AOJ5000/AOL5000

INTELLIGENT FLOW TOTALIZER CONTROLLER

1. GENERAL

1.1 AOJ5000 intelligent flow totalizer controller without compensation. Apply to water, oil, liquid, solid fluid without compensation, and other industrial processes parameters of flow measurement, display, control and measurement of the plot count. It can receive differential input of Orifice or vortex flow-meters, electromagnetic flow-meters and turbine flow-meters.

1.2 AOL5000 intelligent flow totalizer controller with compensation.Apply to water, liquid, saturated steam, superheated steam, gas, compressed air, gas and other general industrial process flow measurement parameters, the control and measurement of the plot and counting sensor output. It can receive differential input of Orifice or vortex flow-meters, electromagnetic flow-meters and turbine flow-meters, with temperature and pressure compensation.

1.3 Designed based on computer processor, Auto cold junction compensation, Auto zero calibration and nonlinear signal linearization, ensure measure Accuracy.

1.4 Use wide supply power and man-machine conversation with character, fall power protect, password lock class, error indication of input signal (break display “ br ”; exceed upper limit “ hi ”; exceed lower limit “ lo ”) and configuration of input and output, easy use and maintenance for consumer.

1.5 Flow input: 0-10mA, 4-20mA, 0 - 5V, 1 - 5V or 0-5kHz frequency.
Pressure compensation input: 0-10mA, 4-20mA, 0 - 5V, 1 - 5V.
Temperature compensation input: Pt100 RTD or K-TC or E-TC or 0-10mA or 4-20mA or 0 - 5V or 1 - 5V.
According to the national standard GB2624-80 design, the whole range of compensation.

1.6 The relays can be configured to report instantaneous flow or pressure or temperature alarm or warning Batch Control (cumulative flow alarm) as a way.

1.7 May bring instantaneous flow of 0-10mA、 4-20mA、 0 - 5V and 1 - 5V output isolation transmission.

1.8 19 kinds of compensation models applicable to the various media and various fluid flow sensors, can switch button, which is located with.

1.9 Single-point calibration, the whole range of compensation.
Required to design points (P_1, t_1), the design point of the flow-meter measurement range (F_0, F_{FS}), temperature sensor types and range temperature sensor (t_0, t_{FS}), the pressure sensor range (P_0, P_{FS}) in the importation of instruments, and so choosing the right compensation model, instrument calibration that is the normal work can be finished, extremely convenient to use.

1.8 May bring 0-10mA, 4-20mA, 0 - 5V, 1 - 5V transmission output isolation.

1.9 With RS232/ RS485/RS422/MODEM communication port.

1.10 Input err manage menu setting.

2. TECHNIQUE PARAMETER

2.1 Environment condition:
Ambient temperature: 0 to 50℃
Relation humidity: ≤90%RH

2.2 Power supply: 90 to 265VAC or 24±10%VDC

2.3 Accuracy: ±0.5%F.S+1digital
Dissolution: 0.001,0.01,0.1,1

2.4 Input feature:
TC: input impedance >10MΩ
RTD: wire resistance 0 ~ 5Ω
V: input impedance >100kΩ
mA: input impedance <300Ω

2.5 Output feature：
Relay capacity: 0.5A/240VAC，
V: output impedance >100kΩ
mA: output impedance <600Ω

2.6 Inside cold compensation: 0 ~ 50℃

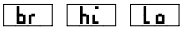
2.7 Power output: 24±10%V DC / 30mA

2.8 Power consumption: <5W
Weight: <0.5kg

2.9 The scope of compensation:

Saturated steam:	T：0~374℃	P：0~28.19MPa(Surface Press)
Superheated steam:	T：140~600℃	P：0~21.41MPa(Surface Press)
Gas:	T：-200~600℃	P：0~10.00MPa(Surface Press)
Liquid:	T：-200~600℃	

3. TROUBLESHOOTING

No	Symptom	Check
1	The front display does not appear.	Is power properly supplied to mainframe? ● The power line connection terminal is wrong. ● Power not supplied. ● Power line not connected or open circuited.
		Is the main unit completely inserted in the mainframe case? ● The main unit is not fully inserted. → Completely push in the main unit.
		Is there any unusual sound, smell or heating from the mainframe? ● Anomaly of mainframe by entry of metal piece, etc. → Immediately stop operating and call us for service.
2	LED display input trouble code. 	Input signal and input wiring? ● Check input signal and input wiring. ● Call us for service.
3	Can't unlock the menu.	● Lose the lock code. → Call us for service.
4	Can not enter the corresponding menu.	The meter with the corresponding menu ● Sure the menu unlock.→ Unlock the menu. ● Sure designate type. →Call us for service.

4. EQUIPMENTS

4.1 Main unit 1 set.

4.2 Instruction manual 1 copy.

4.3 A check mark(A guarantee).

5. MOUNTING

Type code	**(W×H×D)** Meter outline dimensions	**(W×H)** Panel cutoff dimensions
H8	160×80×110 mm	$152^{+0.5}$×$76^{+0.5}$ mm
V8	80×160×110 mm	$76^{+0.5}$×$152^{+0.5}$ mm
H4	96×48×110 mm	$92^{+0.5}$×$45^{+0.5}$ mm
V4	48×96×110 mm	$45^{+0.5}$×$92^{+0.5}$ mm
S7	72×72×85 mm	$68^{+0.5}$×$68^{+0.5}$ mm
S9	96×96×110 mm	$92^{+0.5}$×$92^{+0.5}$ mm

6. WIRING

6.1 CAUTION

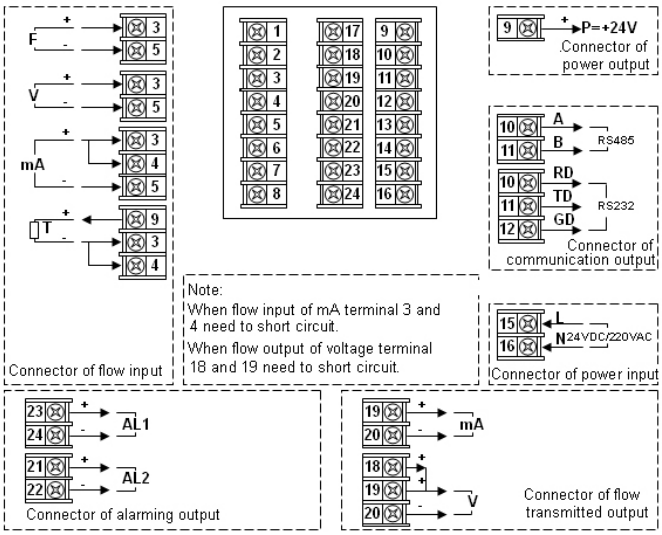
6.1.1 Signal cable should depart from the power supply, and mast be the shield cable, and the shield mast be connected to the signal earth, to avoid the signal influence.

6.1.2 The device power should be an independent power, a cleaning power, and should not be connected to other polluted power.

6.1.3 We keep the right to promote the products, if there are difference between operation instruction and case back wiring, the case back wiring is always the right.

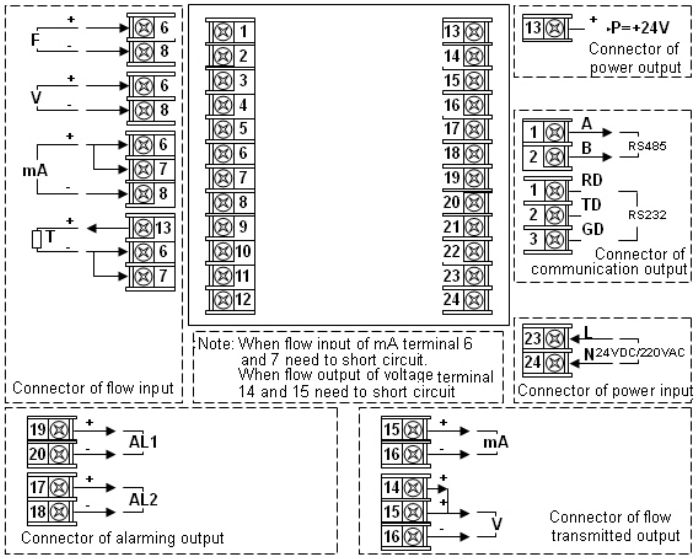
6.2 WIRING DIAGRAM

6.2.1 AOJ5000 [Wiring diagram of S7]



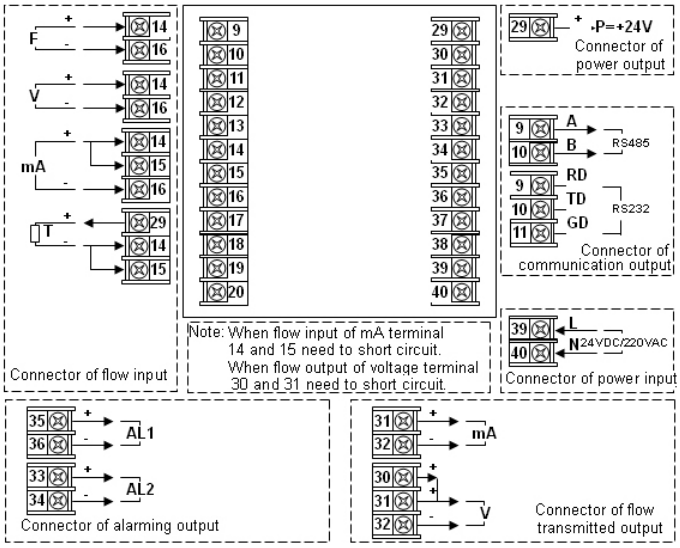
Caution:When input of mA terminal 3 and 4 need to short circuit.

6.2.2 AOJ5000 [Wiring diagram of S9 or V4 or H4(Turn 90 degrees of clockwise)]



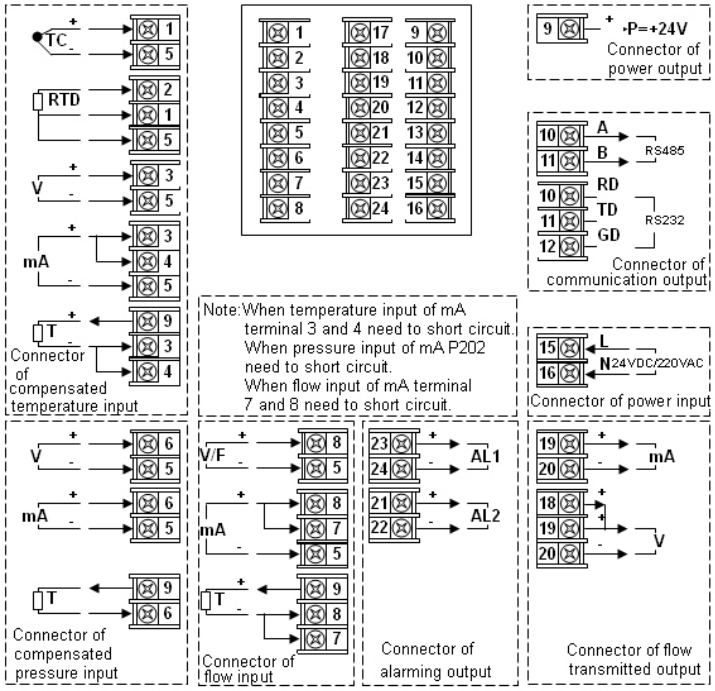
Caution:When input of mA terminal 6 and 7 need to short circuit.

6.2.3 AOJ5000 [Wiring diagram of V8 or H8(Turn 90 degrees of clockwise)]



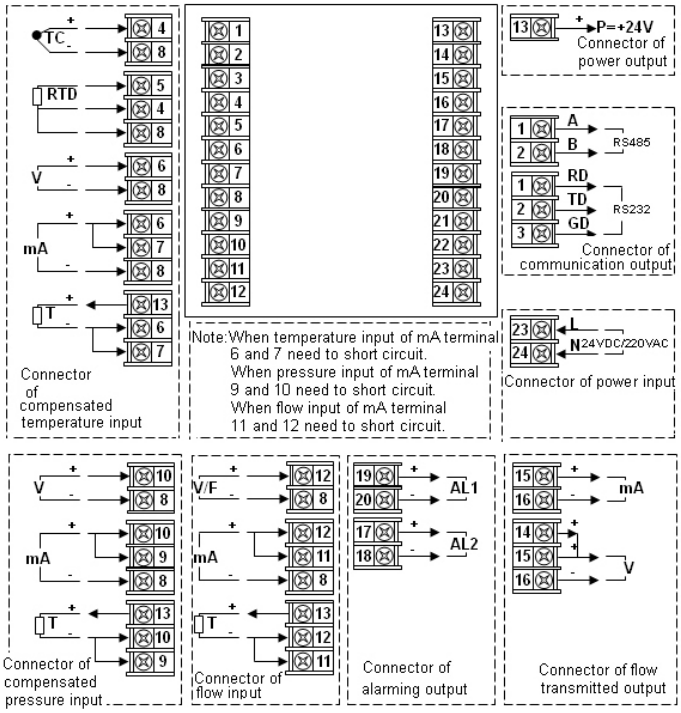
Caution:When input of mA terminal 14 and 15 need to short circuit.

6.2.4 AOL5000 [Wiring diagram of S7]



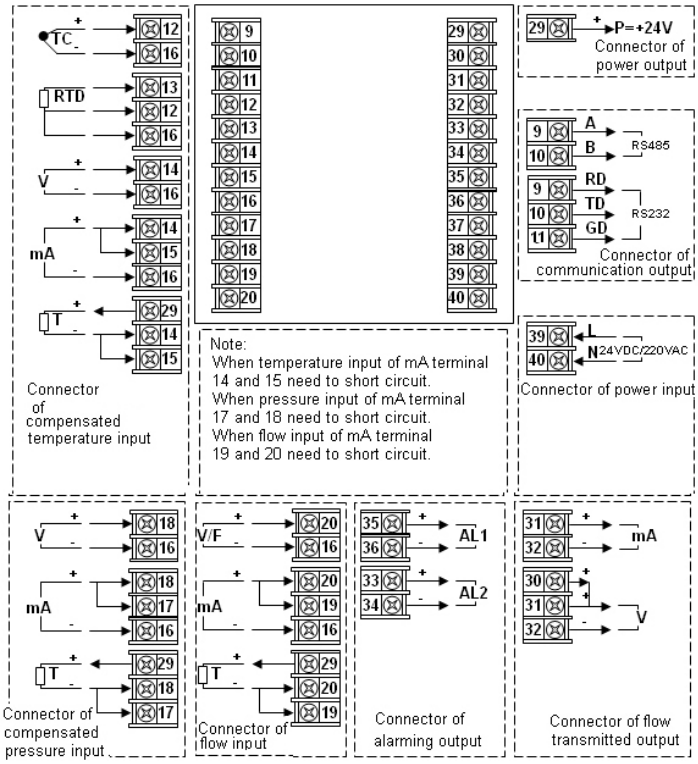
Caution:When F input of mA terminal 11 and 12 need to short circuit.
When P input of mA P202 need to short circuit.
When T input of mA terminal 6 and 7 need to short circuit. Or input of RTD terminal 4 and 8 need to short circuit

6.2.5 AOL5000 [Wiring diagram of S9 or V4 or H4(Turn 90 degrees of clockwise)]



Caution: When F input of mA terminal 11 and 12 need to short circuit.
When P input of mA terminal 9 and 10 need to short circuit.
When T input of mA terminal 6 and 7 need to short circuit. Or input of RTD terminal 4 and 8 need to short circuit

6.2.6 AOL5000 [Wiring diagram of V8 or H8(Turn 90 degrees of clockwise)]



7. HOW TO DESIGNATE TYPE

A	O											Description
												3.Design type
		J										Flow totalizer controller
												4. Design series
			5									Single loop
												5.Contrl output type
				0								With 0 relay output
				1								With 1 relay output
				2								With 2 relay output
				3								Batch control threshold alarm
												6.Input type
					0							Frequency input
					5							0~10mA input
					6							4~20mA input
					7							0~5V input
					8							1~5V input
					9							Special input
												7.Transfer output type
						0						No flow output
						5						0～10mA flow output
						6						4～20mA flow output
						7						0～5V flow output
						8						1～5V flow output
						9						Special flow output
												8-9.Outline type
							H 8					160×80 mm, Horizontal
							V 8					160×80 mm, Vertical
							H 4					96×48 mm, Horizontal
							V 4					48×96 mm, Vertical
							S 7					72×72 mm, Square
							S 9					96×96 mm, Square
												10.Power output type
								N				No power output
								P				With 24VDC/70mA output
												11.Power supply type
									A			220 VAC
									D			24 VDC
												12.Communication port
											0	Without communication port
											3	With RS232 isolated port
											8	With RS485 isolated port
A	**O**	**J**	**5**	**0**	**6**	**0**	**H**	**8**	**P**	**A**	**8**	**Standard Example**

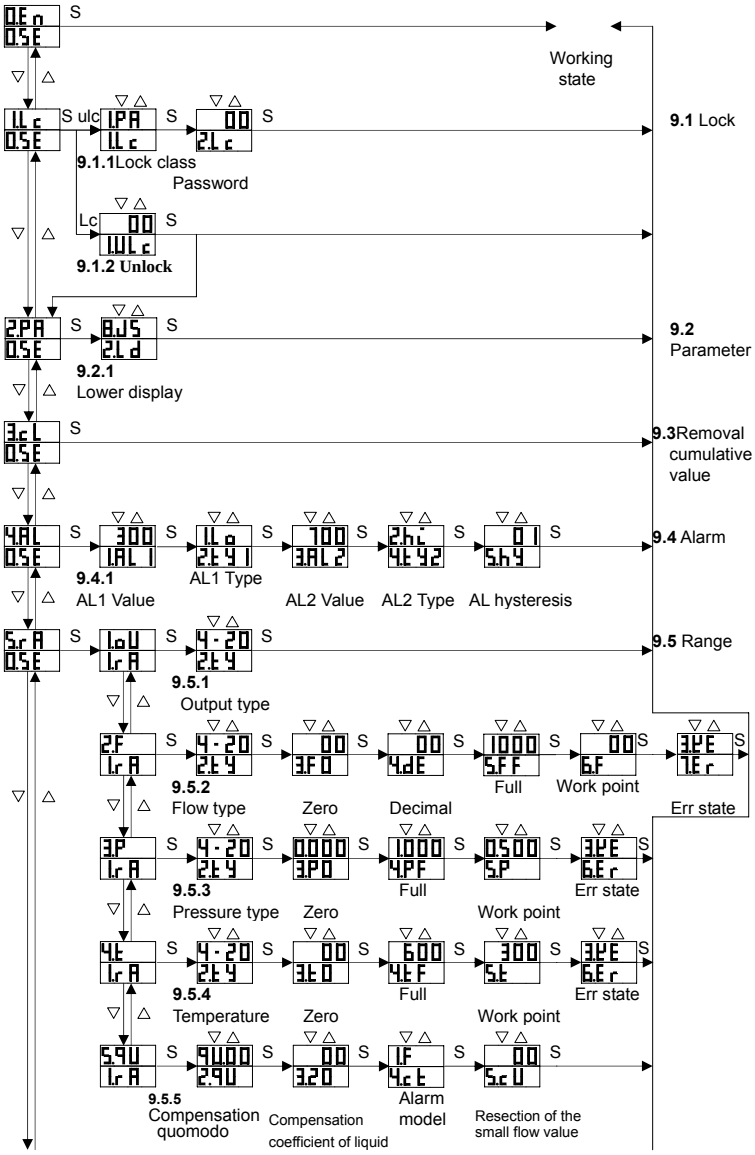
A	O															Description
																3.Design type Intelligent accumulator
		L														**4. Design series** Single loop
			5													**5-6. Compensate mode**
				0	0											00.For linear accumulate, without compensation
				0	1											01.For square accumulate, without compensation
				0	2											02.For saturated steam square accumulate, pressure compensation
				0	3											03.For heated steam square accumulate, with pressure and temperature compensation
				0	4											04.For nature gas square root accumulation , with pressure and temperature compensation
				0	5											05.For saturated steam square accumulate,with temperature compensation
				0	6											06.For saturated steam linear accumulation , with pressure compensation
				0	7											07. For nature gas linear accumulate, with pressure and temperature compensation
				0	8											08. For nature gas linear accumulate, with pressure and temperature compensation
				0	9											09.For saturated steam linear accumulate , with temperature compensation
				1	0											10.For liquid flow linear accumulation , with temperature compensation
				1	1											11.For liquid flow square root accumulation , with temperature compensation
				1	2											12.For saturated steam linear accumulate , pressure compensation
				1	3											13.For heated steam linear accumulate , with temperature and pressure compensation
				1	4											14.For nature gas linear accumulate,with temperature and pressure compensation
				1	5											15.For saturated steam linear accumulate , with temperature compensation
				1	6											16.For dry air square root accumulate , with temperature and pressure compensation
				1	7											17.For dry air linear accumulate, with temperature and pressure compensation
				1	8											18.For dry air linear accumulate, with temperature and pressure compensation
						0										**7.Contrl relay** With 0 relay output

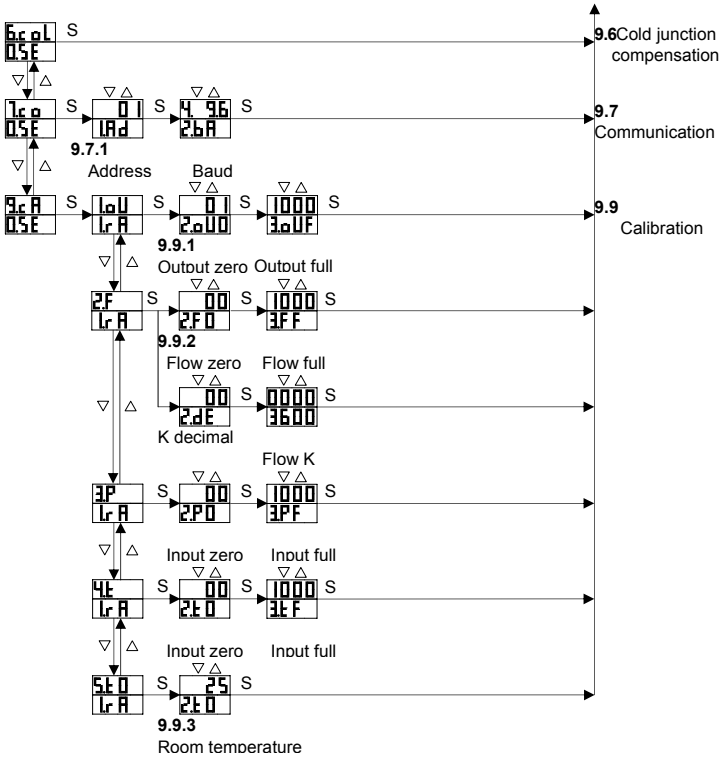
						1										With 1 relay output
						2										With 2 relay output
						3										Batch control alarm
																8.Flow input type
							0									0～10kHz input
							5									0～10mA input
							6									4～20mA input
							7									0～5V input
							8									1～5V input
							9									Special input
																9.Pressure input type
								0								No pressure input
								5								0～10mA input
								6								4～20mA input
								7								0～5V input
								8								1～5V input
								9								Special input
																10.Temperatur input type
									0							No temperature input
									1							TC-K/TC-E input
									2							RTD-PT100 input
									5							0～10mA input
									6							4～20mA input
									7							0～5V input
									8							1～5V input
									9							Special input
																11.Transfer output type
										0						No flow output
										5						0～10mA flow output
										6						4～20mA flow output
										7						0～5V flow output
										8						1～5V flow output
										9						Special flow output
																12-13.Outline type
											H	8				160×80 mm, Horizontal
											V	8				160×80 mm, Vertical
											H	4				96×48 mm, Horizontal
											V	4				48×96 mm, Vertical
											S	7				72×72 mm, Square
											S	9				96×96 mm, Square
																14.Power output type
													N			No power output
													P			With 24VDC/70mA output
																15.Power supply type
														A		220 VAC
														D		24 VDC
																16.Communication port
															0	Without port
															3	With RS232 isolated port
															8	With RS485 isolated port
A	O	L	5	0	3	0	6	6	6	6	H	8	P	A	0	**Standard**

8. DESCRIPTION OF PANEL

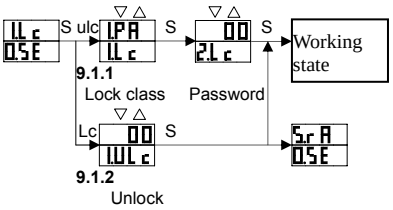
Panel message		Description
Display	Upper display	● When in working state, it indicates input ● When in setting state, it indicates parameter name or parameter value
	Lower display	● When in working state, it indicates other parameter with low display setting menu. ● When in setting state, it indicates parameter suggestive information
Key	▽	● It is used to decrease parameter in setting state
	SET	● It is used to confirm parameter setting in setting state
	△	● It is used to increase parameter in setting state
	A/M	● It is used to switch state of work and confiscate.
LED	AL1	● Alarm 1 indicator
	AL2	● Alarm 2 indicator
	CO	●Communication indicator

9. PARAMETER SETTING DIAGRAM




S
9.6 Cold junction compensation
9.7 Communication
9.7.1
Address
Baud
9.9 Calibration
9.9.1
Output zero
Output full
9.9.2
Flow zero
Flow full
K decimal
Flow K
Input zero
Input full
Input zero
Input full
9.9.3
Room temperature

9.1 LOCK SETTING



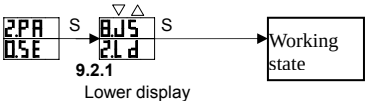
9.1.1.1 Lock class

Display code	Explain
LPA	Lock parameter
2rA	Lock range
3cA	Lock calibration

9.1.1.2 Password setting

9.1.2 Delete password
Factory setting password for 01

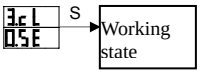
9.2 PARAMETER SETTING



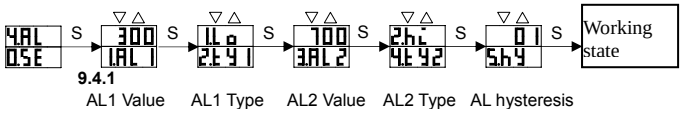
9.2.1 Lower display setting

Display code	Explain
LoU	Transmission output
2F	Instantaneous flow
3P	Instantaneous pressure.
4t	Instantaneous temperature
5tO	Room temperature
6AL1	Alarm 1 value
7AL2	Alarm 2 value
8JS	Cumulative value
9bc	Batch control value

9.3 REMOVAL CUMULATIVE VALUE



9.4 ALARM SETTING

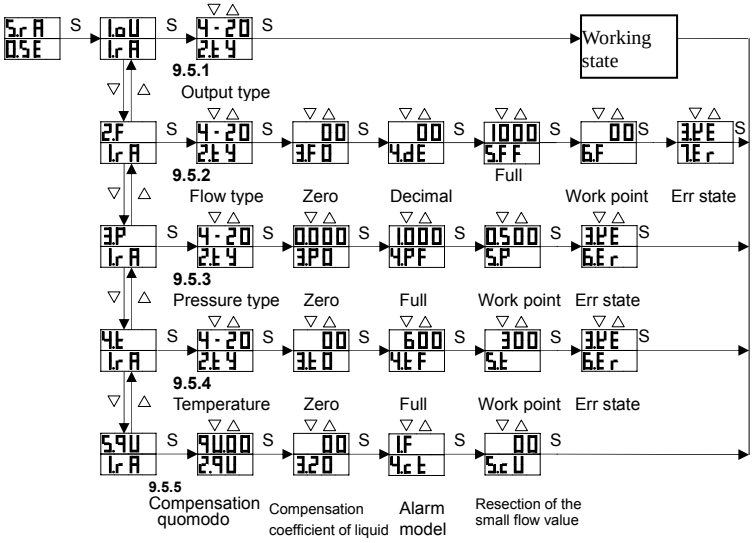


9.4.1 IAL 1 3AL2 5hY Alarm AL1 value，Alarm AL2 value，Alarm hysteresis value setting

9.4.2 2tY1 4tY2 Alarm AL1 type，Alarm AL2 type setting

Display code	Explain
1.Lo	Low alarm
2.hi	High alarm

9.5 RANGE SETTING



9.5.1 2t Y Output type setting

Table of input and output sensor type

Display code	Explain
0-10	0 to 10 mA
4-20	4 to 20 mA
0-5u	0 to 5 V
1-5u	1 to 5 V
0-100	
FrE	Frequency
Pt	Pt100
K	K
E	E

9.5.2 Flow input setting

9.5.2.1 2t Y Flow input type setting

9.5.2.2 3F0 Flow input zero setting

9.5.2.3 4dE Flow decimal setting

9.5.2.4 5FF Flow input full setting

9.5.2.5 6F Flow input work point setting

9.5.2.6 7Er Flow input Err setting

Table of err state.

Display code	Explain
1.Lo	Zero
2.hi	Full
3.KEE	Keep
4.Po	Work point

9.5.3 Pressure input setting

9.5.3.1 2t Y Pressure input type setting

9.5.3.2 3P0 Pressure input zero setting

9.5.3.3 4PF Pressure input full setting

9.5.3.4 5P Pressure input work point setting

9.5.3.5 6Er Pressure input Err setting

9.5.4 Temperature input setting

9.5.4.1 2t Y Temperature input type setting

9.5.4.2 3t0 Temperature input zero setting

9.5.4.3 4tF Temperature input full setting

9.5.4.4 5t Temperature input work point setting

9.5.4.5 6Er Temperature input Err setting

9.5.5 Mode setting

9.5.5.1 2.9U Compensation quomodo setting

Display code	Explain
9U. 0	Linear No compensation
9U. 1	Square No compensation
9U. 2	Saturated steam Square with P
9U. 3	Heated steam Square with P and T
9U. 4	Gas Square with P and T
9U. 5	Saturated steam Square with T
9U. 6	Saturated steam Linear with P
9U. 7	Heated steam Linear with P and T
9U. 8	Gas Linear with P and T
9U. 9	Saturated steam Linear with T
9U.10	Liquid Linear with T
9U.11	Liquid Linear with T
9U.12	Saturated steam Linear with P
9U.13	Heated steam Linear with P and T
9U.14	Gas Linear with P and T
9U.15	Saturated steam Linear with T
9U.16	Dry air Square with P and T
9U.17	Dry air Linear with P and T
9U.18	Dry air Linear with P and T

9.5.5.2 3.2D Liquid compensation coefficient setting

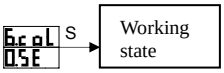
This to compensate mode 10 with 11 valid.The coefficient calculation according to 11.3

9.5.5.3 4.cE Alarm model setting

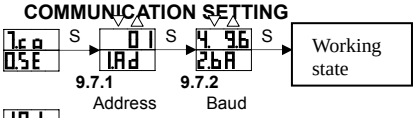
Display code	Explain
1.F	Flow alarm
2.P	Pressure alarm
3.t	Temperature alarm
4.bc	Batch control alarm

9.5.5.4 5.cU The small discharge cuts off a value setting

9.6 COLD-COMPENSATION PROVISION



9.7 COMMUNICATION SETTING

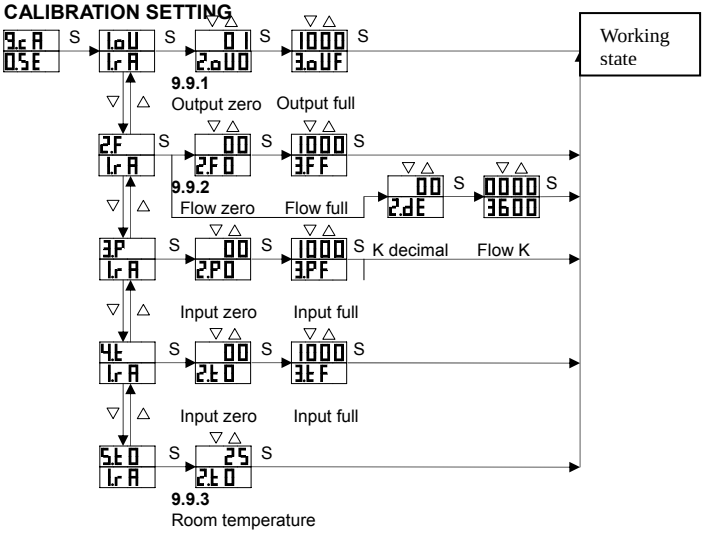


9.7.1 Address of communication port setting

9.7.2 Baud of communication port setting

Display code	Explain
1. 1.2	**1200 bps**
2. 2.4	**2400 bps**
3. 4.8	**4800 bps**
4. 9.6	**9600 bps**

9.9 CALIBRATION SETTING



9.9.1 Output zero and output full calibration.
Signal of output zero,4.00mA,1.000V. Signal of output full,20.00mA, 5.000V.

9.9.2 Input zero and input full calibration.
Signal of input zero，0.00mA，0.000V，0.00mV，20.0Ω.
Signal of input full，20.00mA，5.000V，60.00mV，340.0Ω.

9.9.3 Room temperature calibration.

10. USE GUIDEBOOK

10.1 Accumulate operate

The work Tai presses the AM key, up hold to show to accumulate to calculate a high, next hold to show to accumulate calculate low, press the ﹀ , the ﹀ key can move next hold to show to accumulate calculate decimal point, press the SET key conservancy to accumulate calculate decimal point position.

10.2 The batch control setting

10.2.1 Attach to hold a manifestation constitution to control a value for the batch quantity.(see 9.2)

10.2.2 Report to the police a value constitution to control a value for the batch quantity.(see 9.4)

10.2.3 Report to the police a mode constitution to report to the police for the batch quantity control.(see 9.5.5.3)

10.2.4 Press ﹀or﹀key,The batch quantity is pure zero.

10.3 The liquid repair coefficient compute

$$L_k = 10000 * (\rho_{(t+10)} - \rho_{(t-10)}) / \rho_{(t)}$$

$\rho_{(t)}$: t (the work order)℃temperature liquid density

$\rho_{(t+10)}$: t+10 ℃ temperature liquid density

$\rho_{(t-10)}$: t-10 ℃ temperature liquid density

10.4 The discharge K coefficient compute

10.4.1 The discharge unit is a t/h, the mark fixed-point density is a ρ , the flowmeter coefficient is a k/l, the appearance discharge coefficient K=1000000*k/ρ.

10.4.2 The discharge unit is a t/h, the mark fixed-point density is a ρ , the flowmeter coefficient is a k/m^3, appearance coefficient K=1000*k/ρ.

10.4.3 The discharge unit is a t/h, the mark fixed-point density is a ρ , the flowmeter coefficient is a k/l, the appearance discharge coefficient K=1000*k/ρ.

10.4.4 The discharge unit is a t/h, the mark fixed-point density is a ρ , the flowmeter coefficient is a k/m^3, appearance coefficient K=k/ρ.

10.5 ΔP Flow range calculation，The work order(P_1,t_1)

$$F_{00} = f(\Delta P, P, t) \qquad (P=P_1, t=t_1, \Delta P=\Delta P_0)$$

$$F_{FS} = f（\Delta P,P,t）$$

$$(P=P_1,t=t_1,\Delta P=\Delta P_{FS})$$

10.6 Simulation I Flow range calculation, work to order(P_1,t_1)

$$F_{00} = R_{00}\ (P=P_1,t=t_1)$$

$$F_{FS} = R_{FS}\ (P=P_1,t=t_1)$$

10.7 Compensation totalizer basic formula

10.7.1 Orifice measurement differential input

$$Q_{vb} = Q_v \cdot \sqrt{\rho / \rho_0} \qquad Q_v = K \cdot \sqrt{\Delta P} \qquad (1)$$

ΔP ： Differential input signal

Q_v ： Volume flow before compensation

Q_{vb} ： Volume flow after compensation

ρ ： Transient fluid density

ρ_0 ： Standards state of fluid density

$$Q_{mb} = Q_m \cdot \sqrt{\rho / \rho_0} \qquad Q_m = K \cdot \sqrt{\Delta P} \qquad (2)$$

Q_m ： Quality flow before compensation

Q_{mb} ： Quality flow after compensation

10.7.2 Linear flow-meter measurement, linear flow signal input

$Q_{vb} = Q_v \cdot \rho/\rho_0$ $\qquad$ $Q_v = K \cdot In$ $\qquad$ (3)

$Q_{mb} = Q_m \cdot \rho/\rho_0$ $\qquad$ $Q_m = K \cdot In$ $\qquad$ (4)

In ： Linear flow input signal

10.7.3 Orifice measurement, differential input signal after prescribing

$$Q_{vb} = Q_v \cdot \sqrt{\rho / \rho_0} \qquad Q_v = K \cdot In \qquad (5)$$

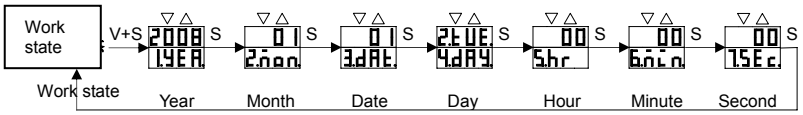
$$Q_{mb} = Q_m \cdot \sqrt{\rho / \rho_0} \qquad Q_m = K \cdot In \qquad (6)$$

10.7.4 Determined flow coefficient K according orifice or a nameplate data of flow-meter calculated

$$K = (Q_{FS} - Q_0)/(In_{FS} - In_{00}) \qquad (7)$$

10.8 POWER OFF TIME ACCUMULATE SETTING

10.8.1 CLOCK SETTING



The work state presses the V + SET key get into a clock setting menu.

4dAY Table of day setting

Display code	Explain
1.Mon.	**Monday**
2.tUE.	**Tuesday**
3.WEd.	**Wednesday**
4.thU.	**Thursday**
5.Fri.	**Friday**
6.SAt.	**Saturday**
7.Sun.	**Sunday**

10.8.2 The work state press the V key, in proper order search total have a power off time(display hhhh . mm . ss, 0000 : 00 : 00 ~ 9999 : 59 : 59); Clock(display yy . dd . hh . mm); Power on time(display yy . dd . hh . mm); Power off time(display yy . dd . hh . mm);

10.9 Table of GB density

10.9.1 ρ---kg/m3，P---MPa

Dry air density ρ---kg/m3，P---MPa（Absolute pressure）

P	T ℃									
Mpa	0	10	20	30	40	50	60	70	80	90
0.098	1.2515	1.2072	1.1661	1.1276	1.0917	1.0577	1.0261	0.9962	0.9680	0.9413
0.101	1.2928	1.2471	1.2046	1.1649	1.1277	1.0926	1.0600	1.0291	1.000	0.9724
0.196	2.5030	2.4144	2.3322	2.2552	2.1834	2.1154	2.0522	1.9924	1.9360	1.8826
0.294	3.7545	3.6216	3.4983	3.3825	3.2751	3.1731	3.0783	2.9886	2.9040	2.8239
0.392	5.0060	4.8288	4.6644	4.5104	4.3668	4.2308	4.1044	3.9848	3.8720	3.7652
0.490	6.2575	6.0360	5.8205	5.6380	5.4585	5.2885	5.1305	4.9810	4.8400	4.7065
0.588	7.5090	7.2432	6.9966	6.7656	6.5502	6.3462	6.1566	5.9772	5.8080	5.6478
0.686	8.7605	8.4504	8.1627	7.8932	7.6419	7.4039	7.1827	6.9734	6.7760	6.5891
0.784	10.012	9.6576	9.3288	9.0208	8.7336	8.4616	8.2088	7.9696	7.7440	5.5304
0.882	11.263	10.864	10.494	10.148	9.8253	9.5193	9.2349	8.9658	8.7120	8.4717
0.980	12.515	12.072	11.661	11.276	10.917	10.577	10.261	9.9620	9.6800	9.4130
1.078	13.766	13.279	12.827	12.403	12.008	11.634	11.287	10.958	10.648	10.354
1.176	15.018	14.486	13.993	13.531	13.100	12.692	12.313	11.954	11.616	11.295
1.274	16.269	15.693	15.159	14.658	14.192	13.750	13.339	12.950	12.584	12.236
1.372	17.521	16.900	16.325	15.786	15.283	14.807	14.365	13.946	13.552	13.178
1.470	18.772	18.108	17.491	16.914	16.375	15.865	15.391	14.943	14.520	14.119
1.569	20.024	19.315	18.657	18.041	17.467	16.923	16.417	15.939	15.488	15.060
1.667	21.275	20.522	19.823	19.169	18.558	17.980	17.443	16.935	16.458	16.002
1.765	22.527	21.729	20.989	20.296	19.650	19.038	18.469	17.931	17.424	16.943
1.863	23.778	22.936	22.155	21.424	20.742	20.096	19.495	18.927	18.392	17.884
1.961	25.030	24.144	23.322	22.552	21.834	21.154	20.522	19.924	19.360	18.826

10.9.2 Superheated steam density ρ---kg/m3，P---MPa（Absolute pressure）

P	T ℃									
MPa	160		160		160		160		160	
0.101	0.5047	0.101	0.5047	0.101	0.5047	0.101	0.5047	0.101	0.5047	0.101
0.196	0.9963	0.196	0.9963	0.196	0.9963	0.196	0.9963	0.196	0.9963	0.196
0.294	1.5067	0.294	1.5067	0.294	1.5067	0.294	1.5067	0.294	1.5067	0.294
0.392	2.0259	1.8349	1.6147	1.4972	1.3514	1.2694	1.1637	1.1028	1.0226	0.9753
0.490	2.5549	2.3063	2.0251	1.8762	1.6920	1.5888	1.4562	1.3795	1.2789	1.2198
0.686	------	3.2669	2.8539	2.6399	2.3770	2.2302	2.0425	1.9346	1.7928	1.7094
0.980	------	4.7551	4.3328	3.7994	3.5868	3.1990	2.9265	2.7701	2.5654	2.4456
1.176	------	5.7837	4.9801	4.5830	4.1085	3.8491	3.5186	3.3289	3.0826	2.9377
1.470	------	7.3910	6.2933	5.7737	5.1626	4.8309	4.4111	4.1719	3.8595	3.6765
1.961	------	------	8.5616	7.8064	6.9444	6.4851	5.9102	5.5835	5.1600	4.9410
2.451	------	------	10.931	9.8990	8.7604	8.1639	7.4245	7.0082	6.4704	6.1584
2.941	------	------	13.426	12.061	10.611	9.8668	8.9542	8.4438	7.7876	7.4080
3.432	------	------	16.066	14.300	12.498	11.594	10.498	9.8912	9.1124	8.6640
3.922	------	------	18.875	16.622	14.425	13.349	12.059	11.350	10.466	9.9256
4.412	------	------	21.891	19.040	16.396	15.130	13.638	12.822	11.786	11.193
4.903	------	------	------	21.565	18.409	16.943	15.232	14.306	13.135	12.468
5.883	------	------	------	26.983	22.583	20.656	18.474	17.310	15.857	15.035
6.864	------	------	------	33.046	26.976	24.509	21.791	20.370	19.615	17.627
7.845	------	------	------	40.000	31.625	28.498	25.182	23.479	21.404	20.247
8.825	------	------	------	------	36.549	32.658	28.953	26.652	24.230	22.893
9.806	------	------	------	------	41.823	36.995	32.216	29.877	27.092	25.568
11.76	------	------	------	------	53.676	46.274	39.635	36.523	32.927	30.998
13.72	------	------	------	------	68.073	56.529	47.460	43.440	39.925	36.536
15.69	------	------	------	------	86.956	68.073	55.772	50.658	45.085	42.194
17.65	------	------	------	------	115.70	81.360	64.612	58.203	51.413	47.975
19.61	------	------	------	------	------	97.059	74.079	66.098	57.930	53.882
21.57	------	------	------	------	------	116.36	84.253	74.377	64.637	59.919

10.9.3 Saturated vapor density ρ---kg/m3，P---MPa (absolute pressure)

T	0		2		4		6		8	
℃	P	ρ	P	ρ	P		P	ρ	P	ρ
100	0.101	0.5977	0.108	0.6388	0.116	100	0.101	0.5977	0.108	0.6388
110	0.143	0.8265	0.153	0.8798	0.163	110	0.143	0.8265	0.153	0.8798
120	0.198	1.122	0.211	1.190	0.225	120	0.198	1.122	0.211	1.190
130	0.270	1.497	0.286	1.583	0.304	130	0.270	1.497	0.286	1.583
140	0.361	1.967	0.382	2.073	0.404	140	0.361	1.967	0.382	2.073
150	0.476	2.548	0.502	2.679	0.529	150	0.476	2.548	0.502	2.679
160	0.618	3.260	0.650	3.420	0.683	160	0.618	3.260	0.650	3.420
170	0.791	4.123	0.831	4.316	0.871	170	0.791	4.123	0.831	4.316
180	1.002	5.160	1.049	5.391	1.098	180	1.002	5.160	1.049	5.391
190	1.255	6.397	1.311	6.671	1.369	190	1.255	6.397	1.311	6.671
200	1.554	7.864	1.621	8.188	1.689	200	1.554	7.864	1.621	8.188
210	1.907	9.593	1.985	9.974	2.065	210	1.907	9.593	1.985	9.974
220	2.319	11.62	2.409	12.07	2.502	220	2.319	11.62	2.409	12.07
230	2.797	14.00	2.900	14.52	3.008	230	2.797	14.00	2.900	14.52
240	3.347	16.76	3.467	17.37	3.589	240	3.347	16.76	3.467	17.37
250	3.977	19.99	4.113	20.69	4.253	250	3.977	19.99	4.113	20.69
260	4.694	23.73	4.848	24.55	5.007	260	4.694	23.73	4.848	24.55
270	5.505	28.10	5.680	29.06	5.858	270	5.505	28.10	5.680	29.06
280	6.420	33.19	6.616	34.31	6.816	280	6.420	33.19	6.616	34.31
290	7.446	39.16	7.665	40.48	7.889	290	7.446	39.16	7.665	40.48
300	8.592	46.19	8.837	47.75	9.087	300	8.592	46.19	8.837	47.75
310	9.870	54.54	10.142	56.40	10.419	310	9.870	54.54	10.142	56.40
320	11.289	64.60	11.591	66.86	11.899	320	11.289	64.60	11.591	66.86
330	12.862	76.99	13.196	79.83	13.538	330	12.862	76.99	13.196	79.83
340	14.605	92.76	14.975	96.46	15.353	340	14.605	92.76	14.975	96.46
350	16.534	113.6	16.945	118.8	17.364	350	16.534	113.6	16.945	118.8
360	18.674	144.1	19.130	152.1	19.595	360	18.674	144.1	19.130	152.1
370	21.053	201.1	21.561	225.3	22.080	370	21.053	201.1	21.561	225.3