2SK Type
WATER RING VACUUM PUMP

Operating instructions

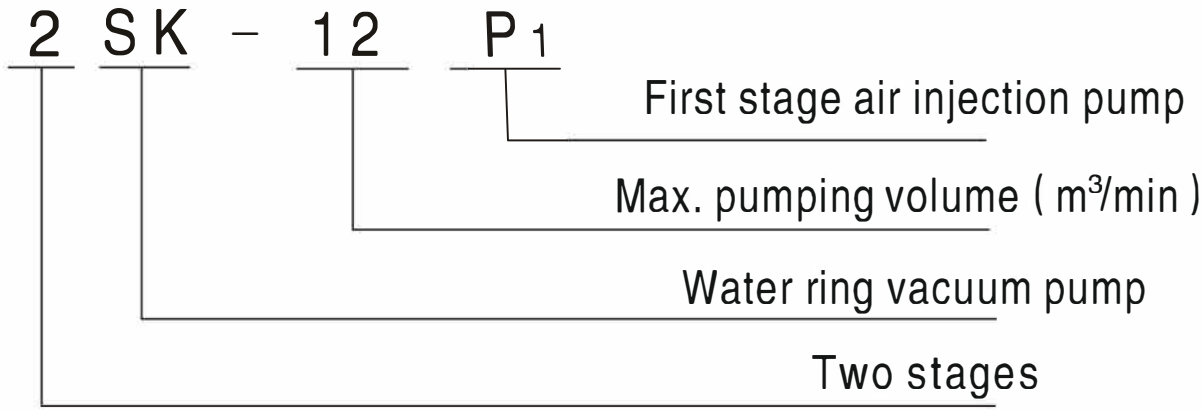
ZHEJIANG YANGTZE VIVER PUMP CO.,LTD.

Instruction

2SK series and 2SK–P_1 series two stage water ring vacuum pump are air injection pump group, which are invented and developed according to"Industry Standard JB/T 7255–94 Models and basal parameter for water ring vacuum pump and water ring compressor". The pumps have advantages, like high vacuity, fast pumping speed in high vacuity space, compact structures, trustable operation and convenient assembly or disassembly.

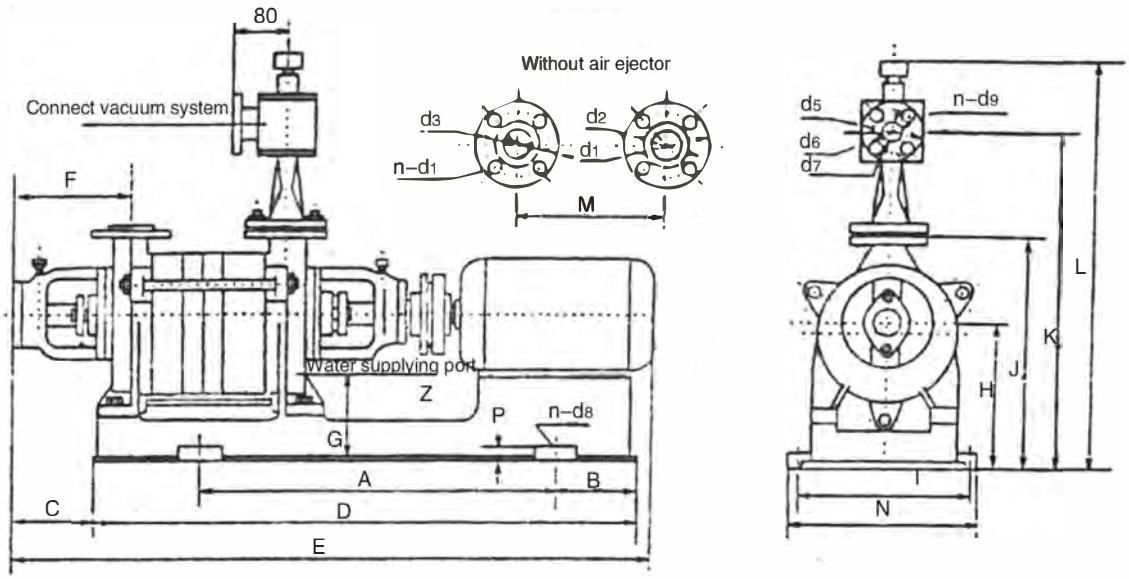
The pump group is formed by two stage water ring vacuum pump and first class air injection pump group. Users can use two stage water ring vacuum pump and vacuum pump group separately to pump air or other gas which is water–fast, without solids or noncorrosive. The pump group is most suitable in food, chemical, mining, light textile and other industries, where the insdustries need processes like vacuum evaporation, vacuum concentration, vacuum reversion, vacuum drying, vacuum smelting and others.

Model meaning

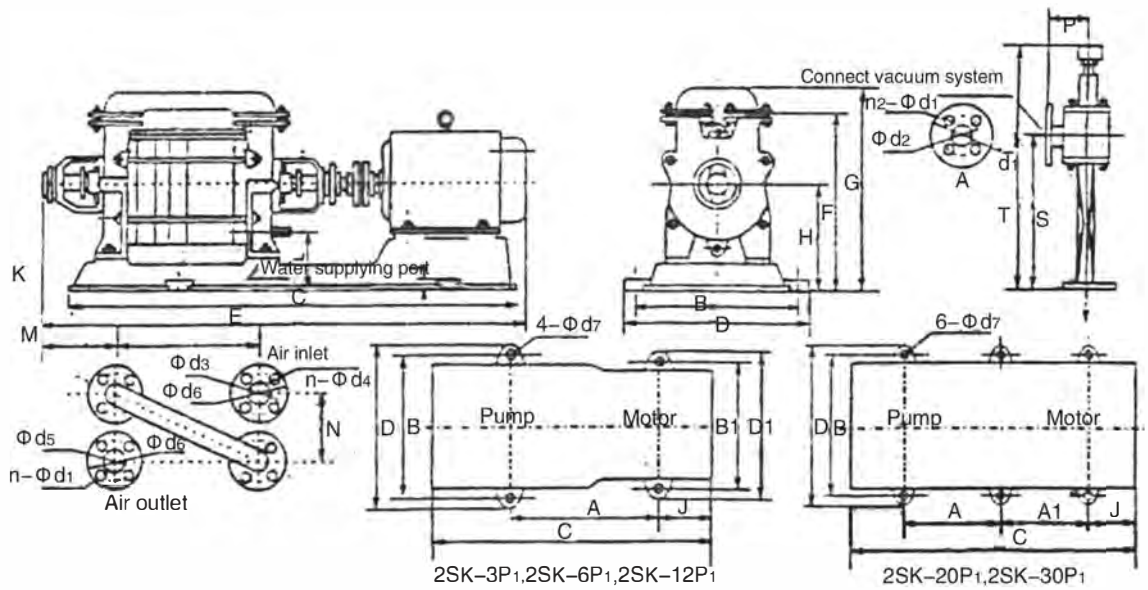


Work principle

Working principle of Two stage water ring vacuum pump is as drawing I . When the pump starts, the impeller slings the liquid sealant by centrifugal force, to the outside walls of the body, forming a ring of liquid at the outside walls of the body. Because the impeller is off–set from the body, some of the blades are fully immersed in



Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Z	n	d1	d2	d3	d4	d5	d6	d7	d8	d9
2SK–1.5P1	605	125	125	950	1150	212	144	252	369	404	584	764	255	419	25	RP 1/2"	4	Φ135	Φ98	Φ40	Φ14	Φ120	Φ92	Φ40	Φ18	Φ14



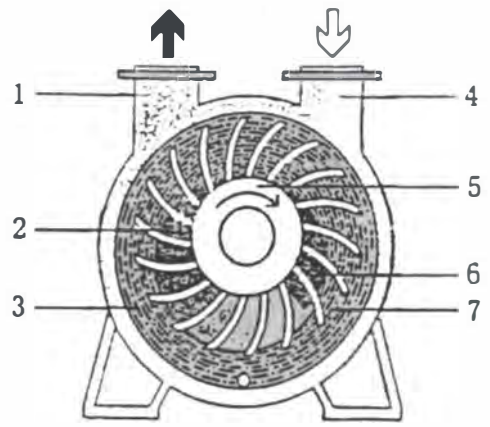
Model	A	A1	B	B1	C	D	D1	E	F	G	H	I	J	K	L	M	N	P	S	T	I"	n1	n2	d1	d2	d3	d4	d5	d6	d7
2SK–3P1	710	/	400	400	1136	460	460	1346	404	478	252	25	159	214	157	344	162	99	357	570	3/4"	4	4	14	120	153	18	110	150	14
2SK–6P1	880	/	420	420	1381	470	470	1623	570	615	325	30	218	234	183	429	210	99	515	734	3/4"	4	4	14	120		14	125	160	18
2SK–12P1	1037	/	520	460	1618	580	520	1965	690	750	375	30	216	246	183	599	280	120	565	800	1/2"	6	6	14	150	180	14	170	200	27
2SK–20P1	700	700	690	/	1972	750	/	2375	835	1000	518	40	306	283	225	619	350	180	774	1022	1/2"	8	8	18	200	235	18	200	235	24
2SK–30P1	810	750	720	/	2215	780	/	2715	840	1004	500	30	344	283	225	749	350	180	1015	1264	3/4"	8	8	18	200	235	18	200	235	27

Commonly see fault and solutions

Fault	Reasons	Solution
Insufficient Pumping Volume	1. Oversize Gap 2. Packing Area Leaking 3. water ring over temperature 4. Pipe system leaking	1. adjust gap 2. tight or replace packing 3. increase water supply 4. tight flange boltings or replace gasket or weld crakles
Vacuity reduced	1.Pipeline problem a. flange connection leaking b. Crackle on pipeline	a. tight flange boltings or replace gasket b. weld up pipeline or replace
Vacuity reduced	2. water ring pump problem a. packings leaking b. Gap between impeller and side cover is oversize c. water ring heating d. water lacking e. Spare parts heating due to friction leading to water ring temperature raise	a. tight or replace packing b. replace gasket or adjust gap c. lower supplying water temperature e. adjust or re–assemble spare parts
Vibration or noise	1. boltings on foot loosing 2. There is other things in pump body 3. vanes drop off 4. gas etching	1. Tight boltings 2. stop and checking pump and pick out the things 3. replace vanes 4. open suction pipe
Bearing heating	1. insufficient lubrication 2. packings over–tight 3. no or insufficient sealing water 4. bearing and shaft or bearing bracket and shaft over–tight, so that there is friction	1.add lubrication 2. loose packing gland a little 3. add or increase sealing water 4. adjust bearing, shaft or bearing brackt
Starting difficult	1.rustiness in pump after long term power–off 2. packings over–tight 3. eccentric wear of impeller and pump body	1. turn impellers with hand or special tools 2. loose packing gland 3. reassemble and adjust impeller and boby

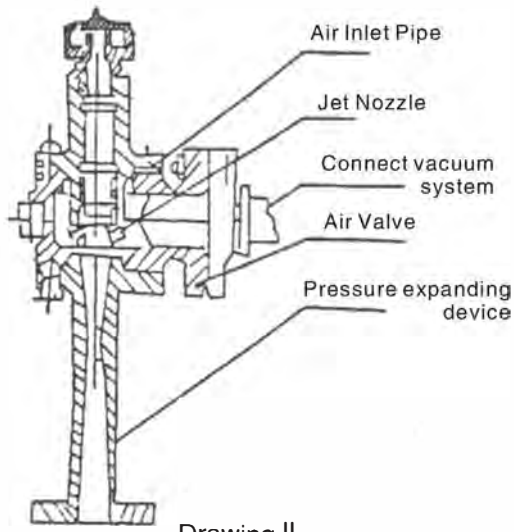
Liquid, and some are almost out of the liquid. The area of void space without liquid, is sealed off between the liquid (and hence the term "sealant") and between the impeller blades, called an "impeller cell".As we follow one impeller cell from the top of the pump, counter–clockwise, you can see the liquid recedes from the center hub, acting as a liquid piston to create a larger cell. This is the suction of the pump, drawing in air, gases, or vapors thru the "inlet port" at the sides of the impeller. After impeller cell passes the inlet port and travels toward the discharge port, the sealant liquid is forced back toward the center hub of the impeller, creating the compression step. As the impeller cell passes the discharge port, the compression is at its highest, and the gases, along with some of the liquid sealant are exhausted thru the discharge port to atmosphere. Although the diagrams show a very smooth ring of liquid, in actuality, the liquid sealant is highly turbulent, which is why some of the liquid sealant is discharged with the gases.

Air injection vacuum pump is a kind of jet injector as drawing Ⅱ. Working principle is as below: The effect of water ring vacuum pump, forming a certain of vacuum container, when close to the limit of vacuum pump, connect big pump inlet, outside the atmosphere (or pressed air) and the pressure difference is very big, in the differential pressure under the influence of atmospheric sharply in pipe, through the nozzle of air injection pump and airflow velocity, thus further increases rapidly reduced pressure, form within the nozzle. So, continue to higher vacuum pump system will be the gas suction pump.



1. Vent–pipe
2. Air outlet
3. Pump casing
4. Air inlet
5. Impeller
6. Water ring
7. Air suction port

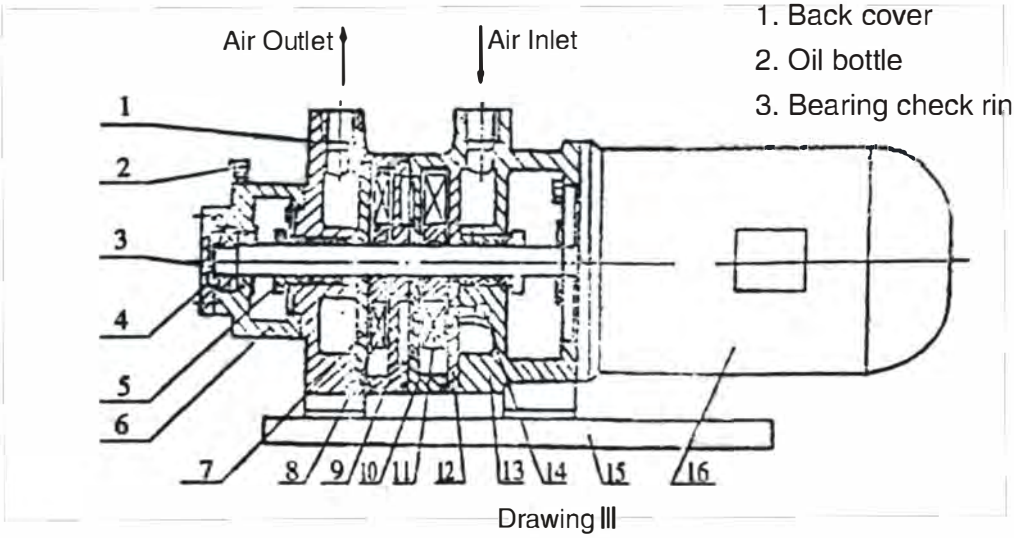
Drawing Ⅰ
Working principle drawing of water ring pump



Drawing Ⅱ
Construction drawing of air injection pump

Structure declaration

Structure of 2SK–0.4,2SK–0.8 two stage water ring vacuum pump is as drawing Ⅲ , the upper and lower vacuum stage structure is same as drawing Ⅳ which has no connecting pipe. The pumps are matched with special–made extended motor. Longer and shorter impellers are fixed on shaft by a key, but they can be axial eccentricity and assembled in longer and shorter pump casing eccentrically.



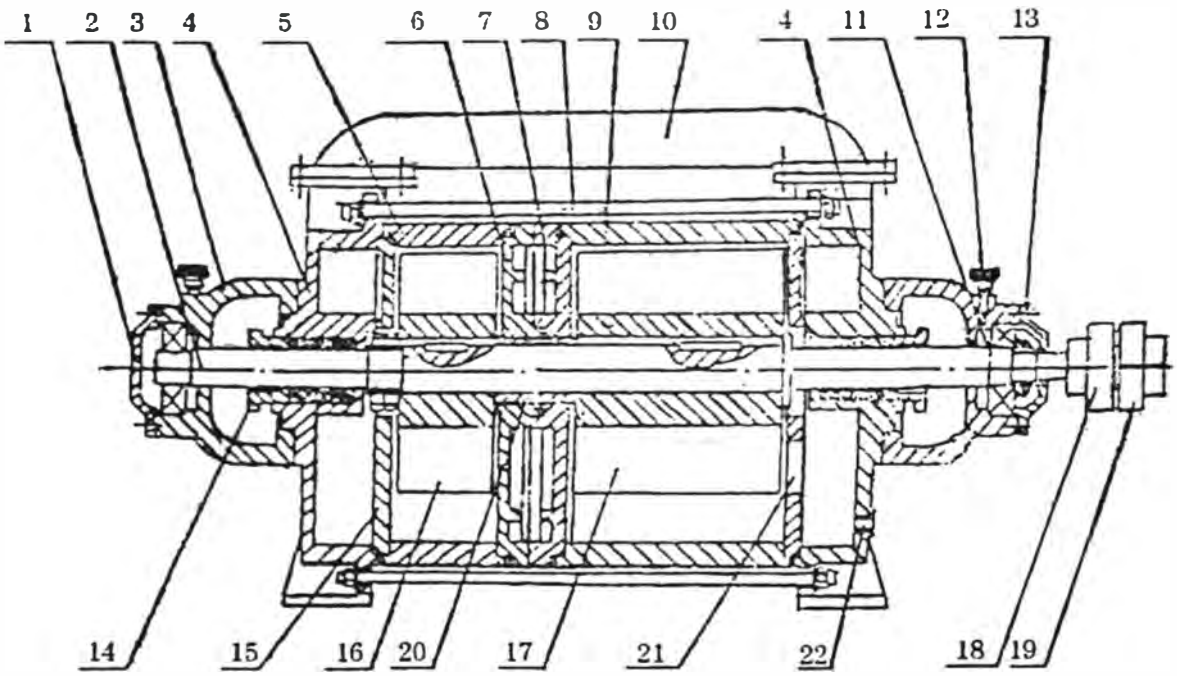
Drawing Ⅲ

1. Back cover
2. Oil bottle
3. Bearing check ring
4. Bearing gland
5. Packing gland
6. Bearing bracket
7. Exhausting plate
8. Short impeller
9. Short pump casing
10. Long pump casing
11. Long impeller
12. Air suction plate
13. Front cover
14. Water inlet
15. Base
16. Motor

Construction drawing of two stage water ring vacuum pump 2SK–0.4/2sk–0.8

Structure of Two stages water ring vacuum pump, which Pumping volumn is 1.5m3/min and above is as drawing Ⅳ . Longer and shorter impellers are fixed on shaft by a key, and between them there is shaft housing for allocation and locked by nut, which forms the rotor part and was assembled eccentrically in the pump, support in two separate centripetal ball bearing parts, rotor pump coupling is connected with the report couplet additionally, and at the same speed motor with rotation. Longer impeller, pump body and suction parts form the high vacuum, the shorter impeller, pump body and discharge parts form the lower vacuum, high vacuum level vacuum exhaust and the lower vacuum suction connection with connecting pipe (2SK–1.5 doesn't have this part) forms double levels concatenation, the double levels are devided by midfellow A and B. There is discharging hole on midfellow A and suction port on midfellow B.

Oiled asbestos packing is used for sealing in two sides of 2SK series two stage pump.



Drawing Ⅳ

Construction of pumping volume above 1.5m³/min (2SK–1.5) two stage water ring vacuum pump

1. Back bearing cover
2. Shaft
3. Bearing frame
4. Front and back cover
5. Short pump casing
6. Midfellow (B)
7. Midfellow (A)
8. Tightening nut
9. Long pump casing
10. Connecting pipe
11. Adjusting gasket
12. Oil pump
13. Front bearing cover
14. Packing gland
15. back cover plate
16. Short impeller
17. Long impeller
18. Coupling of pump
19. Coupling of motor
20. Shaft housing
21. Front cover plate
22. Water inlet port

Main performance indication and technical specifications

Notes:

1. The performance indication mentioned in below tables are under 3 conditions:

A. Air pressure: 0.1013Mpa(760mmHg)

b. Inlet water temperature is 15℃.

c. Inlet air temperature is 20℃.

d. Relative humidity of air is 70%

2. Figure of water supply volumn is made out when inlet pressure is 0.05Mpa(400mmHg). The figure will be bigger when space is final vacuum.

3. Allowed difference of performance is ± 10%.

Table 1: Technical Specification of 2SK series two stage water ring vacuum pump

Model	Pumping volume		Extreme pressure Mpa (mmHg)	Power kW	Speed r/min	Supplying L/min	Size mm
	Max.	sucking pressure −700mmHg					
2SK−0.4	0.4	0.25	−0.096 (−725)	2.2	2900	3~5	25
2SK−0.8	0.8	0.5	−0.096 (−725)	3	2900	5~8	25
2SK−1.5	1.5	0.9	−0.097 (−730)	4	1450	10~15	40
2SK−3	3	2	−0.098 (−735)	7.5	1450	15~20	50
2SK−6	6	4	−0.098 (−735)	15	1450	25~35	70
2SK−12	12	8	−0.098 (−735)	22	970	40~50	100
2SK−20	20	14	−0.098 (−735)	45	740	60~80	125
2SK−30	32	20	−0.098 (−735)	55	740	70~90	125

Table 2: Technical Specification of 2SK−P_1 series two stage water ring vccum pumpair injection pump group

Model	Pumping volume		Extreme pressure Mpa (mmHg)	Power kW	Speed r/min	Supplying L/min	Size mm
	sucking pressure −700mmHg	sucking pressure −700mmHg					
2SK−0.4P_1	0.28	0.24	−0.096 (−725)	2.2	2900	3~5	25
2SK−0.8P_1	0.56	0.48	−0.096 (−725)	3	2900	5~8	25
2SK−1.5P_1	1.05	0.9	−0.097 (−730)	4	1450	10~15	40
2SK−3P_1	2.1	1.8	−0.098 (−735)	7.5	1450	15~20	50
2SK−6P_1	4.2	3.6	−0.098 (−735)	15	1450	25~35	70
2SK−12P_1	8.4	7.2	−0.098 (−735)	22	970	40~50	100
2SK−20P_1	14	12	−0.098 (−735)	45	740	60~80	125
2SK−30P_1	21	18	−0.098 (−735)	55	740	70~90	125

Installation of the equipment

Installation dimension of 2SK two stage water ring vacuum pump is shown on drawing 5,6 and 7

A.Installation of pump:

If the pump is damaged or 6 months later from finishing date,please disassemble the pump to check and repair before installation.

Turn the coupling before installation to ensure the pump is not locked. Please make sure the pump will be installed horizontally, and check the concentricity between motor arbor and pump shaft. In case any deviation of concentricity, the bearing heats, spare parts damages and other results.

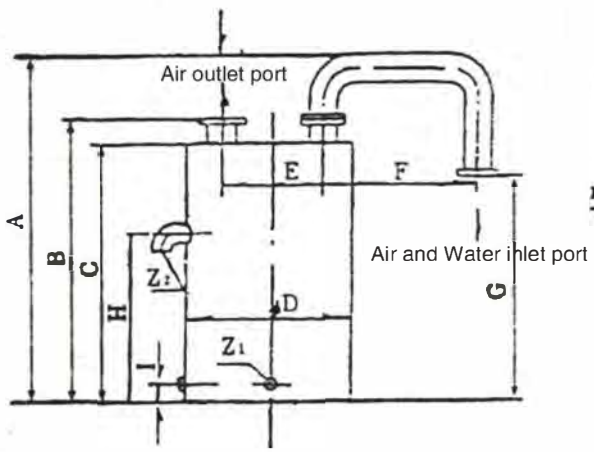
B.Pipe installation

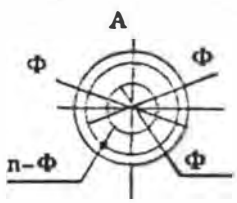
In case there is slit on inlet pipe, the pump can't reach calculative vacuum level, so gaskets are needed to assure compactness of flange connector in pipe.

It is better to install a gate vale on suction pipe of pump to avoid the water back in pump when the pump is power off. For convenient inspection, please install a vacuum meter on the pipe between gate valve and suction inlet. Also a gate valve is needed on supplying pipe to adjust water supplying volumn, which will affect the pump performance directly. A filter which maximum hole size is under 0.5mm in suction pipe is needed to avoid any inpurity sucked into pump.

C.Air and water separator

The air and water separator is installed on the groundsill accord to drawing 5. If you want to change the installing site, please note the connecting pipe can't be too long or too curve which should be lower than 0.5 meter, shorter than 2 meters and less than 3 turns, or it will increse discharging pressure, influence the performance and vacuum level and consume more power.





Drawing V
Outside and assemble Dimensions
of air and water separator
2SK-6P1,2SK-12P1,2SK-20P1,2SK-30P1

Model	A	B	C	D	E	F	G	H	I	Z_1	Z_2	d_1	d_2	d_3	d_4	n
2SK–3P_1	937	740	690	400	220	500	404	400	60	3/4"	65	150	110	40	14	4
2SK–6P_1	900	740	670	500	220	500	510	410	60	3/4"	65	160	130	65	14	4
2SK–12P_1	1070	910	840	650	260	500	690	480	60	3/4"	80	185	150	80	18	4
2SK–20P_1	1333	1070	1000	650	260	500	835	690	60	3/4"	80	235	200	125	18	8
2SK–30P_1	1333	1070	1000	650	260	500	840	690	60	3/4"	80	235	200	125	18	8

Start and Stop

A.Start

Before start, please handle coupling several truns to make sure the rotors can be turnned freely, especially when the pump is after a long term stop. Please release water inside the pump completely.

Follow below steps for 2SK series pumps:

a.Close gate valve on suction pipe

b.Open motor (right side is suction and left side is discharge when motor is whirling clockwisely behind it.)

c.Open gate valve on water supplying pipe to increase water volumn till standard specification

d.Open gate valve on suction pipe when pump reaches extreme vacuum and pump starts working.

e.Adjust packing gland. When pump is working under extreme vacuum, there might be explode noise because of physical action. But the noise will not increase power consumption. If the explode noise is happened from increasing power consumption, please stop pump and check the damage.

Follow below steps for 2SK–P_1 series water ring air injection pump group

First, follow above 5 steps to start two stage water ring vacuum pump first. The air injection pump can work by itself, if it is installed on suction port of two stage pump. Pump group takes more time to reach extreme vacuum. If the air injection pump is operated by solenoid valve, pump group starts working when two stage pump connects air injection pump at its extreme vaccum.

B.Stop:

When 2SK series two stage water ring vacuum pump is used individually, please follow below steps:

a.close gate valve on suction pipe

b.close gate valve on supplying pipe to stop water and let the pump work 1 to 2 minutes more to discharge fluid

c.shut off motor

d.If the pump will not operate for more than one day, please drain out all water in pump.

Stope for 2SK–P_1 series water ring air injection pump group

a.Please follow steps of 2SK series two stage vacuum pump if the air injection pump is installed on its suction flange.

b.If air injection pump group is connected to two stage water ring vacuum pump by bypass pipes and using solenoid valve to operate, please stop it first and then stop tow stage vacuum pump.

Disassembly and assembly of pump

A. Disassembly

Purpose: inspect, clean, repair and replace the spare parts. Before disassembly, please drain out all water in pump. Take away every sealing gaskets carefully during disassembling. In case damage, change a new gasket with same thickness and material following below steps (drawing 3 and 4):

a.Pleae devide pump with system piping, separator, motor and base plate, take out pump head and lie on a flat. (Don't take off the motor for 2SK–0.4 and 2SK–0.8)

b.Take off connecting pipe (2SK–0.4 and 2SK–0.8 don't have this)

c.For convenient disassembly, please lie the pump vertically with driving side down.

d.Take off behind bearing cover with bearing bracket

e.Disassemble all boltings

f.Take off shorter pump casing, shorter impeller cap, short impeller, midfellow, shaft housing, longer pump casing, longer impeller in correct order. Please don't disassemble longer impeller from shaft if you don't plan to replace them.

g.Lay down the pump (drawing 4), take off front bearing gland, front bearing bracket and front end cover (drawign 3)

Please pay special attention to the gap size between surface of two impellers and pump cover, midfellow. Add or minus gaskets accord to the gap.

B. Assembly

Please wash spare parts, grease threads and change grease in ball bearing and shaft block before assembly.Change rejected parts and replace old gaskets with same thickness new ones.

The order of assembly is contrary with disassmebly, but pls note:

a.Pleae fix the location bearing which is on driving end and adjust the gap between longer impeller and front end cover plate.

b.Balance the tension on each bolting.

c.The keypoint for two stage water ring pumps assembly is assure the gap of impeller with two sides can reach standard requirement. If the gap is too big, too small or unbalance, pump performance especially the sucking rate will be affected a lot, or even damage impeller.

d.For the gap between impeller and two sides, please refer to below table 3.

Mode	Face gap (mm)	Mode	Face gap (mm)
2SK–1.5	0.15–0.20	2SK–3	0.15–0.20
2SK–6	0.15–0.20	2SK–12	0.15–0.25
2SK–20	0.20–0.30	2SK–30	0.20–0.30

Maintenance

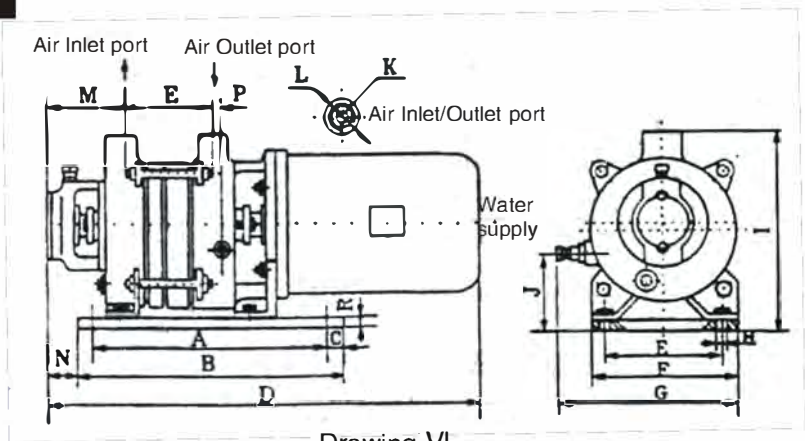
A. Press the packings tight termly.Change new packings when the sealing effect is not good due to packing worn. The packings can't be pressed too tight, it is allow leaking water drops. The packing material should be oiled asbestos.

B. Ball bearings shall work in a good operating condition which temperature is upto 35℃, but measured value is not more than 70℃. Fill bearing house 2/3 full with grease. Normally working bearing should be filled with grease 3 to 4 times, washed at least 1 time and change all grease per year.

Instruction for equipment

Assembly and out dimension of 2SK series and 2SK–P1 series are ad drawing Ⅴ,Ⅵ and Ⅶ.

Vacuity and sucking rate can be adjusted by the gate valve on pipe (which is not mentioned on drawing, users has to assemble by themselves).



Drawing Ⅵ

Outer and assemble dimension of 2SK–0.4,2SK–0.8

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R
2SK–0.4	310	350	20	590	125	200	235	Φ14	280	102	Φ25	1"	104	36	5	15
2SK–0.8	335	375	20	660	150	210	260	Φ14	280	102	Φ25	1"	104	36	5	15

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As we are constantly endeavouring to improve the performance of our equipment.

The company reserves the right to make alteration from time to time and equipment differ from that detailed in this brochure.

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