# آگهی فراخوان شناسایی به شماره ۱۰/۱۴۰۱/۰۱۵

شرکت پتروشیمی اروند (سهامی خاص) در نظر دارد جهت شناسایی شرکتهای دانش بنیان فعال و توانمند جهت ساخت کمپرسور سانتریفیوژ اکسیژن برای واحد AIR SEPARATION UNIT مطابق با مشخصات منـدرج در سایت شرکت پتروشیمی اروند به شرح ذیل اقدام نماید:

1- O2 Compressor Tech. Data & DRAWING
2- O2 Compressor Installation, Operation and Maintenance Manual
3-

لذا از شرکت‌های فعال در این زمینه دعوت می‌شود اسناد و مدارک ذیل را حداکثر تا ساعت ۱۴:۰۰ روز سـه شـنبه مورخ ۱۴۰۱/۱۰/۲۰ به نشانی استان خوزستان – بندر امام خمینی – منطقه ویژه اقتصادی پتروشیمی- سـایت ۳ – کد پستی ۶۳۵۶۱۷۸۷۳۴ امور حقوقی و پیمانها شرکت پتروشیمی اروند تحویل نمایند:

الف- اساسنامه، آگهی تاسیس، پروانه فعالیت

ب- معرفی کارخانه یا کارگاه

ج- سوابق اجرایی کار مشابه یا مرتبط

د- رزومه علمی و فنی

ه- سوابق گواهی حسن انجام کار مشابه یا مرتبط با کار

و- معرفی نفر فنی ( رابط ) به همراه شماره تماس ( موبایل )

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۳) متقاضیان در صورت نیاز به اطلاعات فنی بیشتر میتوانند با شـماره تلفـن :۰۶۱۵۲۱۲۶۰۲۲ و جهـت اطلاعـات حقوقی با تلفن: ۰۶۱۵۲۱۲۶۴۷۴ تماس حاصل نمایند.

۴) تصویرآگهی به همراه شرح مختصر کار از طریق نشانی اینترنتی www.arvandpvc.ir قابل ملاحظه می‌باشد.

شایان ذکر است این فراخوان صرفاً جهت شناسایی می‌باشد.

# INSTRUCTION MANUAL FOR OPERATION AND MAINTENANCE OF MODEL ZW-63.5/30 OXYGEN COMPRESSOR

**(MANUFACTURER'S CODE NO.: Y314BCK)**

**HANGZHOU HANGYANG COMPRESSOR CO., LTD.**

**THE PEOPLE'S REPUBLIC OF CHINA**

**April 2009**

**Warning !**

The surface of all parts and components in contact with Oxygen should be carefully degreased before installing, and the oil residual adsorption be not exceed **125** mg/m$^2$.

## Contents

## 1 Main technical data

- Type: Vertical, four-row, three stages double-acting compression, non-lubricated cylinders and water-cooled
- Discharge capacity: 3810 $m^3$/h (under suction condition)
- Parameters of suction condition: i Medium: dry oxygen
  ii Pressure: 0.115 MPa(A)
  iii Temperature: 22℃
- Final discharge pressure: 3.1 MPa(A)
- Gas temperature after end stage cooler: ≤45℃
- Cylinder bore: The 1st stage: Φ500 mm × 2
  The 2nd stage: Φ410 mm
  The 3rd stage: Φ240 mm
- Piston stroke: 240 mm
- Speed of compressor: 493 r/min
- Direction of rotation of the crankshaft: the counter-clockwise view from the side of oil supply unit

- Kind of drive: Transmitted by the rigid coupling connected directly with the electric motor
- Shaft power of compressor: 725 kW
- Maximum weight of the hoisting parts: 10820 kg
- Lube oil: turbine oil ( No.68 L-TSA, GB 11120-1989 eqv ISO VG68), a filling quantity required: 520 L
- Motor to be used: Model: type Y630-12 Rated power: 800 kW Voltage: 6000 V
  Frequency: 50 Hz Rated speed: 493 r/min
- Cooling-water consumption: 90 t/h (inlet temp. ≤35℃)
- Oxygen inlet pipe for 1st stage: Φ325 x 4
- Oxygen outlet pipe for end stage: Φ108 x 4

## 2 General description

The oxygen compressor is comprised of such main parts as crankcase, machine frame, crankshaft, connecting rod, crosshead, cylinder, piston, valve, sealer, piping, pulsation damper, cooler, safety valve, check valve, filter, gear oil pump, oil vapour extraction device, local instruments & electric control cabinet, electric motor, etc.

The crankcase as the upper part joins the machine frame as the lower parts at the centerline of crankshaft to constitute the machine pedestal.

The **crankshaft** is cast with rare-earth nodular cast iron, it supported on three bearings located in crankcase. One end of crankshaft is connected with electric motor by means of rigid coupling while the other end powers the geared oil pump by means of overdrive clutch. In crankshaft, holes for delivery of oil are drilled and they are the only passageway for lubricating oil to flow to the main bearing and to the bearing in the major head of connecting rod.

The **connecting rod body** is forged from No.45 the finest carbon steel. To the small end of connecting rod, the acid bronze alloy bush is pressed while the big end is provided with thin walled bushing in karmarsch alloy.

The **crosshead** is integrally cast with cast-steel, friction surface with babbit alloy. The linking between crosshead and piston rod is completed by hydraulic fastening device.

The **cylinders** are cast with high-test cast iron. The 1st cylinder are integrated by casting while the 2nd and 3rd cylinders are casted as one. All cylinder bodies are lined with cylinder sleeves made of corrosion-resistant 3Cr13. The sealing faces of cylinder heads and waist shape holes in the cylinder bodies are abraded to seal. In the cylinder heads and cylinder bodies water will flow for cooling.

The **piston** is of double-action type and comprised of piston body, piston rod, piston ring, guide ring and oil-catch ring, etc. The 1st stage piston body is cast with aluminum alloy and the surface is treated by anodic oxidation. The 2nd stage piston body is composited of aluminum alloy and stainless steel. The 3rd stage piston body is in stainless steel. The guide rings and piston rings are made of corrosion-resistant PTFE which is wear-resisting and self-lubricates.

The **suction & discharge valves** are reticular valves with the characteristics of multi channels and lower lift, and all of their parts are made of stainless steel and can be replaced each other.

The **sealer** at each stage has the same structure and consists of one interceptor ring, one throttling ring, five groups of sealing box and last end sealing ring. The interceptor ring and the throttling ring serves the function of equalization of pressure by throttle and reduction of gas flow pulsation. There are three different rings in each group of sealing box. The first one is a radial notched ring, the second one is a tangential notched ring and both of them are seal rings. The third one is a supporting ring without notch which is used to prevent the cold flow from side and corner when the 1st and 2nd sealing rings are under the pressure. The three sealing rings numbered 1, 2 and 3. The assembly of sealer shall be in light of drawing Y314.60000 with no change the order of the sealing rings, and attention shall be given to enough axial gap. The sealer is provided with connector for gas filling so that the guarantee can be taken for the quality of the delivered oxygen.

The **oil scraper** at each rank of piston rod has the same structure, and It is comprised of oil scraper body, oil scraper ring and oil deflector, etc. The oil scraper rings are made of tin bronze and oil deflectors are made of PTFE. The oil scraper is used to prevent the liquid oil and oil fog from being brought into the sealer along with the up-and- down movement of piston rod.

**Gas cooler** of each stage is of horizontal, stuffing, floating-head type and high efficiency exchanger. The cooling tube is high inner fin copper tube, and other parts in contact with oxygen are all made of stainless steel. The oxygen flows inside the tube side and the cooling water flows inside the shell side.

All the **oxygen pipes** are of stainless steel. It insure that the machine can safely run with the suction & discharge stop valves which are made of stainless steel, the check valve and the 1st, 2nd & 3rd safety valves.

The **cooling water system** for the compressor is in closed circulation. Regulate the stop valves in the water watcher to control the outlet temperature of cooling water not exceed 42℃.

The **lubricating** of moving mechanism is provided forced lubrication by the gear oil pump at the end of crankshaft providing the pressure oil, and a reserve gear oil pump is equiped. The lube oil is sucked by the gear oil pump from crankcase through the oil filter. The pressure oil is fed into two parts, one into crankshaft to lubricate the main bearing and the big head bearing of connecting rod and also through the connecting rod to lubricate the small head bearing, while the other to lubricate the crosshead guide and also to the small head bearing.

The machine is set with an oil vapour extraction device. Through ejector the pressure inside oil vapor pipe can be made to reach -5~ -2 kPa, and it prevents oil fog from going out of oil scraper and entering oxygen compressing area and makes oxygen compressor safer. Ejector needs 0.30 MPa(~30 $Nm^3/h$) dry air or nitrogen as power supply.

The compressor is provided with **local instruments and electric control cabinets**, and most of pressure gauges and temperature indicators are mounted on it. There is signal alarm or interlock stop when the 1st stage suction pressure, 3rd stage discharge pressure, discharge temperature for each stage, oil supply pressure, cooling water flow, compressor bearing temperature and electric motor bearing temperature go beyond the normal range. The others measuring points are only as ordinary indication. The detailed parameters are listed below:

| Measuring Point Name | Normal Indication Value | Measuring Point Position | Instrument Installation Site | Remarks |
|---|---|---|---|---|
| 1. Suction pressure for 1st stage | 15 kPa | Pulsation damper (R4Y18.000) | Local instr. control panel | Alarm at ＜8 kPa<br>Stop at ＜5 kPa |
| 2. Discharge pressure for 1st stage | 0.22~0.27 MPa | Pulsation damper (R4Y19.000) | Local instr. control panel | Safety valve opening at ≥0.33 MPa |
| 3. Discharge pressure for 2nd stage | 0.90~1.05 MPa | Pulsation damper (R4Y21.000) | Local instr. control panel | Safety valve opening at ≥1.16 MPa |
| 4. Discharge pressure for 3rd stage | 3.0 MPa | Discharge pipe from end（Ⅰ） (M1Y27.01200) | Local instr. control panel | Alarm at ＞3.3 MPa<br>Stop at ＞3.4 MPa<br>Safety valve opening at ≥3.3 MPa |
| 5. Oil supply pressure for lube oil | 0.30~0.35 MPa | Oil supply unit (W4Z12.70100) | Local instr. control panel | Alarm at ＜0.25 MPa<br>Stop at ＜0.20 MPa |
| 6. Oil pressure before oil cooler | 0.35 MPa | Gear oil pump (W4Z12.50000) | Local instr. | |
| 7. Oil pressure after oil cooler | 0.35 MPa | Oil supply unit (W4Z12.70100) | Local instr. control panel | |
| 8. Oil vapor extracting pressure | -5 kPa~ -2 kPa | Manifold (Y314.00303) | Local instr. , Local instr. control panel | |
| 9. Water supply pressure | 0.45~0.55 MPa | Water supply pipe (M3Y07.200) | Local instr. control panel | |
| 10. Cooling water flow | 90 t/h | After return pipe（M3Y07.300） | Local instr. control panel | Alarm at ＜75 t/h<br>Stop at ＜60 t/h |
| 11. Water supply temp. | ≤35℃ | Water supply pipe (M3Y07.200) | Local instr. control panel | |
| 12. Suction temp. for 1st stage | 22℃ | Pulsation damper (R4Y18.000) | Local instr. control panel | |
| 13. Suction temp. for 2nd stage | ≤40℃ | Pulsation damper (R4Y20.000) | Local instr. control panel | |
| 14. Suction temp. for 3rd stage | ≤40℃ | Suction pipe 3rd stage (M1Y27.00500) | Local instr. control panel | |
| 15. Discharge temp. from end | ≤45℃ | Discharge pipe from end（Ⅰ） (M1Y27.01200) | Local instr. control panel | |
| 16. Discharge temp. for 1st stage | ≤170℃ | Pulsation damper (R4Y19.000) | Local instr. control panel | Alarm at ＞170℃ |
| 17. Discharge temp. for 2nd stage | ≤170℃ | Pulsation damper (R4Y21.000) | Local instr. control panel | Alarm at ＞170℃ |
| 18. Discharge temp. for 3rd stage | ≤170℃ | Discharge pipe 3rd stage (M1Y27.01100) | Local instr. control panel | Alarm at ＞170℃ |
| 19. Each of the water outlet temperature | ≤45℃ | Water watcher (M3Y07.100) | Local instr. | |
| 20. Oil supply temp. for lube oil | ≤50℃ | Oil supply unit (W4Z12.70100) | Local instr. control panel | Alarm at ＞50℃<br>Stop at ＞60℃ |

# GUIDEBOOK FOR THE INSTALLATION OF MODEL ZW-63.5/30 OXYGEN COMPRESSOR AT SITE

## (MANUFACTURER'S CODE NO.: Y314BCK)

### Requirements for installation of OXYGEN COMPRESSOR

**1 Preparations to be made before installation**

1.1 Eliminate the oil seal from the machine and clean the machine. Thoroughly clean and unblock the oil path such as in crankshaft, cross head, oil filter and all the oil pipes, and also blown off by compressed air. The crankcase should also be thoroughly cleaned so as to insure that the lube oil used in running is clean.

1.2 All the components to be in contact with Oxygen should be degreased and cleaned with trichloroethylene, and the oil residual adsorption be not exceed 125 mg/$m^2$.

1.3 Pre-anneal the copper washers.

1.4 The foundation has undergone a certain period of concrete curing and the liners (supplied by user) are prepared.

**2 Fitting-up clearance**

Before the compressor is delivered from the manufacturer, the fitting-up clearances at main locations are adjusted in pre-installation to those required by the design. In reassembly, the fitting-up should be done according to the numbering and the fitting-up clearances should be rechecked.

2.1 Diameter of crankshaft: Φ 220 mm

Radial clearance between crankshaft and main bearing shell: 0.18 to 0.25 mm.

Radial clearance between crankshaft and thrust bearing shell: 0.18 to 0.25 mm,

axial clearance between crankshaft and thrust bearing shell: 0.30 to 0.50 mm.

2.2 Diameter of crank: Φ 220 mm

Radial clearance between crank and big end bushing of conrod: 0.10 to 0.20 mm.

2.3 Diameter of crosshead pin: Φ 120 mm

Radial clearance between crosshead pin and small end bushing of conrod: 0.10 to 0.14 mm.

Axial clearance between crosshead and small end bushing of conrod: 0.40 to 0.70 mm.

2.4 Diameter of crosshead: Φ 360 mm

Clearance between crosshead and guide track: 0.25 to 0.32 mm.

2.5 Dead clearance for cylinders:

Top dead clearance: 2.0 to 2.5 mm

Bottom dead clearance: 1.5 to 2.0 mm.

2.6 Guide ring:

- Radial thickness (in initial installation):

1st stage: 8 (±0.04) mm, 2nd stage: 6.5 (±0.04) mm, 3rd stage: 6.5 (±0.04) mm

- Allowable value of min. radial thickness:

It is not exceed 0.50 mm that the excircle of ring than the excircle of piston body.

- End face axial clearance:

1st stage: 0.35 to 0.45 mm, 2nd stage: 0.35 to 0.40 mm, 3rd stage: 0.28 to 0.43 mm

2.7 Piston ring:

- Radial thickness (in initial installation):

1st stage: 20±0.10 mm, 2nd stage: 18±0.10 mm, 3rd stage: 12±0.10 mm

- Allowable value of min. radial thickness:

1st stage: 13 mm, 2nd stage: 12 mm, 3rd stage: 8 mm

- End face axial clearance:

1st stage: 0.25 to 0.32 mm, 2nd stage: 0.22 to 0.30 mm, 3rd stage: 0.15 to 0.22 mm

- Round junction point clearance (at an angle of 45 degrees in initial installation):

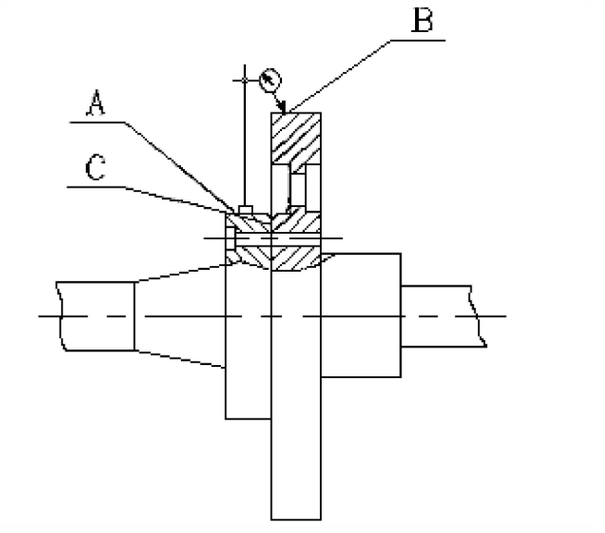
1st stage: 10 mm, 2nd stage: 8.5 mm, 3rd stage: 4.6 mm.

2.8 Axial clearance for oil scraper ring: 0.15 to 0.21 mm.

**3 Installation of machine frame and electric motor**

3.1 Adjust the levelness of compressor and el. motor bottom guides with liners to a range of 0.05 :1000 mm. Deviations should be in the same direction.

3.2 Align the compressor shaft with motor shaft. Put the magnetic dial gauge seat on plane A shown in Figure 1. Use the dial gauge to rectify plane B on the basis of periphery and the required dial gauge error should not be greater than 0.03 mm. The plane C is measured simultaneously. Four points are measured in cross direction and the error should not be greater than 0.03 mm.



3.3 Tighten the screws on coupling.

3.4 Only when the secondary grouted layer in foundation is solidified can the test run is carried out.

**4 Installation of piston and crosshead (W4Z12.40000)**

4.1 For the assembly of pistons refer to the drawings (Y314.30000, Y314.40000, Y314.50000). Before installation, thoroughly clean the pistons with trichloroethylene and dry it by blowing. Check the clearance for piston ring groove in the meantime. If the clearance does not comply with the requirement, assembly can be performed only when the rectification is done.

4.2 Before the pistons are put into cylinders, lay the tools No. 0315.90001, Y314.70001, Y314.70002 for mounting of pistons respectively on each stage cylinder in order for the piston to go smoothly into the cylinder. Screw in the eyebolt M16 at the top of piston, and mount the guide sleeve of piston rod Y314.70003 to help the piston rod enter sealer.

4.3 Lift piston, and dismantle the guide sleeve of piston rod after the piston rod going through the sealer and join the crosshead and the piston rod correctly referring to the drawing W4Z12.40000. Tweak the adjusting ring to reach the required dead clearance of cylinder. The linking between crosshead and piston rod is completed by hydraulic fastening device. For the principle and operation, see **INSTRUCTION MANUAL**--- **Appendix 8.2**: **Hydraulic fastening device of connection for crosshead**.

4.4 The crosshead is delivered through oil sealed in the manufactory, and it must be disassembled and cleaned thoroughly and the crosshead pin must be checked for oil hole when installing. Mount crosshead in the former mounting position, and check the fitting-up clearance and also keep them for reference in the future.

4.5 In assembling piston, pay attention to the notch of piston ring escaping from passing the port of valve antrum.

4.6 Because of the running-in of the ring, the new piston ring shall be gradually pressurized after it runs continuously without load for 8 hrs. The guide ring is of integral type and tightly affixed on each stage piston by shrinking method, and for the shrinking regulations of the ring refer to **INSTRUCTION MANUAL**--- **Appendix 8.1: Shrinking-on regulations for integral guide ring**.

**5 Installation of valve**

5.1 For the assembly of each stage suction / discharge valves refer to the drawings HT.HY01-41-00, HT.HY01-51-00, HT.HY01-42-00, HT.HY01-52-00, HT.HY01-43-00, HT.HY01-53-00. When the valve is assembled, pay attention to get the concave side of the spring arm of valve disc faced to the valve seat and to keep valve disc and the skew groove of damper disc in the same direction. Take care there is no friction between springs and holes of damper discs. The bolts and nuts of valves shall be tightened and fixed. Do not mix the springs and the spacers, or the valves shall not be normally operated.

5.2 After assembly, cleaning by use of trichloroethylene and dry by blowing should be done again.

5.3 When mounting each stage valve on cylinder and dismounting each stage valve from cylinder, the tools No. Y314.70004, 0263.210007 for mounting and dismounting valves can be respectively used.

5.4 As mounting the valve covers, firstly tighten the four nuts on it. After tightening the holding screw, check the degree of tightness for the four nuts to assure the tightness of valve covers.

**6 Installation of sealer (Y314.60000)**

6.1 When the sealer is assembled, pay attention to the locations for installation of different types of seal rings. The seal ring with radial notch should be mounted in front sealing box, i.e. towards the pressure side. The seal ring with tangential notch is then mounted in the middle of three different types of seal rings. The integral supporting ring is mounted in the end of sealing box. Such a group of seal rings must not be wrongly positioned, otherwise, the service effect will be reduced.

6.2 When the sealer is assembled, make sure that the sharp angles on the edge of seal ring must not be damaged and it is absolutely not allowed to scrape or repair them with a knife or file.

6.3 Clean the assembled sealer further by use of trichloroethylene and only when it is dried by blowing can it be installed.

6.4 To avoid the excess temperature of the piston rod, the sealer shall run for 8 hrs without load after changing the new seal rings.

**7 Installation of oil scraper (W4Z12.60000)**

When the scraper ring (W4Z12.60000) is installed, remain the wedge angle of cutting edge without damaging and keep movable in the oil scraper ring box. The inner hole of oil scraper ring (W4Z12.60009) is tubaeform, and it should be upward when mounting. When assembling, **4** sets of oil scrapers must be installed according to the numbering.

**8 Installation of connecting rod (W4Z12.30000)**

Though the connecting rod have been assembled by the manufacturer, it is delivered through oil sealed and they must be disassembled and cleaned, and the connecting rod body must be checked for oil holes by compressed air when installing. Pay attention to the numbering of the parts when assembling and mount them correctly in the position of dismounting, and check the fitting-up clearance and also keep them for reference in the future.

The connecting rod bolts are also pulled by hydraulic fastening device. Firstly, tighten the connecting rod bolts and the connecting rod nuts, and then connect the two sets of hydraulic tools for connecting rod nuts (Y314.70400) and the connecting rod bolts. After the hydraulic fastening device and the hydraulic tools is connected, press simultaneously to the pressure 150MPa and then tighten the nuts, and the quantity of extension of the connecting rod bolts should be controlled by pre-tightening force at 0.35 mm to 0.40 mm.

When assembling, four sets of connecting rods must be installed according to the numbering.

**9 Installation of gas cooler (G7Y24, G7Y25, G7Y26) and piping**

After the secondary grouting is done for the main machine and electric motor, such accessories as cooler and piping can be installed. The height and levelness of cooler are firstly rectified and then pre-install the piping. When every thing is acceptable, the anchor bolts of cooler are grouted.

All the oxygen pipes are made of stainless steel. Few interfaces of the pipes have been welded by spot welding in the manufactory and they shall be welded after site installation and adjustment. Adjustment and welding of them shall be in accordance with the specification specified in the drawing M1Y27B.00000. The welding slag and mechanical impurity must be removed as well as degrease in the pipes after welding.

The oxygen pipes shall be welded and mounted in the field acc. to JB/T 5902-2001, Specification for Oxygen Piping of Air Separation Plant.

Adjust the locations of supports or increase extra supports if there is some abnormal vibration in the piping when running of the compressor.

Translated from the Chinese by G. K. Shao

## 4 Trial run of Compressor

Trial run of the oxygen compressor shall be done after installation, and the gas for trial run must be dry oil-free air or nitrogen. After repairing the oxygen compressor or replacing the wearing parts, the oxygen compressor shall not be operated with load till it is tested.

**4.1 Preparations before trial run**

4.1.1 All the parts, pipes, valves and coolers, etc. which contact oxygen must be cleaned and degreased up to grade. The oil piping is flushed clean and tested by pressure to up grade. The oil vapour extraction device is installed. Do not fix the suction and discharge valves temporarily.

4.1.2 Check all the instruments to see whether they are in correctly connected position and whether each of water flows and the instruments are normal.

4.1.3 Before the electric motor is coupled with crankshaft, perform the test run of electric motor separately and complete the regulation of rotational direction. The rotation is counter-clockwise as viewed from oil supply unit.

4.1.4 Recheck the assembling quality of all parts, especially that of moving parts.

4.1.5 Turn the flywheel several times in order to see whether there are impediments to the moving parts.

4.1.6 Charge 520 L turbine oil L-TSA 68 (GB11120-1989) into the cleaned oil pool of crankcase till the 2/3 height of the inspection glass. Don't get the crankcase fully filled with oil.

4.1.7 Open each of cooling water valves until a greater flow is obtained.

4.1.8 Open the vent valve (V805) at the end and the reflux valve (V806).

4.1.9 Start the reserve gear oil pump and adjust the oil pressure in time up to 0.30 MPa to 0.40 MPa. Check whether the quantity of lube oil of all the lubricating points (such as main bearing, big/small bearings of conrod and sliding path of crosshead) is enough.

**4.2 Steps for trail run**

4.2.1 Inch the motor to check the compressor for running. If it is normal, start the motor again to let the compressor begin running and adjust the oil pressure in time up to about 0.35 MPa.

4.2.2 Stop the motor to check the main bearing and major/minor bearings of connecting rod for their temperatures after running 5 minutes and 30 minutes in turn. After maintaining the running for 2 hrs, stop the motor and check the temperature-rises of each bearing, sliding path of crosshead should be less than 40℃ and the temperature of piston rod should be less than 80℃.

If abnormality is found during trail run, stopping must be immediately done for inspection. Only when the abnormality is eliminated, the trail run can be continued.

**4.3 Unload test running of oxygen compressor**

After the test run of oxygen compressor is accepted, carry out the unload running continuously for 8 hrs in order that the moving parts can be in a good state of running-in and the possible defect can be found and rectified at the same time. The unload continuous running, which is particularly important to the running-in of PTFE sealing ring, piston ring and oil scraper ring, cannot be neglected.

**4.4 Blow-off of oxygen compressor**

4.4.1 The compressor sucks in from air by dismantling the 1st stage suction pipe.

4.4.2 Mount the suction & discharge valves (HT.HY01-41-00, HT.HY01-51-00) of the 1st stage cylinder and dismantle the 2nd stage suction pipe. Run the oxygen compressor for about 30 minutes in order to blow off the 1st stage cylinder, the 1st stage gas cooler and piping. Following stopping, dismantle and clean the 1st stage suction & discharge valves for inspection. If no abnormality is found, remount them to the cylinder.

4.4.3 Mount the suction pipe and suction & discharge valves (HT.HY01-42-00, HT.HY01-52-00) of the 2nd stage cylinder and dismantle the 3rd stage suction pipe. Run the oxygen compressor for about 30 minutes in order to blow off the 2nd stage cylinder,

the 2nd stage gas cooler and piping. Following stopping, dismantle and clean the 2nd stage suction & discharge valves for inspection. If no abnormality is found, remount them to the cylinder.

4.4.4 Mount the suction pipe of the 3rd stage cylinder and the 3rd stage suction & discharge valves (HT.HY01-43-00, HT.HY01-53-00). Run the oxygen compressor for about 30 minutes in order to blow off the 3rd stage cylinder and piping. Following stopping, dismantle and clean the 3rd stage suction & discharge valves for inspection. If everything is normal, remount them to the 3rd stage cylinder.

**4.5 Load test running of oxygen compressor**

4.5.1 After the oxygen compressor is cleaned by blow-off, the test running for rising pressure gradually can be done. The dry oil-free air or nitrogen shall be used for the medium of gas of pressure rising run acc. to the suction condition of oxygen compressor. Start the compressor to run normally and close the vent valve at the end and regulate the globe valve at the end to let the discharge pressure for each stage go up gradually. It is about 4 hrs to the pressure rising run, during which 1 hour is needed for the pressure to increase respectively from the initial value to 1.0 MPa and from 1.0 MPa 2.0 MPa, and 2 hrs are needed for the pressure to increase from 2.0 MPa to 3.0 MPa. During the period of gradual increase of pressure, attention must be paid to such matters as oil pressure, water pressure and temperature, each stage discharge temperature and the abnormal knocking noises.

**4.5.2 Full load running of oxygen compressor**

After the end discharge pressure goes up to 3.0 MPa, run the compressor continuously for 4 hrs. Keep the vacuum pressure in the pipe maintain –5 kPa to –2 kPa by regulating opening of angle stop valve (V852) on oil vapour extraction device while running.

Attention must be paid to the following during full load running.

- Whether the oil & water pressures are normal.
- Whether the discharge temperatures of each stage are normal.
- Whether the gas temperatures after each stage coolers are normal.
- Check the sealing effect of sealer.
- Check the oil scraping effect of oil scraper.
- Check the gas tightness of the whole system.
- Check the working situation of ejector in the oil vapour extraction device.
- Monitor the working situation of each suction & discharge valves.
- Check the vibration situation of machine and piping.
- Pay close attention to the indication situation of instruments and test the instrument to see whether the alarm is sensitive and reliable.
- When instrument gives the alarm, the cause must be immediately ascertained and regulation must be made at once.
- Pay attention to the temperature rise of electric motor.
- Pay attention to change situation of input voltage and current for electric motor.
- Record the operational data every half an hour and check whether they are in accordance with the specification.

If everything is normal in the full load running of oxygen compressor, the compressor can be put in normal production.

## 5 Normal operation of Compressor

Before compressing oxygen, the globe valve (V802, V808) for nitrogen should be closed while the globe valve (V807) opened.

**5.1 Start-up**

5.1.1 Turn the flywheel several times in order to see whether there are impediments to the moving parts.

5.1.2 Open the cooling water valves and properly regulate each of the water flow.

5.1.3 Open the reserve gear oil pump so that the oil can be supplied to each lubricating point.

5.1.4 Open the reflux valve (V806) and the vent valve (V805) at the end.

5.1.5 Start motor in line with the manual given by the manufacturer of motor. After 20 seconds, the 1st suction valve (V801) shall automatically open and supply oxygen. It runs for several minutes to change air or nitrogen in oxygen compressor system into oxygen.

5.1.6 After running, gradually close the reflux valve (V806) and the vent valve (V805) at the end. Meanwhile, open the end discharge valve (V804) and adjust its opening degree to make the end discharge pressure reach the rated value or pressure needed by pipe network.

5.1.7 Connect gas source with pressure used for oil vapour extraction device, and regulate opening of angle stop valve (V852) to make the vacuum pressure in the pipe maintain at about –2 kPa.

5.1.8 Check the running situation of machine. After the machine is confirmed to run normally, it can be put into normal operation.

**5.2 Operations in normal running of oxygen compressor**

5.2.1 The main parameters are listed below when the oxygen compressor is in normal operation.

| Item | Normal Value | Remarks |
|---|---|---|
| 1. Suction pressure for 1st stage **PIAS 811** | 15 kPa | Alarm at ＜8 kPa, stop at ＜5 kPa |
| 2. Discharge pressure for 3rd stage **PIAS 801** | 3.0 MPa | Alarm at＞3.30 MPa, stop at＞3.40 MPa |
| 3. Oil supply pressure for lube oil **PIAS 803** | 0.30~0.35 MPa | Alarm at＜0.25 MPa, stop at＜0.20 MPa |
| 4. Oil vapor extracting pressure **PI 808, 809** | -5 kPa~ -2 kPa | |
| 5. Cooling water flow **FIAS 801** | 90 t/h | Alarm at ＜75 t/h, stop at ＜60 t/h |
| 6. Water supply temp. **TI 806** | ≤35℃ | |
| 7. Suction temp. for 1st stage **TI 811** | 22℃ | |
| 8. Discharge temp. from end **TI 801** | ≤45℃ | |
| 9. Each of the water outlet temperatures **TI 874~876, TI 871~873** | ≤45℃ | |
| 10. Oil supply temp. for lube oil **TIAS 803** | ≤50℃ | Alarm at ＞50℃, stop at ＞60℃ |
| 11. Bearing temp. for main el. motor **TIAS 863, 864** | ≤90℃ | Alarm at ＞90℃, stop at ＞95℃ |
| 12. Main bearing temp. for compressor **TIAS 860~862** | ≤75℃ | Alarm at ＞75℃, stop at ＞80℃ |

5.2.2 Record the actual operational readings on instrument for an hour.

5.2.3 If the instrument gives the alarm signal, it must be done immediately to find out the cause and regulate in time.

**5.3 Normal stop of oxygen compressor**

5.3.1 Open the reflux valve (V806) slowly so as to unload the cylinder, and then close the end discharge valve (V804) and open the vent valve (V805).

5.3.2 Stop the electric motor and the 1st stage suction valve (V801) will close automatically.

5.3.3 When the electric motor stops running, close the vent valve (V805).

5.3.4 Disconnect the gas source with pressure used for oil vapour extraction device.

5.3.5 Close the water inlet valve. Drain the cooling water from each stage cylinder, cooler and all water piping completely. Especially, the machine will encounter cracking in freezing area in winter if the water is not emptied.

**5.4 Emergency stop of oxygen compressor**

In the event of accident, firstly stop the electric motor. Then open the vent valve (V805) at the end immediately and close the globe valve (V804) at the end.

**5.5 Long stop of oxygen compressor**

If the oxygen compressor is stopped for several weeks, use dry nitrogen to do test running after normal stop in order to avoid rust inside the equipment and operate according to the following order.

5.5.1 Open the vent valve (V805) and close the nitrogen by-pass valve (V807), and then open the nitrogen suction valve (V802, V808) to connect the nitrogen source.

5.5.2 After oxygen inside the machine is discharged, firstly relieve valve position interlock of oxygen suction valve V801 and close vent valve (V805) as well as open the reflux valve (V806). Then start motor to run for several minutes. After the machine is filled with nitrogen, stop the machine.

5.5.3 After the machine stops, close the nitrogen suction valve (V802, V808) and open the nitrogen by-pass valve (V807).

5.5.4 Close the cooling water inlet valve and drain all the accumulated water in the compressor unit.

5.5.5 During shutdown period, start the reserve gear oil pump once a week and run for 30 minutes. Meanwhile, turn the flywheel several times.

## 6 Possible Problems and Troubleshooting !!!

**6.1 Cylinder**

6.1.1 Abnormal gas suction & discharge pressure and temperature

- Leakage and abnormal resistance are found at any stage of oxygen compressor so as to cause the abnormal pressure at this stage.
- Blockage occurs so that the discharge pressure at this stage goes up and the gas discharge temperature goes up too.
- Discharge valve is unsealed so as to cause the temperature to go up due to suction, compression and discharge of leaking gas.

The leaking component should be replaced and blockage should be eliminated in order to remedy the above troubles.

6.1.2 Leakage of gas

- Valve plate is cracked or spring breaks off so that filings fill the valve.
- There is excessive wear in piston ring and cylinder liner so that the sealing is out of function.
- There is excessive wear in sealer and seal ring so that the sealing is out of function.
- Safety valve and atmospheric valve are not tightly closed.
- Valve seat is not tightly fitted against the fitting surface in cylinderblock.

For remedy of these troubles, such quick-wear parts as valve disc, piston ring, sealing ring, and backing ring should be replaced and the fitting surface should be abraded.

6.1.3 Water in cylinder

- Crack occurs because the cylinder cover and cylinderblock are damaged.
- There is leakage of water from the last stage cooler.

**6.2 Lubricating oil system**

6.2.1 Low oil pressure

- Oil level in crankcase is lower than the required height.
- Oil filter is blocked.
- Pump or pressure regulating valve is damaged.
- Leakage takes place on oil inlet & outlet pipes.

6.2.2 High oil pressure

- Setting value for pressure regulating valve is too great.
- Oil outlet piping is obstructed.
- Oil is poor in quality or the brand of oil is wrong.
- Oil temperature is too low.

In order to remedy these troubles, the oil should be added or replaced and the oil filter as well as oil piping should be cleaned, and the clearances of gear oil pump should be regulated.

**6.3 Knocking noise**

6.3.1 Oxygen compressor frame

- Excessive clearance is caused by the wear main bearings or bearings of connecting rod.
- Clearance between crosshead and guide track is excessive.
- Locking nut on crosshead works loose.
- Connecting rod nut works loose.

6.3.2 Cylinder

- Dead clearance is too small.
- Connecting part for piston works loose.
- Foreign matters enter cylinder.
- Valve disc is cracked or spring is damaged.
- Clearance between piston ring and groove is excessive.

Regulation of clearance, tightening of nuts, elimination of foreign matters and specification of operating are the measures to remove these troubles.

## 7. Maintenance of Compressor !!!

**In order to guarantee the normal running of oxygen compressor and avoid unexpected damage of parts, daily check and periodical inspection and maintenance must be maintained. Generally, overhaul should be done once a year and intermediate inspection & maintenance should be done once half a year or in shorter time.**

**7.1 Daily check**

7.1.1 Each stage suction & discharge temperature and pressure are normal or not.

7.1.2 Supply of cooling water is normal or not.

7.1.3 Check the oil pressure and quantity.

7.1.4 Listen regularity to the working sound of valve in order to know whether it is normal or not.

7.1.5 Check moving parts to know whether there is any knocking noise or not.

7.1.6 Check the working situations of sealer and oil scraper.

7.1.7 Check the degree of vibration for the machine and piping.

**7.2 medium maintenance**

7.2.1 Examine each stage valve to know whether there are any damaged parts. Replace them by spare parts if necessary.

7.2.2 Examine each instrument for its accuracy and each stage safety valve for its reliability.

7.2.3 Clean suction strainer, oil filter and breather valve located on the machine frame.

7.2.4 Examine the wearing of piston ring and guide ring. Replace them by new rings if necessary.

7.2.5 Examine and clean the sealer and oil scraper.

7.2.6 Clean the crankcase and change the lube oil.

7.2.7 Examine each bearing and the clearance between crosshead and guide track. Make adjustment according to the requirements if necessary.

**7.3 Heavy maintenance**

Dismantle and clean every component of the whole machine and also carry out the examination and maintenance. In addition to the items, which are the same as those maintenance and examination in medium maintenance, the electric motor should be cleaned in line with the manual given by the manufacturer of motor. Furthermore, maintenance and assembly, do as follows.

7.3.1 The dismantled parts must be installed according to the numbering. It should be particularly noticed that the 4 rows of connecting rods should not be wrongly exchanged with each other or reversely mounted.

7.3.2 All parts and components, contact with Oxygen must be carefully degreased and cleaned before assembling.

**7.4 Examination and maintenance of important parts**

**7.4.1 Valves**

The valves must be examined after 3000 hrs of continuous operation. The examination time shall be shortened properly if the running period is irregular. The valves shall be dismantled and cleaned upon the examination, and the damaged parts shall be replaced. Refer to Para 3.5 for the assembling of valves. If there is fault during valves working, the whole part can be replaced.

**7.4.2 Pistons**

Examine the wearing of the piston ring after running for 4000 hrs. Replace the piston ring if necessary.

**7.4.3 Sealers**

Check the wearing of sealing rings after running for 4000 hrs. Replace them if necessary. Refer to Para 3.6 for the assembling of seal ring.

**7.4.4 Oil scrapers**

Often check the oil scraper. If the efficiency is not very well, check it as follows:

-- Check the fit between scraper rings and piston rod. Re-abrade or replace them if necessary. The contact height of each scraper ring with the piston rod is 1.5 mm. The scraper rings shall be obtained in the scraping efficiency by abrading the lower part of the piston rod with fine abrasive paste after dismantling piston rod. Replace the piston rod if it is dashed or worn out.

-- Check the tension of spiral locking spring.

-- Check the lube oil of moving parts for the specification. If it is too thin, the scraping effect shall not be guaranteed.

**7.4.5 Lube oil ( L-TSA 68 GB 11120-1989 eqv ISO VG 68 )**

Turbine oil L-TSA 68 is used and the kinematic viscosity is 61.2~74.8 $mm^2/s$ at 40℃. Change the oil every 6 months in the first year and once a year later. Clean oil filters and crankcase thoroughly when changing.

7.4.6 Check the tightness of connecting rod nuts and locking nuts for crosshead once a year.

7.4.7 Clean the cooling water piping

If the outlet temperature of gas or oil is up and the water outlet temperature of cooler drop, this means the scaling exists in the water pipe. The following solution is recommended for cleaning of the pipe.

-- The deposited sand particles must be loosened mechanically and flushed out of the pipe. The leak test of water pipe must be made after cleaning.

-- Solution Formula and Handling for Descaling (at room temperature)

The preparation of 100 kg solution needs the material and ratio: citric acid 9 kg, sulphuric acid 800 g, thiocarbamide 1 kg, ethyl alcohol 1500 ml, 0P-10 1 kg (JIANG NAN chemical plant), and water 86 kg.

Method for use: First, mix citric acid, thiocarbamide, ethyl alcohol and 0P-10 with water, and then pour sulphuric acid into prepared solution. Never pour sulphuric acid into water directly. The solution feed to the pipeline by liquid pump for cleaning. After clear away the scaling, the coolers will be rinsed with a large number of water.

NB: Seal up the used solution after clear away the precipitate, it may again used at descaling next time.

## 8 Appendix 8.1 : Shrinking-on regulations for integral guide ring

The guide ring is an important part of compressor. If it is necessary to change the guide ring, it must be shrunk acc. to the shrinking-on process specified in the regulations.

8.1 Items to be prepared

-- Guide ring

-- Piston body

-- Tools for mounting (expander ring tool provided together with the compressor by the manufacturer)

-- Heater

8.2 Cut off the worn guide ring.

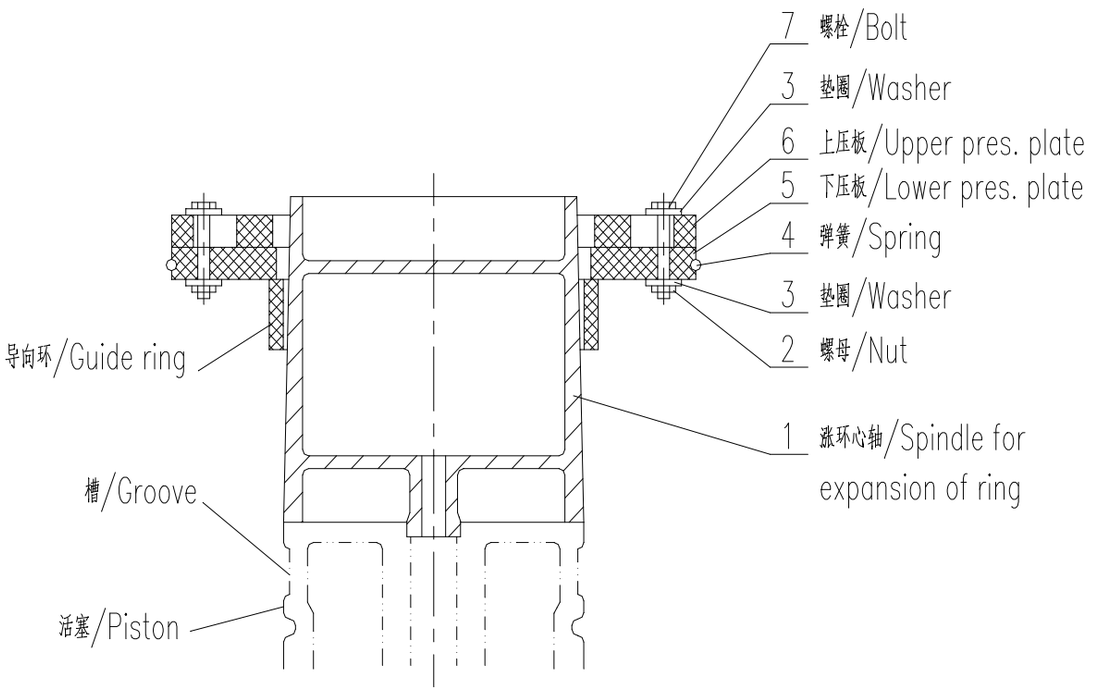
8.3 Clean the new guide ring and the expander ring tool and dry them.

8.4 Put the new guide ring, piston body and conical spindle with the shrink ring in an electric oven and heat them to 100℃, and to keep that temperature up to one hour (not allowed to directly heat them with fire).

8.5 As shown in the following figure, locate the conical spindle with the shrink ring on the piston body, then shrink the guide ring on the spindle with the shrink ring and press it into the guide ring groove of the piston rapidly within 20 seconds.

8.6 Put the piston body integrated with the guide ring into the electric oven and heat it slowly to 120℃ ~ 150℃ and insulate it for 1h. After the piston body is cooled to the room temperature in the electric oven gradually. At this time, the shrinking work is ended. Don't cool them in air and rapid cooling will damage guide ring.

8.7 Check the guide ring on the piston body for looseness in the room temperature and the size shall meet the design requirement.




序号2.3.7的紧固后应使序号5.6能相对自由滑动

After S/N 2, 3 and 7 are fastened, the S/N 5 and 6 can relatively and freely slide.

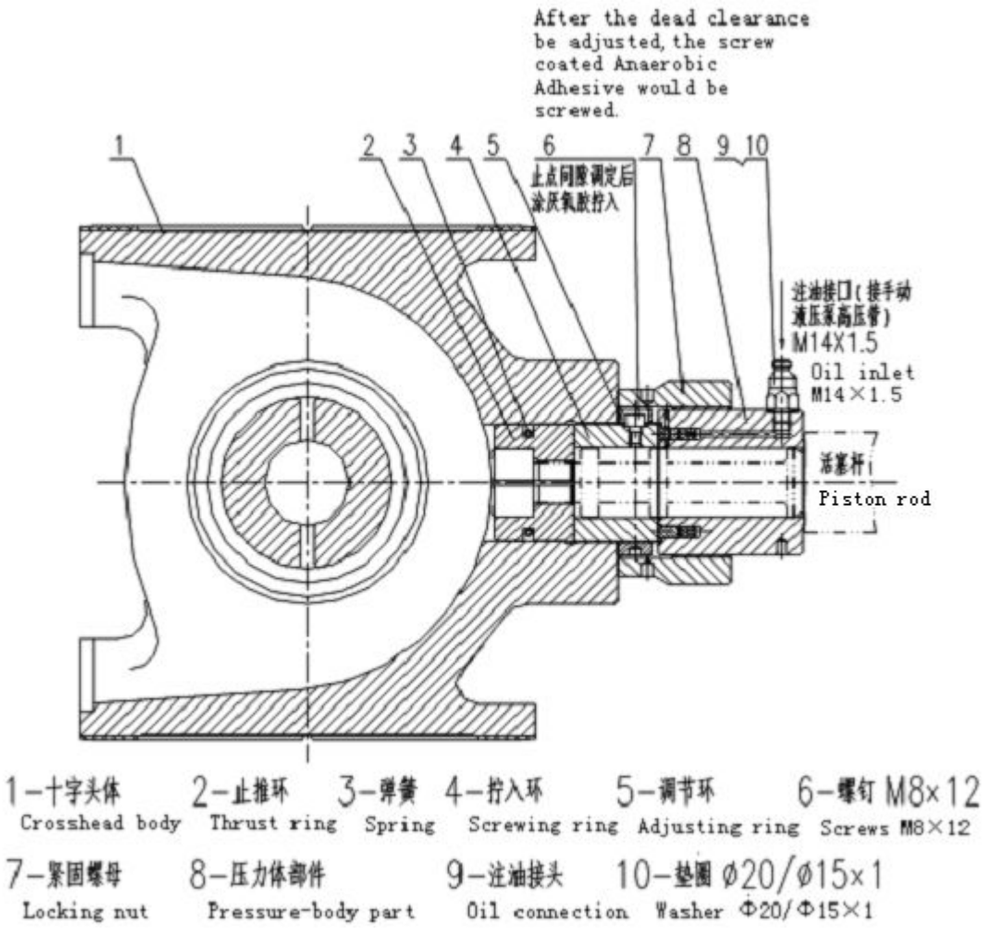
## Appendix 8.2 : Hydraulic fastening device of connection for crosshead

The hydraulic fastening device of connection is used for connecting between piston rod and crosshead and also for the connecting rod bolts. It is composed of two parts, the connecting device and fastening device.

The principle of hydraulic connecting for piston rod and crosshead is such. Through the fastening device of connecting, press the hydraulic oil with pressure of 150 MPa into S/N.8 the pressure-body part with hydraulic ultra-high pressure hand pump after connecting the piston rod and crosshead, as shown in the following figure. Using the character of incompressibility for liquid, pushed the piston in pressure-body to make elastic extending deformation at the end of piston rod. After locking S/N.7 the locking nut, release the oil pressure and thus the pretightening force needed can be reached.

The operating procedures of connection for crosshead, see the stipulations of technical requirement in the attached drawing W4Z12.40000 .

During the continuous pressing, pay attention to such as the maximum pressure not exceed 150 MPa, the process of tighten needing 3 times and each interval time needing 1 hr as well as adopting the same method of tighten at each time.



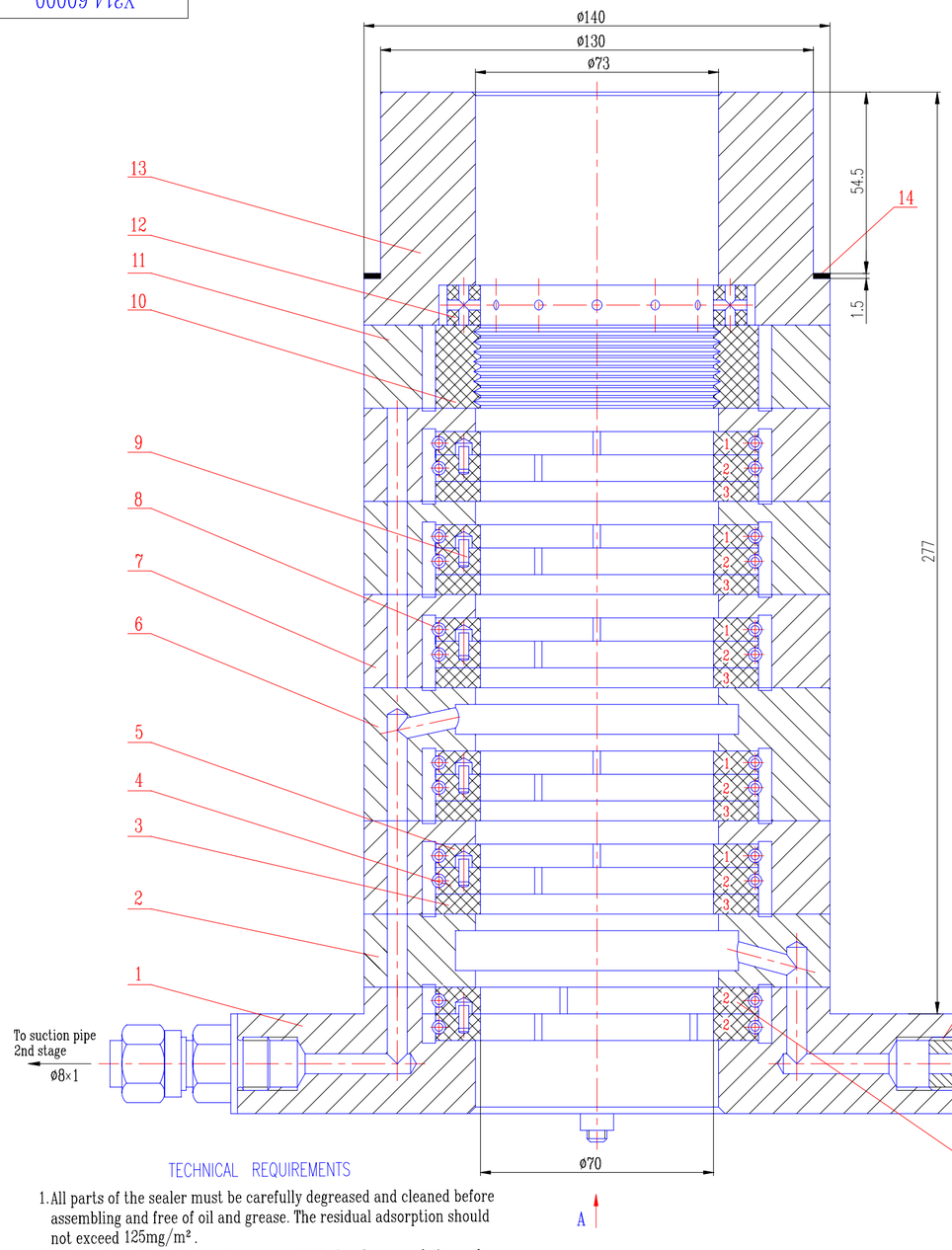

Translated from the Chinese by G. K. Shao

# Y314BCK 技术数据/ TECHNICAL DATA

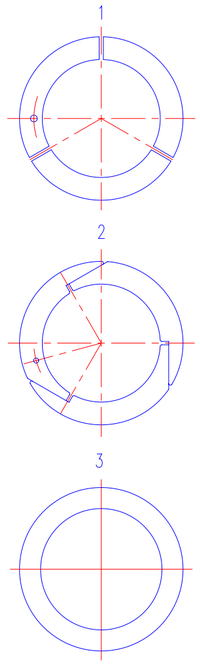
| No | 项目/ Item | 内容/ Description |
|---|---|---|
| 1 | 型号/Model | ZW-63.5/30 |
| 2 | 型式/Type | 立式、四列、三级双作用压缩、气缸无润滑、水冷式/<br>Vertical,four-row, three stages double-acting, non-lubricated cylinders and water-cooled. |
| 3 | 排气量/Capacity | 63.5 $m^3$ /min（吸入状态/under suction condition） |
| 4 | 介质/Medium: | 干燥氧气/Dry oxygen |
| 5 | 吸入状态/<br>Parameters of suction condition | 温度/Temperature: 25℃<br>压力/ Pressure：0.115 MPa(A) |
| 6 | 终压/Final discharge pressure: | 3.1 MPa (A) |
| 7 | 气缸内径/Cylinder bore: | φ500×2, φ410, φ240 mm |
| 8 | 冷却器后的气体温度/<br>Gas temp. after cooler | ≤45℃ |
| 9 | 压缩机转速/Speed of compressor | 493 r/min (由刚性联轴节与电机直接联接传动/Transmitted by the rigid coupling connected directly with the electric motor) |
| 10 | 冷却水进水温度/Cooling-water temp. inlet: | ≤35℃ |
| 11 | 冷却水耗量/Cooling-water consumption | 90 t/h |
| 12 | 润滑油量/ Quantity of lube oil | 520 L (一次装机量/a filling quantity required) |
| 13 | 润滑油品牌/ Lube oil grade | 68 号 L-TSA 汽轮机油/ No. 68 L-TSA Turbine oil（GB 11120-1989 eqv **ISO** VG68） |
| 14 | 活塞行程/ Piston stroke | 240 mm |

| | | |
|---|---|---|
| 15 | 压缩机轴功率/ Shaft power of compressor | 725 kW |
| 16 | 配用电机/ Electric motor | YKK6304-12 Type，6 kV, 50 Hz, 493 r/min, 800 kW　Asynchronous motor |
| 17 | 主机外形尺寸/<br>Overall dimensions (Compr. unit) | ~7840×1630×4030 mm，主机重量/Weight (Compr. unit): 19200 kg |
| 18 | Ⅰ级安全阀开启压力/<br>Opening pressure for Safety valve Ⅰ stage | 0.33 MPa |
| 19 | Ⅱ级安全阀开启压力/<br>Opening pressure for Safety valve Ⅱ stage | 1.16 MPa |
| 20 | Ⅲ级安全阀开启压力/<br>Opening pressure for Safety valveⅢstage | 3.30 MPa |
| 21 | 全机组占地面积/The occupied area of the whole compressor unit | 12×7.1 $m^2$ （包括电机抽芯空间和冷却器抽芯空间/including electric motor and gas cooler both remove space) |
| 22 | 最大起吊部件重量/<br>The maximum weight of the hoisting parts | 10820Kg |

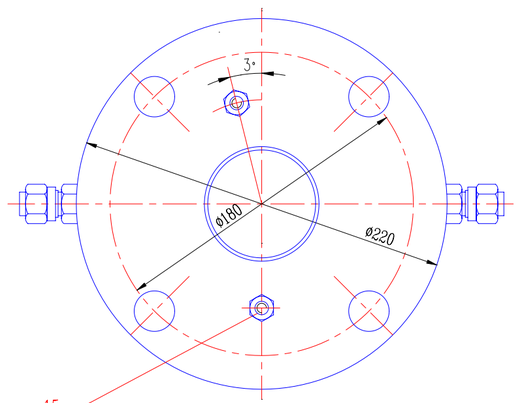
Y314.60000




ASS Y. SCHEMATIC DRAWING OF THE SEALING RING




View A
1:2




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21 | Y314.60008 | Sealing ring (top) | 1 | PTFE with compounds | 0.06 | | |
| 20 | HT2509-83 | Inner joint DN6 | 2 | HPb59-1 | 0.015 | 0.030 | |
| 19 | HTA3701-93 | Cap nut M18×1.5×13 | 2 | H62 | 0.0398 | 0.0796 | |
| 18 | HT2510-83 | Gasket ø17/ø28×1 | 2 | XB350 | 0.0002 | 0.0004 | |
| 17 | HT2508-83 | Screwed joint DN6 | 2 | HPb59-1 | 0.076 | 0.152 | |
| 16 | GB/T6170-2000 | Nut M6 | 2 | HPb59-1 | 0.002 | 0.004 | |
| 15 | 0310.150004 | Double screw bolt | 2 | H62 | 0.064 | 0.128 | |
| 14 | Y314.60013 | ø139/ø131×1.5 Washer | 1 | T2-M | 0.027 | | No drawing |
| 13 | Y314.60003 | Sealer seat | 1 | ZCuAl10Fe3 | 2.1 | | |
| 12 | Y314.60005 | Interceptor ring | 1 | PTFE with compounds | 0.09 | | |
| 11 | Y314.60012 | Throttling box | 1 | ZCuAl10Fe3 | 1.35 | | |
| 10 | Y314.60002 | Throttling ring | 1 | PTFE with compounds | 0.27 | | |
| 9 | GB/T119.2-2000 | Pin 3×8 | 6 | 3Cr13 | 0.004 | 0.024 | |
| 8 | 0310.150013 | Locking spring | 12 | 1Cr18Ni12Mo2Ti | 0.01 | 0.12 | |
| 7 | Y314.60010 | Sealing box | 4 | ZCuAl10Fe3 | 2.33 | 9.32 | |
| 6 | Y314.60011 | Sealing box | 1 | ZCuAl10Fe3 | 3.25 | | |
| 5 | Y314.60007 | Sealing ring | 5 | PTFE with compounds | 0.06 | 0.30 | |
| 4 | Y314.60009 | Sealing ring (bottom) | 6 | PTFE with compounds | 0.06 | 0.36 | |
| 3 | Y314.60004 | Backing ring | 5 | PTFE with compounds | 0.06 | 0.30 | |
| 2 | Y314.60006 | Distance ring | 1 | ZCuAl10Fe3 | 1.8 | | |
| 1 | Y314.60001 | Gland cover | 1 | 3Cr13 | 7.8 | | |
| S/N | DWG. NO. | DESCRIPTION | QTY | MATERIAL | SINGLE WEIGHT (kg) | TOTAL WEIGHT (kg) | REMARKS |

TECHNICAL REQUIREMENTS

1. All parts of the sealer must be carefully degreased and cleaned before assembling and free of oil and grease. The residual adsorption should not exceed 125mg/m².
2. After each sealing ring has been assembled, the clearance between boxes terminal face must be maintained at 0.30-0.40 mm.

| 更改 | 数量 | 文件及其号码 | 签名 | 日期 |
|---|---|---|---|---|
| 设计 | | | | |
| 制图 | | | | |
| 校对 | | | | |
| 标准化审查 | | | | |
| 工艺会签 | | | | |
| 审核 | | | | |

SEALER

ASSEMBLY

Y314.60000

| 图样标记 | 重量 (kg) | 比例尺 |
|---|---|---|
| 试 | 27.6 | 1:1 |

共 张 第 张

HANGZHOU HANGYANG COMPRESSOR CO., LTD.

| | |
|---|---|
| 描图 | |
| 写字 | |
| 描校 | |
| 旧底图总号 | |
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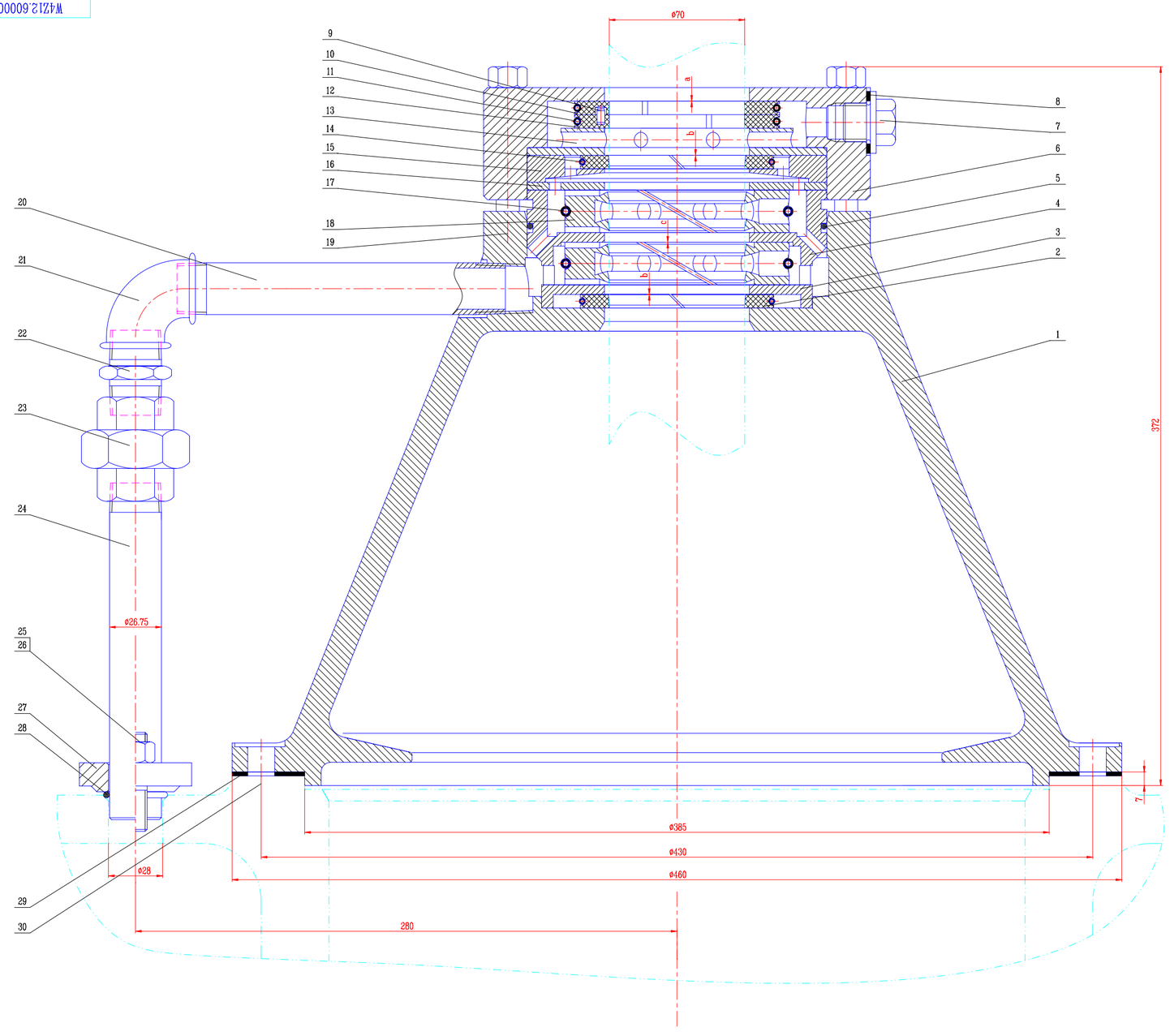
W4Z12.60000




## TECHNICAL REQUIREMENTS

1.The axial clearance a: 0.10~0.20 mm. b: 0.10~0.17 mm.
c: 0.15~0.21 mm.
2.When the compressor need to pump oil vapour, should demount screwed plug (S/N 7) and connect the suction of vacuum pump.

| S/N | DWG. NO. | DESCRIPTION | QTY | MATERIAL | SINGLE WEIGHT kg | TOTAL WEIGHT kg | REMARKS |
|---|---|---|---|---|---|---|---|
| 30 | GB5782-86 | Bolt M12×30 | 8 | Steel gr. 8.8 | 0.036 | 0.288 | Zinc-coated & passivated |
| 29 | W4Z12.60015 | Gasket | 1 | Oil-proof rubber asbestos sheet | 0.12 | | |
| 28 | GB/T3452.1-92 | O-ring seal 26.5×3.55 | 1 | Oil-proof rubber | 0.002 | | Purchased |
| 27 | W4Z12.60014 | Flange | 1 | Q235-A | 0.3 | | |
| 26 | GB899-88 | Double end stud AM10×30 | 2 | Steel gr. 6.8 | 0.023 | 0.046 | Zinc-coated & passivated |
| 25 | GB6170-86 | Nut M10 | 2 | Steel gr. 6 | 0.0079 | 0.0158 | Zinc-coated & passivated |
| 24 | W4Z12.60008 | Oil pipe | 1 | Galvanized pipe-20 | 0.34 | | |
| 23 | HT7036-82 | Adjustable union ZG3/4" | 1 | KT33-8 | 0.31 | | Zinc-coated & passivated |
| 22 | HT7025-82 | Male thread ZG3/4" | 1 | KT33-8 | 0.17 | | Zinc-coated & passivated |
| 21 | HT7031-82 | 90° Elbow ZG3/4" | 1 | KT33-8 | 0.156 | | Zinc-coated & passivated |
| 20 | W4Z12.60007 | Oil pipe | 1 | Galvanized pipe-20 | 0.37 | | |
| 19 | GB5782-86 | Bolt M12×80 | 4 | Steel gr. 8.8 | 0.077 | 0.308 | Zinc-coated & passivated |
| 18 | W4Z12.60010 | Oil scraper ring | 2 | ZCuSn10Pb1 | 0.75 | 1.50 | |
| 17 | W2Z16.50013 | Locking spring | 2 | Cr18Ni12Mo2Ti | 0.019 | 0.038 | |
| 16 | W4Z12.60011 | Backing ring | 1 | Q235-A.F | 0.4 | | |
| 15 | W4Z12.60013 | Oil scraper ring stand | 1 | Q235-A.F | 0.86 | | |
| 14 | W2Z16.50002 | Locking spring | 2 | Cr18Ni12Mo2Ti | 0.006 | 0.012 | |
| 13 | W4Z12.60012 | Sealing ring | 1 | Q235-A.F | 0.82 | | |
| 12 | W4Z12.60005 | Sealing ring (bottom) | 1 | PTFE with compounds | 0.65 | | |
| 11 | W2Z16.50004 | Locking spring | 2 | Cr18Ni12Mo2Ti | 0.009 | 0.018 | |
| 10 | W4Z12.60006 | Sealing ring (top) | 1 | PTFE with compounds | 0.65 | | |
| 9 | GB119-86 | Parallel pin A4×8 | 1 | 3Cr13 | 0.0007 | | |
| 8 | W4Z12.60016 | Gasket ø32/ø21×2 | 1 | XB350 | 0.0003 | | No drawing |
| 7 | HTA3711-93 | Screwed plug M20×1.5 | 1 | Q235-A.F | 0.1 | | Oxidized |
| 6 | W4Z12.60002 | Oil scraper cover | 1 | 5A02-F | 2.5 | | |
| 5 | GB/T3452.1-1992 | O-ring 145×3.55 | 1 | Oil-proof rubber | 0.0054 | | Purchased |
| 4 | W4Z12.60003 | Oil scraper ring box | 1 | HT250 | 0.17 | | |
| 3 | W4Z12.60004 | Oil scraper ring gland | 1 | Q235-A.F | 0.58 | | |
| 2 | W4Z12.60009 | Oil scraper ring | 2 | PTFE with compounds | 0.05 | 0.10 | |
| 1 | W4Z12.60001 | Oil scraper body | 1 | ZL104 | 9.25 | | |

| 更改 | 数量 | 文件更改单号 | 签名 | 日期 |
|---|---|---|---|---|
| 设计 | | | | |
| 制图 | | | | |
| 校对 | | | | |
| 标准化审查 | | | | |
| 工艺会签 | | | | |
| 审核 | | | | |

OIL SCRAPER

ASSEMBLY

W4Z12.60000

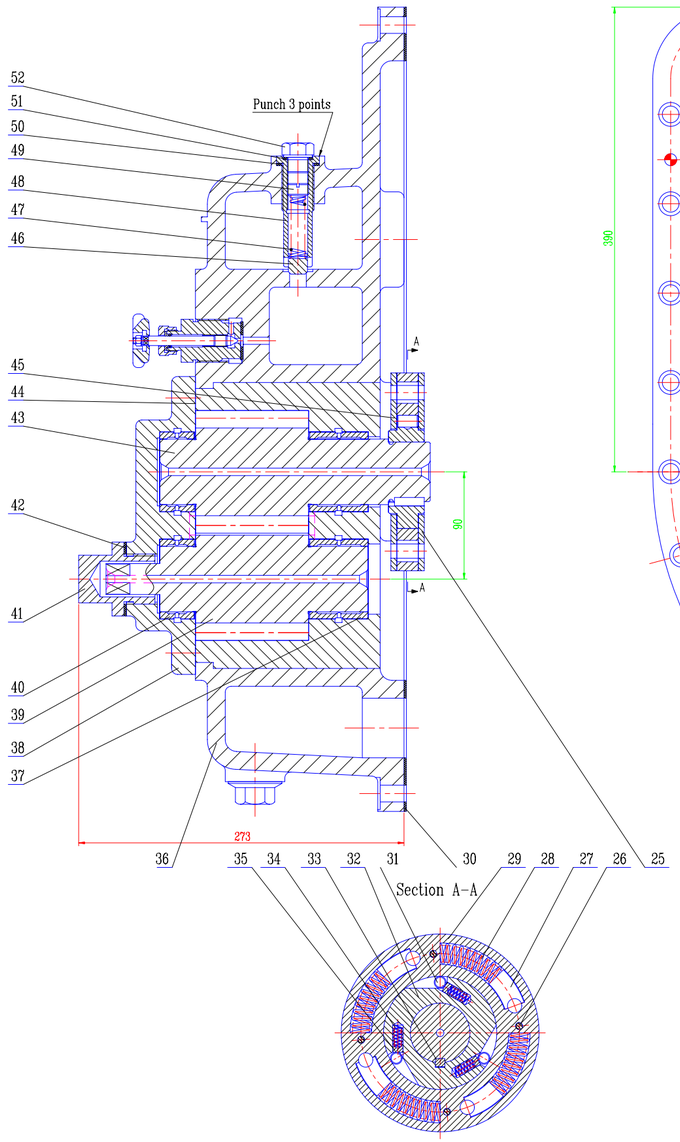
| 图样标记 | 质量 (kg) | 比例尺 |
|---|---|---|
| 试 | 19.36 | 1:1 |

共 张 第 张

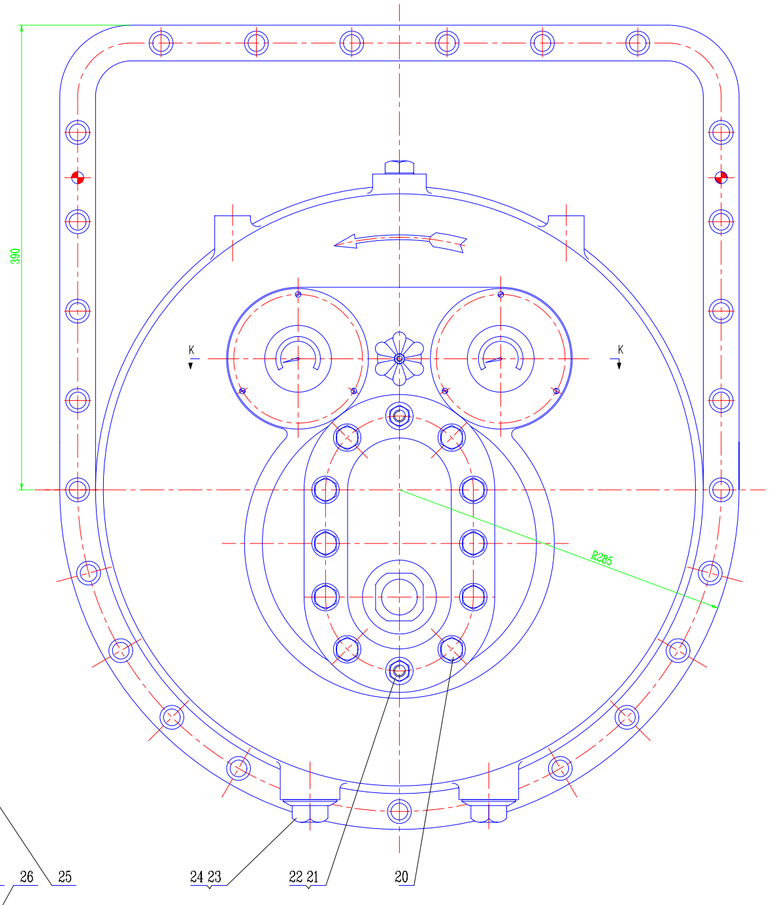
HANGZHOU HANGYANG COMPRESSOR CO., LTD.

描图
写字
描校
日底图总号
底图总号
日期 签字

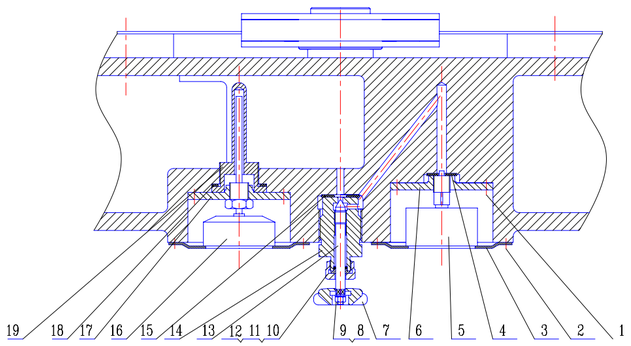
W4Z12.50000




Section A-A




Section K-K




## TECHNICAL DATA

The discharge capacity is 125 L/min at the driving gear speed 493 r/min and the oil pressure 0.40 MPa for gear oil pump.

## TECHNICAL REQUIREMENTS

1. The axial clearance of gears is 0.08~0.12 mm, and the radial clearance between gears and pump body is 0.06~0.12 mm.
2. The radial clearance between bushing and gears is 0.08~0.12 mm.
3. After the oil pump up to rated flow on the rated pressure in test, the adjusting screw (S/N 49) be not allowed to adjust.
4. The oil pump participate in the trial run in the manufactory, and it would be put in warehouse after the test run is passed and the technical parameters meet the requirement.
5. The non-machined surfaces of the oil pump should be shot blasted and polished, and then coated the under-coat inorganic zinc-rich, the top-coat of the oil pump painted together with the compressor unit after it has been assembled with compressor.

| S/N | DWG. NO. | DESCRIPTION | QTY | MATERIAL | SINGLE WEIGHT(kg) | TOTAL WEIGHT(kg) | REMARKS |
|---|---|---|---|---|---|---|---|
| 52 | HTA3711-93 | Screwed plug M18×1.5 | 1 | Q235-A.F | 0.065 | | Oxidized |
| 51 | W4Z12.50024 | Gasket ø24/ø20×2 | 1 | Oil-proof rubber asbestos sheet | 0.001 | | No drawing |
| 50 | W4Z12.50023 | Gasket ø34/ø28×2 | 1 | Oil-proof rubber asbestos sheet | 0.0012 | | No drawing |
| 49 | W4Z12.50015 | Adjusting screw | 1 | 35 | 0.03 | | |
| 48 | W4Z8.60005 | Guide sleeve | 1 | 35 | 0.26 | | |
| 47 | W4Z8.60007 | Spring | 1 | 70 Steel wire II | 0.012 | | |
| 46 | W4Z8.60006 | Safety valve head | 1 | 35 | 0.015 | | |
| 45 | W4Z12.50014 | Inner cover plate | 1 | Q235-A.F | 0.68 | | |
| 44 | W4Z12.50016 | Shim | 1 group | Sodium benzoate paper | 0.001 | | |
| 43 | W4Z12.50003 | Driving gear | 1 | 45 | 6.9 | | |
| 42 | W4Z12.50022 | Gasket ø62/ø43×2 | 1 | Oil-proof rubber asbestos sheet | 0.018 | | No drawing |
| 41 | W4Z12.50007 | Closed nut | 1 | Q235-A.F | 0.50 | | |
| 40 | W4Z12.50006 | Bushing | 2 | ZCuSn10Pb1 | 0.28 | 0.56 | |
| 39 | W4Z12.50004 | Driven gear | 1 | 45 | 5.7 | | |
| 38 | W4Z12.50002 | End cover | 1 | HT200 | 6 | | |
| 37 | W4Z12.50005 | Bushing | 2 | ZCuSn10Pb1 | 0.47 | 0.94 | |
| 36 | W4Z12.50001 | Pump body | 1 | Composite component | 126.6 | | |
| 35 | W3Z3.5.50018 | Spring seat | 3 | 35 | 0.0046 | 0.0138 | |
| 34 | W3Z3.5.50019 | Spring | 3 | 70 Steel wire II | 0.0005 | 0.0015 | |
| 33 | GB1095-79 | Key 8×25 | 1 | 45 | 0.01 | | |
| 32 | W4Z12.50008 | Clutch body | 1 | 20 | 0.65 | | |
| 31 | W4Z12.50009 | Roller | 3 | GCr15 | 0.03 | 0.09 | |
| 30 | W4Z12.50017 | Spring | 1 | Oil-proof rubber asbestos sheet | 0.4 | | |
| 29 | W4Z12.50010 | Outer race | 1 | 20 | 1.21 | | |
| 28 | W4Z12.50012 | Spring | 4 | 70 Steel wire II | 0.029 | 0.116 | |
| 27 | W4Z12.50011 | Slipper block | 4 | 45 | 0.065 | | |
| 26 | GB68-85 | Screw M6×12 | 8 | Steel gr. 4.8 | 0.00456 | 0.03648 | Zinc-coated & passivated |
| 25 | W4Z12.50013 | Outer cover plate | 1 | Q235-A.F | 0.68 | | |
| 24 | W4Z12.50021 | Gasket ø45/ø38×2 | 2 | Oil-proof rubber asbestos sheet | 0.018 | 0.036 | No drawing |
| 23 | HTA3711-93 | Screwed plug M36×2 | 2 | Q235-A.F | 0.238 | 0.476 | Oxidized |
| 22 | GB6170-86 | Nut M10 | 2 | Steel gr. 6 | 0.011 | 0.022 | Zinc-coated & passivated |
| 21 | GB881-86 | Taper pin 10×65 | 2 | 45 | 0.032 | 0.064 | Oxidized |
| 20 | GB5783-86 | Bolt M12×35 | 10 | Steel gr. 8.8 | 0.044 | 0.44 | Zinc-coated & passivated |
| 19 | W4Z8.60009 | Inserted sleeve for thermometer | 1 | H62 | 0.25 | | |
| 18 | W4Z12.50020 | Gasket ø45/ø35×2 | 1 | Oil-proof rubber asbestos sheet | 0.0025 | | No drawing |
| 17 | W4Z8.60010 | Seat board for thermometer | 1 | 35 | 0.29 | | |
| 16 | WSS-301 | ø60, L=75, 0-160℃ | 1 | Bimetallic thermometer with movable male screw | 0.3 | | Purchased |
| 15 | W4Z12.50019 | Gasket ø32/ø10×2 | 1 | Oil-proof rubber asbestos sheet | 0.001 | | No drawing |
| 14 | W4Z8.60008 | Valve seat | 1 | HPb59-1 | 0.38 | | |
| 13 | W4Z8.60014 | Valve rod | 1 | 3Cr13 | 0.033 | | |
| 12 | 501J4A.006 | Pressure ring | 1 | HPb59-1 | 0.014 | | |
| 11 | 501J4A.005 | O-ring seal | 1 | Neoprene | 0.002 | | |
| 10 | 501J4A.004 | Washer | 1 | HPb59-1 | 0.01 | | |
| 9 | GB6170-86 | Nut M5 | 1 | Steel gr. 6 | 0.0012 | | Chromium-coated & passivated |
| 8 | GB97.1-85 | Plain washer 5 | 1 | Steel 140HV | 0.00105 | | Chromium-coated & passivated |
| 7 | 500J6.07 | Handwheel | 1 | Composite component | 0.027 | | |
| 6 | W4Z8.60011 | Seat board for pressure gauge | 1 | 35 | 0.28 | | |
| 5 | Y-60Z | Pressure gauge ø60, 0~1MPa, M14×1.5, c=0 | 1 | | 0.8 | | Purchased |
| 4 | W4Z12.50018 | Gasket ø24/ø6×2 | 1 | Oil-proof rubber asbestos sheet | 0.0007 | | No drawing |
| 3 | W4Z8.60015 | Gland plate | 2 | Q235-A.F | 0.16 | 0.32 | |
| 2 | GB65-85 | Screw M4×10 | 6 | Steel gr. 4.8 | 0.0014 | 0.0084 | Zinc-coated & passivated |
| 1 | GB65-85 | Screw M4×16 | 8 | Steel gr. 4.8 | 0.0019 | 0.152 | Zinc-coated & passivated |

| 更改 | 数量 | 文件更改号码 | 签名 | 日期 |
|---|---|---|---|---|
| 设计 | | | | |
| 制图 | | | | |
| 校对 | | | | |
| 标准化审查 | | | | |
| 工艺会签 | | | | |
| 审核 | | | | |

GEAR OIL PUMP

ASSEMBLY

| W4Z12.50000 | | | |
|---|---|---|---|
| 图样标记 | 重量 (kg) | 比例尺 | |
| 试 | 155.16 | 1:2 | |
| 共 张 | 第 张 | | |

HANGZHOU HANGYANG COMPRESSOR CO., LTD.

| 描图 | |
|---|---|
| 写字 | |
| 描校 | |
| 旧底图总号 | |
| 底图总号 | |
| 日期 | 签字 |