

ZW-3.0/10-16  
LPG Compressor

Technical Proposal

Anhui Hongshen Energy Equipment Co., LTD

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## 1. Implemented standards / specifications

GB / T4980-2009 Determination of Noise Sound Power Level of Volumes Compressor

GB / T15487-1995 Flow Measurement Method of Volumes Compressor

GB / T3853-98 Acceptance of Volume Compressor

SH3406 Petrochemical Steel Pipe Flange

HG / T20615-2009 Steel Pipe Flanges

JB / T7240-1994 Technical Conditions of General Compressors

API618-2007 Reciprocating Compressors for the Petroleum, Chemical, and Natural Gas Industries

GB7777-2003 Measurement and Evaluation of Mechanical Vibration of Reciprocating Piston Compressor

GB150 The Steel Pressure Vessel

GB151-99 Pipe and Shell Heat Exchanger

JB4730-94 Nondestructive Testing for Pressure Vessels

TSG R0004-2009 Safety Technical Supervision Regulation for Fixed Pressure Vessel

GB / T755-2000 Quota and Performance of Rotary Motor

GB3836.1-2000 Electrical equipment for Explosive gas environment-Part 1: General Requirements

GB3836.2-2000 Electrical Equipment for Explosive Gas Environment-Part 2: "d"

SHJ3019-90 Code for Design of Instrument Pipe for Petrochemical Enterprises

SHJ3521-91 Technical Specification for Construction of Instrument Engineering of Petrochemical Enterprises

GBJ 93-86 Code for Construction and Acceptance of Industrial Automation Instrument Engineering

GB / T13306-1991 Sign age

GB / T13384 General Technical Conditions for Mechanical and Electrical Product Packaging

SY5548.3-92 General Regulations on the Acceptance of Common Mechanical and Electrical Products in the Petroleum Industry

**API618 Reciprocating Compressors for Petrochemical Industry and Gas Industry**

**Compressor**

When different standards have different requirements, higher standards are adopted to ensure the quality and performance of equipment. The manufacturer shall guarantee to provide the quality products conforming to this technical specification and the current relevant national standards.

**2. Design basic data**

- (1) Nominal volume flow rate: 3.0m<sup>3</sup> / min;
- (2) Rated suction pressure: 1.0MPa; rated discharge pressure: 1.6MPa;
- (3) Suction temperature: 40°C; discharge temperature: 110°C
- (4) Motor power: 45KW; motor explosion-proof grade: Exd IIBT4; motor protection grade: IP55;
- (5) Cooling mode: natural air cooling
- (6) Inlet and outlet flange connection standard: HG/T20592; grade: PN25; flange surface: WN RF.

**1. Overview of the compressor body:**

(1) The compressor adopts vertical direct connection, one-stage compression and reciprocating piston compressor, and the unit layout shall meet the long-term operation requirements of the compressor.

(2) The unit adopts compartment double sealing; the structure of the isolation parts is designed according to the requirements of API618; the opening of the isolation room is provided with an integral cover plate with gasket.

(3) The maximum average speed of the piston is 1.9 m / s, and the crankshaft speed is 740 r/min.

(4) The actual discharge temperature of the gas at the cylinder outlet flange: the process gas is  $\leq 100^{\circ}\text{C}$ .

(5) The cylinder and packing cylinder are designed according to oil-free lubrication

operation. All seals are made of special reinforced carbon fiber materials, with good heat resistance, wear resistance and long service life.

(6) All oil scraper and pressure packing are split ring packing with stainless steel clamp spring.

(7) The piston rod is connected with the crosshead by thread, and the piston rod is hardened through the surface of the packing function part, with the minimum hardness RC52.

(8) Connecting rods are made of forged steel.

(9) The air valve valve plate is made of stainless steel in order to ensure its long-term stable work under the action of alternating stress.

(10) The compressor is set with a crosshead (its material is ductile iron).

(11) The main bearing of the compressor adopts the rolling bearing.

(12) The crank linkage mechanism is lubricated by pressure oil.

(13) Main parts and components and materials:

Part name	Material type	Code
Compressor body	iron casting	HT250
Crankshaft	forged steel	45
Connecting rod	forged steel	45
Piston ring, support ring	Enhance carbon fiber	CRPTFE
Cylinder	iron casting	HT250
Cylinder head	iron casting	HT250
Piston	carbon steel	45
Piston rod	forged steel	40Cr
Piston rod nut	forged steel	45
Gas valve seat	stainless steel	2Cr13
Gas valve limiter	stainless steel	2Cr13
Valves and buffers	stainless steel	2Cr13
Valve spring	stainless steel	17-7PH
Packing ring	Enhance carbon fiber	CRPTFE
Filler box / Gland(cover)	45	45
Crosshead pin	forged steel	20Cr

Crosshead	iron casting	QT600-3
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## 2. Lubricating oil system:

The lubrication system of the compressor body adopts pressure lubrication, including: the oil pump is driven by the crankshaft, and the lubrication system is equipped with precision filter, oil pressure gauge, etc.

## 3. The cylinder and filler cooling system

(1) Natural air cooling mode is adopted for packing cooling.

(2) The cylinder cooling adopts water cooling mode.

## 4. Pipeline and ancillary equipment

(1) The nominal pressure grade of the process gas pipeline, flange and valve is selected according to the standard. The manufacturer provides all interfaces, matching flanges, bolts and gaskets.

(2) All the valves on the gas, oil and water pipes are not allowed to be made of cast iron material.

(3) The pressure level of the inlet and outlet flanges at all stages is selected according to the standard.

(4) GB8163 carbon steel seamless steel gas pipeline.

## 5. Electric motor and electrical equipment requirements

(1) Requirements for explosion-proof level of main motor: dBT4; motor protection level: IP55.

(2) The motor adopts 380V three-phase asynchronous explosion-proof motor.

(3) The motor and the compressor are installed on the same skid body.

(4) The compressor should have the following protection functions: low intake pressure alarm & shutdown, low oil pressure alarm & shutdown, high discharge pressure alarm & shutdown, high discharge temperature alarm & shutdown.

## 6. Control and instrumentation (optional)

The system is a component of the fixed compressor, and the electrical control system is composed of non-explosion-proof control cabinet, frequency converter, PLC, touch screen, module and other on-board control components. The compressor control cabinet PLC is composed of Siemens S7-200 and Witron touch screen. Through the control cabinet, the motor start, stop, transmission, flow adjustment, signal acquisition, fault record, overload protection, alarm and protection, modification, setting and other functions can be completed.

6.1 The electrical control system is composed of primary local instrument, local instrument panel and secondary instrument control system.

6.2 The controller is a mechanical pressure transmitter;

6.3 Display and control items of various parameters

6.4 Instrument reserved DCS, modbus communication protocol 485 communication interface.

Pressure:

Item	Quantity	Display		Control			Remarks
		On the spot	On the territory	Display	Alarm	Interlock shutdown	
Inlet pressure	1	√		√	√(L/H)	√(LL/HH)	
Discharge pressure	1	√		√	√(H)	√(HH)	
Lubricating oil pressure	1	√		√	√(L)	√(LL)	

Temperature:

Item	Quantity	Display		Control			Remarks
		on the spot	On the territory	Display	Alarm	Interlock	
Discharge temperature	1	√		√	√(H)	√(HH)	
Lubricating oil temperature	1	√		√	√(H)	√(HH)	

The selection of automatic control equipment to ensure safety and reliability, advanced technology, reasonable price, good after-sales service, product quality can meet the relevant national standards or international standards of quality products, priority to the selection of spare parts or devices with ISO9000 certification, joint venture introduction of technology, or export license, if it can not meet the requirements, then the introduction of imported products will be done.

## 7. Detection and testing

Part material test

Party B shall conduct mechanical performance inspection and chemical composition analysis of the following parts:

Cylinder, cylinder head, crankshaft, body, connecting rod, piston rod, crosshead, crosshead pin / connecting rod bolt ( Cast iron parts will not be provided chemical composition. )

## 8. Non-destructive inspection

Party B shall conduct nondestructive inspection on the following parts:

Part name	Inspection means				Remarks
	Magnetic particle	Painting	Ultrasonic wave	Ray	
crank axle	Y		Y		
connecting rod	Y		Y		
connecting-rod bolts	Y				
crosshead cotter	Y				
piston rod	Y		Y		

## 9. Hydrostatic test

The test pressure of cylinder, cylinder head and cylinder head is at least 1.5 times of the design pressure, and the test pressure of the water chamber of the above parts is 2.4 Mpa.

10. Vessel test pressure is applied according to the relevant standards.

## 11. Operation test

### (1) Factory machinery operation test

At least one intake valve set and one discharge valve set shall be removed from each cylinder side. The compressor shall operate at a minimum for 4 hours at rated speed. After operation, the temperature of the main bearing, crankshaft bearing and cross bearing shall be checked immediately, the temperature shall be less than 70°C.

### (2) Air load test

The load test shall be carried out after site installation by Party A, with the test at the working speed, and the operation time shall be 4 hours.

### **3. Technical service and after-sales service**

1. Provide equipment installation, debugging, on-site operation guidance, technical consultation, etc.
2. Within one year after the equipment acceptance, the damage caused by the manufacturing quality shall be responsible for the "three guarantees".
3. During the warranty period, if the equipment is damaged or caused by equipment quality problems or cannot be used normally, it shall be repaired or replaced for free in time.
4. When there are problems in the operation of the field compressor in China, it shall give a reply within 2 hours after receiving the notice from Party A. If you need to send people to the site (in China) to solve the problem, you need to send personnel to the site within 48 hours.

### **4. Quality assurance**

- 1、Products are manufactured in strict accordance with the ISO9001:2000 quality assurance system.
2. The service life of the compressor is 25 years.
3. Performance guarantee (rated working condition)  
Compressor discharge pressure: no negative deviation
4. Life of wearing parts ( It is effected by compressor working conditions.)  
Piston ring:  $\geq 6,000$  hours  
Piston support ring:  $\geq 6,000$  hours  
Filling material:  $\geq 6,000$  hours  
Gas valve, valve plate, spring plate:  $\geq 6000$  hours  
Piston rod:  $\geq 30,000$  hours  
Croshead:  $\geq 30000$  hours  
Piston:  $\geq 30,000$  hours



Crankshaft:  $\geq 30,000$  hours

Connecting rod:  $\geq 30,000$  hours

#### 5. Performance guarantee

(1) There is no negative deviation in the compressor exhaust capacity, and the positive deviation is less than or equal to + 3%;

(2) Power deviation of compressor rated shaft is less than or equal to + 3%;

(3) Compressor vibration intensity  $\leq 20$  mm/s;

(4) The lubrication oil temperature is  $\leq 65^{\circ}\text{C}$ ;

(5) noise  $\leq 85\text{dB(A)}$

#### 6. Mechanical guarantee period

Equipment shall be protected to avoid any loss due from design, materials and manufacturing. The mechanical guarantee period is 12 months after passing the performance assessment, or 18 months after passing the acceptance of the equipment, and the first arrival date shall prevail.

#### 7. Service commitment

(1) In the test stage of the equipment installation, appoint the compressor technicians according to the requirements, debug the compressor equipment for free and train the operators.

(2) Provide the free technical consultation service from the date of operation of the equipment during the warranty period.

#### 5. Scope of supply (per set)

No.	Item	Quantity	Model	Specs.	Remarks
One	Compressor host part				
1	Body components	1			
2	Crankshaft components	1			
3	Connecting rod assembly	1			
4	Cross-head components	1			
5	Distance piece components	1			
6	Coupling assembly	1			
7	Cylinder assembly	1			

No.	Item	Quantity	Model	Specs.	Remarks
8	Piston group	1			
9	Filling assembly	1			
10	Scrapper assembly	1			
11	Suction valve assembly	4			
12	Discharge valve assembly	4			
13	Cylinder assembly	1			
Two	Auxiliary machine part				
1	Gas and liquid separation tank	1			
Three	Base, pipe, and auxiliary parts				
1	Gas pipe assembly	1			
3	Cycle oil pump assembly	1			
4	Instrument pipe assembly	1			
5	Base components	1			
6	Coupling hood assembly	1			
7	Ground foot bolt assembly	1			
8	Quick-wear part	1			
Four	Driving main motor				
1	Model, explosion-proof three-phase asynchronous motor YBX3-280M-8 45KW-8	1			
Five	Electrical instrument				
1	Junction box				
2	PLC control cabinet (optional)				

#### VI. Spare parts (list of vulnerable parts)

1	Piston ring	set	1	
2	Support ring	set	1	
3	Wiper ring	set	1	
4	Filling seal ring	set	1	

5	Choke ring	set	1	
6	Valve plates of suction and discharge valves	set	1	
7	Oil filter	set	1	
8	O-ring	set	1	

## 7. Delivery of data and drawings

Name of the delivered drawings: The following data noted A (intermediate information) means to be provided in one week after the contract takes effect, and the one noted B is provided within the fifth week after the contract takes effect. The one noted C indicates the data delivered with the compressor. Provide the stamped drawings in four copies.

(A) Technical data sheet of the main equipment of the unit (equipment list)

(A) Basic condition diagram

Include anchor bolt position, reserved holes, foundation shape, and all information required for foundation design.

(A) Model and specification of the gas safety valve.

(B) Factory test and inspection report, qualification certificate of all supplied equipment, and relevant evidence collection data of pressure vessel according to the capacity regulations.

(B) Spare parts list

(B) Packing list

(C) Other conventional documents delivered with compressors

## 8. Transportation & painting

Paint, packaging, and shipping

The compressor paint complies with the requirements of JB / T7663.2 volume compressor coating technology.

1. Compressor host and auxiliary equipment for rust and mildew prevention treatment.
2. After the test of this machine, the supplier shall conduct comprehensive cleaning,

and all exposed pipe openings have been closed.

3. The compressor and auxiliary equipment of this model are suitable for road transportation. And it has proper protective measures and transportation insurance, in the normal shipment of the equipment it is not damaged and rusted. Party B shall be fully responsible for any occurrence of any problems.
4. Mode of transportation: It should be sent to the construction site by automobile.

### 9. List of suppliers

No.	Part name	Supply unit	Remarks
1	Connecting rod bearing shell	Wuxi axis tile factory	
2	Relief valve	He fei / yong yi	
3	Stop valve, check valve	He fei / yong yi	
5	Gas valve	Herbig, Shanghai Rising Star	
6	Filling	Domestic famous	
7	Explosion proof motor	Wuxi Xishan Anda, Nanyang Electric Machinery	
8	Coupling	Shanghai show Yang	
9	Pressure vessel	Bengbu four friends	
10	Rotor oil pump	HongShen	
11	Mechanical seal	HongShen	
12	Main bearing	Harbin	

### 10. Machine pictures



(Picture of unloading compressor, details change without notice)

11. Quote

Name	Brand / model	Unit price (CNY)	Quantity	Total price (CNY)
LPG compressor	ZW-3.0/10-16	000.00	1	000.00
Total RMB in words: thousand and hundred CNY only (tax and inland freight included)				

Name	Brand / model	Unit price (CNY)	Quantity	Total price (CNY)
Control system	PLC non-explosion-proof control cabinet	000.00	1	000.00
Total RMB in words: thousand hundred CNY only (tax and inland freight included)				

Quote:

1. The above prices include tax and inland freight in China;
2. Payment method: T/T, 30% in advance to arrange production, pay off the balance before delivery.
3. Including the factory personnel training and debugging costs in China;
4. The warranty period is one year, lifetime service;
5. Delivery time: 30 working days.

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