



Eberhardt Comércio e Assist. Técnica. Ltda.

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Ultrasonic wall type Open-channel Flow meter

Operation Manual (Remote type)



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I Overview

Function Description

1. Composition

Instrument is composed by host and sensor.

2. Display

Display the information of selected tank

Display time

Display total flow

Display flow rate

Display liquid level or distance

Display relay status

Display scale drawing of flow rate

3. Password protection

To protect inter parameters from modifying freely.

4. Calibration method

Liquid level calibration method: distance setting from sensor bottom to zero liquid level.

5. Current output

Provide 4-20mA output (0-20mA is required to inform), 16 digit high accuracy D/A, reach 750 Ω load.

Users can set current point between 4mA and 20mA.

6. Relay Output

(1) Pulse output relay (K1): Cumulative value reaches pulse flow cumulative value, closing one time (50ms)

(2) High alarming relay (K2)

(3) Low alarming relay (K3)

(4) Duplicate relay (K4), design as require.

7. Communication

RS485 interface



8. Historical records

Historical hourly flow: 128 records

Historical daily flow: 64 records

Historical monthly flow: 32 records

Historical yearly flow: 4 records

Specification description

1. Flow range: 0 L/m³/s (confirmed by measuring weir tank size)
2. Total flow: 12 digit of decimal number, auto-zero after the expiration of the cumulative.
3. Flow accuracy: 3%
4. Distance measuring range: 3m
5. Distance measuring accuracy: 0.25%
6. Liquid level distinguish: 1mm
7. Ambient temperature: -20~70°C
8. Protection level: display part: IP65; probe part: IP67
9. Power supply: 220VAC or 24V DC
10. 4~20mA current output: (corresponding to flow rate)
Maximum loading resistance: 750Ω
11. RS485 interface (attached 485 communication description)
12. Relay output: 4 way relay output
Pulse output relay (K1)
High alarming relay (K2)
Low alarming relay (K3)
duplicate relay (K4) : design as required
13. Display: 192*64 LCD



II Installation and Wiring

1. Transmitter Installation

Wall mounted

Installation requirements:

Clean and dry place

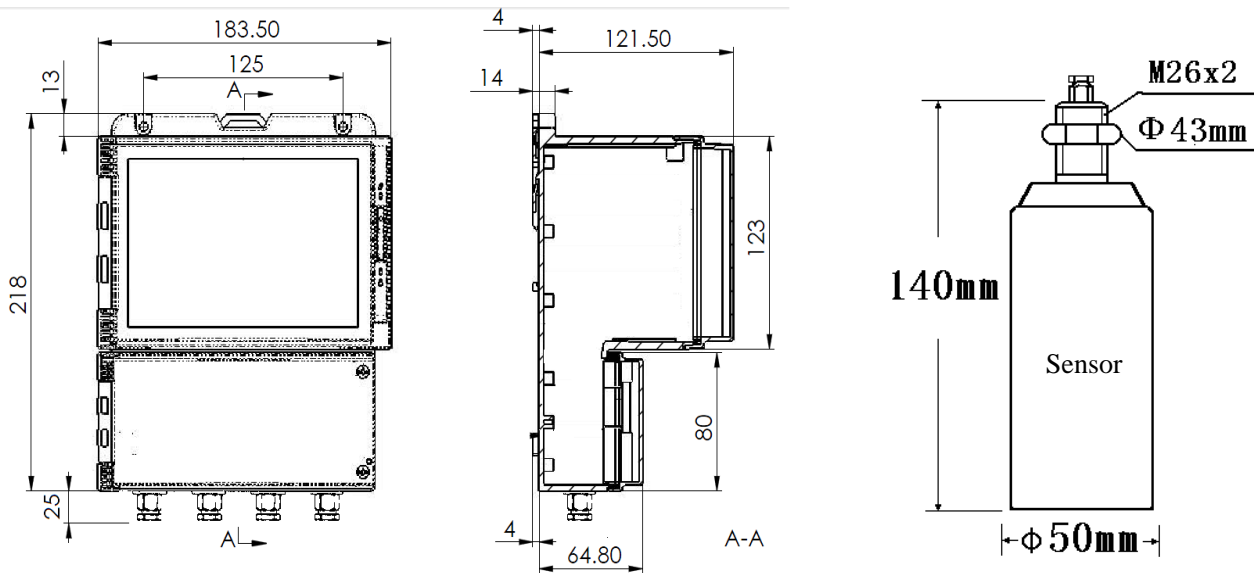
Avoid Corrosion liquid and gas or require isolation protection.

Use sun shade at direct sunlight.

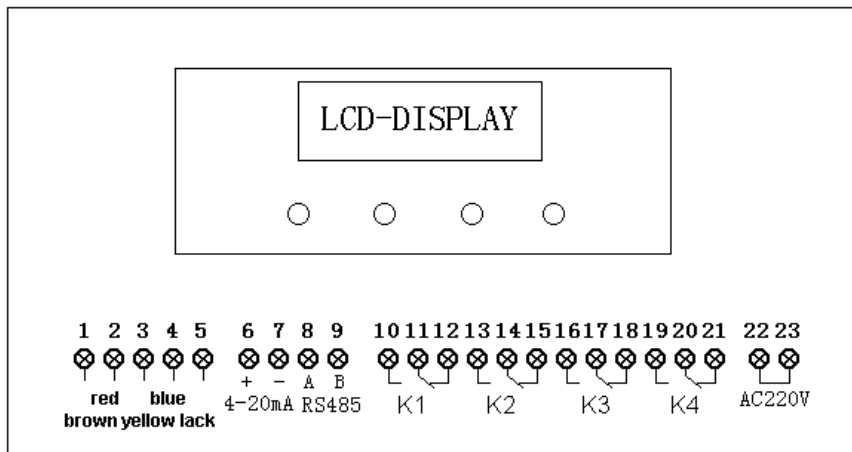
2. Sensor Installation

There is 10 m cable between transmitter and sensor.

Transmitter and Sensor Size below:

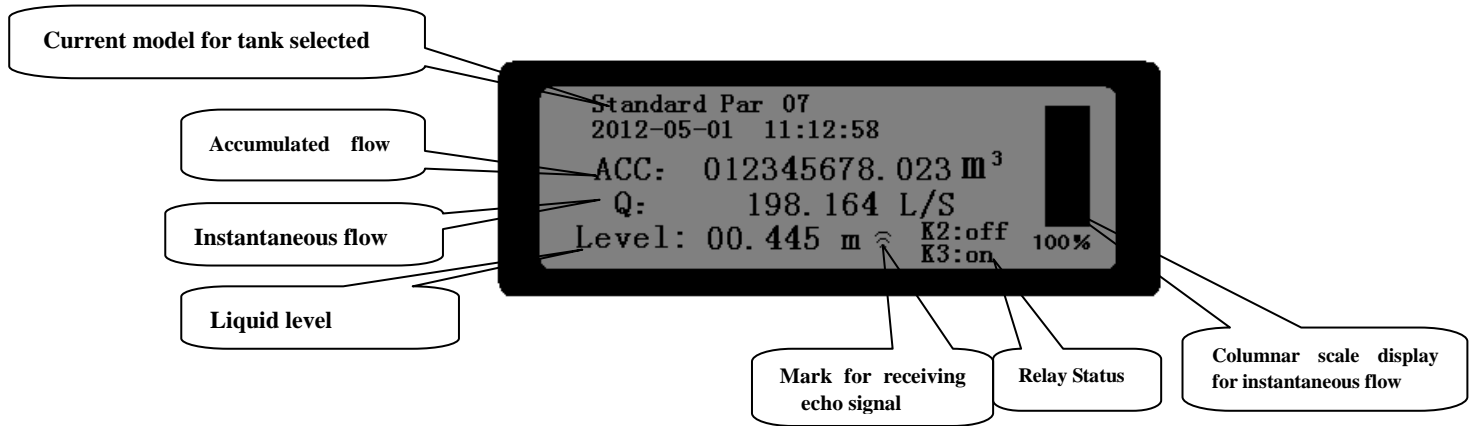


3. Wiring









III Button and Display interface

1. Main interface



2. Buttons

-  Change display content: at the main interface, press this button to enter password interface; at the user parameters interface, press this button to enter the next parameters interface.
-  When inputting password or modifying parameters is required, press this button to enter setting status, a flashing cursor will appear, repress this button, flashing cursor figure will add “1” .
-  The cursor move right to the next figure, use  and  together to modify parameters or password.
-  Press this button to confirm after modifying parameters (no flashing cursor after confirmation), repress this button to return the main interface.



IV Parameters interface and Description

```
Max_Dist:01.178 M
Blank:    40 CM
Disp:     03
Num:      00 C00298.1 n1.234
```

Max_Dist: The distance from zero level to probe. Zero level definition see below. Input correct Max_Dist value after installation.

Blank: Normally, blank zone is set as 30-50cm before leaving factory.

Display:

- 00 Display distance and signal
 - 01 Display liquid level and signal
 - 02 Display distance and relay status
 - 03 Display liquid level and relay status
- Be set as 03 before leaving factory.

Num: Code setting

- 00 User parshall flume, input C and n based on the actual.
- 01~25 Standard parshall flume(refer to Appendix I Tank code list and Parshall flume structure).
- 26 V-flume
- 27 Rectangular flume, input B,b,p value
B and b value should be the same for equally width weir, unit is meter.

Code Option:

- 0 User Define Par
- 1-25 Standard Par XX , XX stands for the code of parshall flume.
- 26 Triangular Weir
- 27 Rectangular Weir X.XX m, X.XX stands for the weir crest width “b”.



```
Damp:      3      Rate: 20mm
485_ID:    00
20mA_Q:    0999.9 L/S
4mA_Q:     0000.0 L/S
```

Damp: input figure '0-9', 0-without damping, 9-maximum damping coefficient.

Rate: Allowed maximum change value for liquid level, Unit: mm. The smaller the value, the better the anti-interference, but the slower the response speed.

485_ID: set communication address, refer to appendix III

20mA_Q (20mA flow): corresponding to instantaneous flow

4mA_Q(4mA flow): corresponding to instantaneous flow

```
Level_T: 00mm ~ 1000mm
K1 A: 01.05m3 T: 20秒 C: Yes
K2_High: 1.020m 0.988m
K3_Low : 0.900m 1.000m
```

(Level_T) effective level: the starting effective level and the highest effective level measured by instantaneous flow. The instantaneous flow is zero when level is lower than starting effective level; The flow rate corresponding to the highest effective level is instantaneous flow when level is higher than the highest effective level. Unit: mm

K1: A(flow target value), T(alarming delay), C (clear total accumulated flow)

A is zero, K1 is invalid

T is zero, relay K1 absorb one time (50ms) when flow rate reaches A.

T is not zero, when flow rate reaches A, relay K1 absorb and will disconnect after

T seconds, then flow accumulate again.

When C is "No", do not clear up ACC value when the relay resets ; When C is "Yes", ACC is zero.

Eg: A 01.20 m³ T 10s C yes

When accumulated flow reaches 1.20 m³, K1 absorbs, after 10 seconds, K1 recovers, at the same time, clear up total accumulated flow.

K2_High: up control relay set. Absorb point must be not less than cut point. Unit: m

K3_Low: down control relay set. Absorb point must be not more than cut point. Unit: m.



```
Test:      0
Q_unit:    0 L/S
ACC_set:   123456789. 123 m3
Flow_sp:   1.000
```

Test: if accumulated flow is not required, you can set it as 01, but set as 0 for normal operation

Q_unit: only for instantaneous flow: '0-4'; 0-L/S; 1-m³/h; 2-L/min; 3- m³/min; 4- m³/s



ACC_set: you can reset accumulated flow.

Flow_sp: relative to instantaneous flow, input value=actual value ÷ display value. Normally, it has been set well before leaving factory.



```
Date:      13.01.01
Time:      12:01:01
Time_sev:  00
24mA_err:  No
```

24mA_err (24mA alarm): It's set as Yes, when liquid level exceeds the upper limit of "efficient level", current outputs 24mA. It's set as No, this parameter is invalid.



V Historical flow query

Press  to query hourly flow, daily flow, monthly flow, yearly flow. Under the status of querying flow records, press , forward to retrieve records not shown.



Hourly flow: display accumulated flow per hour, can save 128 records.

Under the status of the main interface, press  twice, enter the interface of querying hourly flow, press , you can cyclic query hourly flow records.

Daily flow: display accumulated flow per day, can save 64 records.

Under the interface of querying hourly flow, press  one time, can enter query daily flow interface, press  again, you can cyclic query daily flow records.

Monthly flow: display accumulated flow per month, can save 32 records.

Under the interface of querying daily, press  one time, can enter query monthly flow interface, press  again, you can cyclic query monthly flow records.

Yearly flow: display accumulated flow per year, can save 4 records.

Under the interface of querying monthly flow, press  one time, you can enter query yearly flow interface.



VI Installation and Debugging steps

1. After installation, connect cables well.
2. Measure the distance from sensor to zero level, which is ullage.
3. Select relevant water tank code based on the actual condition. Code can be set as “00” for Parshall flume, then set the value of C and n. Instrument will display liquid level and flow rate after correct setting.
4. Based on actual requirements, set current parameter, 485 interface parameter, or relay parameter.
5. Set “adjusting” as “0”, the accumulated flow will increase only when “adjusting” is “0”.



VII Measuring Parshall flume structure and Installation technology

Parshall flume standard size is throat width "b". Firstly, based on required maximum flow, find suitable

Parshall flume width "b" from "Appendix II Parshall flume level-flow formula. Then find other size (like L, N, B1, L1) corresponding to throat width "b".

Parshall flume level-flow relationship: $Q=C \cdot h^n$. Based on throat width "b", find the relevant formula from "Appendix II Parshall flume level-flow formula".

Form 1 and Form 2 are representatively throat width 0.025m, 0.051m Parshall flume level and flow correspondence.

Form 1 Throat 0.025m Parshall flume level and flow correspondence

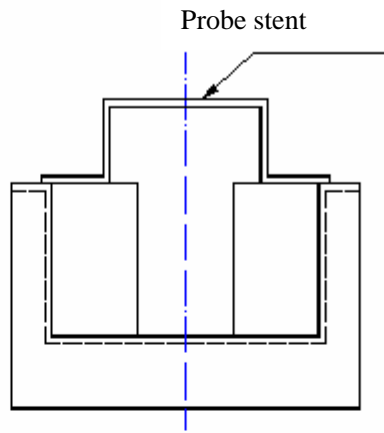
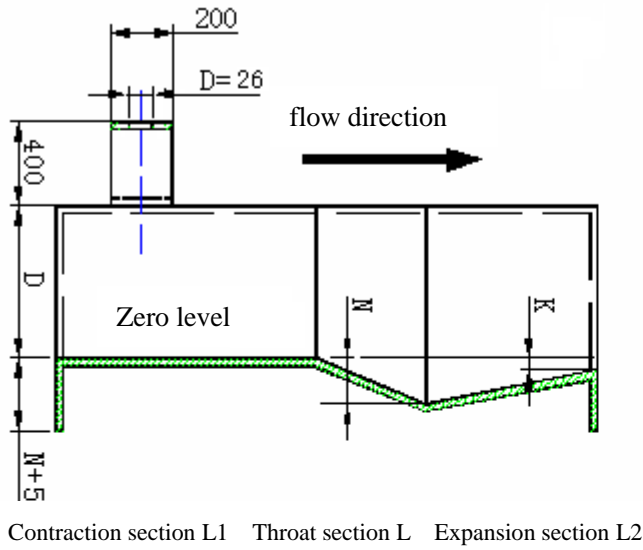
Level unit: m Flow unit: l/s

level	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
flow	0.0000	0.0480	0.1405	0.2634	0.4114	0.5814	0.7712	0.9794	1.2046	1.4458
level	0.100	0.110	0.120	0.130	0.140	0.150	0.160	0.170	0.180	0.190
flow	1.7023	1.9733	2.2582	2.5565	2.8677	3.1914	3.5271	3.8747	4.2336	4.6037
level	0.200	0.210	0.220	0.230	0.240	0.250	0.260	0.270	0.280	0.290
flow	4.9846	5.3762	5.3762	5.3762	5.3762	5.3762	-	-	-	-

Form 2 Throat 0.051m Parshall flume level and flow correspondence

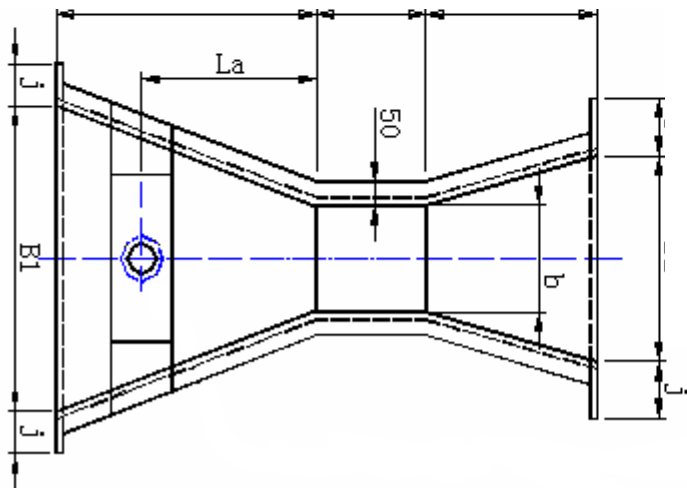
Level unit: m Flow unit: l/s

level	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
flow	0.0000	0.0959	0.2807	0.5263	0.8221	1.1617	1.5411	1.9571	2.4071	2.8892
level	0.100	0.110	0.120	0.130	0.140	0.150	0.160	0.170	0.180	0.190
flow	3.4018	3.9434	4.5127	5.1088	5.7307	6.3775	7.0484	7.7429	8.4602	9.1997
level	0.200	0.210	0.220	0.230	0.240	0.250	0.260	0.270	0.280	0.290
flow	9.9610	10.744	11.547	12.370	13.214	13.214	-	-	-	-



Unit:mm

b	
L1	
La	
L	
L2	
E1	
E2	
D	
N	
K	
j	



Parshall flume Structure



Appendix I: Parshall flume code list and Size

Unit: m

TYPE	Code	Throat section			contraction section			expansion section			Wall height
		b	L	N	B1	L1	La	B2	L2	K	D
Small	1	0.025	0.076	0.029	0.167	0.356	0.237	0.093	0.203	0.019	0.23
	2	0.051	0.114	0.043	0.214	0.406	0.271	0.135	0.254	0.022	0.26
	3	0.076	0.152	0.057	0.259	0.457	0.305	0.178	0.305	0.025	0.46
	4	0.152	0.305	0.114	0.400	0.610	0.407	0.394	0.610	0.076	0.61
	5	0.228	0.305	0.114	0.575	0.864	0.576	0.381	0.457	0.076	0.77
Standard	6	0.25	0.60	0.23	0.78	1.325	0.883	0.55	0.92	0.08	0.80
	7	0.30	0.60	0.23	0.84	1.350	0.902	0.60	0.92	0.08	0.95
	8	0.45	0.60	0.23	1.02	1.425	0.948	0.75	0.92	0.08	0.95
	9	0.60	0.60	0.23	1.20	1.500	1.0	0.90	0.92	0.08	0.95
	10	0.75	0.60	0.23	1.38	1.575	1.053	1.05	0.92	0.08	0.95
	11	0.90	0.60	0.23	1.56	1.650	1.099	1.20	0.92	0.08	0.95
	12	1.00	0.60	0.23	1.68	1.705	1.139	1.30	0.92	0.08	1.0
	13	1.20	0.60	0.23	1.92	1.800	1.203	1.50	0.92	0.08	1.0
	14	1.50	0.60	0.23	2.28	1.95	1.303	1.80	0.92	0.08	1.0
	15	1.80	0.60	0.23	2.64	2.10	1.399	2.10	0.92	0.08	1.0
	16	2.10	0.60	0.23	3.00	2.25	1.504	2.40	0.92	0.08	1.0
Large	17	2.40	0.60	0.23	3.36	2.40	1.604	2.70	0.92	0.08	1.0
	18	3.05	0.91	0.343	4.76	4.27	1.794	3.68	1.83	0.152	1.22
	19	3.66	0.91	0.343	5.61	4.88	1.991	4.47	2.44	0.152	1.52
	20	4.57	1.22	0.457	7.62	7.62	2.295	5.59	3.05	0.229	1.83
	21	6.10	1.83	0.686	9.14	7.62	2.785	7.32	3.66	0.305	2.13
	22	7.62	1.83	0.686	10.67	7.62	3.383	8.94	3.96	0.305	2.13
	23	9.14	1.83	0.686	12.31	7.93	3.785	10.57	4.27	0.305	2.13
	24	12.19	1.83	0.686	15.48	8.23	4.785	13.82	4.88	0.305	2.13
25	15.24	1.83	0.686	18.53	8.23	5.776	17.27	6.10	0.305	2.13	



Appendix II: Parshall flumes level- flow formula

Type	Code	throat width b(m)	Flow formula $Q=Ch^n$ (L/S)	Level range h(m)		Flow range Q(L/S)		critical submergence %
				Min	Max	Min	Max	
Small	1	0.025	$60.4ha^{1.55}$	0.015	0.21	0.09	5.4	0.5
	2	0.051	$120.7ha^{1.55}$	0.015	0.24	0.18	13.2	0.5
	3	0.076	$177.1ha^{1.55}$	0.03	0.33	0.77	32.1	0.5
	4	0.152	$381.2ha^{1.54}$	0.03	0.45	1.50	111.0	0.6
	5	0.228	$535.4ha^{1.53}$	0.03	0.60	2.5	251	0.6
Standard	6	0.25	$561ha^{1.513}$	0.03	0.60	3.0	250	0.6
	7	0.30	$679ha^{1.521}$	0.03	0.75	3.5	400	0.6
	8	0.45	$1038ha^{1.537}$	0.03	0.75	4.5	630	0.6
	9	0.60	$1403ha^{1.548}$	0.05	0.75	12.5	850	0.6
	10	0.75	$1772ha^{1.557}$	0.06	0.75	25.0	1100	0.6
	11	0.90	$2147ha^{1.565}$	0.06	0.75	30.0	1250	0.6
	12	1.00	$2397ha^{1.569}$	0.06	0.80	30.0	1500	0.7
	13	1.20	$2904ha^{1.577}$	0.06	0.80	35.0	2000	0.7
	14	1.50	$3668ha^{1.586}$	0.06	0.80	45.0	2500	0.7
	15	1.80	$4440ha^{1.593}$	0.08	0.80	80.0	3000	0.7
	16	2.10	$5222ha^{1.599}$	0.08	0.80	95.0	3600	0.7
	17	2.40	$6004ha^{1.605}$	0.08	0.80	100.0	4000	0.7
Large	18	3.05	$7463ha^{1.6}$	0.09	1.07	160.0	8280	0.8
	19	3.66	$8859ha^{1.6}$	0.09	1.37	190.0	14680	0.8
	20	4.57	$10960ha^{1.6}$	0.09	1.67	230.0	25040	0.8
	21	6.10	$14450ha^{1.6}$	0.09	1.83	310.0	37970	0.8
	22	7.62	$17940ha^{1.6}$	0.09	1.83	380.0	47160	0.8
	23	9.14	$21440ha^{1.6}$	0.09	1.83	460.0	56330	0.8
	24	12.19	$28430ha^{1.6}$	0.09	1.83	600.0	74700	0.8
	25	15.24	$35410ha^{1.6}$	0.09	1.83	750.0	93040	0.8

