERAMIC STATIONARY FACE.

NOTE #1
CAUTION: LIQUID INJECTED INTO THIS CONNECTION MIXES WITH THE PUMPAGE AND THEREFORE MUST BE COMPATIBLE (CHEMICALLY, THERMALLY, ETC.) WITH THE PUMPAGE.

DESCRIPTION	INSIDE UNBALANCED MECHANICAL SEAL FOR CNV JOHN CRANE TYPE 9T
DRAWING NO.	SK1820

PUMP SERIES	CN, CNV IMP DIA.	A			D1			E			ALLOW. STUFF. BOX PRESS			PART NAME	PART NO.	MATERIALS		
		6	8 1/2	11 1/2	6	8 1/2	11 1/2	1150 RPM	1750 RPM	3500 RPM	MATERIAL CLASSES 22 AND 50	SPECIAL						
143JM, 145JM	1 3/8	1/64	13/64	13/64	25/32	1	7/8	250	250	240	STATIONARY SEAT	315	NIRESSIST, CERAMIC, TUNG. CARBIDE, SILICON CARBIDE					
182JM, 184JM	1 3/8	1/64	13/64	13/64	25/32	1	7/8	250	250	240	SEAT RING	328	VITON					
213JM, 215KM	1 3/8	1/64	13/64	13/64	25/32	1	7/8	250	250	240	ROTAT. FACE	336	CARBON					
254JM, 256JM	1 3/4		* 49/64	31/64		1	1	250	250	140	GENERAL SERVICE	336	CARBON					
284JM, 286JM	1 3/4		* 49/64	31/64		1	1	250	250	140	ROTATING FACE	336	BABBIT FILLED CARBON					
324JM, 326JM	1 3/4		* 49/64	31/64		1	1	250	250	140	MED. TEMP. WATER	336	BABBIT FILLED CARBON					
364JM, 365JM	2 1/8			23/64		1	1	250	250	110	SHAFT PACK	345	VITON					
											COMP. RING	355	304 S/S					
											SPRING	360	304 S/S					
											RETAINER	365	304S/S					
											LOCATING COLLAR	366	304 S/S					
											SEAT LOCK PIN	375	316 S/S					



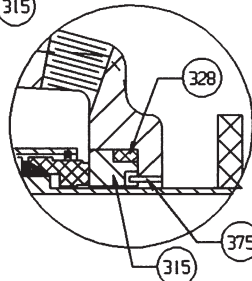
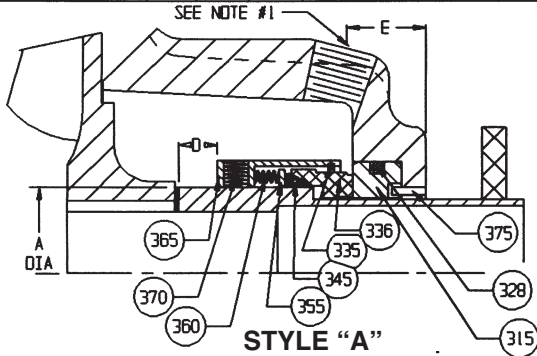
ALLOWABLE PRESSURES BASED ON NON-LUBRICATING LIQUIDS AND NIRESSIST OR CERAMIC STATIONARY FACE.

NOTE #1
CAUTION: LIQUID INJECTED INTO THIS CONNECTION MIXES WITH THE PUMPAGE AND THEREFORE MUST BE COMPATIBLE (CHEMICALLY, THERMALLY, ETC.) WITH THE PUMPAGE.

DESCRIPTION	INSIDE UNBALANCED MECHANICAL SEAL FOR CN & CNV JOHN CRANE TYPE 1
DRAWING NO.	SK1821

TYPICAL MECHANICAL SEALS

PUMP SERIES	A			D			E			ALLOW. STUFF. BOX PRESS			PART NAME	PART NO.	MATERIALS		
	CN	CNV	IMP DIA.	6	8 1/2	11 1/2	6	8 1/2	11 1/2	1150 RPM	1750 RPM	3500 RPM			CLASS 22 & 50	CL 60	SPECIAL
143JM, 145JM	1	3/8	1 3/4	13/64	21/64	21/64	25/32	1	7/8	275	275	275	STATIONARY SEAT	315	NIRESSIST, CERAMIC, TUNG. CARBIDE, SILICON CARBIDE		
182JM, 184JM	1	3/8	1 3/4	13/64	21/64	21/64	25/32	1	7/8	275	275	275	SEAT RING <small>STYLE A</small>	328	VITON		
213JM, 215JM	1	3/8	1 3/4	13/64	21/64	21/64	25/32	1	7/8	275	275	275	SEAT RING <small>STYLE B</small>	328	TEFLON		
254JM, 256JM		1	3/4		5/64	51/64		1	1	275	275	275	SNAP RING	335	316 S/S	ALLOY 20	
284JM, 286JM		1	3/4		5/64	51/64		1	1	275	275	275	ROTAT. FACE	336	CARBON		
324JM, 326JM		1	3/4		5/64	51/64		1	1	275	275	275	SHAFT PACK	345	TEFLON		
364JM, 365JM		2	1/8			27/64			1	275	275	275	DISC.	355	316 S/S	ALLOY 20	
													SPRING	360	316 S/S	ALLOY 20	
													RETAINER	365	316 S/S	ALLOY 20	
													SET SCREW	370	316 S/S	ALLOY 20	
													SEAT LOCK PIN	375	316 S/S	ALLOY 20	



ALLOWABLE PRESSURES BASED ON NON-LUBRICATING LIQUIDS AND NIRESSIST OR CERAMIC STATIONARY FACE.

NOTE #1

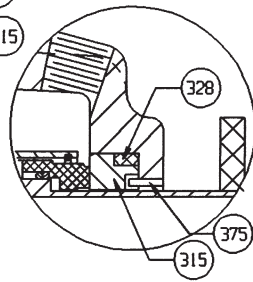
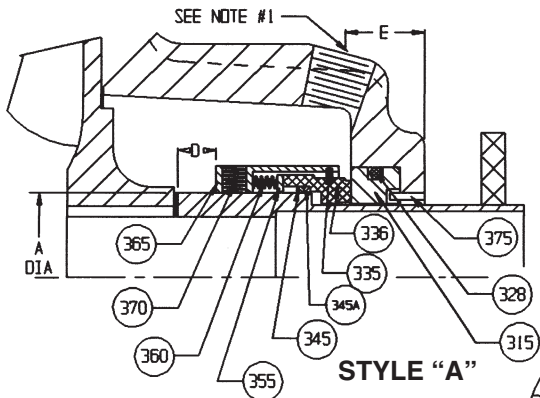
CAUTION: LIQUID INJECTED INTO THIS CONNECTION MIXES WITH THE PUMPAGE AND THEREFORE MUST BE COMPATIBLE (CHEMICALLY, THERMALLY, ETC) WITH THE PUMPAGE.

INSIDE BALANCED
MECHANICAL SEAL FOR CN & CNV
JOHN CRANE TYPE 9BT

DRAWING NO.

SK1822

PUMP SERIES	A			D			E			ALLOW. STUFF. BOX PRESS			PART NAME	PART NO.	MATERIALS		
	CN	CNV	IMP DIA.	6	8 1/2	11 1/2	6	8 1/2	11 1/2	1150 RPM	1750 RPM	3500 RPM			CLASS 22 & 50	CL 60	SPECIAL
143JM, 145JM	1	3/8	1 3/4	13/64	21/64	21/64	25/32	1	7/8	275	275	275	STATIONARY SEAT	315	NIRESSIST, CERAMIC, TUNG. CARBIDE, SILICON CARBIDE		
182JM, 184JM	1	3/8	1 3/4	13/64	21/64	21/64	25/32	1	7/8	275	275	275	SEAT RING <small>STYLE A</small>	328	VITON		
213JM, 215JM	1	3/8	1 3/4	13/64	21/64	21/64	25/32	1	7/8	275	275	275	SEAT RING <small>STYLE B</small>	328	TEFLON		
254JM, 256JM		1	3/4		5/64	51/64		1	1	275	275	275	SNAP RING	335	316 S/S	ALLOY 20	
284JM, 286JM		1	3/4		5/64	51/64		1	1	275	275	275	ROTAT. FACE	336	CARBON, BABBITTED CARBON		
324JM, 326JM		1	3/4		5/64	51/64		1	1	275	275	275	SHAFT PACK	345	VITON		
364JM, 365JM		2	1/8			27/64			1	275	275	275	BACKUP RING	345A	TEFLON		
													DISC.	355	316 S/S	ALLOY 20	
													SPRING	360	316 S/S	ALLOY 20	
													RETAINER	365	316 S/S	ALLOY 20	
													SET SCREW	370	316 S/S	ALLOY 20	
													SEAT LOCK PIN	375	316 S/S	ALLOY 20	



ALLOWABLE PRESSURES BASED ON NON-LUBRICATING LIQUIDS AND NIRESSIST OR CERAMIC STATIONARY FACE.

NOTE #1

CAUTION: LIQUID INJECTED INTO THIS CONNECTION MIXES WITH THE PUMPAGE AND THEREFORE MUST BE COMPATIBLE (CHEMICALLY, THERMALLY, ETC) WITH THE PUMPAGE.

INSIDE BALANCED
MECHANICAL SEAL FOR CN & CNV
JOHN CRANE TYPE 8BIT

DRAWING NO.

SK1823

CUSTOMER PLANT MAINTENANCE RECORD

DEAN PUMP SERIAL No.

PLANT PROPERTY No.

SERVICE

LOCATION

Capacity _____ ; T.D.H. _____ ; Imp. Dia. _____ ; Temp. _____ ; RPM _____

SPARE PARTS IN PLANT STOCK ROOM: _____

INTERCHANGEABLE WITH DEAN SERIAL NUMBERS _____
