

IWAKI

Electromagnetic Metering Pump

ES-B 24VDC Type

Instruction Manual

⚠ Read this manual before use of product

Thank you for selecting the IWAKI's electromagnetic metering pump ES series. This instruction manual deals with "*Safety Instructions*", "*Outline*", "*Installation*", "*Operation*" and "*Maintenance*" sections.

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

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

Important instructions

For the Safe and Correct Handling of the pump

- "Safety Instruction" section deals with important details about handling of the product. Before the use of the pump, read this section carefully for the prevention of personnel injury or loss.
- 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 a personal injury or 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 instructions

WARNING

- **Turn off power**

Working on the pump while the power is ON, you may be shocked. Be sure to turn off the pump and related devices before any work.



Electrical Shock

- **Terminate operation**

Finding any abnormal condition, stop the operation immediately and inspect/solve problems.



- **For specified application only**

The use of the pump in any application other than those clearly specified may result in injury or damage. Use the pump in a specified condition.



Prohibited

- **No modification**

Do not modify the pump. We are not responsible for any accidents or damage due to modification.



No Remodeling

- **Wear protective clothing**

Always wear protective clothing such as safety goggles and protective gloves when arranging piping or dismantling the pump.



Wear protective gear

- **Do not place the pump close to water**

The pump is not water-proof construction. The use of the pump in a humid place or a place where the pump can get wet, electrical shock or short-circuit may result.



Prohibited

CAUTION

- **Restriction on pump operator**

The pump shall be handled by a qualified person with a full understanding of the pump.



Prohibited

- **Specified power only**

Do not apply any power other than the specified one on the nameplate. Otherwise damage or fire may result.



Prohibited

- **Do not run pump dry**

Friction heat damages the pump if the pump runs without liquid.



Prohibited

- **Do not wet the pump**

If a liquid spills over electric parts or wires, a fire or electrical shock may be caused. Install the pump in a place free from liquid spillage.



Do not wet or dampen

Safety instructions

CAUTION

- **Ventilate**

Poisoning may result when handling toxic or odorous liquid. Ventilate the operating site sufficiently.



Caution

- **Countermeasure against efflux**

Take a protective measure against the accidental efflux caused by the pump or piping breakage.



Caution

- **Damaged pumps**

Do not use any damaged pump. Using a damaged pump could lead to an electric leak or shock.



Prohibited

- **Do not damage power cable**

Do not scratch, damage, modify, or pull the power cable. Heating the cable or placing a heavy thing on it may also damage the cable and may result in a fire or electrical shock.



Caution

- **Install an earth leakage breaker**

Risk of electrical shock. Do not run the product without an optional leakage breaker. Install a leakage breaker to reduce the risk of electrical shock. Purchase separately.



Electrical Shock

- **Damaged power cable**

Do not use any damaged power cable for the prevention of a fire or electrical shock.



Electrical Shock

- **Wear parts replacement**

Replace wear parts in accordance with instructions. Do not dismantle the pump beyond the extension described on this manual.



- **Limited operating site and storage**

Do not install or store the pump in the following places...

1. Ambient temperature is beyond 0-40 dig.C.
2. Under a flammable atmosphere.



Prohibited

- **Pump disposal**

Dispose of any used or damaged pump in accordance with local laws and regulations. Consult a licensed industrial waste products disposing company.



- **Always set the stroke length to 60% or more**

The pump may not discharge liquid with the stroke length below 60% even if the maximum discharge pressure is observed. In this case the pump internal temperature rises and failure may result.



Caution

- **Set a stroke rate at 180spm or below for a long period of the external operation (more than 30 minutes)**

Otherwise the coil temperature rises and failure may result.



Caution

Outline

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Outline

1. Safety & Caution notes

Avoid areas where ambient temperature exceeds 40 deg.C or falls below 0 deg.C, or where the pump or tubing would be exposed to direct sunlight.

Disconnect the pump from the power source before performing any maintenance.

Always wear proper protective clothing recommended by the chemical liquid supplier.

Depressurize the discharge line before disconnecting the tubing or performing maintenance on the pump.

2. Principle of operation

The ES series electromagnetic metering pump consists of a pump unit, a drive unit, and a control unit. The drive unit has an electromagnetic solenoid system. The magnetic force of the solenoid and a spring force make a reciprocating motion of an armature shaft. PTFE covered diaphragm is attached at the end of the armature shaft.

Liquid is discharged as the shaft advances by the electromagnetic force, decreasing the volume and increasing the pressure in the pump head.

Liquid is sucked as the shaft retracts by the spring force, increasing the volume and decreasing the pressure in the pump head.

3. Specifications

Capacity/Pressure rating

Model	B11	B16	B21	B31
Max. discharge capacity (L/H)	2.28	3.9	5.7	10.8
Max. discharge capacity (ml/min)	38	65	95	180
Max. discharge pressure (MPa)	1.0	0.7	0.4	0.2
Stroke length mm(%)	0.5-1.0 (50-100%)			0.43-0.85 (50-100%)
Stroke rate (spm)	0-360			
Connection tube size (mm)	ø4×ø9, ø4×ø6 ø1/4"×ø3/8"			ø8×ø13, ø9×ø12 ø3/8"×ø1/2"
Rated voltage (VDC)	24			
Permissible voltage range (VDC)	22.8-25.2			
Average power consumption (W)	22			
Average current (A)	1.8			

NOTE 1. The data above is based on the operation with clean water at the rated voltage in ambient temperature.

NOTE 2. The discharge capacity is based on the operation with clean water at the max discharge pressure (100% stroke length and 360spm). A discharge capacity becomes higher than the max level as discharge pressure gets lower.

NOTE 3. Permissible ambient temperature : 0 - 40°C

NOTE 4. Permissible liquid temperature : 0 - 40°C

NOTE 5. Permissible relative humidity : 30 - 90%RH Non-condensing

NOTE 6. Permissible voltage fluctuation: ± 5% of the rated voltage

- Ask us for special cases such as slurry transfer.

- Specification may be changed for product improvement without prior notice.

NOTE 7. The power source shall satisfy the maximum current of 4A. If it is not satisfied, the performance above may not be obtained.

CAUTION

- **Always set stroke length to 60% or more**

The pump may not discharge liquid with the stroke length below 60% even if the maximum discharge pressure is observed. In this case the pump internal temperature rises and failure may result.

- **Set a stroke rate at 180spm or below in a continuous external operation (more than 30 minutes)**

Otherwise, the coil temperature rises and failure may result.

Liquid end materials

Liquid ends	VC
Pump head	PVC
Diaphragm	PTFE (bonded to EPDM)
Valve ball	Alumina ceramic
Valve seat	FKM
Valve guide	PVC
Gasket	PTFE
O ring	FKM

PVC: Polyvinyl chloride

PTFE: Polyterafluoroethylene

EPDM: Ethylene propylene diene monomer

FKM: Fluoroelastmer

Installation

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Installation

1. Unpacking

After unpacking, check for transit damage. Contact us or your nearest dealer if the delivery is imperfect.

2. Location

Install the pump in a clean and dry atmosphere where is convenient for wiring and pipework. Avoid areas where ambient temperature exceeds 40 deg.C or falls below 0 deg.C, or where the pump or tubing would be exposed to direct sunlight.

Flooded suction (mounting the pump below the liquid level in the supply tank) is strongly recommended, especially when pumping gaseous liquid such as sodium hypochlorite and hydrogen peroxide (See Figure 1).

If flooded suction is not possible, install a shelf and place the pump on it (See Figure 2).

Use a special tank or cover when mounting the pump on top of it (See Figure 3).

In any cases, the total suction lift should not exceed 1.0m.

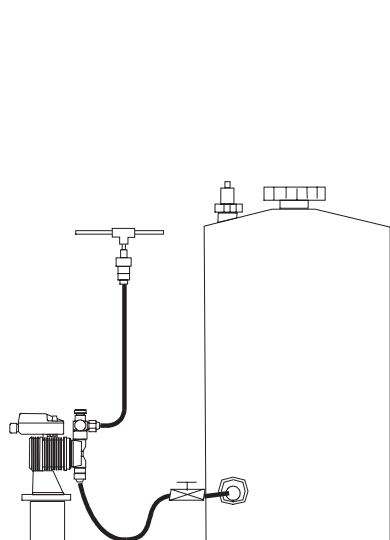


Figure 1
Flooded Suction

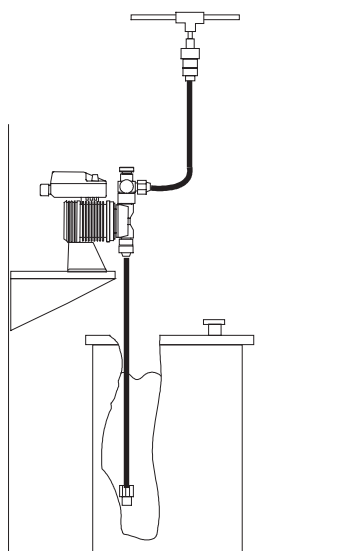


Figure 2
Shelf Mount

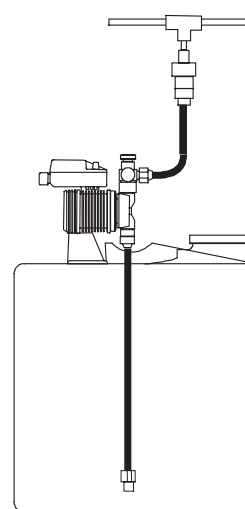


Figure 3
Tank Mount

Installation

3. Suction line

Have tubing the shortest with the minimum number of bends. In flooded suction, install a gate valve on the suction line for easier overhaul and inspection. In other than flooded suction, install a foot valve to the suction tube end. The foot valve shall be at least 25mm away from the bottom of the tank. Do not make an arched line in order to prevent air from being trapped. To keep a straight tube line, lay the tube through the PVC pipe.

4. Discharge line

The length of a discharge line is not restricted, however, try not to bend or twist a tube. Install a check valve (optionally available) at the end of discharge line (injection point).



Hastelloy or other metal springs in the check valve are attacked by some chemicals such as HCL. Contact us for a special check valve for this application.

5. Wiring

■ Power source



Only qualified operators/service staff shall be in charge of the related electrical arrangement and the control for the power source. Failure to observe this instruction may result in personal injury or property damage.

Before wiring

- Be sure to turn off the pump and related devices.
- Note that the pump is not equipped with a switching device. The pump starts to run as powered on.
- Always observe applicable codes or regulations during wiring work. Use suitable wiring materials.

Precautions for ON-OFF control by the relay

When using a relay for ON-OFF operation, its contact capacity should be 15A or more. Contact point may fail if contact capacity is less than 15A.



Do not apply any power other than the one specified on the nameplate. Otherwise, the control unit may be damaged.

Installation

■ External control

CAUTION

- Risk of electrical shock or short circuit. Do not conduct wiring work while the pump is powered.
- The pump is still charged right after turning off power. Wait for one minute before wiring.

External signal

The ES-B features ...

External operation : The input of the external signal controls pump spm.

STOP function : The input of the external signal (no voltage contact or open collector signal) starts/stops the pump operation. Set pulse width from 10ms to 100ms. The number of pulses shall be at or below 360spm.

CAUTION

Set a stroke rate at 180spm or below for a continuous external operation (more than 30 minutes). Otherwise, the coil temperature rises and failure may result.

Operation

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Operation

Run the pump according to the following procedures after pipework and wiring is completed.

CAUTION

- External operation

Before the pump is operated by the external signal, be sure to set the stroke rate adjusting knob to "E" position. Otherwise failure may result.

*Set a stroke rate at 180spm or below in a continuous external operation (more than 30 minutes). Otherwise the coil temperature rises and failure may result.

- Do not run the pump with a closed-discharge. Otherwise, leakage or pipe rupture may result. In addition, if a closed-discharge operation continues more than 30 minutes, pump internal temperature may rise significantly. This can lead to leakage when the pump head and valve cases are deformed or when the pump head becomes loose.

- Do not run pump dry. Once a pump runs dry, it carries the possibility of leakage. Be sure to check if the pump is primed before operation.

* If the pump runs dry for longer than 30 minutes, the internal temperature of the pump rises, so that the pump head and valve guide deform and the pump head fixation becomes loose, resulting in leakage.

- Keep the pump head fixed. Otherwise leakage may result.

* Retighten four pump head fixing bolts before starting the initial pump operation. The bolts may be loosened during storage or transit.

* Tightening torque: 2.16N•m (B11•16•21)
2.55N•m (B31)

Always tighten the bolts diagonally and evenly by the tightening torque.

1. Degassing

Observe the above instructions to install the pump. Turn on the pump and set stroke rate to 100%.

If the pump is equipped with an air vent port, open the adjusting screw by 1/2 turn. Then liquid starts to move into the pump head through the suction tube. When liquid starts to come out from the air bleed tube, close the adjusting screw. See "Flow rate adjustment" section on next page. If an air vent port is not equipped, disconnect the discharge tube from your system. When liquid comes to the discharge tube from the pump head, set stroke rate to 0% to stop the pump and reconnect the discharge tube to your system.

Operation

2. Flow rate adjustment

First adjust the flow rate by the stroke rate adjustment. Adjust the stroke length for the range where stroke rate adjustment can not reach.

Precautions for stroke rate adjustment

- **When pumping gaseous liquid such as sodium hypochlorite (NaOCl) and hydrazine solution (N₂H₂O₂)**

Set stroke length to 100% and adjust the flow by changing stroke rate.

Air lock may occur when stroke length is set short.

- **When back pressure is high**

Set stroke length to 100% and adjust the flow by changing stroke rate.

- **When the flow rate per shot greatly influences the reaction in neutralization or titration application**

Shorten the stroke length to reduce the flow rate per shot. And then adjust the flow by changing a stroke rate.

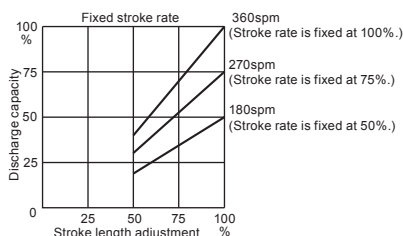


Always set stroke length to 60% or more

The pump may not discharge liquid with the stroke length below 60% even if the maximum discharge pressure is observed. In this case the pump internal temperature rises and failure may result.

Procedure

Determine a suitable stroke length and stroke rate, taking account of the pump operating condition and liquid characteristics.



- a. Set stroke length to 100% and then target a specified flow rate by changing a stroke rate.
- b. Measure a flow rate.
- c. If the flow rate have not reached a specified level, change a stroke rate and measure it again.
- d. Change the stroke length for fine adjustment.



- **Always set stroke length to 60% or more**

The pump may not discharge liquid with the stroke length below 60% even if the maximum discharge pressure is observed. In this case the pump internal temperature rises and failure may result.

- **Never turn the stroke length adjusting knob when the pump is stopped.**

- e. Measure the flow again to see if the specified flow is obtained.

Operation

Stroke rate adjustment

A stroke rate can be adjusted by changing the stroke rate adjusting knob.

- A stroke rate shall be changed between 20-360spm (10-100%).

If a precise flow rate is required, measure the actual flow volume by minute.

Operation

Start the pump operation after degassing and flow rate adjustment are finished. Select either manual operation or external operation.

Manual operation

- The pump starts as powered on. At this time the LED on the controller starts to blink orange with each shot.
- The pump stops as powered off. At this time the LED stops blinking.

External operation

- The pump can be controlled by the external signal. Arrange wiring between the red wire (external) and blue wire (common).
- Set the stroke rate adjusting knob to "E" position during wiring work.
- The pump makes one shot as receiving a signal. The pump can run at 0-360spm according to the number of signals.
- Use the no voltage contact signal or open collector signal.
- The pulse width of the external signal shall be 10-100msec.
- Set a stroke rate at 180spm or below in a continuous external operation (more than 30 minutes).
- Be sure to set the stroke rate adjusting knob to "E" position in the external operation.

Stop function

The start/stop of the pump operation can be controlled by the external signal. Arrange wiring between the yellow wire (STOP) and blue wire (common). Use the no voltage contact signal for the input of the stop signal. Contact us or your nearest dealer for detail.

- The pump starts as powered on. At this time the LED on the controller starts to blink orange with each shot.
- The pump stops as receiving the stop signal. The LED stops blinking, staying orange.

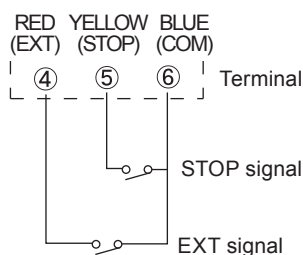
Operation stop

The pump stops running and the LED disappears as powered off.

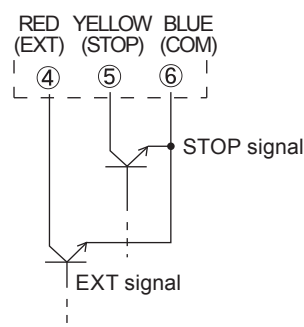
- Before a long period of stoppage (One month or more), run the pump with clean water for about thirty minutes to rinse the insides of the pump head and tubing.
- Before resuming operation after a long period of stoppage, clean the valve sets, removing foreign matters. If gas is in the pump head, expel gas and readjust the flow rate.

Wiring diagram

When a no-voltage contact is used



When an open collector signal is used



Maintenance

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Maintenance

⚠ CAUTION

Before working on the pump, disconnect the power cord, depressurize the discharge line. And then drain or flush any residual liquid for the pump head and valves.

1. Diaphragm replacement

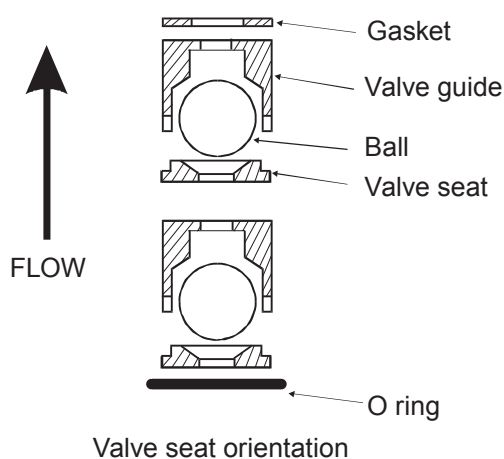
Remove the power cord from the terminal and disconnect the suction, discharge and air bleed tubes. Remove the four pump head fixing bolts with a 4mm hex wrench. Unscrew the diaphragm and remove a retainer (small disk behind the diaphragm). Install the new retainer and diaphragm on the shaft. Turn the diaphragm clockwise on the shaft until it bottoms. Refit the pump head and tighten the pump head fixing bolts by 2.16/2.55 N•m.

2.16N•m (B11•16•21)

2.55N•m (B31)

2. Valve replacement

Remove the suction & discharge tubes, the fittings and the valve set (valve ball×2, valve seat×2, valve guide×2, gasket×1 and O ring×1). Mount new valve sets. Be sure both valve seats are in the same orientation. Refer to the diagram below. Refit the fitting and connect tubes in the last place.



3. Tubing

Check tube ends for splits, cracks & spots. Check entire tube length for wear and the damage due to exposure to excessive temperature or ultraviolet ray (direct sunlight or mercury vapour lamps). If any signs of deterioration exist, replace the entire tube. Replace discharge tube every 12 months.

Maintenance

4. Troubleshooting



CAUTION

Unplug the pump before work. Release the internal pressure from discharge line and drain or flush residual liquid from the pump head.

Problem	Possible cause	Corrective action
Pump does not start	<ul style="list-style-type: none"> - Faulty wiring - Improper voltage - The control unit is damaged. 	<ul style="list-style-type: none"> - Correct wiring. - Apply a proper voltage. - Replace the control unit.
Pump does not prime	<ul style="list-style-type: none"> - Air stays in suction line. - Valve gasket is not installed. - Valve set is set up improperly. - Air lock - Pump head valves are clogged with foreign matters. - A ball valve is stuck to the valve seat. 	<ul style="list-style-type: none"> - Reroute suction line to eliminate air trap. - Install a valve gasket. - Set it properly. - Open an air vent valve. - Disassemble, inspect, clean the valves. - Disassemble, inspect, clean the valves.
Output fluctuates	<ul style="list-style-type: none"> - Pump head valves are clogged with foreign matters. - Air is trapped in pump. - Overfeeding - Diaphragm is damaged. 	<ul style="list-style-type: none"> - Disassemble, inspect, clean the valves. - Open an air vent valve. - Install check valve or back pressure valve. - Replace diaphragm.
Liquid leaks	<ul style="list-style-type: none"> - Fitting or coupling nut is loose. - Pump head fixing bolts are loose. - Diaphragm is damaged. - O ring or valve gasket is missing. 	<ul style="list-style-type: none"> - Retighten them. - Tighten pump head bolts. - Torque: 2.16N•m (B11•16•21) 2.55N•m (B31) - Replace diaphragm. - Install O ring or valve gasket.

! Check if the pump head fixing bolts are not loosen every 3 months. Tighten them diagonally by the following tightening torques as necessary. The fixing bolts may loosen during operation (An extent of looseness depends on operating condition.).

Tightening torque of the pump head fixing screw

Torque	Torque	Part names
ES-B11 • 16 • 21	2.16N • m	M4 hex. socket head bolts
ES-B31	2.55N • m	M4 hex. socket head bolts

Maintenance

5. Model code

Pump

ES-B 16 VC-24D 1 -
a b c d e f g

a. Series name

ES: With manual stroke speed control

b. Drive unit

Average power consumption: B 22W

c. Diaphragm effective diameter

11: 10mm 16: 15mm 21: 20mm 31: 30mm

d. Liquid end material

See the table of liquid end materials on page 6.

VC: Ceramic ball valves

e. Power-supply voltage

24D: 22.8-25.2VDC

f. Tube connection bore

1: 4×9mm 2: 4×6mm 4: 8×13mm

5: 9×12mm 7: 1/4"×3/8" 8: 3/8"×1/2"

g. Special version

Controller

ESC-B 24D -
a b c d

a. Series name

b. Drive unit

Code	Average power consumption
B	22W

c. Power source

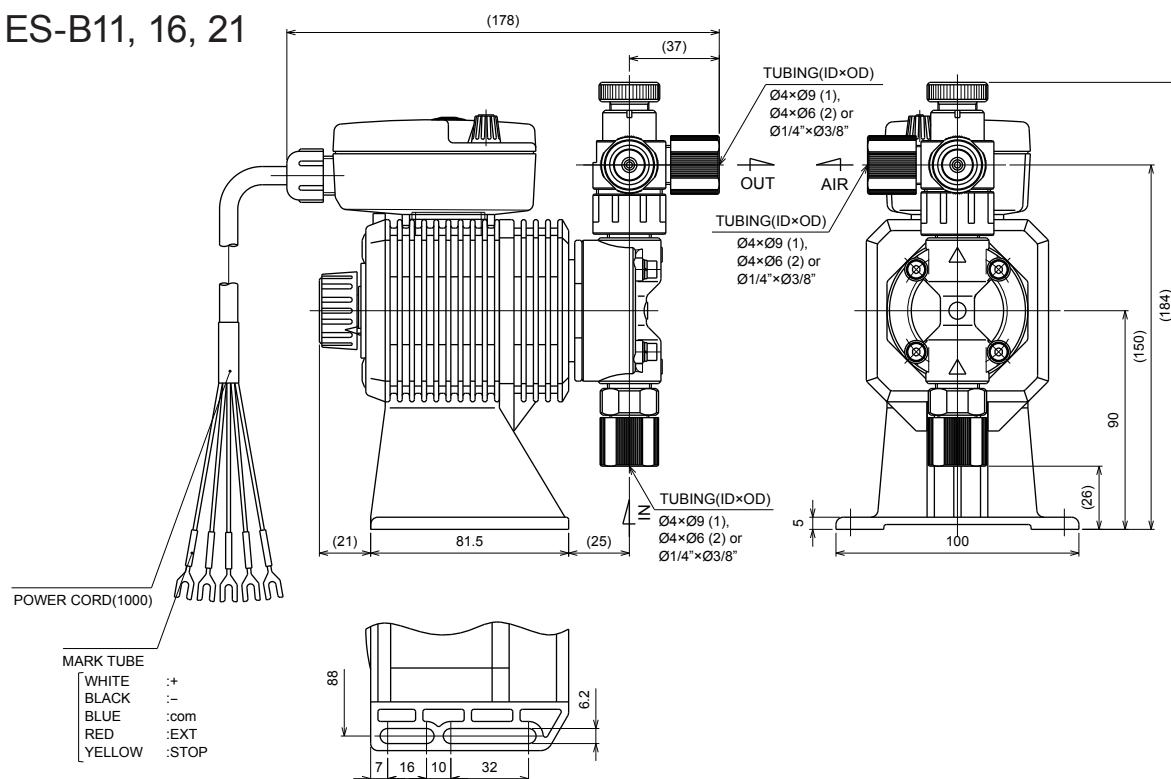
Code	Voltage	Permissible voltage range
24D	24VDC	22.8-25.2VDC

d. Special version

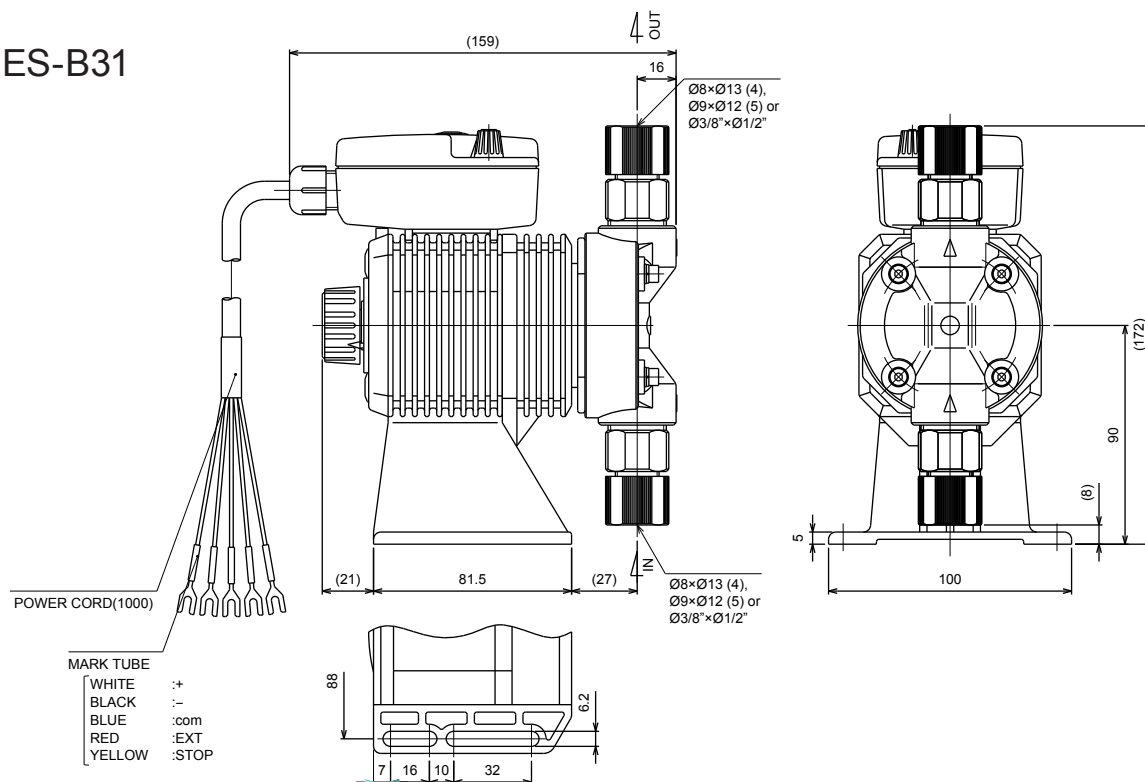
Maintenance

6. Dimensions

ES-B11, 16, 21



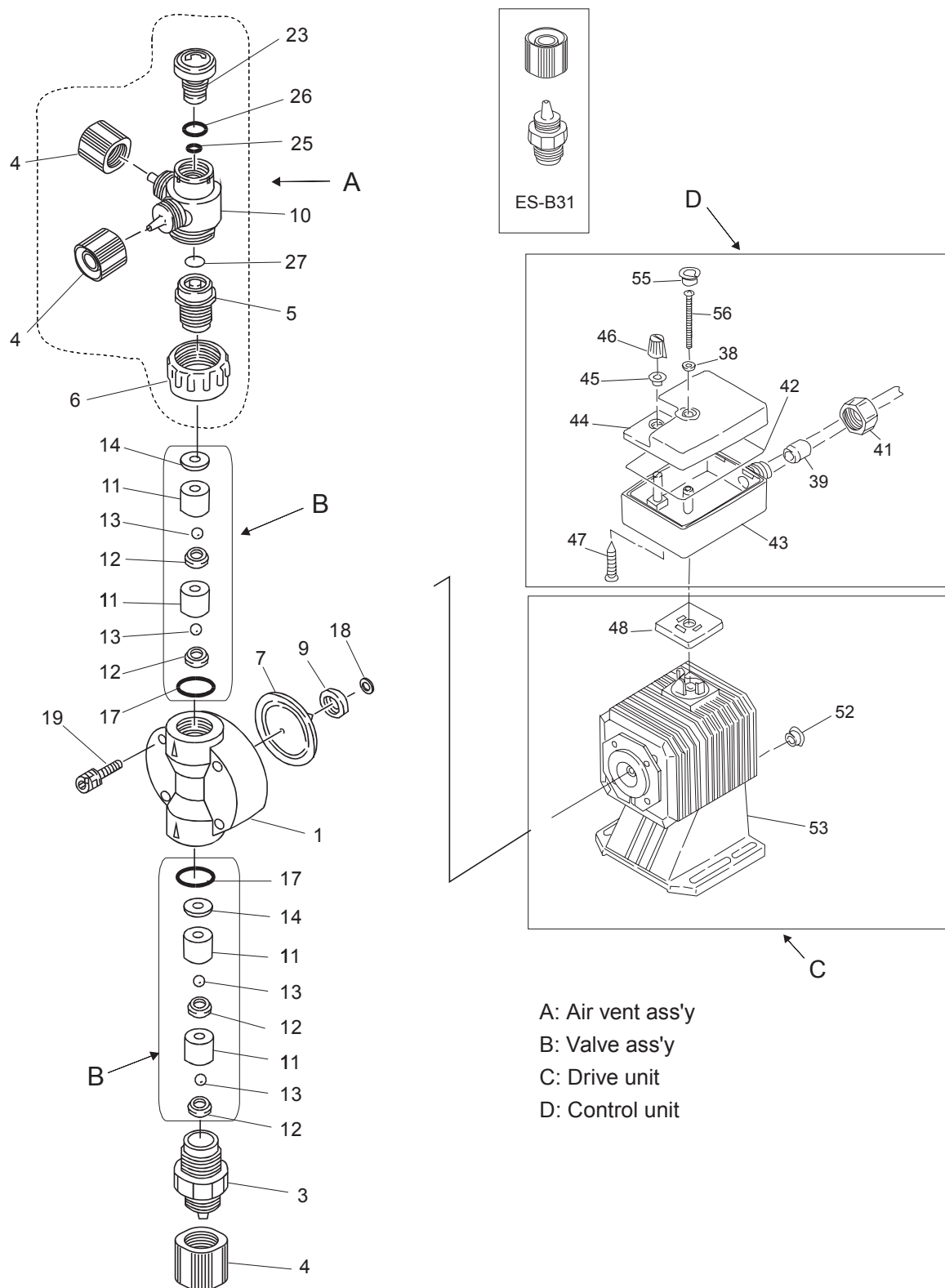
ES-B31



Maintenance

7. Exploded view

Models with thermoplastic liquid end materials and air vent valve



- A: Air vent ass'y
- B: Valve ass'y
- C: Drive unit
- D: Control unit

NOTE: The fitting nut (4) may differ from illustrated ones.

Maintenance

8. Parts list

Item	Description	Material	Q'ty per Item			
			B11	B16	B21	B31
1	Head, 11	PVC	1			
	Head, 16			1		
	Head, 21				1	
	Head, 31					1
3	Fitting, $\varnothing 4 \times \varnothing 9, \varnothing 4 \times \varnothing 6, \varnothing 1/4" \times \varnothing 3/8"$	PVC	1			
	Fitting, $\varnothing 8 \times \varnothing 13, \varnothing 9 \times \varnothing 12, \varnothing 3/8" \times \varnothing 1/2"$					2
4	Fitting, $\varnothing 4 \times \varnothing 9, \varnothing 4 \times \varnothing 6, \varnothing 1/4" \times \varnothing 3/8"$	PVC	3			
	Fitting, $\varnothing 8 \times \varnothing 13, \varnothing 9 \times \varnothing 12, \varnothing 3/8" \times \varnothing 1/2"$					2
5	Air vent body B	PVC	1			
6	Lock nut	PVC	1			
7	Diaphragm, 11	PTFE+EPDM	1			
	Diaphragm, 16			1		
	Diaphragm, 21				1	
	Diaphragm, 31					1
9	Retainer, 11	PPS	1			
	Retainer, 16			1		
	Retainer, 21				1	
	Retainer, 31					1
10	Air vent body A	PVC	1			
11	Valve guide	PVC	4			
12	Valve seat	FKM	4			
13	Valve ball	CE	4			
14	Gasket	PTFE	2			
17	O-ring, S14	FKM	2			
18	Spacer:0.2,0.3,0.5,0.7mm	Brass	1			
19	Bolt, M4X40	SUS316 equivalent	4			
23	Adjusting Screw	PVC	1			
25	O-ring, P4	FKM-A	1			
26	O-ring, P10A	FKM-A	1			
27	O-ring, P7	FKM-A	1			
38	Gasket	EPDM	1			
39	Cord Gasket M	NBR	1			
41	Cord Nut	POM	1			
42	Case Gasket	NBR	1			
43	Control unit case	PPE	1			
44	Control unit cover	PPE	1			
45	SF Gasket	EPDM	1			
46	SF Knob	PE	1			
47	Screw 4x25	SUS304 equivalent	1			
48	Terminal Gasket	NBR	1			
53	Pump body	PPG	1			
52	Plug		1			
55	Cap Gasket	EPDM	1			
56	Screw, M3x35	SUS304 equivalent	1			

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Australia	: IWAKI Pumps Australia Pty. Ltd.	TEL : (61)2 9899 2411	FAX : 2 9899 2421	Italy	: IWAKI Italia S.R.L.	TEL : (39)02 990 3931	FAX : 02 990 42888
Singapore	: IWAKI Singapore Pte. Ltd.	TEL : (65)763 2744	FAX : 763 2372	Denmark	: IWAKI Pumper A/S	TEL : (45)48 24 2345	FAX : 48 24 2346
Indonesia	: IWAKI Singapore (Indonesia Branch)	TEL : (62)21 690 6607	FAX : 21 690 6612	Sweden	: IWAKI Sverige AB	TEL : (46)8 511 72900	FAX : 8 511 72922
Malaysia	: IWAKIm Sdn. Bhd.	TEL : (60)3 7803 8807	FAX : 3 7803 4800	Finland	: IWAKI Suomi Oy	TEL : (358)9 2742714	FAX : 9 2742715
Taiwan	: IWAKI Pumps Taiwan Co., Ltd.	TEL : (886)2 8227 6900	FAX : 2 8227 6818	Norway	: IWAKI Norge AS	TEL : (47)66 81 16 60	FAX : 66 81 16 61
Thailand	: IWAKI (Thailand) Co.,Ltd.	TEL : (66)2 320 1303	FAX : 2 322 2477	France	: IWAKI France S.A.	TEL : (33)1 69 63 33 70	FAX : 1 64 49 92 73
Hong Kong	: IWAKI Pumps Co., Ltd.	TEL : (852)2 607 1168	FAX : 2 607 1000	U.K.	: IWAKI PUMPS (UK) LTD.	TEL : (44)1743 231363	FAX : 1743 366507
China	: GFTZ IWAKI Engineering & Trading Co., Ltd.	TEL : (86)20 8435 0603	FAX : 20 8435 9181	Switzerland	: IWAKI (Schweiz) AG	TEL : (41)32 3235024	FAX : 32 3226084
China	: IWAKI Pumps Co., Ltd. (Beijing office)	TEL : (86)10 6442 7713	FAX : 10 6442 7712	Austria	: IWAKI (Austria) GmbH	TEL : (43)2236 33469	FAX : 2236 33469
China	: IWAKI Pumps (Shanghai) Co., Ltd.	TEL : (86)21 6272 7502	FAX : 21 6272 6929	Holland	: IWAKI Holland B.V.	TEL : (31)297 241121	FAX : 297 273902
Philippines	: IWAKI Chemical Pumps Philippines, Inc.	TEL : (63)2 888 0245	FAX : 2 843 3096	Spain	: IWAKI Iberica Pumps, S.A.	TEL : (34)943 630030	FAX : 943 628799
Korea	: IWAKI Korea Co.,Ltd.	TEL : (82)2 3474 0523	FAX : 2 3474 0221	Belgium	: IWAKI Belgium n.v.	TEL : (32)1430 7007	FAX : 1430 7008
Vietnam	: IWAKI Pumps Vietnam Joint Venture Co.,Ltd.	TEL : (84)613 933456	FAX : 613 933399				

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