IWAKI PUMPS

IWAKI Metering Pump

LK Series

Instruction Manual

⚠ Read this manual before use of product

Thank you for selecting the Iwaki Mechanical-driven Diaphragm Type Metering Pump LK Series. This instruction manual has been prepared to ensure correct and safe handling of the pump. Please read this manual carefully and thoroughly prior to operating the pump.
Pay special attention to the "Safety Instruction," "Warning," and "Caution" messages included in this manual.
This instruction manual should be kept by each end user and within reach of the actual operator, for quick reference when needed.

Contents

Please contact the Iwaki sales office or Iwaki dealer for any inquiries or questions regarding this product.

IMPORTANT INSTRUCTIONS

Important notes and statements for safe operation, preventing physical injury, and property damage, are included on the body of the product and in the attached instruction manual.

Always Observe These Safety Instructions!

Safety Instruction to Prevent Personal Injuries

In this manual, the following symbols and signs are used to clearly indicate safety instructions.

⚠ **Warning**	**Nonobservance or misapplication of the contents of the "Warning" section could lead to a serious accident, including death or injury.**
⚠ **Caution**	**Nonobservance or misapplication of the contents of the "Caution" section could lead to serious physical injury to the user or serious damage to the product.**

Types of Symbols

⚠ Indicates that "Warning" or "Caution" must be exercised. Inside this triangle, a concrete and practical image provided as a warning or caution message is depicted.

⃠ Indicates a prohibited action or procedure. Inside or near this circle, a concrete and practical image of the activity to be avoided is depicted.

❗ Indicates an important action or procedure which must be performed or carried out without fail. Failure to follow the instructions herein can lead to malfunction or damage to the pump.

Safety Instruction

⚠ Warning

- **Turn off power supply**
  Turn off poser supply prior before maintenance or other works are done. Pay special attention so that no other person turns on by mistake the power supply while the works are done.


Power off

- **Wear protectors**
  When disassembling, assembling, and conducting maintenance or when handling a dangerous type of liquid or a liquid of unknown property, be sure to wear safety gloves, helmet and protective shoes etc.


Wear protective gear

- **To prevent death or injury from falling pump**
  Make sure the rope or chain used for lifting the pump is not accidentally cut or disconnected during installation. Make sure the rope or the chain used to lift the pump has sufficient strength in relation to the pump load. Also, be sure not to stand underneath a lifted or suspended pump.


Prohibited

- **Qualified operator only**
  Pump must be handled or operated by the person who has enough knowledge and acquainted with handling the pump.


Caution

- **No remodeling**
  Remodeling the pump results in personal injury or damage of pump. Never remodel the pump.


Do not disassemble

- **For specified application only**
  Do not use the pump for any other application and specification than specified ones. The use of pump for other application or specification may cause accident or failure.


Prohibited

- **Do not step on pump**
  If you step on the pump as a stand, you may be injured by falling down or so.


Prohibited

- **Attention to reciprocating parts**
  Do not insert finger or so into hole at the bottom of pump bracket. Diaphragm or so make reciprocating movement in the bracket and you will be injured if you touch them.


Caution

- **Do not close valve**
  If pump is operated with discharge side valve closed, pump or pipe may be burst. Do not operate pump with discharge valve closed.


Prohibited

- **Pump starting**
  Pump has no on/off switch. Pump starts to run when power cord is connected to power supply.


Caution

Safety Instruction

⚠ Caution

- **Ventilate**
  If toxic or odorous liquids are handled, you may be poisoned by them. Ventilate the site.

- **No fire**
  Check the leakage of lubrication oil and repair the pump if leakage is found. Observe the local law for the stocking of lubrication oil.

- **Attention to hot pump or pipe**
  When high temperature liquid is transferred or when pump is operated continuously, pump body, pipe or motor are hot. Do not touch them by bare hand.

- **Broken pump**
  Broken pump may cause electrical leakage and electrical shock. Do not use broken pump.

- **Take ground**
  Connect ground wire. Otherwise you may be electrically shocked.

- **Specified power source only**
  If the other power than specified one is supplied to pump/motor, it may cause pump failure, fire or electrical shock. Never supply pump with other power source than specified one.

- **Use earth leakage breaker**
  Install earth leakage breaker. Otherwise you may be electrically shocked.

- **Prohibited place to be installed**
  Do not install or store pump at following places.
  • Inflammable place, explosive atmosphere, powdery place
  • place where corrosive gas (chlorine gas etc.) is generated
  • place ambient temperature exceeds 40 deg. C or below zero.
  • place dusty, humid or exposed to rain (except weather-proof type)

- **Do not cover pump with cloth or like**
  If pump is covered by cloth or so, heat can not released resulting in fire or failure. Keep enough aeration.

- **Do not freeze pump**
  When ambient temperature becomes below freezing point, pump body may be broken by freezing if liquid stays inside pump. Discharge liquid in pump and piping.

Safety Instruction

⚠ Caution

- **Do not close suction and discharge valves during operation**
  If pump is operated with discharge valve closed, pressure increases abnormally which may cause breakdown of pump/motor.

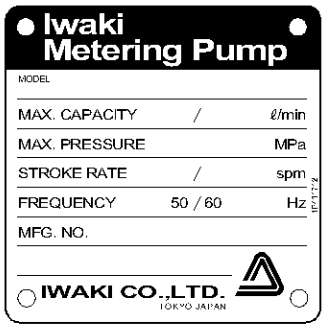
- **Countermeasures for liquid flow out**
  Take appropriate countermeasures for the liquid flowing out because of the broken pump or pipe.

- **Foreign matters in pump**
  If foreign matters get into the pump, switch off power and remove them. If pump continues to run with foreign matters getting in, pump may be broken or failed.

- **Disposal of used pump**
  Observe your local law for disposal of used pump.

OUTLINE OF PRODUCT

1. Before Using Pump



After unpacking, check the following points to confirm that the delivered product is exactly what you ordered.

(1) Do the model, capacity, pressure, stroke rate and frequency indicated on the nameplate conform to your order?

(2) Has the pump unit or any part of it been damaged or bolts and nuts been loosened during delivery?

(3) Are any accessories not missing?

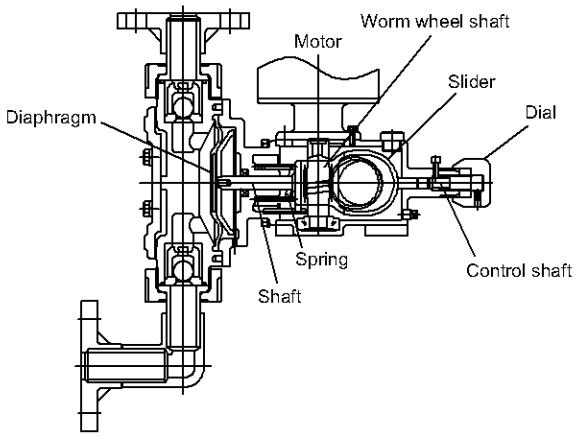
(4) Union socket and flange unit of pump models shown in table on left ▩ are removed from pump and packaged together with pump.

Accessories

	Accessories \ Model	VHH VCH VSH	VHU VCU	VH, VC VS, TC	S6
Standard accessories	Pump mounting bolt (M8 × 25) 4pcs	○	○	○	○
	Back press. valve w/check valve (1pc)	○※	—	—	—
	PVC hose (1pc)	○	—	—	—
	Strainer (1pc)	○	—	—	—
Option	Pump base set (Base, anchor bolt, nut)	(on order)			

Note 1. Mark ○ … attached Mark — … not attached
2. Q'ty is per pump head
3. ※ marked parts not attached to LK-47.

2. Operating Principle



The rotation of the motor is reduced by means of the worm and wheel. The rotary motion is changed to a reciprocating motion by the spring-back mechanism (including the worm wheel shaft, slider, spring, etc.). The reciprocating motion is transmitted to the diaphragm and the functioning of the valves in the pump head produce pump operation.
For adjusting the discharge capacity, the adjusting dial fixed on the control shaft is rotated to change the stroke length.

3. Identification Codes

Example:

2 LK 31 VC H – 02 F E S (1) (2) (3) (4) (5) (6) (7) (8) (9)	
(1) Number of pump head	No symbol: Simplex (Single head) 2: Duplex (Dual heads)
(2) Series	LK: Mechanical diaphragm type
(3) Model number	First figure: Diaphragm effective diameter (See "Specification" on page 8) Second figure: Reduction gear ratio 1: 1/30, 2: 1/15…for diaphragm dia. symbols 1, 2 and 3. 5: 1/30, 7: 1/15…for diaphragm dia. symbols 4 and 5.
(4) Material symbol	Refer to the wet-end material table on page 8. (ex. VC, VH, VS, TC, S6)
(5) Connection	No symbol: Flange (JIS) U: Union H: Hose
(6) Motor output	02: 0.2kW
(7) Motor	No symbol: General purpose motor F: Inverter control
(8) Stroke adjustment	No symbol: Manual adjustment E: with electric servo unit
(9) Special symbol	S: Special specification other than standard

■ Wet-end Material

Material symbol			VC	VH	VS	S6	TC
Parts	Pump head		PVC	PVC	PVC	SUS316	PVDF
	Valve		CE	HC	HC/SUS304	HC	HC
	Valve seat	Type 11 to 32	FKM	EPDM	SUS304	SUS316	FKM
		Type 45 to 57	PVC	PVC	SUS304	SUS316	PVDF
	Valve guide		PVC			SUS316	PVDF
	Valve gasket		PTFE				
	O ring		FKM	EPDM	EPDM	—	FKM
	Diaphragm		PTFE+EPDM				

CE: Alumina ceramic HC: Hastelloy C267

(Note) For the actual names of the parts, refer to a paragraph "Names of Parts" on pages 10 to 20.

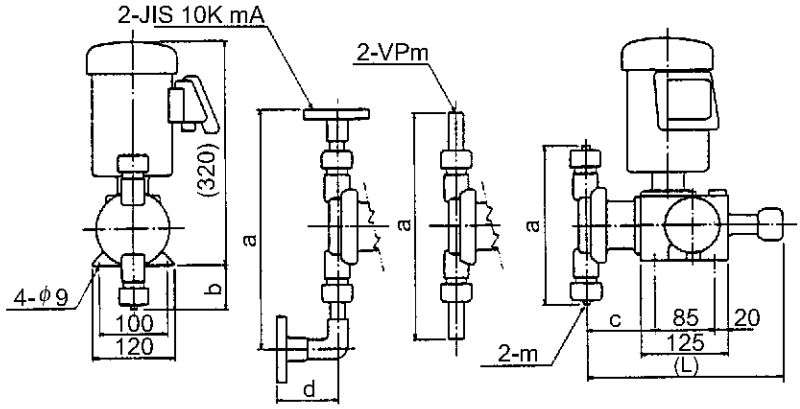
4. Specifications

Model	Max. disch. capacity L/min		Max. disch. pressure MPa		Viscosity mPa·S		Stroke speed spm		Diaphragm Effective dia mm	Stroke length mm	Connection			
											Flange (Nominal dia)		Union	Hose
	50Hz	60Hz	PVC *	SUS *	PVC *	SUS *	50Hz	60Hz			PVC *	SUS *	PVC *	PVC
LK-11	0.020	0.024	1.0	1.5	VC: 300 VH: 500	500	48	58	22	1.5	JIS10K 15A (VH, VC, VS, TC) JIS10K25A (LK-47 VS)	JIS16K 15A	VP16 VP25 (LK-47 VS)	I.D.4mm O.D.9mm
21	0.050	0.060	1.0	1.5			48	58	30	2				
22	0.10	0.12	1.0	1.5			96	116	30	2				
31	0.25	0.30	1.0	1.5		1000	48	58	60	2.5				I.D.12mm O.D.18mm
32	0.50	0.60	1.0	1.5			96	116	60	2.5				
45	0.85	1.0	1.0	1.5			48	58	72	6				
47	1.7	2.0	0.8	0.8			96	116	72	6				
55	2.8	3.3	0.5	0.5			48	58	100	10	JIS10K 25A			
57	6.0	7.2	0.3	0.3			96	116	100	10				

* PVC refers to the material symbols VC, VH, or VS while SUS refers to the material symbol S6.
Motor: TEFC outdoor, 0.2kW, 4P (Exclusive motor for LK Series)
Metering accuracy: Within ± 2% FS
Lineality: Within ± 3% FS
Liquid temperature: 0 - 50 deg. C for VC, VH, VS, TC
0 - 80 deg. C for S6
Self-priming ability: Within 1m (at full stroke length)
Ambient temperature: 0 - 40 deg. C

Note1: Max. discharge capacity is based on pumping clear water at 20 deg. C at max. discarge pressure.
2: Only flange connection is available for S6 & TC.

5. Outer Dimensions



Note: Drawings show PVC type. Suction flange pipe is straight for SUS type.

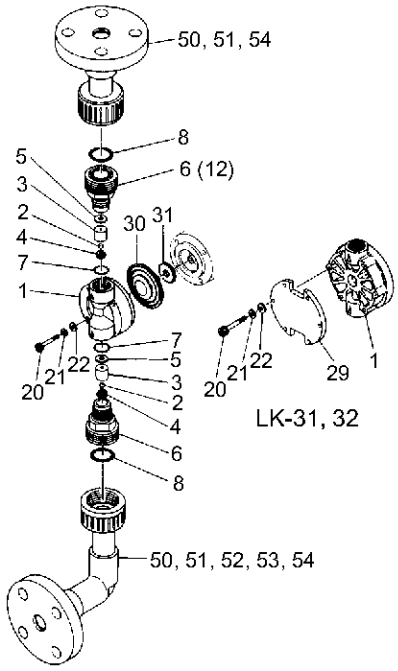
Unit : mm

Model	Hose type					Union type					Flange type										
	PVC					PVC					PVC						SUS				
	L	a	b	c	m	L	a	b	c	m	L	a	b	c	d	m	L	a	b	c	m
LK-1	275	146	23	95	See bellow	275	244	72	95	16	275	264	86	95	89	15	272	141	20	92	15
2	275	164	32	95		275	262	81	95	16	275	282	95	95	89	15	272	151	25	92	15
3	277	224	62	97		277	318	109	97	16	277	342	125	97	89	15	277	184	42	97	15
4	281	243	72	99		281	337	119	99	16	281	361	135	99	89	15	283	261	80	101	15
5	—	—	—	—		298	314	107	114	25	298	338	125	114	97	25	295	320	110	111	25
42VS	—	—	—	—		281	272	86	99	25	281	308	104	99	97	25	—	—	—	—	—

※Hose dia. … LK-1, LK-2 : 4 × 9 LK-3, LK-4, VS type of LK-1 to 4 : 12 × 18

6. Names of Parts

■ LK-11, 21, 22, 31, 32 VC, VH, VS

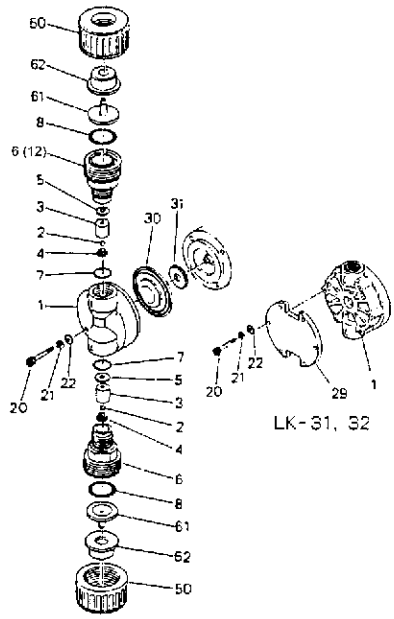


No.	Parts name	Q'ty	Material		
			VC	VH	VS
1	Pump head	1	PVC	PVC	PVC
2	Valve (ball check)	2	ALUMINA CERAMIC	HASTELLOY C276	HASTELLOY C276
3	Valve guide	2	PVC	PVC	PVC
4	Valve seat	2	FKM	EPDM	SUS304
5	Valve gasket	2	PTFE	PTFE	PTFE
6	Adapter	2 (Note3)	PVC	PVC	PVC
7	O-ring (S14) (Note1)	2	FKM	EPDM	EPDM
8	O-ring (P20)	2	FKM	EPDM	EPDM
(12)	Disch. adapter (Note4)	1	—	—	PVC

No.	Parts name	Q'ty	Material	Remarks		
				LK-11	LK-21, 22	LK-31, 32
20	Hex. socket head bolt	—	STNLS STL	M4 × 35 4PCS		
20	Hex. head bolt	—	STNLS STL		M5 × 30 4PCS	M5 × 45 6PCS
21	Spring washer	—	STNLS STL	M4 4PCS	M5 4PCS	M5 6PCS
22	Plain washer	—	STNLS STL	M4 4PCS	M5 4PCS	M5 6PCS
29	Reinforcing plate (Note5)	1	SS400	—	—	
30	Diaphragm	1	PTFE+EPDM			
31	Retainer plate	1	SUS304			
50	Nut*	2	PVC			
51	Union*	2	PVC			
52	Elbow*	2	PVC			
53	Pipe*	2	PVC			
54	Flange*	2	PVC			

Note1: S16 for LK-31, 32.
Note2: The parts asterisked (*) are supplied as the flange unit.
Note3: One piece for VS.
Note4: For VS only.
Note5: For LK-31, 32 only.

■ LK-11, 21, 22, 31, 32 VHH, VCH, VSH

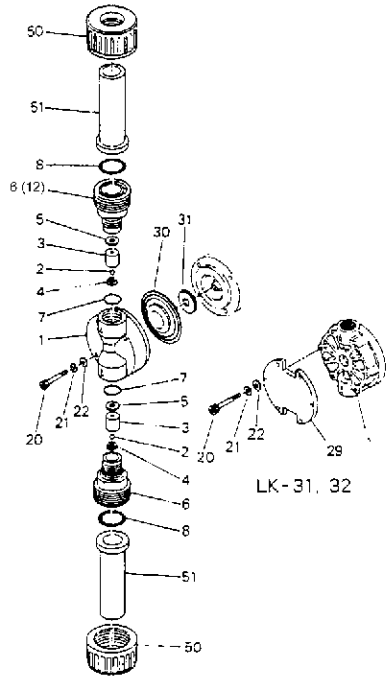


No.	Parts name	Q'ty	Material		
			VC	VH	VS
1	Pump head	1	PVC	PVC	PVC
2	Valve (ball check)	2	ALUMINA CERAMIC	HASTELLOY C276	HASTELLOY C276
3	Valve guide	2	PVC	PVC	PVC
4	Valve seat	2	FKM	EPDM	SUS304
5	Valve gasket	2	PTFE	PTFE	PTFE
6	Adapter	2 (Note2)	PVC	PVC	PVC
7	O-ring (S14) (Note1)	2	FKM	EPDM	EPDM
8	O-ring (P20)	2	FKM	EPDM	EPDM
(12)	Disch. adapter (Note3)	1	——	——	PVC

No.	Parts name	Q'ty	Material	Remarks		
				LK-11	LK-21, 22	LK-31, 32
20	Hex. socket head bolt	—	STNLS STL	M4 × 35 4PCS		
20	Hex. head bolt	—	STNLS STL		M5 × 30 4PCS	M5 × 45 6PCS
21	Spring washer	—	STNLS STL	M4 4PCS	M5 4PCS	M5 6PCS
22	Plain washer	—	STNLS STL	M4 4PCS	M5 4PCS	M5 6PCS
29	Reinforcing plate (Note4)	1	SS400	——	——	
30	Diaphragm	1	PTFE+EPDM			
31	Retainer plate	1	SUS304			
50	Nut	2	PVC			
61	Tube insert	2	PVC			
62	Ferrule	2	SS400			

Note1: S16 for LK-31, 32.
Note2: One piece for VS.
Note3: For VS only.
Note4: For LK-31, 32 only.

■ LK-11, 21, 22, 31, 32 VHU, VCU, VSU

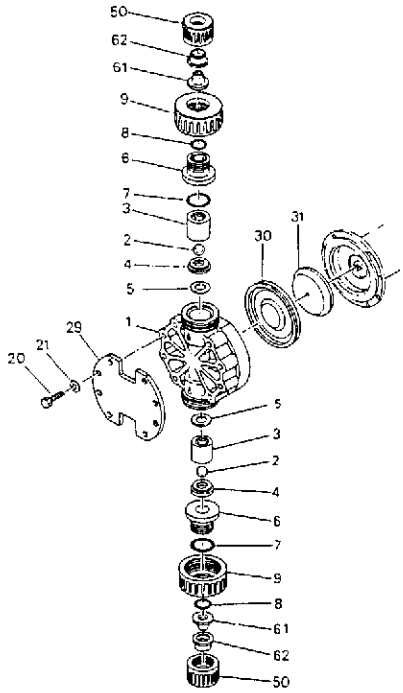


No.	Parts name	Q'ty	Material		
			VCU	VHU	VSU
1	Pump head	1	PVC	PVC	PVC
2	Valve (ball check)	2	ALUMINA CERAMIC	HASTELLOY C276	HASTELLOY C276
3	Valve guide	2	PVC	PVC	PVC
4	Valve seat	2	FKM	EPDM	SUS304
5	Valve gasket	2	PTFE	PTFE	PTFE
6	Adapter	2 (Note2)	PVC	PVC	PVC
7	O-ring (S14) (Note1)	2	FKM	EPDM	EPDM
8	O-ring	2	FKM	EPDM	EPDM
(12)	Disch. adapter (Note3)	1	—	—	PVC

No.	Parts name	Q'ty	Material	Remarks		
				LK-11	LK-21, 22	LK-31, 32
20	Hex. socket head bolt	—	STNLS STL	M4 × 35 4PCS		
20	Hex. head bolt	—	STNLS STL		M5 × 30 4PCS	M5 × 45 6PCS
21	Spring washer	—	STNLS STL	M4 4PCS	M5 4PCS	M5 6PCS
22	Plain washer	—	STNLS STL	M4 4PCS	M5 4PCS	M5 6PCS
29	Reinforcing plate (Note4)	1	SS400	—	—	
30	Diaphragm	1	PTFE+EPDM			
31	Retainer plate	1	SUS304			
50	Nut	2	PVC			
51	Union*	2	PVC			

Note1: S16 for LK-31, 32.
Note2: One piece for VS.
Note3: For VS only.
Note4: For LK-31, 32 only.

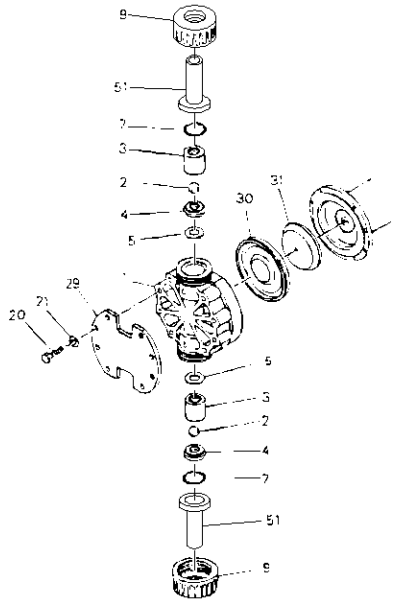
■ LK-45, 47 VHH, VCH, VSH (Only for LK-45 for VSH)



No.	Parts name	Q'ty	Material		
			VCH	VHH	VSH
1	Pump head	1	PVC	PVC	PVC
2	Valve (ball check)	2	ALUMINA CERAMIC	HASTELLOY C276	HASTELLOY C276
3	Valve guide	2	PVC	PVC	PVC
4	Valve seat	2	PVC	PVC	SUS304
5	Valve gasket	2	PTFE	PTFE	PTFE
6	Adapter	2	PVC	PVC	PVC
7	O-ring (P32)	2	FKM	EPDM	EPDM
8	O-ring (P20)	2	FKM	EPDM	EPDM
9	Nut	1	PVC	PVC	PVC

No.	Parts name	Q'ty	Material	Remarks
20	Hex. head bolt	8	STNLS STL	M8 × 60
21	Spring washer	8	STNLS STL	M8
29	Reinforcing plate	1	SS400	
30	Diaphragm	1	PTFE+EPDM	
31	Retainer plate	1	SUS304	
50	Nut	2	PVC	
61	Tube insert	2	PVC	
62	Ferrule	2	SS400	

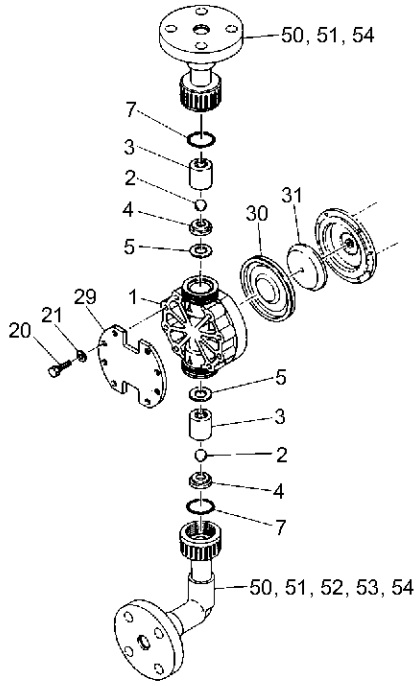
■ LK-45, 47 VCU, VHU, VSU (Only for LK-45 for VSU)



No.	Parts name	Q'ty	Material		
			VCU	VHU	VSU
1	Pump head	1	PVC	PVC	PVC
2	Valve (ball check)	2	ALUMINA CERAMIC	HASTELLOY C276	HASTELLOY C276
3	Valve guide	2	PVC	PVC	PVC
4	Valve seat	2	PVC	PVC	SUS304
5	Valve gasket	2	PTFE	PTFE	PTFE
7	O-ring (P32)	2	FKM	EPDM	EPDM
9	Nut	2	PVC	PVC	PVC

No.	Parts name	Q'ty	Material	Remarks
20	Hex. head bolt	8	STNLS STL	M8 × 60
21	Spring washer	8	STNLS STL	M8
29	Reinforcing plate	1	SS400	
30	Diaphragm	1	PTFE+EPDM	
31	Retainer plate	1	SUS304	
51	Union	2	PVC	

■ LK-45, 47, 55, 57 VC, VH, VS

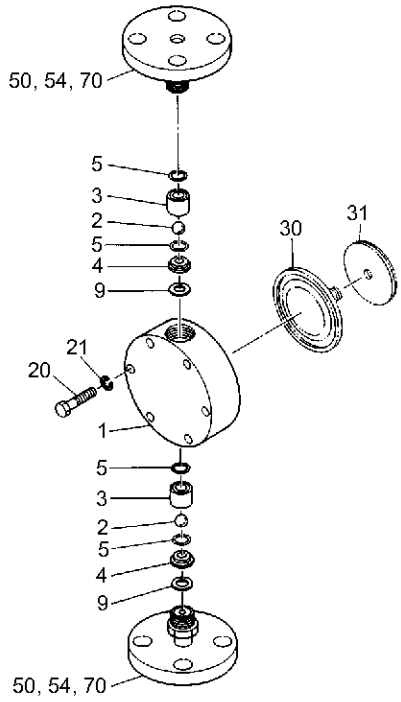


No.	Parts name	Q'ty	Material		
			VC	VH	VS
1	Pump head	1	PVC	PVC	PVC
2	Valve (ball check)	2	ALUMINA CERAMIC	HASTELLOY C276	HASTELLOY C276
3	Valve guide	2	PVC	PVC	PVC
4	Valve seat	2	PVC	PVC	SUS304
5	Valve gasket	2	PTFE	PTFE	PTFE
7	O-ring (P32) (Note1)	2	FKM	EPDM	EPDM

No.	Parts name	Q'ty	Material	Remarks	
				LK-45, 47	LK-55, 57
20	Hex. head bolt	8	STNLS STL	M8 × 60	M8 × 75
21	Spring washer	8	STNLS STL	M8	M8
29	Reinforcing plate	1	SS400 (FC200) (Note 3)		
30	Diaphragm	1	PTFE+EPDM		
31	Retainer plate	1	SUS304		
50	Nut*	2	PVC		
51	Union*	2	PVC		
52	Elbow* (Note4)	1	PVC		
53	Pipe* (Note4)	1	PVC		
54	Flange*	2	PVC		

Note1: P38 for LK-55, 57.
Note2: The parts asterisked (*) are supplied as the flange unit.
Note3: FC200 is for LK-55, 57.
Note4: Only for suction side.

■ LK-11, 21, 22, 31, 32 S6

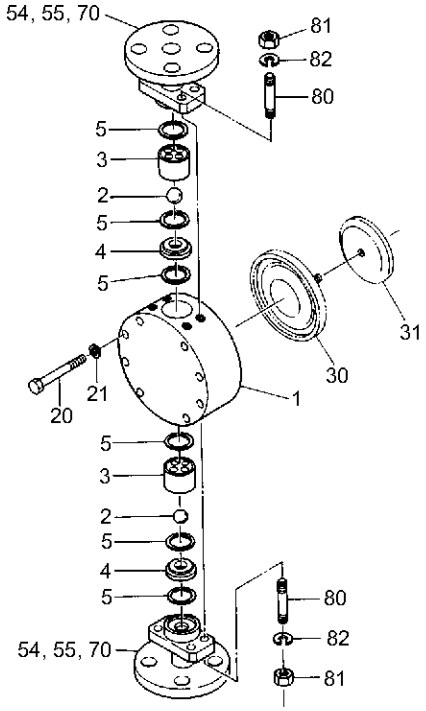


No.	Parts name	Q'ty	Material
1	Pump head	1	SUS316
2	Valve (ball check)	2	HASTELLOY C276
3	Valve guide	2	SUS316
4	Valve seat	2	SUS316
10	Valve gasket A	4	PTFE
11	Valve gasket B	2	PTFE

No.	Parts name	Q'ty	Material	Remarks		
				LK-11	LK-21, 22	LK-31, 32
20	Hex. head bolt	—	STNLS STL	M4 × 40 4PCS	M5 × 35 4PCS	M5 × 45 6PCS
21	Spring washer	—	STNLS STL	M4 4PCS	M5 4PCS	M5 6PCS
30	Diaphragm	1	PTFE+EPDM			
31	Retainer plate	1	SUS304			
50	Nut*	2	SUS304			
54	Flange*	2	SUS316			
70	Connection port*	2	SUS316			

Note: The parts asterisked (*) are supplied as the flange unit.

■ LK-45, 47, 55, 57 S6

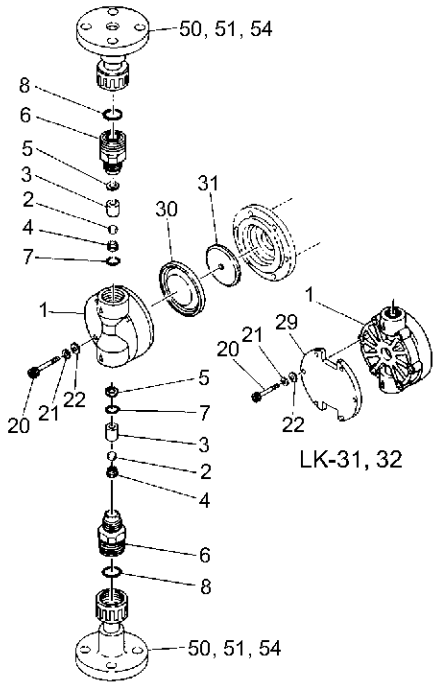


No.	Parts name	Q'ty	Material
1	Pump head	1	SUS316
2	Valve (ball check)	2	HASTELLOY C276
3	Valve guide	2	SUS316
4	Valve seat	2	SUS316
5	Valve gasket	6	PTFE

No.	Parts name	Q'ty	Material	Remarks	
				LK-45, 47	LK-55, 57
20	Hex. head bolt	8	STNLS STL	M8 × 65	M8 × 65
21	Spring washer	8	STNLS STL	M8	M8
30	Diaphragm	1	PTFE+EPDM		
31	Retainer plate	1	SUS304		
54	Flange*	2	SUS316		
55	Setting flange*	2	SS400		
70	Connection port*	2	SUS316		
80	Stud bolt	8	STNLS STL	M8	M10
81	Hex. nut	8	STNLS STL	M8	M10
82	Spring washer	8	STNLS STL	M8	M10

Note: The parts asterisked (*) are supplied as the flange unit.

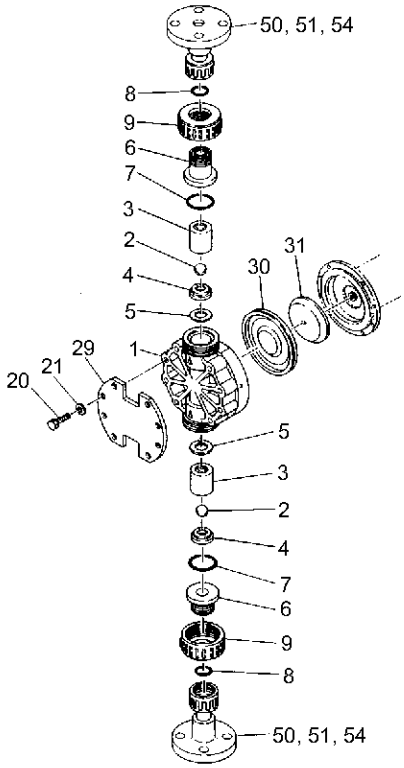
■ LK-1, 2, 3 TC



No.	Parts name	Q'ty	Material	Remarks
1	Pump head	1	PVDF	
2	Valve	2	Ceramic	
3	Valve guide	2	PVDF	
4	Valve seat	2	FKM	
5	Valve gasket	2	PTFE	
6	Adapter	2	PVDF	
7	O ring	2	FKM	S14 (S16 for LK-31, 32)
8	O ring	2	FKM	P20
20	Hex. socket head bolt (Hex. bolt for LK-31, 32)	6	STNLS STL	M4 × 35 (M5 × 30 for LK-21, 22 & M5 × 45 for LK-31, 32)
21	Spring washer	6	STNLS STL	M4 (M5 for LK-21, 22, 31, 32)
22	Plain washer	6	STNLS STL	M4 (M5 for LK-21, 22, 31, 32)
29	Reinforcing plate (Only for LK-31, 32)	1	SS400	
30	Diaphragm	1	PTFE/EPDM	
31	Retainer plate	1	SUS304	
50, 51, 54	Flange unit (Suction, discharge)	2		
(50)	Nut	(2)	PVDF	
(51)	Union	(2)	PVDF	
(54)	Flange	(2)	PVDF	

Note: (50), (51) & (54) are available as a flange unit.

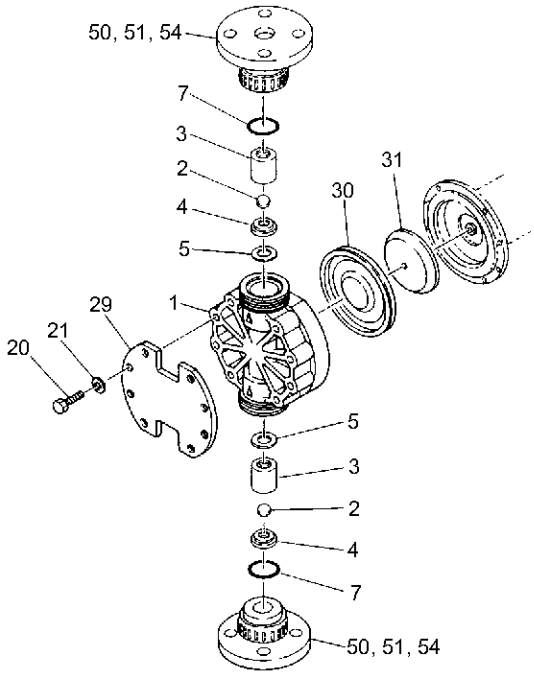
■ LK-4 TC



No.	Parts name	Q'ty	Material	Remarks
1	Pump head	1	PVDF	
2	Valve	2	Ceramic	
3	Valve guide	2	PVDF	
4	Valve seat	2	PVDF	
5	Valve gasket	2	PTFE	
6	Adapter	2	PVDF	
7	O ring	2	FKM	P32
8	O ring	2	FKM	P20
9	Nut	2	PVDF	
20	Hex. head bolt	8	STNLS STL	M8 × 60
21	Spring washer	8	STNLS STL	M8
29	Reinforcing plate	1	SS400	
30	Diaphragm	1	PTFE/EPDM	
31	Retainer plate	1	SUS304	
50, 51, 54	Flange unit (Suction, discharge)	2		
(50)	Nut	(2)	PVDF	
(51)	Union	(2)	PVDF	
(54)	Flange	(2)	PVDF	

Note: (50), (51) & (54) are available as a flange unit.

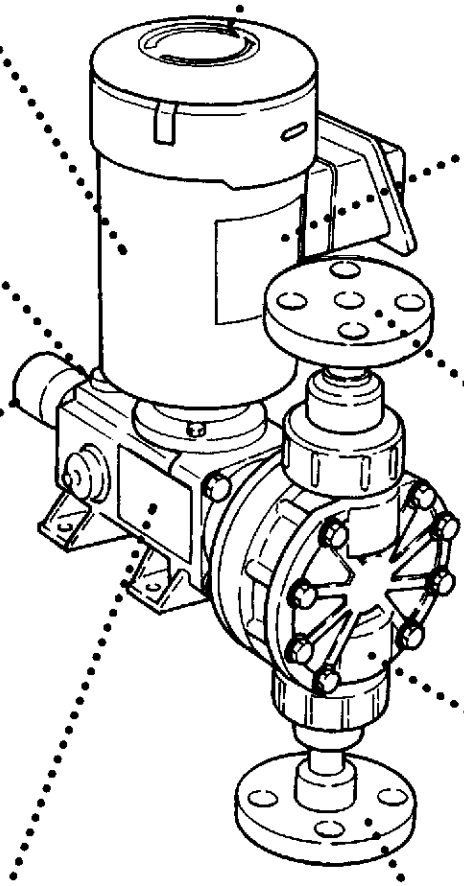
■ LK-5 TC



No.	Parts name	Q'ty	Material	Remarks
1	Pump head	1	PVDF	
2	Valve	2	Ceramic	
3	Valve guide	2	PVDF	
4	Valve seat	2	PVDF	
5	Valve gasket	2	PTFE	
7	O ring	2	FKM	P38
20	Hex. head bolt	8	STNLS STL	M8 × 60
21	Spring washer	8	STNLS STL	M8
29	Reinforcing plate	1	SS400	
30	Diaphragm	1	PTFE/EPDM	
31	Retainer plate	1	SUS304	
50, 51, 54	Flange unit (Suction, discharge)	2		
(50)	Nut	(2)	PVDF	
(51)	Union	(2)	PVDF	
(54)	Flange	(2)	PVDF	

Note: (50), (51) & (54) are available as a flange unit.

6. Description on Main Unit and Label



ROTATING DIRECTION, NO REVERSE ROTATION label
Rotale motor to direction show by arrow.

Motor

Reduction gear box

SCREWING TORQUE label
Tighten pump head mounting bolts at screwing torque shown on label.

Discharge port

STROKE LENGTH ADJUSTING DIRECTION indication label
The stroke length can be adjusted through a range of 100% to 0% by rotating the dial.

Pump unit (Liquid feeding section)

SPECIFICATION NAMEPLATE
Operate the pump by strictly observing the pump specifications indicated on this nameplate.

Suction port

⚠ **Caution**
Do not use any solvent when wiping the nameplate, labels, or the pump main unit.

INSTALLATION

1. Before Use

⚠ Caution

When pump is operated for the first time, check if liquid does not leak from flange connecting parts.

For flange connection and union connection types of LK-VH, VC VS TC models, the flange unit and union socket are put in the box separately from the pump body. When the pump is installed, mount the flange unit or union socket on the pump body according to the following procedure.

How to mount flange unit or union socket on the pump

(1) Remove caps from discharge and suction ports. (Only for LK-4 and LK-5)
When the caps are removed, valve comes out from suction port. Referring to Fig. 1, mount them on pump head in correct direction and order.

(2) Securely and correctly mount O ring.

⚠ Caution

When flange unit or union socket is mounted on pump body, pay attention so that O ring can not come off from groove. Especially pay attention to suction side O ring.

(3) Securely tighten flange unit or union socket to pump body with nut and fix them. Tighten nut by hand. For LK-1, 2 and 3, tighten nut holding the connecting adapter with wrench.

Fig. 1 LK-4 & 5

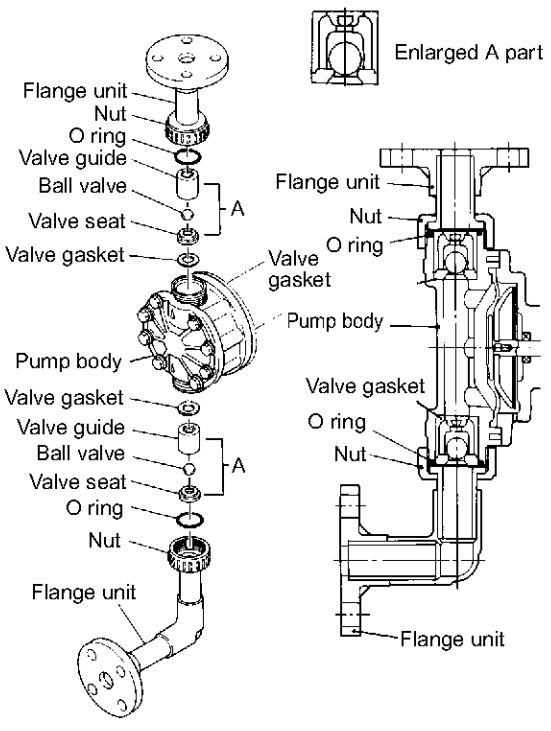
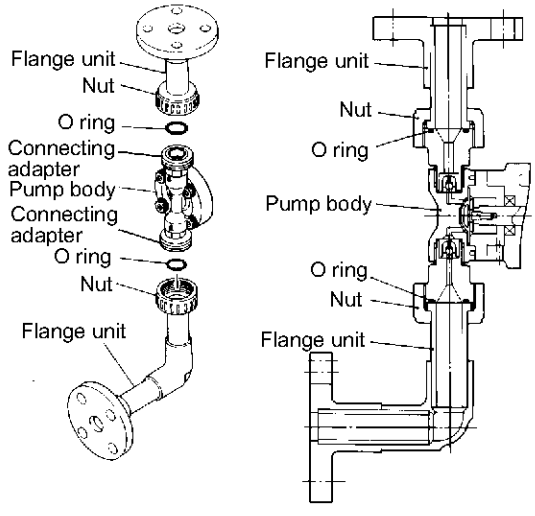


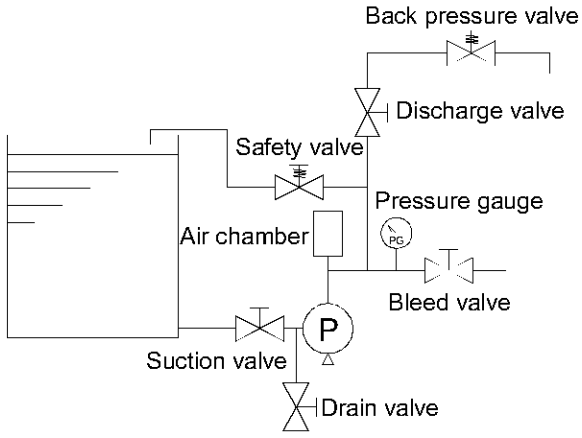
Fig. 2 LK-1, 2 & 3



Figures show flange connection type.

2. Installation, Piping, Wiring

Example of recommended piping



Arrange piping to satisfy suction and discharge conditions. Especially, pay special attention to piping system in case sedimentary slurry liquid is handled.

2.1 Installation

(1) Install the pump as close to suction tank as possible and below the lowest liquid level. Also discharge piping should be as short as possible.

(2) Keep enough space around pump for the future maintenance works. Also take care of the safety of motor and distribution panel in case of disaster such as flood etc.

(3) Install the pump at flat place free from vibration caused by nearby machine.

(4) Install the pump horizontally on foundation concrete or stand table which can support the pump. (Apply a level on flange surface to check the horizontal.

2.2 Piping

(1) Arrange piping as short as possible, as less bends as possible and make no place where air is trapped.

(2) Install pipe support so that the pipe load can not be applied to the pump. Especially special attention should be paid for PVC pump head.

(3) Do not make U shaped piping when sedimentary slurry liquid is transferred. Also, install a drain plug at the bottom of piping.

(4) When viscous, toxic or adhesive liquid is transferred, install cleaning purpose piping for maintenance and inspection.

(5) When high temperature or low temperature liquid is transferred, arrange piping so that the pump can not be influenced by the expansion or shrinkage of pipe.

(6) Select pipe considering chemical resistibility to pumped liquid and pressure applied to pipe.

(7) PVC pipe is used for suction piping of pump, pay attention for bonding agent not to flow into the pump.

(8) Before pipes are connected to pump, clean the inside and remove blind caps at suction and discharge ports of pump.

(9) Safety valve must be installed to protect pump and pipe. Install it in discharge piping near to pump.

2.2.1 Suction piping

(1) Employ flooded suction (Pump to be installed below liquid level). Diameter of suction pipe must be larger than suction port bore of pump.

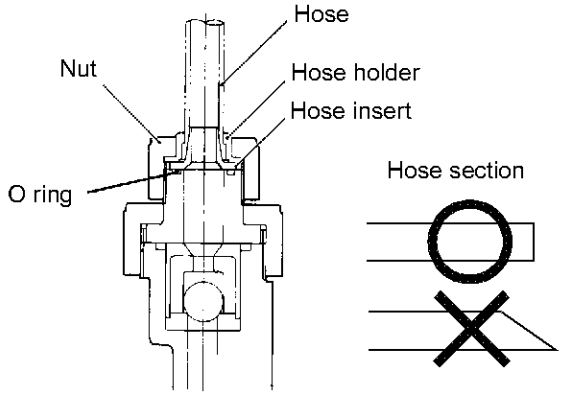
(2) Arrange suction piping so that air can not be sucked in through jointed parts. Air sucked in suction piping will cause instable or failed discharge.

2.2.2 Discharge piping

(1) Install a safety valve near to pump in discharge pipe. Install the discharge valve after the safety valve.

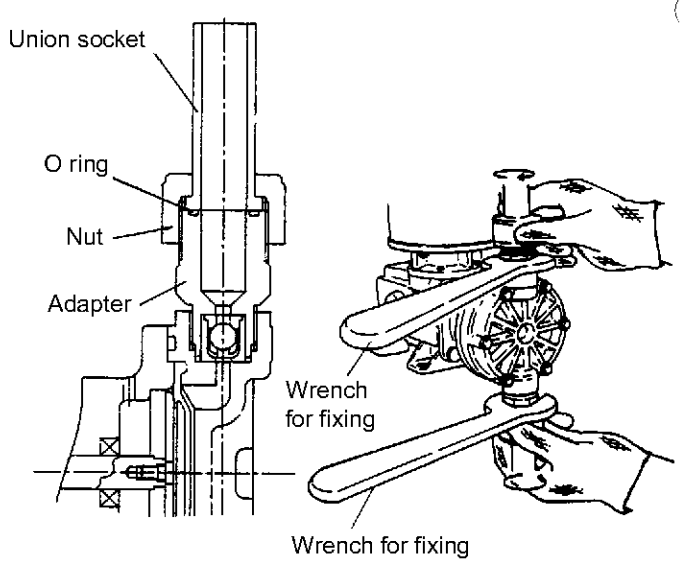
(2) Pressure resistance of discharge pipe must be larger than the set pressure of safety valve.

2.2.3 Mounting of suction/discharge hose (for hose & union connections)



Picture shows LK-4

(1) In case of hose connection (VHH, VCH types)
Insert hose into hose holder and tighten nut by hand. Refer to picture on left.
Pay attention not to tighten nut excessively because it is plastics made. (After tighten it by hand, re-tighten it by half turn with wrench.)



(2) In case of connection by union (VHU, VCU types)
Fix flange or socket available in market to the union socket by bonding agent. For LK-1, 2 and 3 models, when nut is tighten by hand, fix a connection adapter by wrench.

2.3 Wiring

Wiring works should be done by qualified person observing local laws and following points.

(1) Use electromagnetic relay which satisfies the specification of used motor. (Voltage, capacity etc.)

(2) In case pump is used outdoor, take measures so that rain and water can not get into switch.

(3) Do not mount electromagnet relay or push button switch on pump or its base.

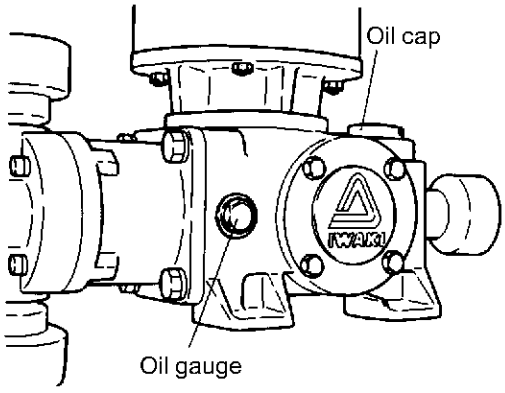
(4) Install ammeter to know the operating condition of pump.

(5) Motor rotation is clockwise seen from motor fan side. Reverse rotation may cause pump failure. Start motor in a moment to check direction of rotation.

PUMP OPERATION

1. Preparation for Operation

When the pump is operated initially after installation, confirm following items.



(1) Check if there is no damage on pump, no loosened bolts, no oil leakage.
(2) Check oil gauge if oil is filled to specified level.

2. Operation

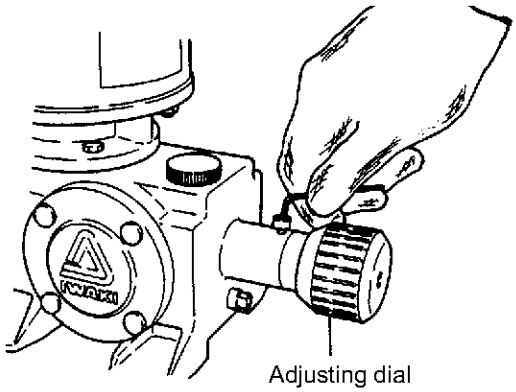
When the pump is operated for the first time after installation, follow steps below.

No.	Operation	Remarks
1	• Open valves in discharge and suction piping.	
2	• Switch on motor power to start pump.	• Confirm motor rotates clockwise seen from motor fan side.
3	• Set stroke length at 0%.	• Refer to item of stroke adjustment.
4	• Run pump for about 5 minutes with stroke length at 0% and confirm if there is no abnormality on pump.	• In cold weather, it may happen motor is overloaded for a while (Current exceeds rated value.). This is because of low temperature of oil in gear box. In this case, continue to operate pump at no load until oil temperature increases.
5	• Exclude air from pump chamber.	• Open bleed valve in discharge piping and flow liquid, or increase the stroke length a little by little with no pressure applied to discharge side.
6	• Set stroke length at 100% and run pump 30 to 60 minutes for running-in.	• Confirm motor current value is within rated one also confirm there is no abnormality on each part.
7	• If no abnormality is found at running in operation, gradually close bleed valve to transfer liquid to pipe line.	

No.	Operation	Remarks
8	• Check discharge capacity. • If no abnormality is found on pump, check discharge capacity at actual condition using measuring cylinder or so. • To set discharge capacity, make graph which shows relation between discharge capacity and stroke length at actual operating conditions.	• Measure discharge capacity. • Repeatedly measure discharge capacity. Pump is normal if no change of discharge capacity. • If you ask us pump test data, IWAKI submit it but this data is obtained by pumping clear water at ambient temperature but not by actual liquid and piping conditions.
9	• Periodically replenish air to air chamber. • Refer to instruction manual of air chamber for detail of air chamber.	• Liquid directly contacts air in air chamber and compressed air is dissolved little by little in liquid and air is decreased as time passes resulting in insufficient performance.

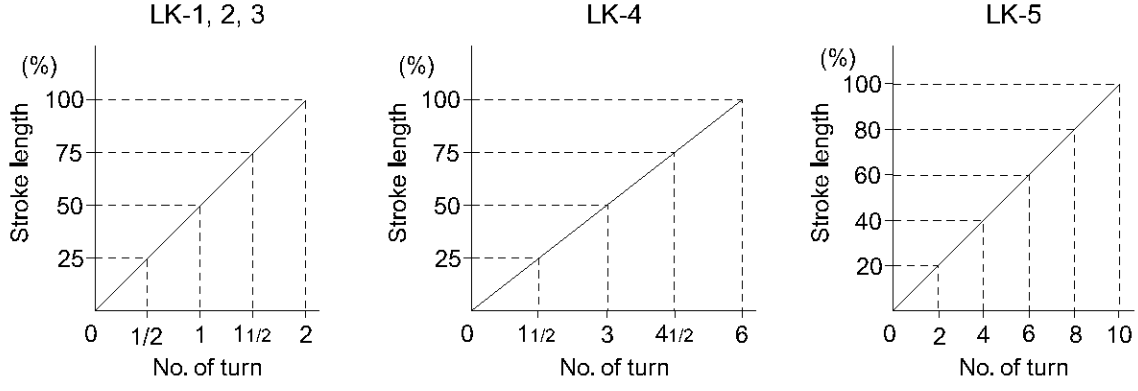
3. Adjustment of Stroke Length

Adjustment of stroke length is done by turning adjusting dial to change returning distance of pump shaft. Adjustment must be done during pump is running.



(1) Loosen hex. socket head bolt in adjusting dial.
(2) Decide required stroke length according to pump performance curve. Stroke length gauge is in percent.
(3) Adjust dial to required stroke length. Refer to figures below for number of turns corresponding to stroke length of 0 to 100%.
(4) After stroke length is adjusted, tighten hex. socket head bolt.

Number of turns of dial and stroke length



4. When pump is not used

(1) In a cold weather, whether or not pump rests for a long time or short time, open a drain valve in suction side and run pump with no load to exclude liquid in pump and pipe. (to avoid pump to be broken due to liquid frozen in pump) If the liquid can not be removed, warm pump and pipe with band heater or like so that liquid inside can not be frozen.

(2) When the pump is at rest for more than half a year, stop the pump at the bottom dead point to avoid the deformation of diaphragm. To stop the pump at bottom dead point, adjust the stroke length at 100%, rotate the motor fan by hand (remove fan cover) and stop the rotation when you feel it becomes light to turn. (Confirm that you can turn the fan lightly within the stroke length range of 90 to 100% by turning the dial to 0% direction.)

(3) When you start the pump again within a week rest, it can start at any stroke length and at any discharge pressure.

(4) When you starts the pump again after more than one week rest, start it at stroke length of 0% and at no discharge load to operate it for several minutes to get into full operation after enough lubrication starts to be done in gear box. Do not get into full operation immediately. When the pump rested two or three months, it may be possible the required discharge capacity can not be got even when it comes to full operation. This is because of temporal deformation of diaphragm. In this case operated the pump at 100% stroke length for several hours and you can get required discharge capacity.

MAINTENANCE

1. Troubleshooting

Trouble \ Cause	Failed motor	Short circuit or wrong connection	Melted fuse	Decreased voltage	Lack of NPSH (Cavitation)	Worn valve seat	Valve clogged by foreign matters	Clogged suction pipe, strainer	Displaced stroke length gauge	Over feeding due to shortage of min. diff. press.	Changed pump stroke speed	Over load (Excessive disch. press.)	Incorrect power source	Air sucked in from suction pipe	Changed pumped liquid	Failed pressure gauge	Foreign matters are clogged at inlet of press. gauge.	Leakage from safety valve	Broken diaphragm	Damaged valve gasket, O ring	Damaged oil seal, O ring	Unsuitable lubrication oil	Air is not vented well from pump chamber.	Wrongly assembled valve ass'y
Motor does not run.	○	○	○	○								○	○											
Shortage of discharge capacity					○	○	○	○	○		○	○		○	○	○	○	○	○	○			○	○
Too much discharge capacity									○	○					○									
Unstable discharge capacity					○	○	○	○		○	○			○	○			○			○			○
Excessive motor current	○	○		○			○	○				○	○		○							○		
Liquid is not discharged.					○	○	○	○						○	○			○	○				○	○
Discharge pressure does not increase.					○	○	○	○						○	○	○		○	○				○	○
Liquid leaks.								○					○		○				○	○	○		○	○
Excessive vibration and noise	○				○	○	○	○					○										○	○
Oil leaks.																					○			
Liquid is not sucked in.					○	○	○	○						○					○	○	○		○	○
Too hot reduction gear temp.												○										○		

Countermeasure
Replace.
Re-wire or replace.
Check cause.
Check cause.
Check suction condition.
Replace.
Disassemble and clean.
Disassemble and clean.
Measure stroke length and adjust gauge.
Apply min. required diff. press.
Check power source, motor, reduction gear.
Check discharge piping and improve.
Check.
Check piping and improve.
Check pump specifications.
Replace.
Re-adjust set pressure of safety valve.
Clean.
Replace.
Replace.
Replace.
Check volume, kind and dirt of oil.
Take air out of pump chamber.
Reassemble

2. Maintenance and Inspection

⚠ Warning

- **Switch off power**
  You may be electrically shocked if you do the work with motor power switched on. Switch off power to stop pump and system when works are done.

- **Wear protector**
  When you do disassembling, assembling and maintenance works, wear protectors such as glasses, cap, mask etc.

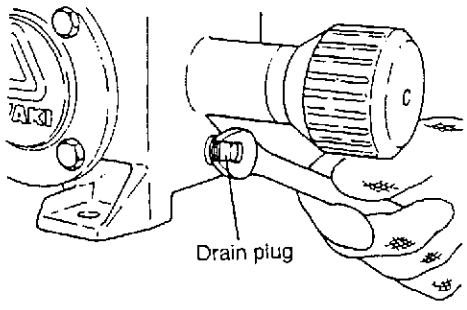
- **Attention to rotating parts**
  You may be seriously injured if your fingers, hair or cloths are caught in rotating part such as coupling etc. Pay attention for them not to be caught.

2.1 Daily inspection

[1] Check whether the pump operates smoothly, without generating any abnormal noise or vibration.
[2] Check to be sure the discharge pressure, discharge flow rate, and motor power supply voltage do not fluctuate during pump operation. If considerable fluctuation of the respective values occurs, refer to "1. Troubleshooting" for correct measures.
[3] Check for no leakage.
[4] Check the drive unit for oil loss and leakage.
[5] If a spare pump is available, activate it from time to time to keep it ready for use any time.

2.2 Periodic inspection

[1] Valve Unit
Check the valve balls, valve seats and valve guides every 6 months. If flaws or worn parts are found, replace them.
[2] Diaphragm
Check the diaphragm every 6 months.
[3] Oil
Check oil once every six month or more.
Time to be replaced ..... Replace oil first time in 500 hours operation after start. After that replace every 2,000 to 3,000 hours operation.
Volume of oil to be replaced ..... 220 mL (500 mL for 2LK)
Suction and discharge valve units and diaphragm are consumable parts. Refer to item below "Consumable parts".



Oil replacement procedure ..... Remove drain plug to drain oil. Clean inside of gear box with flashing oil. After flashing, fill new oil till specified level on oil gauge.

Recommended Oil
Esso (EXXON) GP80W-90, Shell SPIRAX/EP80. Mobil PEGASUS GEAR OIL 80.

Automobile gear oil SAE-80, API: GL-4grade.

3. Cousumable Parts

If pump is operated continuously for a long time, it is recommended that following consumable parts are always kept by you.

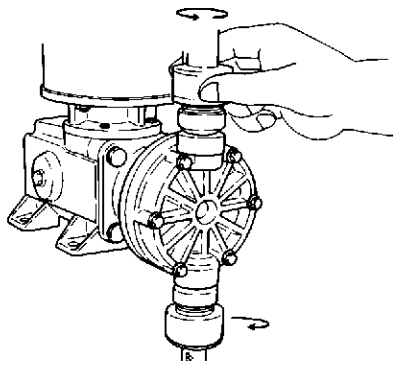
Parts	Q'ty per pump head	Time to be replaced
Valve	2	One year
Valve guide		
Valve seat		
O ring (VH, VC, VS, TC)	4	
Valve gasket (S6)	6	
Diaphragm	1	4,000 hours

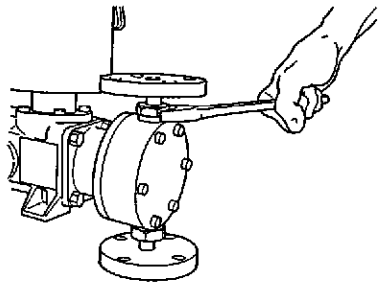
Note: Time to be replaced is reference but not guaranteed one. It may depend on pumped liquid and used conditions.

4. Disassembly and Assembly

For disassembling, assembling and adjustment, refer to pictures on "Names of Parts" on pages 10 to 20. Pay attention to heavy parts. Clean pump chamber before disassembling.

4.1 Disassembly and assembly of valve





● Disassembly

(1) Remove pipes on suction and discharge sides.

(2) Remove suction and discharge flange units and take out valves. If scratch or wear are found on suction and discharge valves or valve seat etc., replace them by new ones. When pump is disassembled, pay attention to the liquid which goes out from pump chamber or valve.

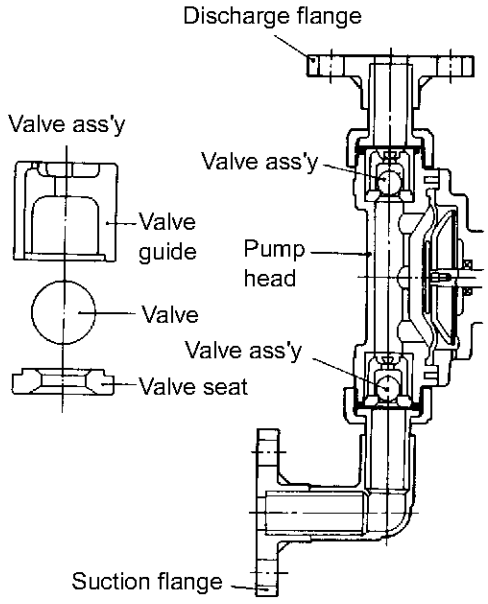
● Assembly

(1) Assemble valves referring to the pictures on "Names of Parts" and pictures shown below.

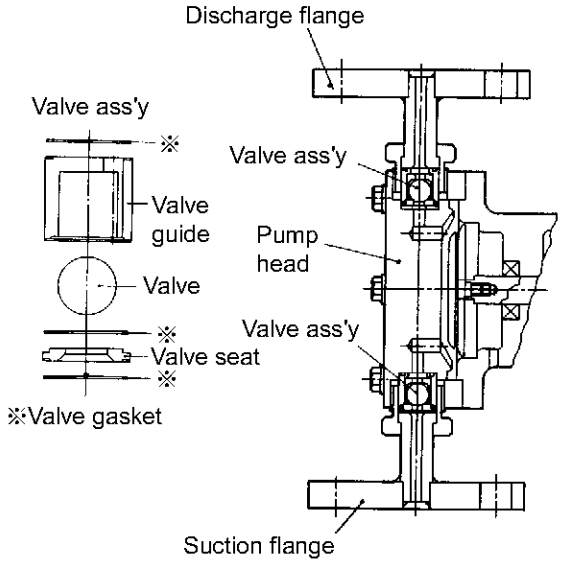
> ⚠ **Danger**
>
> Pay attention to the position and direction of valve guide (3), valve (2), valve seat (4). Wrong assembly of valve unit causes reverse flow of liquid or too high pressure in pump housing resulting in burnt motor or broken pump head and splash of liquid.

(2) Mount connection joints of suction and discharge ports and securely tighten valve ass'y.
(3) Mount suction and discharge pipes to pump suction and discharge ports.

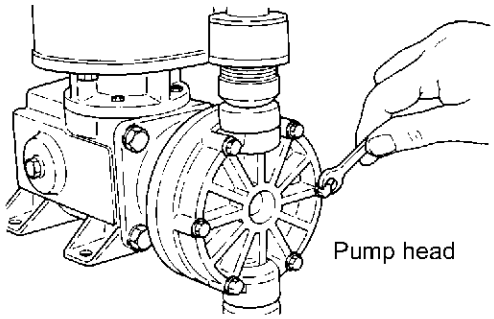
LK-VH, VC, VS, TC types



LK-S6 type

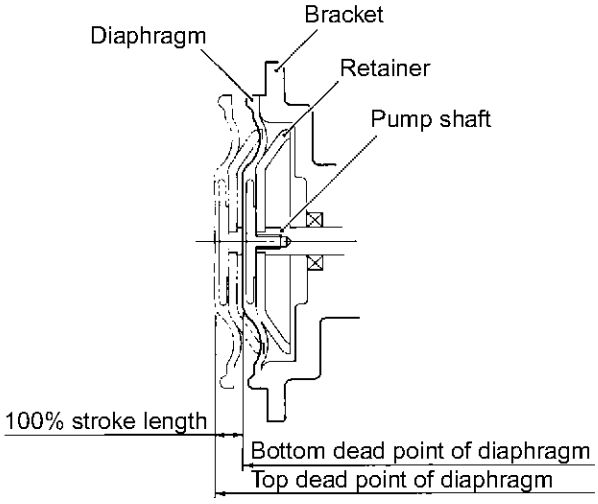


4.2 Disassembly and assembly of diaphragm



● Disassembly

(1) Remove pipes on discharge and suction sides.
(2) Remove pump head fixing bolts with wrench.
(3) Take diaphragm and turn it to counter-clockwise to remove diaphragm from pump shaft. Diaphragm can be easily removed if diaphragm is stopped at the top dead point by switching on and off motor power. If wear or damage is seen on diaphragm, replace it by new one.



● Assembly

(1) Move pump shaft to the top dead point by switching on and off motor power.

(2) Turn diaphragm to clockwise and mount it to pump shaft. In this case, check that a retainer securely fits to insert bolt of diaphragm and touches shaft end.

(3) Before mounting pump head, move diaphragm position to the bottom dead end at 100% stroke length. To do so, adjust the dial gauge to 100% and switch on and off motor power to move to bottom dead point.

(4) When pump head is mounted, tighten bolts referring to screwing torque shown below.
For LK-4 and 5, tighten bolts till you see no gap between pump head and bracket.
Tighten bolts evenly and diagonally.

(5) In the reverse manner to disassembling, mount connection joints to discharge and suction ports and mount pipes on discharge and suction sides.

Pump head tightening torque

Unit: N·m

	LK-1	LK-2	LK-3	LK-4	LK-5
VH, VC VS, TC	2.2	2.9	2.9	11.8	11.8
S6	2.2	2.9	4.9	11.8	11.8

IWAKI PUMPS

( )Country codes

IWAKI CO.,LTD. 6-6 Kanda-Sudacho 2-chome Chiyoda-ku Tokyo 101-8558 Japan
TEL:(81)3 3254 2935 FAX:3 3252 8892(http://www.iwaki-pumps.co.jp/)

Singapore	: IWAKI Singapore Pte. Ltd.	TEL : (65)763 2744	FAX : 763 2372	Germany	: IWAKI EUROPE GmbH	TEL : (49)2154 9254 0	FAX : 2154 1028
Indonesia	: IWAKI Singapore (Indonesia Branch)	TEL : (62)21 392 8288	FAX : 21 392 8088	Italy	: IWAKI Italia S.R.L.	TEL : (39)02 990 3931	FAX : 02 990 42888
Malaysia	: IWAKIm Sdn. Bhd.	TEL : (60)3 7803 8807	FAX : 3 7803 4800	Denmark	: IWAKI Pumper A/S	TEL : (45)48 24 2345	FAX : 48 24 2346
Taiwan	: IWAKI Pumps Taiwan Co., Ltd.	TEL : (886)2 8227 6900	FAX : 2 8227 6818	Sweden	: IWAKI Sverige AB	TEL : (46)8 511 72900	FAX : 8 511 72922
Thailand	: IWAKI (Thailand) Co.,Ltd.	TEL : (66)2 320 1303	FAX : 2 322 2477	Finland	: IWAKI Suomi Oy	TEL : (358)9 2742714	FAX : 9 2742715
Hong Kong	: IWAKI Pumps Co., Ltd.	TEL : (852)2 607 1168	FAX : 2 607 1000	Norway	: IWAKI Norge AS	TEL : (47)66 81 16 60	FAX : 66 81 16 61
China	: IWAKI Pumps Co., Ltd. (Guangzhou office)	TEL : (86)20 8130 0605	FAX : 20 8130 0601	France	: IWAKI France S.A.	TEL : (33)1 69 63 33 70	FAX : 1 64 49 92 73
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China	: IWAKI Pumps (Shanghai) Co., Ltd.	TEL : (86)21 6272 7502	FAX : 21 6272 6929	Switzerland	: IWAKI (Schweiz) AG	TEL : (41)32 3235024	FAX : 32 3226064
Philippines	: IWAKI Chemical Pumps Philippines, Inc.	TEL : (63)2 888 0245	FAX : 2 843 3096	Austria	: IWAKI (Austria) GmbH	TEL : (43)2236 33469	FAX : 2236 33469
Korea	: IWAKI Korea Co.,Ltd.	TEL : (82)2 3474 0523	FAX : 2 3474 0221	Holland	: IWAKI Holland B.V.	TEL : (31)297 241121	FAX : 297 273902
U.S.A.	: IWAKI WALCHEM Corporation	TEL : (1)508 429 1440	FAX : 508 429 1386	Spain	: IWAKI Iberica Pumps, S.A.	TEL : (34)943 630030	FAX : 943 626799
Australia	: IWAKI Pumps Australia Pty. Ltd.	TEL : (61)2 9899 2411	FAX : 2 9899 2421	Belgium	: IWAKI Belgium n.v.	TEL : (32)1430 7007	FAX : 1430 7008

T334 01/11

IWAKI PUMPS

IWAKI Metering Pump

LK-A, B, C Models

Instruction Manual

⚠ Read this manual before use of product

Thank you for selecting IWAKI's diaphragm pump LK. This pump is a diaphragm type metering pump of which the stroke length is adjustable due to spring back mechanism. Please read this manual carefully and thoroughly to use pump correctly and safely.

Contents

IMPORTANT INSTRUCTIONS

Important notes and statements for safe operation, preventing physical injury, and property damage, are included on the body of the product and in the attached instruction manual.

Always Observe These Safety Instructions!

Safety Instruction to Prevent Personal Injuries

In this manual, the following symbols and signs are used to clearly indicate safety instructions.

⚠ **Warning**	**Nonobservance or misapplication of the contents of the "Warning" section could lead to a serious accident, including death or injury.**
⚠ **Caution**	**Nonobservance or misapplication of the contents of the "Caution" section could lead to serious physical injury to the user or serious damage to the product.**

Types of Symbols

⚠ Indicates that "Warning" or "Caution" must be exercised. Inside this triangle, a concrete and practical image provided as a warning or caution message is depicted.

⃠ Indicates a prohibited action or procedure. Inside or near this circle, a concrete and practical image of the activity to be avoided is depicted.

❗ Indicates an important action or procedure which must be performed or carried out without fail. Failure to follow the instructions herein can lead to malfunction or damage to the pump.

Safety Instruction

⚠ Warning

- **Turn off power supply**
  Turn off poser supply prior before maintenance or other works are done. Pay special attention so that no other person turns on by mistake the power supply while the works are done.


Power off

- **Wear protectors**
  When disassembling, assembling, and conducting maintenance or when handling a dangerous type of liquid or a liquid of unknown property, be sure to wear safety gloves, helmet and protective shoes etc.


Wear protective gear

- **To prevent death or injury from falling pump**
  Make sure the rope or chain used for lifting the pump is not accidentally cut or disconnected during installation. Make sure the rope or the chain used to lift the pump has sufficient strength in relation to the pump load. Also, be sure not to stand underneath a lifted or suspended pump.


Prohibited

- **Qualified operator only**
  Pump must be handled or operated by the person who has enough knowledge and acquainted with handling the pump.


Caution

- **No remodeling**
  Remodeling the pump results in personal injury or damage of pump. Never remodel the pump.


Do not disassemble

- **For specified application only**
  Do not use the pump for any other application and specification than specified ones. The use of pump for other application or specification may cause accident or failure.


Prohibited

- **Do not step on pump**
  If you step on the pump as a stand, you may be injured by falling down or so.


Prohibited

- **Attention to reciprocating parts**
  Do not insert finger or so into hole at the bottom of pump bracket. Diaphragm or so make reciprocating movement in the bracket and you will be injured if you touch them.


Caution

- **Do not close valve**
  If pump is operated with discharge side valve closed, pump or pipe may be burst. Do not operate pump with discharge valve closed.


Prohibited

- **Pump starting**
  Pump has no on/off switch. Pump starts to run when power cord is connected to power supply.


Caution

Safety Instruction

⚠ Caution

- **Ventilate**
  If toxic or odorous liquids are handled, you may be poisoned by them. Ventilate the site.

- **No fire**
  Check the leakage of lubrication oil and repair the pump if leakage is found. Observe the local law for the stocking of lubrication oil.

- **Attention to hot pump or pipe**
  When high temperature liquid is transferred or when pump is operated continuously, pump body, pipe or motor are hot. Do not touch them by bare hand.

- **Broken pump**
  Broken pump may cause electrical leakage and electrical shock. Do not use broken pump.

- **Take ground**
  Connect ground wire. Otherwise you may be electrically shocked.

- **Specified power source only**
  If the other power than specified one is supplied to pump/motor, it may cause pump failure, fire or electrical shock. Never supply pump with other power source than specified one.

- **Use earth leakage breaker**
  Install earth leakage breaker. Otherwise you may be electrically shocked.

- **Prohibited place to be installed**
  Do not install or store pump at following places.
  • Inflammable place, explosive atmosphere, powdery place
  • place where corrosive gas (chlorine gas etc.) is generated
  • place ambient temperature exceeds 40 deg. C or below zero.
  • place dusty, humid or exposed to rain (except weather-proof type)

- **Do not cover pump with cloth or like**
  If pump is covered by cloth or so, heat can not released resulting in fire or failure. Keep enough aeration.

- **Do not freeze pump**
  When ambient temperature becomes below freezing point, pump body may be broken by freezing if liquid stays inside pump. Discharge liquid in pump and piping.

Safety Instruction

⚠ Caution

- **Do not close suction and discharge valves during operation**
  If pump is operated with discharge valve closed, pressure increases abnormally which may cause breakdown of pump/motor.

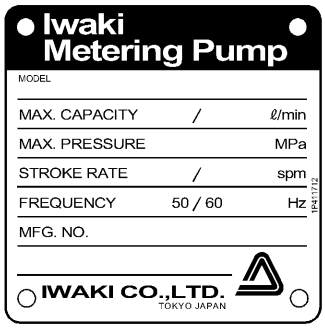
- **Countermeasures for liquid flow out**
  Take appropriate countermeasures for the liquid flowing out because of the broken pump or pipe.

- **Foreign matters in pump**
  If foreign matters get into the pump, switch off power and remove them. If pump continues to run with foreign matters getting in, pump may be broken or failed.

- **Disposal of used pump**
  Observe your local law for disposal of used pump.

OUTLINE OF PRODUCT

1. Unpacking and Inspection



After unpacking, check the following points to confirm that the delivered product is exactly what you ordered.

(1) Do the model, capacity, pressure, stroke rate and frequency indicated on the nameplate conform to your order?
(2) Has the pump unit or any part of it been damaged or bolts and nuts been loosened during delivery?

2. Model Identification

2 LK – A 65 VC – 04 E S
(1) (2) (3) (4) (5) (6) (7) (8)

(1) Number of pump head
No symbol : Simplex
2 : Duplex

(2) Series name
LK : LK series mechanical diaphragm pump

(3) Drive unit
A : A type (0.4kW)
B : B type (0.75kW)
C : C type (1.5kW)

(4) Diaphragm size & gear ratio
First figure : Diaphragm (pump head) size
Second figure : Reduction gear ratio
5 : 1/30
6 : 1/20
7 : 1/15

(5) Material symbol

	Polyvinyl chloride				Fluoro plastic	Stainless steel	
	For acid	For alkali		Viscous, slurry	Strong acid	Solvent	
Material symbol	VC	VH	VS4	VS	TC	S6	S4
Diaphragm size	For all	5	6 to 8	For all	5 & 6	5	6 to 8
Pump head	PVC	PVC	PVC	PVC	PVDF	SUS316	SCS13
Valve	CE	HC	SUS304	HC/SUS304 (Note)	High purity CE	HC	SUS304
Valve seat	PVC	PVC	PVC	SUS304	PVDF	SUS316	SUS304
O ring	FKM	EPDM	EPDM	EPDM	FKM	–	–
Valve gasket	PTFE						
Diaphragm	PTFE + EPDM (EPDM is not wet-end)						
Typical liquids handled	Sulfuric acid, Hydro chloric acid, Hypo	Caustic soda, Coagulant, Lime slurry (low conc.)		Lime slurry, Highmolecular coagulant	Conc. sulfuric acid, Hydro-fluoric acid, Mixed acid	Organic solvent, Chemicals for paper mill	

Note : Valve material of VS type is HC for diaphragm size type 5 and SUS304 for 6 to 8 types.

Material symbols : PVDF … Polyvinylidene fluoride, SCS13… Cast stainless steel equivalent to SUS304, CE … Ceramic, FKM … Fluoro rubber, EPDM … Ethylene propylene rubber, HC … Hastelloy C276

(6) Motor output

04 : 0.4kW or 0.37kW, 07 : 0.75kW, 15 : 1.5kW

(7) Electric servo

No symbol : Manual (without servo unit)

E : with electric servo unit

(8) Special configuration

F : Inverter motor

S : Special version

3. Specifications

Model	Flow rate L/min		Max. disch. press. MPa		Stroke speed spm		Eff. diaphragm dia.	Max. stroke length	Conn. flange (JIS10K)	Motor output	Mass kg (with motor)	
	50Hz	60Hz	PVC	SUS	50Hz	60Hz	mm	mm		kW	PVC	SUS
A55	2.8	3.3	1.0		48	58	110	10	25A	0.4 or 0.37	Approx. 65	Approx. 80
A57	6.0	7.2	0.7		96	116						
A65	9.0	10.8	0.3		48	58	138	17.5	40A		Approx. 70	Approx. 73
B65	9.0	10.8	0.5	0.7	48	58	138	17.5		0.75	Approx. 100	Approx. 100
B75	13.3	16.0	0.5				150	20	50A		Approx. 105	Approx. 105
C76	20	24	0.5		72	86	150			1.5	Approx. 120	Approx. 20
C86	33	40	0.3				205		65A		Approx. 140	Approx. 155
C87	45	54	0.3		96	116						

Note 1. Flow rate shown above is at max. discharge pressure when pumping clear water at ambient temperature. When the discharge pressure is low, the flow rate may be larger than the figures shown above.

2. Mass is complete with TEFC indoor use motor.
   Painting color : A39-60D. Maker standard painting for motor.

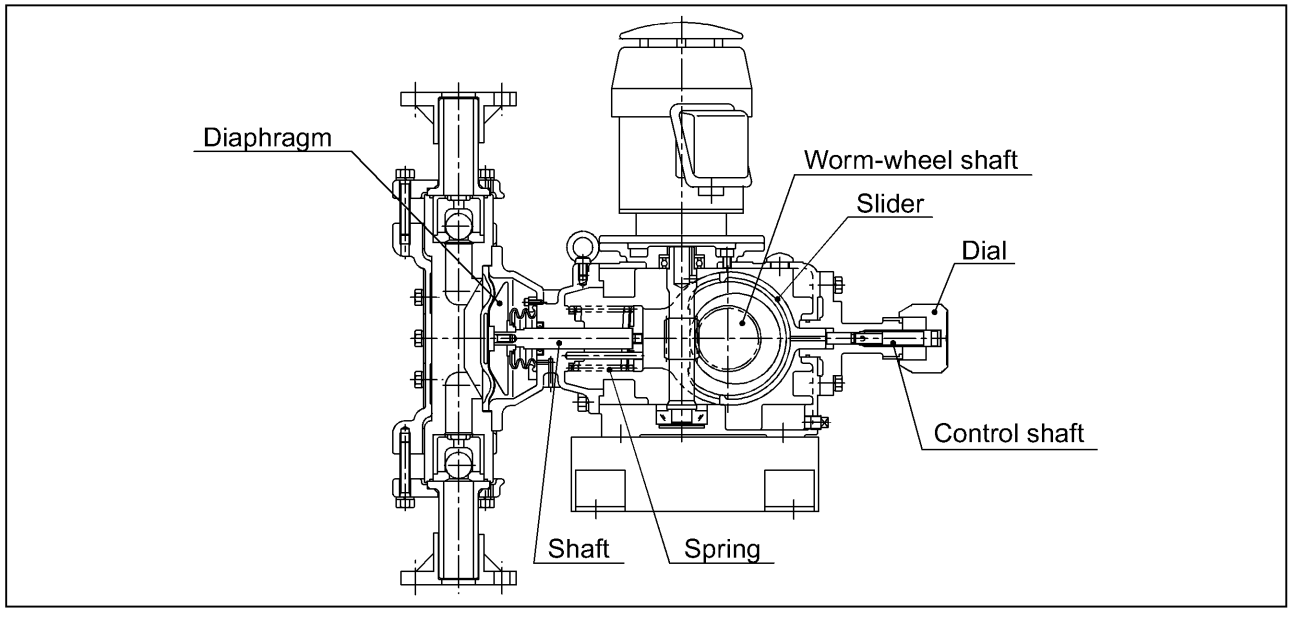
4. Operating Principle and Stroke Length Adjustment

Operating principle

Motor rotation speed is reduced by worm and wheel and its rotating movement is changed to reciprocating movement by means of spring back mechanism (worm wheel shaft, slider, eccentric cam, spring etc.). The reciprocating movement is transferred to diaphragm which is connected to a shaft to change the volume in pump chamber. Pumping operation is done by the volumetric change in pump chamber and by the function of valves located in pump head.

Stroke length adjusting mechanism

Stroke length is adjusted by rotating a dial which is fixed to control shaft to change the length for the slider to come back.



INSTALLATION

5. Installation, Piping and Wiring

5.1 Installation place

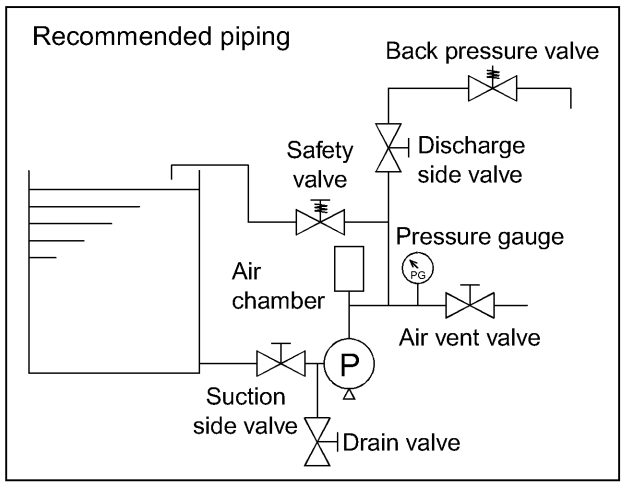
(1) Install the pump as close to suction tank as possible and below the lowest liquid level. Also discharge piping should be as short as possible.

(2) Keep enough space around pump for the future maintenance works. Also take care of the safety of motor and distribution panel in case of disaster such as flood etc.

(3) Install the pump at flat place free from vibration caused by nearby machine.

(4) Install the pump horizontally on foundation concrete or stand table which can support the pump. (Apply a level on flange surface to check the horizontal.

5.2 Piping



(1) Arrange piping as short as possible, as less bends as possible and make no place where air is trapped.

(2) Install pipe support so that the pipe load can not be applied to the pump. Especially special attention should be paid for PVC pump head.

(3) Do not make U shaped piping when sedimentary slurry liquid is transferred. Also, install a drain plug at the bottom of piping.

(4) When viscous, toxic or adhesive liquid is transferred, install cleaning purpose piping for maintenance and inspection.

(5) When high temperature or low temperature liquid is transferred, arrange piping so that the pump can not be influenced by the expansion or shrinkage of pipe.

(6) Select pipe considering chemical resistibility to pumped liquid and pressure applied to pipe.

(7) PVC pipe is used for suction piping of pump, pay attention for bonding agent not to flow into the pump.

(8) Before pipes are connected to pump, clean the inside and remove blind caps at suction and discharge ports of pump.

⚠ Caution

Safety valve must be installed to protect pump and pipe. Install it in discharge piping near to pump.

5.3 Suction piping

(1) Employ flooded suction (Pump to be installed below liquid level). Diameter of suction pipe must be larger than suction port bore of pump.

(2) Arrange suction piping so that air can not be sucked in through jointed parts. Air sucked in suction piping will cause instable or failed discharge.

5.4 Discharge piping

(1) Install a safety valve near to pump in discharge pipe. Install the discharge valve after the safety valve.

(2) Pressure resistance of discharge pipe must be larger than the set pressure of safety valve.

5.5 Wiring

Wiring works should be done by qualified person observing local laws and following points.

(1) Use electromagnetic relay which satisfies the specification of used motor. (Voltage, capacity etc.)

(2) In case pump is used outdoor, take measures so that rain and water can not get into switch.

(3) Do not mount electromagnet relay or push button switch on pump or its base.

(4) Install ammeter to know the operating condition of pump.

⚠ Caution

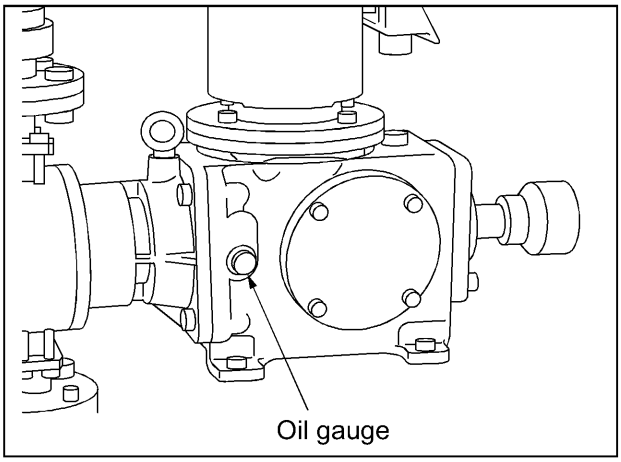
Motor rotation is clockwise seen from motor fan side. Start motor in a moment to check direction of rotation.

OPERATION

6. Operation

6.1 Preparation for operation

When the pump is operated initially after installation, confirm following items.



(1) Check if there is no damage on pump, no loosened bolts, no oil leakage.
(2) Check oil gauge if oil is filled to specified level.

6.2 Preparation

When the pump is operated for the first time after installation, follow steps below.

⚠ Caution
Fully open valves in discharge and suction piping to start operation.

No.	Operation	Remarks
1	• Check piping from tank to pump and from pump to discharge end.	
2	• Switch on motor power to start pump.	• Confirm motor rotates clockwise seen from motor fan side.
3	• Set stroke length at 0 %.	• Refer to item of stroke adjustment.
4	• Run pump for about 5 minutes with stroke length at 0 % and confirm if there is no abnormality on pump.	• In cold weather, it may happen motor is overloaded for a while (Current exceeds rated value.). This is because of low temperature of oil in gear box. In this case, continue to operate pump at no load until oil temperature increases.
5	• Exclude air from pump chamber.	• Open bleed valve in discharge piping and flow liquid, or increase the stroke length a little by little with no pressure applied to discharge side.
6	• Set stroke length at 100% and run pump 30 to 60 minutes for running-in.	• Confirm motor current value is within rated one also confirm there is no abnormality on each part.
7	• If no abnormality is found at running-in operation, gradually close bleed valve to transfer liquid to pipe line. Check if electric current of motor is within rated one and no abnormality in each part.	

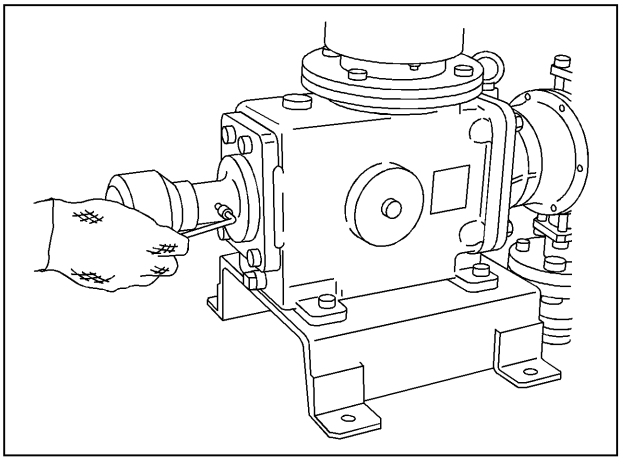
6.3 Stroke length adjustment

Stroke length is adjusted by turning adjusting dial.

⚠ Caution
Adjustment of stroke length should be done while pump is running.

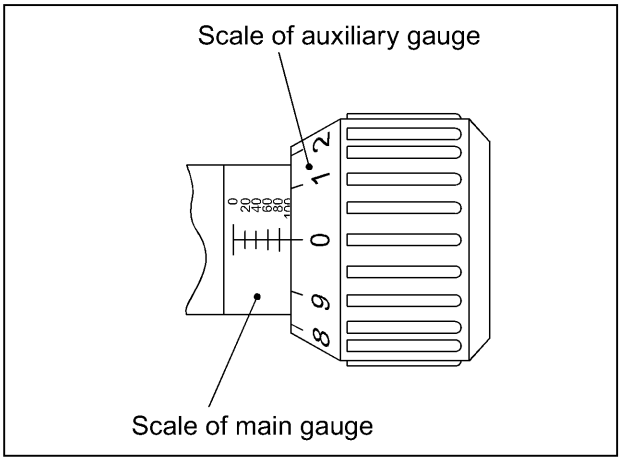
(1) Fix required stroke length according to pump standard performance curve. The stroke length on the dial is shown by percent (%).

(2) Loosen a hex. socket head bolt on the dial.



(3) Adjust the dial to required stroke length. Scale of main gauge plus that of auxiliary gauge makes stroke length.

(4) Tighten the hex. socket head bolt after the stroke length is adjusted.



6.4 Check of discharge capacity

If no abnormality is found, check the discharge capacity at the actual operating condition.

(1) In case the discharge capacity was changed by changing the stroke length, the stroke capacity should be measured one minute after the change of stroke length.

(2) Measure the capacity repeatedly and if you find no change in each measured capacity, then the pump is normal.

(3) To set the discharge capacity, make the graph of the relation between the capacity and stroke length in the actual operating condition.

* The pump test record which was submitted to you by request on order is based on pumping clear water at ambient temperature but not the record employing your actual piping and liquid.

6.5 When pump is stopped and re-started

(1) In cold weather time, when pump is stopped, remove the liquid in pipe and pump chamber by opening suction side valve and running pump without load regardless of long time or short time stop (to avoid the break down of pump due to frozen liquid).
If the liquid inside can not be removed because of temporally stop or so, heat the pipe or pump by band heater or like so that the liquid inside can not be frozen.

(2) When the pump is started after it is stopped long time (one week or more), adjust the stroke length to zero to operate the pump a few minutes with no load added condition and then go into normal operation after the drive unit is sufficiently lubricated. Do not go into full operation just after pump is started.

(3) When the pump is started after it is stopped short time (a week or less), the pump can be started at required stroke length and discharge pressure.

6.6 Precautions on operation

(1) Be sure to open both the valves at discharge and suction sides when pump is started.

(2) Compressed air melts into liquid because liquid and air contact each other in the air chamber. So, the volume of air decreases as time passes and the air chamber can not show its ability. Replenish air periodically. Refer to operating manual for details of air chamber.

MAINTENANCE

7. Maintenance and Inspection

7.1 Daily inspection

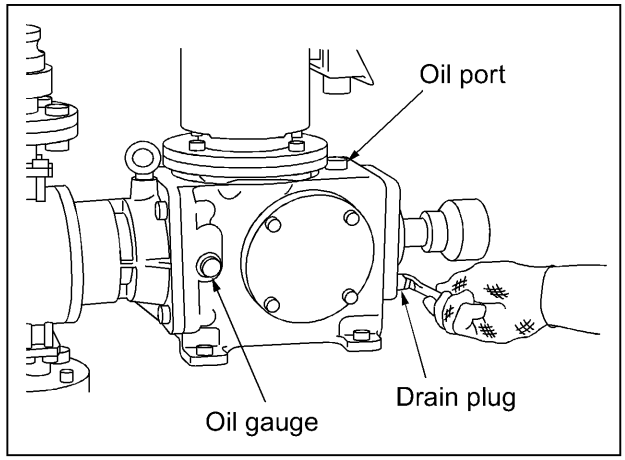
(1) Check if pump runs smoothly.
(2) Check if discharge capacity and discharge pressure do not change.
(3) Check if no liquid leaks from wet end.
(4) Check if oil in driving unit is enough and it does not leaks nor dirty.
(5) Check if electric current is normal.
(6) If stand-by pump is prepared, operate it sometimes so that it can be used whenever necessary.

7.2 Periodic inspection

(1) Inspection of discharge and suction valves
Inspect discharge and suction valves once a half year and replace it if any scratch or wear is found. When slurry or viscous liquid is pumped, inspect them at any time.
(2) Inspection of diaphragm
Inspect the diaphragm once every six months. Diaphragm is consuming parts and its life depends on the liquid to be handled and pressure.

7.3 Replacement of oil in driving unit

(1) Time to be replaced
Replace oil in driving unit once a year. However, when oil is emulsified, replace it at once.
(2) Volume of oil to be replaced
A type driving unit : 1.6 Litters
B type driving unit : 2.8 Litters
C type driving unit : 3.4 Litters
(3) Procedure to replace
Remove a drain plug to drain oil inside. Clean inside of driving unit with new oil and drain it and then replenish new oil till specified level of oil gauge.



(4) Suitable oil
Use the following oil. The oil mentioned below can be used throughout the year.
Shell… Shell Omara Oil 220
Esso … Spaltan EP220
Mobil … Mobil Gear 630 (used oil for this pump)
Caltex … MEROPA 220

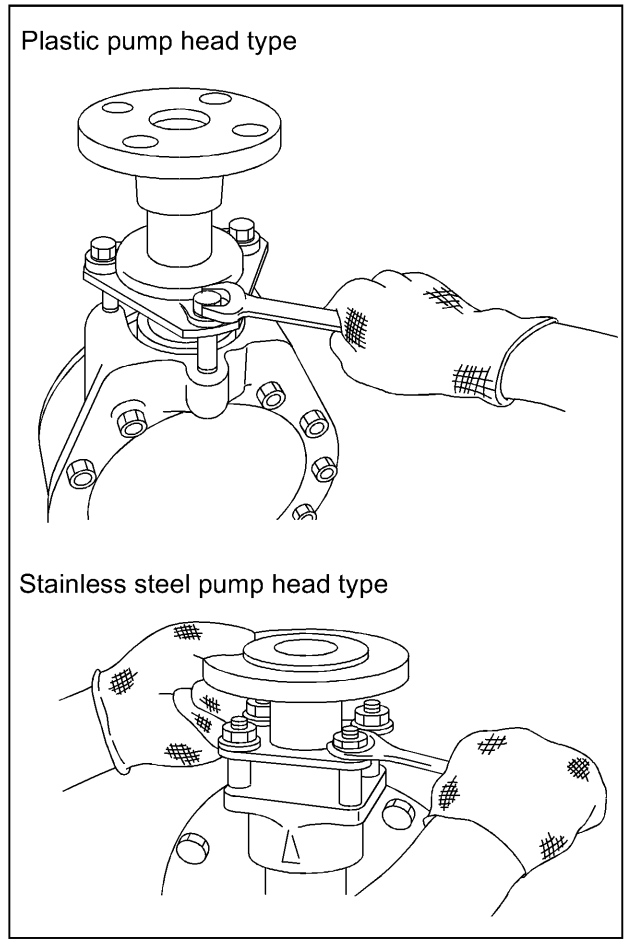
8. Trouble Cause and Countermeasures

Trouble \ Cause	Failed motor	Short circuit or wrong connection	Melted fuse	Decreased voltage	Lack of NPSH (Cavitation)	Worn valve seat	Valve clogged by foreign matters	Clogged suction pipe, strainer	Displaced stroke length gauge	Over feeding due to shortage of min. diff. press.	Changed pump stroke speed	Over load (Excessive disch. press.)	Incorrect power source	Air sucked in from suction pipe	Changed pumped liquid	Failed pressure gauge	Foreign matters are clogged at inlet of press. gauge.	Leakage from safety valve	Broken diaphragm	Damaged valve gasket, O ring	Damaged oil seal, O ring	Unsuitable lubrication oil	Air is not vented well from pump chamber.	Wrongly assembled valve ass'y
Motor does not run.	X	X	X	X								X	X											
Shortage of discharge capacity					X	X	X	X	X		X	X		X	X	X	X	X	X	X			X	X
Too much discharge capacity									X	X					X									
Unstable discharge capacity					X	X	X	X		X	X			X	X			X		X			X	
Excessive motor current	X	X		X			X	X				X	X		X							X		
Liquid is not discharged.					X	X	X	X						X	X			X	X				X	X
Discharge pressure does not increase.					X	X	X	X						X	X	X	X	X	X				X	X
Liquid leaks.								X				X			X				X	X				X
Excessive vibration and noise	X				X	X	X	X				X										X		X
Oil leaks.																					X			
Liquid is not sucked in.					X	X	X	X						X					X	X			X	X
Too hot reduction gear temp.												X										X		
Countermeasure	Replace.	Re-wire or replace.	Check cause.	Check cause.	Check suction condition.	Replace.	Disassemble and clean.	Disassemble and clean.	Measure stroke length and adjust gauge.	Apply min. required diff. press.	Check power source, motor, reduction gear.	Check discharge piping and improve.	Check.	Check piping and improve.	Check pump specifications.	Replace.	Clean.	Re-adjust set pressure of safety valve.	Replace.	Replace.	Replace.	Check volume, kind and dirt of oil.	Take air out of pump chamber.	Reassemble

9. Disassembling, Assembling and Adjustment

Disassembly and assembly of pump must be done to the extent and by the procedure which are mentioned in this manual. Never disassemble the pump beyond the extent which is mentioned in this manual. If the pump is disassembled or remodeled beyond the extent which is instructed in this manual, the pump can not be guaranteed, and IWAKI is not responsible for the accident or damage which is caused by non observance of this instruction.

Disassembling, assembling and adjustment should be done referring to "Exploded views of pump head" on page 21 to 23 as well as the illustrations on right. Some parts are heavy. Pay attention to handling them. Clean pump chamber before disassembling.



9.1 Disassembly and assembly of valve assembly

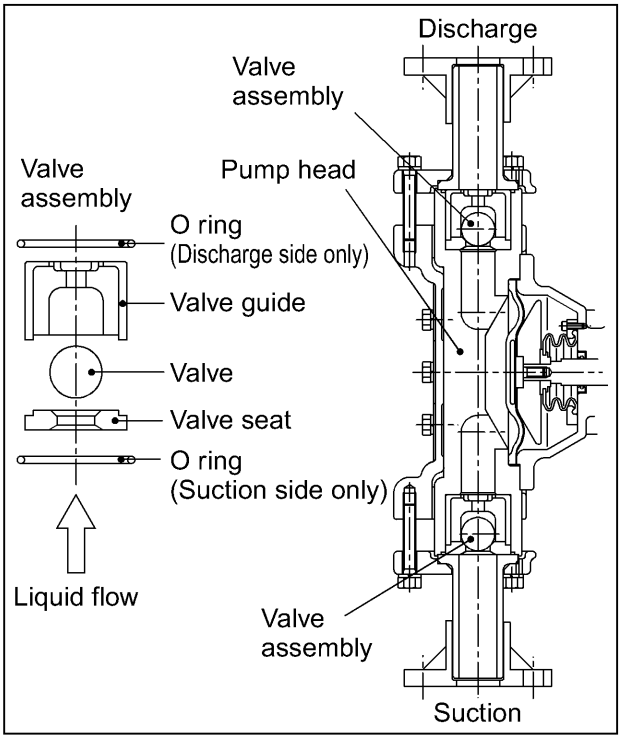
9.1.1 Disassembly

(1) Remove both suction and discharge sides pipes. Pay attention to the liquid which flows out from pump chamber and valve.

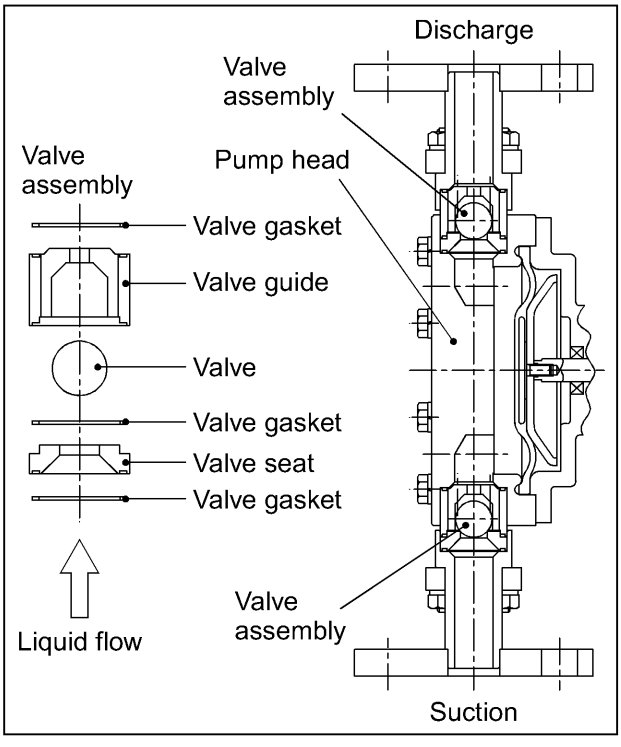
(2) Remove flanges of suction and discharge sides to take the valve assembly out. If scratch or wear is found on valve, valve case and valve seat, replace them by new ones.

Arrangement of valve assembly

Models	A55 A57 A65 B65	VH VC VS TC



Models	A55 A57	S6



9.1.2 Assembly

After clean the parts, mount them to the pump head paying attention to following points.

* Arrangement and direction of insertion of parts

  Arrange both of suction and discharge valve assembly, from top to bottom, in order of valve gasket, valve guide, valve, valve case, valve seat and valve gasket.

* In case of LK-S4 model

  Valve guide is a pair of two split ones. Mount it in correct direction.

(1) Insert valve assembly into pump head. Check the mounting direction and if any parts are not missed to be mounted. Mount the suction side valve assembly to the pump head after it is inserted into suction side flange unit. Never make mistake of mounting direction and order.

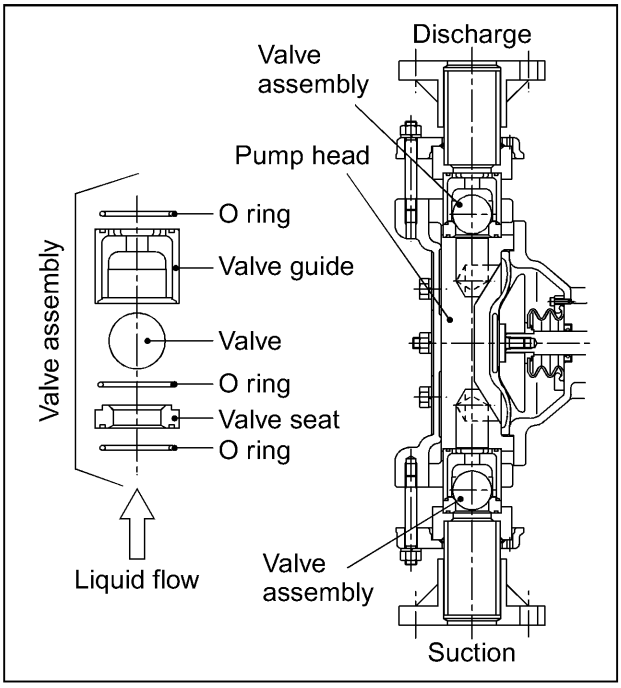
⚠ Caution

Wrongly assembled and mounted valve assembly may cause counter-flow of liquid, abnormal pressure applied to pump, burnt motor or pump break down and liquid splash, which are very dangerous.

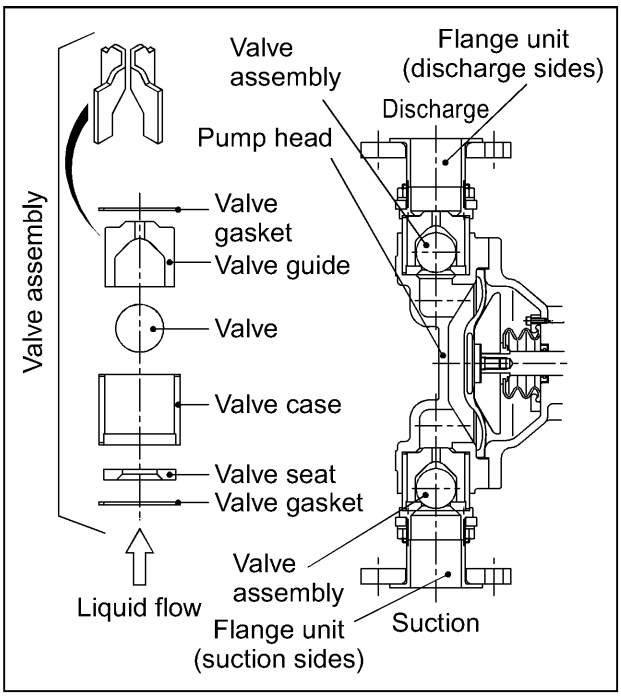
(2) Mount suction and discharge sides of flange units to securely tighten valve assembly.

(3) Mount discharge and suction side pipes.

Models	B75 C76 C86 C87	VH VC VS



Models	A65 B65 B75 C76 C86 C87	S4

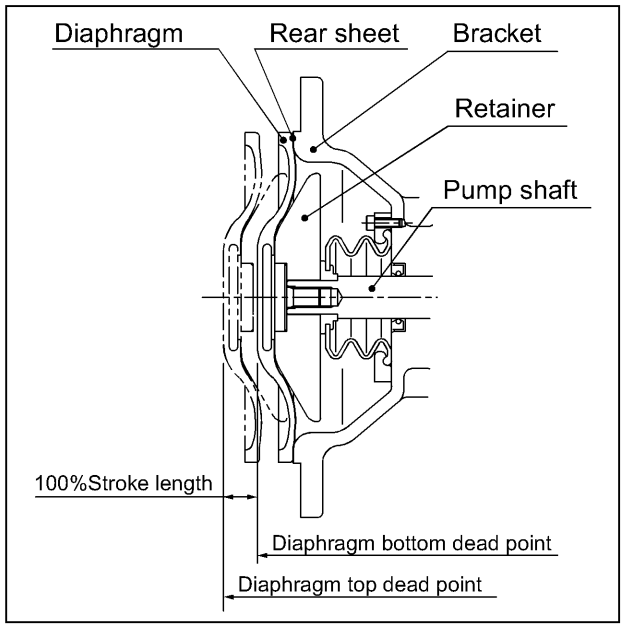


9.2 Disassembly and assembly of diaphragm

9.2.1 Disassembly

(1) Remove pipes of discharge and suction sides.

(2) Remove pump head fixing bolts with wrench.



(3) Turn the diaphragm counter clockwise to remove the diaphragm from the pump shaft. To remove it easily, switch ON and OFF the motor repeatedly to stop the diaphragm at the top dead point.

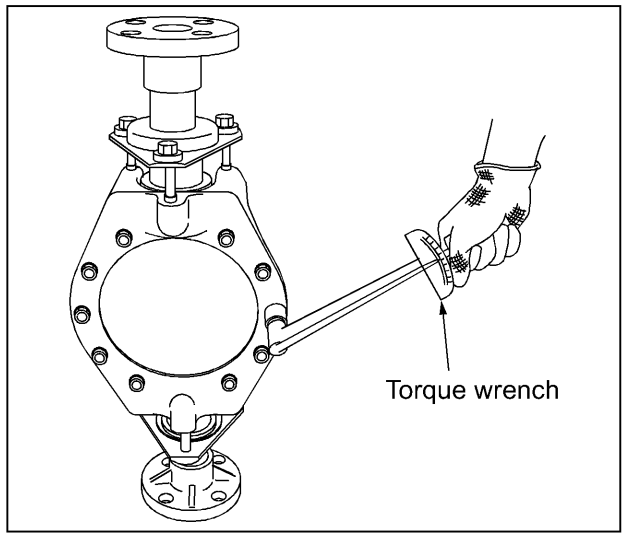
(4) If the diaphragm is worn or broken, replace it by new one. Check the rear sheet, too.

9.2.2 Assembly

(1) Adjust the stroke length adjusting dial at 100% and set the pump shaft position at top dead point (the most advanced position) by switching motor ON and OFF repeatedly.

(2) Turn the diaphragm and rear sheet (except LK-5 type) clockwise direction to mount it to the pump shaft. Confirm if the retainer is securely positioned in the faucet part of insert bolt of diaphragm, and it touches to shaft end surface.

(3) Set the diaphragm position at bottom dead end of 100% of stroke length before the pump head is mounted. It can be done easily if the dial gauge is set at 100% and switch ON and OFF the motor repeatedly.



(4) Mount the pump head to the bracket by tightening pump head fixing bolts until no gap is seen between pump head and bracket. Screw in the bolts evenly at screwing torque of 13.7N.m.

(5) In the reverse manner of disassembly, mount connecting flanges of discharge and suction port and mount pipes at discharge and suction sides.

10. Consumable Parts

Following consumable parts must be replaced at the time to be replaced shown as below.

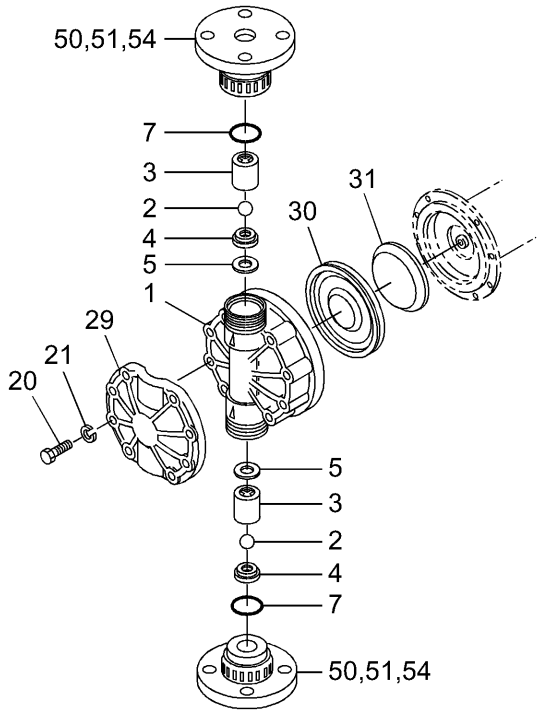
No.	Parts name	Q'ty per pump head	Time to be replaced
2	Valve	2 pcs	One year
3	Valve guide	2 (2 sets for S6, S4)	One year
4	Valve seat	2	One year
7, 8	O ring (VH, VS4, VC, TC)	4	One year
5	Valve gasket (S4, SH)	6	One year
30	Diaphragm	1	4000 hours
83	Rear seat	1	4000 hours
250	Seal bellows	1	One year

Note 1. The time to be replaced mentioned as above is based on pumping clear water at ambient temperature and it depends on the characteristics of liquid handled and other conditions.

2. O ring and valve gasket must be replaced by new ones every time when pump is disassembled regardless of the time to be replaced shown as above.

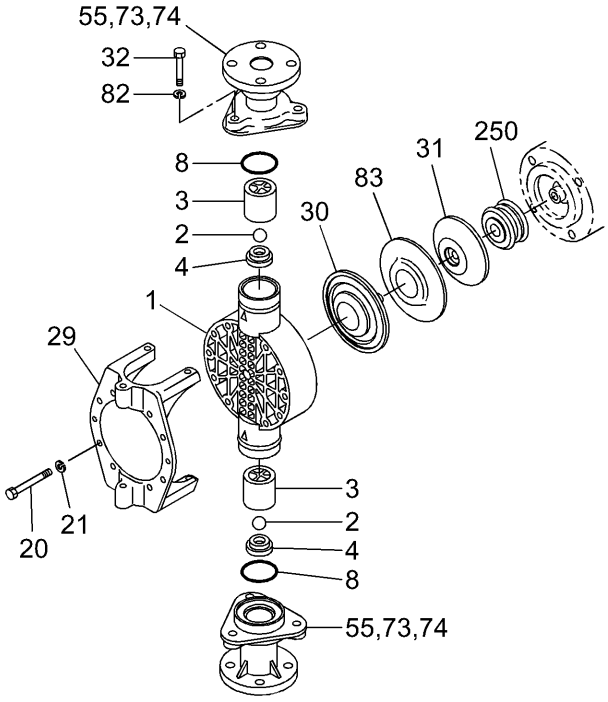
11. Exploded Views of Pump Head

LK-55, 57 VH, VC, TC



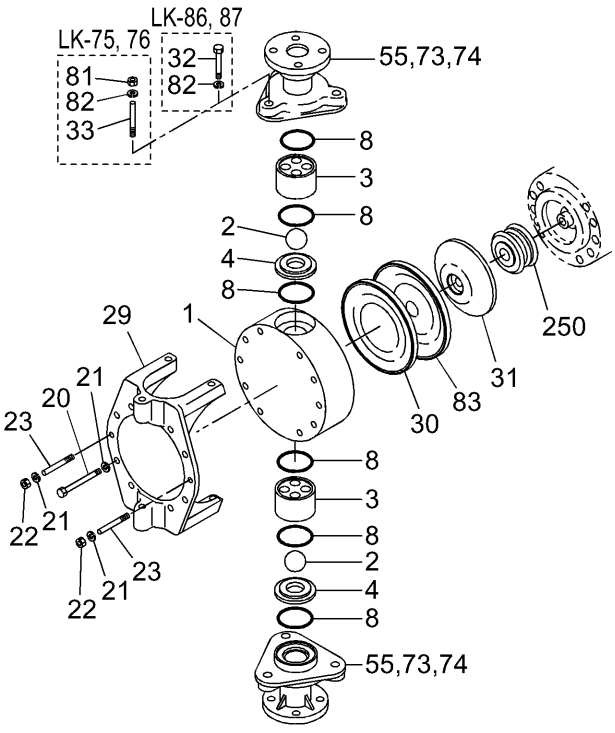
No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2
4	Valve seat	2
5	Valve gasket	2
7	O ring	2
20	Hex. bolt	8
21	Spring washer	8
29	Reinforcing plate	1
30	Diaphragm	1
31	Retainer	1
50, 51, 54	Flange unit	2 sets
(50)	Nut	(1)
(51)	Union	(1)
(54)	Flange	(1)

LK-65 VS4, VC, VS, TC



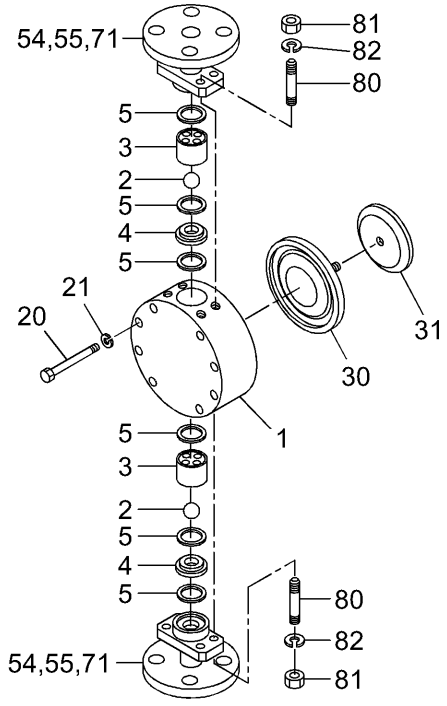
No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2
4	Valve seat	2
8	O ring	2
20	Hex. bolt	8
21	Spring washer	8
29	Reinforcing plate	1
30	Diaphragm	1
31	Retainer	1
55, 73, 74	Flange unit	2 sets
(55)	Flange holder	(1)
(73)	Connection port	(1)
(74)	Flange	(1)
82	Spring washer	6
83	Rear sheet	1
250	Seal bellows	1

LK-75, 76, 86, 87 VS4, VC, VS



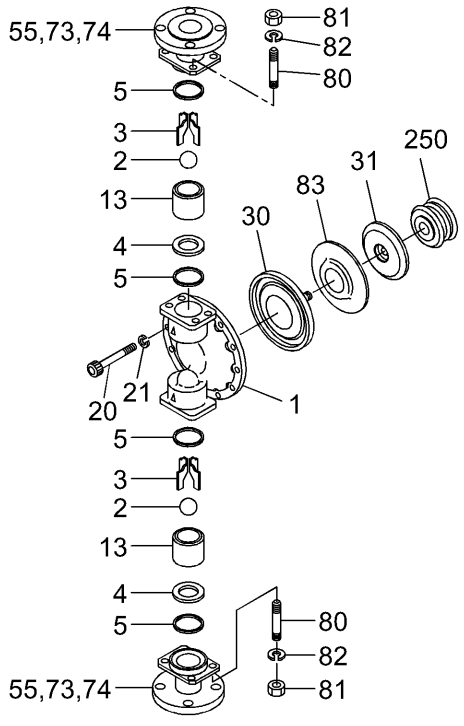
No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2
4	Valve seat	2
8	O ring	6
20	Hex. bolt	8
21	Spring washer	10
22	Nut	2
23	Stud bolt	2
29	Reinforcing plate	1
30	Diaphragm	1
31	Retainer	1
32	Hex. bolt (for LK-8 type only)	6
33	Stud bolt (for LK-6 type only)	6
55, 73, 74	Flange unit	2 sets
(55)	Flange holder	(1)
(73)	Connection port	(1)
(74)	Flange	(1)
81	Hex. nut	6
82	Spring washer	6
83	Rear sheet	1
250	Seal bellows	1

LK-55, 57 S6

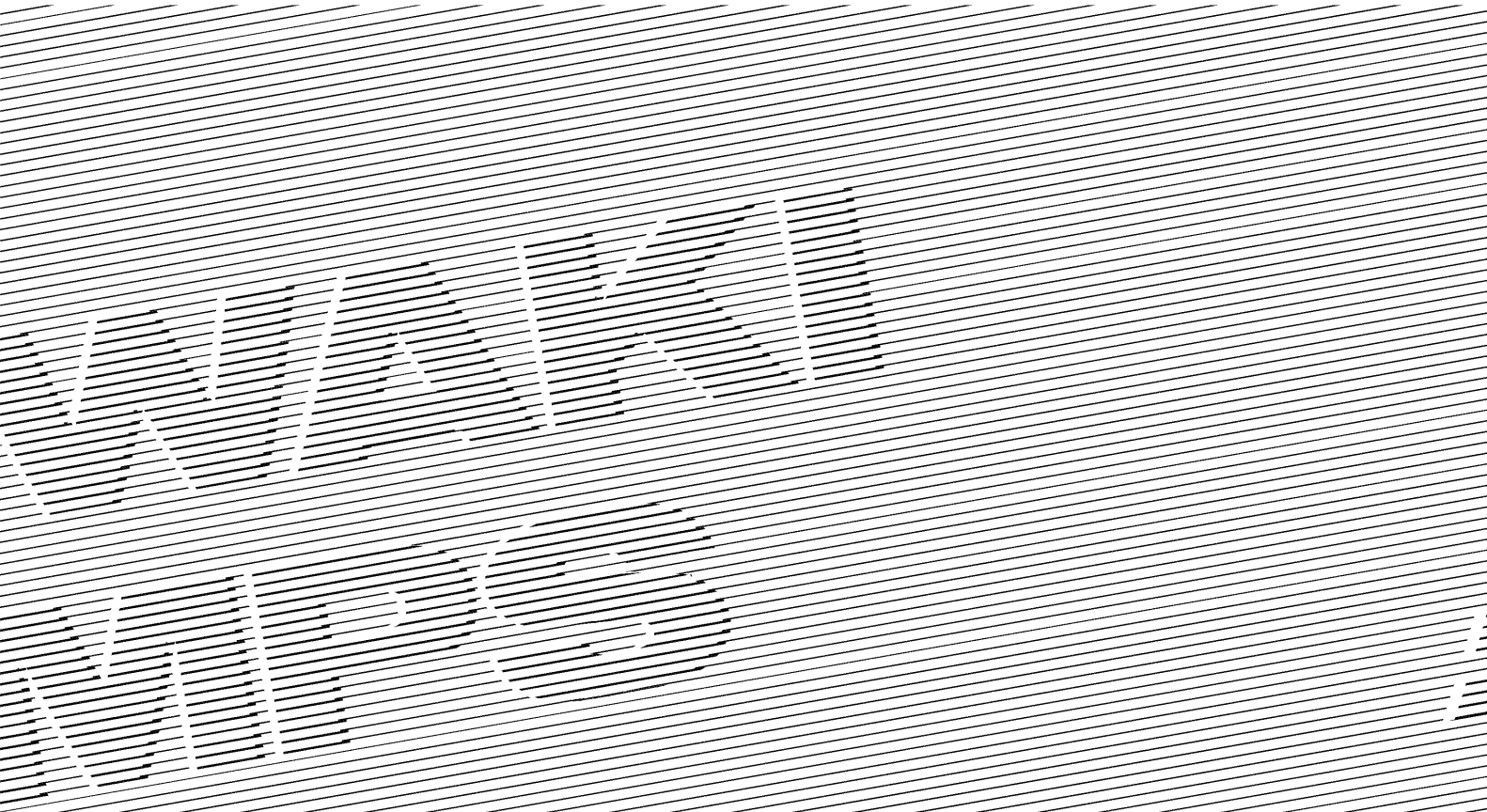


No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2
4	Valve seat	2
5	Valve gasket	6
20	Hex. bolt	8
21	Spring washer	8
30	Diaphragm	1
31	Retainer	1
54, 55, 71	Flange unit	2 sets
(54)	Flange	(1)
(55)	Flange holder	(1)
(71)	Connection port	(1)
80	Stud bolt	8
81	Hex. nut	8
82	Spring washer	8

LK-65, 75, 76, 86, 87 S4



No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2 sets
4	Valve seat	2
5	Valve gasket	4
13	Valve cased	2
20	Hex. bolt	8
21	Spring washer	8
30	Diaphragm	1
31	Retainer	1
55, 73, 74	Flange unit	2 sets
32	Hex. bolt (for LK-8 type only)	6
33	Stud bolt (for LK-6 type only)	6
55, 73, 74	Flange unit	2 sets
(55)	Flange holder	(1)
(73)	Connection port	(1)
(74)	Flange	(1)
80	Stud bolt	8
81	Hex. nut	8
82	Spring washer	8
83	Rear sheet	1
250	Seal bellows	1



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