IWAKI PUMPS

IWAKI Controller

Model FDC-1

Instruction Manual

⚠ Read this manual before use of product

Thank you for purchasing Iwaki Controller Model FDC-1.
This controller is an exclusive use for Iwaki pneumatic bellows pump. This document provides “Notice and warnings”, “Overview”, “Set up”, “Operation” and “Maintenance”, and explains handling and how to operate the controller.
To make sure for your safety and correct use, please read this manual entirely before using the controller, and comprehend thoroughly for each clause.

Contents

Please keep this document at customer’s site in order to review whenever it is necessary. For additional information, please inquire our local representatives in your area, or call us directly.

Important Instruction

For the Safe and Correct Handling of the Pump

- Read the "Safety Instructions" sections carefully to prevent accidents involving your customers or other personnel and to avoid damage or loss of other assets. Always follow the instructions and advice found in these sections.

- Observe and abide by the instructions described in this manual. These instructions are very important for protecting pump users from potentially dangerous conditions and situations related with the use of the pump system.

- The symbols relate to the following meanings described below:

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

Types of Symbols

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

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

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

Safety Section

⚠ WARNING

- **For specified application only**
  Model FDC-1 is the exclusive use controller designed for IWAKI pneumatic drive bellows pump FA, FF, FH, FW and FS Series. Do not use this controller for other pumps or application.


Prohibited

- **Do not disassemble and remodel**
  Do not disassemble and remodel the controller.


No Remodeling

⚠ CAUTION

- **Qualified operator only**
  The controller must be operated or maintained by the person who has enough knowledge of the product and experience of handling of product.


Prohibited

- **Place to be installed and stored**
  This controller is not explosion-proof design. Do not install or store the controller at flammable atmosphere. Do not install or store the controller at corrosive atmosphere.Otherwise, it may be failed or cause accident.


Prohibited

- **Precautions for wiring proximity switches**
  Wrongly wired proximity switches (Right and Left) may cause the seizure of contacts. Pay attention to the wiring.


Caution

- **Specified voltage only**
  Do not use the controller with other voltage than specified one. Otherwise it may causes fire or electrical shock.


Prohibited

OVERVIEW

1. Unpacking and inspection

1) Please inspect immediately on the followings as soon as you receive the product, and inquire the shop you ordered if any objectionable was found.
   (1) Identify if the model number described on the front panel is the same as you ordered.
   (2) Check if there is any damage(s) suffered from accident(s) during transportation.
   (3) Confirm all of accessories were included. (if specified)
      *Standard accessories: one each connector (CN1~CN6), total 6 connectors and a set of contact for the connectors.
      *Optional accessories: Cable exclusively used for Electro- pneumatic regulator. (Only if ordered as an optional)

2. Specification

General Spec.	Power supply	DC24V + / - 10%	
	Power Consumption	24VA or less	
	Ambient temp.	0 ~ 50 °C	
	Ambient humidity	85% or less (No condensing)	
Input Spec.	Leak sensor input	Voltage between electrodes	DC24V + / - 10%
		Operating resistance	Detect:0~15kohm (25k ohm or more: no detection)
	Proximity switch input	Input signal	Proximity Switch (negative logic operation)
		ON voltage level	3V or less
		OFF voltage level	5V or more
	External start input	Input signal	Potential free contact or NPN open collector output
		ON voltage level	3V or less
		OFF voltage level	18V or more
	External alarm reset input	Input signal	Potential free contact or NPN open collector output
		ON voltage level	3V or less
		OFF voltage level	18V or more
Output Spec.	Solenoid valve operation output	Output	NPN open collector output
		Output load voltage	DC 24V + / - 10%
		Output load current	1A (MAX)
	Leak alarm output Time-up alarm output Life alarm output Fast alarm output	Output	NPN open collector output
		Output load voltage	DC 24V + / - 10%
		Output load current	1A (MAX)
	Electro-pneumatic Regulator control output	Output signal	Analog signal
		Voltage range	0 ~ 10V
		Resolution	8bit D/A converter

3. External dimensions

(1) Controller (Fig. 1)
(2) Electro-pneumatic regulator (Option) (Fig. 2)

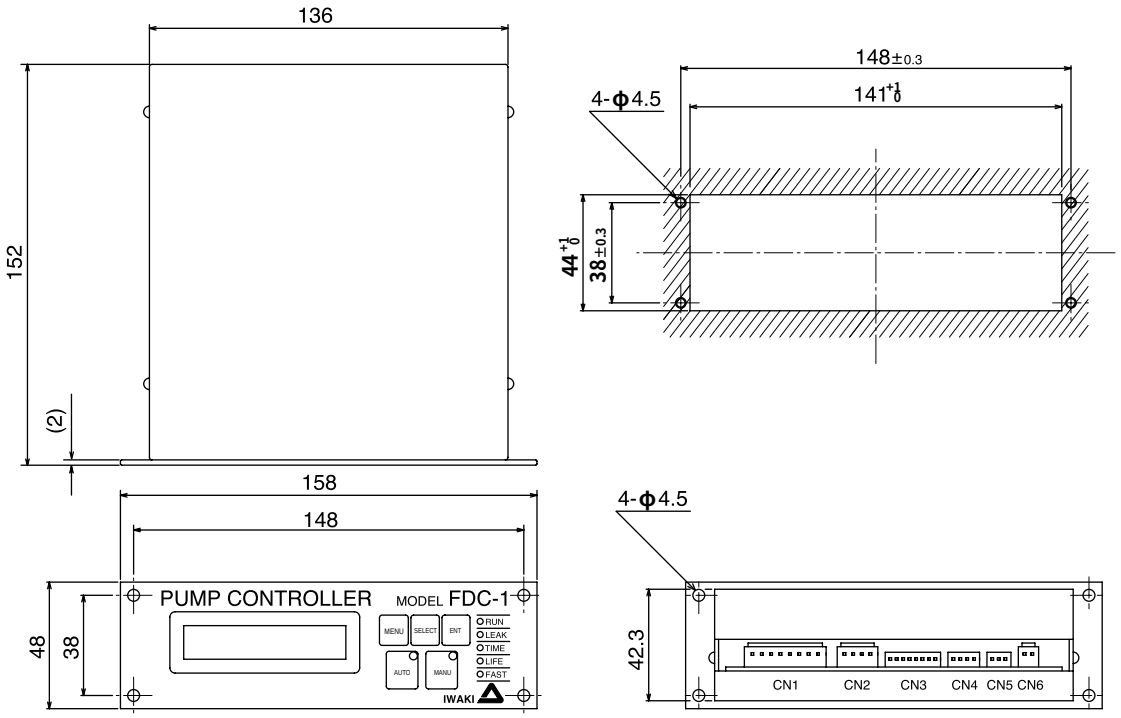


Fig. 1

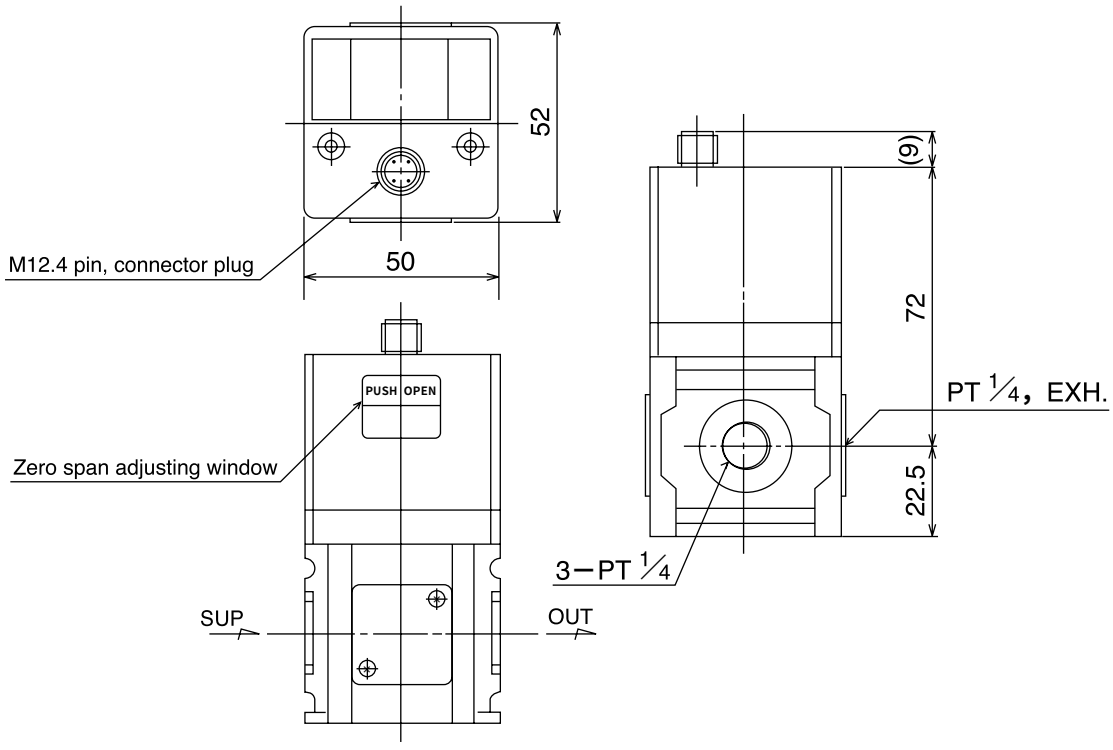


Fig. 2

4. Names and explanations of component devices

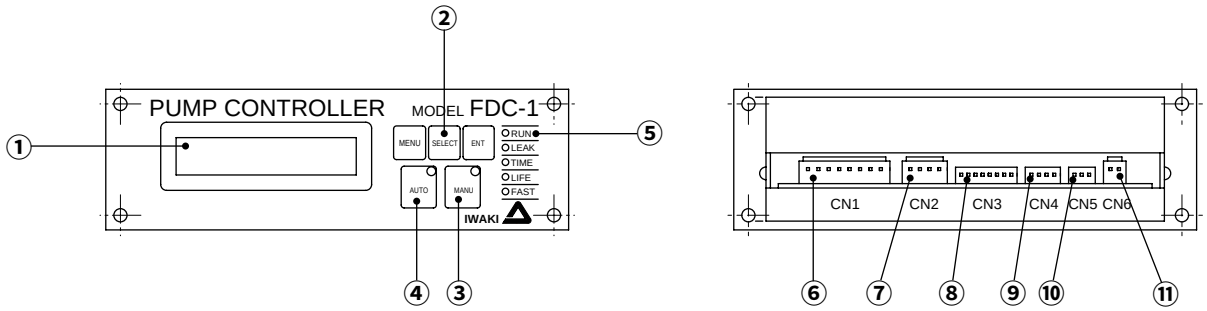


Fig. 3

① LCD panel:

Describes setting item, operating condition and contents of alarm for each pump in English abbreviation. (2 lines, 16 alphabets)

② **MENU** key, **SELECT** key and **ENTER** key :

SELECT key: To be used for writing selection of each setting value. At that time, ENTER key will be used for confirmation of figure down of value and operation.

By the combination of MENU key and SELECT key, it is able to access to each setting screen individually.

ENTER key: The designation of setting screens No., changeover of Stop & Run and Alarm reset can be executed.

③ Controller operation mode selection key (MANU operation):

When LED turns on by depressing **MANU** key, operation mode can be switched to manual operation mode. Manual mode can effect all sort of setting and work on the panel manually.

④ Controller operation mode selection key (AUTO operation):

When LED turns on by depressing **AUTO** key, operation mode can be switched to automatic operation mode. Automatic operation mode can effect all sort of setting on the panel manually, and remote operation can be effected for pump start, pump stop and alarm reset respectively by zero voltage contact signal or open collector signal.

⑤ LEDs:

There are 5 LEDs in total. The explanation of each LED is as follows.

RUN: Turns on while pump is operating. (Green)

LEAK: Turns on when leak alarm is detected. (Red)

TIME: Turns on when time-up alarm is detected. (Red)

LIFE: Turns on when life alarm is detected. (Red)

FAST: Turns on when fast alarm is detected. (Red)

⑥ Exclusive connector for alarm output signal (CN1):

At the same time of each alarm detection, each alarm output signal are made out to the external. Connect this controller and your equipment with an output cable (optional).

⑦ Connector exclusively used for driving solenoid valve (CN2):

Solenoid valve driven signal will be generated. Then, connect this controller and solenoid valve (single or double solenoid valve) with an output cable (optional).

⑧ Connector exclusively used for pump input (CN3) :

This connector effects to input the signal of proximity switch and leak sensor. Connect this controller and pump with an input cable (optional).

⑨ Connector exclusively used for external input (CN4):

This connector effects to input signals of pump start, pump stop and alarm reset respectively from the external. Connect this controller and your equipment with an input cable (optional).

⑩ Connector exclusively used for electro-pneumatic regulator (CN5):

This connector generates regulator control signal for flow rate control. Connect this controller and electro-pneumatic regulator with an output cable (optional).

⑪ Connector exclusively used for power supply (CN6):

This connector supplies DC24V + / - 10%.

Connect this controller and power supply with a cable for power supply (optional).

5. Explanation of work

(1) Pump operation:

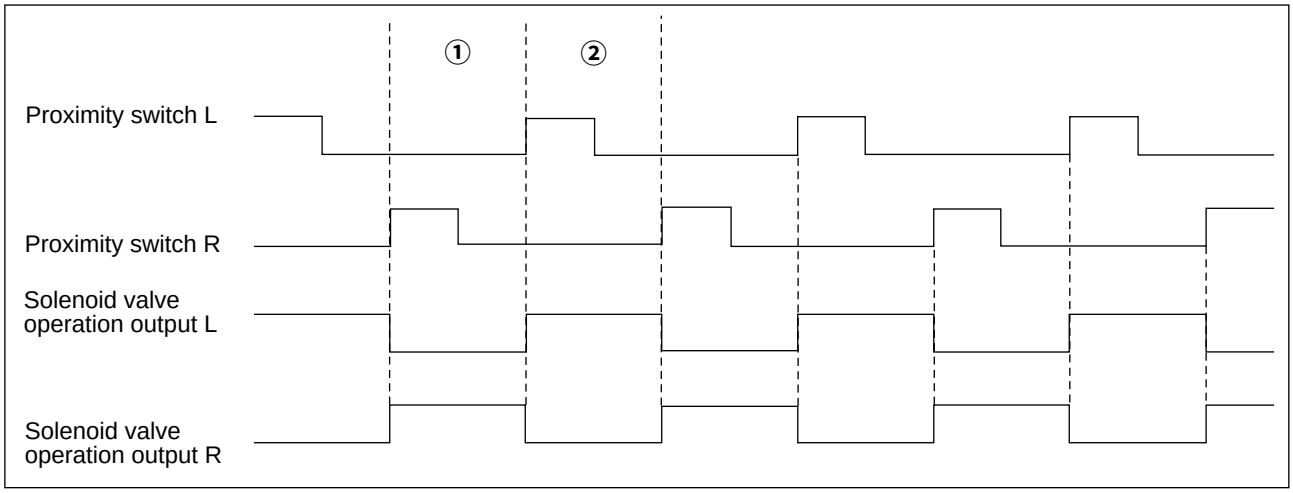
① When proximity switch R input is on, solenoid valve operation output keeps ON condition.

② Even if proximity switch R input is off, solenoid valve operation output keeps ON condition.

③ At the condition of proximity switch L input is on, solenoid valve operation output becomes off.

④ Then, until proximity switch R input comes on, solenoid valve operation output keeps off condition.

⑤ The above operations (①~④) shall be repeated in order.



(2) Flow rate control:

1 shot flow rate for F pump has been arranged; discharge capacity shall be “pump stroke rate times 1 shot flow rate”. When the flow rate was set arbitrarily, stroke rate shall be converted automatically within the controller. Comparing this converted stroke rate and operating cycle of proximity switch, which is effected to input into controller while pump is operating, control voltage (DC0~10V) to Electro-pneumatic regulator (ER1) shall be adjusted. Varying secondary air pressure of electro-pneumatic regulator (ER1), discharge capacity shall be controlled.

(3) Leak alarm:

This function effects to stop pump with alarm signal when pump brings about leakage.

It detects leakage and makes output signal by that leaked liquid conducts between electrodes (C1- C2 or D1-D2) of which set up corresponding to each bellows (left and right).

Receiving this alarm, the controller effects warning, and put control signal off to Electro-pneumatic regulator simultaneously. Then, it makes stop pump.

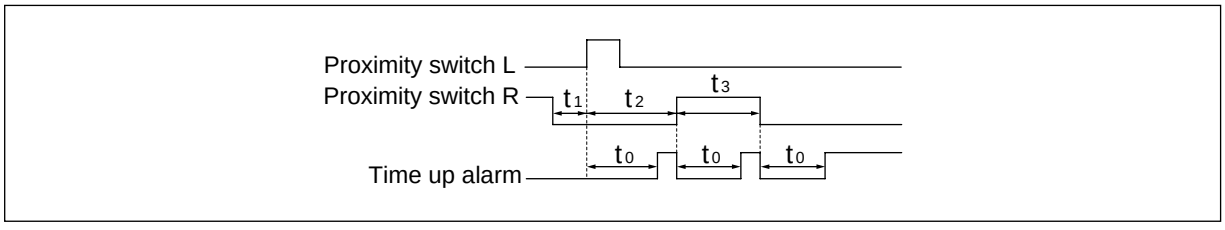
On this occasion, pneumatic pressure to drive inside of pump shall be released and becomes no-pressure only when Electro-pneumatic regulator (optional) is being used.

(4) Time up alarm:

This function effect to alarm when pump stops or stroke speed becomes abnormally slow down for some reason.

Output for solenoid valve still keeps operating condition, though. Time set for criterion of warning shall be executed on setting screen No.8.

It makes output as an alarm in case of whatever longer stroke time (t1, t2 and t3), than preset time t0. When all of t1, t2 and t3 become shorter than t0, this alarm shall be reset automatically, and starts operation again.



(5) Life alarm:

This function effects to alarm and notice when accumulated count number becomes beyond the fixed total count number which was set manually.

Output for solenoid valve and Electro-pneumatic regulator (optional) still keep operating condition, though.

Total count number setting can be executed at setting screen No.9, and also, it is able to reset by manual reset or reset signal from the externals. After input of reset, Life alarm detection is neglected for 2 minutes. After 2 minutes past, it detects again if pump is operating condition.

(6) Fast alarm:

This function effects to alarm when pump stroke became abnormally faster than the preset stroke rate for some reasons. Output for solenoid valve and Electro-pneumatic regulator (optional) still keep operating condition, though.

Stroke rate setting for criterion of warning shall be executed on setting screen No.10.

If actual operating stroke becomes slower than the fixed stroke, then it resets automatically. Also it is able to reset by reset signal from manual reset device. After reset signal input, it neglects detection for 2 minutes. After 2minuites, it may start again if it is in alarm condition.

6. Main functions

① Possible to fix a specified flow rate control against the load fluctuation at discharge side.
② Possible to set flow rate freely.
③ Possible to display stroke rate, flow rate and total count number while pump is operating.
④ In case of bellows broken, leak alarm will be output to the externals. Pump stops simultaneously with alarm output.
⑤ Possible to set necessary time set for 1 shot of pump operation. When the time for 1 shot of pump is beyond the setting time, time up alarm will be output to the externals.
⑥ Possible to set total counts number of pump. When count number for 1 shot of pump is beyond the setting number, life alarm will be output to the externals.
⑦ Possible to set maximum counts stroke rate. When count number for stroke is beyond the setting number while its operation, first alarm will be outputting to the externals.
⑧ Possible to set alarm reset for start / stop of pump by signals from the externals.
⑨ Possible to select operation mode of controller from MANU and AUTO.
⑩ In case of proximity switch broken, possible to operate pump by timer mode until proximity switch is replaced.

SETUP

1. Installation

⚠ WARNING

- Do not install or store at explosion atmosphere, such places causing particulate or corrosion gases (such as chlorine gas).
  It may cause fire or harm to human body.

(1) Installation to instrument panels (see the illustration):

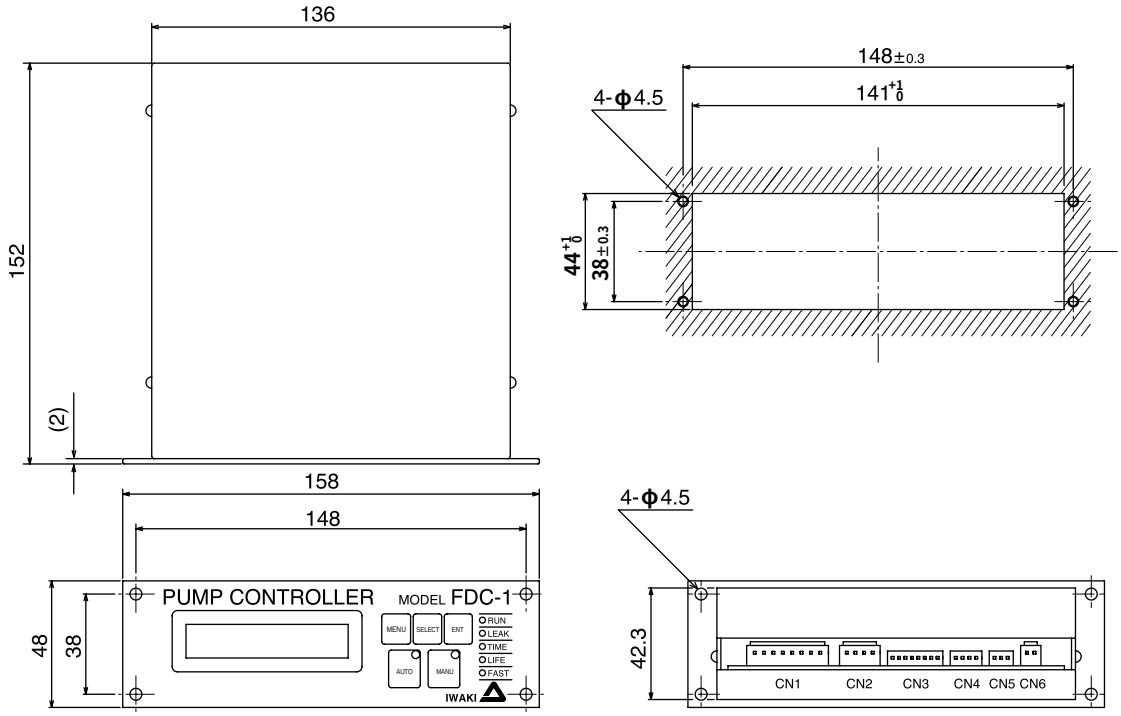


Fig. 4

- Cutout (W141 x H44mm) on instrument panel.
- Tap 4 screw holes (W148 x H38mm) for fitting.
- Insert the controller into the hole, and fix firmly with M4 screws.
- Install with enough room toward the depth.

2. Connection

Execute wiring and piping referring illustrations 5 & 6 of which shows electrical wiring of controller and piping drawing of air and charts 2 ~ 7 as well as an instruction of pump.

Caution: In case of wrong wiring, it may cause breakdown or wrong operation of controller and pump. Please pay special attention!

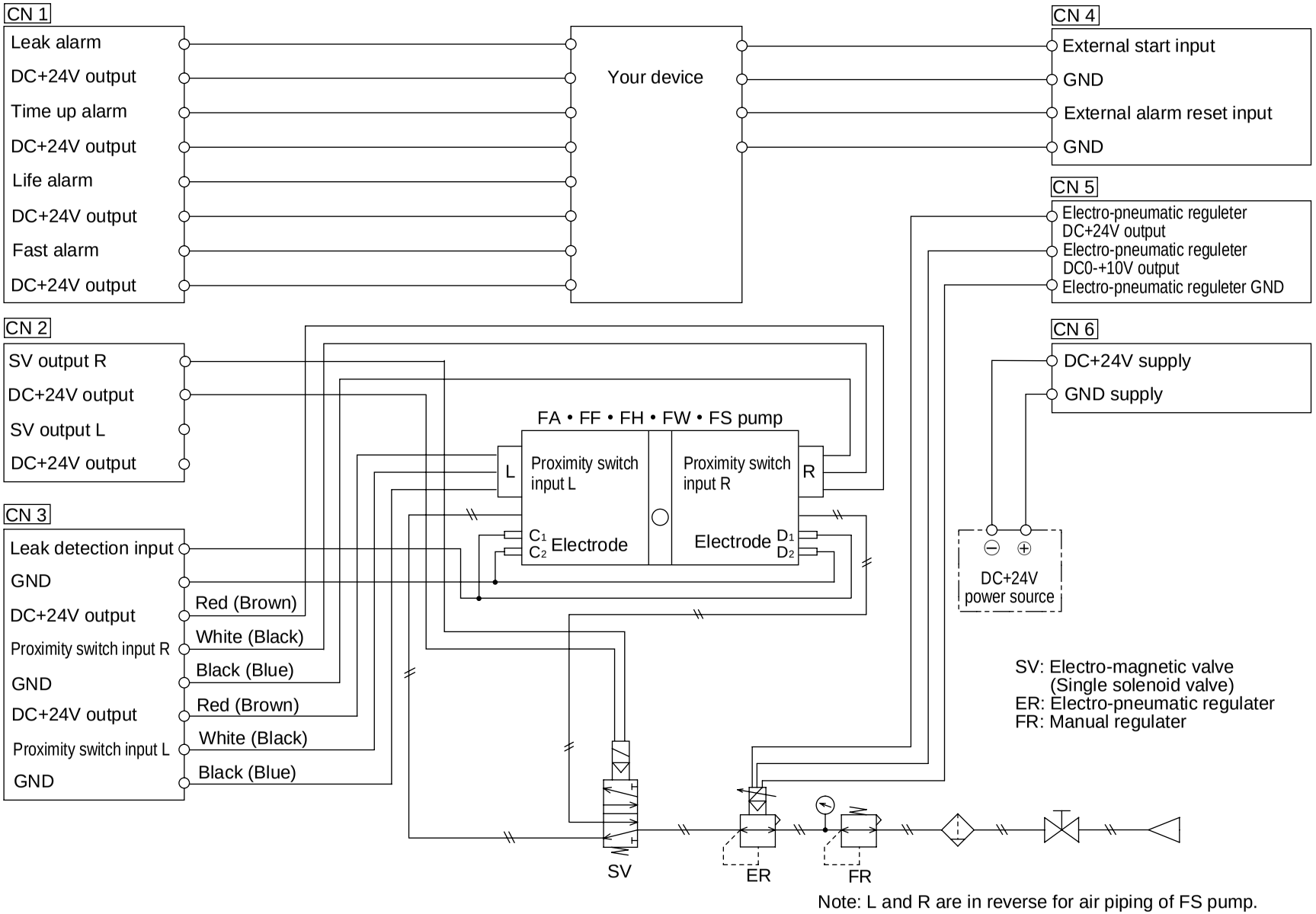


Fig. 5 Wiring for single solenoid valve.

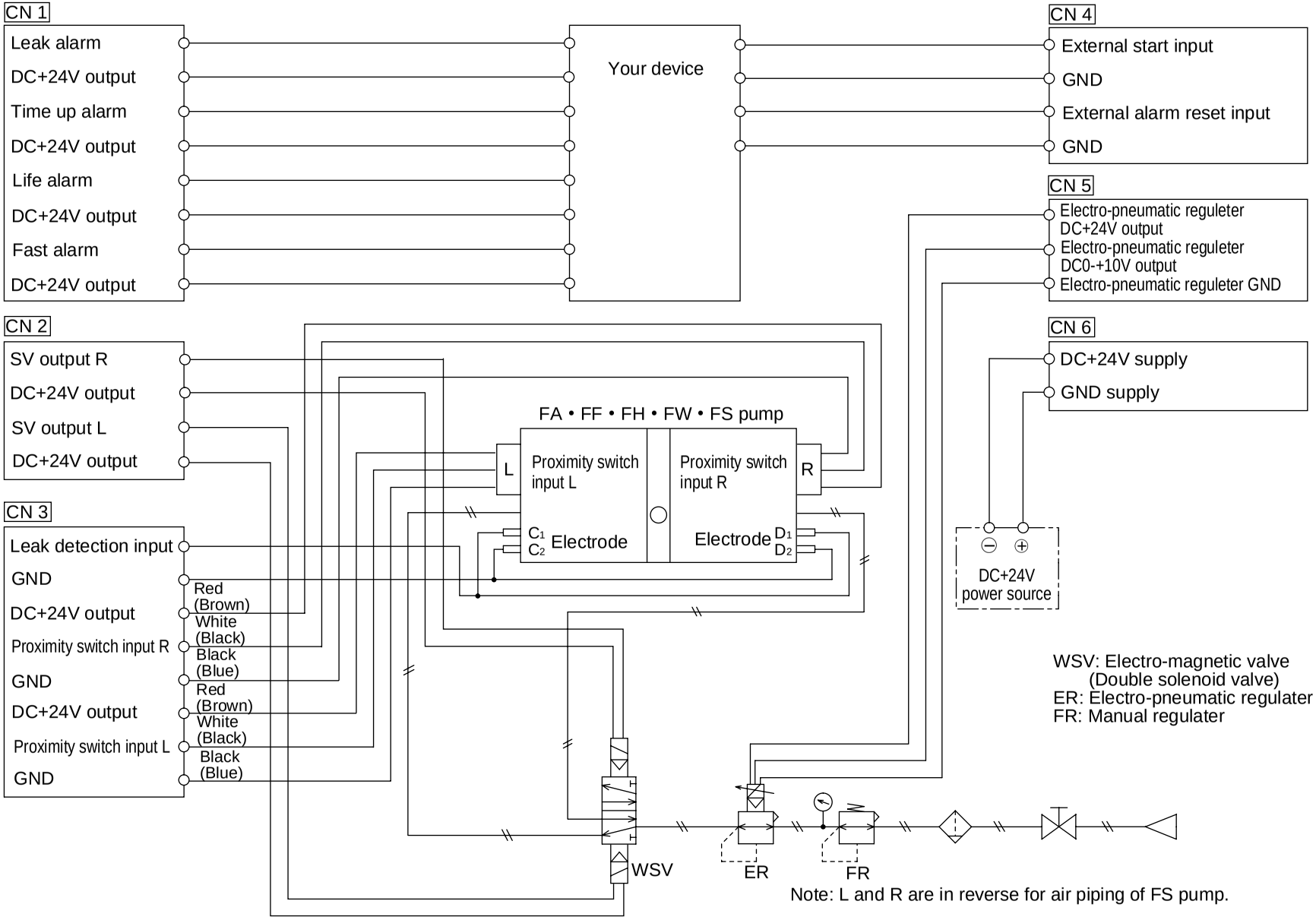


Fig. 6 Wiring for double-solenoid valve.

CN1 Chart 2

OUTPUT		Purpose of wiring	Wiring objects
Pin No.	Marker Tube No.		
1P	1	Leak alarm	Connection between FDC-1 and your equipment
2P	2	COM (DC+24V)	
3P	3	Time up alarm	
4P	4	COM (DC+24V)	
5P	5	Life alarm	
6P	6	COM (DC+24V)	
7P	7	Fast alarm	
8P	8	COM (DC+24V)	

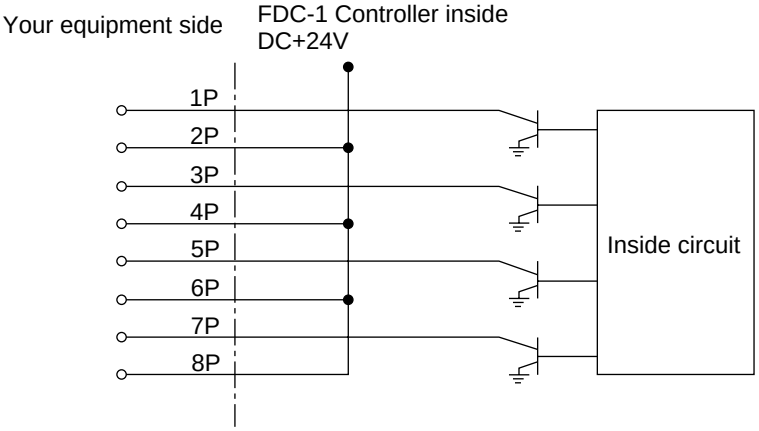


Fig. 7 Output scheme

CN2 Chart 3

OUTPUT		Purpose of wiring	Wiring objects
Pin No.	Marker Tube No.		
1P	9	Solenoid valve output R-	Connection between FDC-1 and Solenoid valve (Note)
2P	10	Solenoid valve output R+	
3P	11	Solenoid valve output L-	
4P	12	Solenoid valve output L+	

Note: In case of connection with single solenoid, it is no matter to connect pin Nos. 3P and 4P

CN3 Chart 4

INPUT		Purpose of wiring	Wiring objects
Pin No.	Marker Tube No.		
1P	13	Leak sensor C_1, D_1	Connection between FDC-1 and pump
2P	14	Leak sensor C_2, D_2	
3P	15	Proximity switch R (Brown) [Red]	
4P	16	Proximity switch R (Black) [White]	
5P	17	Proximity switch R (Blue) [Black]	
6P	18	Proximity switch L (Brown) [Red]	
7P	19	Proximity switch L (Black) [White]	
8P	20	Proximity switch L (Blue) [Black]	

(Brown) (Black) (Blue) : FH, FA type pump proximity switch

(Red) (White) (Black) : FF, FW, FS type pump proximity switch

Note: Proximity switch L & R signify Left and Right respectively from the view of pump inlet port.
For FH-40R, FA-40VE, L & R are Upper side and Lower side respectively.

CN4 Chart 5

INPUT		Purpose of wiring	Wiring objects
Pin No.	Marker Tube No.		
1P	21	External input (pump start, stop)	Connection between FDC-1 and your equipment
2P	22	GND	
3P	23	External input (alarm reset)	
4P	24	GND	

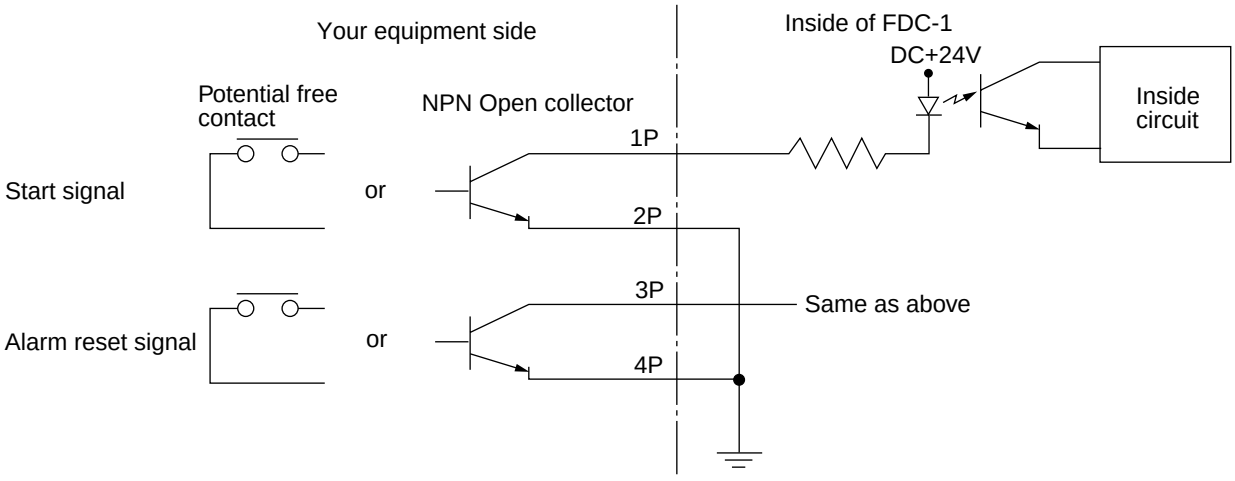


Fig. 8 CN4 Input scheme

CN5 Chart 6

INPUT		Purpose of wiring	Wiring objects
Pin No.	Marker Tube No.		
1P	25	Power supply for Electro-pneumatic regulator (Red)	Connection between FDC-1 and Electro-pneumatic regulator
2P	26	Input signal for Electro-pneumatic regulator (White)	
3P	27	GND for Electro-pneumatic regulator (Black)	

Note: Wiring is not needed when electro-pneumatic regulator is not used.

CN6 Chart 7

INPUT		Purpose of wiring	Wiring objects
Pin No.	Marker Tube No.		
1P	28	DC24V Power supply +	Connection between FDC-1 and power supply (Note)
2P	29	GND	

Note: Please provides DC24V power supply with 1A or more.

Chart 8 Table of wiring devices

	FDC-1 side connector	Contact	Wire		Remarks
			Cross section mm^2	AWG	
CN1	VHR-8N	BVH-21T-P1.1	0.5	20	8 wires, 5m or less
CN2	VHR-4N	BVH-21T-P1.1	0.5	20	4 wires, 5m or less
CN3	XHP-8	BXH-001T-P0.6	0.3	22	8 wires, 5m or less
CN4	XHP-4	BXH-001T-P0.6	0.3	22	4 wires, 5m or less
CN5	XHP-3	BXH-001T-P0.6	0.3mm^2, Outer dia. ϕ5.9		4 wires shield cord、5m or less
CN6	VHR-2N	BVH-21T-P1.1	0.5	20	2 wires, 5m or less

Note 1: Use the connector and pin made by J.S.T. Mfg. Co., Ltd.

2: For the wiring of CN5, use Omron made XS2C-D422 as electro-pneumatic regulator side I/O connector. Refer to Chart 9) for connection.

Chart 9 Wiring of electro-pneumatic regulator

FDC-1 side connector	Electro-pneumatic regulator side I/O connector
1P	1P
2P	4P
3P	3P

Note: Connect shield cord to 3P of FDC-1 side connector XHP-3.

⚠ Caution

• Proximity switch cord of FF, FW and FS pumps consists of three wires of black, white and red. Wrong connection of them will cause the failure of proximity switch.

⚠ Caution

1. Standard proximity switch can not be used to handle flammable liquid such as solvent or so. Ask IWAKI for explosion-proof proximity switch.
2. Electrode can not be used to handle flammable liquid. If used, it may spark resulting in fire.

⚠ Caution

• Use power source of DC24V plus minus 10% range.

■Air piping

Figure 5 and 6 show electrical wiring and air piping schemes. Make the air piping according to following procedures referring to the schemes.

(1) Precautions for air piping

a) Bad quality air will give bad influence to the performance and life of the equipments.
Supply clean air which contains no solid matters, water and oil.

b) Flush pipes before they are connected. When the seal tape is used for piping, pay attention so that the tape can be get into the pipe.

c) Install a regulator before the electro-pneumatic regulator (option) and adjust supplied air pressure to get the stable performance.

d) If the electro-pneumatic regulator is not used, connect pipe from manual regulator (FR) on Fig. 5 and 6 to the solenoid valve.

Note: The secondary side set pressure of manual regulator must not exceed the max. supply air pressure of the pump. Refer to the instruction manual of the used pump. (Pay attention to the pumped liquid temperature range.)

(2) Piping of electro-pneumatic regulator

Install the electro-pneumatic regulator between the manual regulator and the solenoid valve. Refer to the instruction manual of the electro-pneumatic regulator for details.

The first side set pressure of electro-pneumatic regulator : Between the max. supply air pressure of pump and the max. supply air pressure of pump + 0.05 MPa (Pay attention to the pumped liquid temperature range.)

OPERATION

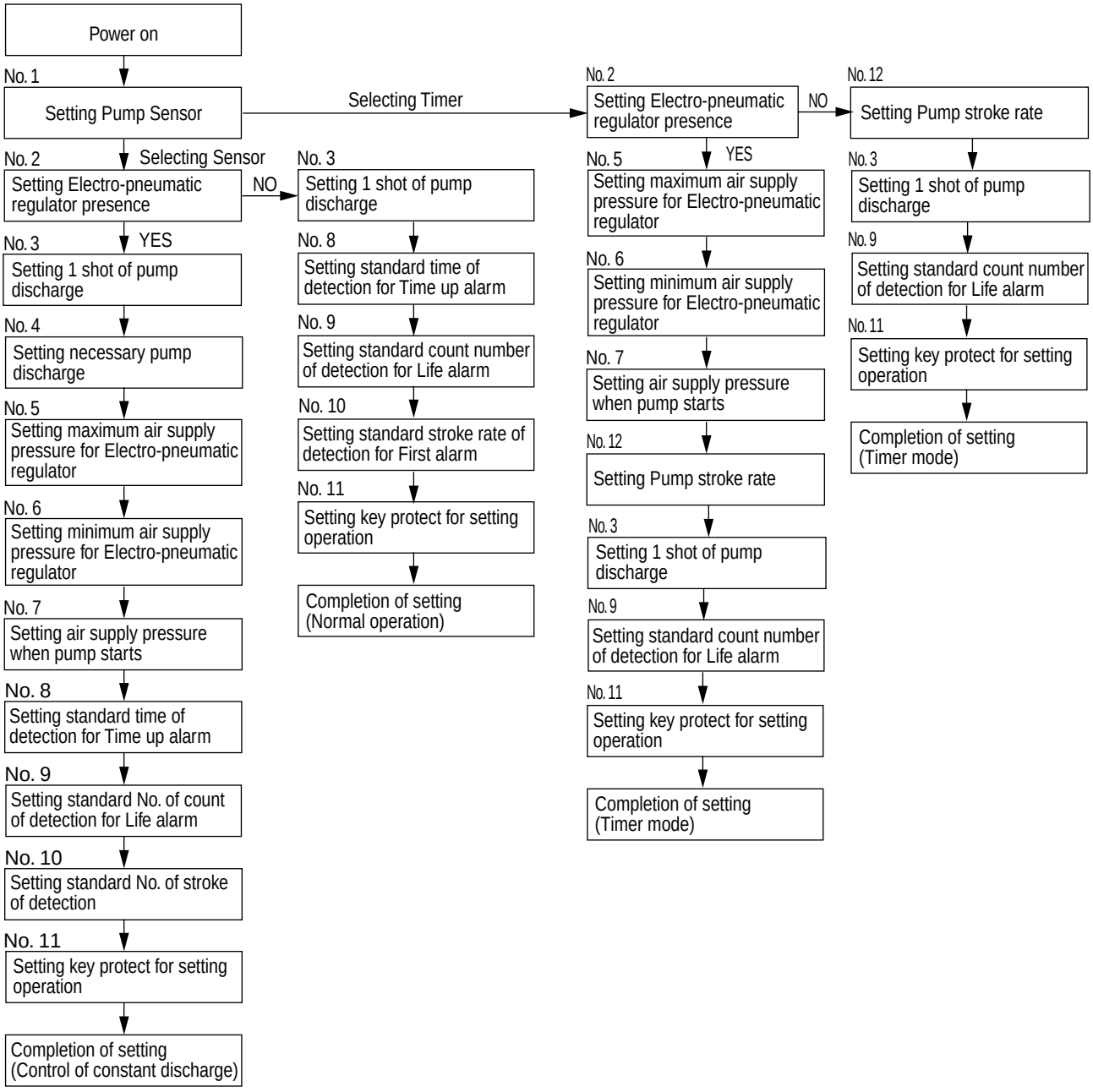
1. How to operate

① Confirm if pump, solenoid valve, alarm devices and electro-pneumatic regulator are connected correctly each other, and if it is connected DC24V as well.
(Adjust voltage to DC24V with the help of transformer if it is an abnormal voltage.)
② Supply air to preliminary inlet of electro-pneumatic regulator with manual regulator.

2. How to set controller

2-1 Flow of setting

Flow of setting is as follow.



2-2 Setting

• Initial screen (At power on)

```
PUMP CONTROLLER
        IWAKI PUMPS
```

After indicated on screen, it scrolls automatically to screen No.1.

• Setting screen No.1 (Setting the pump drive system)

```
1. DRIVE MODE
  SENSOR?  TIMER?
```

- The setting object mode is flickering.
- Select the setting object with [SELECT] key, and enter by [ENTER] key.
  A specified flow rate control,Normal operation → SENSOR → Setting screen No.2
  Timer mode → TIMER → Setting screen No.12

• Setting screen No.2 (Setting the presence of electro-pneumatic regulator)

```
2. E−P Reg SET
   Yes?     No?
```

- The setting object mode is flickering.
- Select the presence (Y / N) of Electro-pneumatic regulator.
- Select the setting object with [SELECT] key, and enter by [ENTER] key.
  A specified flow rate control → Yes → Setting screen No.3
  Normal operation
  → No → Setting screen No.8

• Setting screen No.3 (Setting 1 shot discharge capacity of pump)

```
3. 1Shot d capa.
dc=＊＊＊＊.＊ cc／shot
```

- Setting 1 shot discharge capacity of pump to ****.* area.
- Set 1 shot discharge capacity of each pump as shown in Chart 8.
- Every time depressing [SELECT] key, each input value is sequentially indicated as 1 → 2 → 3 → ..... → 9 → 0 → 1.....
  Then the required value can be settled by depressing ENTER key.
  After the settlement of the first figure, by depressing ENTER key to decrease the figure, and then input each required value as the same step as above.

Chart 10

Pump type	Logical value of 1 shot discharge capacity [cc / shot]
FF-10H	93
FF-20H	185
FF-40H	500
FH-10R	85
FH-20R	190
FH-40R	500
FF-10	93
FF-20	204
FA-40VE	500
FW-20	200
FW-40	500
FW-80	1000
FS-15	63
FS-30	138
FS-60	284

• Setting screen No.4 (Setting the required flow rate of pump)

```
4. FLOW RATE SET
   fr=＊＊＊.＊ L／min
```

- Setting the required flow rate of pump in ****.* area.
- Input of value shall be processed as same as Setting screen No.3.
- For the protection of pump, do not set the value exceeding the maximum discharge capacity.

• Setting screen No.5 (Setting the maximum air pressure being supplied by Electro-pneumatic regulator)

```
5. E－P Reg Pres.
   MAX.= 0.＊＊ MPa
```

- Setting the maximum air pressure being supplied by Electro-pneumatic regulator in 0.** area.
- Input of value shall be processed as same as Setting screen No.3.
- Electro-pneumatic regulator supplies air as the setting value is to be the upper limit.
- For the protection of pump, do not set the value exceeding the maximum air pressure supply of pump.

• Setting screen No.6 (Setting the minimum air pressure being supplied by Electro-pneumatic regulator)

```
6. E－P Reg Pres.
   MIN.= 0.＊＊ MPa
```

- Setting the minimum air pressure being supplied by Electro-pneumatic regulator in 0.** area.
- Input of value shall be processed as same as Setting screen No.3.
- Electro-pneumatic regulator supplies air as the setting value must be the lowest limit.

• Setting screen No.7 (Setting the air pressure being supplied at the start of pump operation)

```
7. START Pres.
   sp= 0.＊＊ MPa
```

- Setting the required air pressure at the start of pump operation.
- Input of value shall be processed as same as Setting screen No.3.
- For the protection of pump, do not set the value exceeding the maximum air pressure supply of pump.

• Setting screen No.8 (Setting the standard time of Time Up alarm detection)

```
8. TIME UP ALARM
   T= ＊＊.＊ Sec
```

- Setting the standard time of Time Up alarm detection in **.* area.
- Input of value shall be processed as same as Setting screen No.3.
- In case pump operates slower than the setting value, then the alarm will be output.

• Setting screen No.9 (Setting the standard count number of Life alarm detection)

```
9. LIFE ALARM
L= ＊＊＊＊×100000 count
```

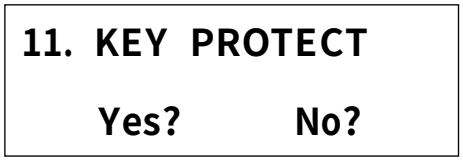
- Setting the standard count number of Life alarm detection in **** area.
- Input of value shall be processed as same as Setting screen No.3.
- In case pump operates exceeding the setting value, then the alarm will be output.

• Setting screen No.10 (Setting the standard stroke rate of Fast alarm detection)

```
10. FAST ALARM
    F= ＊＊＊.＊ spm
```

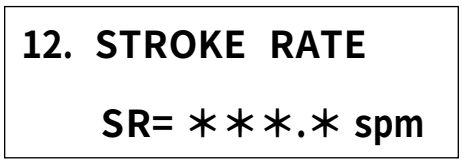
- Setting the standard count number of Fast alarm detection in ***.* area.
- Input of value shall be processed as same as Setting screen No.3.
- In case pump operates faster than the setting value, then the alarm will be output.

• Setting screen No.11 (Setting the key protect of setting operation)



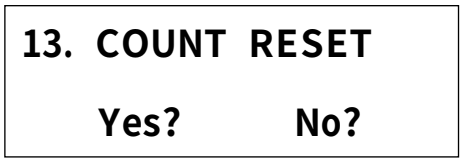
- Setting the key protect of setting operation.
- This function is to prevent the setting change by wrong operation once the setting has been executed.
- The selection procedure shall be the same as Setting screen No.2.
- When it is necessary to change the setting, refer "4-2 Setting change".

• Setting screen No.12 (Setting the stroke rate at Timer mode)



- Setting the pump stroke rate at Timer mode.
- This function is to operate ON/OFF of the solenoid valve compulsory, so as to become the settled stroke number.
- Pump may operate intermittently depending on stroke rate to be set.

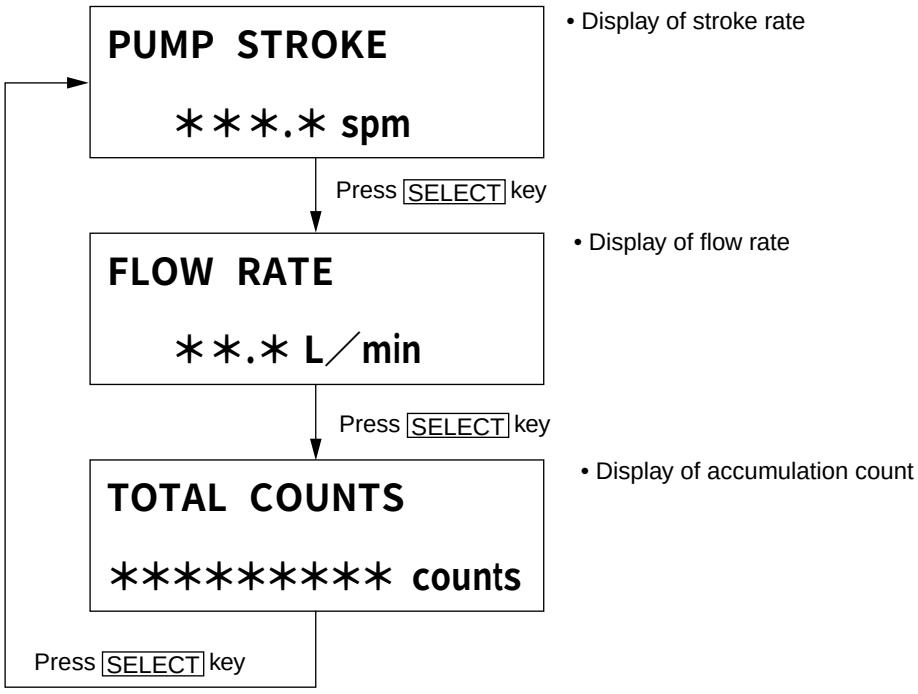
• Setting screen No.13 (Reset of the accumulation count of pump)



- This function is used whenever it is required to reset the accumulation count, in case of changing pump, etc.
- The selection procedure shall be the same as Setting screen No.2.
- Unless the accumulation count is not to be reset at changing pump, etc., the Life alarm may alert.

3. Operation screen

Stroke rate, flow rate and accumulation count can be displayed on LCD screen of controller.



4. Setting confirmation and setting change procedure

4-1 Setting confirmation:

CHANGE No. No. ＊＊

Confirm if the screen is the operation screen, then press [MENU] key. LCD screen of the controller is displayed as shown left. Then, input [01] in "No. **" area.
Input of value shall be processed as same as Setting screen No.3.
Every time pressing [ENTER] key, display comes out in the order of setting. If it is necessary to confirm each screen individually, input the required setting screen No. into the "No.**" area.

4-2 Setting change:

CHANGE No. No. ＊＊

In case of setting the key protect for setting operation, it is able to cancel the key protect for setting operation using [SELECT] key + [ENTER] key in the operation screen. After the cancellation, press [MENU] key. Then LCD screen of the controller displays as mentioned left.
Input the required Setting screen No. into "No.**".
Input of value shall be processed as same as setting screen No.3.
If "01" is input, all of setting are reset again.

CHANGE OK!!

After the completion of cancel procedure, LCD screen of the controller displays as mentioned left and the operation screen is automatically displayed.
Note : After the change is done, set the key protect according to setting screen No.11.

5. Pump operation

5-1 Manual operation (if necessary) :

14. DRIVE MODE START? STOP?

Confirm if the screen shows the operation mode.
Confirm that LED of [MANU] key lights on, and then press [ENTER] key.
LCD screen of the controller displays as mentioned left.
Select START or STOP by [SELECT] key, and then enter by [ENTER] key.
Select START? ····· pump start
Select STOP? ····· pump stop

5-2 Automatic operation (If it is necessary to operate from your equipment using an external signal)

Non-voltage contact signal or open collector signal from the externals can operate this controller, as well.
Automatic operation for pump start, pump stop and alarm reset are available by an external signal.
Confirm if the screen displays the operation mode.
Automatic operation is practicable if LED of [AUTO] key lights on when pressed [AUTO] key.

5-3 To change operation mode

Press [SELECT] key and [ENTER] key simultaneously to release the key protection. After the protection is released, press either [MANU] key or [AUTO] key to change to operation mode. After the change, set the key protection according to item 4-2 “setting change” on page 22.

6. Alarm reset procedure

When each alarm (leak alarm, time up alarm, life alarm and fast alarm) outputs, LED corresponding to each alarm lights on and displayed on LCD screen of the controller as mentioned below.

Leak alarm	Time up alarm	Life alarm	Fast alarm
LEAK ALARM RESET	TIME UP ALARM RESET	LIFE ALARM RESET	FAST ALARM RESET

In case of LED of [MANU] key lights on, by depressing [ENTER] key, alarm shall be reset.
In case of LED of [AUTO] key lights on, non-voltage contact signal or open collector signal from the externals shall reset alarm.
Other work shall not be accepted until all of alarms are released.

⚠ WARNING

- When the pump is stopped and air piping is removed or bolts on pump are loosened, it may happen the inside liquid spauts due to the residual pressure. Pay attention to liquid spauting.

MAINTENANCE

1. Troubleshooting

Symptom	Causes	Check point & countermeasure
Pump does not start	Defective electrical wiring line	Confirm wiring between FDC-1 and solenoid valve for pump.
		Confirm wiring between FDC-1 and proximity switch.
		NO and NC proximity sensor of pump supply are being input to FDC-1 as right and left reversed.
		Defective pump proximity sensor. After power on to FDC-1, confirm output voltage of proximity sensor without supplying air to pump. FF pump: voltage between white and black is approx. 24V. FH, FA pump: voltage between black and blue is approx. 24V. FS pump: voltage between white and black is approx. 24V. FW pump: voltage between white and black is approx. 24V. If the above voltages close to 0V, it seems defective.
		Confirm wiring between FDC-1 and Electro-pneumatic regulator EV2500.
		Electrode (leak sensor) is conducted.
		The sequence is arranged to let inter-lock work among pump, FDC-1 and equipment when pump starts.
	Defective air piping line	Air supply is not provided correctly to the preliminary (IN) side of Electro-pneumatic regulator EV2000.
		Defective solenoid valve.
		Minimum air pressure for drive becomes higher due to solenoid valve run down.
		Exhaust outlet of solenoid valve or QEV is covered or closed.
		Wrong IN and OUT connection of Electro-pneumatic regulator EV2500.
		Wrong IN and OUT connection of QEV.
		Air piping for pilot is not arranged in spite of using solenoid valve for external pilot way.
	Defective liquid piping line	Liquid valve installed at both sides of pump inlet and outlet are closed.
		The sequence is arranged for not to open liquid valve when pump starts
		Sufficient filtration size is not secured and it becomes high load due to entangled filter by air.
Pump stops soon after it starts. Time up alarm outputs.	Improper setting	Too little flow rates. Resettle value of setting screen No.4.
		When the pump discharge side pressure gets lower, the flow control function of FDC-1 lowers the supply air pressure. When the air pressure gets lowered, it may happen the pump stops because enough air pressure to drive the pump can not be kept. If this happens, change the value on Setting screen No. 6 on page 20 to the value at which the pump can not stop.

Symptom	Causes	Check point & countermeasure
Leak alarm comes out so often.	Broken bellows	Check and change pump, if necessary.
	Water included in air supplied	Drop of water mixed in pump cylinder.
	Condensation of air piping. Pinhole of bellows.	Electrodes are conducted by condensed drop of water. (short circuited) Check and change pump, if necessary.
Time up alarm comes out so often.	Solenoid valve run down	Minimum air pressure of solenoid valve becomes higher.
	Air pressure to pump becomes lower and fluctuates.	Confirm if air is supplied correctly to preliminary side of EV2500.
	Setting value in setting screen No. 6 is too small.	Change setting value.
Fast alarm comes out.	Pump stroke exceeds pump spec.	It occasionally outputs at the initial starting of pump or idling at changing liquid medicine. Max stroke alarm may output when pump stroke exceeds stroke rate of spec. after 10 sec., after pump started. Take measure for your equipment so that the alarm can not be activated.
	Bubbles are mingled suddenly during pump operation. (especially foamy liquid)	Take measure for bubble not to be mingled.
Pump stops when some alarm outputs.	Improper sequence at equipment side.	When alarm was recognized at equipment side, equipment side will stop pump. Function to stop pump by output of alarm effects only for leak alarm.

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