2X型

旋片式真空泵

使用说明书

四川华新南光真空设备有限公司

目　录

1 概述

1.1 用途

2X型旋片式真空泵(以下简称真空泵)是用以抽除特定密容器内的气体，使该容器获得一定真空度的基本设备。可供冶金、化工、石油、医疗、制药、印染、电器、电真空、半导体、食品、原子能、纺织等科研机关、大专院校、工矿企业作科研和生产与教学之用。

真空泵可直接获得1.3×10^{-1}Pa以下的真空度：也可作为其它真空设备的前级泵使用。

1.2特点及其不适用范围

真空泵是用黑色金属制造，属较精密的设备。真空泵的主要工作部件浸在特制的真空泵油中工作。因此，不适用于抽除含氧过高的、有毒的、有爆炸性的、对真空泵油起化学作用或对黑色金属有腐蚀作用的气体；也不能作为压缩机和输送泵使用。

1.3品种、规格及其主要性能参数(见表1)

表一：

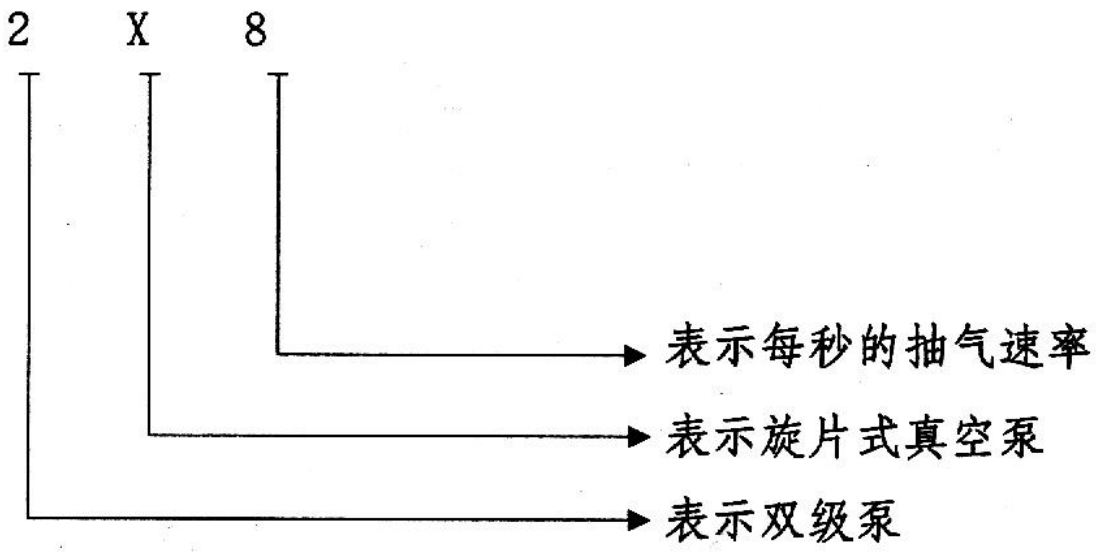
项目 \ 型号			2X—0.5	2X—1	2X—4	2X—8A (原2XF-8)	2X—8	2X—15A	2X—15	2X—30	2X—70
极限压力	不掺气	分压力Pa	1.3×10^{-1}		6.0×10^{-2}						
		总压力Pa	2.8		2.1				1.3		
	掺气	分压力Pa			1.3						
抽气速率L/S			0.5	1	4	8		15		30	70
噪音(声功率级)dB			65	68	72	75		80		82	86
抽大气不喷油时间min			1								
配电用机	功率Kw		0.18	0.25	0.6	1.1		1.5		3	5.5
	转速r/min		1400	1450	1420	1410		1425		1430	1400
配用三角皮带	型号/长短mm		0/500	0/710	A/889	A/965		A/1120		B/1400	B/1600
	根数		1					2		3	4
用油	牌号		1号真空泵油					石大直联泵油	1号真空泵油		
	数量L		0.3	0.5	1.1	1.5	1.3	3	2.5	4.5	8
泵主轴转速r/min			600	510	525	590		450			
进气口直径mm			10	22	28	34		60		70	90
进气口连接方式			用橡胶管与进气口连接					用法兰与泵体连接			
冷却方式			自然冷却				水冷	自然冷却		水冷	
冷却最小耗量L/h			——				480	——		480	

注：①热偶计测的是各种蒸气和永久性气体的总压力，而麦氏计只能测出永久气体占的分压力，故表1的数值有一定差异。

②几何抽速是根据几何尺寸算出的抽速，在大气压力时，实际抽速与几何抽速基本相符合，在各种不同的压力时，抽速有一定下降，抽速与压力关系（见图5）

③温升是指泵温稳定后，在排气阀门处的油的温度与室温之差。

1.4 型号组成及其代表意义



1.5 使用环境条件

环境温度5-40℃，相对湿度不大于90%

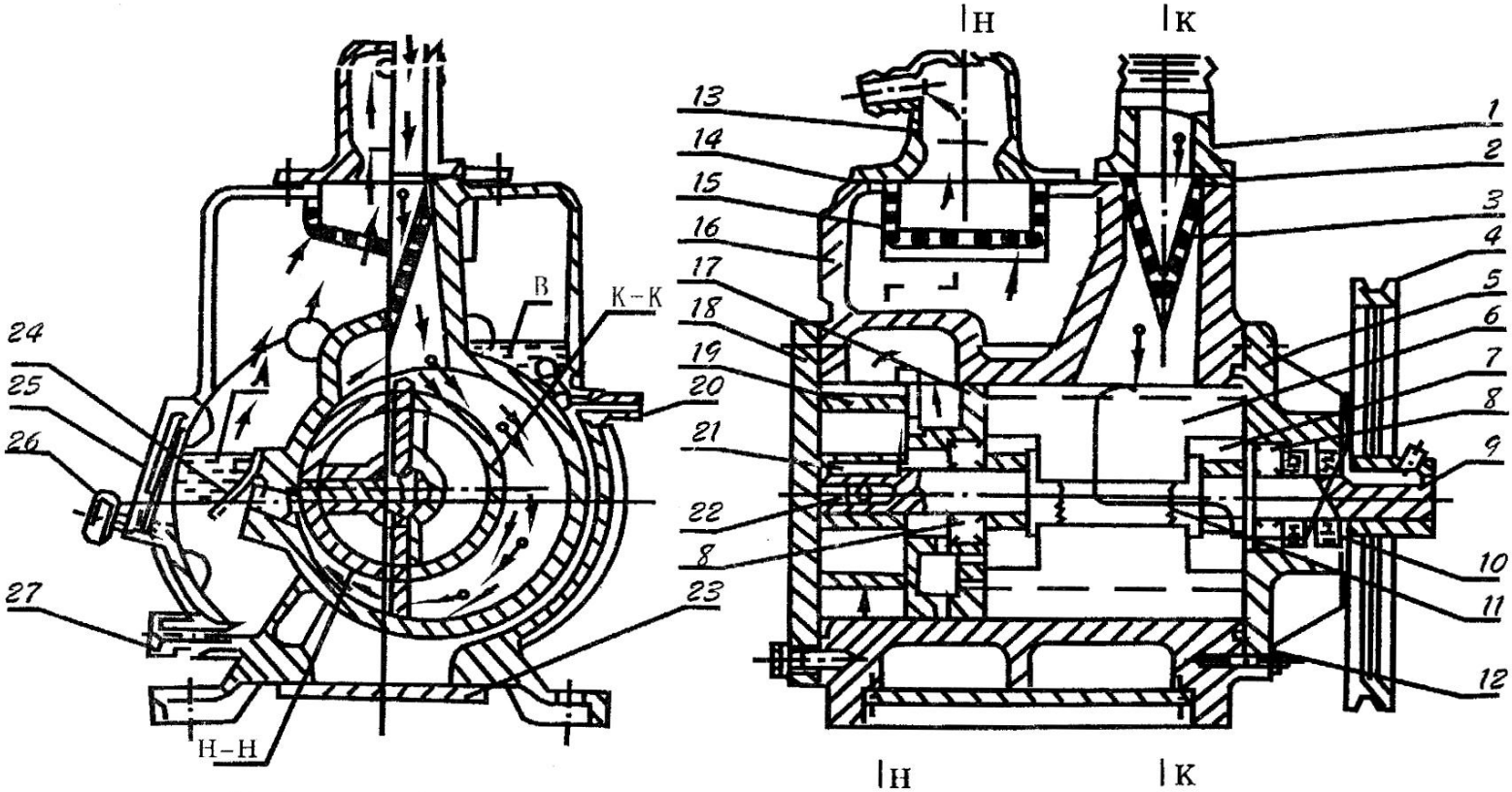
2、结构与工作原理

2.1 结构

2X系列的各种真空泵外形和结构基本相同。泵由电机经三角皮带传动到转子。电动机和泵用螺钉卡板固定在底盘上。

泵由泵体、高转子、低转子、前端板、后端板、高转片、低转片、排气阀、排气罩、视镜……等零部件组成（见图1和图2）。

在泵体内压入一个中隔板，将泵体分成高低真空室。各室都有排气门。高真空室排气与低真空室进气相通。高转子前端伸出前轴，后端伸出后轴，前轴通过前端板的轴承支持，经过油密封室而伸出前端板外；后轴由中隔板上的轴承支持，而伸入低真空室内，低真空室转子则装在后轴上，故高低转子均由前轴带动，高低转子都有对开的槽子，呈“T”型的转片由弹簧支撑开而装于槽内，泵的进气处有过滤网，而排气口处有挡油网，大泵还有挡油板，视镜左边有掺气阀，下边有放油塞。



1. 进气嘴　2. 密封圈　3. 过滤网　4. 皮带轮　5. 前端板　6. 高转片　7. 高转子　8. 轴　承　9. 前　轴
10. 油密封室　11. 弹　簧　12. 定位销　13. 排气罩　14. 排气垫　15. 档油网　16. 泵　体　17. 中隔板　18. 后端板
19. 低转子　20. 水接头　21. 键　22. 低转片　23. 水盖板　24. 排气阀　25. 视镜　26. 掺气阀　27. 放油塞

图1

注：①2X-15A、2X-15、2X-30、2X-70型泵无进气嘴和排气罩。 ②2X-15A、2X-15、2X-30型泵的两端面用胶圈密封。 ③ ⊸表示真空气路；→表示低真空气路

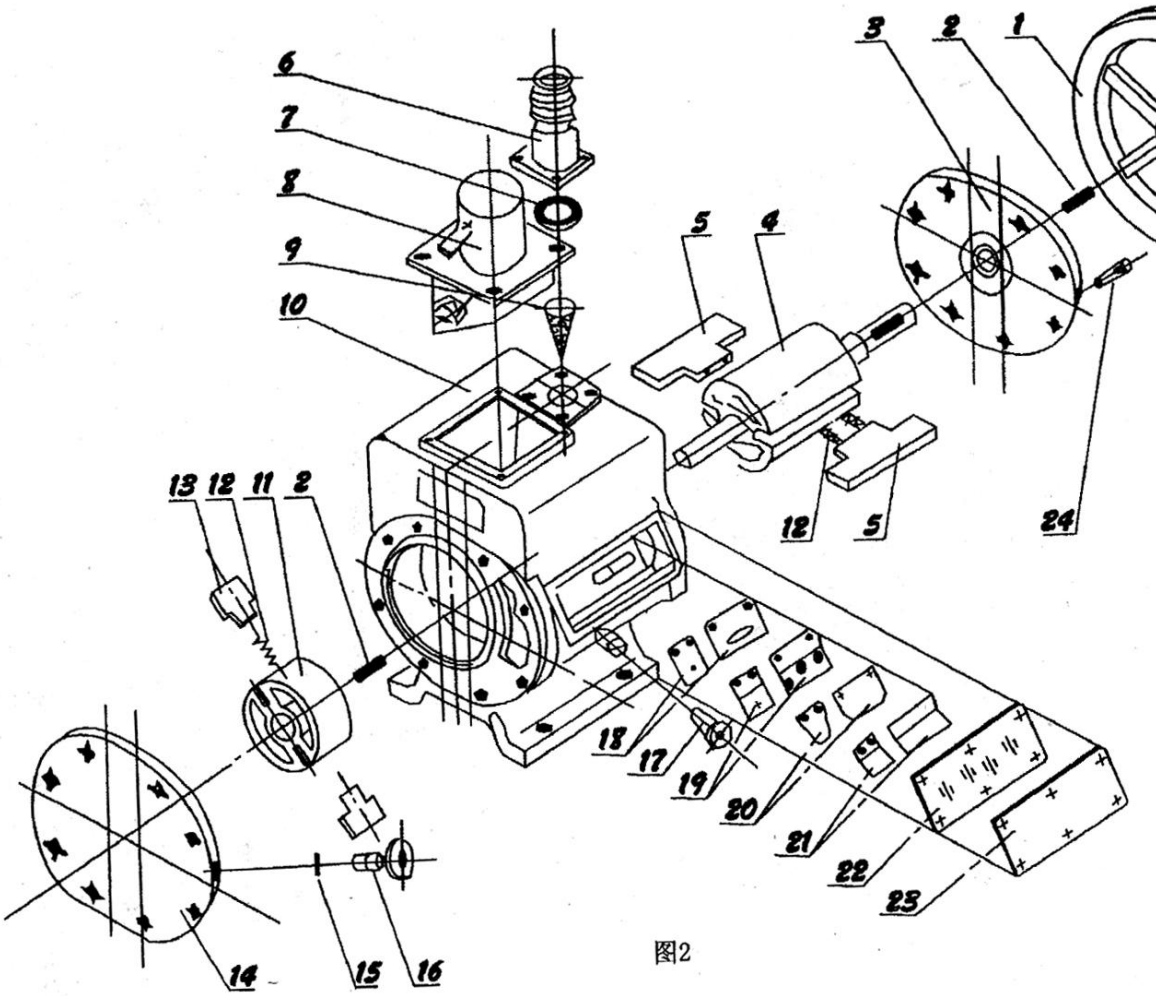


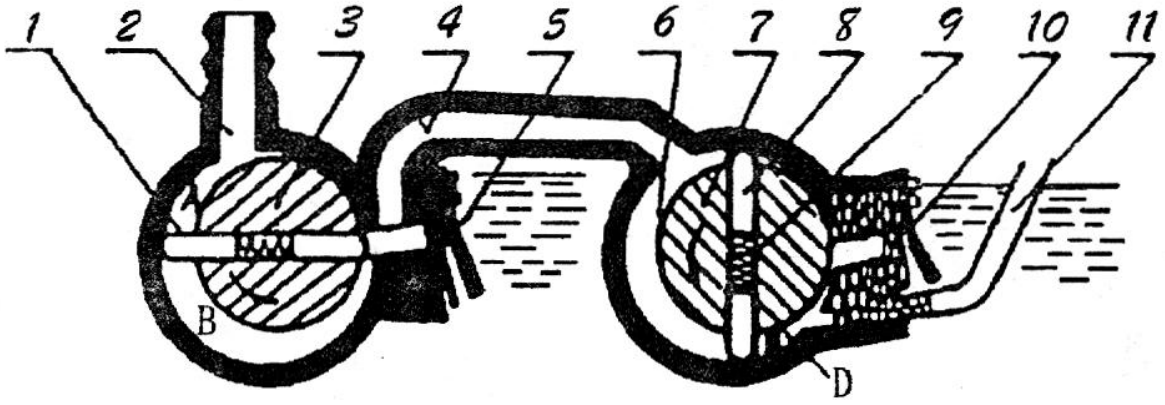
图2

23	镜　框	24	定位销钉
21	档　板	22	视　镜
19	阀　座	20	阀　片
17	放油塞	18	纸　垫
15	密封圈	16	手　柄
13	低转片	14	后端板
11	低转子	12	弹　簧
9	过滤网	10	泵　体
7	密封圈	8	排气罩
5	高转片	6	进气嘴
3	前端板	4	高转子
1	皮带轮	2	健

2．2工作原理

图3是2X系列真空泵原理图，转子3及7与高真空室1及低真空室6相切，转子3与7沿箭头方向旋转，带动转子槽内滑动的转片8旋转，由于弹簧9及离心力的作用，转片外端紧贴高低真空室的内表面滑动，把转子与高低真空室所形成的洼形空间从进气嘴2到排气阀门5和从过气管4到排气阀门10之间分隔开来，形成二或三个容积，并且周期性地大小变化，当在图示位置继续旋转时A及C容积逐渐增大，被抽容积气体沿气嘴进入泵内；同时B及D容积逐渐减小，压力升高，随后冲开排气阀门5及10，将气体排出真空室外，气体经过油面而排于大气之中，因为油是淹住排气门的，故能防止气体返回真空室。当抽气压力较高时，高低真空室的阀门都排气，相当于单级泵；当真空度较高时，全部气体进入低真空室，再由排气阀门10排出，此时二级串联　即进入双级泵工作。

如被抽除的气体中含有较高的蒸汽气体时，在气体受到压缩而其蒸汽的分压强超过此蒸汽在泵内温度下的饱和压力时，此时蒸汽被压缩成为液体，真空泵无法排出，而混在真空油内，使泵的性能大大降低。如果掺入适量的空气，使蒸汽在受到压缩时，其分压力也低于泵温时的饱和压力，则蒸汽在变成液体前就能被排出泵外去，故本系列2X-1以上的泵都装有能放入一定量气体的掺气阀(见图1)。



1、高真空室　2、进气嘴　3、高转子　4、过气管　5、高真空排气阀　6、低真空室
7、低转子　　8、转片　　9、弹簧　　10、低真空排气阀　11、掺气阀

图 3

3 尺寸与重量

3.1 外形尺寸与重量

真空泵的外形尺寸与重量（见图4及表2）

表 2

项目 \ 型号		2X-0.5	2X-1	2X-4	2X-8A	2X-8	2X-15A	2X-15	2X-30	2X-70
外形尺寸	L_1mm	330	430	530	580		660		730	850
	B_1mm	250	260	320	340		440		470	600
	H_1mm	200	250	330	380		580		670	610
重　量kg		23	28	60	78.5		128		231	395

3.2连接尺寸及安装尺寸

真空泵的连接尺寸和安装尺寸（如图4和表3）

代号 / 型号	Φ_1	Φ_2	Φ_3	A_1	A_2	A_3	N_1	N_2	N_3	M	Φd	H_2	L_2	L_3	B_2	B_3	K^1	K_2	Φd_1	Φd_2
2X—0.5	12	10		10	19	25	—	1.7	—		200						——			
2X—1	27	20	50	23	30	38	3	3	48	5.5	240	180	375	135	215	155	60	—	6.5	—
2X—4	34	28	55	33	35	45	4	3	55	6.5	312	262	480	123	260	230	86	115	10	25
2X—8A	40	34	64	38	42	52	4	3	64	8.5	360	282	490	130	280	210	83	112	10	25
2X—8																				
2X—15A	—		60	90	64	68	78	5	3	90	8.5		372	530	165	370	274	105	175	11	M33×1.5
2X—15																				
2X—30			70	105	76	80	90	5	3	100	8.5		463	690	178	370	340	145	128	12	M48×1.5
2X—70			90	130	100	105	115	5	3	130	11		556	758	210	480	440	176	180	14	M76×3

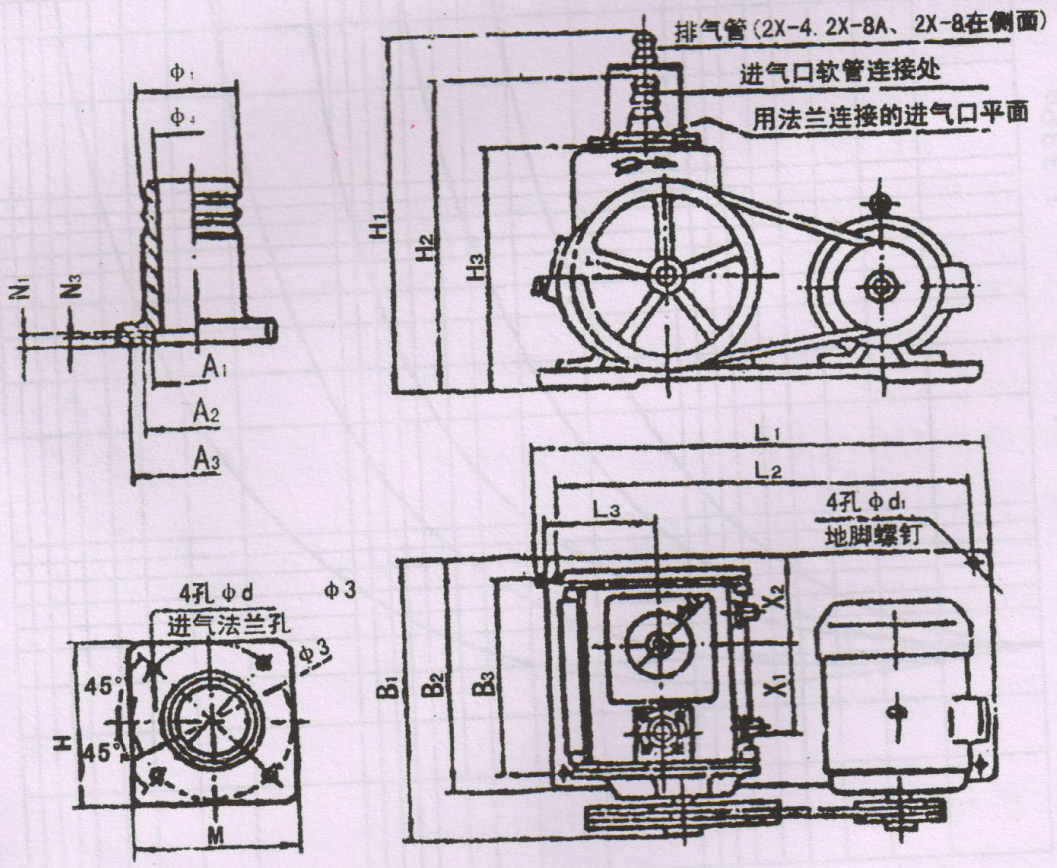


图4

4 拆箱安装与调试

4.1 拆箱安装

4.1.1 拆箱后小心取出真空泵、备附件及说明书。除去填充物，擦净泵的表面灰尘、油垢。按装箱单清点数目。

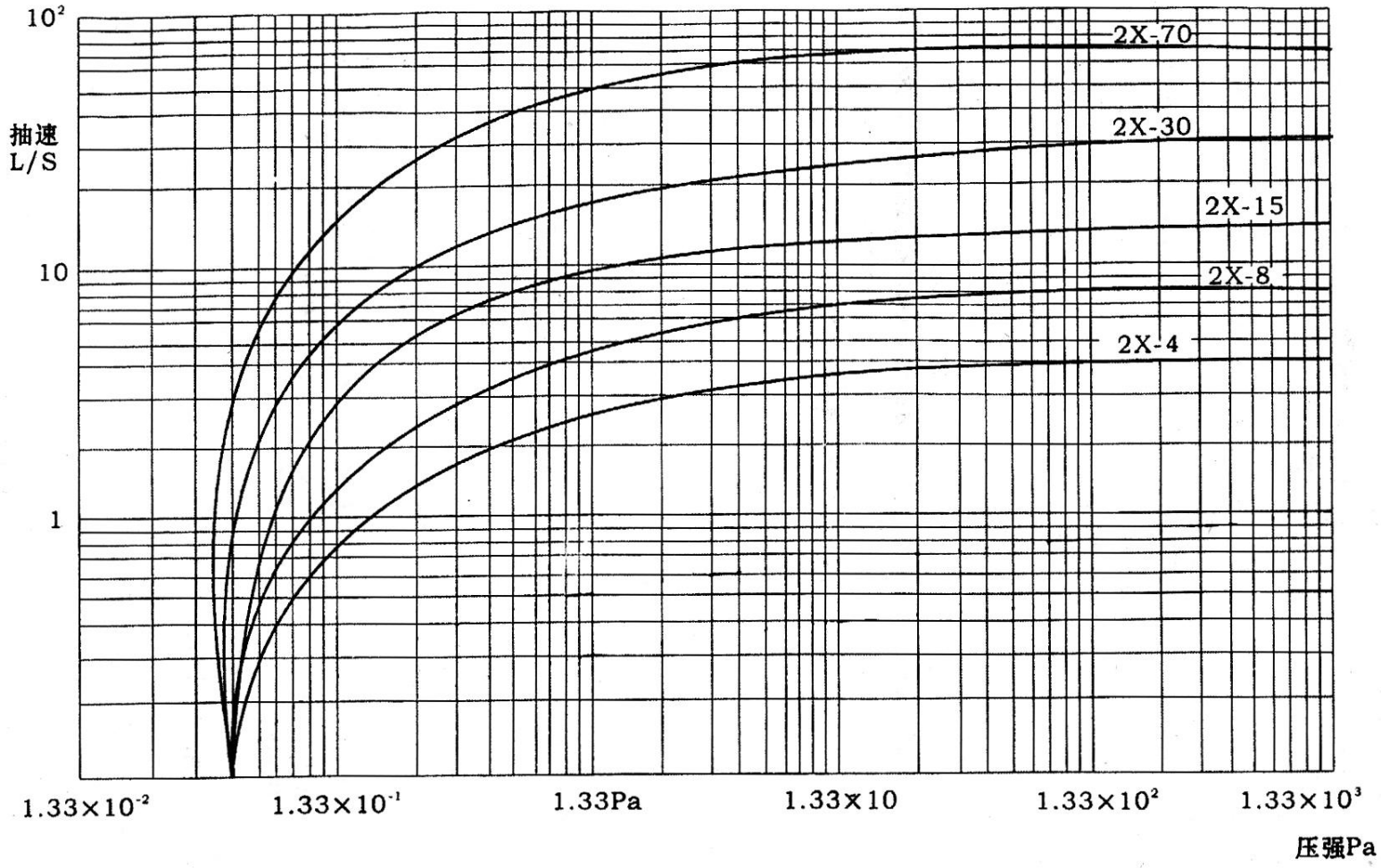
4.1.2 真空泵安装在环境清洁、通风良好、光线充足符合第1.5条要求的室内。根据使用情况泵应安装在有一定宽裕的场地，以便于操作维护。泵的外形尺寸(见表2)。

真空泵可以放置在坚实平坦的地面上，不需特别地基。如需固定可另加螺钉与基础固牢，地脚螺钉尺寸(如图4及表3)。如靠近精密仪表使用时，应考虑增加防震装置。

4.1.3 将被抽容器用真空软管或法兰与泵体相连接，如用法兰连接时，法兰上应有橡胶圈槽，形式及尺寸(见图4表3)。

2X—0.5至2X—8泵可用软管与进气嘴连接。2X—15A至2X—70泵用法兰与进气口连接。连接被抽容器的管径不应小于泵进气口直径，管道宜短，接头宜少，否则影响抽速，管道和接头的漏气量应小。

被抽容器的气体量应与泵的抽速相适应，泵的抽速关系(见图5)。


10^2
抽速
L/S
10
1
2X-70
2X-30
2X-15
2X-8
2X-4
1.33×10^{-2}
1.33×10^{-1}
1.33Pa
1.33×10
1.33×10^{2}
1.33×10^{3}
压强Pa

4.1.4 按照电机标牌所示电压和接线方式接上电源，并建议采用保险装置以免超载，判断电机旋转方向，应与泵上箭头方向一致。

4.1.5 取下排气塞装上排气罩，或将排气嘴上的套子取下。需冷却水者接上水源。

4.1.6 安装时应小心防止铁屑异物等落入泵内。

4.2 调试

4.2.1 对初次安装好的泵，应先做一次试车运转，此时泵应无安装不当的振动及无特殊冲击声响，电机不应超负荷，油温和极限压力应符合技术规格。

4.2.2 继续启动1—2次，观察在运转中有无异常声响及特殊的震动，无问题方可连续运转。

4.2.3 注意油面应在视镜的两条油标线之间，油量多了会引起起动困难，返油、喷油等不良现象，少了则影响真空度。油量不足时应加油。注意久停的泵油面要自然下降，将泵连续运转后，油面才会上升。

4.2.4 打开冷却水。

4.2.5 打开泵进气嘴上的阀门，打开的大小视具体情况而定。

4.2.6 被抽气体中有水蒸汽时，应打开掺气阀，或抽除水蒸汽后，须对泵油净化时也可打开掺气阀，要降低2X—8泵的噪音时，也可以略微打开掺气阀。除前述情况外，掺气阀应处于关闭状态。

4.2.7 停泵时应先关断进气嘴上的阀门，装有放气阀者对泵放气、放气完毕后应关闭掺气阀、再截断电源、再停水源。

5 使用说明

5.1 使用中注意事项。

5.1.1 经常注意油位。

5.1.2 泵起动后再缓慢打开阀门。

5.1.3 经常注意泵运转是否正常，有无特殊声响，电机是否超负荷运转。

5.1.4 注意冷却水是否中断。

5.1.5 注意泵温升不超过40℃。

5.1.6 如停车后泵温要下降至5℃以下时，泵内冷却水必须除净。

5.2 使用中安全事项。

5.2.1 如必须使泵抽除有毒的及腐蚀黑色金属的气体，对真空泵油起化学变化的气体，及超过常温和有尘埃的气体时，应在进气管道上加装中和，冷却、过滤等有关装置配合使用，否则将影响真空泵使用性能和寿命，抽除对人体有害的气体时，应安上相应的管道，将排出气体引至室外远离工区进行处理。

5.2.2 2X-0.5至2X-8几种泵只有挡油罩， 2X-15A以上的泵，可配我厂生产的油烟捕集器以彻底消除喷油，减少污染并节约用油。

6故障分析与排除

6.1 真空度不高

6.1.1 泵温太高：

a. 如被抽气体温度高，则应先将气体冷却后再放入泵内。

b. 如吸入硬物缸内磨损，应修复更换。

C. 如泵的冷却水不够，应打开或加大冷却水。

d. 如装配不当，造成单面磨损，应检查再装。

6.1.2 油位过低未到视镜油线位置，应加够油量。

6.1.3 掺气阀未关严漏气：应关严。

6.1.4 油质变坏：更换新油。

6.1.5 泵漏大气：多是由于泵的端面油密封不良所致，应从排气罩处加油，或放大气开车几秒钟，使油池B处积满油。(油池B见图1)。

6.1.6 转片弹簧折断，应更换。

6.1.7 阀门片损坏，应更换。

6.1.8 前端板上油密封室的密封圈损坏或橡胶变质，应更换。

6.1.9 泵使用时间长，磨损大，间隙增大，应修复或更换受损零件。

6.1.10 进气处过滤网堵塞，取下清洗。

6.2 电机超负荷运转。

6.1.2 泵温太高：按6.1.1条处理。

6.2.2 吸入铁屑或其它机械物质造成单面磨损，应予修复更换磨损零件。

6.2.3 装配不当，造成单面磨损或咬毛，应修理重新装配。

6.3 其它。

6.3.1 轴端漏油，密封圈磨损或装配不正确，应更换或重装。

6.3.2 开车喷油，油位大高，应放出多余的油。或排气盖下面的挡油网装反了，应重装，使网的最低一面向后面。

6.3.3 端面漏油，因前后端面碰伤不平，端板未拧紧，应将端面修平拧紧。

7 维护与保养

7.1 日常维护与保养。

7.1.1 泵在工作中应注意5. 1条规定的事项。

7.1.2 真空泵必须经常保持清洁，泵上不得放置其它物件。

7.1.3 注意皮带松紧是否适当，每半年调整一次。

7.1.4 及时杜绝管道接头处的漏气因素。

7.2 运行时的维护与保养。

7.2.1 真空泵连续工作三月至半年后，就应换油一次，在湿度较大的地区，在潮湿季节工作的泵，或被抽气体污染很大时，应根据具体情况酌情缩短换油时间。

7.2.2 将泵拆除真空系统，把底盘电机一端垫高些，打开放油塞放油，转动真空泵，捂住排气口，使腔内污油全部从放油口放出。现从进气口加入新油、持续转动5～10转以上对内部进行清洗，照此操作3～5次，待污油放净后，再装上放油塞。泵放平，从进气口及排气口处分别加入新油。

7.2.3 换油时不宜长久开动电机，以免使排气阀片跳动过于剧烈和疲劳。

7.2.4 严禁用煤油、汽油、酒精等对泵作非拆卸的清洗。

7.3　长期停放时的维护与保养。

如停放时间较长，应取下排气罩换上排气塞，封闭进气口，放净积水。

8 开箱检查

开箱后检查如下几项内容：

a．产品合格证；

b．产品使用说明书；

c．备件及其数量(见表4)。

表四：

序号	名　称	数量	材　料	备　注
1	低真空阀片	2	瑞典阀片钢带	
2	弹　簧	3	65Mn弹簧钢丝	
3	轴封胶圈	2		
4	进气嘴密封圈	1	5261丁腈橡胶	

注：各种泵备件相同，但规格不同。如端面密封为橡胶圈密封，备件增加大小各2件端面密封圈。

销售部电话：0832-7214115
传真：7222935
地址：四川·简阳
手机：13730723888 13320848083
网址：www.ngby.cn

1 General

1.1 Application

The Model 2X series rotary vacuum pumps are basic equipment for evacuating gases from sealed vessels to produce a vacuum. They find application not only in the electronic, semi-conductor, metallurgy, petroleum, chemistry, textile, food and light industries, but also in research, teaching and many other branches. The rotary pumps can operate directly against the atmos-pheric pressure and generate a vacuum up to 1.3×10^{-1}Pa. In combination with other pumps, they can produce a vacuum better than 1.3×10^{-1}Pa. They can also be used as the backing pumps of other vacuum equipments.

1.2 Characteristics and the unsuitable scope.

The rotary pumps, made of ferrous metal, are fabricated precisely. Their operation is correlated with oil, therefore they are not suitable for pumping the gases which are oxygen－rich, poisonous, explosive, erosive to ferrous metal, or reactive to vacuum oil. They can not be used as compressor or transfer pumps.

1.3 Types, specifications and main technical data (Refer to Table 1)

Table 1

Item \ Types			2X－4	2X－8A (Former 2XF－8)	2X－8	2X－15A	2X－15	2X－30	2X－70	2X－100
Ultimate Pressure	Without ballast	Partial pressure (Pa)	6.0×10^{-2}							
		Total pressure (Pa)	2.1				1.3			
	With ballast	Partial pressure (Pa)	1.3							
Pumping speed L/S			4	8		15		30	70	100
Noise dB			72	75		80		82	86	86
Time without oil splash when pumping atmosphere (min)			1							
Motor	Power KW		0.55	1.1		1.5		3	5.5	7.5
	Rotating speed r/min		1420	1410		1425		1430	1400	970
V-belt	Type/length mm		A/889	A/965		A/1120		B/1400	B/1600	B/1600
	Number		1			2		3	4	4
Oil	Mark		$1^{\#}$ vacuum pump oil			Rotary vane vacuum pump oil made by petroteum university	$1^{\#}$ vacuum pump oil			
	Quantity L		1.1	1.5	1.3	3	2.5	4.5	8	20
Rotating speed of pump shaft r/min			525	590		450				
Inlet diameter mm			28	34		60		70	80	80
Inlet connection			Rubber hose			Flange				
Cooling			Natural air		Water	Natural air	Water			
Min. water consumption L/H			.....		480	.....	480			

Notes:

(1)The thermocouple gauge can measure the total pressure of the permanent gases and vapors. While Mcleod gauge can only measure the partial pressure of the permanent gas, As a result, there is a little difference between the two measurements.

(2)Geometric pump speed is calculated from the geometric dimensions. At the atmospheric pressure, the actual pump speed is almost equal to the geometirc speed, but the actual speed decreases as the pressure falls. (Refer to Fig. 5)

(3)Temperature rise is known as the temperature difference between the oil temperature at the outlet valve and the room temperature when the pump is in steady operating.

1.4 Model composition and significance

Take 2X－8 for example. 2 means two－stage, x means rotary, the number after hyphen signifies pump speed

1.5 Operating conditions

Environment temperature:5－40℃

Relative humidity:below 90%

2 Structure and operation principle

2.1 Structure

All kinds of 2x－series pumps have the same configuration and structure. Pump rotors are driven by a motor through one or more v－belts. Both pump and motor are fixed on the base plate with screws.

The pump consists of pump body, high vacuum rotor and vanes, low vacuum rotor and vanes, front and rear end covers, outlet valves, outlet hood, sight glass, etc. (Refer to Fig. 1 and Fig. 2)

An intermediate plate divides the pump housing into a high vacuum chamber and a low vacuum chamber. Either of them has an outlet port. Both chambers are in connection in such a way that the outlet of the high vacuum chamber leads to the inlet of low vacuum chamber. The front shaft protrudes from the front end of the high vacuum rotor, and the rear shaft protrudes from the rear end. The front shaft is supported by a bearing in the front end cover and stretches through the oil sealed chamber to the outside. The rear shaft is supported by a bearing in the intermediate plate and extends into the low vacuum chamber. The low vacuum rotor is mounted on the rear shaft. Therefore both rotors are driven by the front shaft. The rotors have opposite slots in which the T－vanes are mounted and pressed by springs. At the inlet there is filter screen and at the outlet there is an oil screen. On the left of the sight glass there is a ballast valve under the sight glass an oil drain plug.

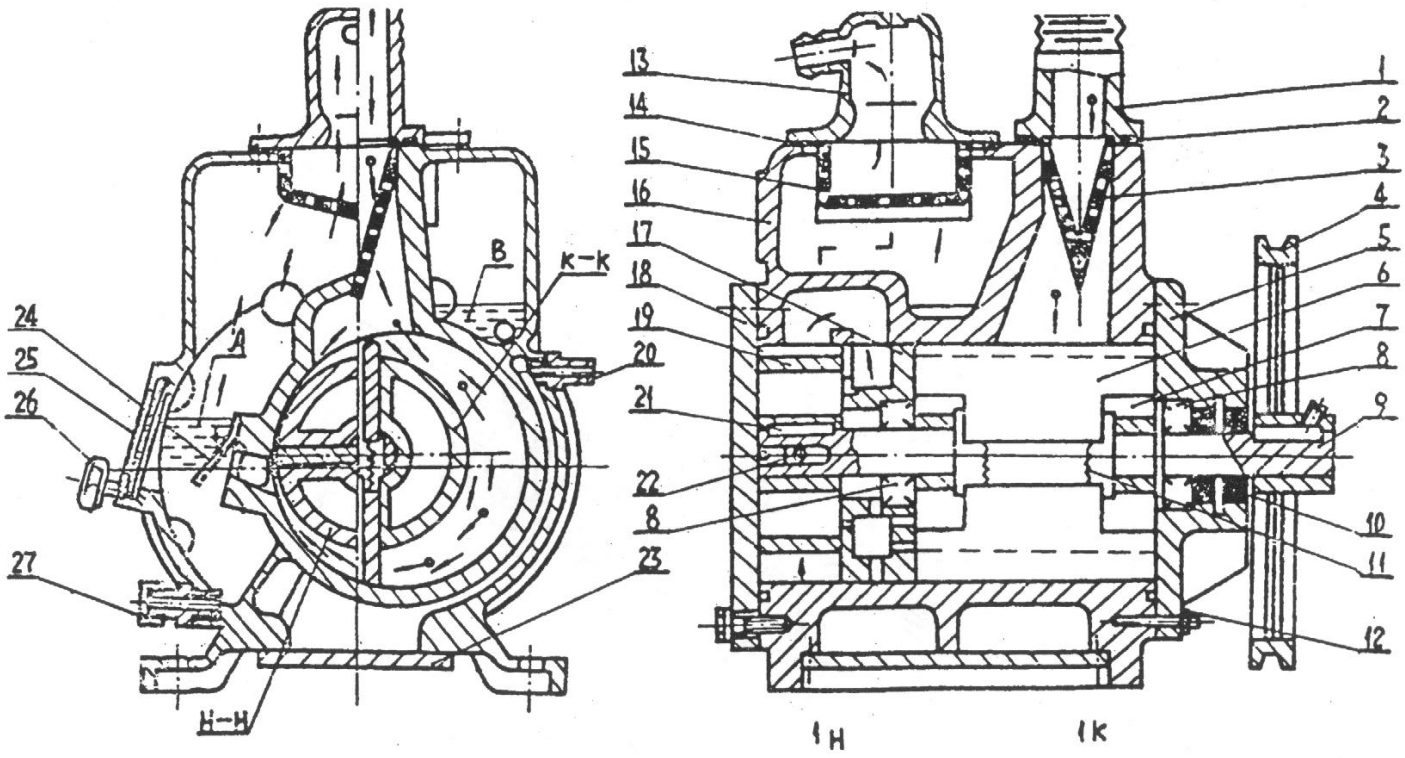


Fig. 1

1 Inlet 2 Sealing ring 3 Filter screen 4 Belt pully 5 Front end cover 6 High vacuum vane 7 High vacuum rotor 8 Balls 9 Front shaft 10 Oil sealed chamber 11 Spring 12 Location pin 13 Outled hood 14 Gasket 15 Oil screen 16 Pump housing 17 Intermediate plate 18 Rear end cover 19 Low vacuum rotor 20 Connector for water 21 Key 22 Low vacuum vane 23 Cover of water tank 24 Outlet valve 25 Sight glass 26 Ballast valve 27 Oil drain plug

Notes:

1. The pumps of 2X－15A, 2X－15, 2X－30, 2X－70 have no inlet and outlet hood.

2. The two end covers of 2X－15A, 2X－15, 2X－30 are sealed by rubber ring.

3. ⊶→Signifies vacuum gas circuit; → signifies low vacuum gas circuit.

1 Belt pully
2 Key
3 Front end cover
4 High vacuum rotor
5 High vacuum vane
6 Inlet
7 Sealing ring
8 Outlet hood
9 Sealing screen
10 Pump housing
11 Low vacuum rotor
12 Spring
13 Low vacuum vane
14 Rear end cover
15 Sealing ring
16 Hand handle
17 Oil drain plug
18 Paper pad
19 Valve base
20 Valve vane
21 Baffle
22 Sight glass
23 Glass frame
24 Location pin

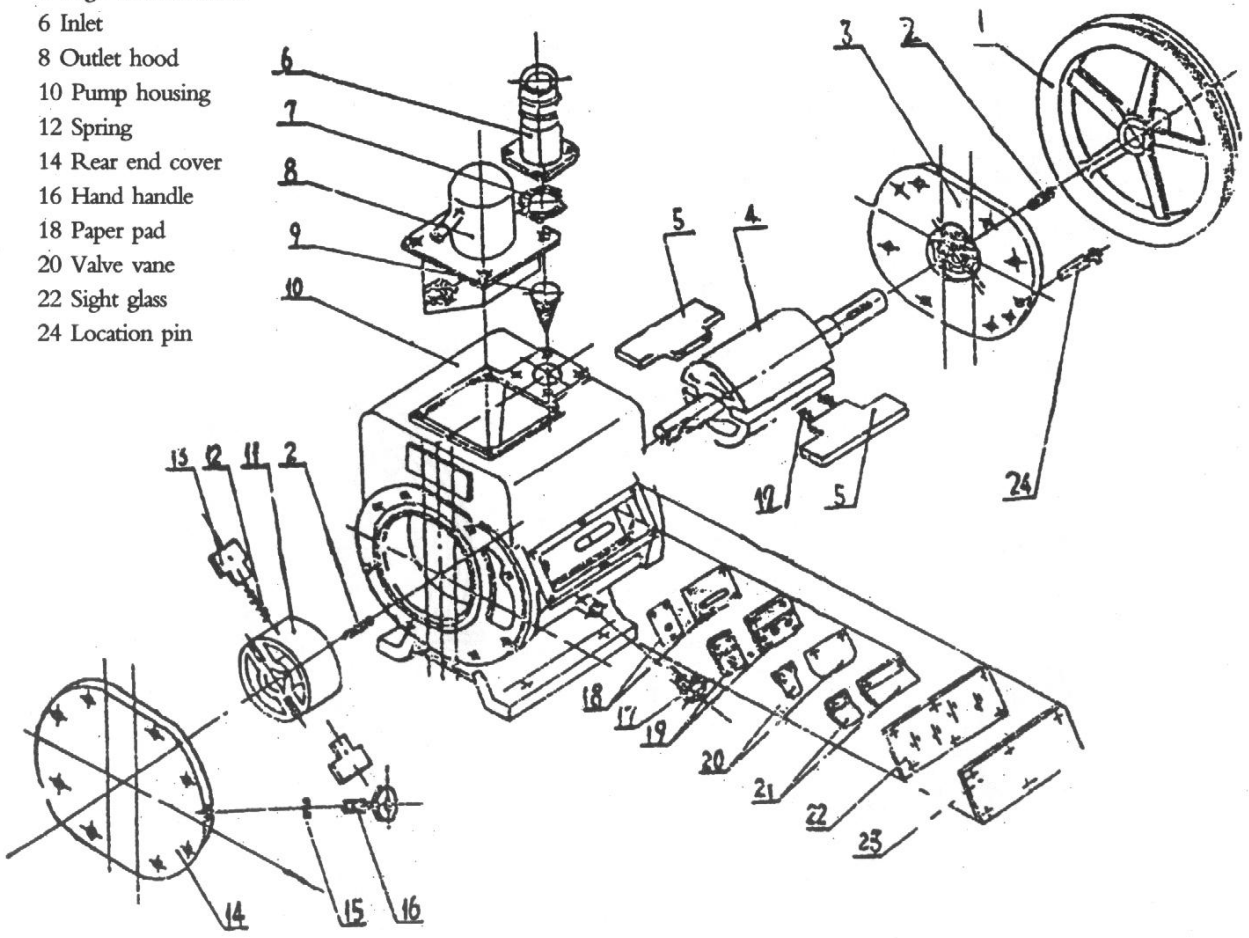


Fig. 2

2.2 Operation principle

Fig 3 is a sketch of 2X series of mechanical pumps. The Rotors 3 and 7 are tangential respectively to the high vacuum chamber 1 and the low vacuum chamber 6. They rotate in the direction indicated by arrows and drive the vanes 8 in the slots of the rotors. By the tension of the springs 9 and centrifugal force, the vanes slide in close fit against the walls of the chambers, dividing each crescent – shaped space between rotor and wall, i.e. from the inlet 2 to the outlet valve 5 and from the passage 4 to the outlet valve 10, into two or three smaller cavities. These cavities vary in volume cyclically. As shown in Fig 3, when the pump rotates, the volumes A and c expand gradually and the gas from the vessel enters the pump. At the same time, with diminishing of volumes B and D the pressure becomes higher and higher until the outlet valves 5 and 10 burst open. Thus, the gas is expelled out of the vacuum chamber, and then goes through the oil surface into the atmosphere. The gas backstreaming is impossible, because the outlet valves are immersed in oil.

When the pressure is relatively high, the rotary pump acts as a combination of two single – stage pumps as both high and low vacuum outlet valves are exhausting. When the vacuum becomes higher, all gas enters the low vacuum chamber and discharges through the outlet valve 10, so the rotary pump acts as a two – stage pump.

If the pumped gas contains too much vapour, its partial pressure will exceed its saturation pressure at the pump temperature. As a result of compression, it will turn into liquid which is beyond the exhausting ability of the pump. Instead of being evacuated, this liquid stays in the pump mixing with oil and degrades the performance of the pump. Nevertheless, this defect can be eliminated by admitting pressure of vapour remains below its sataration pressure even if it is compressed. For this purpose, each pump of 2X – 1 and larger types is provided with a gas ballast valve 11 (Refer to Fig. 1)

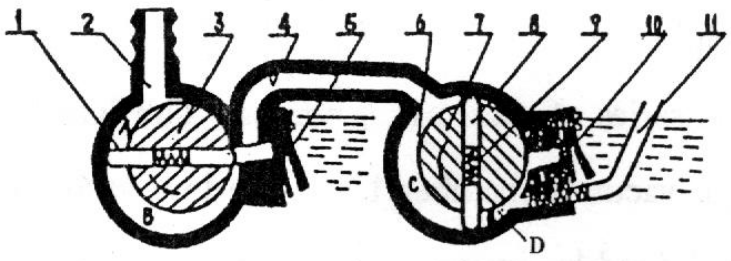


Fig.3 Sketch of rotary pump

1 High Vacuum chamber
2 Inlet
3 High vacuum rotor
4 Passage
5 High Vacuum outlet valve
6 Low vacuum chamber
7 Low vacuum rotor
8 Vane
9 Spring
10 Low vacuum outlet valve
11 Ballast valve

3 Dimensions and weight

3.1 Overall dimensions and weight

The overall dimensions and weight (Refer to Fig.4 and Table 2)

Table 2

Item \ Types		2X-4	2X-8A	2X-8	2X-15A	2X-15	2X-30	2X-70	2X-100
Overall dimensions	L_1 mm	530	580		660		730	850	1055
	B_1 mm	320	340		440		470	600	725
	H_1 mm	335	380		580		670	610	856
Weight kg		60	78.5		128		231	395	570

3.2 Connecting dimensions and installation dimensions

The connecting dimensions and installation dimensions of the pump (Refer to Fig 4 and Table 3)

2X-100 Outline dimension diagram of rotary vane vacuum pump

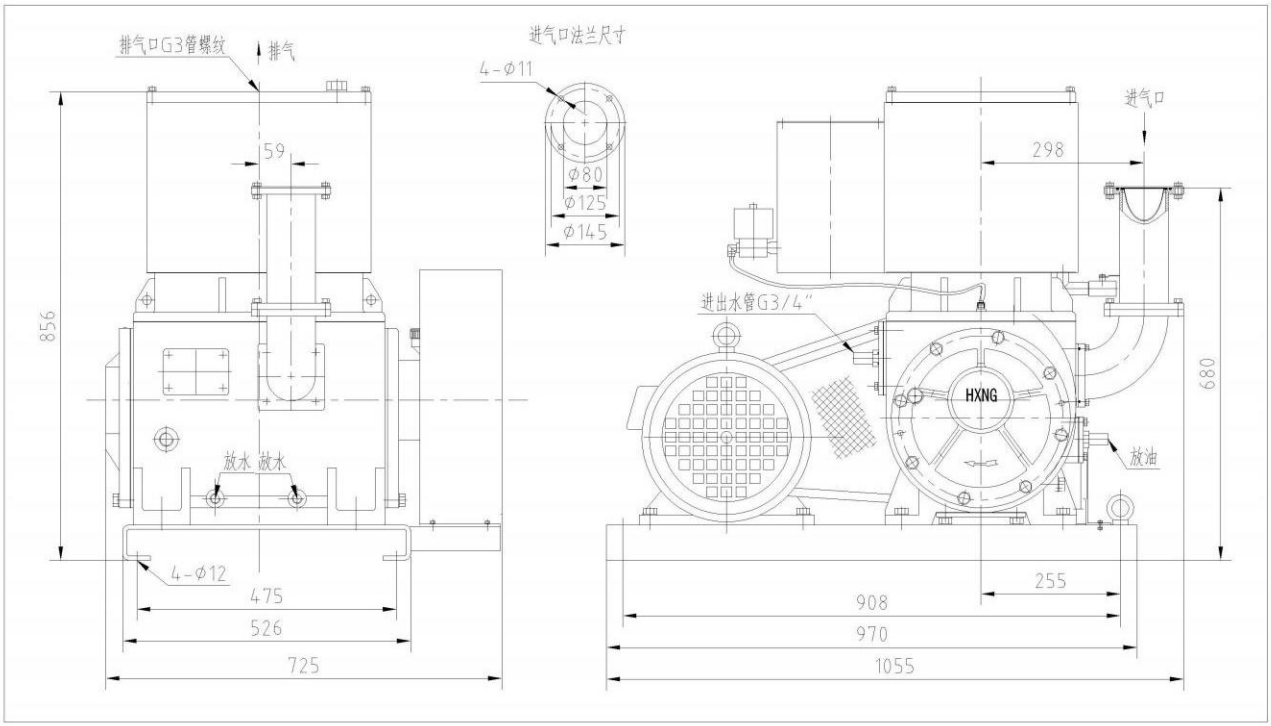
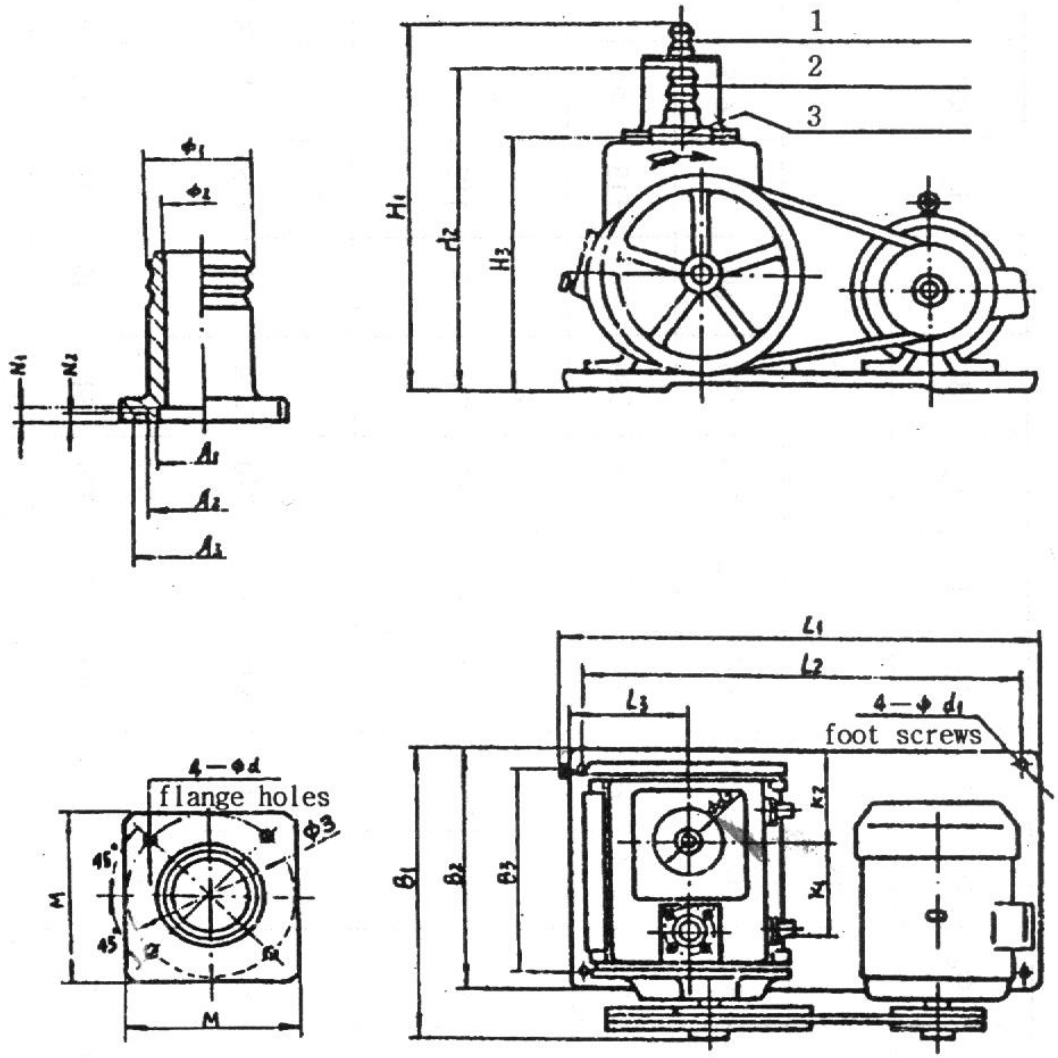


Table 3

Symbols / Types	Φ_1	Φ_2	Φ_3	A_1	A_2	A_3	N_1	N_2	M	Φ_d	H_2	H_3	L_2	L_3	B_2	B_3	K_1	k_2	Φd_1	Φd_2
2X－0.5	12	10	…	10	19	25	…	1.7	…		200	…								
2X－1	27	20	50	23	30	38	3	3	48	5.5	240	180	375	135	215	155	60	…	6.5	…
2X－4	34	28	55	33	35	45	4	3	55	6.5	312	262	480	123	260	230	86	115	10	25
2X－8A	40	34	64	38	42	52	4	3	64	8.5	360	282	490	130	280	210	83	112	10	25
2X－8																				
2X－15A	…	60	90	64	68	78	5	3	90	8.5	…	372	530	165	370	274	105	175	11	M33×1.5
2X－15																				
2X－30		70	105	76	80	90	5	3	100	8.5		463	690	178	370	340	145	128	12	M48×1.5
2X－70		90	130	100	105	115	5	3	130	11		556	758	210	480	440	176	180	14	M76×3



1 Pumping stem (in 2X－4 、2X－8A and 2X－8, it is on one side)

2 Connection for inlet hose

3 Inlet plane for flange connection

Fig.4

4 Installation and Trial run

4.1 Unpacking and Installation

4.1.1 After unpacking, take out pump body, all accessories spare parts along with the operation manual carefully.

Move aside the paddings and clean the pump surface. check the list to make sure that all

part are delivered.

4.1.2 The pump should be installed in a room with clean environment, good ventilation and sufficient light to meet the requirements described in 1.5. It is advisable to install the pump in a spacious room for convenient operation and maintenance. The overall dimensions of the pump, please refer to Table 2.

The pump should be mounted on a solid and even ground. No special foundation is necessary. If the pump is required to be fixed on the basement, fasten it with foot screws. (Refer to Fig 4 and Table 3)

If there is any precise instrument nearby, shockproof precautions must be taken.

4.1.3 The pumped vessel should be connected to the pump inlet by a vacuum hose or a flange with sealing groove. For the way and dimensions, please refer to Fig 4 and Table 3. On the pump of 2x−0.5 to 2X−8, a hose is used to connect it with the vessel. On the pump of 2X−15A to 2X−70, a flange should be used. The diameter of the pipe connecting the vessel and the pump should not be less than that of the pump inlet. The shorter the pipe and the fewer the joints, the better. Be sure to keep the leakage of the pipe and the joints to the minimum, otherwise the pump speed will be reduced.

The volume of the vessel should be in correspondance with the pump speed. Fig 5 shows a pump speed curve.

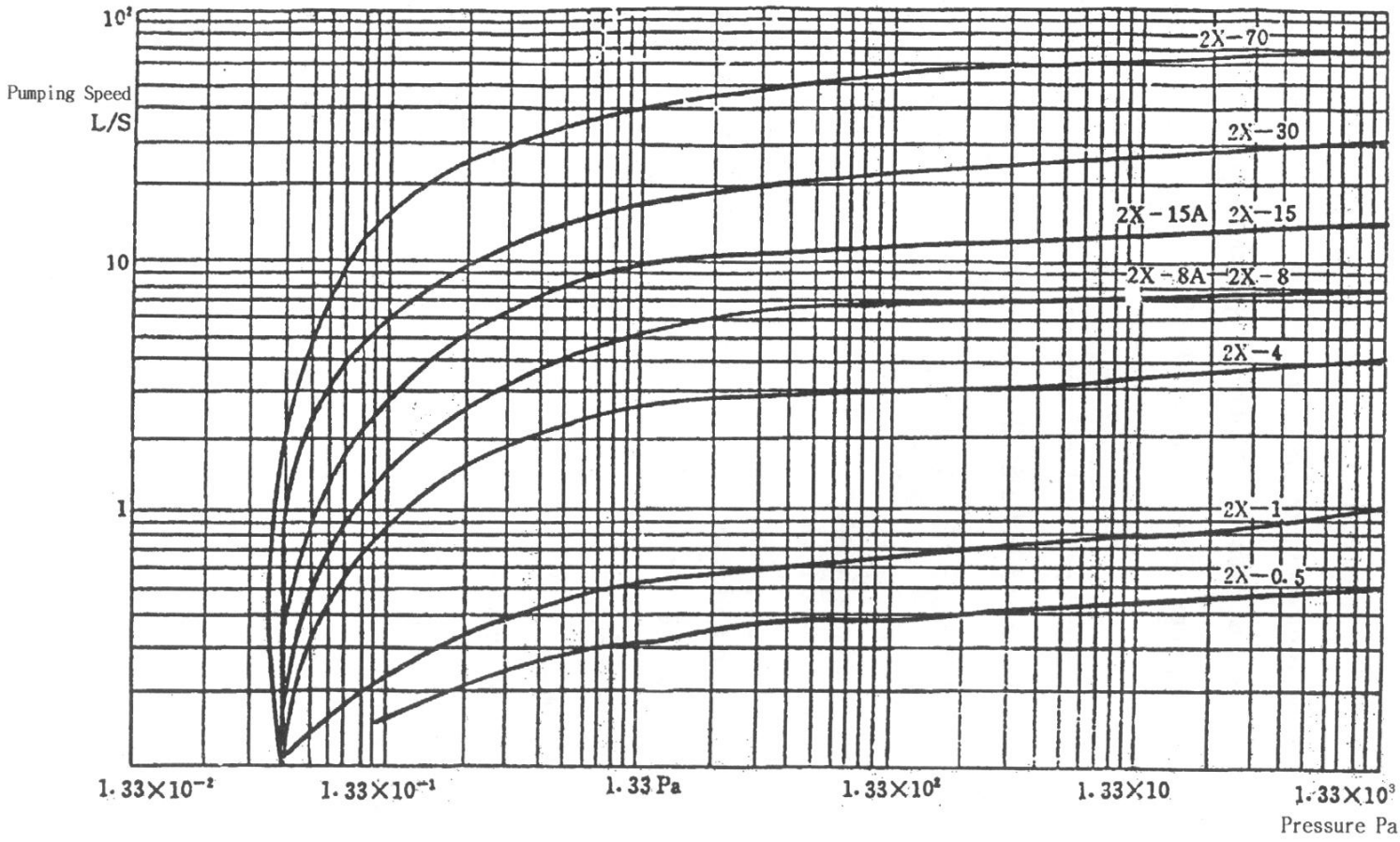

Pumping Speed
L/S
10²
10
1
2X—70
2X—30
2X-15A
2X—15
2X-8A
2X-8
2X—4
2X—1
2X—0.5
1.33×10⁻²
1.33×10⁻¹
1.33 Pa
1.33×10²
1.33×10
1.33×10³
Pressure Pa

Fig.5

4.1.4 Connect the power supply as indicated on the motor mark. Here, a protector is recommended for fear of overload. The motor should rotate in the direction shown by the arrow on the pump.

4.1.5 Remove the outlet plug and mount the outlet hood. For some types, just remove the rubber jacket. Connect the pump to water tap for cooling, if necessary.

4.1.6 During assembling, take care that no scraps, dusts or muds fall into the pump.

4.2 Trial run

4.2.1 The newly assembled pump should have a trial run to make sure that there is no abnormal vibration and jerk noise caused by improper assembling. The motor is not allowed to be overloaded. The oil temperature and the ultimate vacuum should meet the specifications.

4.2.2 Switch the pump on and off several times to see if here is any abnormal noise and unusual vibration. If none of them is found, put the pump into continuous operation.

4.2.3 Always keep the oil level between the two marking lines on the sight glass, because too much oil will cause difficult starting, oil backstreaming and oil splash. On the other hand, insufficient oil will lower the vacuum degree. When oil level drops, remove the outlet hood and refill oil. If the pump has been out of operation for a long period, the oil level goes low, however, it rises again after starting for a while.

4.2.4 Tap the cooling water

4.2.5 Open the inlet valet so wide as the case may be.

4.2.6 If the pumped gas contains water vapor, or if oil is required to be purified after removing vapour, open the gas ballast valve. To reduce the noise of 2X－8 pump, open the ballast valve a little. Except for the above cases, the ballast valve should be in a state of closing.

4.2.7 To stop pump, first close the inlet valve. If it is provided with an air admittance valve, admitting air into the pump. After that, the ballast valve should be closed.

Then turn off the power supply and afterwards shut off the water supply.

5 Operation

5.1 Cautions in operation

5.1.1 Always keep the oil level at the required position.

5.1.2 Open the inlet valve gradually after starting.

5.1.3 Examine frequently if the pump runs normally, if there is any abnormal sound and if the motor is overloaded.

5.1.4 Check if the cooling water is interrupted.

5.1.5 Be sure that the temperature rise is not allowed to exceed 40℃.

5.1.6 If the pump temperature is required to drop down to less than 5℃. The cooling water in the pump must be drained away throughly.

5.2 Safeties in operation

5.2.1 If the pumped gas is poisonous, corrosive to ferrous metal, reactive to oil, or dusty, or its temperature is higher than the room temperature, it is desired to insert an appropriate device into the inlet for the purpose of counteraction, cooling or filtering. Otherwise, the performance and the service life of the pump will be affected. The pumped gas harmful to human health should be led to a remote place to be disposed with.

5.2.2 The pumps of 2X－0.5 to 2X－8 are provided only with oil baffle hoods, while the pumps of 2X－15A and larger types are provided with oil traps which can eliminate oil splash completely, thus reducing oil consumption and enhancing cleanness.

6 Troubleshooting

6.1 The vacuum degree is not high

6.1.1 The pump temperature is too high

a. The pumped gas has too high temperature. It should be cooled before being sucked into the pump

b. The internal surface of pump is worn out by hard scraps. Repair or replace it with a new one.

c. The cooing water is not sufficient. Supply more amount of cooling water.

d. A lopsided wearing takes place due to improper assembling The pump should be re-assembled.

6.1.2 The oil level drops below the lower line of the sight glass. Add oil into the pump.

6.1.3 Close the gas ballast valve tightly for fear of leakage.

6.1.4 The oil is deteriorated. Change it with fresh oil.

6.1.5 A serious leakage takes place: It is caused mostly by bad sealing at the ends of the pump. Fill in oil through the outlet hood, or make the pump run for a few seconds after admitting atmosphere so that the oil reservoir B is filled with oil. (For reservoir B, refer to Fig 1)

6.1.6 The vane spring is broken. Replace it with a new one.

6.1.7 The valve is damaged. Replace it with a new one.

6.1.8 The sealing ring of the front end cover is damaged or rubber is deteriorated. It should be replaced.

6.1.9 Prolonged operation results in bad wear and greater clearance. Repair or replace the damaged parts.

6.1.10 The filter at the inlet is clogged. take it down and clean it.

6.2 Overload run of motor.

6.2.1 The pump temperature is too high.

Treat it according to 6.1.1.

6.2.2 Lopsided wearing takes place caused by hard scraps. Repair or replace the dam-

aged garts.

6.2.3 Lopsided wearing takes place due to improper assembly. Repair or reassemble.

6.3 Others

6.3.1 Oil leaks from the shaft ends caused by seal ring wearing or improper assembly. Reassemble or replace the damaged parts.

6.3.2 If oil splash is caused by too high oil level, drain out the excessive oil. If the oil screen is assembled reversely, reassemble it in such a way that the lowest edge of the screen slope faces backwards.

6.3.3 Oil leakage from the end covers is caused by uneven, damaged or unfastened end covers. Smooth the surfaces and fasten the covers tightly.

7 Maintenance

7.1 General maintenance

7.1.1 Always pay attention to the precautions set in 5.1 when the pump is in use.

7.1.2 Always keep the pump clean and never put anything on it.

7.1.3 Examine the belt tension often, and adjust it every six months.

7.1.4 If there is any leakage on pipes or joints, measures must be taken immediately.

7.2 Maintenance in operation

7.2.1 The oil should be change after the pump runs continuously for 3 to 6 months. The interval may be shortened, if the humidity is high or the pumped gas is badly contaminated.

7.2.2 Disconnect the pump from the vessel. Raise the motor side a little higher and put a pad to support it. Open the oil drain plug. Then make the pump run and cover the outlet port with a hand so that filthy oil can drain away completely. After that, fill in clean oil through the inlet port and make pump rotate more than 5 – 10 revolutions

for internal cleaning. Now repeat this process 3 to 5 times. After the dirty oil drains out thoroughly, reassemble the oil drain plug, level down the pump again, fill in fresh oil through the inlet and outlet.

7.2.3 During oil change, do not make the motor run for a long time for fear that the outlet valve jumps too violently and becomes fatigued.

7.2.4 It is forbidden to clean the pump with kerosene, gasoline or alcohol without disassembling it.

7.3 If the pump is out of operation for long period, remove the outlet hood, put on the outlet pulg, cover the inlet and drain away water.

8 Unpacking and checking

After unpacking, check the following:

a. The approval certificate of the product

b. The operation manual of the product

c. Spare parts and quantity(refer to Table 4)

Table 4

No.	Parts	Quantity	Material	Remark
1	Low-vacuum valve vane	2	Swedish steel for valve vane	
2	Spring	3	65 Mn spring steel	
3	Seal ring	2		
4	Inlet seal ring	1	5261 vacuum rubber	

Notes: All types of the pumps have the same spare parts with different sizes. If the ends of the pumps are required to be sealed with rubber seals, four end seal rings must be added to the list.

9 Others

9.1 Possible changes to dimensions and parameters would be made without motifying.