OVAL

Explosionproof Type
BATCH CONTROLLER
MODEL : EL7210

GENERAL SPECIFICATION
GS.No.GEB504E-2

■GENERAL

Designed to be used in combination with a flowmeter and a shutoff valve, the batch controller passes a predetermined amount of the process fluid in batching operations. Built around a microprocessor, this versatile, easy-to-use controller features elaborate calculating capabilities.

It saves time and effort in many processes, such as blending materials, dosing with additives, transferring materials from one tank to another, or shipping from an outlet, at chemical, food, paint plants or elsewhere where streamlined production lines are desired.

■FEATURES

1. Field-installable in hazardous areas:

Flameproof enclosure (Exd II BT4) permits installation in hazardous locations (Division 1 and 2).

2. Easy to operate:

The controller responds to batch setup, start, stop, and reset commands - all at the touch of front-panel pushbuttons.

3. Accurate batch control:

Thanks to the output of status valve operate signals (2 points) and 4/20mA PID control signal, application-specific accurate valve control and accurate batch measurement can be achieved.

4. Simplifies system configuration:

Can control the system with a start, stop, and reset signal arriving from a remotely located point. Also available is an end-of-batch signal. All these features greatly facilitate interlocking with other control systems.

5. Increased process safety:

（1）The status valve control signal, when set to a two-state open (restricting the initial velocity) and two-stage shutoff (restricting the final velocity) mode, opens and shuts off the valve in two stages; this arrangement prevents not only static electricity buildup in the pipeline or in the tank at startup, but also water hammer, or hydraulic shock, to the pipeline at valve closure.

（2）The system can be configured to produce an alarm signal or sound a buzzer whenever trouble occurs in the process for some reason, resulting in the absence of pulses, or when measurement is made beyond the preset batch quantity.

Wall Mount Type

Stanchion Type

■GENERAL SPECIFICATIONS

Item				Description		
Principle of operation				Pulse addition		
Display				Backlit LCD 320×R. G. B×240 dots		
Information shown	Shown at all times			Grand total (9-digit)：Target batch 6-digit, standard (9-digit max.)：Instant rate (corrected) SV, MV, PU, END, ALARM, com. status, measurement units Alarm identification		
	Scrolling variables			Front panel pushbuttons select one of the variables below. （Temp., press., density, volume conv. factor, grand total (9-digit), total before temp. corr. (9-digit)）		
Input signal	Number of flow inputs			Pulse generator selector board is used. Can accept 2 inputs (option: for checking the deviation of pulse input value)		
	Input pulses	2-wire type / 12VDC 3-wire type contact pulse		PG20, etc.	12VDC	Shortcircuit current 40mA
		2-wire type / 12VDC 3-wire type voltage pulse		PG30, etc.		
		2-wire type / 12VDC 3-wire type Open collector pulse		FLOWPET-NX NPG60A		
		12VDC 2-wire type current pulse		PG30S		
		24VDC 2-wire type current pulse (4/20mA)		PA14/15/25 ULTRA OVAL	24VDC	
		Frequency response		200Hz（2kHz with hardware input scaling enabled）		
		Min. pulse width		0.2ms		
	Remote control input	Start		Instant make, form "a" contact	Capacity 24VDC, 5mA max. Pulse width：30ms min. Secure at least a 0.5 sec interval between signals.	
		Reset		Instant make, form "a" contact		
		Stop		Instant break, form "b" contact		
		Interlock		Normally "short" input (Form "a" contact)		
	Temperature			3-wire Pt100 Transmission length: 300 meters (loop DC resistance 5Ω max. with CVVS 1.25 sq. mm or equiv.) 4 to 20mA (internal load resist.: 250Ω) or 1 to 5V		
	Pressure (option)			4 to 20mA (internal load resist.: 250Ω) or 1 to 5V		
	Power to transmitter (temp. and press.)			24V±10%VDC Max.: 80mA		
Meter factor setting				Significand: 0.0001 to 9.9999 Exponent part: -5 to +5		
Correction	Temperature			JIS K2249-1995 "Crude Oil and Petroleum Product" JIS K2240-2007 "LPG" Other liquids (Correction formula using a quadratic approximation)		
	Temperature range			-20 to +160℃		
	3α			Yes（Can set up temp. to start correction.）		
	Pressure			Option		
Temperature correction accuracy				±0.075% RD, Ambient temperature error: ±0.004%/°C (Reference: 20°C)		
Batch setting	Batch setting value			Any setting or 7 kinds of setting - Default 1k: 1000, 2k: 2000, 4k: 4000 and additional four settings are selectable		
	Initial step value			0 to 9999 counts (default: 80 couns)		
	Final step value			0 to 9999 counts (default: 80 couns)		
	Anticipated overshoot			0 to 99 counts (default: 2 couns)		
	Overshoot			0 to 99 counts (default: 2 couns)		
Pump output delay timer				0 to 9999 sec (default: 30 sec)		
Alarms	Pulse variation			0 to 15 pulses (default: 0 pulse)		
	Missing pulse			0 to 99 sec (default: 5 sec) Invalid for 5 sec after startup		
	Excessive flowrate			1 to 99999		
Valve operate signals	S V			Holds from the start of a batch until end of a batch. Voltage signal which is the same as supply voltage, or Form Relay contact "a" (250VAC, 1A)		
	M V			Holds from the end of initial controlled flow until the start of final controlled flow. Voltage signal which is the same as supply voltage, or Form Relay contact "a" (250VAC, 1A)		
	P I D			4 to 20mA（Max. load resistance 750Ω）		
Output	Pump			Holds from the start of a batch until "end of a batch + timer" setting relay contact "a" or contact "b" (250VAC, 1A)		
	End and Alarm			Non-contact relay (250V AC/DC, 0.15A, resistance 16Ω or less at ON, leak current 1μA or less at OFF)		
	Pulse					
		Pulse width		1 to 99 ms selectable in 1 ms steps		
		Transmission length		One kilometer max. with CVVS 1.25sq. mm or equiv.		
Communication	Interface			RS-485 (standard) or RS-232C (option) or USB2.0 (standard)		
	Protocol			Modbus RTU		
	Baud rate			1200, 2400, 4800, 9600, 19200, 38400bps		
	Transmission length			RS-485: 1.2 kilometers max. （※1）		
	Contents			Parameter read/write, total and other variables read		
Operation check functions				Yes（I/O check except for pulse, temp., press. input, PID output）		
Parameter configuration				Front-panel pushbuttons (available only part of parameters), Communication （※2）		
Power failure backup				Evacuates critical data in EEPROM.		
Power supply				100/110/115VAC, 200/220/230VAC 50/60Hz		
Max. power consumption (apparent power)				AC230V：58VA, AC220V：51VA, AC200V：45VA AC100V：38VA, AC110V：40VA, AC115V：41VA		
Ambient temperature				－10 to ＋50℃		
Insulation resistance				Because of surge suppressors installed, insulation resistance and dielectric tests are unacceptable.		
Dielectric strength						
Explosionproof rating				Flameproof enclosure Exd II BT4 （※3）		
Installation				Stanchion or wall mount type		
Finish				Munsell 2.5PB5/8 (glossy)		
Weight				Stanchion type: 50 kg approx. or wall mount type: 25 kg approx.		
Electromagnetic compatibility				EMS EN55011 EN61000-6-2		

※1: Varies depending on communication rate, cable diameter, and termination resistance.
※2: Reconfigurable parameters are: initial step value, final step value, anticipated overshoot, overshoot, missing pulse interval, and batch setting. Of the PID control function, only set values of P, I, and D parameters can be modified with front-panel pushbutton operation.
※3: To use this controller in a hazardous location, the following pressure-resistant gaskets (options) are required: •Model SXC-28B supplied by Shimada Electric Co. Ground the GND terminal surely.
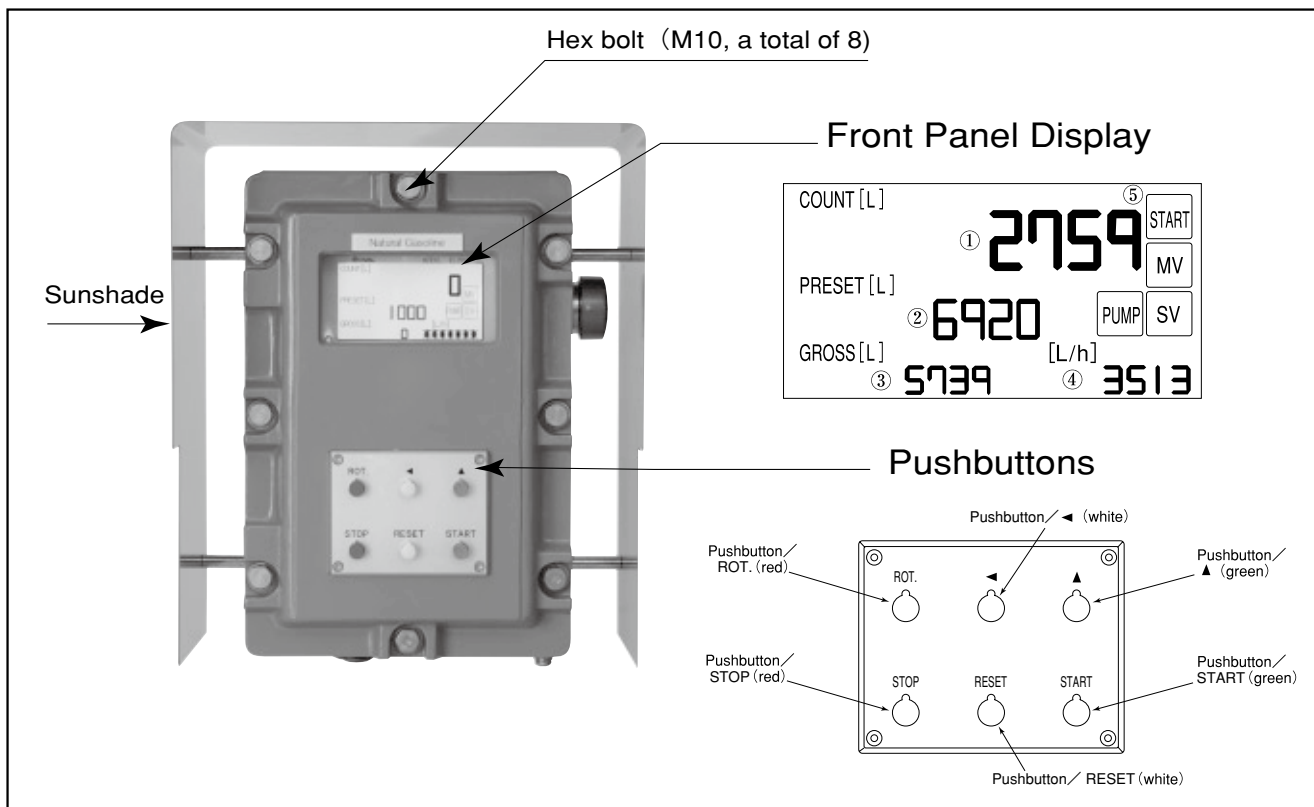
■ OPERATION TIME CHART

Description of Operation (where two-stage open shutoff valve is used.)
Upon depression of START button (point A), the valve opens to a predetermined position (initial controlled flowrate). When a predetermined quantity (from point A to point B) is delivered, the valve opens fully; when metering reaches point C, the valve automatically throttles the flow and maintains a predetermined valve position (final controlled flowrate). At point D, a closure signal is generated. However, due to a time lag in valve actuation inherent to the type of valve used, the valve actually closes at point E. Here, since the quantity delivered from point D to point E is an overshoot that can be anticipated, we can determine the target setpoint with this overshoot corrected. While the time required for the valve to shut off may remain constant, variables, such as line pressure variation, cause the closure point to deviate more or less from point E. By taking into account this overshoot from point E, we can arbitrarily select the magnitude of overshoot. If an overshoot, or overmeasurement, exceeds a predetermined quantity, the controller can be so configured as to produces an alarm. In the event an alarm is issued, the next measurement is prevented.
Safe and accurate measurement is thus achieved. As a matter of course, valve positions from A→B and C→D must be adjusted beforehand on the part of the valve.

Controlled flow functions
PID control to match the instantaneous flowrate to the flow program setting.
Proportional band（P）：0 to 9999％
Integral time（I）：0.01 to 99.99 sec.
Derivative time（D）：0.00 to 99.99 sec.
Settings .. Initial flowrate, full flowrate, final flowrate

■ MODEL CODE NUMBER

Item	Product Code								Supplementary Code							Description
	①	②	③	④	⑤	⑥	—	⑦	⑧	⑨	⑩	⑪	⑫	⑬	
Model	E	L	7	2	1	0	—								Explosionproof Type Batch Controller
Power Supply								1							100VAC　50/60Hz
								2							200VAC　50/60Hz
								3							110/115VAC　50/60Hz
								4							220/230VAC　50/60Hz
								9							Other than above
Flowrate input									2						2-wire type / 12VDC 3-wire type contact pulse (PG20 etc.)
									3						2-wire type / 12VDC 3-wire type voltage pulse (PG30 etc.)
									4						24VDC 2-wire type current pulse (4/20mADC)
									5						12VDC 2-wire type current pulse (PG30S)
									6						2-wire type / 12VDC 3-wire type open collector pulse
									9						Other than above (2 inputs inclusive)
Programming										1					Any 6-digit setting
										2					1-2-4k remote input
										9					Other than above
Temperature input											0				Less temperature input (no correction for temperature)
											1				Pt 100Ω
											2				1 to 5VDC voltage input
											3				4 to 20mA current input
											9				Other than above
Valve operate signals												1			The same voltage as supply voltage
												2			Contact-closure output
												3			For controlled flow PID 4 to 20mA
												4			For controlled flow (term 1 + term 3)
												5			For controlled flow (term 2 + term 3)
												9			Other than above
Installation													1		Wall mount type
													2		Stanchion type
Finish														1	Munsell 2.5PB5/8, glossy
														9	Other than above

○Standard communication interface：RS-485 (RS-232C is optional.)
○Pressure input (pressure compensation) is optional.
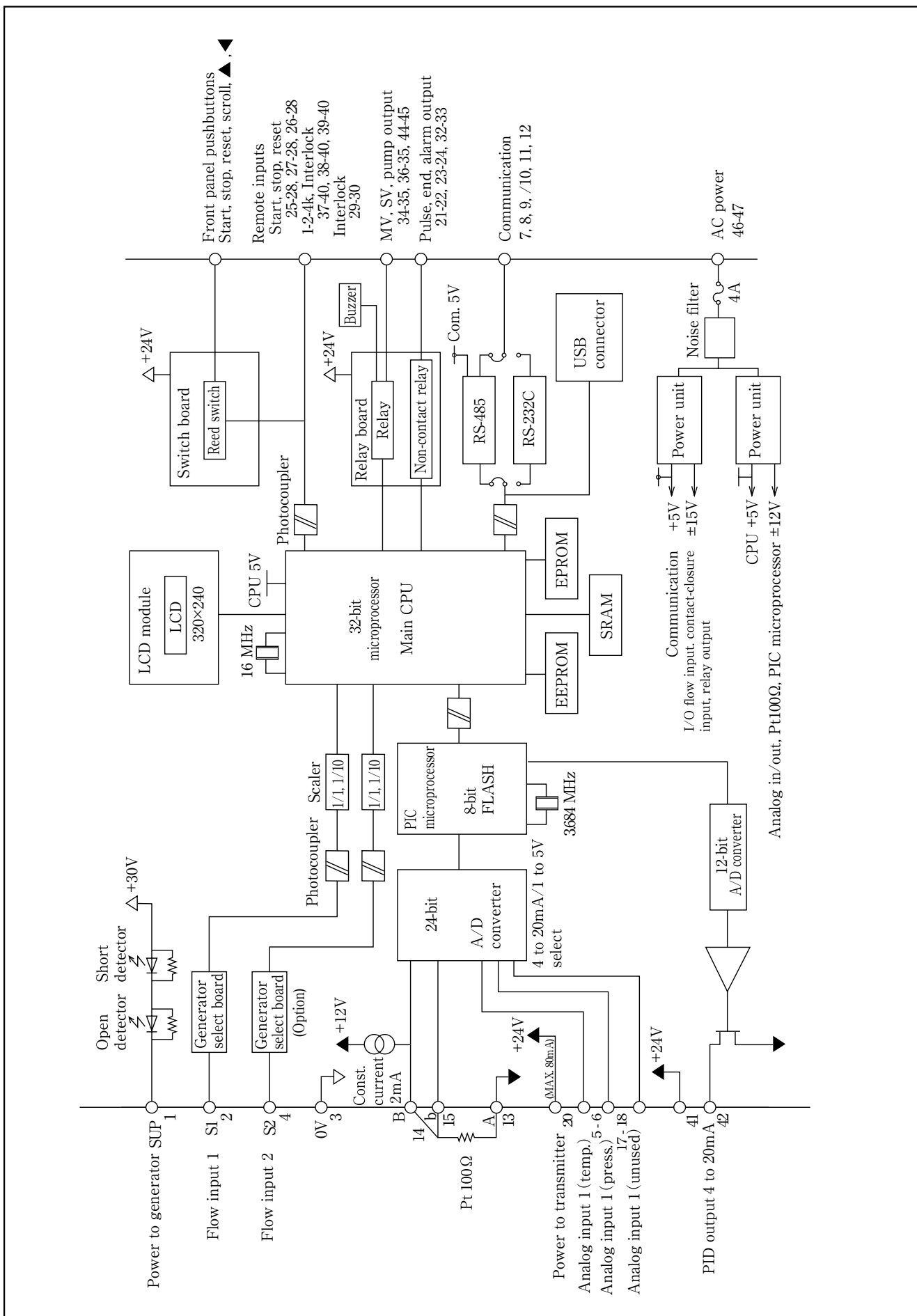
■PART NAMES AND FUNCTIONS

●Front Panel Display and Controls

	Display item		Functions
①	Total counter		Shows accumulated total reading in a range 0 to 999,999,999.
②	Preset window		Shows setting in a range 0 to 999,999,999.
③	Scrolling window		Shows NET, GROSS, TEMP, PRESS, DENSITY, and K.
		NET	Shows Total NET reading in a range 0 to 999,999,999.
		GROSS	Shows Total GROSS reading in a range 0 to 999,999,999.
		TEMP	Shows obtained temperature reading in a range within preset high and low limits.
		PRESS	Shows obtained pressure reading in a range within preset high and low limits. If no pressure input is present, always "1" is shown.
		DENSITY	Shows obtained density reading in the form X.XX (to the second decimal place).
		K	Shows volumetric conversion factor in the form X.XXXX (to the fourth decimal place).
④	Normally flowrate is shown. But in an alarmed condition, an alarm information appears.		
	Instant flowrate display		Shows in a range 0 to 9,999.999 during a batching process. If measurement is made beyond the prese limit, a message "Over" appears. In the standby state, a dotted line ******* appears.
	Messages in an alarm	MissP.	Missing pulse error	Over	Overshoot error
		Temp.Ovr	Temp. high alarm error	Temp.Udr	Temp. low alarm error
		Pres.Ovr	Press. high alarm error	Pres.Udr	Press. low alarm error
		Sensor	Sensor open/shorted error	FlowOver	Excessive flow error
		Pulsedif	Pulse deviation error	Pra.ERR	Parameter error
⑤	Status window		Shows START/STOP/END, MV, SV, PUMP and COM. ・Shows START, STOP, and END corresponding to the operating status. (Nothing appears in the standby state.) ・SV, MV or PUMP appears dimmed, or greyed out, in the absence of output; it becomes visible in color when an output is ON. ・COM appears during communication.

●Pushbutton Functions

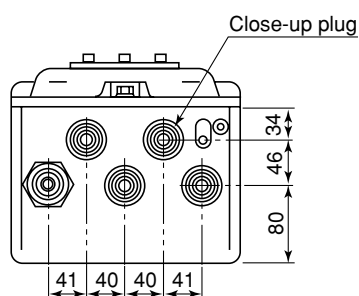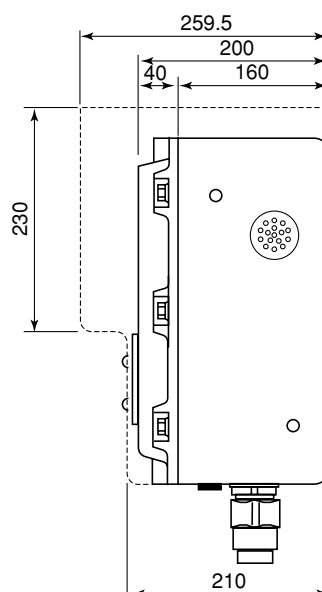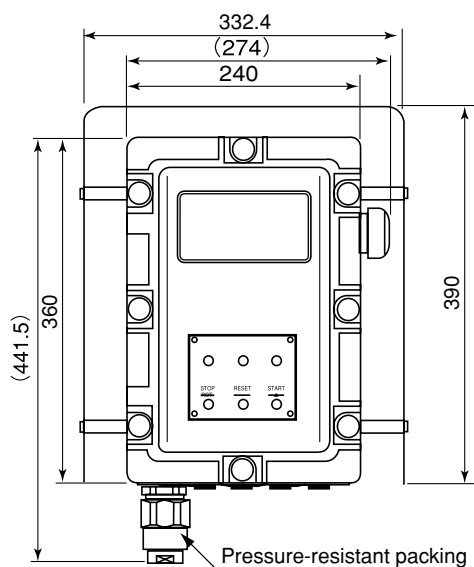| Pushbutton label	Functions
ROT.	Scrolls the menu items in the display. Holding it depressed for 3 seconds moves the mode to Parameter SET mode.
◄	Used to move the cursor when you set up a parameter.
▲	Holding it depressed for 3 seconds moves the mode to SET mode (for setting up various parameters). Also used to increase the figure when you set up a parameter.
STOP	Interrupts the batching cycle temporarily. Also used to reset the buzzer in an alarm or clear an alarmed condition. (See Sec. 12.2 "Alarm Output and Reset Operation" in the instruction manual.)
RESET	Reset the batching cycle. Resets pulse input (counter reading) before initiating a batch, or resets an alarmed . condition.
START	Starts or reopens a batch cycle. Also used to finalize the setting when you set up a parameter.

■CONTROLLER BLOCK DIAGRAM

■ TERMINAL IDENTIFICATION

Term. No.	Label			Description
1	Flow signal input	SUP	FLOW SIGNAL IN	
2		SIG1		
3		0V		
4		SIG2 (Option)		
5	Temp. transmitter	+	TEMP IN	4 to 20mA（internal load resistance：250Ω）or 1 to 5V
6		−		A parameter selects current input or voltage input.
7	Communication	RX+	COMMUNI-CATION	
8		RX−		
9		SG		
10		TX+		
11		TX−		◎If RS-485 is selected, terminals 7-10 and 8-11 are internally connected. With multidrop wiring, etc., either of these terminal pairs may be used as a tie-point.
12		SG		◎Terminals 9-12 are internally connected.
13	Resistance bulbs	A	Pt100Ω	A ■
14		B		B ■ Input terminals for resistance bulbs.
15		b		
16		G		b ■ G terminal⋯GND
17	Pressure transmitter	+(option terminal)	PRESS IN	4 to 20mA（internal load resistance：250Ω）or 1 to 5V
18		−(option terminal)		A parameter selects current input or voltage input.
19		G		G terminal⋯GND（earth ground）
20		SUP		SUP⋯Power to transmitter（for temp. and/or press.）（24VDC）
21	Pulse output	+	TC OUT	Pulse output terminals
22		−		Non-contact relay (250V AC/DC, 0.15A, resistance 16Ω or less at ON, leak current 1μA or less at OFF)
23	END output	+	END OUT	END output terminals
24		−		Non-contact relay (250V AC/DC, 0.15A, resistance 16Ω or less at ON, leak current 1μA or less at OFF)
25	Contact-closure input	SA	REMOTE CONTROL	Start, reset: Form "a" contact Contact "ON" duration: 30ms min. (instant make)
26		RE		Stop: Form "b" contact Contact "OFF" duration: 30ms min. (instant break)
27		ST		Capacity 24VDC, 5mA max.
28		COM2		Secure at least a 0.5 sec interval between signals.
29		LOCK	INTER LOCK	Interlock terminal：Normally "short" input (Form "a" contact)
30		COM2		(Earth grounding input signal, etc.)
31		G	GND terminal	Earth ground terminal
32	Alarm output	+	ALM OUT	Alarm output terminal
33		−		Non-contact relay (250V AC/DC, 0.15A, resistance 16Ω or less at ON, leak current 1μA or less at OFF)
34	Valve operation signals	MV	VALVE OUT	Control valve Control output signal (2-stage shutoff valve) MV: Holds from the end of initial controlled flow until the start of final controlled flow. SV: Holds from the start of a batch until the end of a batch. Voltage signal the level of which is the same as supply voltage, or Form "a" contact (250VAC, 1A)
35		COM1		
36		SV		NOTE: To protect electrical contacts, couple a surge suppressor across MV-COM 1 and across SV-COM 1. (Suggested ratings are R: 120Ω and C: 0.1μF.)
37	Contact-closure signal	1k	REMOTE IN	Remote input terminals for target batch selection.
38		2k		
39		4k		
40		COM2		
41	Valve operation signal	+	PID OUT	PID output terminals for valve control
42		−		4 to 20mA output（max. load resistance 750Ω）
43		G	GND terminal	Earth ground terminal
44	Pump output	+	PUMP OUT	Output terminals for pump Holds from the start of batch until "batch end + time setting"
45		−		Form "a" or Form "b" contact （250VAC, 1A）
46	Power input	H	POWER VAC	100/110/115 VAC, 50/60Hz or
47		N		200/220/230 VAC, 50/60Hz
48		G		G terminal⋯GND (earth ground terminal)

■ OUTLINE DIMENSIONS (Unit in mm)

● **Wall Mount Type** (**EL7210-**□□□□□**1**□)   Approx. Weight 25kg

Pressure-resistant packing

Close-up plug

※: If you want to use the product for explosion proof,
be sure to use the specified pressure tight packing.
(Prepare the pressure tight packing separately by
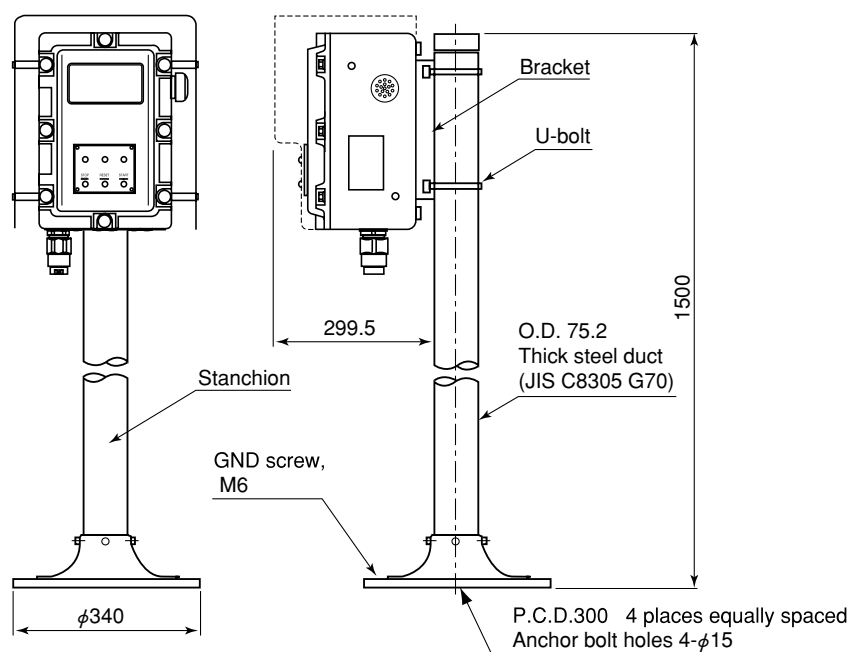specifying the quantity.)
Manufacturer: SHIMADA ELECTRIC CO., LTD
Type: SXC-28B
Block the unused electric wire connection port with
the close-up plug included with this device.

● **Stanchion Type** (**EL7210-**□□□□□**2**□)   Approx. Weight 50kg

Bracket

U-bolt

Stanchion

GND screw,
M6

O.D. 75.2
Thick steel duct
(JIS C8305 G70)

P.C.D.300　4 places equally spaced
Anchor bolt holes 4-φ15

■When making inquiries, please advise the following:
(Fill in the blanks or check □ with ✔ mark.)

1. Product model   EL_____
2. Application _____
3. Companion flowmeter type_____
   Metered process fluid _____
4. Flow range   Min. flowrate_____ Max. flowrate_____
5. Pulse generator type or converter type _____
6. Input (pulse generator) pulse units _____
   Resolution of total counter reading _____
7. Supply voltage_____VAC_____Hz
8. Companion receiving instrument type, model, and specifications for batch end output, remote output to totalizer, and alarm output
9. Remote command input (start, stop, reset, interlock) types
10. Factory- or user-defined parameters
    □Standard   □Specified

Item	Specified setting
(Example) Initial setting	100 counts
_____	_____
_____	_____

11. Temperature input specifications
    □Pt100 Ω   Resistance thermometer type _____
    □4 to 20mA   □1 to 5VDC
    ※Temperature range_____ to _____℃
12. Companion valve type, model, specifications
13. Tag No., instrument No., etc.
14. Pressure-resistant packing quantity desired _____ Unit
15. System block diagram and a sketch of installation location
16. Interface with the host CPU   □Yes   □No

⇒NOTE

This controller has obtained an explosionproof certificate, including pressure-resistant packings. If you plan to use it in an explosionproof application, pressure-resistant packings dedicated to this controller are required separately. So do not forget to specify the quantity of pressure-resistant packings desired.

When you use pressure-resistant packings, use cables 16.0 to 20.0mm in outside diameter and never route signal cables in the same conduit with power cable.