IWAKI PUMPS

IWAKI Bellows Pump

KBR series

Instruction Manual

⚠ Read this manual before use of product

Thank you for selecting an Iwaki KBR series bellows pump. This instruction manual deals with "*Safety Instructions*", "*Outline*", "*Installation*", "*Operation*" and "*Maintenance*" sections.

Please read through this instruction manual to ensure the optimum performance, safety and service of your pump.

Contents

This instruction manual should be kept on hand by the end user for quick reference.

Contact us or your nearest dealer if you have any questions.

Important Instruction

For the Safe and Correct Handling of the Pump

- "Safety Instruction" section deals with important details about handling of the product. Before use, read this section carefully for the prevention of personal injury or property damage.
- Observe the instructions accompanied with "WARNING" or "CAUTION" in this manual. These instructions are very important for protecting pump users from dangerous situations.
- The symbols on this instruction manual have the following meanings:

⚠ WARNING	**Nonobservance or misapplication of the contents of "Warning" section could lead to a serious accident which may result in death.**
⚠ CAUTION	**Nonobservance or misapplication of the contents of "Caution" section could lead to personal injury or property damage.**

Types of Symbols

⃠	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.

⚠ Export Restrictions

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control.
Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

Safety Instructions

⚠ WARNING

- **Turn off power before service**
  Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.


Power off

- **Stop operation**
  If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.

- **Do not use the pump in any condition other than its intended purpose**
  The use of the pump in any conditions other than those clearly specified may result in failure or injury. Use this product in specified conditions only.


Prohibited

- **Do not modify the pump**
  Alternations to the pump carries a high degree of risk. It is not the manufacturer's responsibility for any failure or injury resulting from alterations to the pump.


Do not rework or alter

- **Wear protective clothing**
  Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.


Wear protectors

⚠ CAUTION

- **Qualified personnel only**
  The pump should be handled or operated by a qualified personnel with a full understanding of the pump.


Prohibited

- **Use specified power only**
  Do not apply power other than that specified on the nameplate. Otherwise failure or fire may result. Ensure the pump is properly grounded.


Prohibited

- **Keep electric parts and wiring dry**
  Risk of fire or electric shock. Install the pump where it can be kept dry.


Prohibited

- **Ventilation**
  Fumes or vapours can be hazardous with certain solutions. Ensure proper ventilation at the operation site.


Caution

- **Spill precautions**
  Ensure protection and containment of solution in the event of plumbing or pump damage (secondary containment).


Caution

⚠ CAUTION

- **Do not use a damaged pump**
  Use of a damaged pump could lead to an electric shock or death.


Prohibited

- **Do not use the pump in a wet location**
  The pump is not waterproof. Use of the pump in wet or extremely humid locations could lead to electric shock or short circuit.


Prohibited

- **Do not damage the power cable**
  Do not pull, knot, or crush the power cable. Damage to the power cable could lead to a fire or electrical shock if cut or broken.


Caution

- **Grounding**
  Risk of electric shock! Always properly ground the pump. Conform to local electric codes.


Earthing

- **Install a GFCI (earth leakage breaker)**
  To reduce the risk of electric shock or death, purchase and install a GFCI (earth leakage breaker) separately.


Electrical shock

⚠ CAUTION

- **Damaged power cable**
  Do not use any damaged power cable for the prevention of a fire or electrical shock. The cable is not replaceable, so that the whole pump unit needs to be replaced when the cable is damaged.


Electrical shock

- **Do not drain chemical liquids directly on the ground or the floor.**
  Dispose of chemicals in accordance with local rules and regulations.

- **Do not install or store the pump:**
  - Where ambient temperature falls below 0°C or exceeds 40°C.
  - Under a flammable/corrosive atmosphere.
  - In a dusty/humid environment.
  - Under a mechanical vibration.

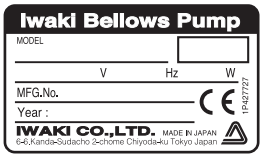

Prohibited

- **Disposal of a used pump**
  Dispose of any used or damaged pump in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company.

1. Unpacking & Inspection

Open the package and check that the product conforms to your order. If any problem or inconsistency is found, immediately contact your distributor.

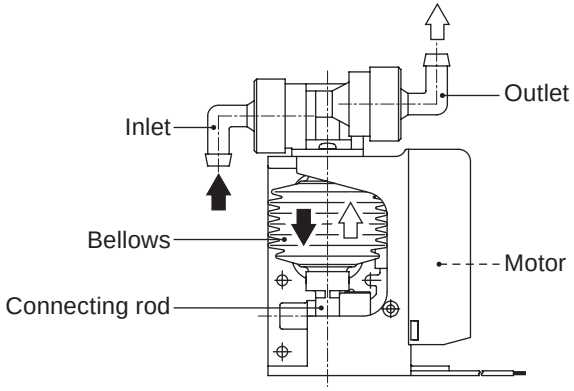
1. Check the nameplate to see if the information such as model codes, discharge capacity and discharge pressure are as ordered.



2. Check for transit damage and loose bolts.

2. Operating principle

The KBR series is a built-in type chemical feeding pump. Motor rotation is transmitted to the connecting rod and then converted to reciprocation of the bellows where pumping action takes place.



➡ : The bellows expands to take in liquid through the inlet.

⇨ : The bellows contacts to send out liquid through the outlet.

3. Identification code

The model code represents the following information.

KBR - 3 X A U 1 M - S01 F
a b c d e f g h

a. Bellows size (O.D.) 0: 14mm 1: 23mm
2: 26mm 3: 50mm

b. Stroke rate X: 20spm Z: 10spm

c. Cam type A: Stationary (KBR-1/-2/-3 -S)
E: Stationary (KBR-0 -S/-H)
C: Stationary (KBR-2/-3 -H)
B: Variable (KBR-1/-2/-3 -S)

d. Standard No code: No specific standard
U: UL compliant

e. Power voltage 1: 100VAC 2: 115VAC 3: 230VAC
4: 200VAC 5: 24VAC D2: 24VDC

f. Motor No code: MG8 motor (KBR-0/-1/-2/-3 Z)
M: M8 motor

g. Hole IC/Custom # S: No hole IC
H: With a hole IC

h. Poppet valve/O ring/Valve gasket materials
No code: EPDM (KBR-1/-2/-3)
F: FKM

4. Specification

■ Pumps with no hole IC

Model	Max flow [ml/min]	Fixed stroke rate [spm]	Max pressure [MPa]	Max suction lift [cm]	Motor	Tube I.D. [mm]
KBR-0ZE	4.1	10	0.01	50	MG8	4
KBR-1Z	17			30		8
KBR-2Z	25			50		
KBR-3Z	90					
KBR-0XE	8.2	20			M8	4
KBR-2X	50					8
KBR-3X	180					

■ Pumps with a hole IC

Model	Max flow [ml/min]	Fixed stroke rate [spm]	Max pressure [MPa]	Max suction lift [cm]	Motor	Tube I.D. [mm]
KBR-0ZE-H	4.1	10	0.01	50	MG8	4
KBR-2ZC-H	29					8
KBR-3ZC-H	103					
KBR-0XE-H	8.2	20			M8	4
KBR-2XC-H	58					8
KBR-3XC-H	206					

■ Power consumption

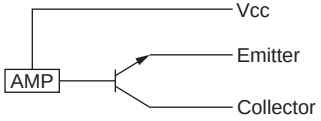
Power voltage	Motor type	
	MG8	M8
100/115V	3.5W	4.5W
200V	-	
230V	4 W	
24V	3 W	3.5W

NOTE:

a. The above data is based on the operation with clan water at 20°C and zero discharge pressure, and 100% stroke length setting.
b. The maximum flow rate changes with liquid temperature and liquid properties.
c. The maximum suction lift is attainable with dry valves.
d. Non freezing
e. Do not deliver slurry.
f. Maximum viscosity: 1mPa•s (at SG 1.0)
g. Allowable liquid temperature range: 0-40°C.
h. Allowable discharge pressure range: 0-0.01MPa.
i. Allowable ambient temperature range: 5-40°C.
j. Allowable ambient humidity range: 35-90%RH.
k. Maximum weight: 0.5kg
l. Maximum noise level: 25dB at 1m (A scale)

■ Hole IC spec (pumps with a hole IC)

Power voltage: Vcc = 4.5-16V
Open collector output: VoH = Max 16V
Io = Max 20mA
VoL = Max 0.4V (Vcc=16V, Io=12mA)

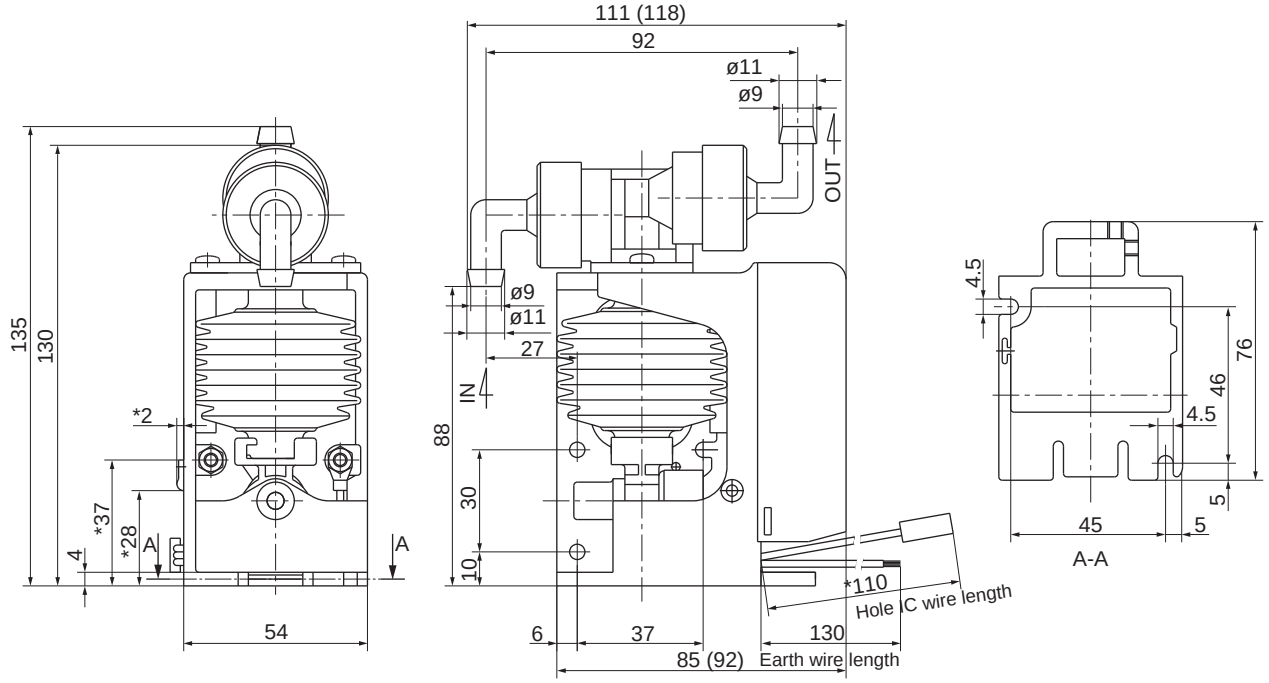


Hole IC circuit

⚠CAUTION
Property damage or personal injury may result. Observe the specification of the hole IC.

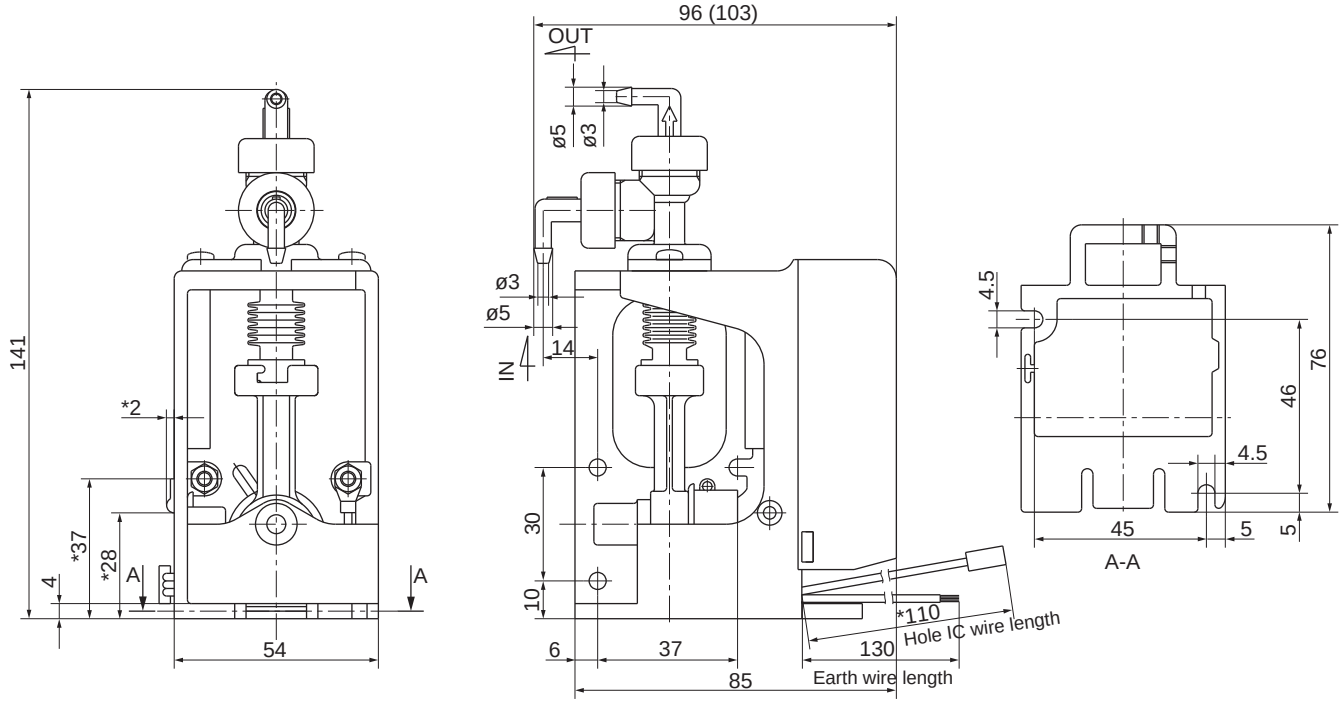
5. Outer dimensions

■ KBR-1/-2/-3 - S/H



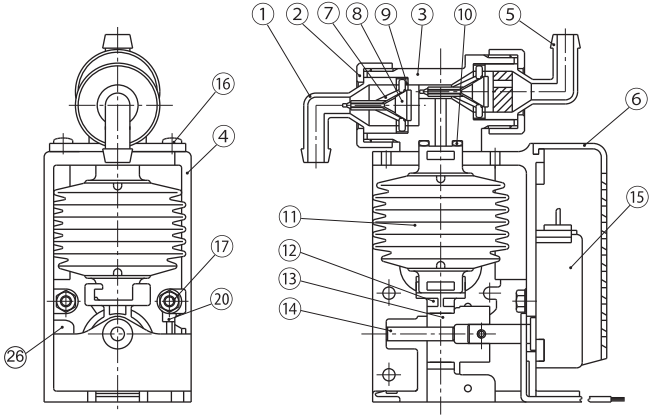
Figures in parentheses are for the pumps with the M8 motor.
Figures accompanied by * are for the pumps with a hole IC.

■ KBR-0 - S/H



Figures in parentheses are for the pumps with the M8 motor.
Figures accompanied by * are for the pumps with a hole IC.

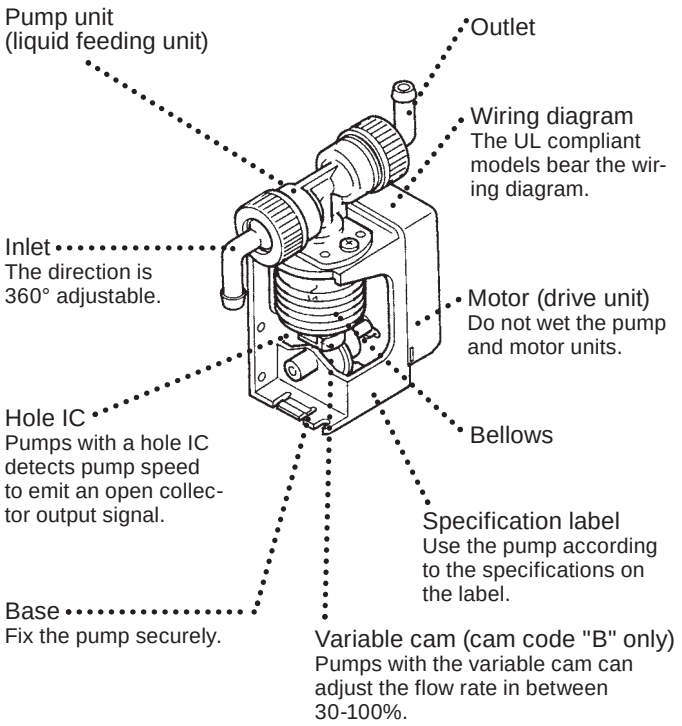
6. Part names & Structure



No.	Part names	Q'ty	Materials	Remarks	No.	Part names	Q'ty	Materials	Remarks
1	Inlet	1	GFRPP		11	Bellows	1	PP	
2	Cap A	2			12	Connecting rod	1	POM	
3	Pump head	1			13	Drive cam A	1		
4	Frame	1	PPE		14	Cam shaft	1	SUS303	
5	Outlet	1	GFRPP		15	Motor	1	-	
6	Motor cover	1	ABS		16	Tapping screw	2	Stainless steel	M4
*7	Poppet valve A	2	PP		17	Nut	2		
*8	Poppet valve B	2	EPDM/FKM		20	Earth	1		
*9	Valve gasket	2			26	Hole IC	1		
10	O ring	1	EPDM/FKM	P-11					

*The parts # 7, 8 and 9 compose the valve set (check valve). The hole IC is equipped to the KBR-H type only.

7. Overview & Label



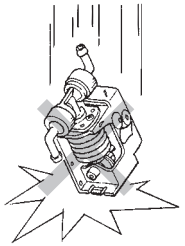
1. Before Installation

The pump should be installed by qualified personnel with a full understanding of the pump.

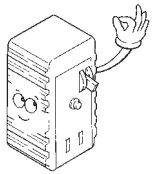
⚠ CAUTION

- **Spill precautions**
  Ensure protection and containment of solution in the event of plumbing or pump damage (secondary containment).
- **Keep electric parts and wiring dry**
  Risk of fire or electric shock. Install the pump where it can be kept dry.
- **Do not operate the pump in a flammable atmosphere.**
  Do not place explosive or flammable material near the pump.
- **Do not install/store the pump:**
  - In a flammable/corrosive atmosphere.
  - In a dusty/humid environment.
  - Where ambient temperature can exceed 0-40°C.
  - In direct sunlight or wind & rain.
- **Do not use a damaged pump**
  Use of a damaged pump could lead to an electric shock or death.

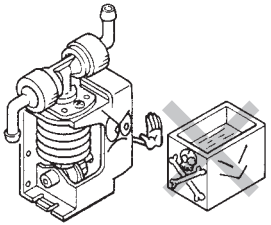
- Use care handling the pump. Do not drop. An impact may affect pump performance.



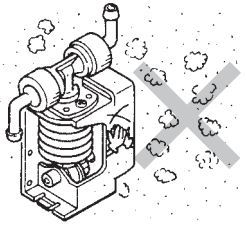
- To reduce the risk of electric shock or death, purchase and install a GFCI (earth leakage breaker) separately.



- Banned solutions:
  - Strong acid or alkaline solution
  - Solutions with hazardous fumes or vapors
  - Paraffinic hydrocarbons such as gasoline and kerosene
  - Halogenated hydrocarbons such as trichloroethylene and carbon tetrachloride
  - Ether and low-grade ester



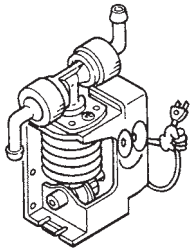
- The pump is not dust-/water-proof. Do not operate the pump while wet with solution or water.



- Risk of electric shock! Always properly ground the pump. Conform to local electric codes. See page 13 for detail.

- Provide the inlet with a filter to prevent foreign matters from getting into the pump and periodically clean the filter, or the pump performance will reduce.

- For the pumps with the variable cam, always stop the pump before adjusting the stroke length (adjustment can not be made while the pump is running.).



⚠CAUTION
The motor may fail when rotated in reverse (positive direction seen from motor end). Do not rotate the motor by hand.

- Observe the allowable discharge pressure range of 0-0.01MPa.

⚠CAUTION
Operation beyond the pressure range can lock, damage or even burn out the motor.

- **Do not clean the pump or nameplate with a solvent such as benzine or thinner. This may discolour the pump or erase printing. Use a dry or damp cloth or a neutral detergent.**

2. Installation/ Piping/ Electrical wiring

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.

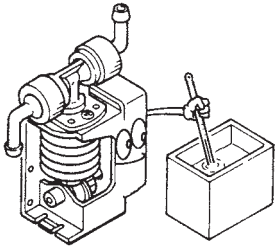
⚠ CAUTION

- **Turn off power before service**
  Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- **Wear protective clothing**
  Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to MSDS precautions from the solution supplier.
- **Qualified personnel only**
  The pump should be handled or operated by qualified personnel with a full understanding of the pump. Any person not familiar with the product should not take part in the operation or maintenance of the pump.

2.1 Installation

1. Installation location

- Select a level location. Ensure proper ventilation at the operation site.
- Keep electric parts and wiring dry.
- Observe the allowable ambient temperature of 5-40°C and ambient humidity of 35-90%RH.
- Allow sufficient space around the pump for easy access and maintenance.

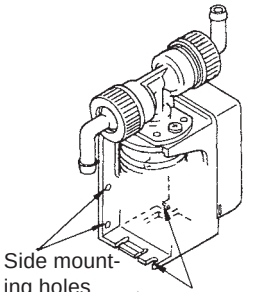


2. The pumps with FKM wet ends must be installed under flooded suction.

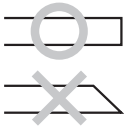
3. Secure the pump by two M4 screws.

CAUTION

Do not install the pump on a unstable place.



4. Cut the tube ends flat beforehand.



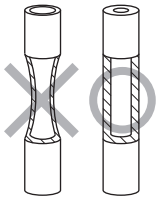
2.2 Piping

1. The short piping with the minimum bends is optimal to reduce resistance. Use a proper suction line I.D. for the prevention of cavitation. For example, use a 2mm or shorter length for a 8mm I.D.

⚠CAUTION

Use a corrosion-/pressure-resistant vinyl tube, otherwise a suction tube can be crushed by negative pressure (especially with a hight temperature liquid). Use of a teflon or braided tube is recommended.

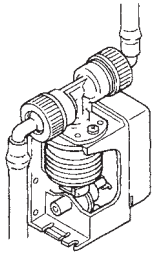
2. Select a suitable tube I.D. for secure connection.



Tube ID: 8mm (KBR-1/-2/-3) or 4mm (KBR-0)

3. Install valves on both discharge and suction lines for easy pump removal and maintenance.

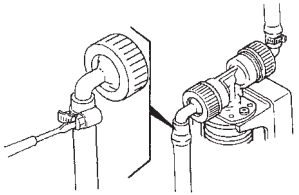
4. Insert the tube into the inlet and outlet as far as it will go.
   Air is entrained and performance reduction results if a suction tube connection is imperfect.



5. Use a band clamp to secure the connection and eliminate the possibility of leakage.

⚠CAUTION

Do not tighten the clamp too much. The plastic inlet or outlet may break.



2.3 Electrical wiring

Electrical wiring must be performed by a qualified electrician. Otherwise, personal injury or property damage could result. Contact us or your nearest distributor for wiring as necessary.

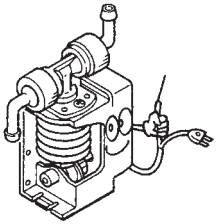
■ Before wiring

1. Check that the main power is turned off.
2. Electrical work should be performed in accordance with local electric codes, with an appropriate wire gauge or so.
3. Apply the specified power voltage. See the spec label.
4. The pump doesn't have an ON-OFF switch and so starts as a power cable is plugged in.

■ Wiring

1. Grounding

Connect the ground wire coming from the motor to a grounding point (except the pumps with 100/115VAC power voltage).



2. Power cable

Pumps with the M8 motor have the power leads coming from the motor. Use suitable solderless connectors to the bare ends of the leads and make an electrical connection with an external power supply.

Pumps with the MG8 motor have no lead wires. Open the motor cover and locate the power terminals of the motor. Use the JST 187 Tab-on type solderless connectors to make an electrical connection with an external power supply.

3. When an earth leakage breaker is used and has blown out, Always investigate and solve root causes. Be sure to unplug the pump before investigation is performed.

1. Before operation

The pump becomes ready after pipework and wiring are completed.

■ Before operation

1. Check for loose screws or tube connections.
2. Check the discharge and suction lines are fully opened.
3. Check for a leak when commissioning is performed.

■ Operation/Stop

The pump doesn't have an ON-OFF switch and so starts as a power cable is plugged in and stops as unplugged.

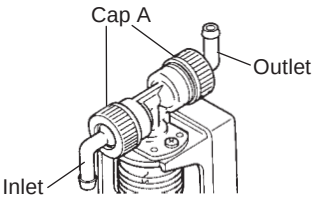
⚠CAUTION

Any rotating part such as the cam, connecting rod and bellows may catch the hand or finger, and it may result in serious injury.

2. Pump head adjustment

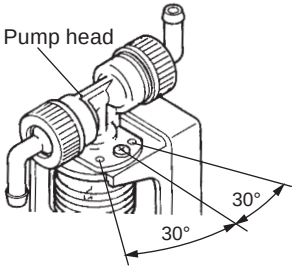
■ Inlet/Outlet directions

Loosen the cap A to release the inlet and outlet to any directions you want. Tighten the cap A to fix them afterwards.



■ Pump head directions

Loosen the fixing screw to change the direction of the pump head in the range shown at right. Tighten the screw to fix the new angle afterwards.

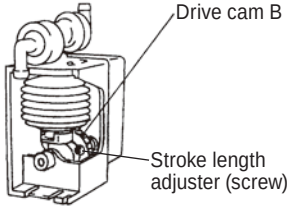


⚠CAUTION

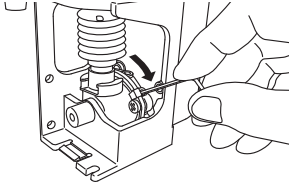
A broken screw hole may result. Do not use excess force when tightening the screw into the plastic frame.
To screw it in without breaking the plastic screw hole, be sure to find the start of the female screw thread.

■ Stroke length adjustment (pumps with variable cam type)

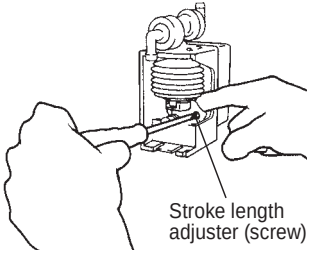
The flow rate can be changed by the stroke length adjustment.



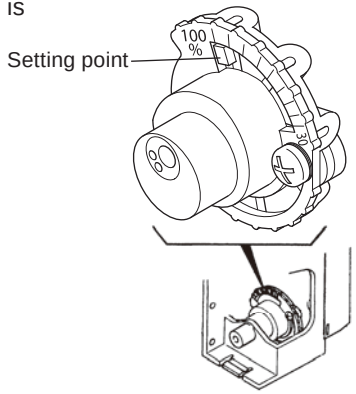
1. Stop the pump, locating the stroke length adjuster screw to the right position.



2. Use a Phillips screw driver to loosen (90-180° counter-clock-wise rotation) the screw. Do not loosen too much, or the nut behind the screw will comes off.



3. Set the gauge to the desired position in between 30-100% stroke length (default setting is 100%SL).



4. Tighten the adjuster screw to secure the position.

1. Trouble shooting

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems. Contact us or your nearest distributor as necessary.

Phenomenon / Cause	Pump does not take in liquid.	No flow rate	Poor flow rate	Leakage	Measure
The check valve is wrongly built.	○	○			Correct the valve.
Clogged check valve	○	○	○		Clean the valve.
Damaged check valve	○	○			Replace the valve.
Loose inlet/outlet	○		○	○	Tighten the cap A.
Loose pump head	○		○	○	Tighten the pump head fixing screws.
Broken bellows	○	○		○	Replace the whole pump unit.
An air lock in the bellows	○	○			Disconnect the discharge line and fill up the bellows with liquid.
Air suction from the inlet	○		○		Secure the tube connection.
The motor doesn't start.	○	○			Check the power voltage. Replace the pump as necessary.
Empty supply tank	○	○			Refill the tank with liquid.
Stroke length is too short (pumps with the variable cam).	○				Run the pump with 100% stroke length and reduce it to a desired length.

2. Maintenance & Inspection

Check for abnormality such as a leak every day. If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems according to the troubleshooting section. If pump performance has remarkably reduced, replace the valve set (poppet valve A and B, valve gasket) or the pump as necessary.

■ Wear parts list

To run the pump for a long period, wear parts need to be replaced periodically. It is recommended that the following parts are always stocked for immediate replacement.

No.	Parts		Estimated life
7 8 9	Poppet valve A* Poppet valve B* Valve gasket*		3000 hr
10	O ring		Every time the bellows is replaced.
11	Bellows		5,000,000 strokes

The parts with * compose the valve set (check valve).
Wear part duration varies with the pressure, temperature and characteristics of gas.
The estimated life above is based on continuous operation with clean water at 20-25°C.

3. Wear parts replacement

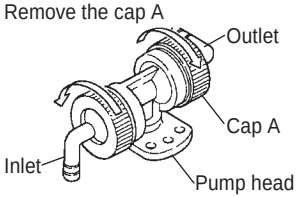
Follow the steps below for replacing wear parts.

⚠ CAUTION

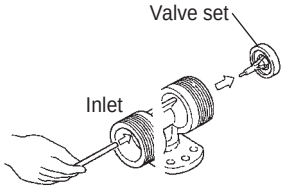
- Turn off power before service.
- Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.
- Dilute and flush out harmful liquid before removing a tube or a pipe.
- Be careful not to loose parts when taking apart the pump.

■ Valve set replacement

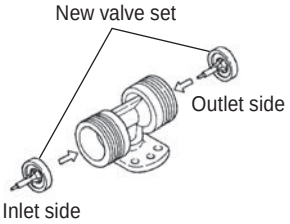
1. Unscrew the cap A to remove the inlet and outlet.



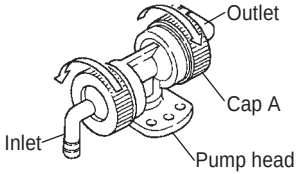
2. Take out the valve sets (check valves). If the outlet valve set has been stuck in the pump head, use a 4mm O.D. or smaller bar to push it out from the opposite side.



3. Replace the new valve sets in place.

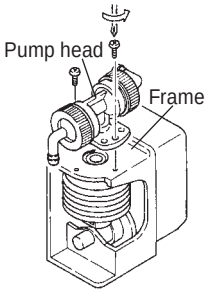


4. Refit the inlet and outlet in place and fasten the cap A to hand tight.

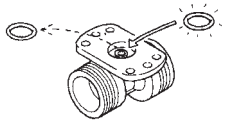


■ O ring replacement

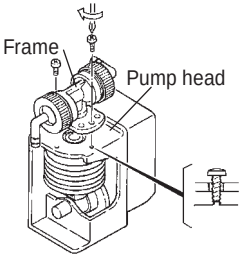
1. Remove the pump head fixing screws and disconnect the pump head.



2. Replace the O ring on the bottom of the pump head with new one.
   *Be careful not to scratch the O ring.



3. Reposition the pump head and fasten the fixing screws by 1.3-1.4N•m.



⚠CAUTION

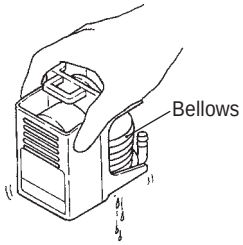
A broken screw hole may result. Do not use excess force when tightening the screw into the plastic frame.

To screw it in without breaking the plastic screw hole, be sure to find the start of a female thread tapped in the frame.

■ Bellows replacement

1. Remove the pump head fixing screws and disconnect the pump head.

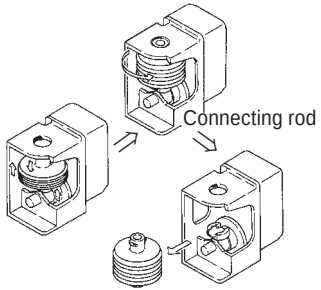
2. Hold the pump upside down to empty the bellows of chemical liquid. Use a syringe as necessary.



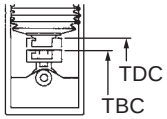
⚠CAUTION

Make sure the bellows is empty and dry. Take measures to keep electric parts and wiring dry.

3. Turn the bellows 90° counter-clockwise to remove it from the pump, vertically shrinking it as necessary.

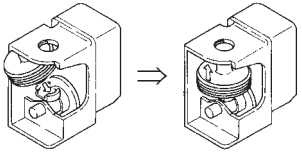


4. Rotate the motor electrically until the connecting rod bottoms out.



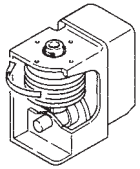
⚠CAUTION
The motor may break. Do not rotate the motor by hand.

5. Refit the new bellows, the bottom end first, into the pump.



6. Rotate the motor electrically until the connecting rod fully contracts.

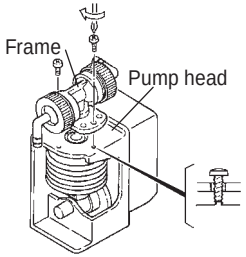
7. Turn the bellows 90° clockwise to catch the connecting rod and the pump frame.



8. Rotate the motor electrically until the connecting rod bottoms out again to check the bellows does not come off.

9. Attach the pump head onto the flame.

⚠CAUTION
A broken screw hole may result. Do not use excess force when tightening the screw into the plastic frame.
To screw it in without breaking the plastic screw hole, be sure to find the start of a female thread tapped in the frame.



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.iwakipumps.jp)

Australia	**IWAKI Pumps Australia Pty. Ltd.**	TEL : (61)2 9899 2411	FAX : 2 9899 2421	**Italy**	**IWAKI Europe GmbH, Italy Branch**	TEL : (39)0444 371115	FAX : 0444 335350
Austria	**IWAKI EUROPE GmbH**	TEL : (49)2154 92540	FAX : 2154 9254 48	**Korea**	**IWAKI Korea Co.,Ltd.**	TEL : (82)2 2630 4800	FAX : 2 2630 4801
Belgium	**IWAKI Belgium n.v.**	TEL : (32)1367 0200	FAX : 1367 2030	**Malaysia**	**IWAKIm Sdn. Bhd.**	TEL : (60)3 7803 8807	FAX : 3 7803 4800
China	**IWAKI Pumps (Shanghai) Co., Ltd.**	TEL : (86)21 6272 7502	FAX : 21 6272 6929	**Norway**	**IWAKI Norge AS**	TEL : (47)23 38 49 00	FAX : 23 38 49 01
China	**IWAKI Pumps (Guangdong) Co., Ltd.**	TEL : (86)750 3866228	FAX : 750 3866278	**Singapore**	**IWAKI Singapore Pte. Ltd.**	TEL : (65)6316 2028	FAX : 6316 3221
China	**GFTZ IWAKI Engineering & Trading (Guangzhou)**	TEL : (86)20 8435 0603	FAX : 20 8435 9181	**Spain**	**IWAKI Europe GmbH, Spain Branch**	TEL : (34)93 37 70 198	FAX : 93 47 40 991
China	**GFTZ IWAKI Engineering & Trading (Beijing)**	TEL : (86)10 6442 7713	FAX : 10 6442 7712	**Sweden**	**IWAKI Sverige AB**	TEL : (46)8 511 72900	FAX : 8 511 72922
Denmark	**IWAKI Nordic A/S**	TEL : (45)48 24 2345	FAX : 48 24 2346	**Switzerland**	**IP Service SA**	TEL : (41)26 674 9300	FAX : 26 674 9302
Finland	**IWAKI Suomi Oy**	TEL : (358)9 2745810	FAX : 9 2742715	**Taiwan**	**IWAKI Pumps Taiwan Co., Ltd.**	TEL : (886)2 8227 6900	FAX : 2 8227 6818
France	**IWAKI France S.A.**	TEL : (33)1 69 63 33 70	FAX : 1 64 49 92 73	**Taiwan**	**IWAKI Pumps Taiwan (Hsin-chu) Co., Ltd.**	TEL : (886)3 573 5797	FAX : (886)3 573 5798
Germany	**IWAKI EUROPE GmbH**	TEL : (49)2154 92540	FAX : 2154 9254 48	**Thailand**	**IWAKI (Thailand) Co.,Ltd.**	TEL : (66)2 322 2471	FAX : 2 322 2477
Holland	**IWAKI Europe GmbH, Netherlands Branch**	TEL : (31)74 2420011	FAX : 2154 9254 48	**U.K.**	**IWAKI Pumps (UK) LTD.**	TEL : (44)1743 231363	FAX : 1743 366507
Hong Kong	**IWAKI Pumps Co., Ltd.**	TEL : (852)2 607 1168	FAX : 2 607 1000	**U.S.A.**	**IWAKI AMERICA Inc.**	TEL : (1)508 429 1440	FAX : 508 429 1386
Indonesia	**IWAKI Singapore (Indonesia Branch)**	TEL : (62)21 690 6606	FAX : 21 690 6612	**Vietnam**	**IWAKI pumps Vietnam Co.,Ltd.**	TEL : (84)613 933456	FAX : 613 933399

T407-4 '14/10