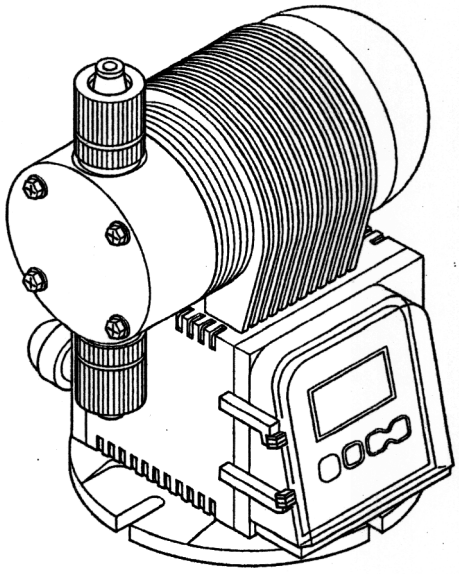
Solenoid-driven Metering Pump

PZi Series

Instructions and Key Operation Manual for Special Functions

Before you start using this metering pump, read this manual together with the separate Operation Manual.



— Applicable Models —

PZi4-32•52
PZi8-32•52

- For details on the liquid pumping unit and general handling, refer to the "PZD Series Operation Manual."

Liquid Control Technology
TACMINA CORPORATION

CE

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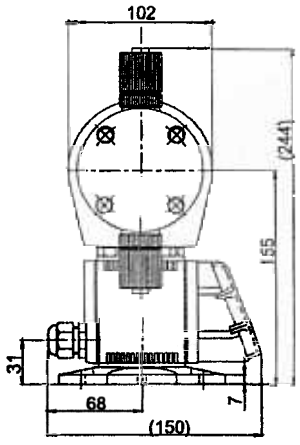
1 Outline

The PZi4/8-32•52 models has a high-grade chemical injection amount control function and an LCD display integrated into its compact body. It allows easy and reliable setup by key operation, control of injection amount by external input signals, and operation by level switch inputs, for example.

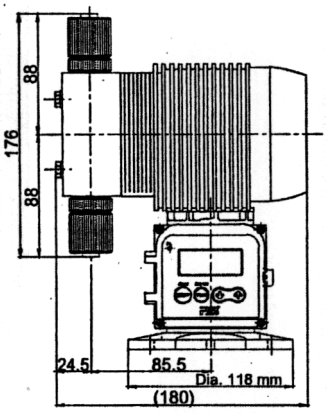
The PZi8 is provided with an interval function and other additional modes.

2 External Dimensions

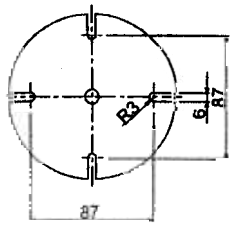
2-1 Overview



Pump head view



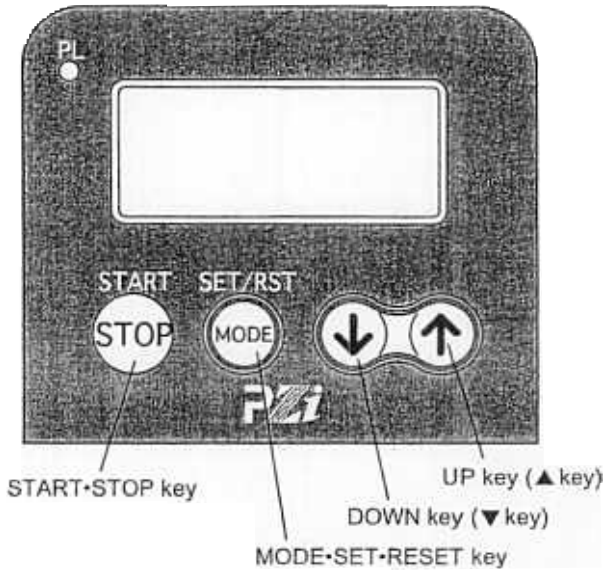
Side view



Bottom view

Note: The pump can be mounted within a mounting pitch of 87 to 110 mm.

2-2 Layout of Operation/Display Panel



Important:

In text descriptions, individual operations on dual-function keys are referred to by the required function.

(Example)

To start pump operation
START key (START•STOP key)

To determine setting values
SET key (MODE•SET•RESET key)

To change the mode
MODE key (MODE•SET•RESET key)

3 Model Selection Guide

PZi□-□-□□□-□□W-□□

(1) (2) (3) (4) (5) (6) (7) (8) (9)

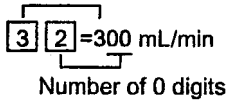
(1) Series name

PZi: PZi series

(2) Pump model

4: Input control
8: Input/output control

(3) Model type



32: Rated discharge volume 360 mL/min
52: Rated discharge volume 540 mL/min

(4) Liquid end materials

Type	Pump head	Valve seat	Check ball
FTC:	PVdF	PTFE	Ceramic
VEC:	PVC	EPDM	Ceramic
VFC:	PVC	Fluro rubber	Ceramic
STC:	SUS304	PTFE	Ceramic
6TC:	SUS316	PTFE	Ceramic

(5) Hose material

H: Soft PVC
T: PE
F: PTFE

(6) Hose size

1: dia. 4 x 9 mm
2: dia. 6 x 8 mm
3: dia. 6 x 11 mm
4: dia. 10 x 12 mm
5: dia. 1/4 x 3/8 inch
6: dia. 9 x 12 mm
7: dia. 3/8 x 1/2 inch
8: dia 12 x 15 mm
9: dia. 12 x 18 mm

(7) Joint specification

W: Standard

(8) Standards

None: Standard
CE: CE marking compatible
UL: UL standard-compatible
CSA: CSA standard-compatible

(9) Cable specifications

None: Lead wire type
1: Euro plug
2: Swiss plug
3: UL plug
4: Australia plug
5: U.K. plug

4 Features

4-1 Common Terms

- Power supply can be used in a wide range of 100 to 240 VAC. (Wide range voltage supply) The pump is free from the power voltage fluctuation.
- Operation keys and LCD display offer high-precision setup and a variety of control modes.
- Injection amount can be controlled and pump operation/stop can be controlled by input signals. Analog signals of 4-20 mA DC (0-20 mA DC is available in the case of PZi8 model), pulse signals (flow meter signal, open collector, etc.), or open collector signal can be used for controlling the injection amount.
- Contact signals such as a level switch can be input directly as the operation/stop signal.

4-2 PZi8 (input/output control model)

Provided with a control signal output function in addition to the input control functions of PZi4. Signal during operation, operation synchronous pulse signals, and alarm signals can be output.

- An input port is provided for extensive control.
- Counter and interval functions are provided as the self control function as standard.
- Parameter settings are open to users to enable detailed setup.
- Input/output port assignment is possible to provide many selections for functions.

4-3 Special Function Model

PZiP: pH control can be achieved by combination with a pH meter without the need to use a controller.

PZiR: Residual chlorine control can be achieved by combination with a residual chlorine meter without the need to use a controller.

PZiN: Provided with an internal non-linearizer function to achieve non-linear control.

5 Installation

Refer to the "PZD Series Operation Manual."

6 Preparing for Operation

Check the installation state of the PZi, hoses on the discharge and suction sides, and power supply and signal lead connections. If there are no problems for installation, turn the power ON.

7 Mode Functions

PZi4 PZi8 Special Function Model

- Manual operation:

  The number of strokes (spm) can be set directly on the operation panel.

  (Set within the range 1 to 300 spm digitally in single-step increments.)

- Automatic operation:

  Control is performed by changing the number of strokes per minute by external signals (analog signal, pulse signal).

- Timer operation

  The interval function is automatically turned ON/OFF according to an internal timer.

  (The PZi4 is not provided with this function.)

- Stop input signal control:

  Pump operation is controlled by non-voltage contact signals from a level switch or other device. (External stops and control by alarms can be set.) (PZi4/8)

When setting modes, the applicable model is indicated as PZi4, PZi8 or Special Function Model. If none of these is indicated, the mode itself is not provided on any model.

7-1 Manual mode

1. Basic operation

   (1) The number of strokes can be set digitally in single-step increments within the range 1 to 300 spm by the UP, DOWN key on the operation panel.

   (2) With the PZi8 and special function models, the display unit (spm) can be switched to % or mL/min.

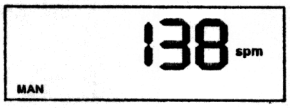
2. Purpose of use

   - Test operation after pump installation
   - Temporary operation, for example, when an error occurs during automatic operation (e.g. signals are not output)
   - The stroke speed during automatic operation (multiplication, count, interval) can be changed.

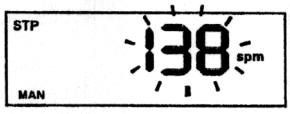
3. LCD display

During a pump stoppage

During pump operation



During setting



* 138 indicates blinking display.

4. Operation control signal

Basically, there is no need to supply signals from the outside in the manual mode. However, operation can be paused by a stop input (continuous signal) from the outside.

7-2 Analog mode

PZi4 PZi8 Special Function Model

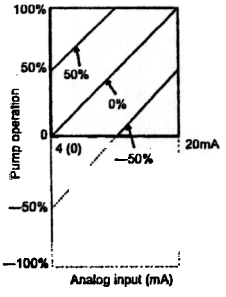
1 Basic operation

(1) Analog input signals from the outside are received, and automatic operation is performed within the range 0 to 300 spm according to the setting value (proportional band and shift amount).

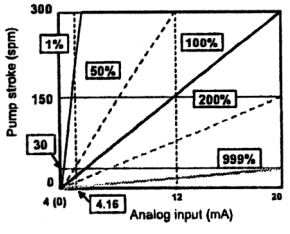
(2) The ramp for the number of strokes in response to analog input can be set by proportional band (1 to 999% for increments and -1 to -999% for decrements). This proportional curve can be shifted in parallel towards the vertical axis by a shift amount (±100%).

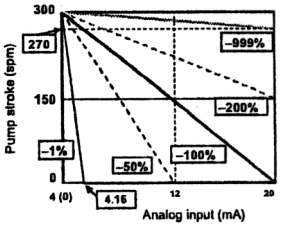
(3) The number of strokes changes linearly in response to the analog input signal from the outside.

Shift function
Shift can be set within the range ±100%.



Proportional band function
The proportional band can be set within wide range ±1% to ±999%.
The increment/decrement polarity can also be easily changed.



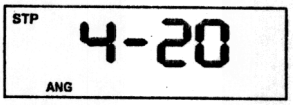


2. Purpose of use

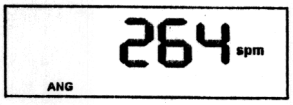
Flowrate proportional injection, etc.

3. LCD display

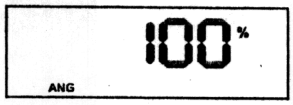
During a pump stoppage



During pump operation



Pressing the UP key



During setting a proportional band

During setting a shift

4. Operation control signal

4 to 20 mA DC
0 to 20 mA DC (PZi8 and special function models only)

7-3 Frequency-division mode

PZi4 PZi8 Special Function Model

1. Basic operation

(1) Pulse signals from the outside are received, and automatic operation is performed according to the frequency-dividing ratio setting value.

(2) The frequency-dividing ratio can be set within the range 1/1 to 1/9999.

Frequency-dividing ratio (1/1 to 1/9999)

(Example) 1/5 dividing ratio

2. Purpose of use

- This mode is used for flowrate proportional injection, etc. The pump operates proportionally to the number of input pulses from the outside.
- Used when there is a large number of pulses from a flow meter or other instrument, and the chemical infection amount is too great. (setting in direction for reducing injection amount)

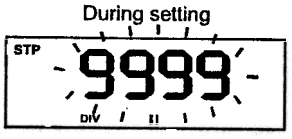
- Fine-adjustment of discharge volume is performed by the stroke adjustment dial. (See 10. Setup Examples.)

3. LCD display

During a pump stoppage

During pump operation

During setting



4. Operation control signal

No-voltage contact or open collector signal input

7-4 Multiplication mode

PZi4 PZi8 Special Function Model

1. Basic operation

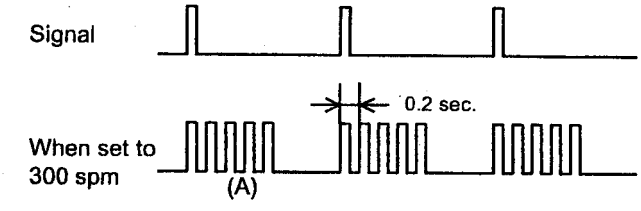
(1) Pulse signals from the outside are received, and automatic operation is performed by the number of strokes corresponding to the multiplication.

(2) The multiplication can be set within the range 1 to 9999. At this time, the pump operates at the number of operation strokes (spm) set in the manual mode.

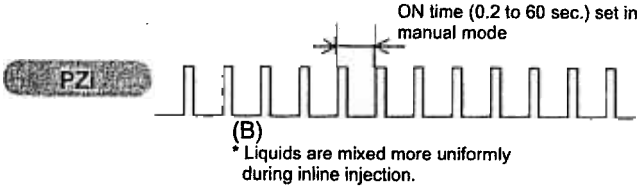
Multiplication (can be set within range 1 to 9999)

As the default setting, external signals are canceled when an external pulse input signal is input again during pump operation. External pulse input signals can also be held and stored to memory by setting in this mode. (PZi8 type special function model only)

(A) Operates five times at 300 spm (fixed)



(B) Operates five times at any value within range 1 to 300 spm



* Liquids are mixed more uniformly during inline injection.

2. Purpose of use

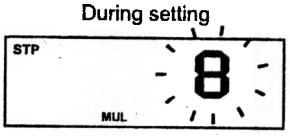
- This mode is used for flowrate proportional injection, etc. The pump operates proportionally to the number of input pulses from the outside.
- Used when there are a few number of pulses from a flow meter or other instrument, and the chemical injection amount is too small. (setting in direction for increasing injection amount)
- Fine-adjustment of discharge volume is performed by the stroke adjustment dial. (See 10. Setup Examples.)

3. LCD display

During a pump stoppage

During pump operation

During setting



4. Operation control signal

No-voltage contact or open collector signal input

7-5 Count mode

PZi8 Special Function Model

1. Basic operation

(1) The start signal is received and the pump operates for the number of preset times. (batch processing)

(2) The setting value can be set by a combination of 1 to 9999 times and X1, X10, X100, X1000 multiplication. (1 to 9999, 10 to 99990, 100 to 999900, 1000 to 9999000)

(3) Start signal can be selected from an external input and START•STOP key.

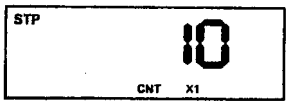
(4) The end signal (100 msec one-shot signal) can be output when operation for the preset count ends.

2. Purpose of use

This mode is used in sites where fixed amounts are repeatedly injected. Operation can be easily instructed or confirmed from the outside by the start and end signals, for example, during batch injection to a container on a conveyor belt.

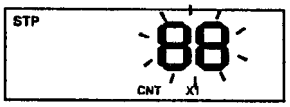
3. LCD display

During a pump stoppage

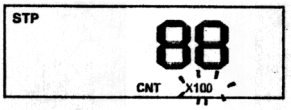


During pump operation

During setting



During setting (Multiple)



4. Operation control signal

[Start signal]
No-voltage contract or open collector signal input
START•STOP key

7-6 Interval mode

PZi8 Special Function Model

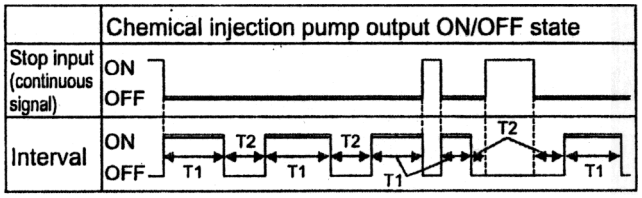
1. Basic operation

(1) Intermittent operation by the preset ON and OFF times is repeated.

* The ON/OFF state during a start can be changed by parameters.

(2) The setting values of each of the ON and OFF times is set from 1 to 9999 minutes (in 1-minute increments).

(3) Operation can be paused by input of an external stop signal.



Operation Time Chart

1) T1 = ON time setting (1 to 9999 min)
T2 = OFF time setting (1 to 9999 min)
2) When the stop signal turns ON, counting of both T1 and T2 is discontinued.

* When an external stop is applied, timers in the interval mode also are paused.

2. Purpose of use

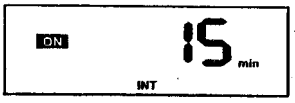
This mode can be used in sites where control is performed by alternate ON/OFF operation.

- Can be used for skipped operation at sites, for example, small amounts of chemicals are injected for air conditioning.
- Small amounts can be injected by operation control by combining intermittent operation and stop input.

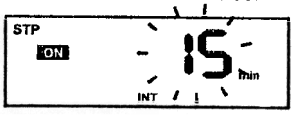
3. LCD display

During a pump stoppage

During pump operation



When the ON time is set



When the OFF time is set

4. Operation control signal

Stop input: Operation is paused by input of an external stop signal.

8 Setting Up Operation

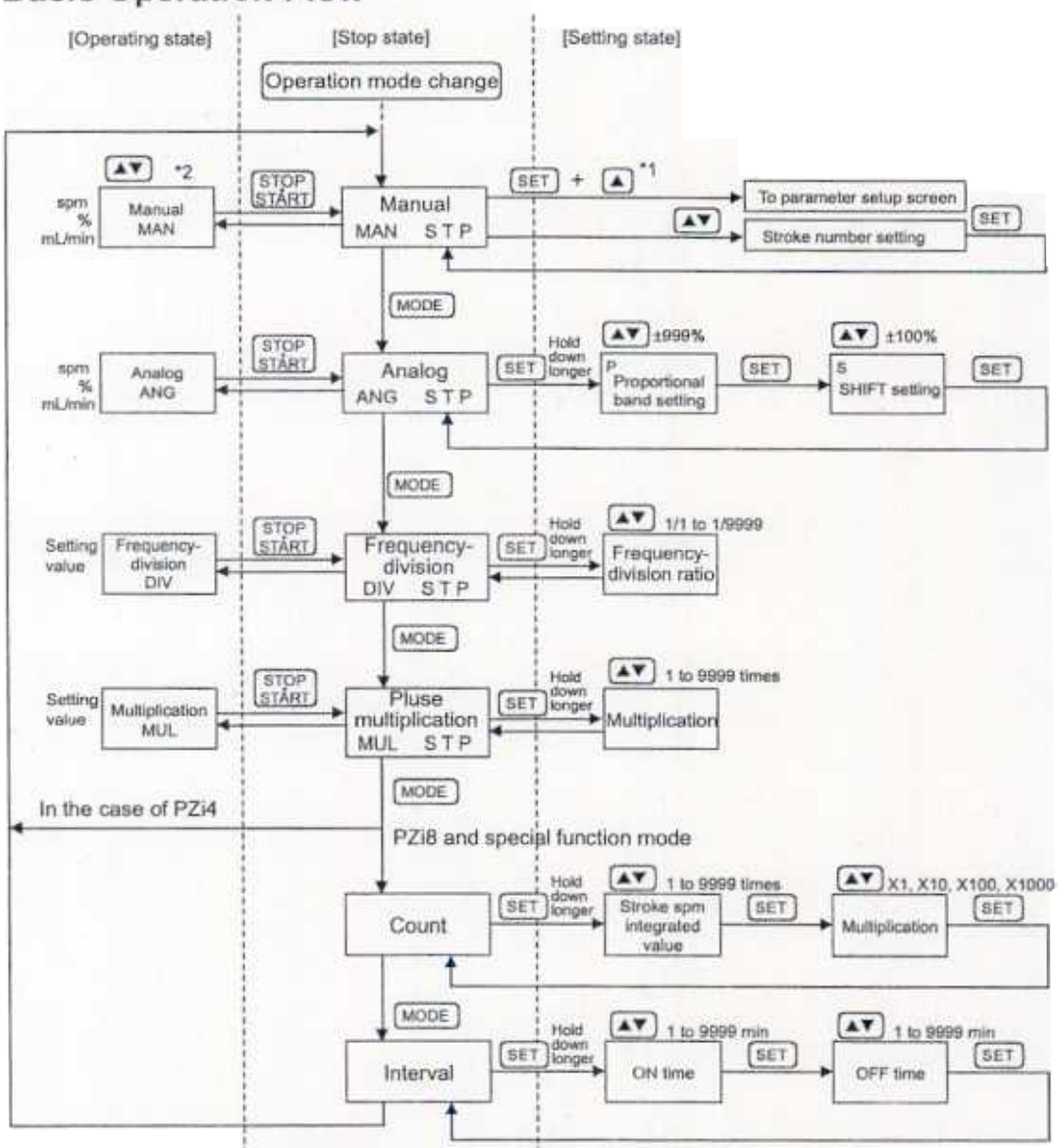
8-1 Changing the Operation Mode

For PZi, the manual and automatic (pulse, analog, etc.) control methods can be switched by changing the operation mode. To change the operation mode, hold down the MODE key for at least 0.5 seconds with the pump stopped. This sets the pump to the setup mode. If the MODE key is held down longer, the screen enters setup screen for each mode. Do not hold the MODE key down longer when changing the operation mode.

Remarks:

- If the key is not pressed for five seconds at [Setting state], the newly set value is canceled, and the STP state is returned to.
- In the [Setting state], the setting value blinks, and lights by pressing the ▲ ▼ keys. The value is scanned.

8-2 Basic Operation Flow



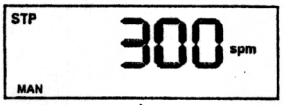
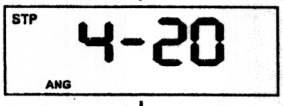
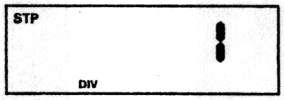
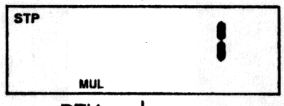
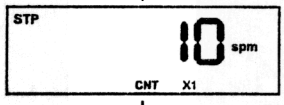
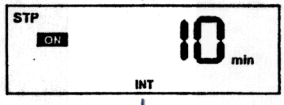
*1: The parameter setup screen is moved by pressing the ▲ key for three seconds with the SET key pressed only during a manual pump stoppage.

*2: In the manual mode only, the setting value can be changed by pressing the ▲ ▼ keys during both a pump stoppage and operation, and the setting value determined by pressing the SET key.

*3: The MODE key and the SET key are the same. To change the operation mode with pump operation stopped, release the MODE key within 0.5 seconds. Holding the MODE key down for 0.5 seconds or longer sets the pump to the setup mode.

8-3 How to Change the Operation Mode

PZi4 PZi8 Special Function Model

Mode	Display	Operation	Explanation
		Power ON	
Manual			The display shows the default state. (manual mode) When the power is next turned ON, the previous operation is stored to memory. (If the power is turned OFF and then back ON again during operation, the pump starts up in the run mode.) "MAN" is displayed at the bottom of the screen.
		SET/RST MODE	To change the mode, press the MODE key. (The manual mode changes to the analog mode.)
Analog			This is the display screen for the analog mode. "ANG" is displayed at the bottom of the screen. The current input mode (4-20mA) is displayed.
		SET/RST MODE	Pressing the MODE key changes the mode as follows: Manual → Analog → Frequency-division → Multiplication.
Pulse Frequency-division			This is the display screen for the frequency-division mode. "DIV" is displayed at the bottom of the screen.
		SET/RST MODE	
Pulse multipli-cation			This is the display screen for the multiplication mode. "MUL" is displayed at the bottom of the screen.
	PZi4 ← PZi8 and special function model	SET/RST MODE	Pressing the MODE key while the pulse multiplication mode is stopped returns the PZi4 to the manual mode. On the PZi8 and special function model, the mode changes to the count mode.
Count			This is the display screen for the count mode. "CNT" is displayed at the bottom of the screen.
		SET/RST MODE	
Interval			This is the display screen for the interval mode. "INT" is displayed at the bottom of the screen. The ON time is displayed.
		SET/RST MODE	Pressing the MODE key while the interval mode is stopped returns to the manual mode.
			

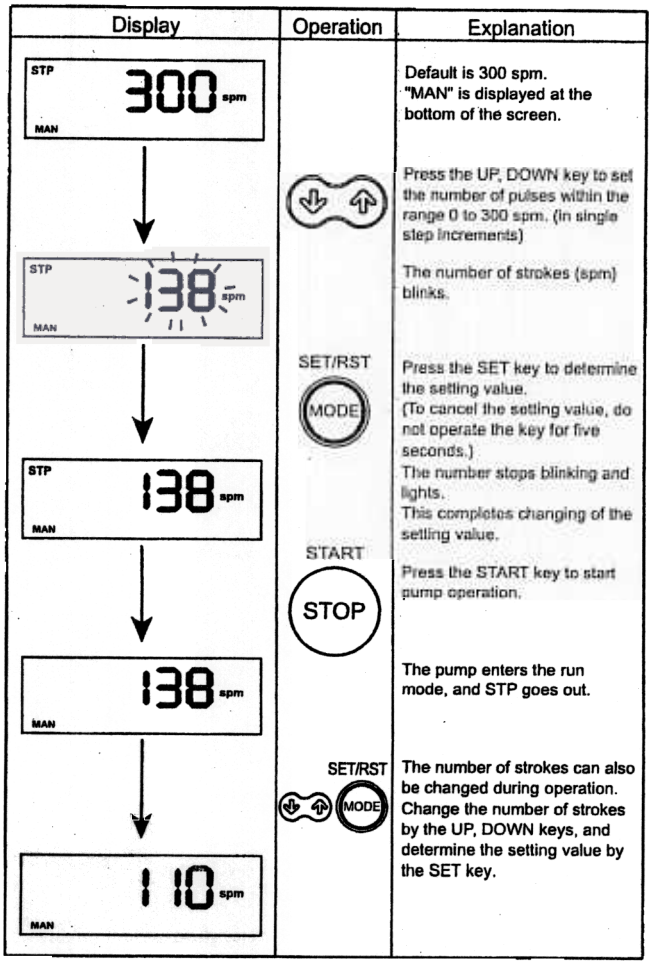
Note 1: The mode can be changed only when pump operation has stopped.

Note 2: The currently set mode is displayed abbreviated as MAN, ANG, etc. at the bottom of the screen.

Note 3: When changing the operation mode, do not hold the MODE key down for 0.5 seconds or longer.

8-4 Setting Manual Mode (changing the number of strokes)

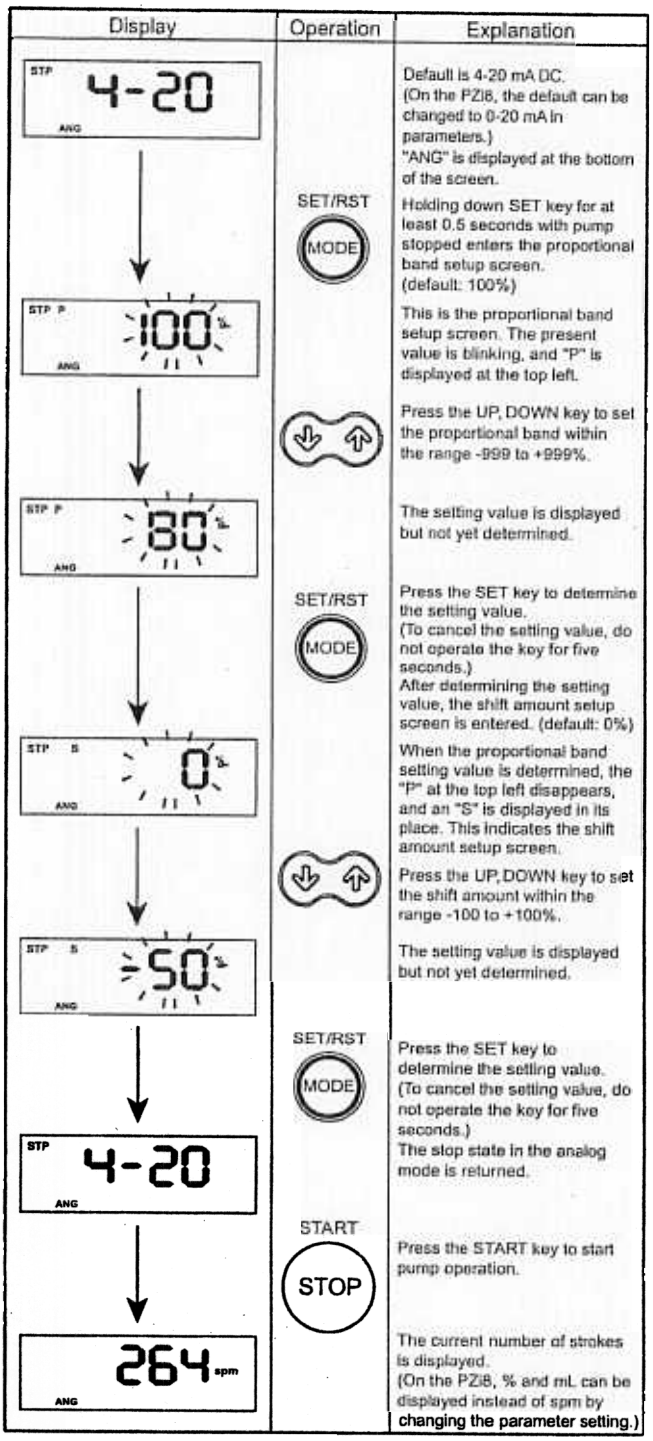
PZi4 PZi8 Special Function Model



* The number of strokes (spm) set here is reflected in the multiplication, count and interval modes.

8-5 Setting the Analog Mode

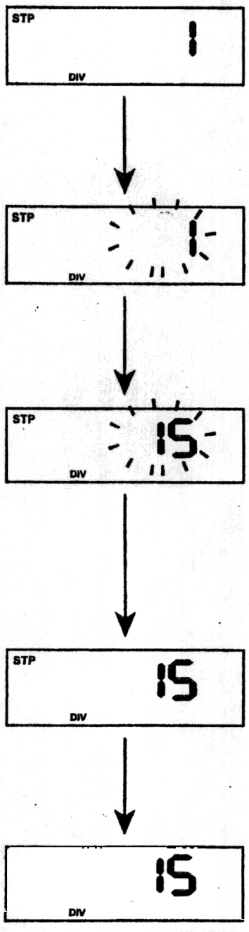
PZi4 PZi8 Special Function Model



* Settings cannot be changed during operation. To change a setting, first stop pump operations.
* The current analog input value is displayed by pressing the ▲ or ▼ key during a pump stoppage.
* Set a minus (–) value to set a decrease in the proportional band setting.

8-6 Setting the Frequency-Division Mode

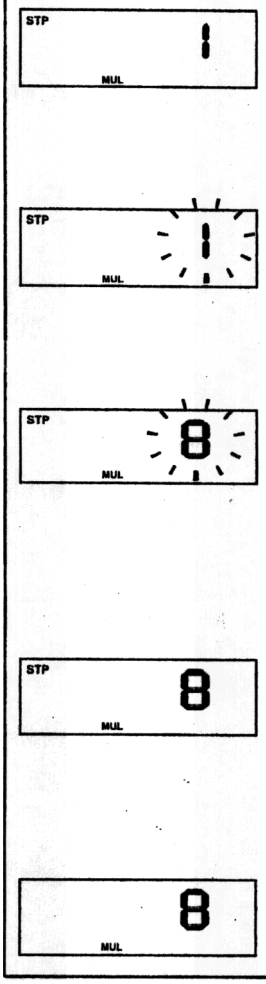
PZi4 PZi8 Special Function Model

Display	Operation	Explanation
		Default is "1" (When the display indicates 1, the set dividing ratio is 1/1.) "DIV" is displayed at the bottom of the screen.
	SET/RST MODE	Holding down SET key for at least 0.5 seconds with pump stopped enters the dividing ratio setup screen.
		The current value starts blinking.
		Press the UP, DOWN key to set the dividing ratio within the range 1/1 to 1/9999. (In this setup, set the denominator of dividing ratio.)
		The setting value is displayed but not yet determined. (The example in this screen is 1/15.)
	SET/RST MODE	Press the SET key to determine the setting value. (To cancel the setting value, do not operate the key for five seconds.) The stop state in the frequency-division mode is returned to.
		This completes the setting, and the display stops blinking and stays lit.
	START STOP	Press the START key to start pump operation.
		STP goes out and pump operation starts. The pump starts to operate according to external signals.

* After setting the above, fine-adjust the discharge volume using the stroke adjustment dial matched to the calculated dividing ratio value.

8-7 Setting the Multiplication Mode

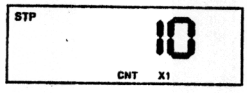
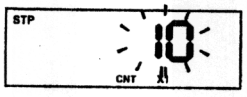
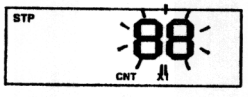
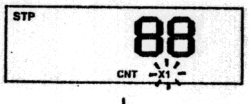
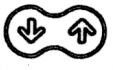
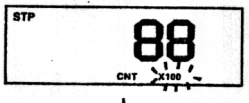
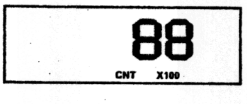
PZi4 PZi8 Special Function Model

Display	Operation	Explanation
		Default is "1". "MUL" is displayed at the bottom of the screen.
	SET/RST MODE	Holding down SET key for at least 0.5 seconds with pump stopped enters the multiplication setup screen.
		The present value starts to blink.
		Press the UP, DOWN key to set the multiplication within the range 1 to 9999.
		The setting value is displayed but not yet determined.
	SET/RST MODE	Press the SET key to determine the setting value. (To cancel the setting value, do not operate the key for five seconds.)
		After the setting value is determined, the multiplication stop mode is returned.
		The setting is completed, and the display stops blinking and stays lit.
	START STOP	Press the START key to start pump operation.
		STP goes out, and the pump enters the run mode. The pump starts to operate according to external signals.

* After setting the above, fine-adjust the discharge volume using the stroke adjustment dial matched to the calculated multiplication value.

8-8 Setting the Count Mode

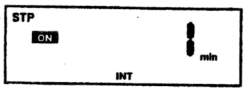
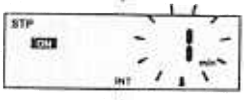
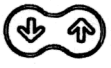
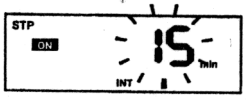
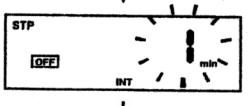
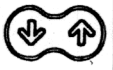
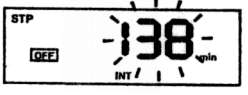
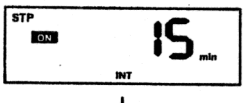
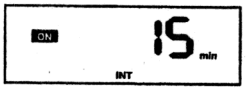
PZi8 Special Function Model

Display	Operation	Explanation
		"CNT" and the multiplication factor (X1, X10, X100, X1000) are displayed at the bottom of the screen.
	SET/RST MODE	Holding down SET key for at least 0.5 seconds with pump stopped enters the strokes setup screen.
		The present value starts to blink.
		Press the UP, DOWN key to set the number of strokes within the range 1 to 9999.
		The setting value is displayed but not yet determined.
	SET/RST MODE	Press the SET key to determine the setting value. (To cancel the setting value, do not operate the key for five seconds.) The setting value is determined, and the multiplication factor setup screen is entered.
		The number of strokes lights, and multiplication starts to blink.
		Press the UP, DOWN key to change the multiplication in four stages: X1, X10, X100 or X1000.
		The multiplication factor setting value is displayed but not yet determined.
	SET/RST MODE	Press the SET key to determine the setting value. (To cancel the setting value, do not operate the key for five seconds.) The setting value is determined, and stop state in the count mode is entered.
		The number of strokes and multiplication factor light to indicate that the settings are determined. Press the START key to start pump operation. In this state, the pump starts to operate by the start signal from the outside. (The pump startup mode can be changed in parameter P-31.)

Note: This function is not provided on the PZi4.

8-9 Setting the Interval Mode

PZi8 Special Function Model

Display	Operation	Explanation
		"INT" is displayed at the bottom of the screen. ON or OFF is displayed at the left. If the start operation state is ON, ON is displayed. (This can be changed in parameter P-30.)
	SET/RST MODE	Holding down SET key for at least 0.5 seconds with pump stopped enters the ON time setup screen.
		ON is displayed at the left of the screen, and the present value of the ON time blinks.
		Press the UP, DOWN key to set the ON time within the range 1 to 9999 minutes.
		The setting value is displayed but not yet determined.
	SET/RST MODE	Press the SET key to determine the setting value. (To cancel the setting value, do not operate the key for five seconds.) After the setting value is determined, the display moves to the OFF time setup screen.
		The ON display goes out, and OFF is displayed. Also, the present value of the OFF time blinks.
		Press the UP, DOWN key to set the OFF time within the range 1 to 9999 minutes.
		The setting value is displayed but not yet determined.
	SET/RST MODE	Press the SET key to determine the setting value. (To cancel the setting value, do not operate the key for five seconds.) The setting value is determined, and the interval stop state is returned to.
		ON is displayed at the left, and the setting value of the ON time is displayed.
	START STOP	Press the START key to start pump operation.
		Counting starts and the display is decremented from the setting value. 15, 14, 13, ···1 (ON time) 138, 137··· (OFF time)

Note: This function is not provided on the PZi4.

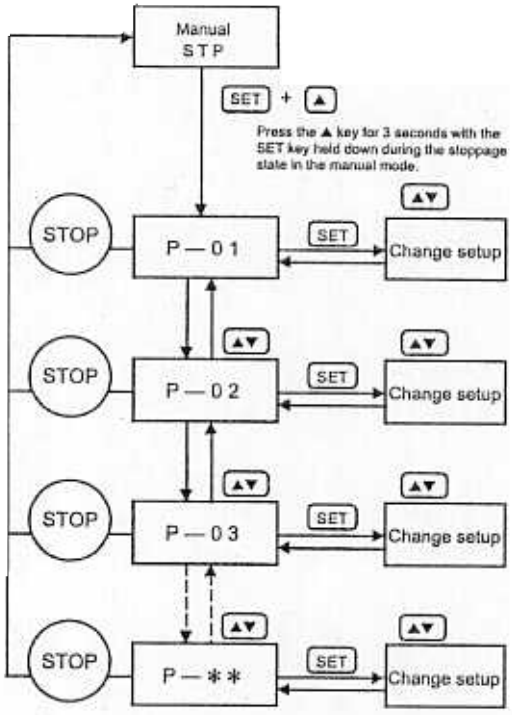
9 Setting Up Parameters

9-1 Parameter Setup Flow

PZi8 Special Function Model

Remarks:

For meanings of parameters, refer to "13-1 List of Parameters".



* The parameter-setting screen can be activated only from the manual mode (pump stoppage state).
* Pressing the SET key in the setting change screen determines the newly set parameter setting.

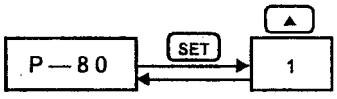
Note: On the PZi4, the parameter setups cannot be changed.

Important:

- Do not change the parameters that are not explained in the parameter list. They are used for internal processing.

Remarks:

- To return the parameters to the values at the factory shipment time, select 1 in P-80 and then press the SET key.



9-2 Setting the Parameters

PZi8 Special Function Model

Display	Operation	Explanation
STP 300 spm MAN		Make sure that "STP" and "MAN" are displayed.
	SET/RST MODE ▲	Pressing the UP key for 3 seconds with the SET key held down enters the parameter setup screen.
P-01		This is the parameter number selection screen.
	▼ ▲	Press the UP, DOWN key to change to the desired parameter number (For details, see the Parameter List.)
P- 12		
	SET/RST MODE	Press the SET key at the parameter number that is to be changed to enter the setting change screen.
0		The present value is displayed.
	▼ ▲	Set the parameter referring to the parameter list.
2		
	SET/RST MODE	Press the SET key to determine the selected value.
P- 12		The original parameter number is displayed.
	START STOP	
STP 300 spm MAN		

Note: Parameters can be continuously changed until the STOP key is pressed.

10 Setup Examples

10-1 Example of Flow Rate Proportional Control in Chlorine Sterilization by a Pulse Transmitting Flow Meter

PZi model pumps receive the no-voltage contact pulse signal from the outside to control the pump injection amount (number of strokes) of the pump.

The following describes two examples of pump control achieved by combination with a pulse generating type flow meter.

10-1-1 Using the frequency-division mode

[Conditions]
Max. flow rate of raw water 10 m³/hr (167 L/min)
Target chlorine injection rate 10 mg/L
Sodium hypochlorite concentration 12%
Pump model PZi□-32 type
(injection amount per stroke: 1.0 mL)

(1) Select the flow meter.

TACMINA provides the pulse generating type flow meters shown in the following table. Select the optimum model of flow meter according to the pipe aperture and the flow rate of raw water.

In this example, NVW-50RC is selected.

Model	Flow rate range (m³/hr)	Pulse (L/P)	Connection aperture
LN-13DRC	0.15 to1.2	0.1	R1/2
LN-20RC	0.2 to 0.16	0.1	R3/4
LN-25RC	0.23 to1.8	0.1	R1
VWK-30RC	0.4 to 6	1	R1 1/4
VWK-40RC	0.4 to 6.5	1	R1 1/2
VWK-50RC	0.8 to 9.6	5	R2
NVW-50RC	1.25 to 15	5	JIS10K 50A
VW-65HRC	1.75 to 20	5	JIS10K 65A
NVW-75RC	2.5 to 30	5	JIS10K 80A
NVW-100RC	4 to 48	5	JIS10K 100A
VW-125RC	5 to 60	50	JIS10K 125A
VW-150RC	7.5 to 90	50	JIS10K 150A
VW-200RC	13 to 156	50	JIS10K 200A
VW-250RC	17.5 to 210	50	JIS10K 250A
VW-300RC	22.5 to 270	50	JIS10K 300A

(2) Set the dilution ratio.

1) Calculate the logical injection rate with undiluted chemical (Q')

Injection rate Q' mL/min

$$= \text{Target injection rate (mg/L)} \times \frac{\text{Max. flow rate of raw water (m}^3\text{/hr)}}{60} \times \frac{100}{\text{Sodium hypochlorite concentration (\%)}}$$

$$= 10 \times \frac{10}{60} \times \frac{100}{12}$$

= 13.9 mL/min

2) Calculate the actual injection rate.

* The following example assumes that undiluted chemical is injected as dilution is not desirable as a gas lock countermeasure or to ensure uniform mixing

Actual injection rate Q mL/min
= Undiluted chemical injection rate Q'mL/min X dilution ratio
= 13.9 X 1.0
= 13.9 (mL/min) = 834 (mL/hr)

Accordingly, the injection rate should be 13.9 mL/min (12% sodium hypochlorite solution) by the PZi pump at the maximum flow rate.

3) Set the frequency-dividing ratio.

Calculate the frequency-dividing ratio N by the following formula:

Frequency-dividing ratio N

$$= \frac{\text{Number of pulses on flow meter per unit time n (pulses/hr)} \times \text{Discharge volume per pump stroke V (mL/stroke)}}{\text{Actual injection rate Q per unit time (mL/hr)}}$$

$$n = \frac{\text{Max. flow rate of raw water (L/hr)}}{\text{Flow rate (L) per pulse of flow meter}}$$ (from flow meter specifications)

$$= \frac{10000}{5}$$

= 2000 (pulses/hr)

v = 1.2 (mL/stroke) (from PZi□-32 type pump specifications)

$$N = \frac{2000 \times 1.2}{83.4} = 2.9$$

As the frequency-dividing ratio must be an integer not greater than the calculated value, discard the digits past the decimal point. The resulting value is "2".

4) Set the frequency-dividing ratio.

5) Set the stroke adjustment dial.

As digits for the frequency-dividing ratio past the decimal point have been discarded, the injection rate will be too great if this value is left as it is. To compensate for this, fine-adjust using the stroke adjustment dial.

Calculate the setting value by the following formula.

$$\text{Stroke adjustment dial setting value (\%)} = \frac{\text{Frequency-dividing ratio setting value}}{\text{Frequency-dividing ratio calculated value}} \quad \cdots\cdots (5)$$

$$= \frac{2}{2.9} \times 100\ (\%)$$

= 69.0 (%)*

* This numerical value is for reference purposes only.

10-1-2 Using the pulse multiplication mode

As the pulse-generating unit (per pulse) of the flow meter is large, it is more convenient to use the "multiplication mode" in the following instances with the undiluted chemical injection method that uses the "frequency-division mode" as in 7-3.

- When the injection interval is too wide, which may cause uneven concentration, or
- When diluted chemical is used

[Conditions]
Assume that a flow meter having a large pulse-generating unit is selected in 10-1-1.

Transmission unit of flow meter (L/P)	50 (L/P) = 0.05 (m³/P)
Target chlorine injection rate	10 mg/L
Sodium hypochlorite concentration	12%
Pump model	PZi□-32
	(injection rate per pulse: 1.0 mL)

(1) Calculate the logical injection rate Q (mL) per flow meter pulse.
= Flow rate (m³) per flow meter pulse X Target injection rate (mg/L) X 100/Sodium hypochlorite concentration (%)
= 0.05 X 10 X 100/12
≒ 4.17

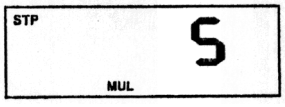
(2) Set the multiplication factor.
= Logical injection rate (mL) per pulse / Injection rate (mL) per pump pulse
= 4.17/1.0
≒ 4.17 times

Remarks:

- The advantages of this method include the following:
  - The concentration is more likely to be uniform in raw water the higher the dilution ratio increases.
  - Response during control is faster and accuracy increases.
  - There is less clogging of injection points.

(3) Set the pulse multiplication factor.

Set the multiplication factor as a value greater than the calculated value and as the integer closest to the calculated value. In this example, set "5".



(4) Set the stroke adjustment dial.

As the numerical value for the multiplication factor has been rounded up, the injection rate will be too great if this value is left as it is. To compensate for this, fine-adjust using the stroke adjustment dial.

Calculate the setting value by the following formula.

$$\text{Stroke adjustment dial setting value (\%)} = \frac{\text{Calculated value of set multiplication}}{\text{Actual set multiplication factor}}$$

$$= \frac{4.17}{5} \times 100\ (\%)$$

$$= 83.3\ (\%)^*$$

* This numerical value is for reference purposes only.

(5) Set the number of strokes (spm).

If the flowmeter signal is input at the default setting, liquid will be injected at a rate of 300 spm. However, increasing the interval up to the next pulse will result in uneven injection.

On PZi pumps, the number of strokes (spm) can be changed in the manual mode setting.

Shortest pulse interval :

$$n = \frac{\text{Max. flow rate of raw water (L/hr)}}{\text{Flow rate (L) per pulse of flow meter}} = \frac{10000}{50} = 200\ (\text{pulse/hr})$$

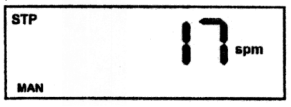
= 3.3 (pulse/min) = 1 pulse/18 seconds

Number of pump strokes (spm):
As the pump should operate by five strokes per 18-second interval

$$\left(5\ \text{strokes} \times \frac{60\ \text{seconds}}{18\ \text{seconds}} = 16.6\right)$$

Injection unevenness can be reduced by setting to as small a value above 17 spm.

In this example, a value between 17 to 20 spm is suitable.



10-2 Control by 2-point Level Switch

PZi8 Special Function Model

(1) Change the parameters.

Change P-06 (IN3) to "6: Level switch input".

Set P-12 to "0" (operation is continued when an alarm occurs).

Set P-08 to "5" (level error alarm is output).

(2) Connect the signals.

- Connect the lower limit signal (IN3) across pins 7 (IN3) and 8 (COM1) on the 8-pin connector.
- Connect the lower/lower limit signal (IN2) across pins 6 (IN2) and 8 (COM1).
- Connect the alarm output signal (OUT1) across pins 9 (OUT1) and 11 (COM2).

10-3 Pulse Signal Noise Countermeasures

If the influence of power supply frequency causes the pump to malfunction during pulse input, this noise influence can be reduced by switching to the low-speed port. (In the case of the signal less than 600 pulse/sec.)

* See "12-4 I/O Signal Specifications."

(1) Change the parameters.

Change P-04 (IN1) to "0: Unused".

Change P-04 (IN2) to "1: Pulse input signal".

(2) Connect the signal.

Connect the pulse signal (IN2) across pins 7 (IN2) and 8 (COM1) on the 8-pin connector.

10-4 Flowrate Display

The indication (setting) in each mode can be set to mL/min by setting the maximum discharge volume (at 300 spm) of the pump in parameters.

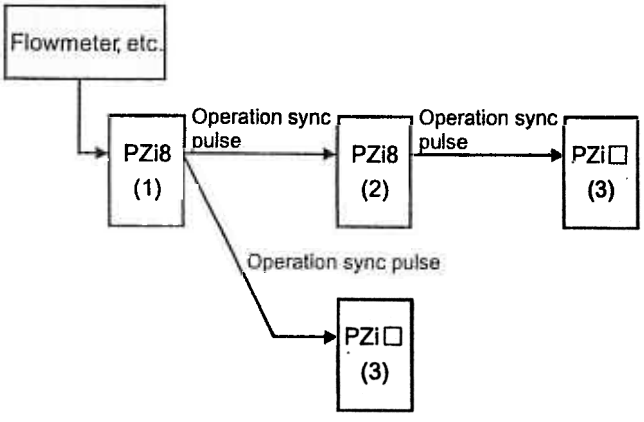
(1) Set the parameters.

- Set P-10 to 0.1 to 600 (mL/min).
  * Set according to the pump specifications or actual measured value.
- Set P-11 to "2: mL/min"
  * Changing the stroke adjustment dial causes the indicated value to deviate.

  The indicated value is the value calculated from the number of strokes (spm).

10-5 Control of Multiple Pumps by a Single Signal

In the following kind of application, a pulse divider is generally used. This, however, is not required on the PZi8.



* On the PZi8 and special function model, two signals can be output.
* After receiving the operation sync pulse, the PZi can also perform frequency-division and multiplication on that signal.
* When the dividing ratios differ, connection is performed using the lower of the two dividing ratios (larger number of pump operations).

(1) Set the parameters.

Set P-8 and P-9 of the PZi8 (1) pump to "2: Operation sync pulse output".

* The operation sync pulse output is set for both OUT1 and OUT2.
* Pumps (2) and (3) are used in the frequency-division (multiplication) mode.

11 Input/Output Port Assignments Change

Input/Output Signals (Port Assignments)

PZi8 Special Function Model

The PZi8 and special function model has three pulse input ports and two pulse output ports. However, these functions are not assigned in the standard specification. In this case, the ports can be switched to make effective use of the limited number of I/O ports.

Note, however, that functions other than "0: Unusable" cannot be assigned in duplicate on input ports.

* See "13-2 Table 1: Input Signal Assignments" and "13-3 Table 2: Output Signal Assignments."

1) Setting of input signals (The following functions can be assigned to inputs 1 to 3.)

0.Unused

Disables use of the input signal port.

(This function is used, for example, when changing ports to avoid duplicate assignments.)

1.Pulse input signal

Performs pulse input for frequency-division and multiplication.

2.Stop input

Pump operation can be paused by inputting this signal during operation.

(Pump operation is stopped by shorting across terminals, and pump operation is started by leaving terminals open.)

When this signal is input, only the STOP key is enabled and pump operation is stopped. The function of other keys is not accepted.

3.Present value reset input

Resets and restarts the current value of the count mode and interval modes.

4.Alarm reset input

Cancels alarm output that is output when an alarm occurs, or pump stoppage according to the setting when an alarm occurs. If the alarm re-occurs even after performing a reset, the alarm cannot be cancelled unless the alarm-reset signal is entered once more.

5.Unused (setting prohibited)

6.Level switch signal input

Alarms are displayed and output when the signal input is ON.

The pump operating state when an alarm occurs can be set by parameter P-12. (default: pump pause)

2) Setting of output signals (The following functions can be assigned to outputs 1 and 2.)

0.Unused

Disables use of the output signal port.

1.Package alarms

The signal is output when an alarm signal is input. This signal is canceled when the alarm is reset by the alarm reset signal or RESET key.

2.Operation sync pulse output

A single pulse signal (pulse width 40 msec) is output per stroke synchronized with solenoid drive.

3.Operation signal output

This signal is output continuously during operation.

Output is also stopped during a stop performed on the operation panel and a pause from the outside.

4.End signal output

When the count preset in the count mode is exceeded, the end signal (100 msec width) is output.

5. to 8. Individual alarm outputs

Alarms are output individually. See "13-3 Table 2: Output Signal Assignments."

3) How to assign ports

Set the respective function No. to parameters P-04 to P-06 and P-08 to P-09.

4) Cautions when Assigning Ports

1.Pulse input port

- The input port cannot be assigned in duplicate except for assignment of "Unusable."

  First, set the duplicate assigned port to "0: Unused" and then set the function No. to the desired port.

- Input control functions on the PZi4 are fixed and cannot be changed.

  1) High-speed port

     Pulse transmitting flow meter signals can be used only on the high-speed port.

  2) Low-speed port

     Malfunction caused by noise can be prevented by using the low-speed port if malfunction occurs by pulse input.

2.Output ports

- All assignments for output ports can be assigned twice or more.
- Two output ports provided.

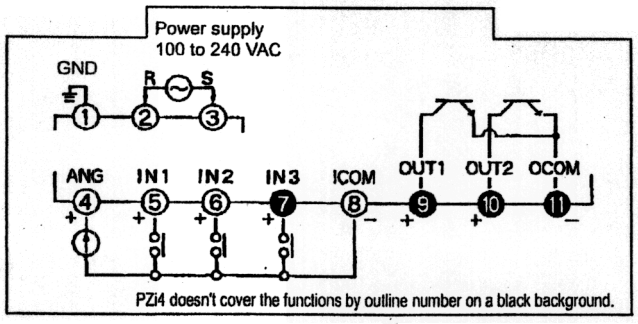
12 Specifications

Specifications	PZi4	PZi8	Special Function Model
12-1 Functions			
Manual operation (0 to 300 spm setting)	Key Operation	Key Operation	Key Operation
Automatic operation (Analog signal input) Proportional band setting, shift setting	○	○	○
Automatic operation (Pulse signal input) Frequency-dividing ratio 1/1 to 1/9999 Multiplication 1 to 9999	○	○	○
Special Function Model *1	—	—	○
12-2 Display			
spm display	spm	spm, %, mL/min	spm, %, mL/min
Mode state display (current mode, unit)	○	○	○
Setup screen, parameters, and error display	○	○	○
12-3 Alarm Display, External Alarm Output			
External stop input	Display	Display, output	Display, output
Input analog signal Out-of-range error *2	Display	Display, output	Display, output
Input pulse signal Memory over *2	Display	Display, output	Display, output
12-4 I/O Signal Specifications (number of ports)			
1) Digital input (high-speed port) No-voltage pulse or open collector Input resistance Approx. 2kΩ Max. number of pulses 7500 pulse/min Min. width of pulses 4 msec (when ON time)	1 port (IN1)	1 port (IN1)	1 port (IN1)
2) Digital input (low-speed port) No-voltage pulse or open collector Input resistance Approx. 2kΩ Max. number of pulses 600 pulse/min Min. width of pulses 50 msec (when ON time)	1 port (IN2)	2 ports (IN2, 3)	2 ports (IN2, 3)
3) Analog input Input resistance Approx. 110 Ω	1 port 4 to 20 mA DC	1 port 4 to 20 mA DC 0 to 20 mA DC	1 port 4 to 20 mA DC 0 to 20 mA DC
4) Digital output 3 mA DC, 25 V or less	None	2 ports (OUT1, 2)	2 ports (OUT1, 2)

*1 See "4-3 Special Function Model"

*2 Automatic operation during the signal input

12-5 Terminal Block Connections



* Use shielded cable for the signal lead, and connect the shield to terminal No.8. (input side) Leave the shield on the signal source lead on the output side connected to terminal No.11 open. (The shielded cable must be of a cross-sectional area of 0.5 mm² or more, and be extended up to 100 meters only.)

13 Data

13-1 List of Parameters

No.	Item	Description	Parameter	Default	Explanation
P-01	Analog mode	Type of input signals	0: 4-20 1: 0-20	0	4 to 20 mA or 0 to 20 mA analog signals supported
P-02	Frequency-division/ multiplication mode	Count of surplus pulse signal	1 to 9999 buffer size	1	Number of pulses to hold.
P-03		Remained pulses when stopped by the external stop signal	0: Save 1: Clear	1	Makes remaining pulses to store/clear at an external signal stop
P-04	Input 1 (high-speed)	Function	See Table 1	1	Any value can be selected from Table 1. Only selected function is enabled (Port and function are assigned simultaneously.) Two or more assignments other than "0: Unused" cannot be set at the same time.
P-05	Input 2 (low-speed)		See Table 1	2	
P-06	Input 3 (low–speed)		See Table 1	3	
P-07	Used for internal processing	—			
P-08	Output 1 (O.C.)	Function	See Table 2	1	Can be freely selected from Table 2. Only the selected functions are effective. (Port assignment and function assignment are performed simultaneously.)
P-09	Output 2 (O.C.)		See Table 2	2	
P-10	Display	Max. displayed discharge volume value	0.1 to 600	360.0	Max. value (reference value) to be displayed when mL/min is selected on P-11.
P-11		Display unit	0: spm 1: % 2: mL/min	0	Unit is displayed as spm or %, mL/min.
P-12	Alarms	Level	0: Operation continued 1: Pause (temporary stop) 2: Pump stopped	1	Selects operation when an alarm occurs. The pause function temporarily stops operation when an alarm occurs, and operation is automatically resumed when the alarm is canceled.
P-13		Injection monitor		0	
P-14		Analog error	0: Operation continued 1: Pause (temporary stop)	1	Select the operation when an analog error occurs.
P-15	Mode screen display	ANG: Analog mode	0: Disabled 1: Enabled	1	When "Disabled" is selected, the mode will be hidden.
P-16		DIV: Frequency-division mode	0: Disabled 1: Enabled	1	
P-17		MUL: Multiplication mode	0: Disabled 1: Enabled	1	
P-18		CNT: Count mode	0: Disabled 1: Enabled	0	
P-19		INT: Interval mode	0: Disabled 1: Enabled	0	
P-20 to P-29	Used for internal processing	—			
P-30	Interval mode	Operation at starting time	0: ON 1: OFF	0	Default operation at starting
P-31	Counter mode	Start trigger	0: Start key 1: External input	1	Sets the start reset method.
P-80	Reset	Reset to the setting at the factory shipment	0: Disabled 1: Effective	0	When 1 is selected and press SET key, all values will be initialized to become the condition at the shipment. The value of P-80 returns to 0.

Note: Parameters cannot be changed on the PZi4 model.

13-2 Table 1: Input Signal Assignments

Code No.	Description	Application
0	Unused	—
1	Pulse input signal	Used in frequency-division/multiplication mode
2	Stop input	When this signal is input, pump operation stops temporarily and the pump standsby.
3	Present value reset input	Resets the present value to the setting value.
4	Alarm reset input	This input resets the alarm flag.
5	Unused (setting prohibited)	
6	Level swich signal input	Alarm is displayed and output when this input is present.

13-3 Table 2: Output Signal Assignments

Code No.	Description	Application	Specifications
0	Unused	—	—
1	Package alarms	This signal is output when any alarm occurs.	Continuous
2	Operation sync pulse output	Pulse signal synchronized with solenoid drive	40 msec pulse
3	Operation signal output	This signal is output during pump operation.	Continuous
4	End signal output	End signal when counting of the setting value ends in the countmeasuring mode.	100 msec pulse
5	Abnormal level error	Selected to output alarm outputs individually.	Continuous
6	Input pulse buffer overflow		
7	Analog input error		
8	Unused (setting prohibited)		

Remarks:

For details on signal specifications, see "12-4 I/O Signal Specifications".

13-4 Alarm PZi8 Special Function Model

13-4-1 Explanation of alarm codes

The following codes appears on the display when an alarm occurs.

Alarm Code No.	Type	State When Alarm Occurs	Remarks
E-01	ROM write error	Pump error	Operation is stopped.
E-02	Abnormal level alarm	When "Level input" is set for the input port, and that port is ON (shorted)	Selects the processing method on P-12.
E-03*	Input pulse buffer overflow	When the number of input pulses increases momentarily during frequency-division/ multiplication mode, and the preset buffer size is exceeded	Operation is continued even if an alarm is output.
E-04*	Analog input error alarm (min to max)	When the input signal deviates from the stipulated range during pump operation in the analog input mode	Selects the processing method on P-14.

* Alarms are only displayed on the PZi4.
When the error is remedied, the alarm is automatically canceled, and the regular display returns.

13-4-2 Mode when an alarm occurs (occurs only during operation)

Alarm Code No.	MAN	ANG	DIV • MUL	CNT • INT
1	●	●	●	●
2	●	●	●	●
3	—	—	●	—
4	—	●	—	—

●: Alarm occurring

13-4-3 How to remedy alarms

<<No.1>>

- Try turning the power OFF and then back ON again. If this does not remedy the alarm, a probable cause is a circuit error.

<<No.2 to 4>>

- Press the RESET key to remedy.
- Remedy by resetting the alarm externally.
- Stop pump operation by the STOP key.

13-5 Display Details in Different Statuses in Each Mode

■ part blinks.

Status / Mode	Operation			External stop			Internal stop			Setting 1			Setting 2		
	Code	Numerical value	Unit	Code	Numerical value	Unit	Code	Numerical value	Unit	Code	Numerical value	Unit	Code	Numerical value	Unit
Manual	MAN	Setting value	*1	MAN STP	Setting value	*1	MAN STP	Setting value	*1						
Analog	ANG	Output value	*1	ANG STP	0	*1	ANG STP	*2		ANG STP P	Proportional band setting value	%	ANG STP P	SHIFT setting value	%
Frequency -division	DIV	Frequency -dividing ratio	Disabled	DIV STP	Frequency -dividing ratio	Disabled	ANG STP	Frequency -dividing ratio	Disabled	DIV STP	Frequency -dividing ratio	Disabled			
Multiplication	MUL	Multipli-cation	Disabled	MUL STP	Multipli-cation	Disabled	ANG STP	Multipli-cation	Disabled	MUL STP	Multipli-cation	Disabled			
Count *9	CNT *8	*3	Disabled	CNT *8 STP	*4	Disabled	CNT STP *8	Setting value	Disabled	CNT STP *8	Setting value	Disabled	CNT STP *8	Setting value	Disabled
Interval *9	INT *7	*7	min	INT STP *5	*4	min	INT STP *6	* Setting value corre-sponding to 6	min	INT STP ON	Setting value	min	INT STP OFF	Setting value	min

*1: spm or % or mL/min (See P-10 and P-11.) The unit is fixed to spm on the PZi4 model.
*2: 4-20 or 0-20 (See P-01.) PZi8 model and special function model only
*3: Countdown display from setting value. Pump operation stops when count reaches 0 at the end of countdown.
*4: Countdown is paused, and standby state is entered. (pause function)
*5: ON/OFF display is switched and lit according to the set time.
*6: State at start of timer operation is displayed. Either of ON or OFF (see P-30)
*7: Countdown display from setting value. ON/OFF is switched at end of countdown.
*8: Digit setting or setting value of X1000, X100, X10, X1
*9: This mode and function are not provided on the PZi4 model.

This is the reference for US users;

Performance Specifications Tables (PZi series)

Item \ Model	PZi-32	PZi-52
Max. discharge volume G/H (L/H)	5.7 (21.6)	8.5 (32.4)
Discharge volume per stroke (mL/stroke)	1.2	1.8
Max. discharge pressure psi (MPa)	43.5 (0.3)	29 (0.2)

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