

# **IWAKI Metering Pump**

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## **LK-A, B, C Models**

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### **Instruction Manual**

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 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.

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# 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.

 <b>Warning</b>	<b>Nonobservance or misapplication of the contents of the "Warning" section could lead to a serious accident, including death or injury.</b>
 <b>Caution</b>	<b>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.</b>

### 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 power 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.



Caution

- **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.



No fire

- **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.



Caution

- **Broken pump**

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



Prohibited

- **Take ground**

Connect ground wire. Otherwise you may be electrically shocked.



Grounding

- **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.



Prohibited

- **Use earth leakage breaker**

Install earth leakage breaker. Otherwise you may be electrically shocked.



Electrical Shock

- **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)



Prohibited

- **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.



Prohibited

- **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.



Prohibited

# Safety Instruction

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## **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.



Caution

- **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.



Caution

- **Disposal of used pump**

Observe your local law for disposal of used pump.

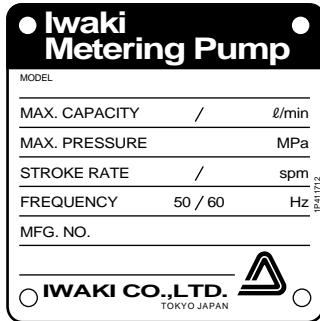


# ***OUTLINE OF PRODUCT***

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4. <i>Operating Principle and Stroke Length Adjustment</i> .....	8

# 1. Unpacking and Inspection

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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

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### 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		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, Hydrochloric acid, Hypo	Caustic soda, Coagulant, Lime slurry (low conc.)		Lime slurry, Highmolecular coagulant	Conc. sulfuric acid, Hydrofluoric 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 kW	Mass kg (with motor)	
	50Hz	60Hz	PVC	SUS	50Hz	60Hz	mm	mm			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					138	17.5
A65	9.0	10.8	0.3		48	58	138	17.5	50A	1.5		
B65	9.0	10.8	0.5	0.7	48	58					150	20
B75	13.3	16.0	0.5				72	86	150	205	65A	
C76	20	24	0.5		96	116			205			205
C86	33	40	0.3				96	116	205	205	65A	
C87	45	54	0.3		96	116			205			205

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.

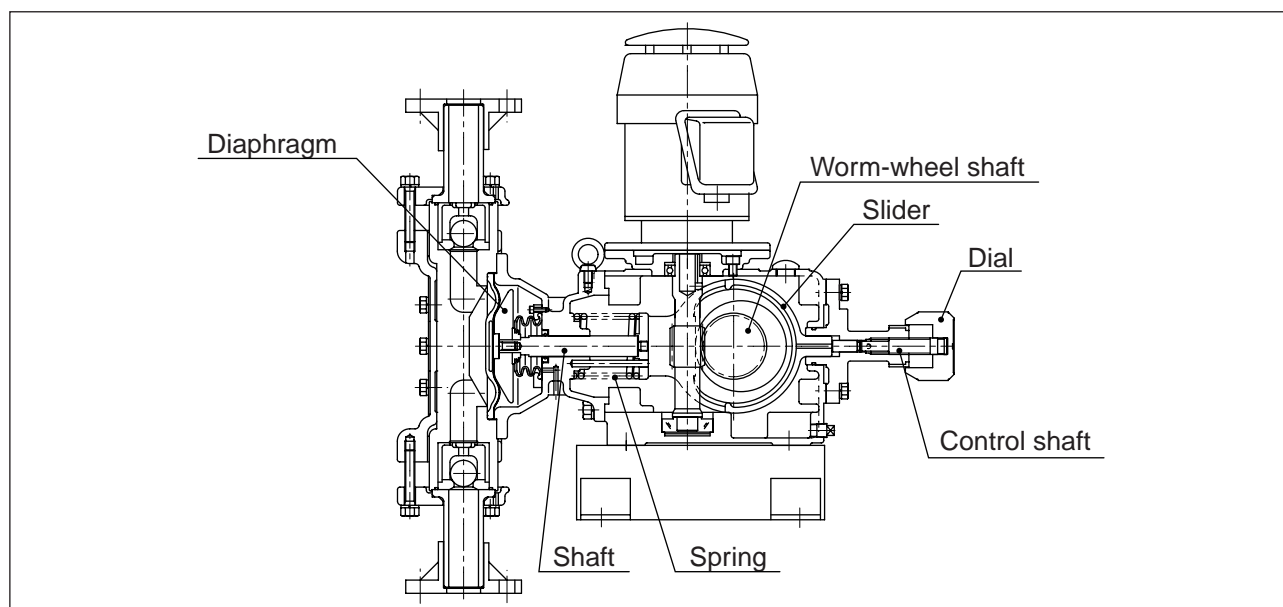
### 4. Operating Principle and Stroke Length Adjustment

#### 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***

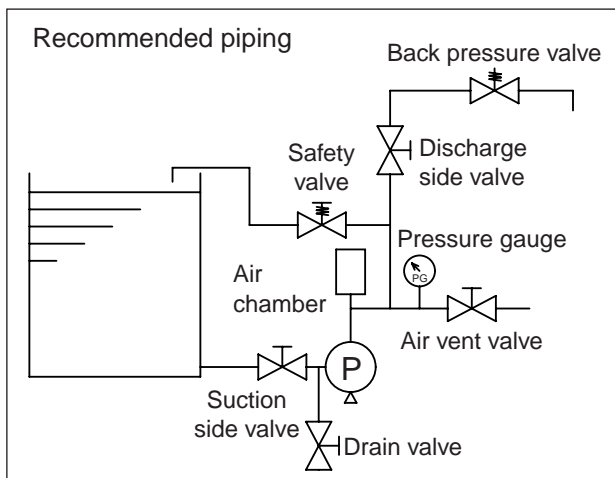
*5. Installation, Piping and Wiring ..... 10*

# 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.

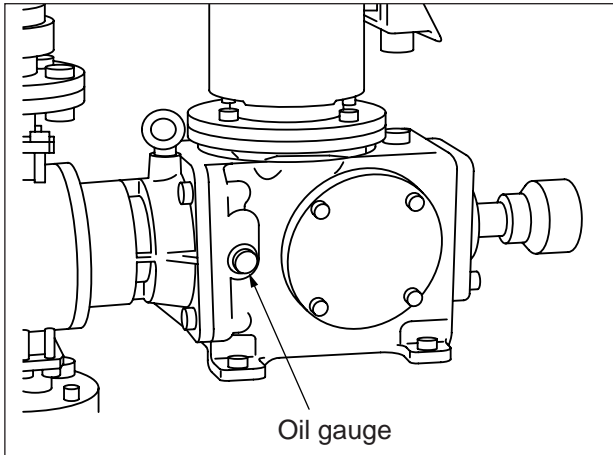
# ***OPERATION***

6. Operation .....	12
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## 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.	

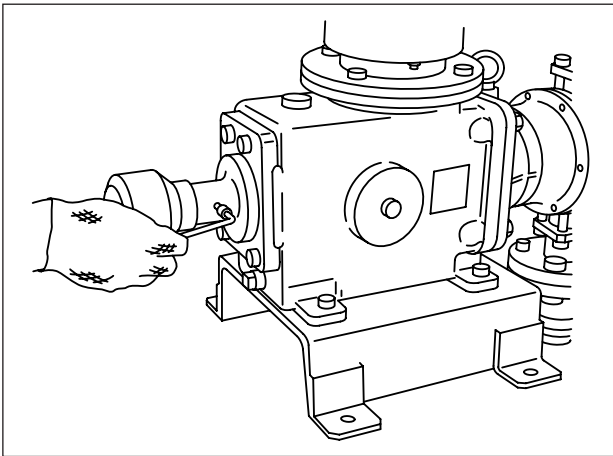
## 6.3 Stroke length adjustment

Stroke length is adjusted by turning adjusting dial.

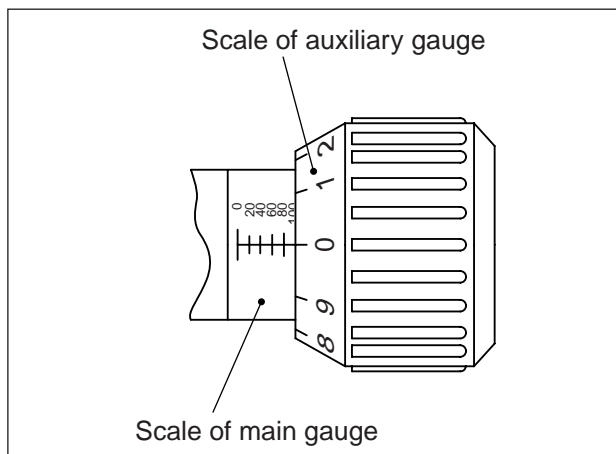
### ⚠ Caution

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 temporarily 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***

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# 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

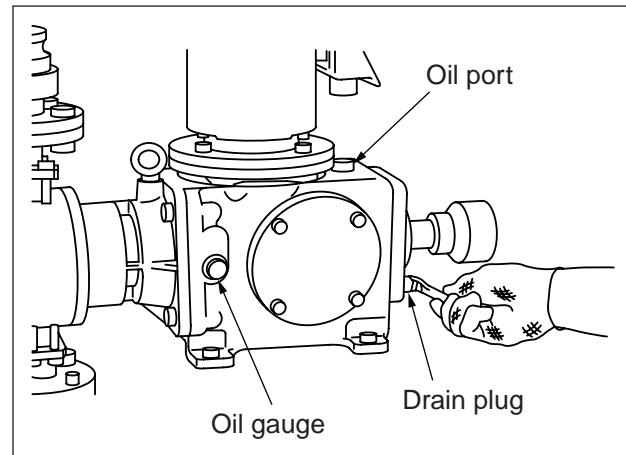
- (1) Inspection of discharge and suction valves  
Inspect discharge and suction valves once a half year and replace it if any scratch or wear is found. When slurry or viscous liquid is pumped, inspect them at any time.
- (2) Inspection of diaphragm  
Inspect the diaphragm once every six months. Diaphragm 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

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

## 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.

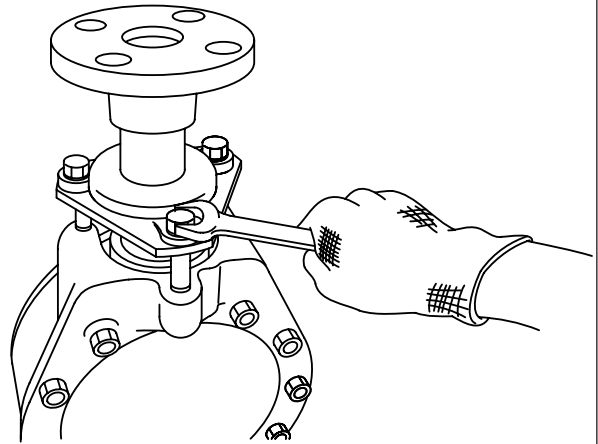
Disassembling, assembling and adjustment should be done referring to “Exploded views of pump head” on page 21 to 23 as well as the illustrations on right. Some parts are heavy. Pay attention to handling them. Clean pump chamber before disassembling.

### 9.1 Disassembly and assembly of valve assembly

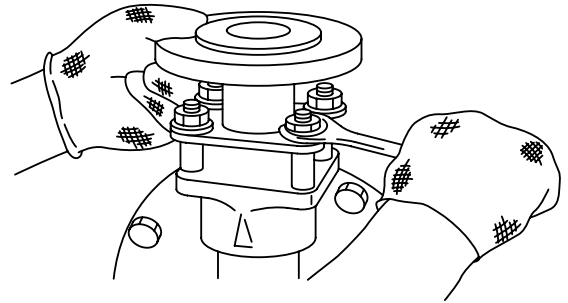
#### 9.1.1 Disassembly

- (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.

Plastic pump head type

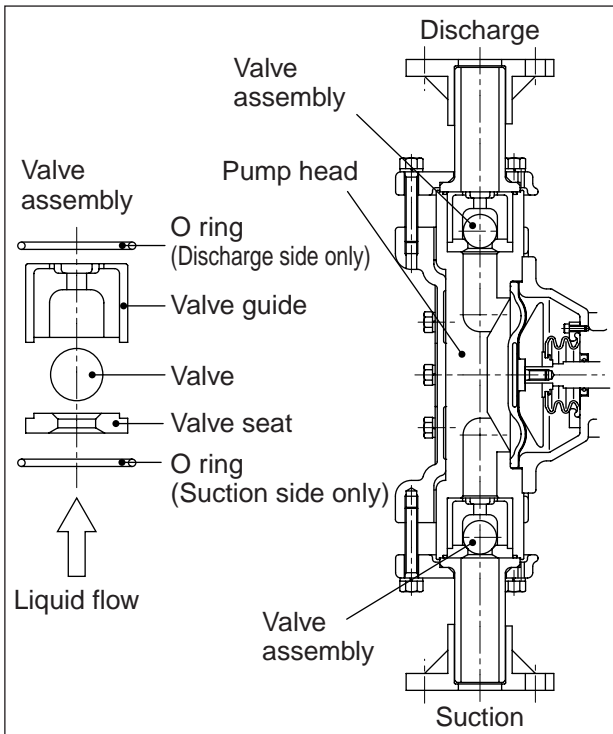


Stainless steel pump head type

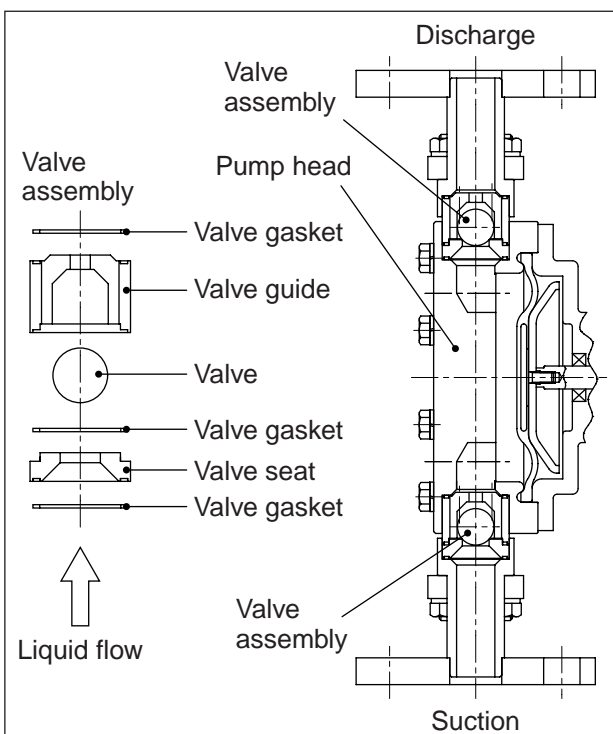


### Arrangement of valve assembly

Models	A55	VH
	A57	VC
	A65	VS
	B65	TC



Models	A55	S6
	A57	



### 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.

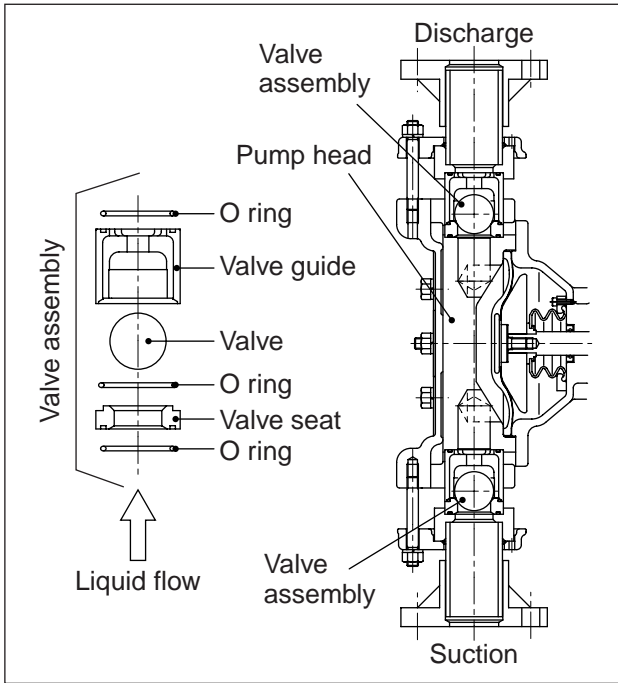
- (1) Insert valve assembly into pump head. Check the mounting direction and if any parts are not missed to be mounted. Mount the suction side valve assembly to the pump head after it is inserted into suction side flange unit. Never make mistake of mounting direction and order.

#### ⚠ Caution

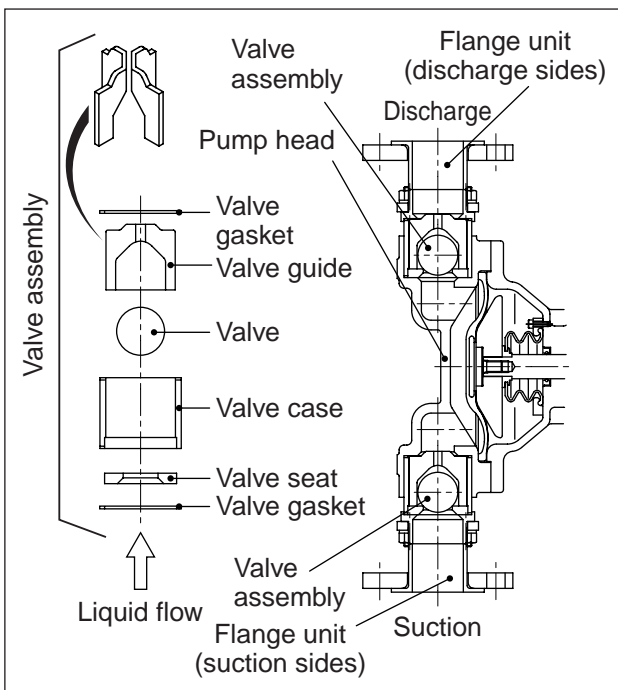
Wrongly assembled and mounted valve assembly may cause counter-flow of liquid, abnormal pressure applied to pump, burnt motor or pump break down and liquid splash, which are very dangerous.

- (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
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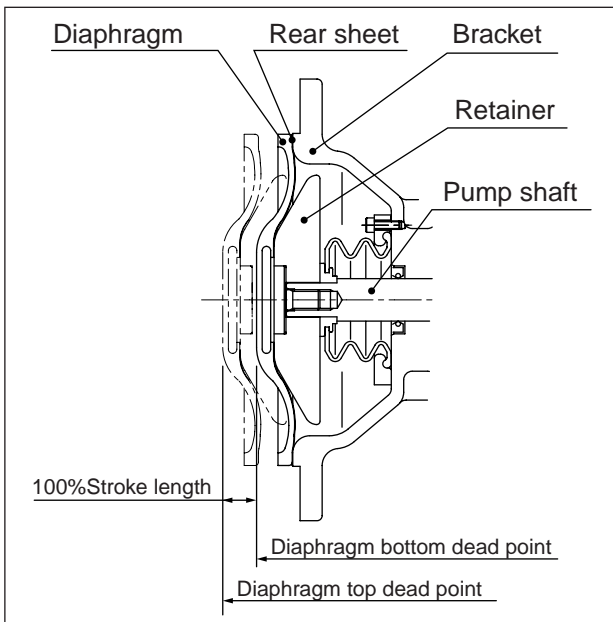
Models	A65 B65 B75 C76 C86 C87	S4
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## 9.2 Disassembly and assembly of diaphragm

### 9.2.1 Disassembly

- (1) Remove pipes of discharge and suction sides.
- (2) Remove pump head fixing bolts with wrench.

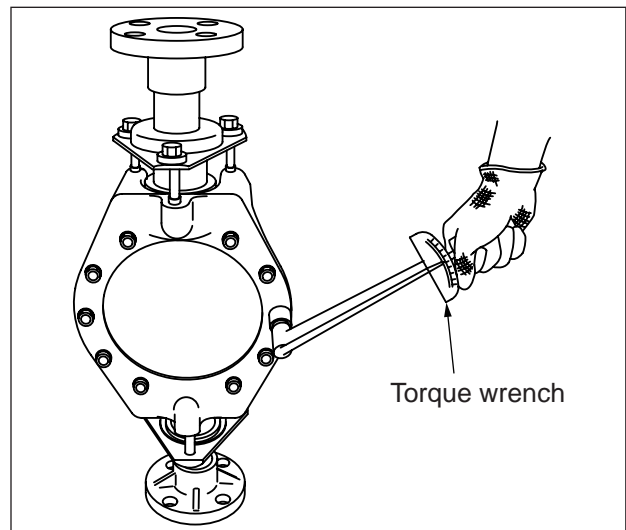


- (3) Turn the diaphragm counter clockwise to remove the diaphragm from the pump shaft. To remove it easily, switch ON and OFF the motor repeatedly to stop the diaphragm at the top dead point.
- (4) If the diaphragm is worn or broken, replace it by new one. Check the rear sheet, too.

### 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.

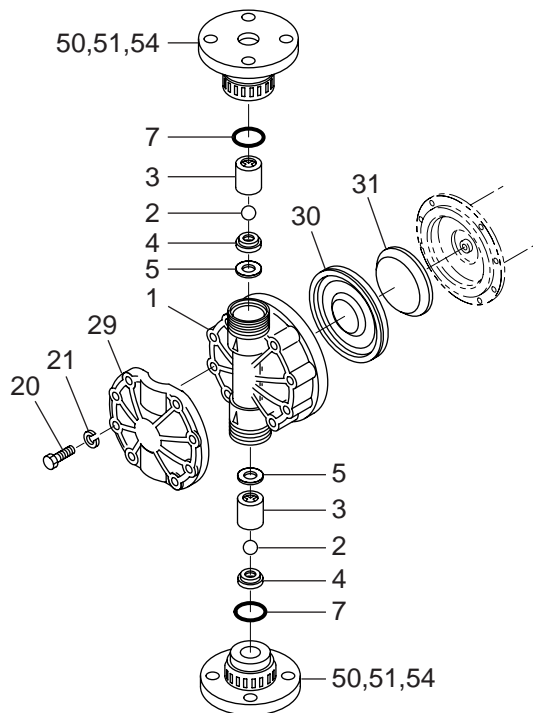
No.	Parts name	Q'ty per pump head	Time to be replaced
2	Valve	2 pcs	One year
3	Valve guide	2 (2 sets for S6, S4)	One year
4	Valve seat	2	One year
7, 8	O ring (VH, VS4, VC, TC)	4	One year
5	Valve gasket (S4, SH)	6	One year
30	Diaphragm	1	4000 hours
83	Rear seat	1	4000 hours
250	Seal bellows	1	One year

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.

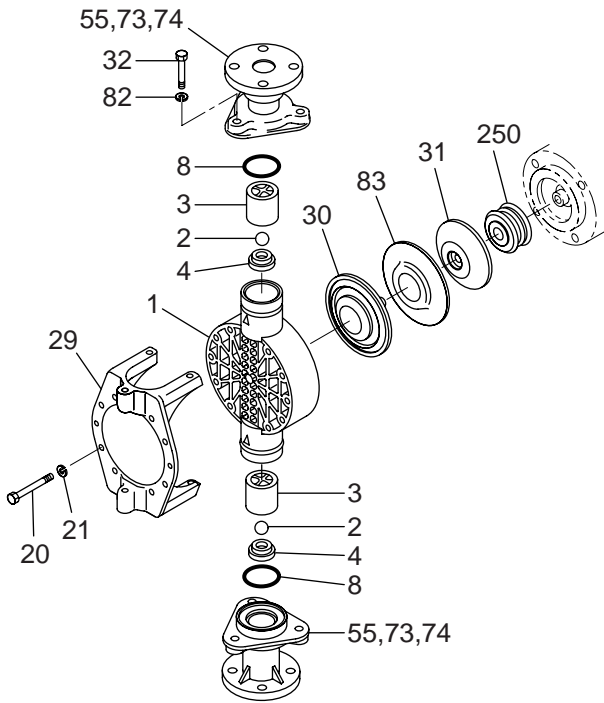
## 11. Exploded Views of Pump Head

LK-55, 57 VH, VC, TC



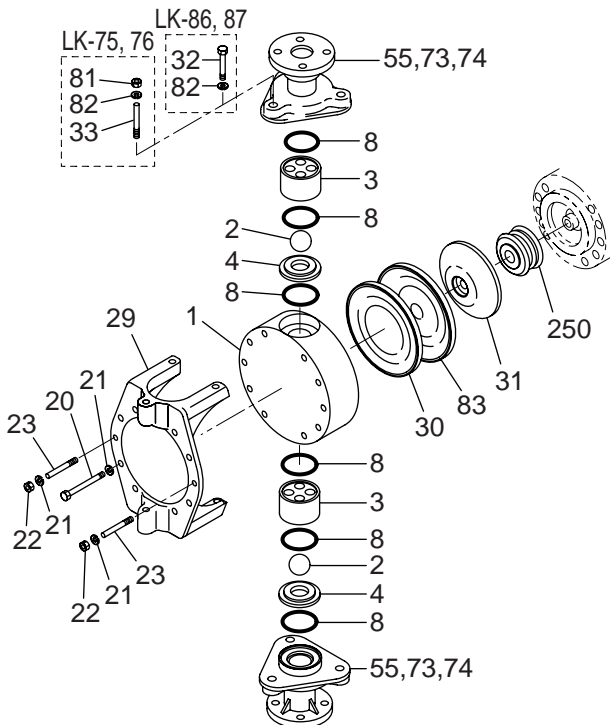
No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2
4	Valve seat	2
5	Valve gasket	2
7	O ring	2
20	Hex. bolt	8
21	Spring washer	8
29	Reinforcing plate	1
30	Diaphragm	1
31	Retainer	1
50, 51, 54	Flange unit	2 sets
(50)	Nut	(1)
(51)	Union	(1)
(54)	Flange	(1)

LK-65 VS4, VC, VS, TC



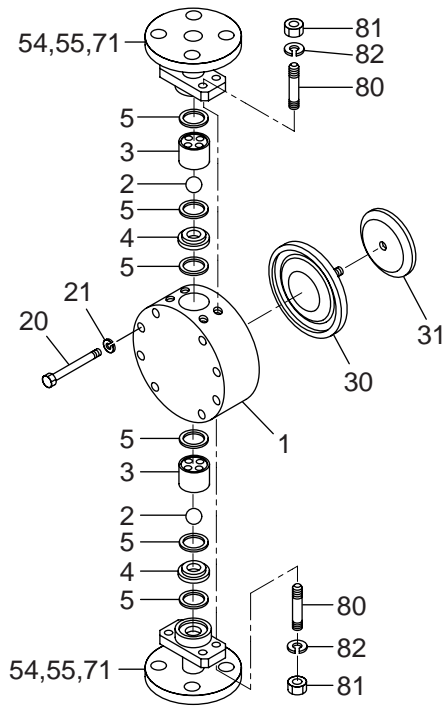
No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2
4	Valve seat	2
8	O ring	2
20	Hex. bolt	8
21	Spring washer	8
29	Reinforcing plate	1
30	Diaphragm	1
31	Retainer	1
55, 73, 74	Flange unit	2 sets
(55)	Flange holder	(1)
(73)	Connection port	(1)
(74)	Flange	(1)
82	Spring washer	6
83	Rear sheet	1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

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



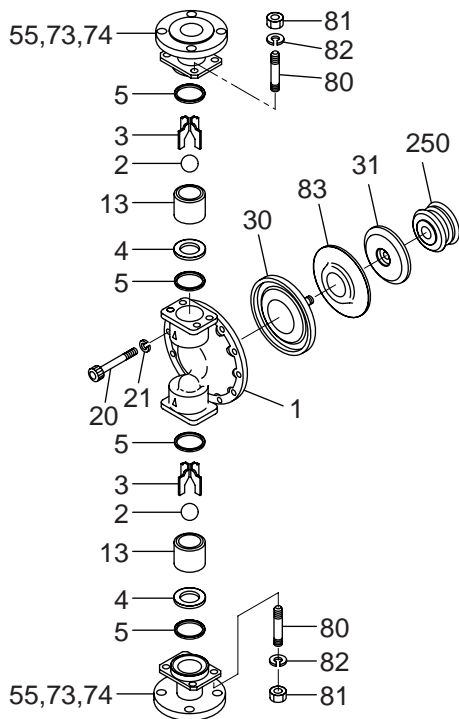
No.	Parts name	Q'ty
1	Pump head	1
2	Valve	2
3	Valve guide	2
4	Valve seat	2
8	O ring	6
20	Hex. bolt	8
21	Spring washer	10
22	Nut	2
23	Stud bolt	2
29	Reinforcing plate	1
30	Diaphragm	1
31	Retainer	1
32	Hex. bolt (for LK-8 type only)	6
33	Stud bolt (for LK-6 type only)	6
55, 73, 74	Flange unit	2 sets
(55)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