

Packager Guidelines
Section 1: General Information

1-1. Serial Numbers

Correspondence concerning your compressor and related equipment must include the serial numbers of the equipment about which you are writing. A complete record of serial numbers and other data on your Siemens Energy compressor is kept at the factory; giving the serial numbers in your correspondence and parts orders helps us in providing prompt service.

1. The *compressor frame* serial number applies to the frame and running gear parts. It is located on a nameplate that is attached to the side of the frame at the oil pump end. The serial number is also permanently stamped directly below the nameplate in the frame metal. It consists of several letters and numbers. Always give the complete serial number (for example; 6HF751, Y6H108) when requesting specific information.
2. Each *compressor cylinder* has its own serial number that is stamped on a nameplate attached to the cylinder. The cylinder nameplate also includes other data; this is described in the section that follows. Always give the complete serial number (for example; 6HC2400, Y6H775) when requesting specific information.

1-2. Cylinder Nameplate Information

The nameplate (Figure 1) attached to the compressor cylinder contains information that allows both the customer and Siemens Energy to identify a particular cylinder. The following is an explanation of some of the terms used on nameplates.

DRESSER-RAND					
GAS FIELD COMPRESSORS					
CYLINDER TYPE		SERIAL NO			
NOMINAL BORE		LINERED BORE		STROKE	
IN	MM	IN	MM	IN	MM
RATED DISCHARGE PRESS.		PSIG		KG/CM ² G	
MAX. ALLOW. WORKING PRESS.		PSIG		KG/CM ² G	
HYDROSTATIC TEST PRESS.		PSIG		KG/CM ² G	
MAX. COOLING WATER PRESS.		PSIG		KG/CM ² G	
MAX. ALLOW. DISCH. GAS TEMP.		°F		°C	
MAXIMUM SPEED	RPM	DUTER END		FRAME END	
BASE CYLINDER CLEARANCE		IN		MM	
NORMAL LINEAL CLEARANCE		IN	MM	IN	MM
ADDED FIXED CLEARANCE		IN ³	MM ³	IN ³	MM ³
ALWAYS GIVE SERIAL NO. WHEN ORDERING SPARE PARTS					
MADE IN U.S.A			KDZP0001		

Figure 1. Cylinder Nameplate

1-2.1. Cylinder Type, Serial Number, Bore & Stroke

The first block describes the compressor type. Following this is the block for the serial number. The cylinder serial number is the most important item stamped on the nameplate. It allows the customer, the distributor and the manufacturer to identify a particular cylinder, its specifications, the parts used to build it and the performance conditions for which it was designed. This is important in that it allows tracking of a particular cylinder throughout its history, no matter what frame it may be installed on in later years. Always give this serial number when ordering spare parts. This will expedite the handling of your order and helps prevent shipment of incorrect parts. The cylinder bore is the inside diameter of the cylinder. If there is a liner present, the cylinder bore is the inside diameter of the liner. This is also the nominal piston diameter. Liners of different thicknesses may be installed in a given cylinder to vary the bore diameter. The stroke is the distance the piston and rod travels (forward or backwards) for every 1/2 revolution of the crank.

1-2.2. Rated Discharge Pressure

The rated discharge pressure, or RDP, is the maximum pressure the cylinder is allowed to see under normal continuous operating conditions.

1-2.3. Maximum Allowable Working Pressure

The maximum allowable working pressure, or MAWP, is the maximum gas pressure permitted in the cylinder period. The cylinder may be operated for short periods of time at pressures up to this figure provided that other factors (such as driver horsepower, maximum bearing loads, and piping and vessel limitations) do not prohibit this. Safety valve settings are usually much lower than this figure, and may never exceed it in any case.

1-2.4. Hydrostatic Test Pressure

The pressure at which the cylinder has been hydrotested. Hydrostatic tests are always performed at pressures at least 1.5 times that of the MAWP.

1-2.5. Maximum Cooling Water Pressure

This pressure limitation applies not only to jacketed cylinders, but to internally water cooled packing cases as well.

1-2.6. Maximum Allowable Discharge Gas Temperature

This is the highest temperature to which any compressor cylinder parts should be exposed to for a short period of time.

1-2.7. Maximum Speed

This is the maximum design speed of the cylinder. Certain cylinders, mainly the large ones with high reciprocating weights, may have speed limits that are lower than that of the frame. This is uncommon and always addressed in the early states of any potential application.

1-2.8. Base Clearance

This is the inherent clearance that lies within and/or built within the cylinder. It is in the form of a percent of the swept volume for a given end of the cylinder. It cannot be changed without physically altering the internals of the cylinder.

1-2.9. Normal Lineal Clearance

The clearance between the piston and the head when the piston is at the end of the stroke (each end). It is required to allow for the thermal expansion of the piston and rod when temperatures increase through compression.

1-2.10. Added Fixed Clearance

The clearance added by some physical means to meet the required operating condition(s). It is typically added in the form of valve spacers or a shorter than normal head or piston.

1-2.11. Noise Levels

Siemens Energy does not guarantee noise levels. Siemens Energy has no practical method of obtaining and isolating compressor noise data. Many factors impact compressor noise that may impact field readings. Some of these factors are ambient noise, motor selection and noise, gas piping noise, system natural frequencies and other noise emitting sources. The values below can be considered a typical range of expected compressor noise and actual values may vary in field.

Electric drive outdoors: 94-98

Electric drive indoors: 98-102

Engine drive outdoors: 96-100

Engine drive indoors: 100-104

1-2-12. Recommended Blow Down Procedure

The recommended blow down procedure is:

1. Comply with the ASME pressure vessel code. This requires rapid venting to 50% pressure.
2. At 50% pressure, hold and slowly vent at a rate of 10 psi/min until pressure reaches 700 psig. This gives the gas time to slowly exit from the o-ring.
3. Below 700 psig, the depressurization rate is not restricted.

1-3. Lifting Devices

Compressor frames are drilled and tapped at the factory for lifting devices. These lifting devices are not supplied as standard scope of supply. These devices can either be purchased locally or from Siemens Energy.

1-4. Storage

If the compressor frame or skid is to be stored at any time and it is not resting on a foundation, it should be supported the full length to prevent any possible sag or distortion. It will also be necessary to protect the unit from the weather, either in a building or by a tarpaulin or similar covering. The standard shipping preparation used by Siemens Energy is suitable for outdoor equipment storage of up to six months. Additional protection for longer storage periods can be provided as an equipment option. This additional protection is normally selected to suit the particular storage requirements and environmental conditions.

NOTE

Local environment has such an effect on how well any rust preventative material or technique will hold up that Siemens Energy cannot realistically accept responsibility for the storage, as we have no control of the local conditions at the installation site.

When a lubricated compressor cylinder is shipped, the main bores and gas passages are coated with rust preventative oil. This oil should not be removed or wiped out of the cylinder until actual starting of the compressor. All of the cylinder openings must be completely closed so that dirt, rain or dust cannot be blown into them. Consult Siemens Energy on storage requirements when non-lubricated cylinders are involved.

Non Lubricated Cylinder Application - For Domestic applications, aluminum paint is used in the cylinder gas passageways and heads as a corrosion preventative. On Export Shipments or Extended Storage, the gas passages and heads will be sprayed with a mineral rust preventative after the aluminum paint is applied. Pressure, partition packings and oil wiper rings are removed and placed into a greaseproof, waterproof, flexible barrier material

followed by an outer wrap. Export or Extended Storage also requires the piston and rod assembly to be removed for shipment. Piston and rider rings are to be removed and packed in the same manner as the packing rings mentioned above. Piston and rod are sprayed with a fingerprint neutralizer, then the piston, rod and jamnut are sprayed with a rust preventative and finally wrapped in the same manner as the packing rings mentioned above.

Before storing the unit, it is important to check inside as well as outside the machine to be sure all running parts and exposed surfaces subject to corrosion are adequately protected. Make certain all covers are bolted tight and all openings are properly closed against moisture and dust. During storage, periodically remove covers and check the frame interior for condensation and for adequate protection of the internal surfaces. This should be done at least once a month.

1-4.1. Extended Storage

The following recommendations apply to compressors that are being stored for an extended period of over six months. Because of the variations between storage sites, these recommendations are presented only as guidelines, which should be modified to suit a particular situation. The following procedure is in addition to the storage instructions described in the preceding paragraphs.

1. The internal surfaces of the frame, frame extensions and the internal running gear components have been coated with a rust preventative at the factory; this protective coating must be left in place. While installing the compressor, take extreme care to prevent dirt, sand and other contaminants from entering it. Any contaminants introduced at this time must be thoroughly removed. After the machine is installed, it is important that all frame openings are closed and sealed to prevent contamination of the frame interior.

NOTE

When the compressor is to be stored for an extended period in an "as shipped" condition, an inspection schedule must be established whereby the frame interior can be periodically examined and the rust preventative coating restored as required. Any rust preventative applied to the parts during this period should meet U.S. Government Specification MIL-C-16173 (latest edition), Grade II, (such as Valvoline Tectyl 502-C® distributed by Ashland Oil, Inc.)

2. All pipe connections must be plugged or fitted with suitable covers. Openings at the ends of the frame extensions must also be closed if the compressor cylinders are not mounted.
3. Ensure all access covers on the compressor are in place. It is important that the machine is adequately closed against moisture and dirt. Wipe the outside of the unit clean and dry. Spray all exposed "bright" surfaces, including that portion of the crankshaft between the drive end and frame, with rust preventative.
4. Bar over the crankshaft at least once every thirty days (more frequently if feasible) during storage. When possible, operate the priming oil pump to be sure that rust preventative oil is flushed onto all internal bearing surfaces. Do not allow the crankshaft to come to rest at the same position it was in before barring. A simple scribe line on an exposed portion of the shaft will aid in this determination.

5. Remove compressor valves from the cylinders and either store them submerged in an oil tank or coat them with a suitable rust preventative, wrap them and store them indoors.
6. When compressor cylinders are shipped, the main bores and gas passages are coated with rust preventative oil. This oil should not be removed or wiped out of the cylinder until it is time to start up the compressor. All of the cylinder openings must be completely closed so that dirt, rain or dust cannot be blown into them.
7. If the pistons, piston rods and packings are left installed during the storage period, the cylinder lubricator should be filled with rust preventative oil. Operate the lubricator so that the rust preventative oil is pumped into the lubricator lines and main bores at the same time the unit is being barred over. Prior to starting, drain this oil and flush the system with the normal lubricating oil.
8. The rust preventative oil we use is only good for six months. We cannot ensure that any parts put in storage over six months will not suffer damage.
9. The following inspections for corrosion should be made at the end of the initial 6-month period and each month thereafter.
 - A. Inspect the internal surfaces of the frame.
 - B. Inspect the cylinder bores.
 - C. Inspect the piston, piston rods and packing for rust.
 - D. Inspect the valves by removing the protective coating of protective paper and checking for rust. Carefully spray with oil and repackage these parts after inspection.
 - E. If there is any rust present, clean and re-coat parts with a preservative oil.
10. When the compressor is ready to be placed in operation, drain all of the rust preventative oil and flush the system as described in CHAPTER 3 (OPERATION AND TROUBLESHOOTING) of the Instruction Manual before filling the lubrication system with the oil selected for regular operation.

1-5. Routine Operation and Maintenance

High speed reciprocating compressors are designed and built for long periods of continuous and reliable full-load operation. It should be equipped with automatic safety devices to protect it and shut it down in case of low frame oil pressure, vibration, extreme temperatures or pressures and lack of cylinder lubrication. It can also be equipped with additional safety devices to obtain practically any degree of protection desired pending on the service and/or owner requirements.

When the unit is first placed in operation and the machine is operating at normal speed and load and with stable operating pressures and temperatures, all safety alarm and shutdown controls should be carefully checked for correct operation and adjusted where necessary. Never disconnect the safety shutdown devices and allow the unit to run unprotected.

Every compressor requires a certain amount of supervision and care if it is to give continued satisfactory performance and long service life. A time schedule of duties for the operator must be subject to alteration by experience to fit the actual conditions and operating environment. The following minimum schedule is suggested based on the continuous duty of 720 hours per month.

NOTE

The time schedule of routine inspections and maintenance for the compressor must be used in conjunction with the schedule and duties recommended by the driver manufacturer for this machine. This also applies to the other accessory equipment.

Daily:

1. Keep the exterior of the compressor/driver clean, as well as the surrounding work area.
2. Check the oil level in the frame sump and add the proper oil as required to maintain the level at the oil level line on the gauge. Check that the oil tank (if so equipped) is also filled to the proper level.
3. Check the oil level in the lubricator drive box and add the proper oil as necessary. If the oil level has increased, then check the pumps for leakage past the plungers. Make sure that all the pumping units are working and also inspect the distribution blocks for leakage, indicator pins "popped up", or other problems.
4. Keep a daily log of all gas temperatures, water temperatures and gauge pressures. One of the principal means of keeping track of the physical condition of a compressor and its equipment is by these daily log readings. Watch carefully for any marked changes which indicate that further attention is warranted. Use the interstage pressures and temperatures to detect abnormal conditions. A decrease in the interstage pressure and temperature means that the lower pressure cylinder has reduced capacity. An increase in interstage pressure and temperature means that the next higher stage cylinder has reduced capacity. These effects can be attributed to leaking valves, worn piston rings or broken parts.

NOTE

In every case, because of variable operating conditions, the operator should establish the frequency of draining off the various drains. This frequency will be determined by the amount of liquid that collects at each drain point.

5. If separators are used in the compressor system, a schedule must be established whereby they are periodically drained to prevent any liquid carryover into the compressor cylinders, which can cause serious damage. If automatic drains are furnished, check them for proper operation and be sure that no liquid has accumulated in the level gauge.

6. Watch for signs of excessive heating and listen for any unusual noises while the machine is operating. Any abnormal condition should be investigated immediately.
7. Visually inspect the unit for loose fasteners and supports or for any excessive shaking from tubing or hoses and secure where appropriate.
8. Check all the gas, water and oil piping for leaks.

First Week:

1. Visually inspect and spot check with torque wrenches, the fasteners on joints with gaskets and the entire cylinder to frame bolting with the unit shut down. Take note of any fasteners that have loosened and pay close attention to these fasteners. Increase the periodic checking of these fasteners if necessary.
2. Visually inspect all the loaded joints for motion across the joint (winking) during operation. Tighten the fasteners as required following the procedures outlined in CHAPTER 5 GENERAL DATA AND SPECIFICATIONS Section 5-3, in this Instruction Manual.
3. Check the runout of the compressor piston rods. Make sure the piston rod is not scored, scratched or discolored.
4. Check the oil scraper packing, piston rod packing and distance piece vents for excessive blowby and/or oil leakage. If blowby is occurring, determine the cause and if required, replace the packing rings.
5. Check for adequate cylinder and packing lubrication. This may require the removal of the outer head and/or valve covers. Compressors typically leave the factory with the cylinder lubrication system set at the maximum flow rate for break-in. Refer to Section 2-3.4 in this Instruction Manual before reducing the flow rate.

Monthly (ALL Daily Checks Plus):**NOTE**

When the compressor is being operated in an extremely dirty atmosphere, or where it is installed outdoors, operated intermittently, handling foul gas in the cylinders, or operating with high oil temperatures in a very hot atmosphere, it may be necessary to change the oil more often. Most reputable oil companies offer laboratory analysis of oil samples, the use of this type service is recommended.

1. Take a sample of the frame oil for analysis. Compare the oil analysis to a clean reference sample. Change the oil and oil filter per the analysis or per the compressor manufacturer's recommendations. Refer to Chapter 2 Section 2-2.8.
2. Visually inspect all the loaded joints for motion across the joint (winking) during operation. Tighten the fasteners as required following the procedures outlined in CHAPTER 5 GENERAL DATA AND SPECIFICATIONS Section 5-3, in this Instruction Manual.
3. Visually check the oil scraper packing, piston rod packing and distance piece vents for excessive blow-by and/or oil leakage.

Every Three Months (ALL Monthly Checks Plus):

1. Check all of the safety shutdowns and the operation of the loading and unloading devices for proper operation.
2. Lubricate all of the variable volume clearance pocket (VVCP) packing grease fittings (See CHAPTER 4 MAINTENANCE Section 4-19.2 in this Instruction Manual) and check for free motion by moving the pocket in and out with the unit not operating. Reset the pocket to the correct clearance setting.
3. Check the frame crankcase breather(s) and clean or replace as necessary.
4. Clean the lubricator reservoir and pumping units as necessary or according to the manufacturer's instructions.
5. Check the compressor piston rings and piston rod for wear and the cylinder bore for scoring, and remove any accumulation of foreign material. Replace the piston rings if they are worn to their limit. Benchmark the wear data. See CHAPTER 4 MAINTENANCE Section 4-14, in this Instruction Manual for the proper procedures on checking the wear rate of, and renewing, PTFE piston and rider rings.
6. Clean the separator sight glasses (if so equipped).
7. Utilizing a temperature measuring gun, measure the temperature of the valve covers; record and benchmark all the data.
8. Check the frame and driver foundation bolts for tightness. Follow the required procedures and tighten to the proper torque values given in CHAPTER 5 GENERAL DATA AND SPECIFICATIONS Section 5-3, found in this Instruction Manual.
9. Inspect the drive coupling. Replace any worn or broken components. Tighten as required.

Every Six Months (ALL Three Month Checks Plus):

1. Check the crankshaft end play.
2. Inspect the piston rod, pressure packing and oil scraper case for discoloration or excessive leakage. Replace the rings as required.
3. Replace the cylinder lubricator filters.

Annually (ALL Six Month Checks Plus):

1. Check all of the running gear clearances and compare them to the benchmark readings. If a change is detected, disassemble and inspect those affected parts. Replace any bearings and/or bushings where necessary.
2. Clean and flush the oil cooler and any other heat exchanger supplied.
3. Check the accuracy of the compressor pressure gauges and recalibrate them as required.
4. Remove all of the inlet and discharge valves. Clean and inspect the valves for excessive wear and broken parts. Lap the seats and guards and replace all internal parts. Refer to the compressor valve instructions located in CHAPTER 4 MAINTENANCE Section 4-18 in this Instruction Manual.
5. Remove the compressor piston and piston rod assemblies and inspect the piston rods, pistons, piston rings and cylinder bore diameters. Record the cylinder bore diameters. Replace components where necessary. Inspections of this nature will indicate the replacement schedule for parts that are subject to wear.
6. Safety valves used in the compressor gas system should have their settings tested at least once a year, and more often under extreme conditions, by a hydraulic test.
7. Examine any separators, bottles, dampers and similar equipment that may be used in the compressor system for accumulation of dirt, rust and other foreign material. Remove the vessel from the system and clean it if necessary.
8. Visually inspect the packing cups; re-lap as required; replace pressure packing and oil wiper rings.
9. Pull the cylinder lubricator box pump covers and inspect the internal gears and cam shaft. Replace pumps where necessary.
10. Pressure test divider valves if a block distribution system.
11. Visually inspect cylinder gas passages for debris and remove where needed.

Every 4-6 Years (Overhaul):

1. Completely disassemble the compressor.
2. Replace the oil pump.
3. Replace all valves.
4. Replace all wear items such as bearings, bushings, pistons and rings.
5. Replace all seals.
6. Replace piston and piston rod if necessary.
7. Replace all cylinder lubricator pumps and divider blocks.

1-6. Unit Throw Configuration

See Drawing to View Throw Configuration

1-7. Recommended Allowable Forces and Moments

See Drawing to View Forces and Moments