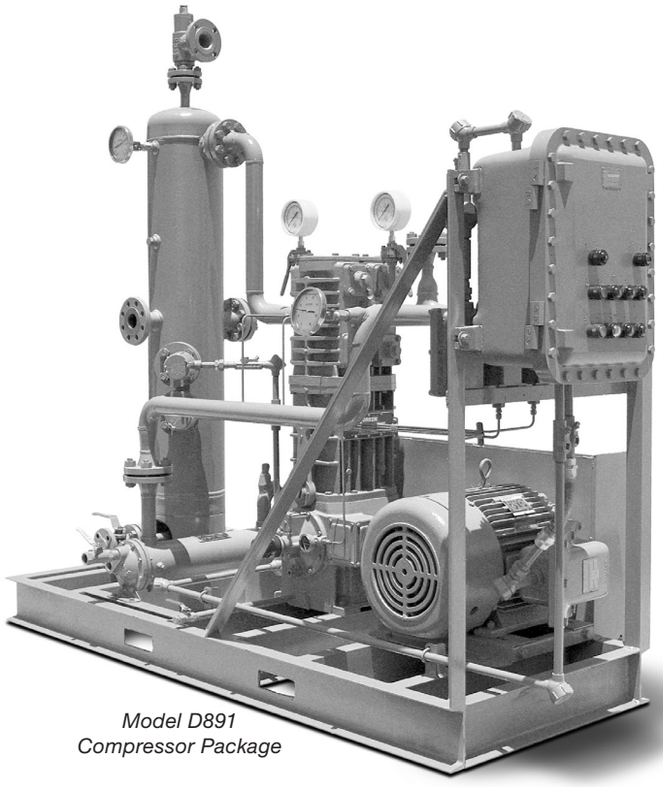
Installation, Operation & Maintenance Manual

D and T-Style Double-Acting Gas Compressors
Models D791, T791, D891 and T891



Model D891
Compressor Package

Model T891
Compressor

Warning: (1) Periodic inspection and maintenance of Corken products is essential. (2) Inspection, maintenance and installation of Corken products must be made only by experienced, trained and qualified personnel. (3) Maintenance, use and installation of Corken products must comply with Corken instructions, applicable laws and safety standards (such as NFPA Pamphlet 58 for LP-Gas and ANSI K61.1-1972 for Anhydrous Ammonia). (4) Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at user's risk and equipment should be operated only by qualified personnel according to applicable laws and safety standards.

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Warning

Install, use and maintain this equipment according to Corken, Inc. instructions and all applicable federal, state, local laws and codes, and NFPA Pamphlet 58 for LP-Gas or ANSI K61.1-1989 for Anhydrous Ammonia. Periodic inspection and maintenance is essential.

Corken One Year Limited Warranty

Corken, Inc. warrants that its products will be free from defects in material and workmanship for a period of 12 months following date of purchase from Corken. Corken products which fail within the warranty period due to defects in material or workmanship will be repaired or replaced at Corken's option, when returned freight prepaid to: Corken, Inc., 9201 North I-35 Service Road, Oklahoma City, OK. 73131.

Parts subject to wear or abuse, such as mechanical seals, blades, piston rings, valves, and packing, and other parts showing signs of abuse are not covered by this limited warranty. Also, equipment, parts and accessories not manufactured by Corken but furnished with Corken products are not covered by this limited warranty and purchaser must look to the original manufacturer's warranty, if any. This limited warranty is void if the Corken product has been altered or repaired without the consent of Corken.

ALL IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY NEGATED TO THE EXTENT PERMITTED BY LAW AND SHALL IN NO EVENT EXTEND BEYOND THE EXPRESSED WARRANTY PERIOD.

Corken disclaims any liability for consequential damages due to breach of any written or implied warranty on Corken products. Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at the user's risk. Such substances should be handled by **experienced, trained personnel in compliance with governmental and industrial safety standards.**

Contacting The Factory

For your convenience, the model number and serial number are given on the compressor nameplate. Space is provided below for you to keep a written record of this information.

Always include the model number and serial number when ordering parts.

Model No. _____

Serial No. _____

Date Purchased _____

Date Installed _____

Purchased From _____

Installed By _____

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Features and Benefits

High-efficiency valves:
Corken valves offer quiet operation and high durability in oil-free gas applications.

Ductile iron construction:
All cylinders and heads are ductile iron for maximum thermal shock endurance.

Self-lubricating PTFE piston rings:
Corken provides a variety of state-of-the-art piston ring designs to provide the most cost-effective operation of compressors for non-lube service. The step-cut design provides higher efficiencies during the entire life of the piston ring.

Positively locked pistons:
Simple piston design allows end clearance to be precisely set to provide maximum efficiency and long life.

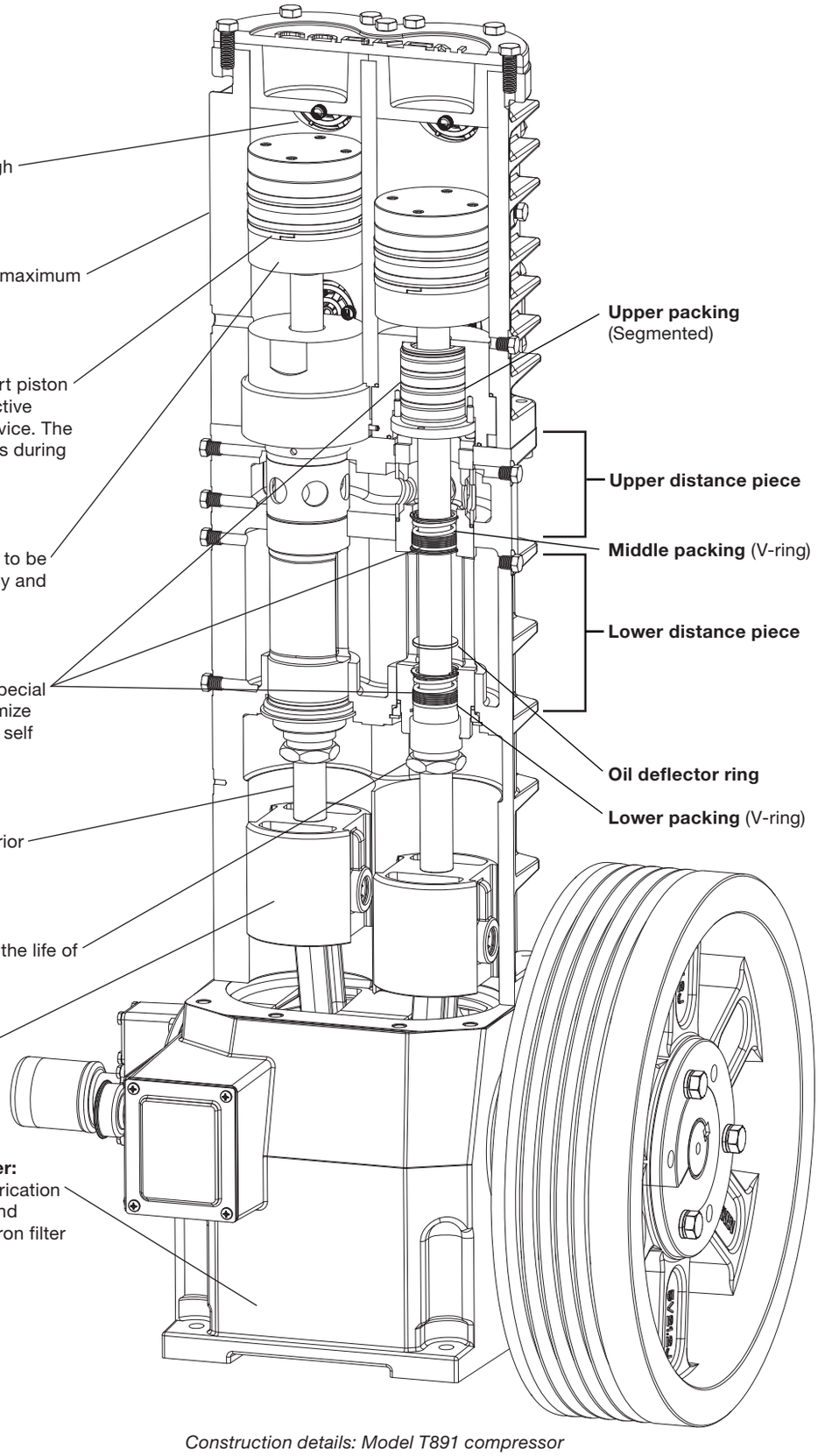
Self-lubricating piston rod seals:
Seals constructed of PTFE incorporating special fillers to ensure no oil carry over and maximize leakage control. Spring loaded seal design self adjusts to compensate for normal wear.

Nitride-coated piston rods:
Impregnated nitride coating provides superior corrosion and wear resistance.

Adjustable packing screw:
Ensures maximum sealing capacity during the life of the packing (T791 and T891 models only).

Cast iron crossheads:
Durable cast iron crossheads provide superior resistance to corrosion and galling.

Pressure-lubricated crankcase with filter:
Self-reversing oil pump ensures proper lubrication regardless of directional rotation to main and connecting rod bearings. Standard 10-micron filter ensures long-lasting bearing life.



Construction details: Model T891 compressor

Chapter 1—Installing Your Corken Compressor

1.1 Location

NOTE: Compressor must be installed in a well ventilated area.

Corken compressors are designed and manufactured for outdoor duty. For applications where the compressor will be subjected to extreme conditions for extended periods such as corrosive environments, arctic conditions, etc., consult Corken. Check local safety regulations and building codes to assure installation will meet local safety standards.

Corken compressors handling toxic or flammable gases such as LPG/NH_3 should be located outdoors in a well ventilated area. A minimum of 18 inches (45 cm) clearance between the compressor and the nearest wall is advised to make it accessible from all sides and to provide unrestricted air flow for adequate cooling.

Noise:

Corken vertical compressors should not exceed an 85 DBA noise level when properly installed.

1.2 Foundation

Proper foundations are essential for a smooth running compression system. Corken recommends the compressor be attached to a concrete slab at least 8 inches thick with a 2 inch skirt around the circumference of the steel structural skid. The steel structural skid should be securely anchored into the foundation by 3/4 inch diameter "J" bolts that are 8 inches long. The total mass of the foundation should be approximately twice the weight of the compressor system (compressor, baseplate, motor, etc.). See figure 1.2 for details.

For a more detailed explanation of a proper foundation design, please refer to ED410, Important Instructions for Compressor Foundation Design.

Note: The depth of the concrete foundation will vary based on local soil conditions.

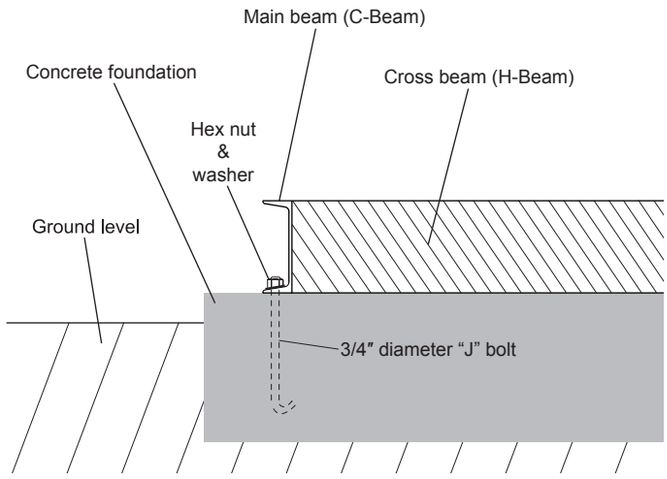


Figure 1.2: Recommended foundation details for Corken compressors

1.3 Piping

Proper piping design and installation is as important as a proper foundation is to a smooth operating compressor. Improper piping installation will result in undesirable transmission of compressor vibration to the piping.

DO NOT SUPPORT PIPING WITH THE COMPRESSOR. Unsupported piping is the most frequent cause of vibration of the pipe. The best method to minimize transmission of vibration from the compressor to the piping is to use flexible connectors (see figure 1.3 for details).

Pipe must be adequately sized to prevent excessive pressure drop between the suction source and the compressor as well as between the compressor and the final discharge point. In most cases, piping should be at least the same diameter as the suction nozzle on the compressor.

If a restrictive device such as a valve, pressure regulator, or back-check valve is to be installed in the compressor's suction line, care must be taken. The suction line volume between the restrictive device and the compressor suction nozzle must be at least ten times the swept cylinder volume.

On liquefied gas applications such as LPG/NH_3, it is of extreme importance to prevent the entry of liquid into the compressor. Installing a liquid trap on the inlet side will prevent liquid from entering the compressor (see section 1.4).

It is of equal importance to protect the discharge side of the compressor from liquid entry. This may be done by installing a check valve on the discharge side of the compressor and using a piping design that does not allow liquid to gravity drain into the compressor.

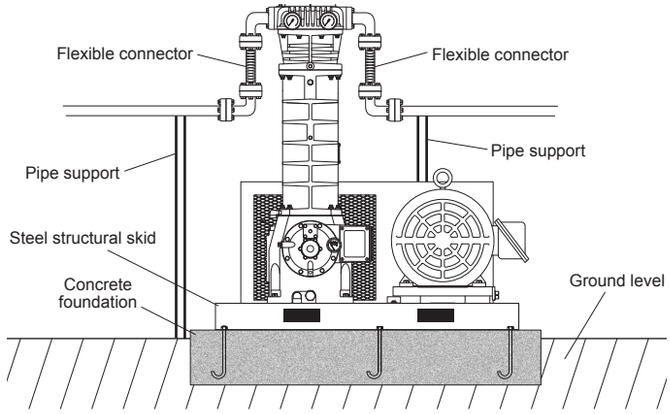


Figure 1.3: Flexible connectors should be used to minimize transmission of vibration to the piping.

For vapor recovery applications, be certain to install a check valve on vapor lines discharging to the liquid space of the tank.

All piping must be in accordance with the laws and codes governing the service. In the United States, the following codes apply:

For LP Gas—The National Fire Protection Association Pamphlet No. 58, Standard for the Storage and Handling of Liquefied Petroleum Gases.

For Ammonia—The American National Standards Institute, Inc., K61.1-1989, Storage and Handling of Anhydrous Ammonia.

Copies of these are available from NFPA, 60 Baterymarch Street, Boston, Mass, 02110 and ANSI, 1430 Broadway, New York, N.Y., 10018. Install, use and maintain this equipment according to Corken instructions and all applicable federal, state, and local laws and previously mentioned codes. Other laws may apply in different industries and applications.

1.4 Liquid Trap

Compressors are designed to pressurize gas—not to pump liquids. The entry of even a small amount of liquid into the compressor will result in serious damage.

On liquefied gas applications, a liquid trap must be used to prevent the entry of liquid into the compressor.

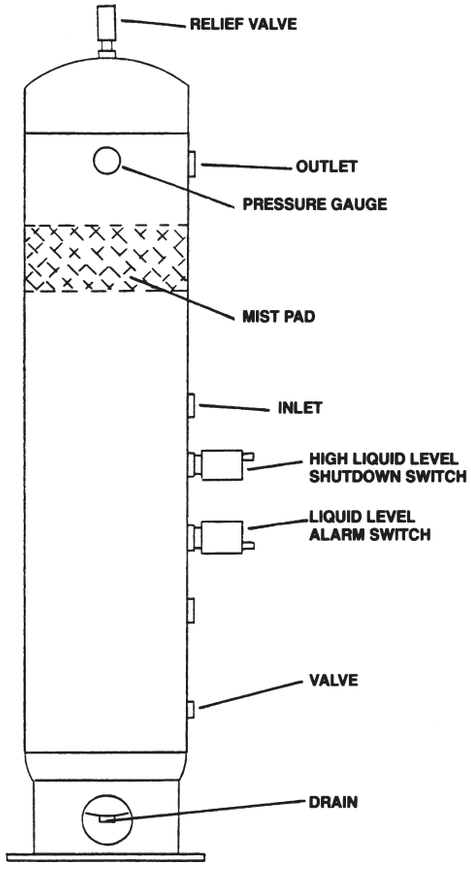


Figure 1.4: ASME automatic liquid trap

Corken's liquid trap provides the most thorough liquid separation (see figure 1.4) and is ASME code stamped. It contains two level switches, one for alarm and one for shutdown. In some cases the alarm switch is used to activate a dump valve (not included with trap) or sound an alarm for the trap to be manually drained by the operator. This trap also contains a mist pad. A mist pad is a mesh of interwoven wire designed to remove fine liquid mists. The ASME code trap is standard in the 109B and 107B mounting configurations.

NOTE: The liquid level switch MUST be removed from the trap before grounding any welding devices to the trap or associated piping! **Failure to do so will damage the switch contacts.**

If your compressor is equipped with a liquid trap not manufactured by Corken, make sure it is adequately sized; otherwise it may not be able to remove the liquid entrained in the suction stream.

1.5 Driver Installation/Flywheels

Corken vertical compressors may be driven by either electric motors or combustion engines (gasoline, diesel, natural gas, etc.).

Note: Never operate a reciprocating compressor without a flywheel.

Drivers should be selected so the compressor operates between 400 and 900 RPM. The unit must not be operated without the flywheel or severe torsional imbalances will result that could cause vibration and a high horsepower requirement. The flywheel should never be replaced by another pulley unless it has a higher wk2 value than the flywheel.

Humid climates can cause problems with explosion proof motors. The normal breathing of the motor and alternating between being warm when running and cool when stopped can cause moist air to be drawn into the motor. This moist air will condense, and may eventually add enough water inside the motor to cause it to fail. To prevent this, make a practice of running the motor at least once a week on a bright, dry day for an hour or so without the V-belts. During this period of time, the motor will heat up and vaporize the condensed moisture. No motor manufacturer will guarantee their explosion proof or totally enclosed (TEFC) motor against damage from moisture.

For installation with engine drivers, thoroughly review instructions from the engine manufacturer to assure the unit is properly installed.

1.6 Crankcase Lubrication

To ensure proper lubrication of the crankcase parts before startup, the crankcase should be filled through the nameplate inspection opening.

Non-detergent oil is recommended for Corken vertical compressors. Detergent oils tend to keep wear particles and debris suspended in the oil, whereas non-detergent oils let them settle in the bottom of the crankcase. When non-detergent oils are not available, detergent oils may usually be successfully substituted, although compressors handling ammonia, amine, or imine gases are notable exceptions. These gases react with the detergent and cause the crankcase oil to become corrosive and contaminated. Figures 1.6A and 1.6B show recommended oil viscosities and crankcase capacities. Ensure oil is compatible with the product being compressed.

Synthetic lubricants are generally not necessary. Please consult your lubricant supplier if you are considering the use of synthetic oil.

1.7 Purging, Padding, Venting and Draining of Distance Pieces

The key to leakage control and oil-free operation of Corken compressors is the distance piece. The distance piece is integral with the crosshead guide and forms the upper portion of it. Distance pieces are equipped with tapped holes to allow purging, padding, venting, and draining (see Figure 1.7). Proper connections to and from these tapped holes are essential for optimum compressor performance.

Corrosive gases should be prevented from entering the crankcase, since even small amounts of gas leakage into the crankcase can seriously contaminate the crankcase oil. To prevent this contamination, the distance piece may be purged, padded, or vented using a clean, non-corrosive gas like dry air or nitrogen.

Purging:

Purging of the distance piece controls leakage of process gas to the atmosphere. Process gas leakage into the distance piece is quickly diluted by the purge gas and swept away. The purge gas should be vented to a safe release area, flare, compressor's inlet, or treatment facility, depending on the gas and local regulations.

When purging, it is critical to maintain the proper pressure loading across each set of packing. The higher pressure should be on the open side of the "V", which is also the side with the spring.

Moisture, oil, or condensate can be removed from the distance piece with the purge gas by using the lower distance piece connection (drain location) as the purge gas outlet connection.

Acceptable Crankcase Oil Products for Corken Compressors				
Constant Weight - Non-Detergent - R&O Inhibited				
Oil product	**ISO**	**VI**	**SAE**	**Ambient Temp.**
Exxon®				
TERESSTIC	100	95	30	65° - 100° F
	68	95	20+	45° - 70° F
	46	95	20	35° - 50° F
Mobil®				
RARUS 427 Reciprocating Compressor Oil	100	95	30	65° - 100° F
DTE Oil Heavy Medium	64	95	20+	45° - 100° F
Dectol R&O Oil	44	95	20	35° - 50° F
Conoco®				
Dectol R&O Oil	100	98	30	35° - 50° F
	68	97	20+	45° - 70° F
	46	99	20	35° - 50° F
Texaco®				
Regal R&O Oil	100	92	30	65° - 100° F
	68	97	20+	45° - 70° F
	46	102	20	35° - 50° F
Sun®				
SunVis 900 Oil	100	100	30	65° - 100° F
	68	100	20+	45° - 70° F
	46	100	20	35° - 50° F

Figure 1.6A: Oil selection chart

Compressor Model	Approximate Quarts	Capacity Liters
791, 891	7.0	6.6

Figure 1.6B: Oil capacity chart

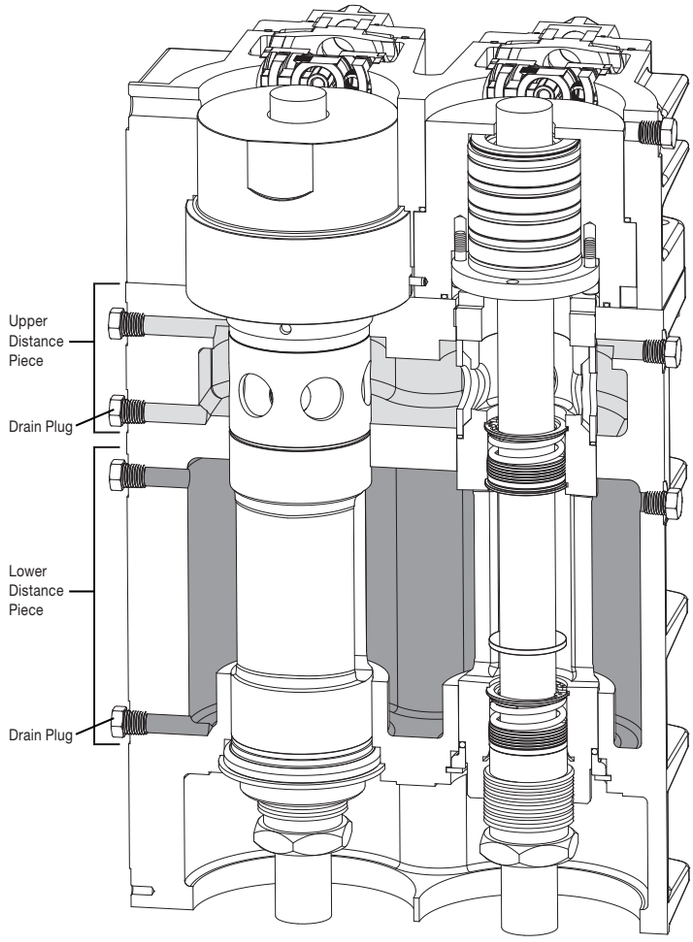


Figure 1.7: Distance piece details

Corken offers Purge Kits which include the necessary regulator, valves, fittings, etc. Consult the factory or see Important Instruction, item number IE210, for details.

Padding (Buffering):

If purging is not practical, the distance piece can be pressurized with a static pressure. This is called padding or buffering. Padding is done at a pressure above the compressor's suction pressure using a clean non-corrosive gas like dry air or nitrogen. The higher pressure in the distance piece tends to reduce the process gas leakage to the atmosphere. A small amount of purge gas will likely get into the process gas. A pressure regulator can be used to maintain proper distance piece pressure.

When padding, it is critical to maintain the proper pressure loading across each set of packing. The higher pressure should be on the open side of the "V", which is also the side with the spring.

Venting:

The distance piece can also simply be vented to an appropriate release area, flare, or treatment facility. This is sometimes useful for indoor installations.

Draining:

Since some oil will pass the lower packing set, regular draining of the distance piece is essential to maintain oil-free operation (See Figure 1.7). Corken recommends draining the distance piece once a week for units in continuous-duty operation. Installing a drain cock to the distance piece drain will help simplify draining of the distance piece.

Highly Corrosive Gases:

The compressor should be blocked from the system via valves on the suction and discharge piping, then purged with dry inert gas before being shut down. Experience has proven this significantly lowers corrosion damage to the machine.

1.8 Relief Valves

An appropriate relief valve must be installed on the discharge side of the compressor. On Corken 107-style mounted units, a relief valve should be fitted in the piping between the compressor discharge and the four-way valve. Relief valves should be made of a material compatible with the gas being compressed. Local codes and regulations should be checked for specific relief valve requirements. Also, relief valves may be required at other points in the compressor's system piping.

1.9 Shutdown/Alarm Devices

For many applications, shutdown/alarm switches will provide worthwhile protection that may prevent serious damage to your compressor system. All electronic devices should be selected to meet local code requirements. Shutdown/alarm devices typically used on Corken compressors are as follows:

Low Oil Pressure Switch—shuts down the unit if crankcase oil pressure falls below 12 psi due to oil pump failure or low oil level in crankcase.

High Temperature Switch—shuts down the unit if the normal discharge temperature is exceeded. This is strongly recommended for all applications. Typically, the set point is about 30°F (-1°C) above the normal discharge temperature.

Low Suction, High Discharge Pressure Switch—shuts down the unit if inlet or outlet pressures are not within preset limits.

Vibration Switch—shuts down the unit if vibration becomes excessive. Recommended for units mounted on portable skids.

Chapter 2—Starting Up Your Corken Compressor

NOTE: Read this entire chapter, then proceed with the startup checklist.

2.1 Inspection After Extended Storage

If your compressor has been out of service for a long period of time, you should verify that the cylinder bore and valve areas are free of rust and other debris. For valve and/or cylinder head removal instructions, refer to chapter 4 of this IOM manual.

Drain the oil from the crankcase and remove the nameplate and crankcase inspection plate. Inspect the running gear for signs of rust and clean or replace parts as necessary. Replace the crankcase inspection plate and fill crankcase with the appropriate lubricant through the nameplate inspection opening. Squirt oil on the crossheads and rotate the crankshaft by hand to ensure that all bearing surfaces are coated with oil.

Rotate unit manually to ensure running gear functions properly. Replace nameplate and proceed with startup.

2.2 Flywheel and V-belt Alignment

Before working on the drive assembly, be sure that the electric power is disconnected. When mounting new belts, always make sure the driver and compressor are close enough together to avoid forcing.

Improper belt tension and sheave alignment can cause vibration, excessive belt wear and premature bearing failures. Before operating your compressor, check alignment of the V-grooves of the compressor flywheel and driver sheave. Visual inspection often will indicate if the belts are properly aligned, but use of a square is the best method.

The flywheel is mounted on the shaft via a split, tapered hub and three bolts (see figure 2.2A). These bolts should be tightened in an even and progressive manner to the specified torque values listed below. There must be a gap between the bushing flange and the flywheel when installation is complete. Always check the flywheel runout before startup and readjust if it exceeds the value listed in Appendix B.

Hub Size	Diameter in. (cm)	Bolt Torque Ft-lb (kg-meter)	Set Screw Torque Ft-lb (kg-meter)
SF	4.625 (11.7)	12-18 (1.7–2.5)	22 (3.1)
E	6.0 (15.2)	30-36 (4.1–4.9)	22 (3.1)
J	7.25 (18.4)	75-81 (10.3–11.1)	109 (15.1)

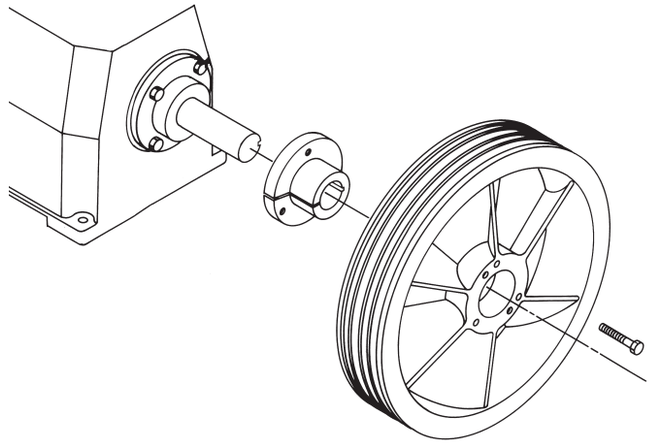


Figure 2.2A: Flywheel installation

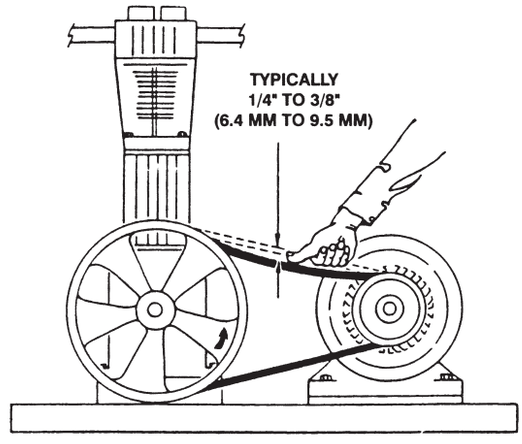


Figure 2.2B: Belt tension

Tighten the belts so that they are taut, but not extremely tight. Consult your V-belt supplier for specific tension recommendations. Belts that are too tight may cause premature bearing failure. Refer to figure 2.2B.

2.3 Crankcase Oil Pressure Adjustment

Your Corken compressor is equipped with an automatically reversible gear type oil pump. It is essential to ensure the pumping system is primed and the oil pressure is properly adjusted in order to assure smooth operation.

Before starting your compressor, check and fill the crankcase with the proper amount of lubricating oil.

When the compressor is first started, observe the crankcase oil pressure gauge. If the gauge fails to indicate pressure within 30 seconds, stop the machine. Loosen the oil filter and remove the pressure gauge. Restart the compressor and run it until oil comes out of the pressure gauge opening or around the filter. Tighten the filter and reinstall the gauge.

The oil pressure should be about 20 psi (1.4 bars) minimum for normal service. If the compressor discharge pressure is above 200 psi (14.8 bars), the oil pressure must be maintained at a minimum of 25 psi (1.7 bars). A spring-loaded relief valve mounted on the bearing housing opposite the flywheel regulates the oil pressure. As shown in figure 2.3, turn the adjusting screw clockwise to increase the oil pressure and counterclockwise to lower it. Be sure to loosen the adjusting screw locknut before trying to turn the screw and retighten it after making any adjustment.

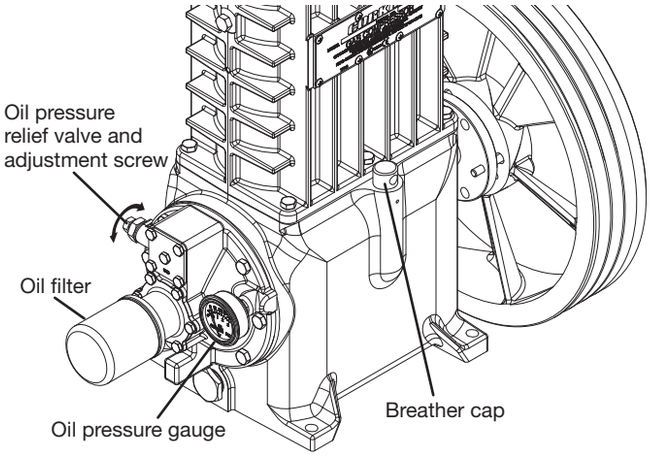


Figure 2.3: Oil pressure adjustment

2.4 Startup Check List

Please verify each item on this list below before starting your compressor! Failure to do so may result in a costly (or dangerous) mistake.

Before Starting the Compressor

1. Become familiar with the function of all piping associated with the compressor. Know each line's use!
2. Make certain actual operating conditions will match the anticipated conditions.
3. Ensure line pressures are within cylinder pressure ratings.
4. Clean out all piping.
5. Ensure all distance piece openings are tubed or plugged as desired.
6. Check all mounting shims, cylinder and piping supports to ensure that no undue twisting forces exist on the compressor.
7. Make certain strainer elements are in place and clean.
8. Make certain cylinder bore and valve areas are clean.
9. Check V-belt tension and alignment or drive alignment on direct drive units.
10. Rotate unit by hand and make certain there is no wobble or play.
11. Check crankcase oil level.
12. Drain all liquid traps, separators, etc.
13. Verify proper electrical supply to motor and panel.
14. Check all gauges and confirm a zero level reading.
15. Test piping system for leaks.
16. Purge unit of air before pressurizing with gas.
17. Carefully check for any loose connections or bolts.
18. Remove all stray objects (rags, tools, etc.) from vicinity of the unit.
19. Confirm all valves are open or closed as required.
20. Double-check all of the above.

After Starting Compressor

1. Verify and note proper oil pressure. Shut down and correct any problems immediately.
2. Observe noise and vibration levels. Correct immediately if excessive.
3. Verify proper compressor speed.
4. Examine entire system for gas or oil leaks.
5. Note rotation direction.
6. Check start-up voltage drop, running amperage and voltage at motor junction box (not at the starter).
7. Verify proper lubrication rate (lubed units only).
8. Test each shutdown device and record set points.
9. Test or confirm set point on all relief valves.
10. Check and record all temperatures, pressures and volumes after 30 minutes and 1 hour.
11. After 1 hour running time, tighten all head bolts, valve holddown bolts, and baseplate bolts. See Appendix B for torque values.

Chapter 3—Routine Maintenance Chart

Item to Check	Daily	Weekly	Monthly	Six Months	Yearly
Crankcase oil pressure	●				
Compressor discharge pressure	●				
Overall visual check	●				
Crankcase oil level			●[2]	●[2]	
Drain liquid from accumulation points		●[3]			
Drain distance pieces		●			
Clean cooling surfaces on compressor and intercooler (if any)		●			
Lubricator supply tank level (if any)		●			
Check belts for correct tension			●		
Inspect valve assemblies				●	
Lubricate motor bearings in accordance with manufacturers' recommendations				●	
Inspect motor starter contact points					●
Inspect piston rings[1]				●[1]	

[1]Piston ring life varies greatly, depending on application, gas, and operating pressures. Consult factory for additional recommendations for your specific application.
[2]Change oil every 2,200 hours of operation or every 6 months, whichever occurs first. If the oil is unusually dirty, change it as often as needed to maintain a clean oil condition. Change replacement filter 4225 with every oil change.
[3]Liquid traps should be drained prior to startup.

Chapter 4—Routine Service and Repair Procedures

CAUTION: Always relieve pressure in the unit before attempting any repairs. After repair, the unit should be pressure tested and checked for leaks at all joints and gasket surfaces.

If routine maintenance is performed as listed in chapter 3, repair service on your Corken gas compressor is generally limited to replacing valves or piston rings. When it comes time to order replacement parts, be sure to consult the part details appendix in the back of this Installation, Operation & Maintenance (IOM) manual for a complete list of part numbers and descriptions.

4.1 Valves

Test the compressor valves by closing the inlet piping valves while the unit is running; however, do not allow the machine to operate in this way very long. If the inlet pressure gauge does not drop to zero almost immediately, one or more of the valves is probably damaged or dirty. However, it is possible for the pressure gauge itself to be faulty.

In most cases, if a valve or gasket is leaking, it will create more heat. On a single-stage compressor, you may be able to compare the operating temperatures of the two suction or discharge valves and cover plates to each other. If a valve or gasket is leaking, it will have a higher operating temperature. NOTE: This method will not be suitable for two-stage compressors if each stage does not have more than one valve.

Each suction and/or discharge valve assembly is easily removed as a unit for inspection. If any part of the valve assembly is broken, the valve assembly should be replaced. See valve assembly parts details in the Appendix E for a complete list of part numbers and descriptions.

If a valve is leaking due to dirt or any other foreign material that keeps the valve plate and seat from sealing, the valve may be cleaned and reused. New valve gaskets and O-rings should be used to assure a good seal.

The valve holddown assemblies and valve assemblies on the following pages show the various specifications used on models 791 and 891 compressors. Since more than one suction valve arrangement is available for each model of compressor, it is necessary to know your complete model number so you can identify the valve type specification number (see example listed below).

Model number D891AM 4 FBANSNN
Valve type = spec 4

Valve Inspection and/or Replacement

Before removing and inspecting the valves, begin by depressurizing and purging (if necessary) the unit.

Disassembly

1. Unscrew the valve cap and remove the O-ring.
2. Remove the valve cover plate, O-ring and holddown screw by removing each of the four bolts. The holddown screw is easily removed with the special wrench supplied with your compressor.
3. After the cover plate and O-ring have been removed, the valve cage, valve assembly and valve gasket can be lifted out.
4. Inspect valves for breakage, corrosion, debris and scratches on the valve plate. In many cases, valves may simply be cleaned and reinstalled. If the valves show any damage, they should be repaired or replaced. Replacement is usually preferable although repair parts are available. If valve plates are replaced, seats should also be lapped until they are perfectly smooth. If more than .005 of an inch must be removed to achieve a smooth surface, the valve should be discarded. If plates are replaced without relapping the seat, rapid wear and leakage may occur.

Assembly

1. Insert metal valve gasket into the suction and/or discharge opening of the head. The metal valve gasket should always be replaced when the valve is reinstalled.
2. Insert cleaned or new valve assembly. Make sure the suction and discharge valves are in the proper suction and discharge opening in the head.
3. Insert the valve cage.
4. Replace the O-ring and valve cover plate. Torque the bolts to the value listed in Appendix B. CAUTION: Be sure the holddown screw has been removed.
5. To ensure the valve gasket is properly seated, insert the holddown screw and tighten to the value listed in Appendix B. NOTE: Gaskets and O-rings are not normally reusable.
6. Replace the O-ring and valve cap and tighten to the value listed in Appendix B.
7. Check bolts and valve holddown screws after first week of operation. Re-torque if necessary. See Appendix B for torque values.

4.2 Heads

A compressor cylinder cap and head very seldom requires replacement if the compressor is properly maintained. The primary cause of damage to a cylinder cap or head is corrosion and the entry of solid debris or liquid into the compression chamber. Improper storage can also result in corrosion damage to the cylinder cap and heads (for proper storage instructions see chapter 5).

Many compressor repair operations require removal of the cylinder cap and heads. While the compressor is disassembled, special care should be taken to avoid damage or corrosion. If the compressor is to be left open for more than a few hours, bare metal surfaces should be coated with rust preventative.

When reassembling the compressor, make sure the bolts are retightened per the torque values listed in Appendix B.

4.3 Piston Rings and Piston Ring Expanders

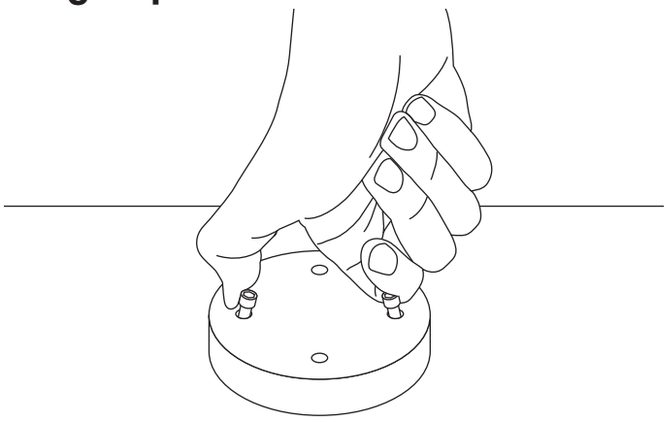


Figure 4.3: Piston cap removal

Piston ring life will vary considerably from application to application. Ring life will improve dramatically at lower speeds and temperatures.

1. To replace the piston rings, depressurize the compressor and purge if necessary.

2. Remove the cylinder cap and heads to gain access to the compressor cylinder.

3. Loosen the piston cap bolts and remove the piston cap as shown in figure 4.3 by pinching two loose bolts together.

4. Remove the lock nut and lift the piston off the end of the piston rod.

5. Piston rings and expanders may then be easily removed and replaced. Corken recommends replacing expanders whenever rings are replaced. To determine if rings should be replaced, measure the radial thickness and compare it to the chart in Appendix B.

4.4 Piston Replacement

1. To replace the pistons, depressurize the compressor and purge if necessary.

2. Remove the compressor cylinder cap, head and cylinder (see section 4.2).

3. Remove the piston cap by loosening and removing the socket head bolts holding the piston cap to the piston (see figure 4.3).

4. Next, remove the lock nut and lift the piston off the end of the piston rod.

5. Check the thrust washer and shims for damage and replace if necessary.

6. Before installing the new piston, measure the thickness of the existing shims.

7. Replace the cylinder.

8. Install the piston with the same thickness of shims as before, and with new piston rings and expanders.

9. Now remove a lower valve and measure dimension “Y” at the bottom of the piston shown in Appendix E—Piston Assembly Details. If this measurement does not fall within the tolerances listed in the piston assembly details (Appendix E), remove the piston, adjust the shims as necessary and remeasure the “Y” dimension.

10. When the piston is properly shimmed, tighten the lock nut as shown in Appendix B.

11. Replace the piston cap with the same thickness of shims as before.

12. Reinstall the piston cap and cylinder head.

13. Now remove an upper valve and measure dimension “X” at the top of the piston shown in Appendix E—Piston Assembly Details. If this measurement does not fall within the tolerances in Appendix E, remove the cylinder head and piston cap and adjust the shims as necessary. Repeat the steps and measure the “X” dimension again.

14. When the piston cap is properly shimmed, tighten the socket head bolts in an alternating sequence. Torque socket head bolt to the values listed in Appendix B.

15. Replace the previously removed valves. Best results will be obtained if new valve gaskets are used.

16. Follow standard startup procedures.

4.5 Piston Rod Packing Adjustment

Piston rod packing should be adjusted or replaced whenever leakage becomes noticeable. Adjust packing by tightening packing nuts as shown in Figure 4.5.

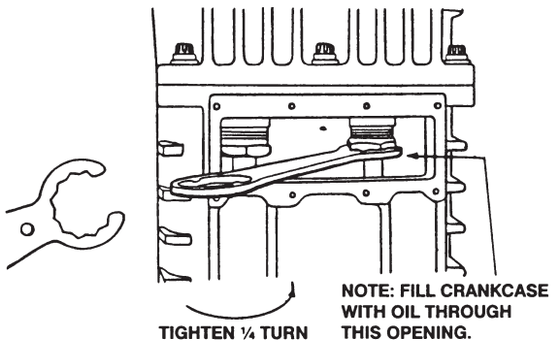


Figure 4.5: Packing adjusting nuts (models T791 and T891 only)

NOTE: Compressor models D791 and D891 do not have adjustable packing nuts so the packing sets on models D791 and D891 are not adjustable, the piston rod packing should be replaced whenever leakage becomes noticeable.

Typically, it is a good idea to replace piston rod packing and piston rings at the same time. For instructions on replacing the piston rod packing, see section 4.6.

4.6 Cylinder and Packing Replacement

Cylinders very seldom require replacement if the compressor is properly maintained. The primary cause of damage to cylinders is corrosion and the entry of solid debris or liquid into the compression chamber. Improper storage can also result in corrosion damage to cylinder (for proper storage instructions see chapter 5).

If the cylinder does become damaged or corroded, use a hone to smooth the cylinder bore and then polish it to the value shown in Appendix B. If more than .005 of an inch must be removed to smooth the bore, replace the cylinder. Cylinder liners and oversized rings are not available. OVERBORING THE CYLINDER WILL RESULT IN GREATLY REDUCED RING LIFE.

Many compressor repair operations require removal of the cylinder. While the compressor is disassembled, special care should be taken to avoid damage or corrosion to the cylinder. If the compressor is to be left open for more than a few hours, bare metal surfaces should be coated with rust preventative.

When reassembling the compressor, make sure the bolts are retightened using the torque values listed in Appendix B.

Packing Replacement Instructions

For specific construction details and actual part numbers, consult Appendix E in the back of this Installation, Operation & Maintenance (IOM) manual. Use instructions below and on the following pages that apply to the MODEL and SERIAL NUMBER of your compressor. Be careful to arrange packing sets in the proper order.

CAUTION: Before installing the new piston rod packing, bleed all pressure from the compressor and piping and purge if necessary. After the new piston rod packing has been installed, the unit should be pressure tested and checked for leaks at all joints and gasket surfaces. When the compressor is being used with toxic, dangerous, flammable or explosive gases, this pressure and leak testing should be done with air or a dry, inert gas such as nitrogen.

Cleanliness:

Sealing a reciprocating piston rod is a very difficult task. Keep all parts, tools and your hands clean during installation. Your new packing needs every chance it can get, so keep it clean.

Workmanship:

Your Corken compressor is a precision piece of equipment with very close tolerances. Treat it as such. Never beat on it to get parts in or out.

Packing Configuration

The packing for these compressors includes segmented packing in a packing barrel at the lower end of the cylinder and V-ring packing in a packing box cartridge below the segmented packing.

Refer to Appendix E for packing assembly details. Note the arrangement of the particular packing sets for the model of machine that you have.

4.6.1 Model D791 and D891 Compressors (D-Style)

On Models D791 and D891, there is one set of V-ring packing in a packing box cartridge attached to the packing barrel. The packing box cartridge holds the segmented packing inside the barrel.

Disassembly of Packing (D-Style)

1. Depressurize and open the compressor.
2. Remove the cylinder cap, heads, pistons and cylinder.
3. Remove the packing barrels by prying upwardly under each one and lifting entire packing barrel/cartridge assembly up from piston rod.

4. Remove the four socket head screws that hold the packing box cartridge to the barrel.

5. Remove segmented packing and cups from barrel.

6. Remove lower retainer ring, washers, packing spring and old V-ring packing from packing box cartridge.

Assembly of Packing (D-Style)

1. Replace packing as required. The segmented packing and cups are located in the packing barrel while the V-ring packing is located in the packing box cartridge. **NOTE: Always use new O-rings when replacing the packing.**

2. V-ring packing set:

   NOTE: The instructions below are for packing specification "J". Depending on the packing specification used in your compressor, the order of assembly for the packing rings, V-ring packing, washers and packing spring will vary. Refer to Appendix E to view the V-ring packing arrangements and follow the order of assembly and V-ring direction. If you do not know the packing arrangement used in your compressor, refer to the model number identification codes listed in Appendix A.

   a. Clean and lightly oil the packing area inside the packing box cartridge.

   b. Insert the oil deflector ring through the bottom opening of the packing box cartridge.

   c. Insert the first retainer ring followed by a washer.

   d. Insert the packing spring followed by another washer.

   e. Insert a male packing ring followed by four V-rings and one female packing ring. **NOTE: Insert packing rings and V-rings one at a time. Refer to Appendix E for the proper direction of the male and female packing rings and V-rings.**

   f. Lastly, insert the final washer. Push in on the washer and install the second retainer ring.

3. Segmented packing:

   NOTE: The instructions below are for packing specification "J". Depending on the packing specification used in your compressor, the order of assembly for the segmented packing arrangement (radial or tangent) will vary. Refer to Appendix E to view the segmented packing arrangements. If you do not know the packing arrangement used in your compressor, refer to the model number identification codes listed in Appendix A.

   a. Clean the segmented packing cups and the area inside the packing barrel.

   b. Insert the segmented packing cups, segmented packing pairs and backup rings one at a time in the order shown in Appendix E.

   c. Reattach the packing box cartridge to the packing barrel using the four socket head screws.

4. Install three O-rings on the packing barrel and packing box cartridge as shown in the D-Style Crosshead Guide Assembly Details in Appendix E.

5. Install packing installation cone part number 3905 over the threaded end of the piston rod.

6. Carefully install barrel/cartridge assemblies over the piston rods, noting the alignment of the barrels as they sit on the crosshead guide. The valve scallops on the barrels must align properly with the valves in the cylinder.

7. Remove packing installation cone.

8. Replace pistons, cylinders, heads and cylinder cap. See details in Section 4.4 for proper assembly of pistons.

9. Rotate unit by hand to ensure proper assembly.

4.6.2 Model T791 and T891 Compressors (T-Style)

On Models T791 and T891 there are two sets of V-ring packing in a separate packing box cartridge held in the crosshead guide by a cartridge holddown screw. A packing adapter holds the segmented packing inside the packing barrel.

Disassembly of Packing (T-Style)

1. Depressurize and open the compressor.

2. Remove the cylinder cap, heads, pistons and cylinder.

3. Remove the packing barrels.

4. Remove the four socket head screws that hold packing adapter to the barrel.

5. Remove segmented packing and cups from barrel.

6. Remove cartridge holddown screws with special wrench supplied with the compressor, and remove cages and packing box cartridges.

7. On the lower V-ring packing set, remove adjusting screw, washers, packing spring and old packing from each packing box cartridge.

8. On the middle V-ring packing set, remove upper retainer ring, washers, packing spring and old packing from each packing box cartridge.

Assembly of Packing (T-Style)

1. Replace packing as required. The segmented packing and cups are located in the packing barrel while the V-ring packing is located in the packing box cartridge. **NOTE: Always use new O-rings when replacing the packing.**

2. Lower V-ring packing set:

   NOTE: The instructions below are for packing specification "G". Depending on the packing specification used in your compressor, the order of assembly for the packing rings, V-ring packing, washers and packing spring will vary. Refer to Appendix E to view the V-ring packing arrangements and follow the order of assembly and V-ring direction. If you do not know the packing arrangement used in your compressor, refer to the model number identification codes listed in Appendix A.

   a. Clean and lightly oil the packing area inside the packing box cartridge.

   b. Insert the first retainer ring followed by a washer through the bottom of the packing box cartridge.

   c. Insert the packing spring followed by another washer.

   d. Insert a male packing ring followed by four V-rings and one female packing ring. **NOTE: Insert packing rings and V-rings one at a time. Refer to Appendix E for the proper direction of the packing rings and V-rings.**

   e. Lastly, install and tightened the adjusting screw until the PTFE locking device located on the side of the adjusting screw is engaged with the first thread of the packing box cartridge. DO NOT OVER TIGHTEN! The PTFE locking device should engage (slightly bent) the first thread but not break off.

3. Middle V-ring packing set:

   a. Clean and lightly oil the packing area inside the packing box cartridge.

   b. Insert the second retainer ring followed by a washer through the top of the packing box cartridge.

   c. Insert a female packing ring followed by four V-rings and one male packing ring. **NOTE: Insert packing rings and V-rings one at a time. Refer to Appendix E for the proper direction of the male and female packing rings and V-rings.**

   d. Insert a washer and a packing spring followed by another washer.

   e. Lastly, push in on the washer and insert the third retainer ring.

   f. Install two O-rings on the packing box cartridge as shown in the T-Style Crosshead Guide Assembly Details in Appendix E.

4. Segmented packing:

   NOTE: The instructions below are for packing specification "G". Depending on the packing specification used in your compressor, the order of assembly for the segmented packing arrangement (radial or tangent) will vary. Refer to Appendix E to view the segmented packing arrangements. If you do not know the packing arrangement used in your compressor, refer to the model number identification codes listed in Appendix A.

   a. Clean the segmented packing cups and the area inside the packing barrel.

   b. Insert the segmented packing cups, segmented packing pairs and backup rings one at a time in the order shown in Appendix E.

   c. Reattach the packing adapter to the packing barrel using the four socket head screws.

   d. Install two O-rings on the packing barrel as shown in the T-Style Crosshead Guide Assembly Details in Appendix E.

5. Install packing installation cone part number 3905 over the threaded end of the piston rod.

6. Before installing the packing box cartridge over the packing cone and piston rod, you must insert the oil deflector ring through the side opening of the packing box cartridge. The oil deflector ring should rest on top of the lower packing set. Make sure the oil deflector ring is centered over the piston rod opening before sliding packing cartridge over the installation cone and piston rod.

7. Install cages.

8. Install and tighten holddown screws with special wrench.

9. Install packing barrels, noting the alignment of the barrels as they sit on the crosshead guide. The valve scallops on the barrels must align properly with the valves in the cylinder.

10. Remove packing installation cone.

11. Replace cylinder, pistons, heads and cylinder cap. See details in Section 4.4 for proper assembly of pistons.

12. Rotate unit by hand to ensure proper assembly.

4.7 Bearing Replacement for Crankcase and Connecting Rod

1. To replace the crankcase roller bearings, wrist pin bushing and connecting rod bearings, begin by removing the cylinder cap, heads, cylinder, pistons, crosshead guide and crosshead assemblies.

2. Drain the crankcase and remove the inspection plates.

3. Before disassembly, choose and mark one connecting rod and the corresponding connecting rod cap. DO NOT MIX CONNECTING RODS AND CAPS. Loosen and remove the connecting rod bolts in order to remove the crosshead and connecting rod assembly.

4.7.1 Wrist Pin Bushing Replacement

1. To replace the wrist pin bushing, remove the retainer rings that position the wrist pin in the crosshead.

2. Press out the wrist pin so the crosshead and connecting rod may be separated. Inspect the wrist pin for wear and damage and replace if necessary.

3. Press out the old wrist pin bushing and press a new bushing into the connecting rod. DO NOT MACHINE THE O.D. OR I.D. OF THE BUSHING BEFORE PRESSING INTO CONNECTING ROD.

4. Make sure the lubrication hole in the bushing matches the oil passage in the connecting rod. If the holes do not align, drill out the bushing through the connecting rod lubricant passage with a long drill. Bore the wrist pin bushing I.D. as indicated. See Appendix E for details. Over boring the bushing can lead to premature failure of the wrist pin bushing.

5. Inspect the oil passage for debris and clean thoroughly before proceeding.

6. Press the wrist pin back into the crosshead and wrist pin bushing and reinstall retainer rings. NOTE: The fit between the wrist pin and bushing is tighter than lubricated air compressors and combustion engines.

4.7.2 Replacing Connecting Rod Bearings

Connecting rod bearings are easily replaced by removing the semicircular bearings. Make sure the indentations in the connecting rod bearing and connecting rod line up when installing the new bearings. MAKE SURE THE ARROW AND/OR ALIGNMENT NOTCH ON CONNECTING ROD AND CAP ARE ALIGNED.

Before reinstalling the crosshead/connecting rod assembly, make sure the crankshaft throw and bearing surface are clean and lubricated. Tighten the connecting rod bolts to the torque values listed in Appendix B.

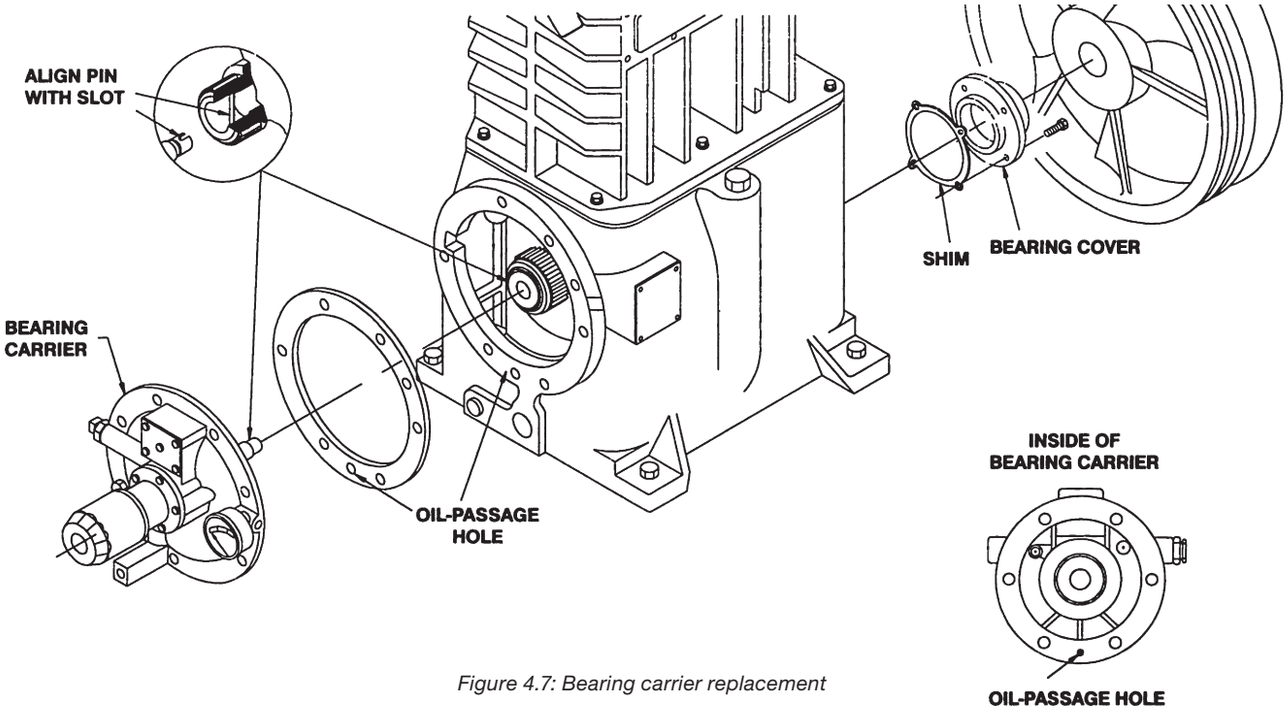


Figure 4.7: Bearing carrier replacement

4.7.3 Replacing Crankcase Roller Bearings

To inspect the roller bearings, remove the flywheel from the crankshaft and then remove the bearing carrier and crankshaft from the crankcase. If corrosion or pitting is present, the roller bearings should be replaced. When replacing roller bearings, always replace the entire bearing and not just the cup or the cone.

1. To replace the bearings, press the cups out of the crankcase and bearing carrier and press the cones off the crankshaft.

2. Press the new bearings into position and reassemble the crankshaft and bearing carrier to the crankcase. When reinstalling the bearing carrier, make sure the oil pump shaft slot is aligned with the pin in the crankshaft. Make sure to install the bearing carrier gasket so the oil passage hole is not blocked (see figure 4.7).

3. In order to check the crankshaft endplay, the oil pump must first be removed (see section 4.8).

4. Press the end of crankshaft towards the crankcase; if a clicking noise or motion is detected, the crankshaft has too much endplay. See Appendix B.

5. To reduce endplay, remove the bearing cover and remove a thin shim. Recheck the endplay after replacing the bearing cover.

6. When there is no detectable endplay, the shaft must still be able to rotate freely. If the crankshaft sticks or becomes abnormally warm, then the crankshaft bearings are too tight. If the crankshaft is too tight, add more shims, but make sure not to over shim. (Appendix B lists the proper crankshaft endplay). When the crankshaft can be rotated freely by hand with proper endplay, the rest of the compressor may be reassembled. If the crankshaft roller bearings are too tight or too loose, premature bearing failure will result.

7. Reinstall the oil pump and flywheel and check the run out as shown in Appendix B.

4.8 Oil Pump Inspection

If the compressor operates for a prolonged period with dirty or contaminated crankcase oil, damage to the oil pump and bearings may result.

1. To check the oil pump, unbolt the pump cover and remove the oil pump, spring guide, spring and oil pump shaft adapter as shown in figure 4.8.

2. Inspect the gears in the oil pump for corrosion or pitting and replace if necessary.

3. Check the oil pump shaft bushing in the bearing carrier. If the bushing is corroded, pitted or worn, the oil pump shaft bushing should be replaced. Inspect and replace other parts as necessary.

4. Before reassembling the oil pump mechanism, replace the O-rings in the oil pump cover and on the oil pump adapter shaft (see figure 4.8).

5. Rotate the drive pin in the crankshaft to a vertical position for easiest reassembly.

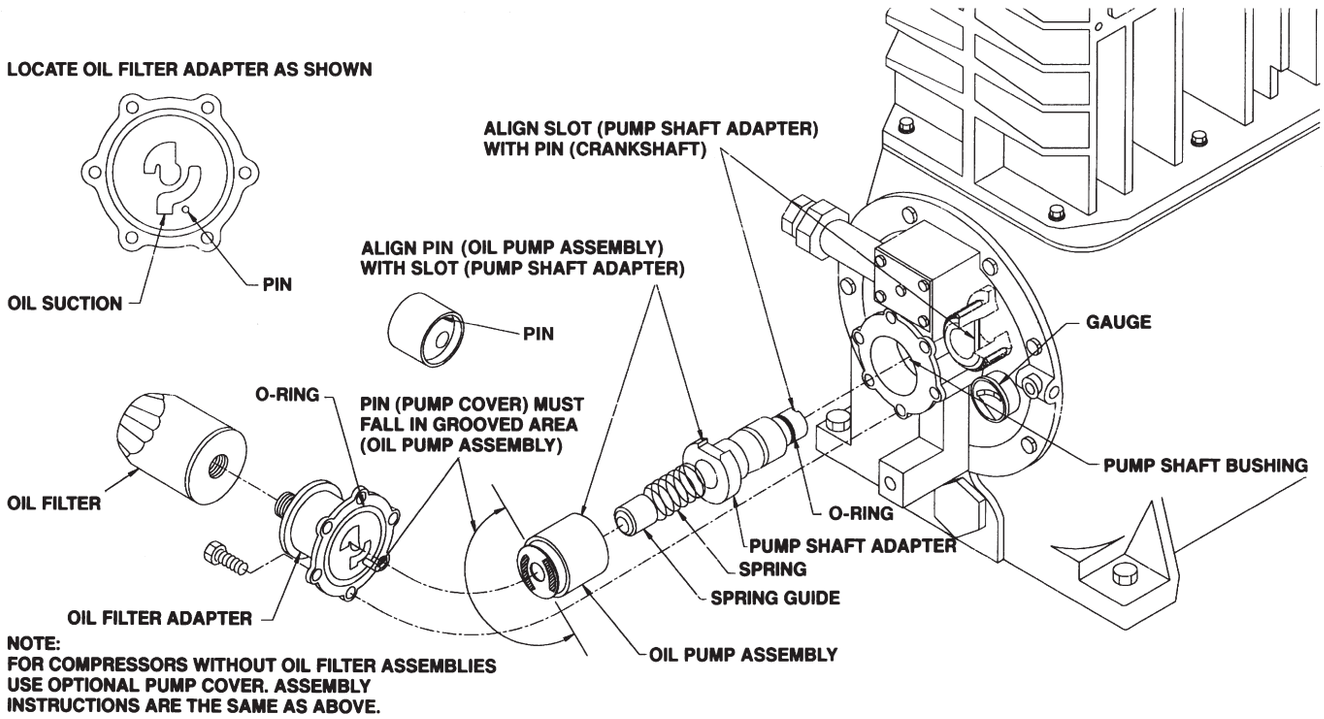


Figure 4.8: Oil pump inspection

6. Insert the shaft adapter so it engages the drive pin.

7. Next, insert the spring, spring guide and oil pump assembly. The pin on the oil pump must align with the slot in the shaft adapter.

8. Install the pump cover so the pin on the case is in the opening on the oil pump assembly as shown in figure 4.8. When you are sure the pin is properly aligned, install the cover bolts finger tight. If alignment is correct, the pump cover will mount flush to the bearing carrier. If it does not, re-check the pin alignment.

9. Tighten the bolts in an alternating sequence. See section 2.3 for directions on oil pressure adjustment.

10. Finally, rotate the crankshaft by hand to ensure smooth operation. Then rotate it in opposite directions, listening for a click, which indicates proper alignment of the oil pump's pins and slots.

Chapter 5—Extended Storage Procedures

Following a few simple procedures will greatly minimize the risk of the unit becoming corroded and damaged. Corken recommends the following precautions to protect the compressor during storage:

1. Drain the crankcase oil and refill with rust inhibiting oil.

2. Operate for a few minutes while fogging oil into the compressor suction.

3. Relieve V-belt tension.

4. Plug all openings to prevent entry of insects and moisture. (The cylinders may also be protected by the use of a vapor phase inhibitor, silica gel, or dry nitrogen gas. If the silica gel is used, hang a tag on the unit indicating that it must be removed before start-up.)

5. Store in a dry area and off the ground if possible.

6. Rotate the flywheel every two weeks if possible.

Appendix A—Industrial Vertical Double Acting Model Number Identification Code (D-Style)

MODEL NUMBER

BASE X X X X X X X X X X

BASE MODEL NUMBER	D791	D891
Inlet	2" weld	2" weld
Outlet	2" weld	2" weld
Intercooler connection	2" weld	NA
Approximate shipping weight (lbs.)	930	900

SPECIFICATION FIELDS

Packing Arrangement	Packing arranged for padding of distance piece	Standard		J
	Packing arranged for venting of distance piece	No charge option		K
	Atmospheric inlet or light vacuum service	No charge option		R
Crankcase Style	Pressure lubricated crankcase	Standard		M
	Std. crankcase with crankcase heater	Charge option		MH
	Std. crankcase with cylinder lubricator	Charge option	Charge option	L
	Std. crankcase with cylinder lubricator and heater	Charge option	Charge option	LH
Valves	Standard suction and discharge valves	Standard		4
	Standard suction & discharge valves w/ light springs	No charge option	No charge option	4L
	Loadless start through suction valve unloaders and hydraulic unloader	Charge option	Charge option	7(a)
	Constant speed unloading through suction valve unloaders and pilot valve	Charge option	Charge option	8(b)
	Combination control: loadless starting and constant speed unloading	Charge option	Charge option	78(a)(b)
	Suction valve unloaders	Charge option	Charge option	9
	Spec 4 valves w/MC1002 corrosion resistant coating	NC	NA	4C*
	Spec 9 valves w/MC1002 corrosion resistant coating	Charge option	NA	9C*
Piston Ring and Packing Material	PTFE piston ring and packing material	Standard	Standard	F
	Same as F with the addition of K-ring spacers	Charge option	Charge option	FK
	Alloy 50 piston rings and packing material	Charge option	Charge option	G
	Same as G with the addition of K-Ring spacers	Charge option	Charge option	GK
	PEEK piston ring and alloy 50 packing material	Charge option	Charge option	H
	Same as H with the addition of K-Ring spacers	Charge option	Charge option	HK
Gasket Material	Aluminum gasket material	Standard		B
	Copper gasket material	No charge option		C
	Iron-lead gasket material	No charge option		D
O-ring Material	Buna-N	Standard		A
	Neoprene®[1]	No charge option		B
	Viton®[1]	Charge option	Charge option	D
	PTFE and Kalrez®[1]			E
Intercooler Connections	Weld flanges only, no intercooler	Standard	NA	F
	Not applicable - single stage compressor, no intercooler	NA	Standard	N
Flywheel	No flywheel supplied	No charge option		N
	Standard flywheel	Standard		S
Protective Coating	Coated cylinder only	Charge option		C
	No coating	Standard		N
	Coating on all necessary wetted parts	Charge option		W*
Piston Rod Coating	Nitride	Standard		N

*Must select Protective Coating Option "W" when selecting valve option "4C", or "9C" for the D791

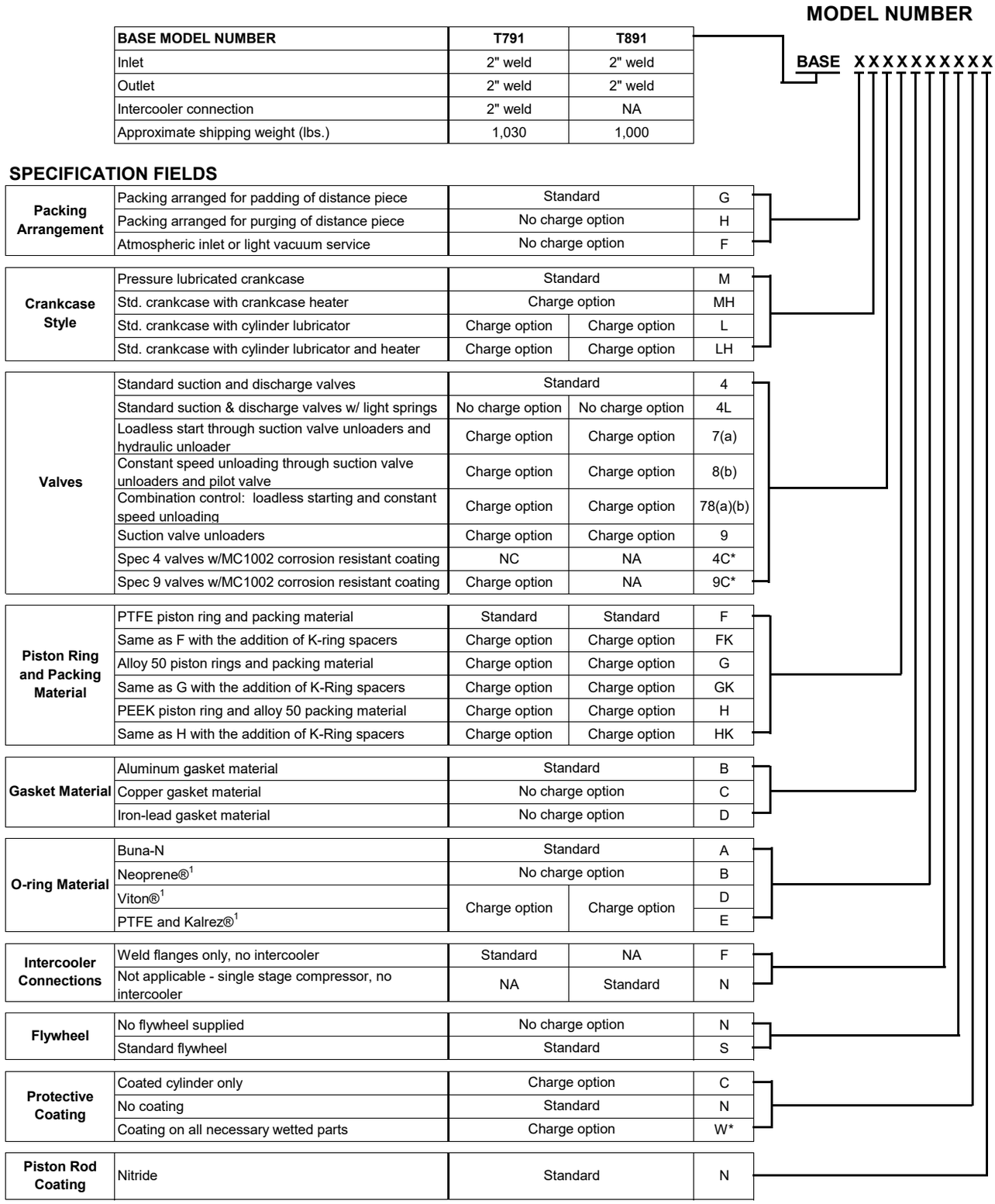
(a) 1 = up to 200 psi or 2 = above 200 psi (discharge pressure)

(b) 1 = 30 to 70 psi or 2 = 71 to 150 psi or 3 = 151 to 500 psi (discharge pressure)

NA = Not Available NC = No Charge Option

[1]Registered trademarks of the DuPont company.

Appendix A—Industrial Vertical Double Acting Model Number Identification Code (T-Style)



MODEL NUMBER

BASE X X X X X X X X X X

BASE MODEL NUMBER	T791	T891
Inlet	2" weld	2" weld
Outlet	2" weld	2" weld
Intercooler connection	2" weld	NA
Approximate shipping weight (lbs.)	1,030	1,000

SPECIFICATION FIELDS

Packing Arrangement	Packing arranged for padding of distance piece	Standard		G
	Packing arranged for purging of distance piece	No charge option		H
	Atmospheric inlet or light vacuum service	No charge option		F
Crankcase Style	Pressure lubricated crankcase	Standard		M
	Std. crankcase with crankcase heater	Charge option		MH
	Std. crankcase with cylinder lubricator	Charge option	Charge option	L
	Std. crankcase with cylinder lubricator and heater	Charge option	Charge option	LH
Valves	Standard suction and discharge valves	Standard		4
	Standard suction & discharge valves w/ light springs	No charge option	No charge option	4L
	Loadless start through suction valve unloaders and hydraulic unloader	Charge option	Charge option	7(a)
	Constant speed unloading through suction valve unloaders and pilot valve	Charge option	Charge option	8(b)
	Combination control: loadless starting and constant speed unloading	Charge option	Charge option	78(a)(b)
	Suction valve unloaders	Charge option	Charge option	9
	Spec 4 valves w/MC1002 corrosion resistant coating	NC	NA	4C*
	Spec 9 valves w/MC1002 corrosion resistant coating	Charge option	NA	9C*
Piston Ring and Packing Material	PTFE piston ring and packing material	Standard	Standard	F
	Same as F with the addition of K-ring spacers	Charge option	Charge option	FK
	Alloy 50 piston rings and packing material	Charge option	Charge option	G
	Same as G with the addition of K-Ring spacers	Charge option	Charge option	GK
	PEEK piston ring and alloy 50 packing material	Charge option	Charge option	H
	Same as H with the addition of K-Ring spacers	Charge option	Charge option	HK
Gasket Material	Aluminum gasket material	Standard		B
	Copper gasket material	No charge option		C
	Iron-lead gasket material	No charge option		D
O-ring Material	Buna-N	Standard		A
	Neoprene®[1]	No charge option		B
	Viton®[1]	Charge option	Charge option	D
	PTFE and Kalrez®[1]			E
Intercooler Connections	Weld flanges only, no intercooler	Standard	NA	F
	Not applicable - single stage compressor, no intercooler	NA	Standard	N
Flywheel	No flywheel supplied	No charge option		N
	Standard flywheel	Standard		S
Protective Coating	Coated cylinder only	Charge option		C
	No coating	Standard		N
	Coating on all necessary wetted parts	Charge option		W*
Piston Rod Coating	Nitride	Standard		N

*Must select Protective Coating Option "W" when selecting valve option "4C", or "9C" for the T791

(a) 1 = up to 200 psi or 2 = above 200 psi (discharge pressure)

(b) 1 = 30 to 70 psi or 2 = 71 to 150 psi or 3 = 151 to 500 psi (discharge pressure)

NA = Not Available NC = No Charge Option

[1]Registered trademarks of the DuPont company.

Appendix B—Vertical Double-Acting Specifications

Equipment Type & Options

Double-acting, vertical, reciprocating piston type compressor Two-stage configuration (model 791 only) Double packed rod (models D791 & D891); triple packed rod (models T791 & T891) Slip-on weld connections

Features & Benefits

Self-lubricating piston rings:	Non-lubricated operation to minimize oil in gas
Multiple materials and configurations:	Versatility for your application
Multiple mounting configurations:	Versatility for your application
High efficiency valves:	Quiet, reliable operation
Reversible oil pump:	Allows operation in either direction
Simplified top down design:	Routine maintenance is minimally invasive

Material Specifications

Part	Standard Material	Optional Material
Head, cylinder, cylinder cap	Ductile iron ASTM A536	
Crosshead guide	Gray iron ASTM A48, Class 30	
Crankcase, flywheel		
Bearing carrier		
Flange	ASTM A36 carbon steel	
Valve seat, bumper	17-7 PH stainless steel	
Valve plate	410 stainless steel	PEEK
Valve spring	17-7 PH stainless steel	
Valve gaskets	Soft aluminum	Copper, iron-lead
Piston	Ductile iron ASTM A536	
Piston rod	1045 steel, Nitrotec	
Crosshead	Ductile iron ASTM A536	
Piston rings	PTFE, glass and moly filled	Alloy 50, PEEK
Piston ring expanders	302 stainless steel	
Packing cartridge and barrel	Ductile iron ASTM A536	
Connecting rod		
Segmented packing rings	Carbon-filled PTFE	
V-ring packing	Filled reinforced PTFE	
Crankshaft	Ductile iron ASTM A536	
Connecting rod bearing	Bimetal SAE 12 babbit	
Wrist pin	C1018 steel or equivalent	
Wrist pin bushing	Bronze SAE J461	
Main bearing	Tapered roller	
Inspection plate	Aluminum	
O-rings	Buna-N	PTFE, Viton®[1], Neoprene®[1]
Retainer rings	Steel	
Miscellaneous gaskets	Rubber compositions	

[1] Registered trademarks of the DuPont company.

Appendix B—Vertical Double-Acting Specifications

Specifications and Performance

Specification	D791	D891	T791	T891
Bore of cylinder, inches (mm) first stage second stage	 6 (152.4) 3.25 (82.5)	 4.5 (113) —	 6 (152.4) 3.25 (82.5)	 4.5 (113) —
Stroke, inches (mm)	4.0 (101.6)	4.0 (101.6)	4.0 (101.6)	4.0 (101.6)
Piston displacement, cfm (m^3/hr) minimum @ 400 RPM maximum @ 900 RPM	 51.2 (87.0) 115.3 (196.0)	 56.6 (96.2) 127.6 (216.8)	 51.2 (87.0) 115.3 (196.0)	 56.6 (96.2) 127.6 (216.8)
Maximum working pressure, psig (bar g) first stage second stage	 350 (24.1) 600 (41.3)	 465 (32.1) —	 350 (24.1) 600 (41.3)	 465 (32.1) —
Maximum brake horsepower, kW	45 (34)	45 (34)	45 (34)	45 (34)
Maximum rod load, lb (kg)	7,000 (3,175.2)	7,000 (3,175.2)	7,000 (3,175.2)	7,000 (3,175.2)
Maximum outlet temperature °F (°C)	350 (177)	350 (177)	350 (177)	350 (177)
Bare unit weight, lb (kg)	900 (408.2)	855 (387.8)	1,060 (480.8)	1,015 (460.4)

791 & 891 Bolt Torque Values

Specification	ft•lb
Connecting rod bolt	40
Bearing carrier	40
Bearing cover	40
Crankcase inspection plate	9
Crosshead guide	65
Cylinder to head[1,2]	65
Valve cover plate bolt	37
Valve holddown screw[2]	40
Piston lock nut torque	150
Piston screw torque (in•lb)	100
Valve cap torque	25

[1]Preliminary tightening—snug all head bolts in the sequence shown. Final torqueing—torque all head bolts in the sequence shown to the listed value.

[2]Retorque to the listed value after 2–5 hours running time.

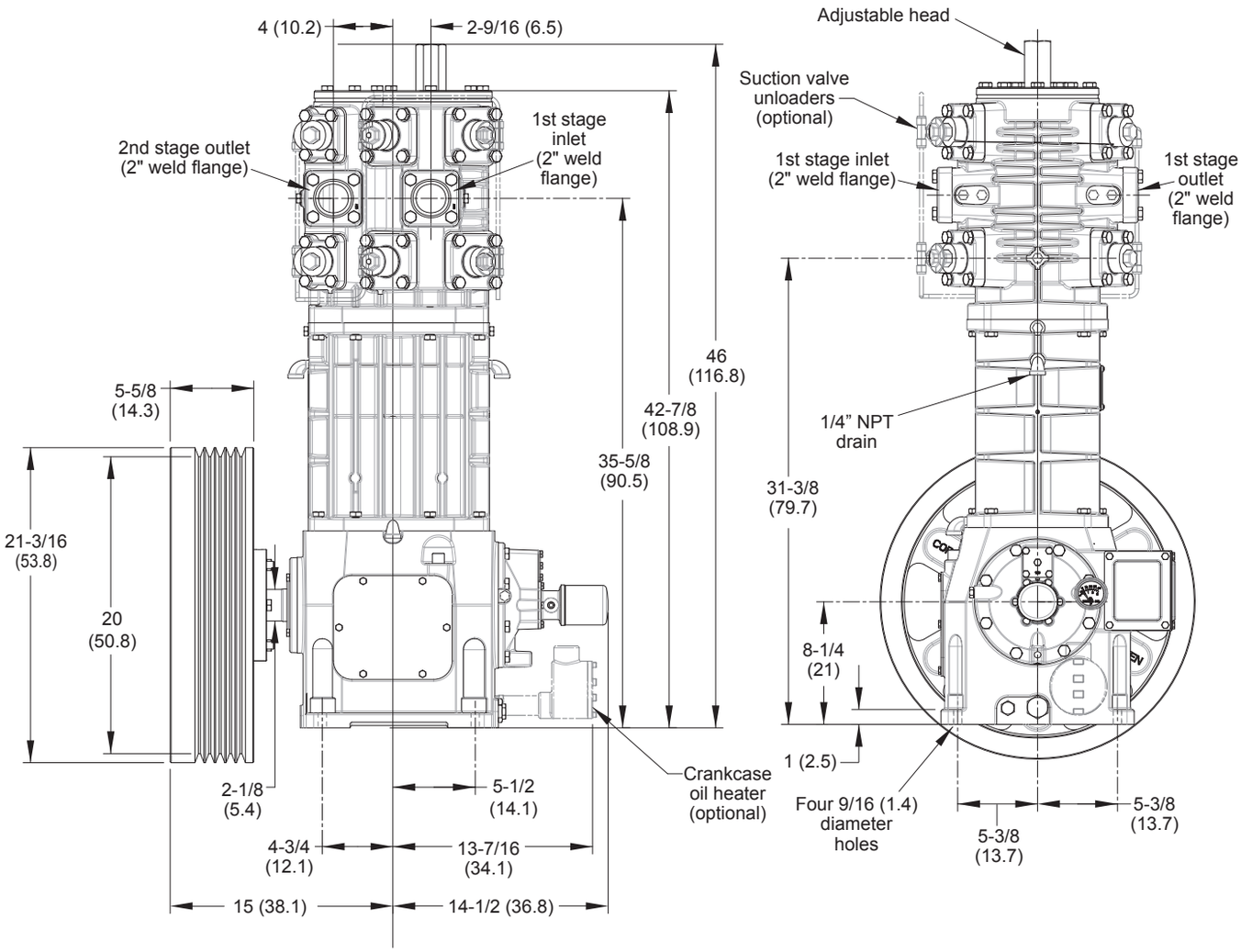
[3]Dimensions for honing are included with new bushings (which must be installed, then honed).

791 & 891 Clearances and Dimensions

Specification	Inches
Piston clearance (see Appendix E)	
Clearance: connecting rod bearing to crankshaft journal	0.0013 0.0033
Clearance: wrist pin to wrist pin bushing (maximum)[3]	0.001
Cylinder bore diameter (maximum)—Single stage 891	4.515
Cylinder bore diameter (maximum)— First stage 791 Second stage 791	 6.018 3.260
Cylinder finish	16–32 RMS
Piston ring radial thickness (minimum) Single stage 891 First stage 791 Second stage 791	 0.082 0.155 0.082
Clearance: oil pump adapter shaft to bushing (maximum)[3]	0.0036
Crankshaft end play (cold)	0.002 0.003
Flywheel runout at O.D. (maximum)	0.020
Clearance: crosshead to crosshead guide bore (maximum)	0.008
Crosshead guide bore finish	32 RMS (limited number of small pits and scratches are acceptable)

Appendix C—Outline Dimensions

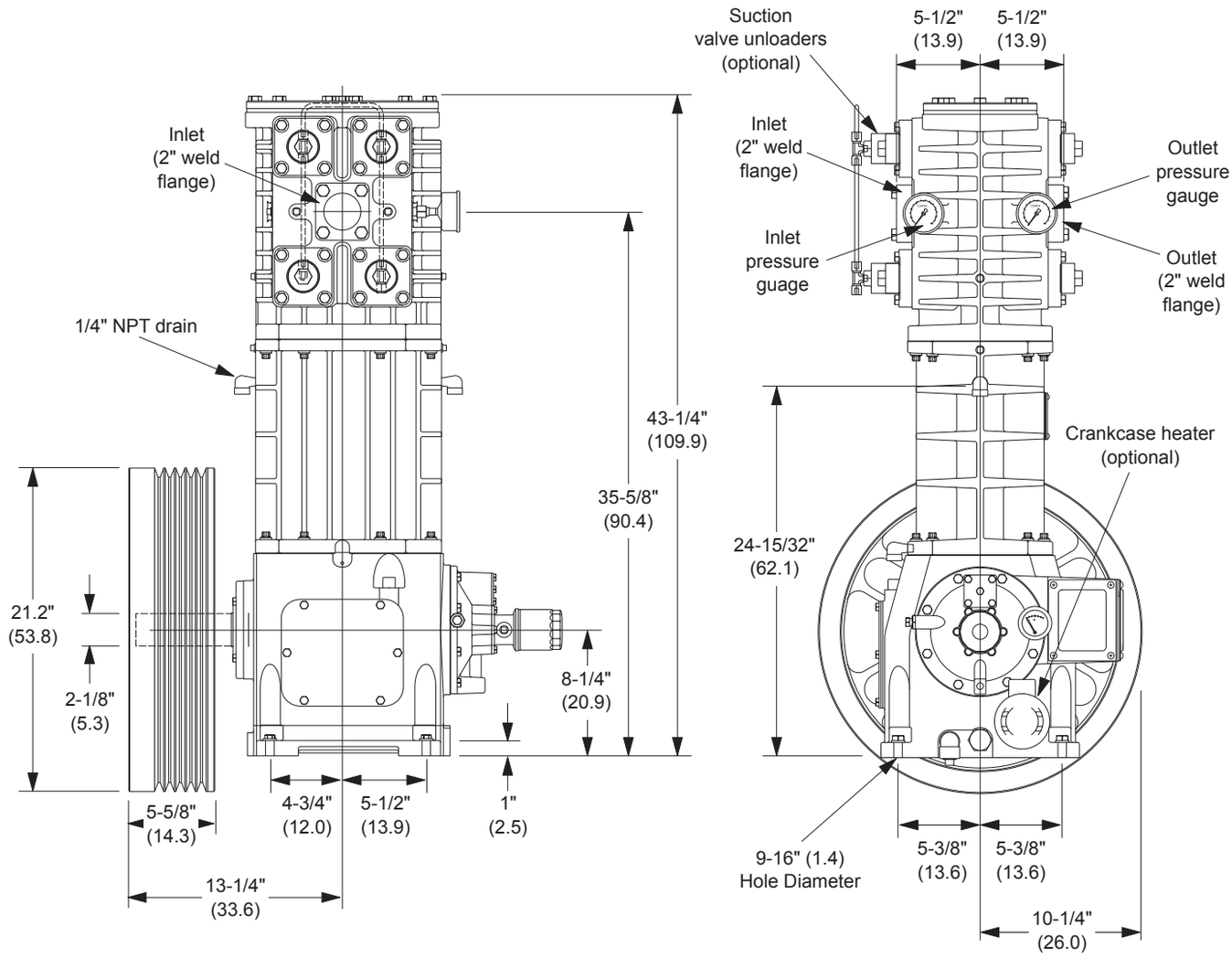
Model D791 (Two Stage) Bare Compressor with Flywheel



Inches (Centimeters)

Appendix C—Outline Dimensions

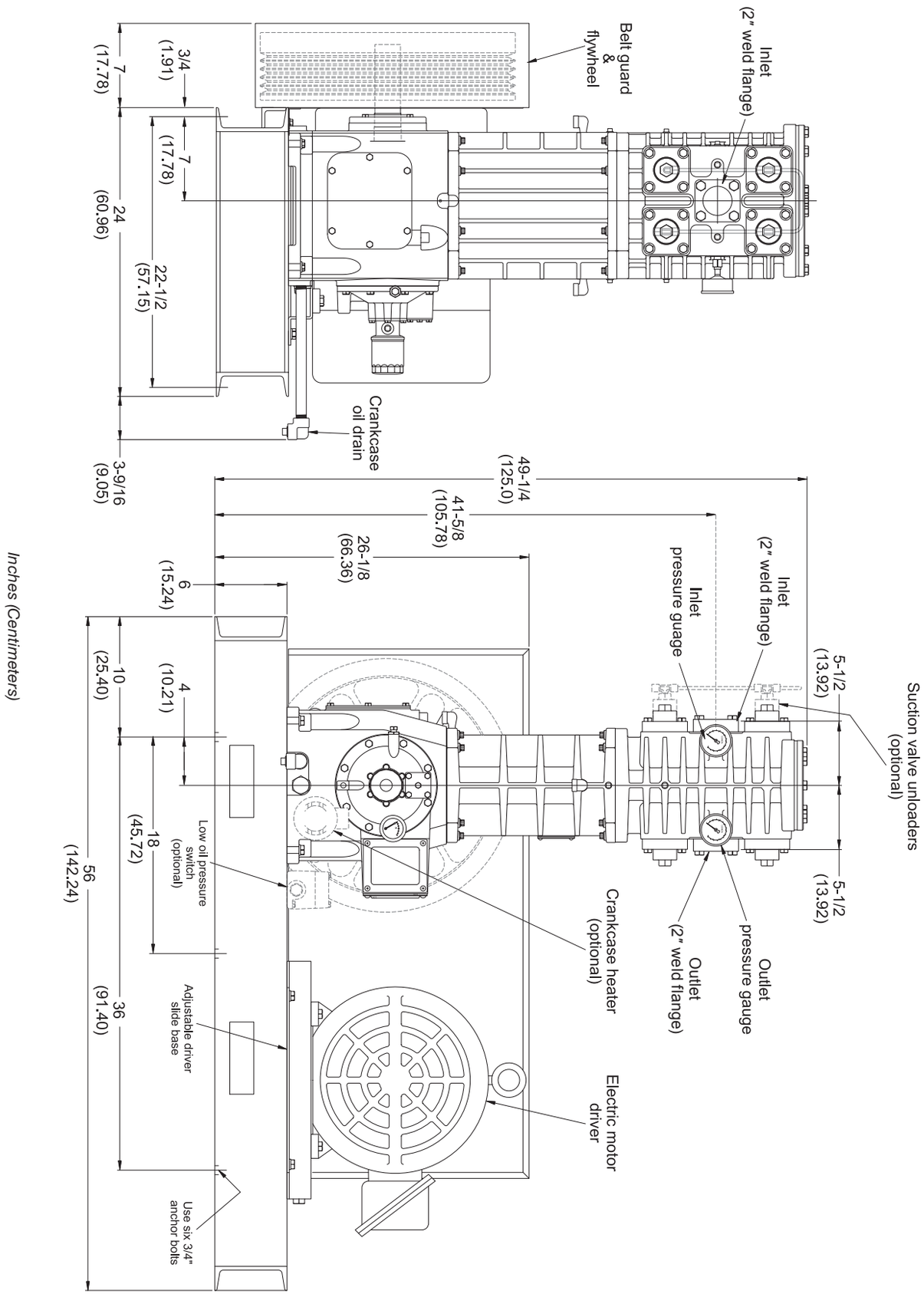
Model D891 (Single Stage) Bare with Flywheel



Inches (Centimeters)

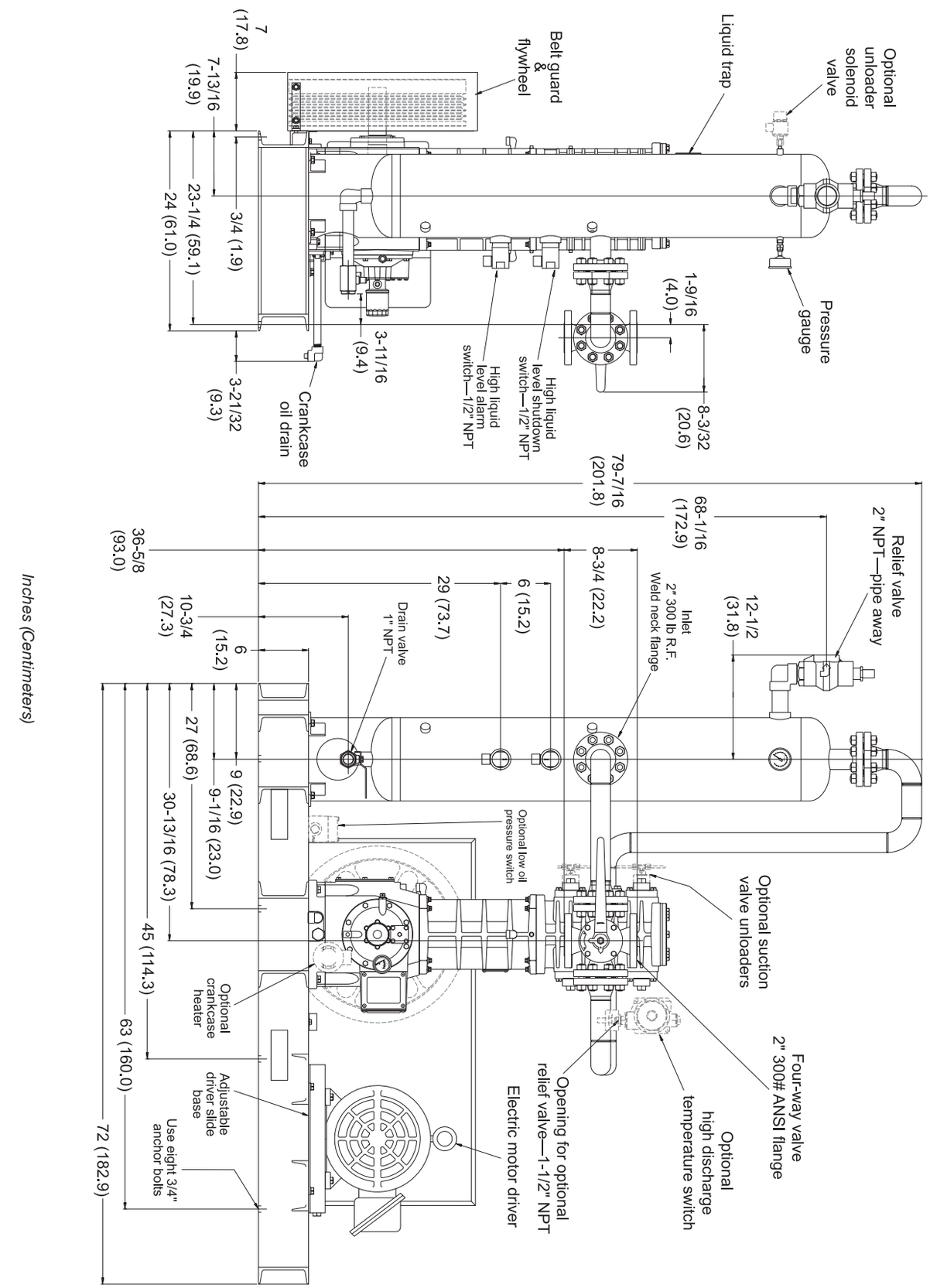
Appendix C—Outline Dimensions

Model D891 (Single Stage) with 103 Mounting



Appendix C—Outline Dimensions

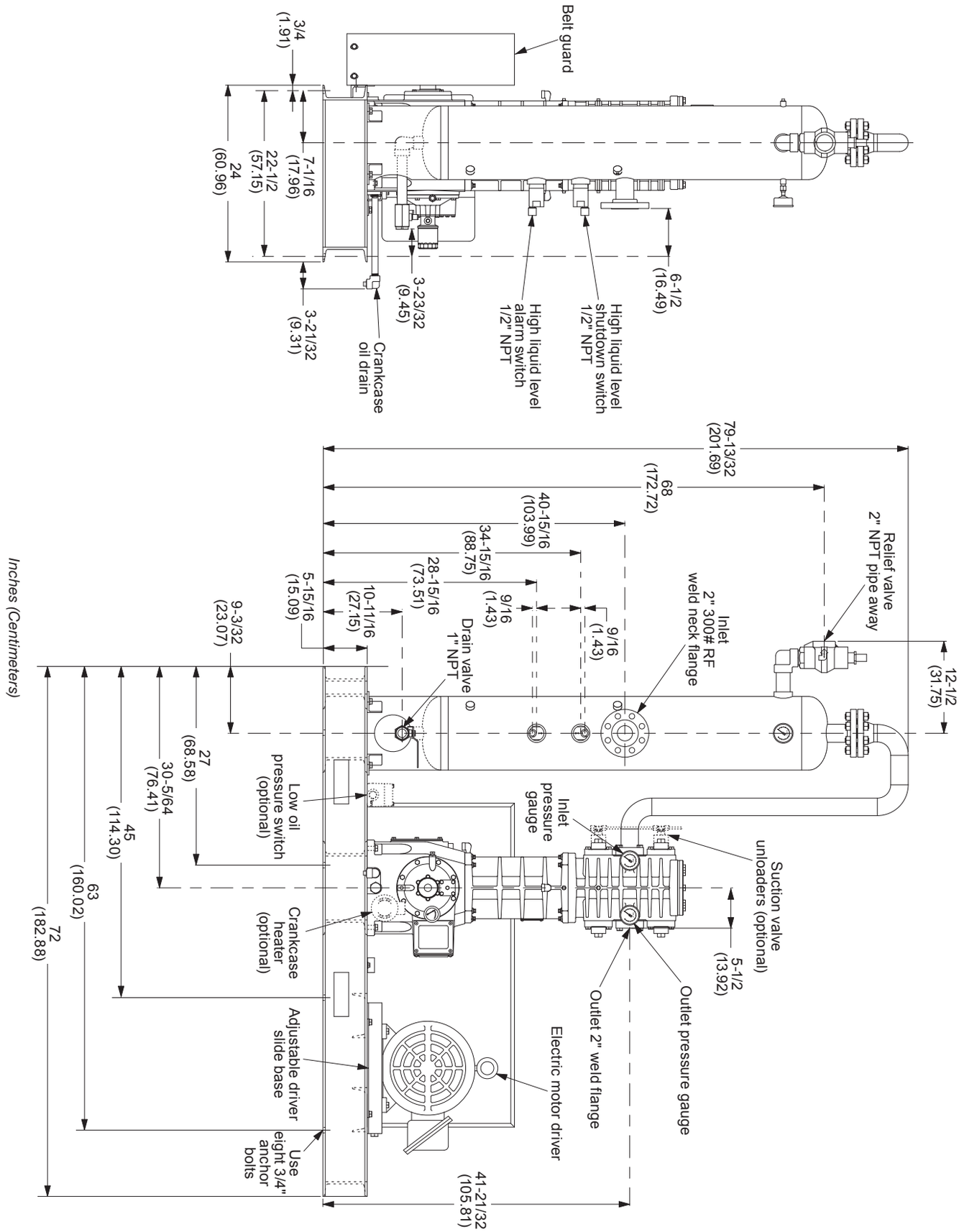
Model D891 (Single Stage) with 107B Mounting



Inches (Centimeters)

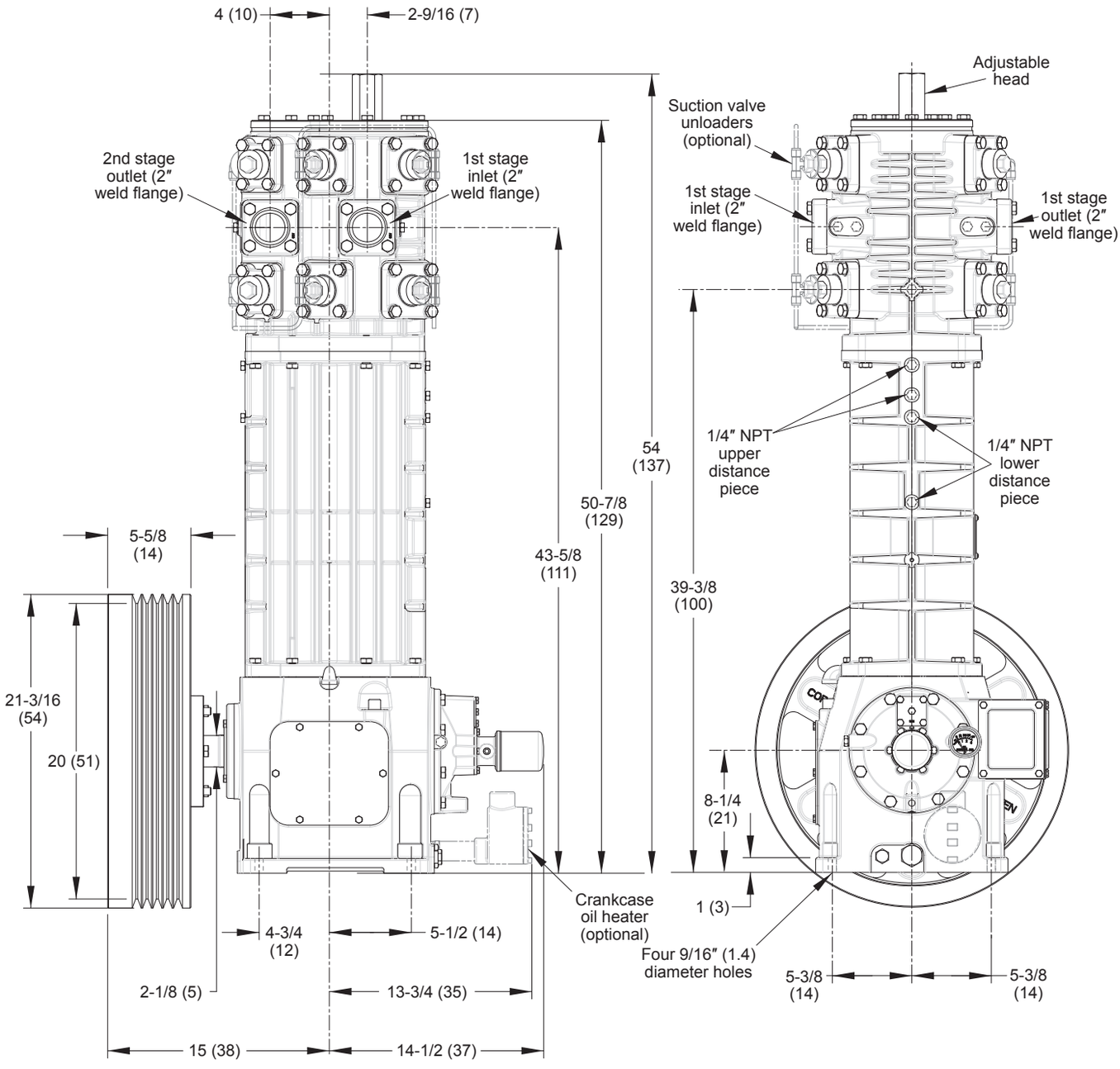
Appendix C—Outline Dimensions

Model D891 (Single Stage) with 109B Mounting



Appendix C—Outline Dimensions

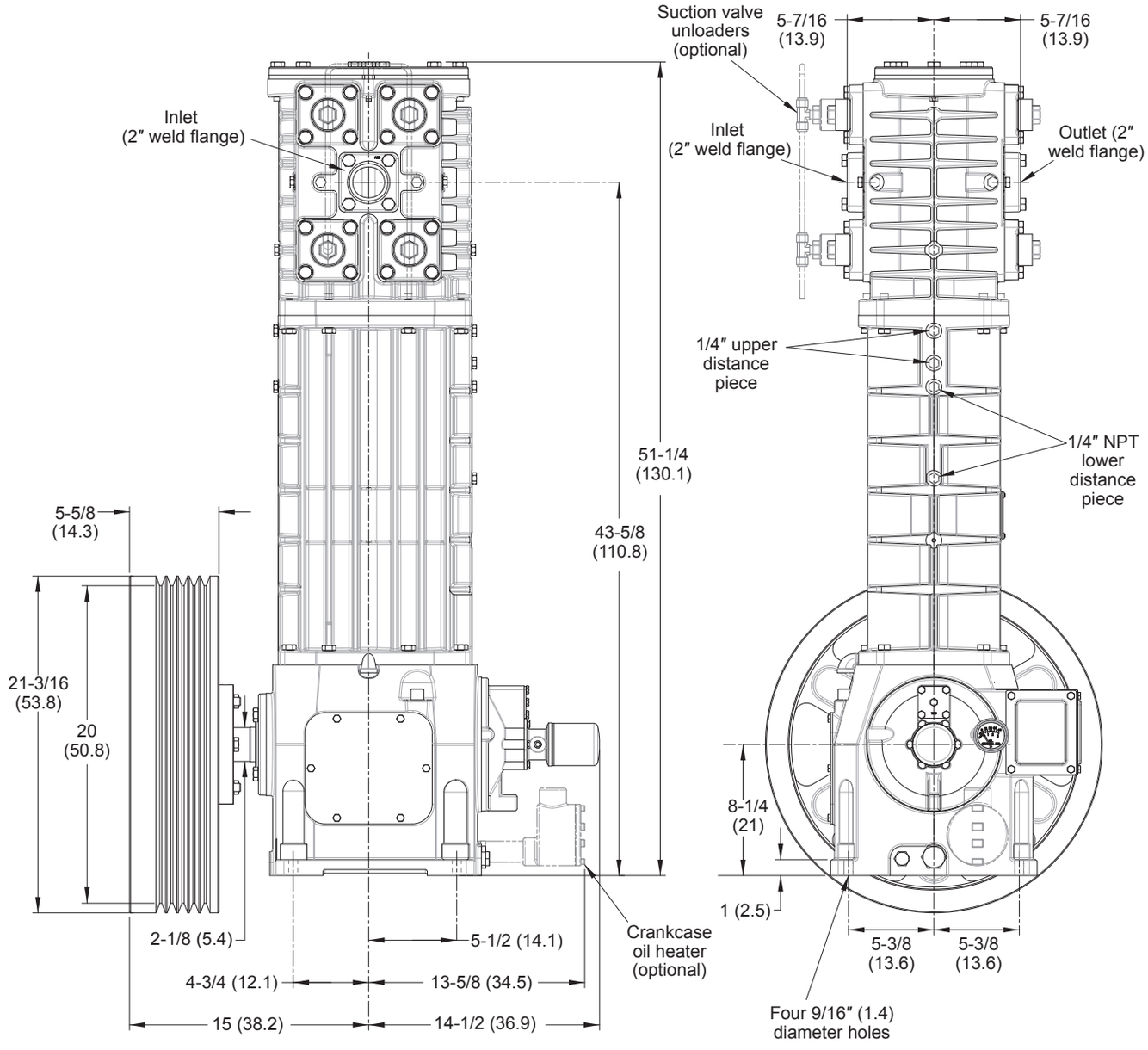
Model T791 (Two Stage) Bare Compressor with Flywheel



Inches (Centimeters)

Appendix C—Outline Dimensions

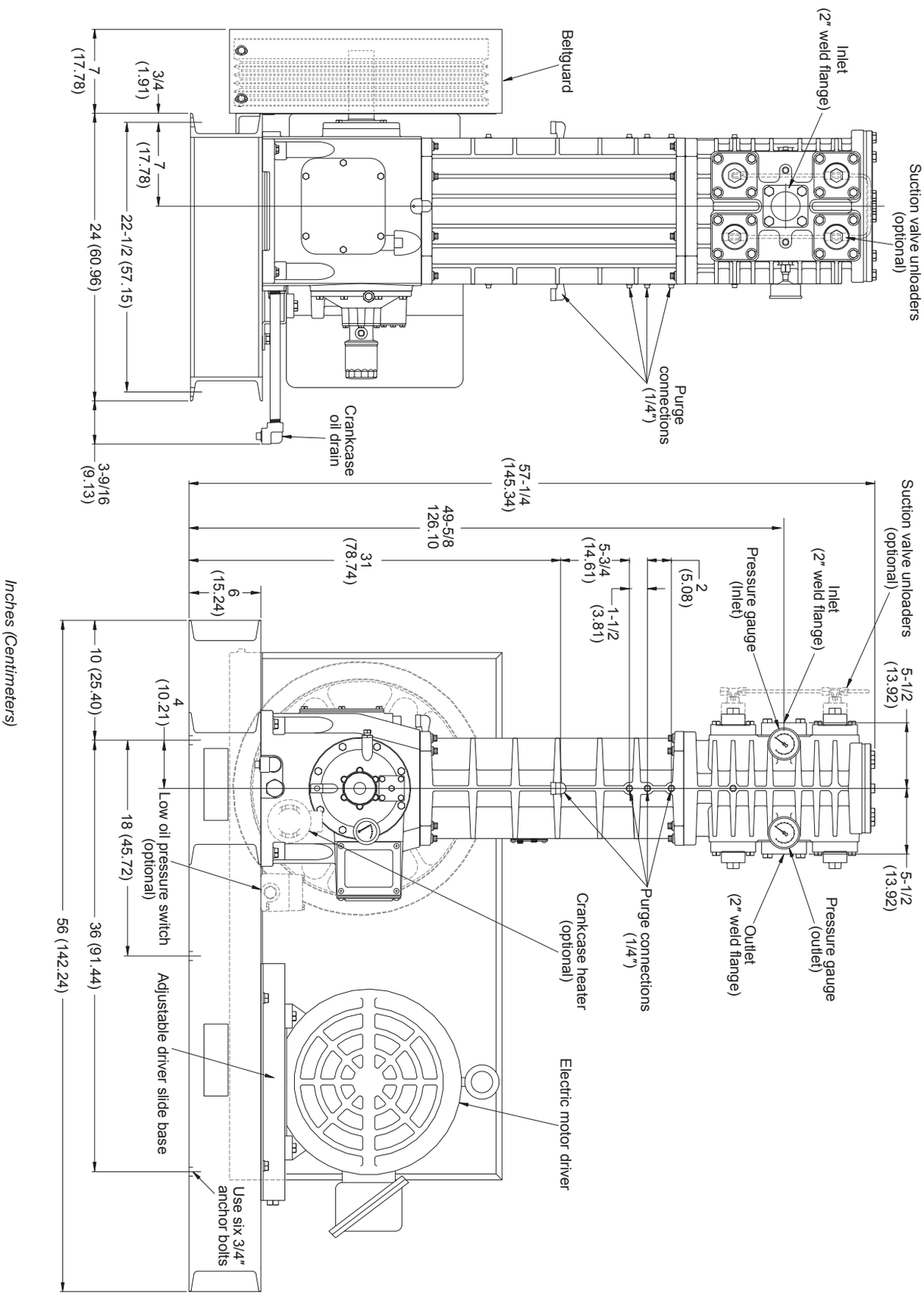
Model T891 (Single Stage) Bare Compressor with Flywheel



Inches (Centimeters)

Appendix C—Outline Dimensions

Model T891 (Single Stage) with 103 Mounting



Appendix D—Troubleshooting

In most cases, problems with your Corken gas compressor can be solved quite simply. This chart lists some of the more frequent problems that occur with reciprocating compressors along with a list of possible causes. If you are having a problem which is not listed, or if you cannot find the source of the problem, consult the factory.

Problem	Possible Cause
Low capacity	1, 2, 3, 4, 8, 15, 17
Overheating	1, 2, 3, 5, 6, 11, 16
Knocks, rattles and noise	1, 7, 9, 10, 11, 15
Oil in cylinder	8, 12, 15
Abnormal piston-ring wear	1, 3, 5, 6, 11, 15, 16
Product leaking through crankcase breather	8, 15
Product leakage	4, 8, 15, 17
Oil leakage around compressor base	17, 18, 19, 20
No oil pressure	19, 20
Excessive vibration	1, 7, 9, 10, 11, 13, 14, 28
Motor overheating or starter tripping out	21, 22, 23, 24, 25, 26, 27, 28

Ref.	Possible Causes	What To Do
1.	Valves broken, stuck or leaking	Inspect and clean or repair
2.	Piston ring worn	Inspect and replace as necessary
3.	Inlet strainer clogged	Clean or replace screen as necessary
4.	Leaks in piping	Inspect and repair
5.	Inlet or ambient temperature too high	Consult factory
6.	Compression ratio too high	Check application and consult factory
7.	Loose flywheel or belt	Tighten
8.	Worn piston-rod packing	Replace
9.	Worn wrist-pin or wrist-pin bushing	Replace
10.	Worn connecting-rod bearing	Replace
11.	Unbalanced load	Inspect valve or consult factory
12.	Oil in distance piece	Tighten packing nut — drain weekly
13.	Inadequate compressor base	Strengthen, replace or grout
14.	Improper foundation or mounting	Tighten mounting or rebuild foundation
15.	Loose valve, piston or packing	Tighten or replace as necessary
16.	Dirty cooling fins	Clean weekly
17.	4-way control valve not lubricated	Inspect and lubricate
18.	Leaking gas blowing oil from crankcase	Tighten packing
19.	Bad oil seal	Replace
20.	No oil in crankcase	Add oil
21.	Oil-pump malfunction	See oil pressure adjustment
22.	Low voltage	Check line voltage with motor nameplate. Consult power company
23.	Motor wired wrong	Check wiring diagram
24.	Wire size too small for length of run	Replace with correct size
25.	Wrong power characteristics	Voltage, phase and frequency must coincide with motor nameplate. Consult with power company.
26.	Wrong size of heaters in starter	Check and replace according to manufacturer's instructions
27.	Compressor overloading	Reduce speed
28.	Motor shorted out	See driver installation
29.	Bad motor bearing	Lubricate according to manufacturer's instructions

Two-Stage Compressor Troubleshooting

Two-stage compressors can have problems that never occur with single-stage machines. Interstage pressure is an important indicator of the condition of a two-stage compressor.

If interstage pressure is too high:

1. Second stage valves may be broken or leaking.
2. Second stage piston rings may be worn.

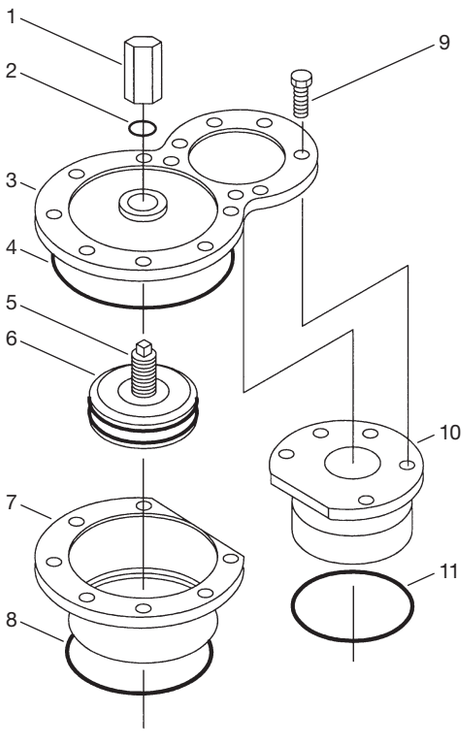
If interstage pressure is too low:

1. First stage valves may be broken or leaking.
2. First stage piston rings may be worn.

Another cause for high interstage pressure is a low compression ratio. Two-stage machines should not be used in applications where the compression ratio is below 5. To use two-stage compressors in this kind of situation results in rapid ring wear, machine imbalance and excessive horsepower. If you think you have a problem in this area, consult factory.

Appendix E—D791 and T791 Head and Valve Holddown Assembly Details

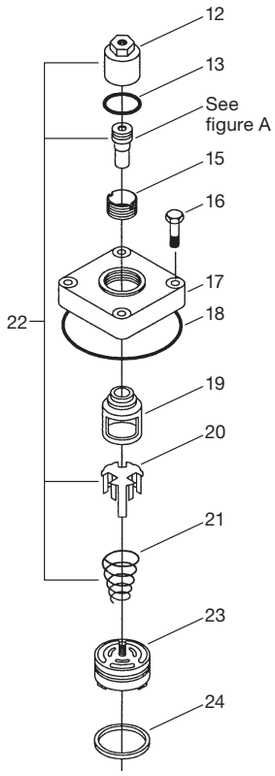
Head



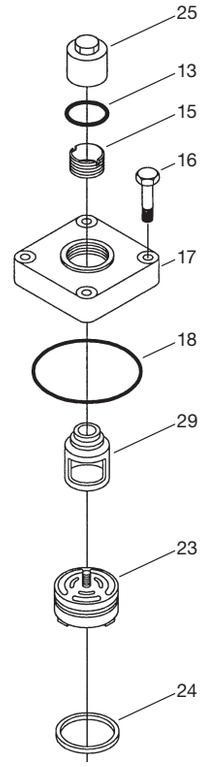
CAUTION: Always relieve pressure in the unit before attempting any repairs.

First Stage Holddown Assembly (6")

Suction with Unloader

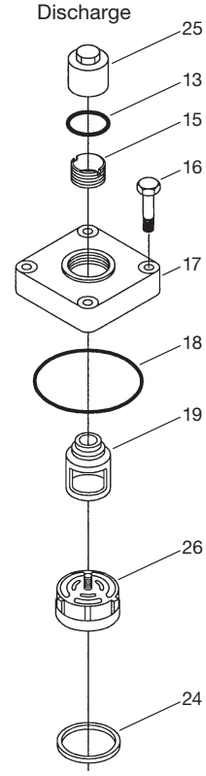


Suction (Standard)



First Stage Holddown Assembly (6")

Discharge



Unloader Piston Assembly Details

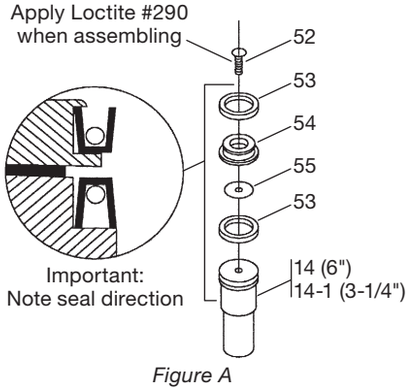
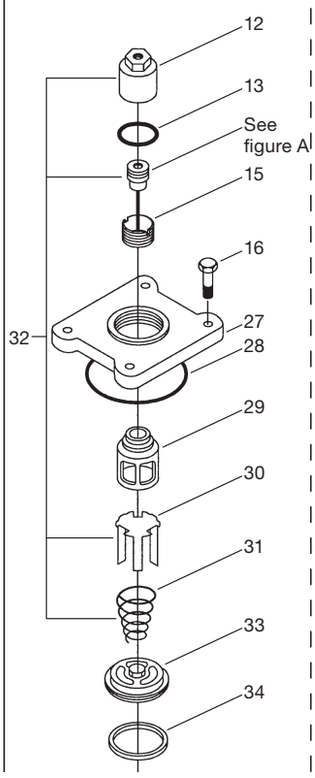


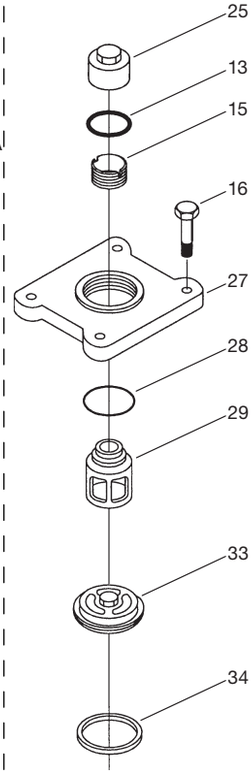
Figure A

Second Stage Holddown Assembly (3-1/4")

Suction with Unloader

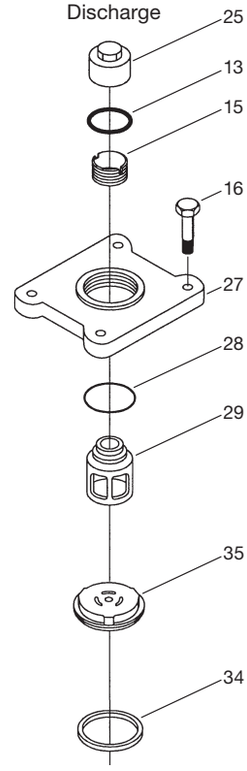


Suction (Standard)



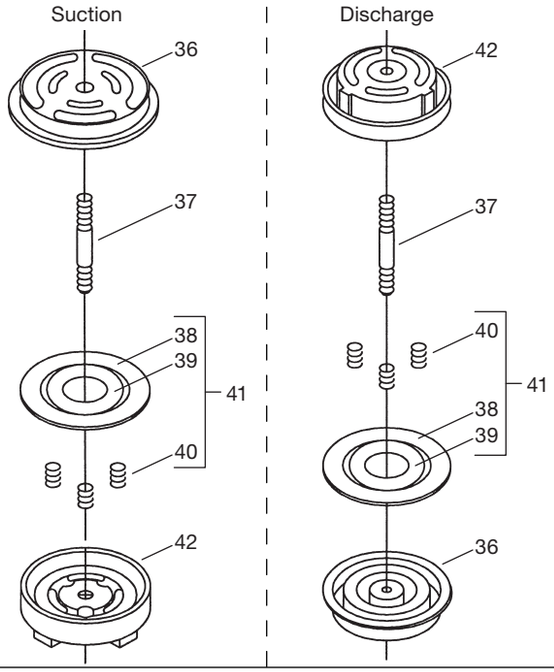
Second Stage Holddown Assembly (3-1/4")

Discharge

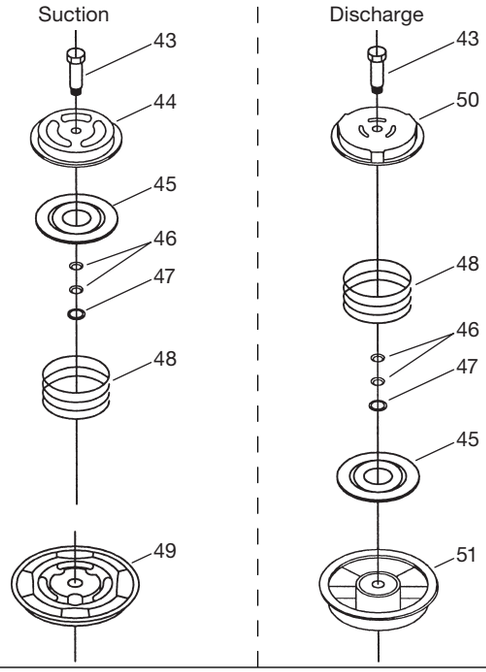


Appendix E—D791 and T791 Head and Valve Holddown Assembly Details

First Stage Valve Assembly (6")



Second Stage Valve Assembly (3-1/4")



Ref No.	Part No.	Description
1.	3665	Adjusting screw nut
2.	2-127_[a]	O-ring
3.	3867	Cylinder cap
4.	2-250_[a]	O-ring
5.	3663	Adjusting cup
6.	2-248_[a]	O-ring
7.	3876	Cylinder head (6")
8.	2-258	O-ring
9.	7001-050-NC150A	Bolt (1/2–13x1-1/2" hex hd gr 5)(Torque to 65 ft•lbs)
10.	3877	Cylinder head (3-1/4")
11.	2-236_[a]	O-ring
12.	2598-1[c]	Unloader cap
13.	2-031_[a]	O-ring
14.	3696[c]	Unloader piston (6")
14-1.	2618[c]	Unloader piston (3-1/4")
15.	2715	Holddown screw
16.	7001-043-NC150A	Bolt (7/16–14x1-1/2" hex hd)(Torque to 37 ft•lbs)
17.	1764	Valve cover plate
18.	2-235_[a]	O-ring
19.	3570-1	Valve cage
20.	3694[c]	Actuator
21.	3695[c]	Spring
22.	3694-X	Unloader assembly (6")
23.	3732-X	Suction valve assembly (6")
24.	2114[b]	Valve gasket
25.	2714-1	Valve cap
26.	3733-X	Discharge valve assembly (6")
27.	2205	Valve cover plate
28.	2-143_[a]	O-ring
29.	3569	Valve cage
30.	3689[c]	Actuator

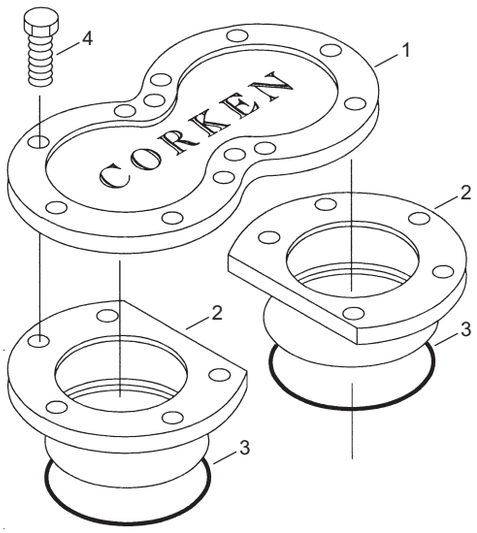
Ref No.	Part No.	Description
31.	3690[c]	Spring
32.	3689-X	Unloader assembly (3-1/4")
33.	2438-X	Suction valve assembly (3-1/4")
34.	1418-2[b]	Valve gasket
35.	2439-X	Discharge valve assembly (3-1/4")
36.	3827	Valve seat (6")
37.	3828	Stud
38.	3830[d]	Outer valve plate
39.	3831[d]	Inner valve plate
40.	3829[d]	Spring
41.	3805-X1	Valve repair kit
42.	3826	Valve bumper (6")
43.	2446	Bolt
44.	2438	Suction valve seat (3-1/4")
45.	2442	Valve plate
46.	2445[e]	Spacer (two per valve)
47.	3355	Washer
48.	1407	Spring
49.	2440	Suction valve bumper (3-1/4")
50.	2441	Discharge valve bumper (3-1/4")
51.	2439	Discharge valve seat (3-1/4")
52.	1910[c]	Bolt
53.	2619-X[c]	Unloader piston seal assembly
54.	2857[c]	Unloader piston cap
55.	2858[c]	Gasket

[a] _ denotes O-ring code. See O-ring chart for details.
[b] Included with valve assembly.
[c] Included with unloader assembly.
[d] Included with valve repair kit.
[e] Install spacers back to back.
[f] Registered trademark of the DuPont company.

O-ring Code	
A	Buna-N
B	Neoprene®[f]
D	Viton®[f]
E	PTFE
K	Kalrez®[f]

Appendix E—D891 and T891 Head and Valve Holddown Assembly Details

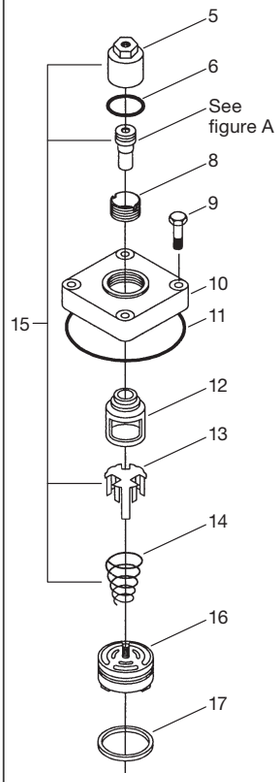
Head



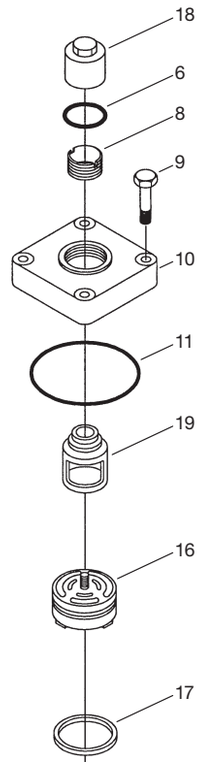
CAUTION: Always relieve pressure in the unit before attempting any repairs.

Holddown Assembly (4-1/2")

Suction with Unloader

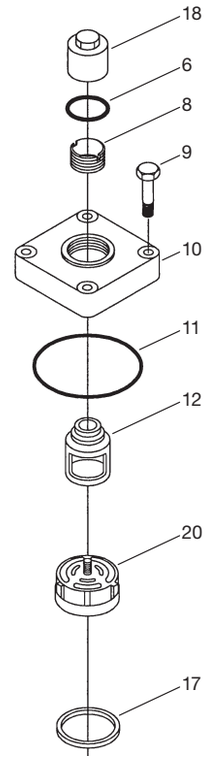


Suction (Standard)



Holddown Assembly (4-1/2")

Discharge



Unloader Assembly Part Details

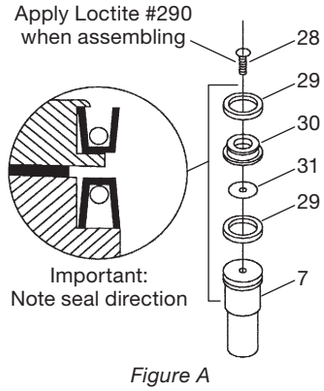
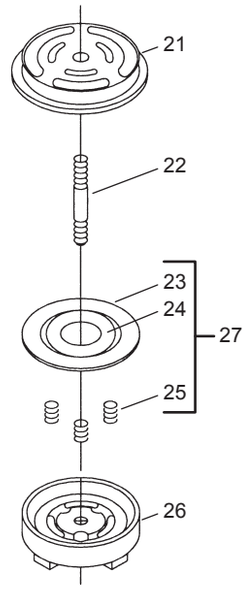


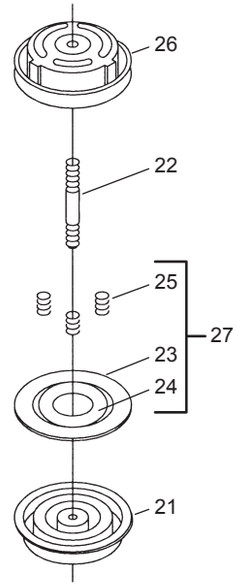
Figure A

Valve Assemblies (4-1/2")

Suction Valve



Discharge Valve



Appendix E—D891 and T891 Head and Valve Holddown Assembly Details

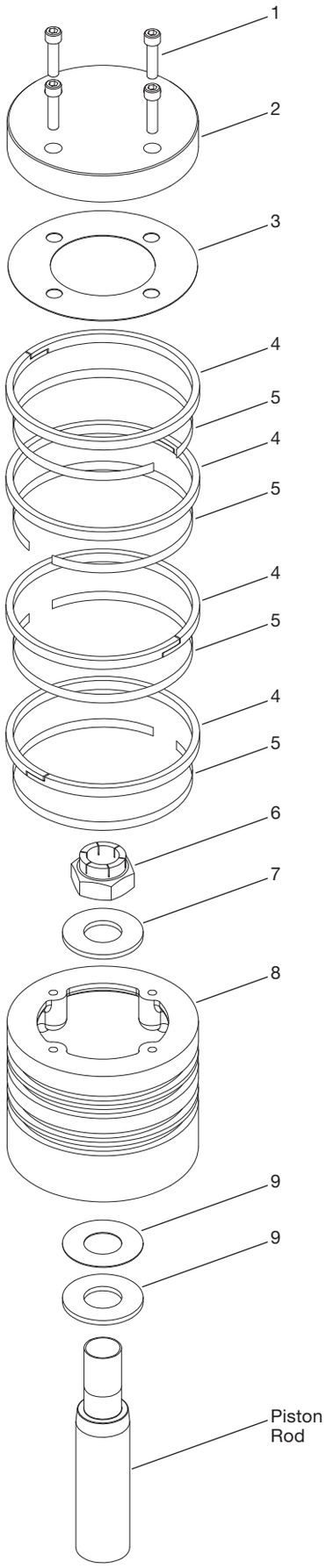
Compressor Head and Valve Bill of Materials

Ref No.	Part No.	Description
1.	3923	Cylinder cap
2.	3924	Cylinder head (4-1/2")
3.	2-246__[a]	O-ring
4.	7001-050 NC150A	Bolt (1/2 - 13 x 1-1/2" hex head Gr 5) (Torque to 65 ft•lbs)
5.	2598-1[c]	Unloader cap
6.	2-031__[a]	O-ring
7.	3696[c]	Unloader piston
8.	2715	Holddown screw
9.	7001-043 NC150A	Bolt (7/16 - 14 x 1-1/2" hex head)(Torque to 37 ft•lbs)
10.	1764	Valve cover plate
11.	2-235__[a]	O-ring
12.	3570-1	Valve cage
13.	3694[c]	Actuator
14.	3695[c]	Spring
15.	3694-X	Unloader assembly (4-1/2")
16.	3732-X	Suction valve assembly (4-1/2")
17.	2114[b]	Valve gasket
18.	2714-1	Valve cap
19.	3569	Valve cage
20.	3733-X	Discharge valve assembly (4-1/2")
21.	3827	Valve seat (4-1/2")
22.	3828	Stud
23.	3830[d]	Valve plate (outer)
24.	3831[d]	Valve plate (inner)
25.	3829[d]	Spring
26.	3826	Valve bumper (4-1/2")
27.	3805-X1	Valve repair kit
28.	1910[c]	Bolt
29.	2619-X[c]	Unloader piston seal assembly
30.	2857[c]	Unloader piston cap
31.	2858[c]	Gasket

[a]_ denotes O-ring code. See O-ring chart below for details.
[b]Included with valve assembly
[c]Included with unloader assembly
[d]Included with valve repair kit.
[e]Registered trademark of the DuPont company.

O-ring Code	
A	Buna-N
B	Neoprene®[e]
D	Viton®[e]
E	PTFE
K	Kalrez®[e]

Appendix E—D791, T791, D891 and T891 Piston Assembly Details



Piston Assembly Bill of Materials

Ref. No.	Part No.			Description	Qty
	D/T791 1st Stage 3879-X1 (6")	D/T791 2nd Stage 3884-X1 (3-1/4")	D/T891 3925-X1 (4-1/2")		
1.	7002-025-TP100A	7002-010-TP100A	7002-025-TP100A	Screw, orlo gr. 8 (torque to 100 in•lbs)	4
2.	3562[a]	3561[a]	3927[a]	Piston cap	1
3.	3625	3731	2902	Shim washer (thick)	As req.
	3625-1	3731-1	2902-1	Shim washer (thin)	
4.	1752	1756	1739	Piston rings	4
	1752-2	1756-4	1739-2	Alloy 50 rings (opt.)	
	1752-3	1756-3	1739-3	Peek rings (opt.)	
5.	1753	1757	1740	Expander ring	4
6.	3604			Lock nut (torque to 150 ft•lbs)	1
7.	3730			Thrust washer	2
8.	3879[a] (6" diameter)	3884[a] (3-1/4" diameter)	3925[a] (4-1/2" diameter)	Piston	1
9.	3603			Shim washer (thick)	As req.
	3603-1			Shim washer (thin)	
10.	3812 (not shown)			Loctite tube (620)	1

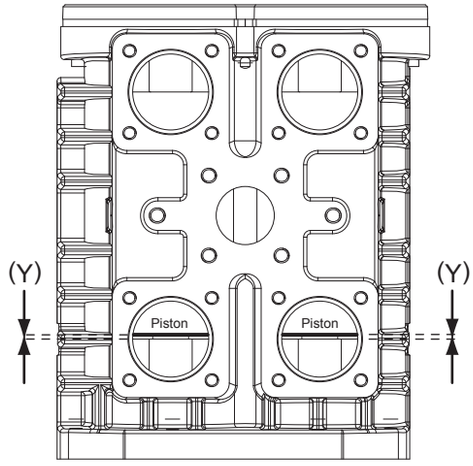
[a]MC1002 coated piston and cap available. Add "C" to end of a standard part number (e.g. 3562C)

Piston Clearance (Cold)

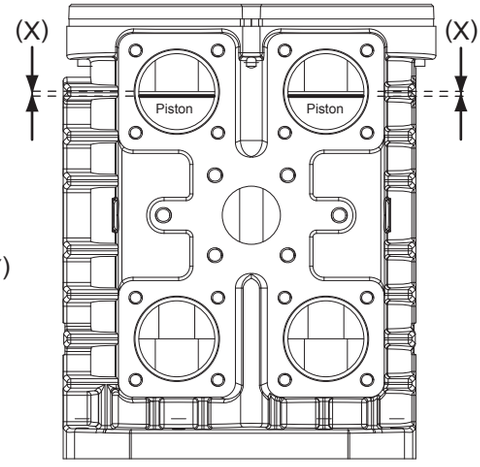
Model	(Y) Bottom Min.[c]	(Y) Bottom Max.[c]	(X) Top Min.[b]	(X) Top Max.[b]
D791/D891	0.010" (0.25 mm)	0.020" (0.50 mm)	0.084" (2.13 mm)	0.104" (2.64 mm)
T791/T891	0.005" (0.13 mm)	0.015" (0.38 mm)	0.089" (2.26 mm)	0.109" (2.77 mm)

[b]The distance from the bottom of the head to the top of the piston.
[c]The distance from the bottom of the piston to the top of the packing barrel.

CAUTION: Always relieve pressure in the unit before attempting any repairs.

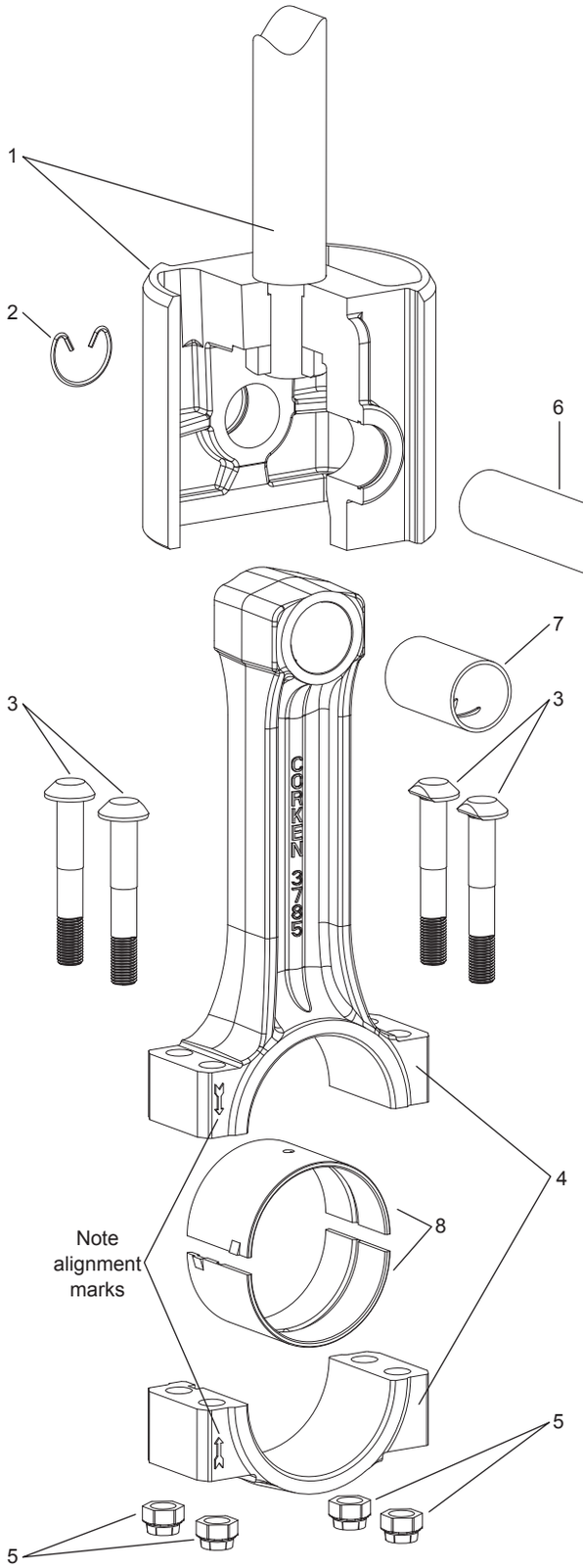


Piston bottom dead center



Piston top dead center

Appendix E—D791, T791, D891 and T891 Connecting Rod and Crosshead Assembly Details



Connecting Rod and Crosshead Assembly Bill of Materials

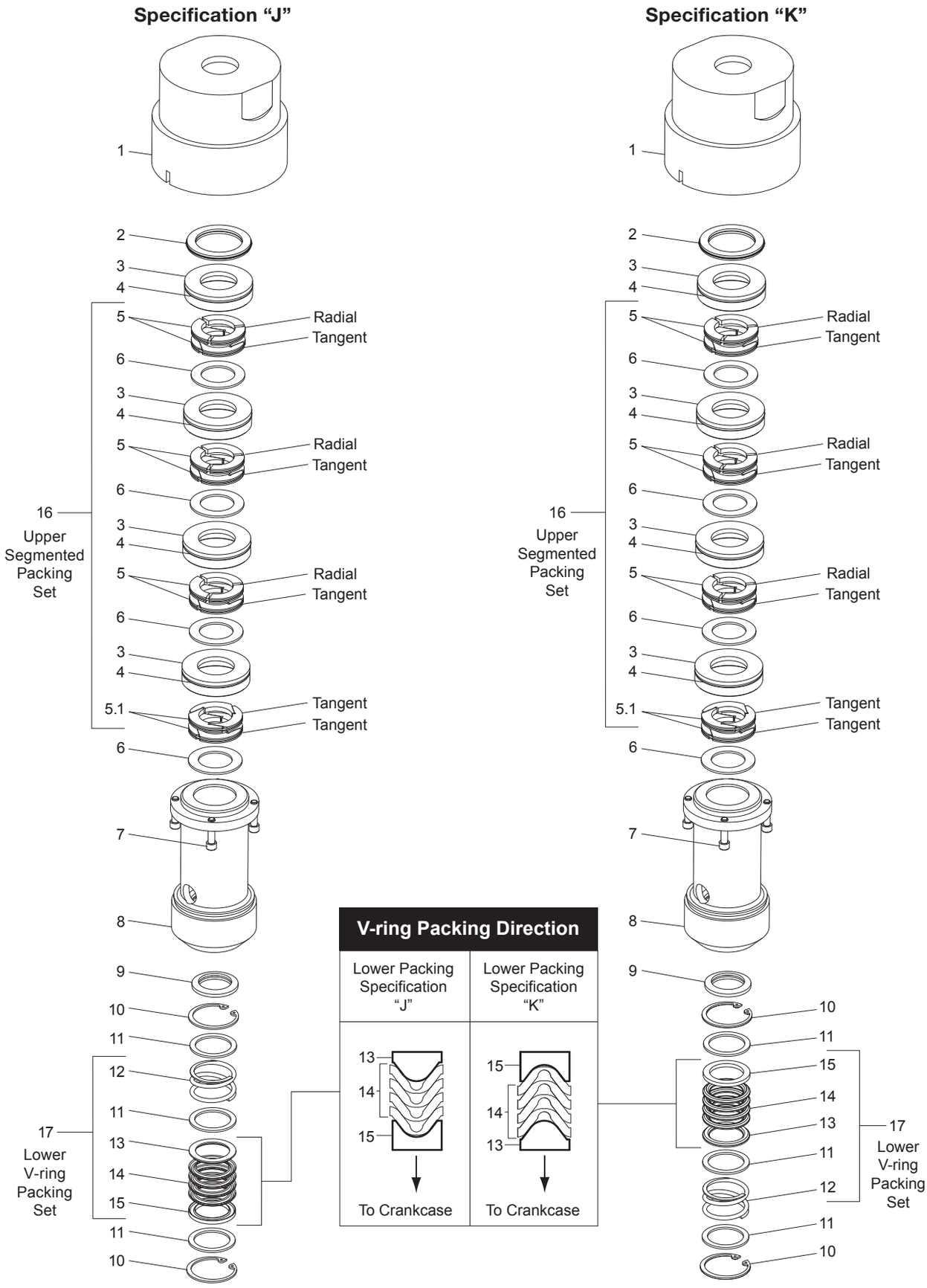
Ref No.	Part No.	Description
1.	3544-X3	Crosshead assembly (D791, D891)
	3544-X9	Crosshead assembly (T791, T891)
	3544-X10	Crosshead assembly—coated piston rod (T791, T891)
2.	3590	Retainer ring
3.	1726[b]	Bolt
4.	3785-X1	Connecting rod assembly
	3785[a,d]	Connecting rod
5.	1727[a,b]	Nut
6.	3540	Wrist pin
7.	3541[a,c]	Wrist pin bushing
8.	3542[a]	Connecting rod bearing

[a]Included with connecting rod assembly
[b]Torque connecting rod nut to 40 ft. lbs.
[c]Must be rebored after replacing (1.1258/1.1254 dia.)
[d]Not sold separately

Never attempt to separate the piston rod and crosshead. When repair becomes necessary, the entire crosshead assembly must be replaced.

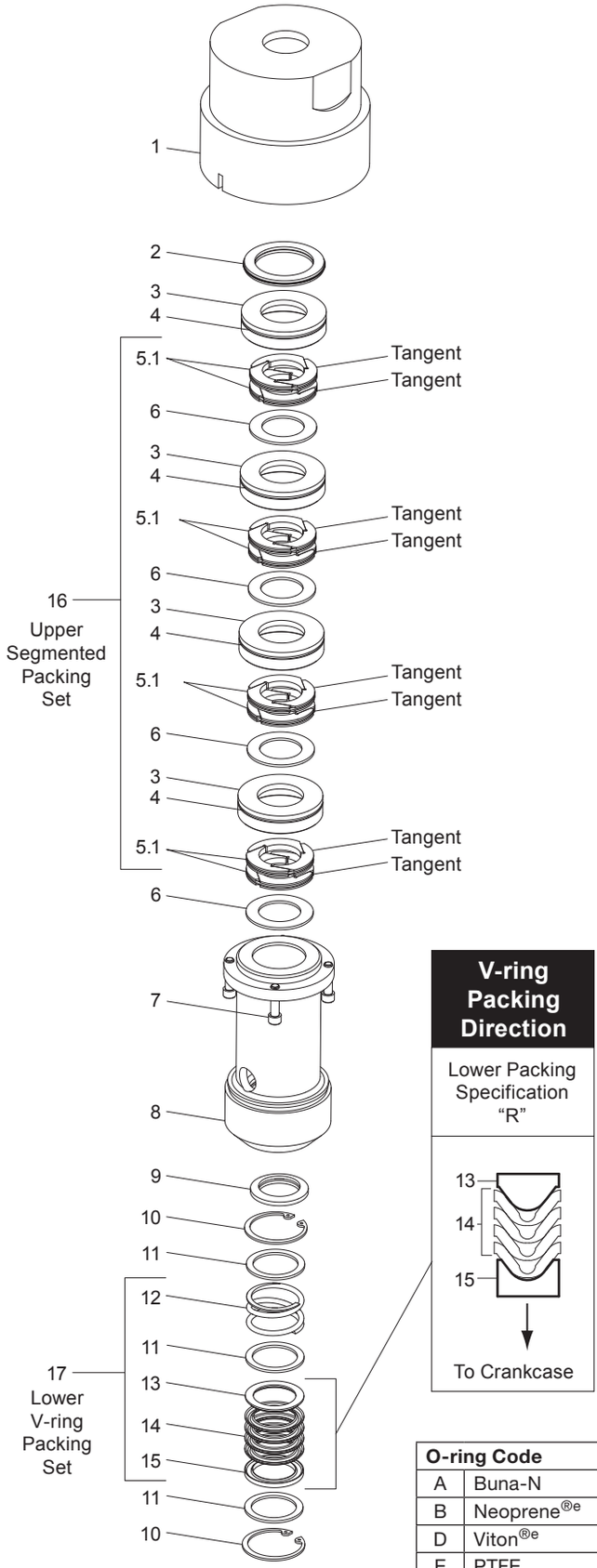
CAUTION: Always relieve pressure in the unit before attempting any repairs.

Appendix E—D791 and D891 Packing Assembly Details



Appendix E—D791 and D891 Packing Assembly Details

Specification “R”



O-ring Code	
A	Buna-N
B	Neoprene®[e]
D	Viton®[e]
E	PTFE
K	Kalrez®[e]

Packing Assembly Bill of Materials

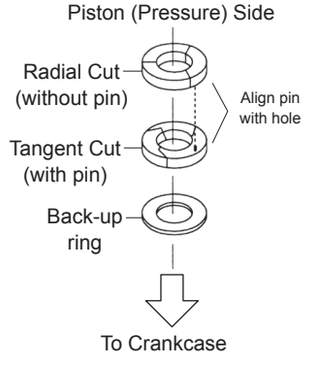
Ref No.	Part No.	Description
1.	3886	Packing barrel (3-1/4")(791 second stage)
	3887	Packing barrel (6")(791 first stage)
	3926	Packing barrel (4-1/2")(891 only)
2.	3906	Crush gasket
3.	3817	Packing cup (Not included in 3810-X1 packing set)
4.	2-036_[a,c,d]	Cup O-ring
5.	3810	Segmented packing (radial—tangent) pair
5.1.	3814	Segmented packing (tangent—tangent) pair
6.	3811	Back-up ring
7.	7002-025OC100A	Screw (1/4-20 x 1" socket head)
8.	3885	Cartridge
9.	1732[b]	Oil deflector ring
10.	5000-175	Retainer ring
11.	1728	Washer
12.	1731	Spring
13.	1724	Male packing ring
14.	1725	V-ring packing
15.	1723	Female packing ring
16.	3810-X1[d]	Segmented packing set
17.	1725-2X	V-ring packing set

Identification of Packing Specification

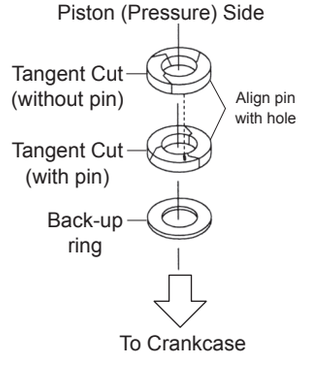
Example: Model Number D891 K M4FBA

Packing Spec.

Segmented Packing for Specification “J” & “K”



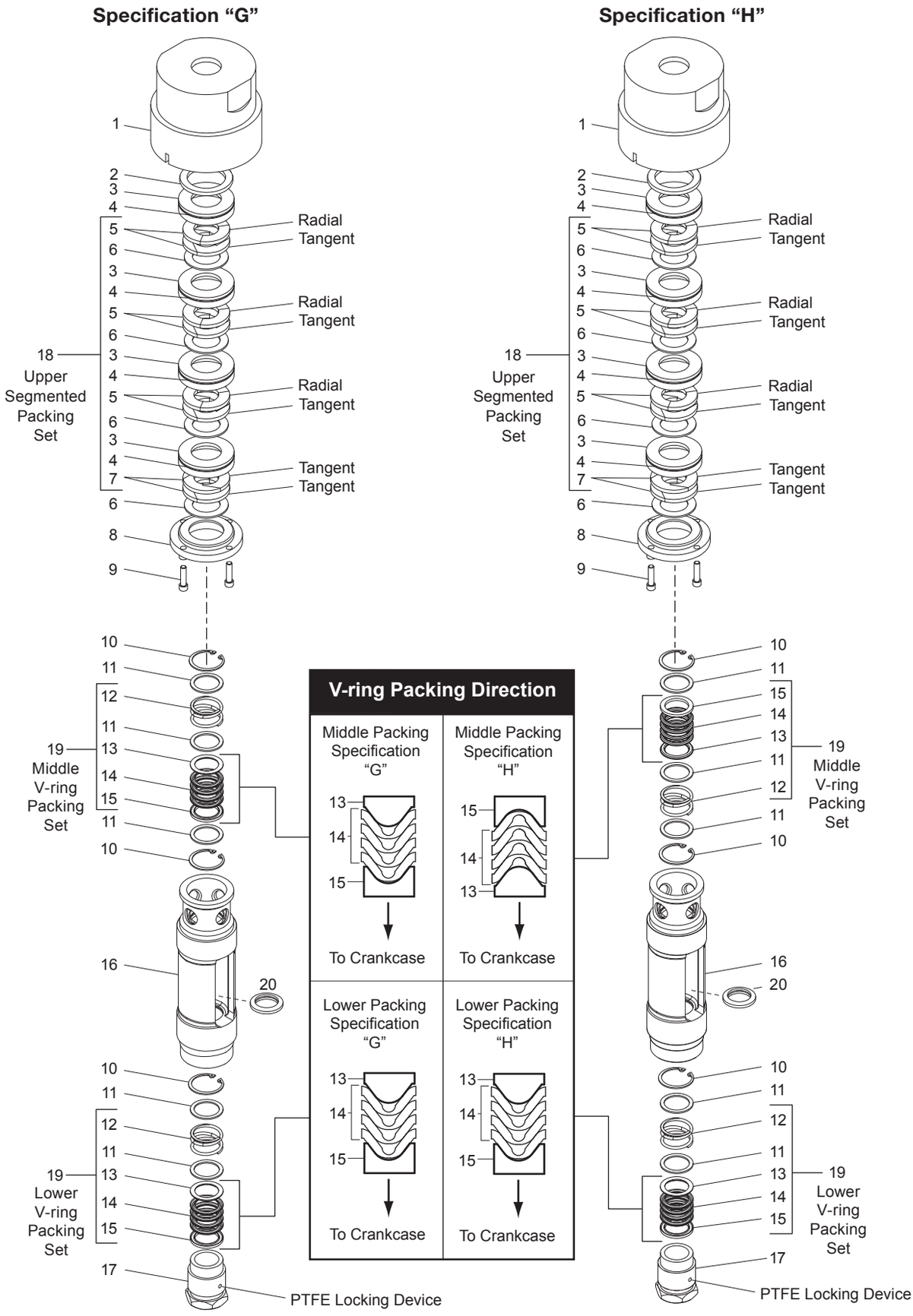
Segmented packing for Specification “J”, “K”, & “R”



IMPORTANT: Identify and line up the rings before installing. Be sure they face the way shown here and that the pin and hole are aligned when assembled.

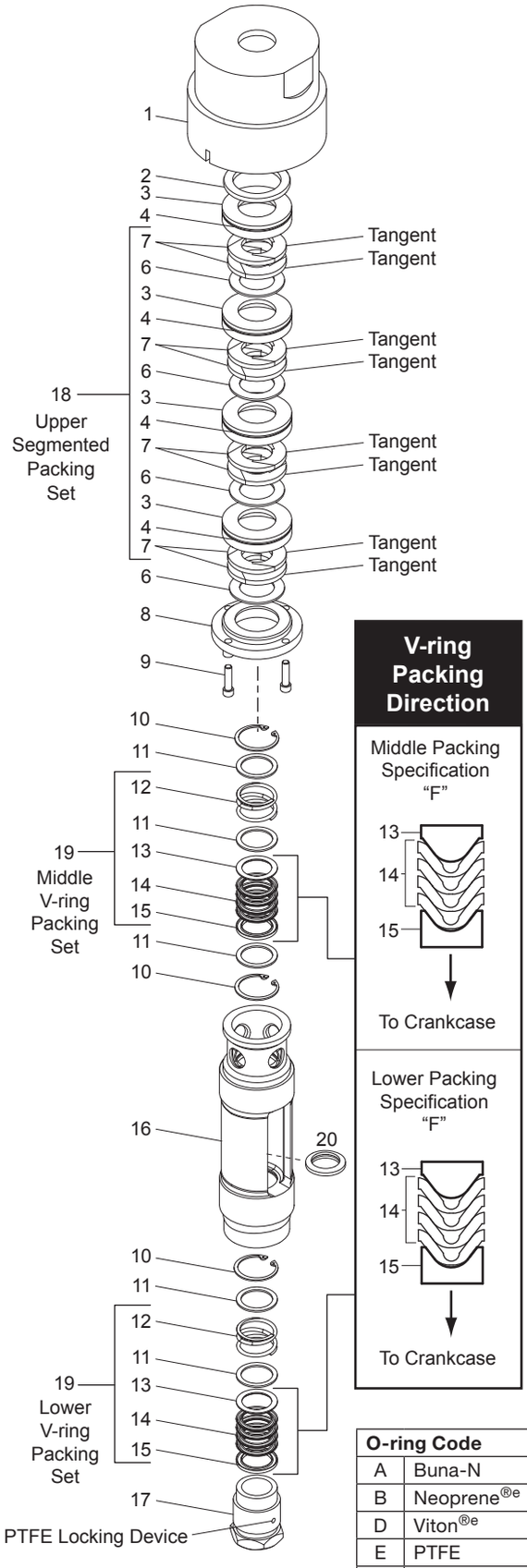
[a] *_ denotes O-ring code. See O-ring chart for details.*
[b] *Deflector ring is loose within the packing cartridge until fitted on the piston rod. Must be put in from the bottom of the cartridge.*
[c] *Starting with S.N. NN51397.*
[d] *Packing cup O-ring not included in packing set.*
[e] *Registered trademark of the DuPont company.*

Appendix E—T791 and T891 Packing Assembly Details



Appendix E—T791 and T891 Packing Assembly Details

Specification “F”



O-ring Code	
A	Buna-N
B	Neoprene®[e]
D	Viton®[e]
E	PTFE
K	Kalrez®[e]

Packing Assembly Bill of Materials

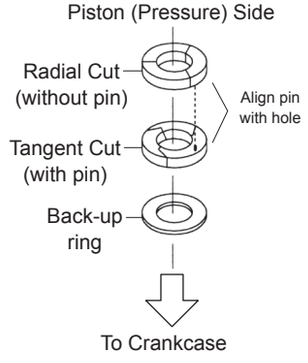
Ref No.	Part No.	Description
1.	3886	Packing barrel (3-1/4")(791 second stage)
	3887	Packing barrel (6")(791 first stage)
	3926	Packing barrel (4-1/2")(891 only)
2.	3906	Crush gasket
3.	3817	Packing cup (Not included in 3810-X1 packing set)
4.	2-036_[a,c,d]	Cup O-ring
5.	3810	Segmented packing (radial—tangent) pair
6.	3811	Back-up ring
7.	3814	Segmented packing (tangent—tangent) pair
8.	4748	Packing adapter
9.	7002-025OC100A	Screw (1/4-20 x 1" socket head)
10.	5000-175	Retainer ring
11.	1728	Washer
12.	1731	Spring
13.	1724	Male packing ring
14.	1725	V-ring packing
15.	1723	Female packing ring
16.	4746	Cartridge
17.	1722-X	Adjusting screw
18.	3810-X1[d]	Segmented packing set
19.	1725-2X	V-ring packing set
20.	1732	Oil deflector ring

Identification of Packing Specification

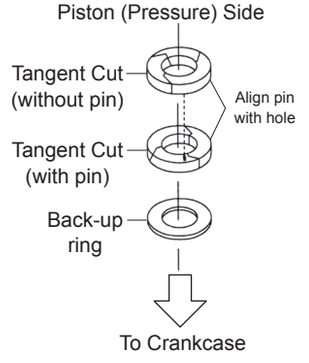
Example: Model Number T891 G L4FBDNSNC

Packing Spec.

Segmented Packing for Specification “F” & “G”



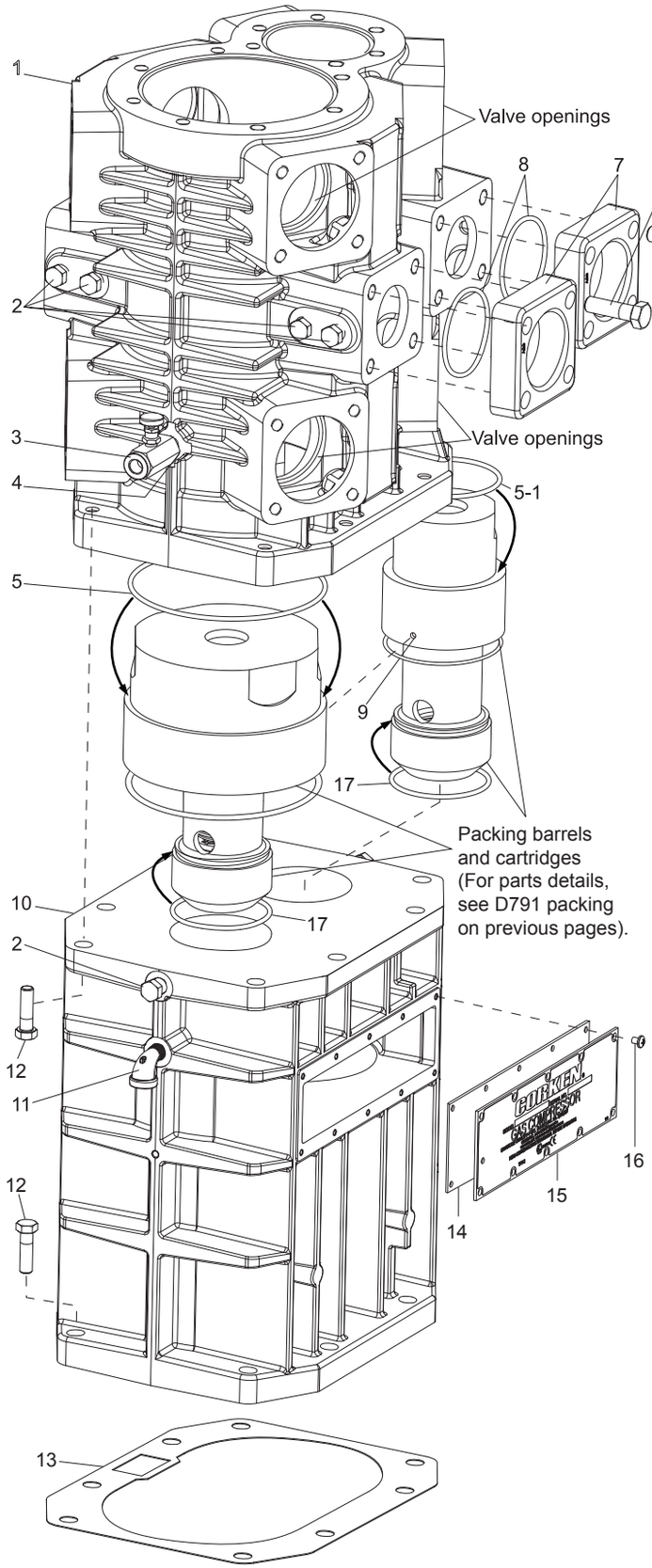
Segmented packing for Specification “F”, “G”, & “H”



IMPORTANT: Identify and line up the rings before installing. Be sure they face the way shown here and that the pin and hole are aligned when assembled.

[a] *_ denotes O-ring code. See O-ring chart for details.*
[b] *Deflector ring is loose within the packing cartridge until fitted on the piston rod. Must be put in from the bottom of the cartridge.*
[c] *Starting with S.N. NN51397.*
[d] *Packing cup O-ring not included in packing set.*
[e] *Registered trademark of the DuPont company.*

Appendix E—D791 Crosshead Guide Assembly Details



Crosshead Guide Bill of Materials

Ref No.	Part No.	Description	Qty
1.	3866	Cylinder	1
2.	3442	Pipe plug (1/4" NPT)	10
3.	1054	Drain valve (lubricated models)	1
4.	1071	Nipple (1/4" x close)	1
5.	2-258_[a]	O-ring for cylinder (1st stage)	1
5-1.	2-236_[a]	O-ring for cylinder (2nd stage)	1
6.	7001-050NC175A	Bolt (1/2" - 13 x 1-3/4" hex head gr 5)	16
7.	3793-2S	Flange (inlet/outlet)	4
8.	2-231_[a]	O-ring for flange	4
9.	3253	Roll pin	1
10.	2405-1	Crosshead guide	1
11.	1064	Elbow (1/4" NPT)	1
12.	7005-050175A	Bolt (1/2" 13 x 1-3/4" ferry head)	16
13.	1761	Gasket (crankcase)	1
14.	1760	Gasket (inspection cover)	1
15.	1721	Inspection cover	1
16.	7012-010NC025B	Bolt (10 - 24 x 1/4" Phillips hd.)	10
17.	2-231_[a]	O-ring	2

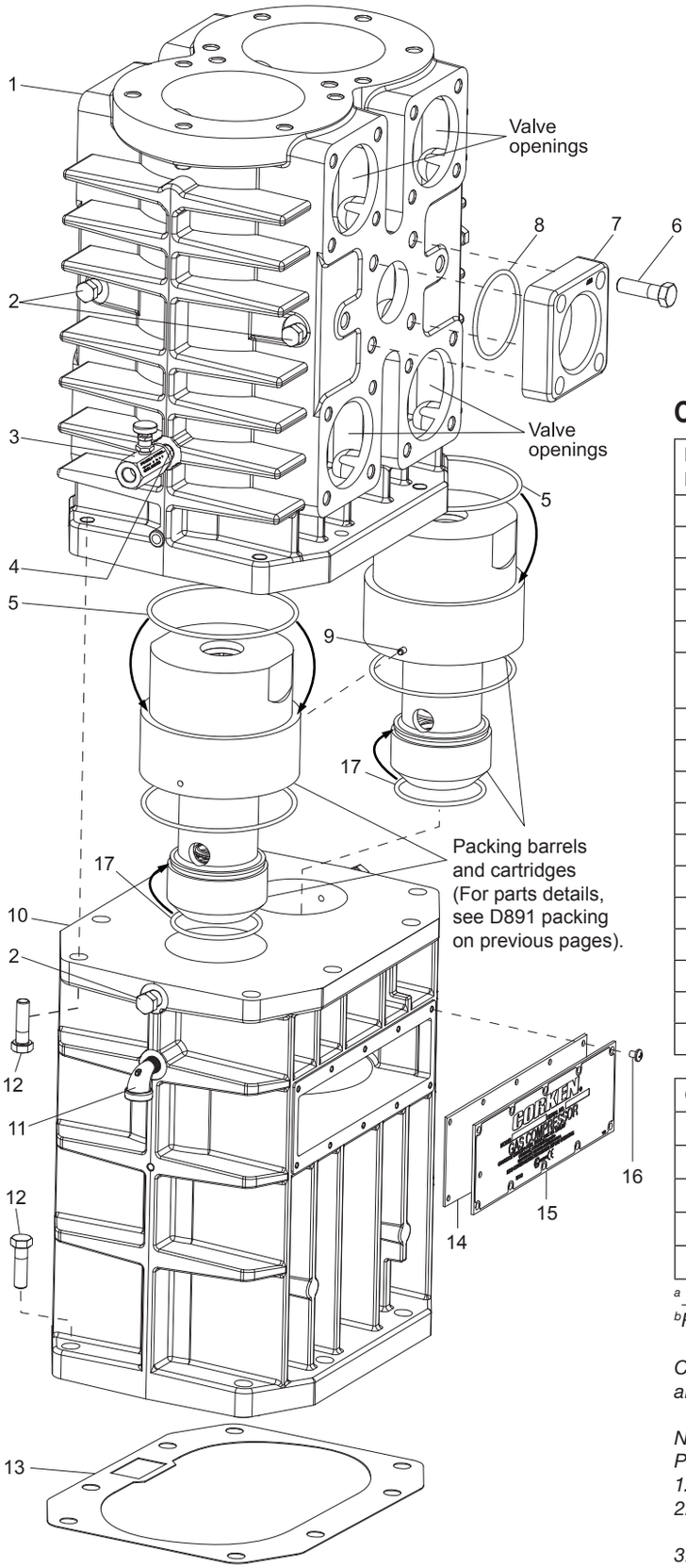
O-ring Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
K	Kalrez®[b]

[a] _ denotes O-ring code. See O-ring chart above for details.
[b] Registered trademark of the DuPont company.

CAUTION: Always relieve pressure in the unit before attempting any repairs.

NOTE:
Packing barrel installation:
1. *Use packing installation cone #3905 on the piston rod.*
2. *Insert small barrel first, use finger holes to align slinger ring on to the rod. Slip the packing barrel into place.*
3. *Align pin with slot in large packing barrel.*
4. *Slip large packing barrel in place.*

Appendix E—D891 Crosshead Guide Assembly Details



Crosshead Guide Bill of Materials

Ref No.	Part No.	Description	Qty
1.	3922	Cylinder	1
2.	3442	Pipe plug (1/4" NPT)	6
3.	1054	Drain valve (lubricated models)	1
4.	1071	Nipple (1/4" x close)	1
5.	2-246_[a]	O-ring for cylinder	2
6.	7001-050NC175A	Bolt (1/2"- 13 x 1-3/4" hex head gr 5)	8
7.	3793-2S	Flange (inlet/outlet)	2
8.	2-231_[a]	O-ring for flange	2
9.	3253	Roll pin	1
10.	2405-1	Crosshead guide	1
11.	1064	Elbow (1/4" NPT)	1
12.	7005-050175A	Bolt (1/2" 13 x 1-3/4" ferry head)	16
13.	1761	Gasket (crankcase)	1
14.	1760	Gasket (inspection cover)	1
15.	1721	Inspection cover	1
16.	7012-010NC025B	Screw (10 - 24 x 1/4" Phillips hd.)	10
17.	2-231_[a]	O-ring	2

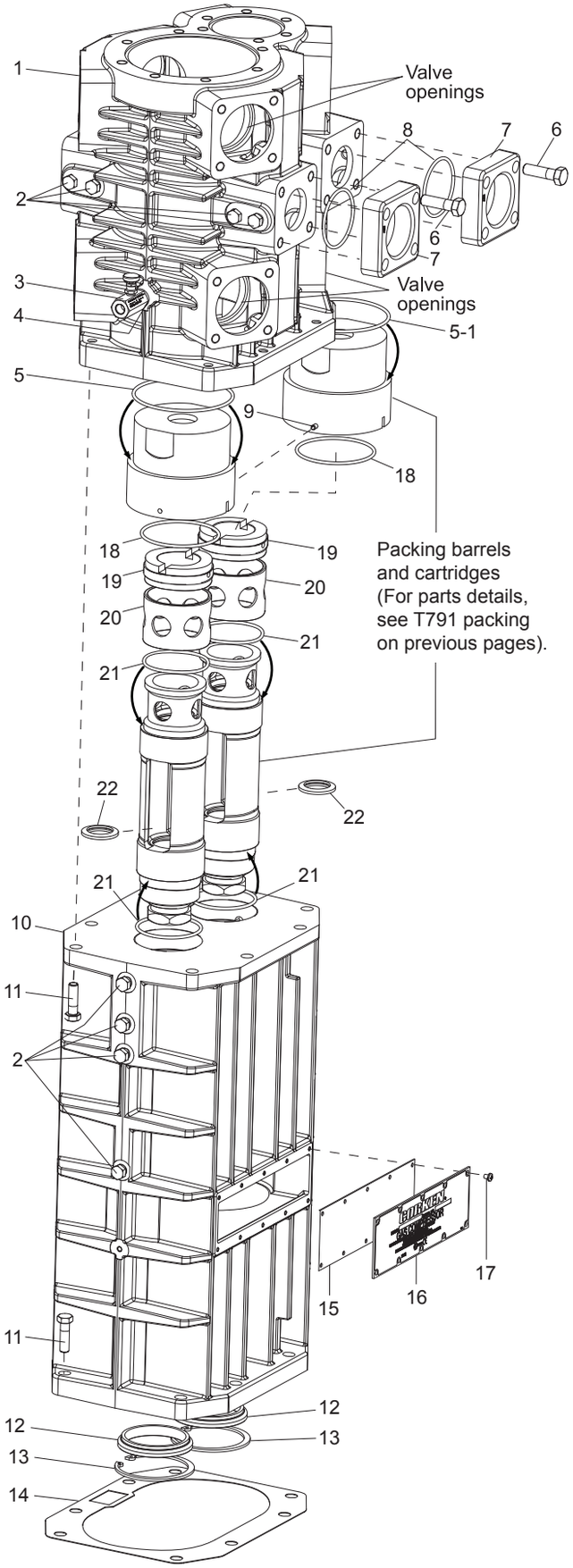
O-ring Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
K	Kalrez®[b]

[a] *_ denotes O-ring code. See O-ring chart above for details.*
[b] *Registered trademark of the DuPont company.*

CAUTION: Always relieve pressure in the unit before attempting any repairs.

NOTE:
Packing barrel installation:
1. *Use packing installation cone #3905 on the piston rod.*
2. *Insert small barrel first, use finger holes to align slinger ring on to the rod. Slip the packing barrel into place.*
3. *Align pin with slot in large packing barrel.*
4. *Slip large packing barrel in place.*

Appendix E—T791 Crosshead Guide Assembly Details



Crosshead Guide Bill of Materials

Ref No.	Part No.	Description	Qty
1.	3866	Cylinder	1
2.	3442	Pipe plug (1/4" NPT)	16
3.	1054	Drain valve (lubricated models)	1
4.	1071	Nipple (1/4" x close)	1
5.	2-258_[a]	O-ring for cylinder (1st stage)	1
5-1.	2-236_[a]	O-ring for cylinder (2nd stage)	1
6.	7001-050NC175A	Bolt (1/2" 13 x 1-3/4" hex head gr 5)	16
7.	3793-2S	Flange (inlet/outlet)	4
8.	2-231_[a]	O-ring for flange	4
9.	3253	Roll pin	1
10.	1716-4	Crosshead guide	1
11.	7005-050175A	Bolt (1/2" 13 x 1-3/4" ferry head)	16
12.	1748	Cartridge plate	2
13.	5000-350	Retainer ring	2
14.	1761	Gasket (crankcase)	1
15.	1760	Gasket (inspection cover)	1
16.	1721	Inspection cover	1
17.	7012-010NC025B	Bolt (10 - 24 x 1/4" Phillips hd.)	10
18.	2-238_[a]	O-ring	2
19.	1749	Cartridge holddown screw	2
20.	4747	Cage	2
21.	2-233_[a]	O-ring	2
22.	1732	Oil deflector ring	2

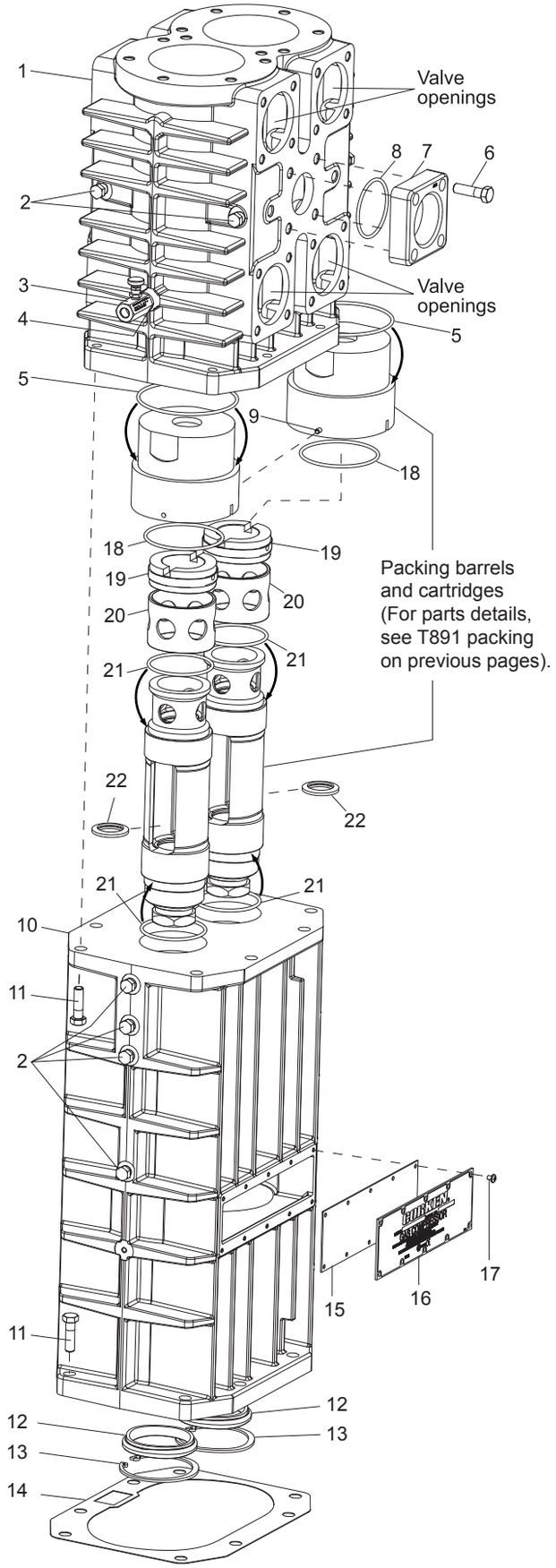
O-ring Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
K	Kalrez®[b]

[a]_ denotes O-ring code. See O-ring chart above for details.
[b]Registered trademark of the DuPont company.

CAUTION: Always relieve pressure in the unit before attempting any repairs.

NOTE:
Packing barrel installation:
1. *Use packing installation cone #3905 on the piston rod.*
2. *Insert small barrel first, use finger holes to align slinger ring on to the rod. Slip the packing barrel into place.*
3. *Align pin with slot in large packing barrel.*
4. *Slip large packing barrel in place.*

Appendix E—T891 Crosshead Guide Assembly Details



Crosshead Guide Bill of Materials

Ref No.	Part No.	Description	Qty
1.	3922	Cylinder	1
2.	3442	Pipe plug (1/4" NPT)	12
3.	1054	Drain valve (lubricated models)	1
4.	1071	Nipple (1/4" x close)	1
5.	2-246_[a]	O-ring for cylinder	2
6.	7001-050NC175A	Bolt (1/2" 13 x 1-3/4" hex head gr 5)	6
7.	3793-2S	Flange (inlet/outlet)	2
8.	2-231_[a]	O-ring for flange	2
9.	3253	Roll pin	1
10.	1716-4	Crosshead guide	1
11.	7005-050175A	Bolt (1/2" 13 x 1-3/4" ferry head)	16
12.	1748	Cartridge plate	2
13.	5000-350	Retainer ring	2
14.	1761	Gasket (crankcase)	1
15.	1760	Gasket (inspection cover)	1
16.	1721	Inspection cover	1
17.	7012-010NC025B	Bolt (10 - 24 x 1/4" Phillips hd.)	10
18.	2-238_[a]	O-ring	2
19.	1749	Cartridge holddown screw	2
20.	4747	Cage	2
21.	2-233_[a]	O-ring	2
22.	1732	Oil deflector ring	2

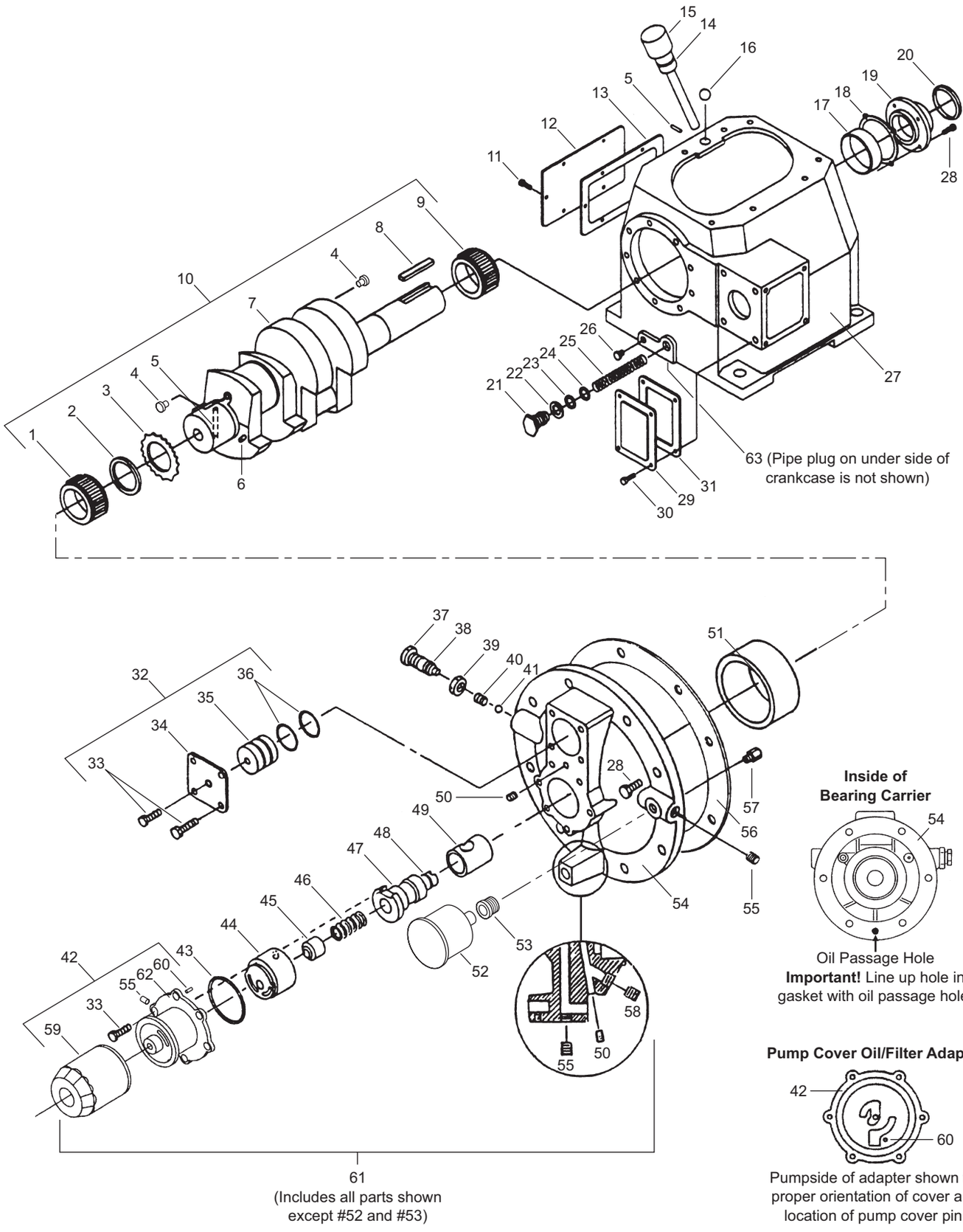
O-ring Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
K	Kalrez®[b]

[a] _ denotes O-ring code. See O-ring chart above for details.
[b] Registered trademark of the DuPont company.

CAUTION: Always relieve pressure in the unit before attempting any repairs.

NOTE:
Packing barrel installation:
1. *Use packing installation cone #3905 on the piston rod.*
2. *Insert small barrel first, use finger holes to align slinger ring on to the rod. Slip the packing barrel into place.*
3. *Align pin with slot in large packing barrel.*
4. *Slip large packing barrel in place.*

Appendix E—Crankcase Assembly Details



Appendix E—Crankcase Assembly Details

Crankcase Assembly Bill of Materials

Ref No.	Part No.	Description
1.	1737	Bearing cone
2.	3638	Spacer
3.	3635	Drive sprocket
4.	1284	Crankshaft orifice
5.	2135	Drive pin
6.	2933	Link pin
7.	3786	Crankshaft
8.	3503	Flywheel key
9.	3580	Bearing cone
10.	3786-X1	Crankshaft assembly
11.	7001-031NC075A	Bolt (5/16 - 18 x 3/4" hex head)
12.	2122	Inspection cover
13.	2123	Gasket, inspection cover
14.	2-112_[c]	O-ring
15.	3225-X1	Oil bayonet assembly (w/O-ring)
16.	2126	Breather ball
17.	3579	Bearing cup
18.	3589	Bearing adjustment shim (.005")
	3589-1	Bearing adjustment shim (.007")
	3589-2	Bearing adjustment shim (.020")
19.	3539	Bearing cover
20.	3526	Oil seal
21.	1280	Filter screw
22.	1281	Gasket, filter
23.	2-116_[c]	O-ring
24.	1276	Washer
25.	1275	Oil filter screen
26.	3443	Pipe plug (1/2" NPT steel)
27.	3221	Crankcase
28.	7001-037NC100A	Bolt (3/8 - 16 x 1" hex head Gr. 5)
29.	3875	Access cover
30.	7003-025NC037E	Screw (1/4 - 20 x 3/8")
31.	3874	Gasket (access cover)
32.	1515-X	Closure cap assembly
33.	7001-025NC050A	Bolt (1/4 - 20 x 1/2" hex head)
34.	1515	Closure cap
35.	1516	Closure body
36.	2-118_[c]	O-ring
37.	1290	Relief valve adjusting screw
38.	2-011_[c]	O-ring
39.	1291	Adjusting screw locknut
40.	1292	Relief valve spring
41.	1293	Relief valve ball
42.	4222-X[b]	Oil filter adapter assembly (w/pin)
43.	2-228_[c]	O-ring
44.	2849-1X[b]	Oil pump assembly
45.	2851	Spring guide
46.	2852	Oil pump spring

Ref No.	Part No.	Description
47.	3219	Pump shaft adapter
48.	2-112_[c]	O-ring
49.	2805-X[a]	Pump shaft bushing
50.	1629	Pipe plug (1/16 NPT fl. seal)
51.	1736	Bearing cup
52.	1302	Oil pressure gauge
53.	1044	Bushing (1/8 x 1/4 NPT)
54.	3220-2	Bearing carrier
55.	3289	Pipe plug (1/4 NPT fl. seal)
56.	2131	Bearing carrier gasket
57.	2961-X	Air release valve assembly
58.	2590	Pipe plug (1/8 NPT fl. seal)
59.	4225	Filter
60.	2798	Pump cover pin (included w/4222-X)
61.	3220-2X	Bearing carrier assembly
62.	4222	Oil filter adapter
63.	3289	Pipe plug (1/4" x 18 NPTF x 7/8")

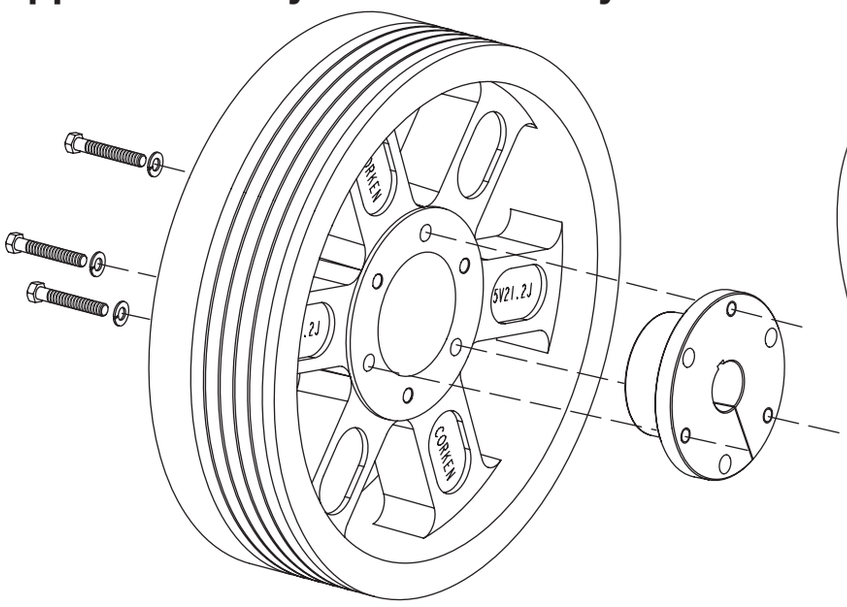
Assembly Number	Assembly Name
3221-X1	Crankcase assembly (M, 4, 8, 9) without lubricator
3221-X2	Crankcase assembly (M7, 78) without lubricator
3221-X3	Crankcase assembly (L, 4, 8, 9) with lubricator
3221-X4	Crankcase assembly (L7, 78) with lubricator

O-ring Code	
A	Buna-N
B	Neoprene®[b]
D	Viton®[b]
E	PTFE
K	Kalrez®[b]

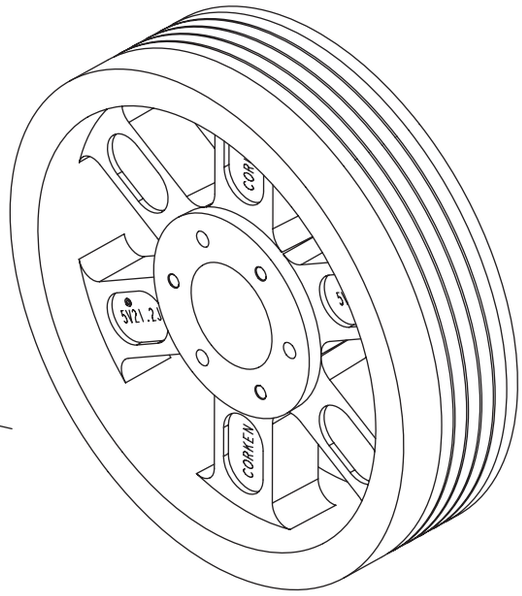
[a]Must be rebored and honed after replacing (0.876"/0.875" diameter)
[b]Caution: To avoid damage during assembly, refer to installation Instruction Manual IE400.
[c]_ denotes O-ring code. See O-ring chart above for details.
[d]Registered trademark of the DuPont company.

CAUTION: Always relieve pressure in the unit before attempting any repairs.

Appendix E—Flywheel Assembly Details



Back Side



Front Side

Flywheel Assembly Bill of Materials

Assembly Number	Assembly Name
3852-X	Flywheel assembly (flywheel, hub, and three bolts)
3852	Flywheel: 21.2" O.D., 5 groove
H J-2.125	Hub with three bolts and lockwashers

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