



# EAX30400-C

## Ultrasonic Level Transmitter

### Operation Manual



#### **FinkTek Co., Ltd.**

No.16, Tzuchiang St., Tucheng Industrial Park, New Taipei City 23678

Tel: 886-2-22696789

Website: <http://www.fine-tek.com>

Fax: 886-2-22686682

E-mail: [info@fine-tek.com](mailto:info@fine-tek.com)

# Contents

<b>1. Reading Labels .....</b>	<b>1</b>
<b>2. Product Warranty .....</b>	<b>2</b>
2.1 New Product Warranty .....	2
2.2 Repair Warranty.....	2
<b>2.3 Service Network.....</b>	<b>3</b>
<b>3. Product Inspection.....</b>	<b>4</b>
3.1 Check content.....	4
3.2 Safety inspection.....	4
<b>4. Summary .....</b>	<b>4</b>
<b>5. Product Features .....</b>	<b>4</b>
<b>6. Ordering Information.....</b>	<b>5</b>
<b>7. Demensions &amp; Wiring.....</b>	<b>6</b>
<b>8. Working Principles .....</b>	<b>9</b>
<b>9. Specification .....</b>	<b>9</b>
<b>10. Installation.....</b>	<b>10</b>
10.1 Mounting.....	10
10.2 Name of each part of main unit .....	11
10.3 Settings to match the tank .....	11
<b>11. Operating instructions.....</b>	<b>12</b>
11.1 Instructions .....	12
11.2 Menu setting .....	21
<b>12. Connection To The Computer (RS232C).....</b>	<b>35</b>
<b>13. Communication To The Computer (RS485) .....</b>	<b>36</b>
<b>14. Transportation And Storage .....</b>	<b>42</b>

# 1. Reading Labels

Thanks for purchasing FineTek's Product. This operation manual describes the product features, working principles, operation and maintenance methods. It makes the user fully understand how to use the product correctly, so as to prevent dangerous situations such as device damage or operator injury.

- Please read this operation manual completely and carefully before using the product.
- Please contact the company if this operation manual can't satisfy your demands.
- The content of the operation manual is updated based on the version upgrade, which will be uploaded to the website for the user to access.
- Please don't disassemble or repair the product on your own, as this will make you disqualified from availing of the warranty service. Please send the product back to the company for repair and calibration, or just contact the company.
- Explanation of warning signs:



Danger→ It indicates that wrong operation will cause death or major disasters.



Note→ It indicates that wrong operation will cause injury and device damage to some extent.



Electric shock→ It warns of possible electric shock.



Fire→ It warns of possible fire.



Prohibited→ It indicates the prohibited wrong behavior.

## 2. Product Warranty

### 2.1 New Product Warranty

- We don't charge for the inspection, part/s and repair for the product of the company that has a defect within 12 months from the delivery date and meets the warranty terms.
- If the product defect is not due to human error during its transportation, user may change to a new unit from the company within 7 days from delivery date.
- When the product needs to be sent back to the factory for repair, please send the whole set, and don't disassemble the parts. Moreover, please be sure it is completely packed to avoid damage and causing more loss and defect during the transportation.
- The warranty is not available for causes that fall under the following circumstances, for which the company shall charge for the inspection, part/s and repair according to the actual condition:
  - The product or its parts are beyond the warranty period.
  - Fault or damage is caused by not following the instruction and use environment described on the operation manual.
  - The product damage is caused by a force majeure factor (natural disasters, floods, fire, earthquakes, lightning, typhoon, etc.), human destruction (scratches, dropping, latch broken, tapping, cracks and punching), human error (using improper voltage, high-humidity, water leakage, stain, corrosion, loss, improper storage, etc.) and other abnormal factors.
  - The damage is caused by the customer or the 3rd party through the installation, addition, expansion, modification and repair of parts not authorized or certified by the company.
  - The volume label information is wrong or unclear, so the product serial number can't be confirmed.

### 2.2 Repair Warranty

A **6-month** warranty service is provided for the repaired part of the product, during which the same product can be repaired free of charge in case of the same fault.

## 2.3 Service Network

Company	Address	Telephon	Fax
<b>Taipei Headquarters (Taiwan)</b>	No.16, Tzuchiang St., Tucheng Industrial Park, New Taipei City 23678	+886 2 2269 6789	+886 2 2268 6682
<b>Taichung Sales office (Taiwan)</b>		+886 4 2465 2820	+886 4 2463 9926
<b>Kaohsiung Sales office (Taiwan)</b>		+886 7 333 6968	+886 7 536 8758
<b>Fine automation Co., Ltd. (China)</b>	No. 451, Duhui Road, Zhuanqiao Township, Minhang District, Shanghai City 201109	+86 021 64907260	+86 021 6490 7276
<b>Aplus FineTek (Sensor Inc.)</b>	355 S. Lemon Ave, Suite D, Walnut, CA 91789	1 909 598 2488	1 909 598 3188
<b>FineTek Pte Ltd. (Singapore Branch)</b>	No. 60 Kaki Bukit Place, #07-06 Eunos Techpark 2 Lobby B, Singapore 415979	+65 6452 6340	+65 6734 1878
<b>FineTek GmbH (Germany Branch)</b>	Bei den Kämpen 26 21220 Seevetal-Ramelsloh, Germany	+49 (0) 4185 8083 12	+49 (0) 4185 8083 80
<b>FineTek Co., Ltd. (Indonesia Branch)</b>	Ruko Golden 8 Blok H No.38 Gading Serpong, Tangerang Indonesia 15810	+62 (21) 2923 1688	+62 (21) 2923 1988

## 3. Product Inspection

### 3.1 Check Content

- Ultrasonic Level Transmitter x1
- Ultrasonic sensor 1 or 2 (Depending on order)
- Operation Manual x1

### 3.2 Safety Inspection

- Please check whether the external package is deformed or damaged. Please remember to take a picture for evidence for compensation later.
- After unpacking, please check whether the content is deformed or damaged, or has any quality problem. Please remember to take a picture for evidence for compensation later.
- After unpacking, please check whether the content is consistent with the ordering info, and whether the quantity is right.
- Please contact the company within 7 days if any of the above situations occur (attach the picture together with your complaint). Otherwise, we won't compensate for, change or repair the product defect.

## 4. Summary

EAX30400-C is a compact, remote type ultrasonic level transmitter for continuous measurement of liquids. As a price leader, it does not compromise on good value; and provides effortless and intuitive operation. Easy and flexible mounting combined with high chemical compatibility and 20-metre measuring range makes the EAX30400-C suitable in multiple applications in all industries.

## 5. Product Features

- 4~20mA 4 wire output (Fully isolated, remote type)
- IP66 protection
- Transducer material: EPOXY , PVDF
- False echo detection
- Internal temperature compensation.
- Not affected by liquid temperature, S.G, viscosity

# 6. Ordering Information

EAX 3 <sup>05</sup> <sup>06</sup>   0 0 - <sup>09</sup> <sup>10</sup> <sup>11</sup> <sup>12</sup> <sup>13</sup> <sup>14</sup> <sup>15</sup> <sup>16</sup>

<sup>05</sup> <sup>06</sup> **Model** \_\_\_\_\_  
 00: Standard type  
 04: Remote type

<sup>09</sup> **Measuring distance** \_\_\_\_\_  
 A: 0.25~7.5m (Standard type)  
 B: 0.3~10m (Standard type)  
 C: 0.3~20m (Remote type)

<sup>10</sup> **Transducer** \_\_\_\_\_  
 A: PP(Standard type)  
 B: Sensor surface: Epoxy, Housing: PP (Remote type)  
 C: PVDF (Remote type)

**Connection** \_\_\_\_\_

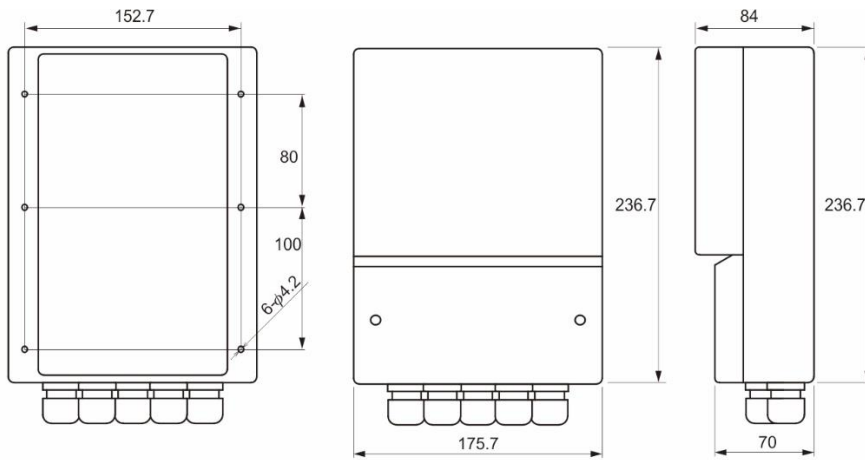
<sup>11</sup> <sup>12</sup>  
 AA: JIS

<sup>13</sup> <sup>14</sup>  
 A8: 1"  
 B2: 2"

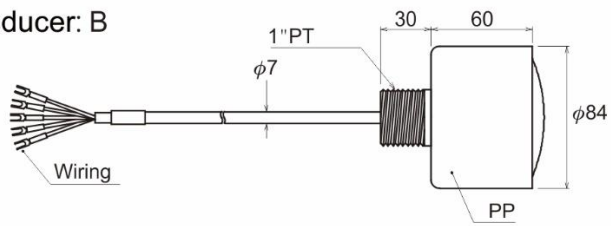
<sup>15</sup> <sup>16</sup>  
 01: PT male  
 03: PF male

PS: Transducer A: AAB203  
 Transducer B: AAA801  
 Transducer C: AAA803

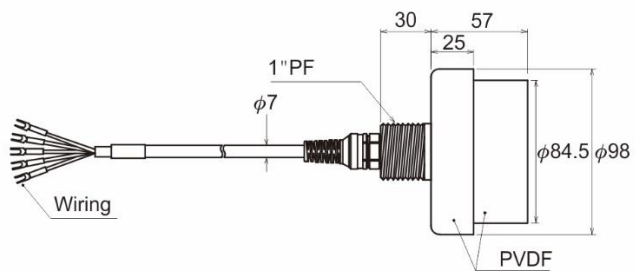
## 7. Demensions & Wiring



Transducer: B



Transducer: C





## Wiring

FG	GND	TX	RX	FG	A	B	GND	4-20	GND	4-20	GND
AC/N	AC/L	WHITE	BLACK	RED	GREEN	GRAY	WHITE	BLACK	RED	GREEN	GRAY
HH	H	L	LL	COM	COM	HH	H	L	LL	SW+	SW-

### Explanation of the terminal

- 1) Connect the power supply, 100 - 240VAC.

AC/N	AC/L
B1	B2

- 2) Connect FG terminal to ground.

F.G.
A1

- 3) Connect the ultrasonic sensor to CH1 or CH2.

CH1					CH2				
WHITE	BLACK	RED	GREEN	GRAY	WHITE	BLACK	RED	GREEN	GRAY
B3	B4	B5	B6	B7	B8	B9	B10	B11	B12

- 4) Wirings for ALARM

CH1 ALARM					CH2 ALARM					PULSE OUT	
HH	H	L	LL	COMMO	COMMO	HH	H	L	LL	SW+	SW-
C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12

HH and COMMON are short-circuited by relay.

H and COMMON, L-COMMON, LL-COMMON are short-circuited in the same manner.

[Caution] Provide the surge protection in case the induced load is driven.

- 5) Wirings for 4-20mA output

CH1		CH2	
4-20mA	GND	4-20mA	GND
A9	A10	A11	A12

A11 and A12 are used for the output of the level difference between CH1 and CH2.

- 6) Wirings for RS-485

RS485			
F.G.	A(+)	B(-)	GND
A5	A6	A7	A8

Use the shielded twisted pair cable for RS-485 line. Connect the shield to FG, A5.

7) Wirings for RS232C      115,200bit/sec   8bit   Parity/none

RS232		
GND	TX	RX
A2	A3	A4

### Setting of the dip switch (SW1)

Setting of the terminating resistance of RS-485 and Profibus

RS-485: 3 and 4 of SW1 should be ON.

Profibus: 1 and 2 of SW1 should be ON.

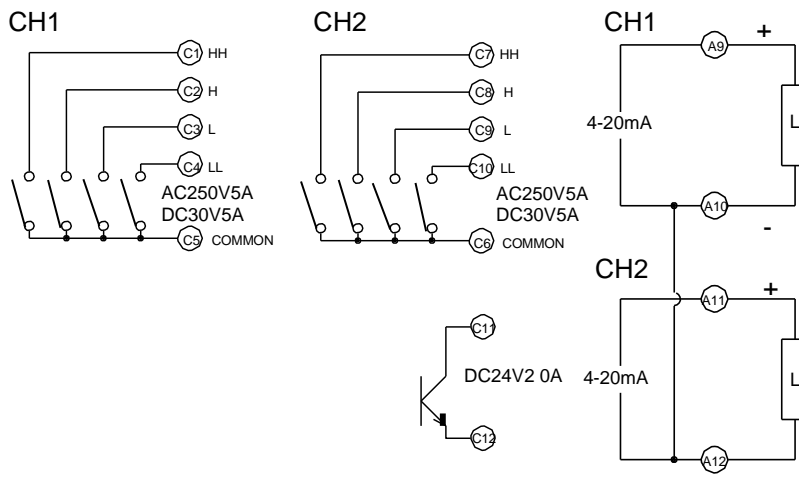


In case the multiple main units are connected, the terminating resistance  $R_t$  (100 ohms) of the main unit which is farthest from the host computer must be ON and those of others must be OFF.

1 and 2 of SW1 or 3 and 4 of SW1 must be ON or OFF at the same time.

### ALARM SW (Relay contact output)

### 4-20mA output



### [Caution]

- Rating of ALARM output is 250 VAC 5A or 30 VDC 5A.
- Rating of Pulse output is 24 VDC 2.0A.
- A10 and A12 of 4-20mA are connected inside.
- Permissible load resistance and resolution of 4-20mA output: 600 ohms or less and 1/4000

## 8. Working Principles

During operation, the device emits a wave to the medium to be measured. The wave reflects off the surface and moves back to the device where a transducer calculates the distance. The distance is based on the time interval between transmission and reception of the wave.  $D = (334.1 + 0.6t) \times T/2$ , where the D = the transmission distance; t = temperature; and T = transmission time.

With 4~20mA output, it can be connected to the PLC, DCS and SCADA systems. In addition, it is also equipped with exclusive PULSE and AGC (Auto Gain Control) echo tracking technology to ensure accuracy and precision even in the harshest environments.

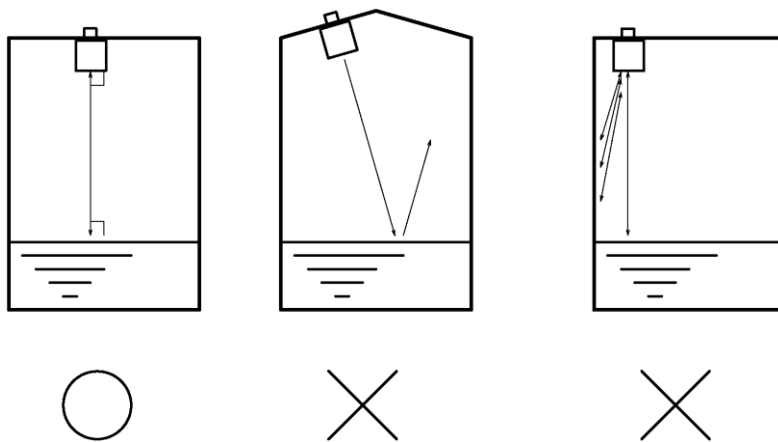
## 9. Specification

Model	EAX30400-C
Number of channels	1 or 2
Frequency	10 - 60kHz
Measurement object	Liquid and powder
Measurement range	0.3 – 20m
Measurement resolution	1mm
Measurement accuracy	+/- 0.25% F.S.
Operation temperature	-20 - +70 °C
Display	LCD display with backlight
Current output	4-20mA output
Contact output	Relay output: 4 points * 2 lines
Signal input/output	RS232, RS485 (PROFIBUS (Option))
Power source	100 – 240 VAC +/- 15% 10VA
Dimensions(mm)	Main unit: 175.7(W) * 84(D) * 236.7(H) Transducer B: Dia.84*60 / Transducer C: Dia.98*57
Weight	Main unit: 1.8kg Transducer B: 500g / Transducer C: 860g
Installation (Former JIS standard)	Main unit: Wall mount Transducer B: Screw mount R1(1"PT) Transducer C: Screw mount: G1(1"PF)
Sensor material	Transducer B: Epoxy (Sensor surface) and PP (Housing) Transducer C: PVDF(Sensor surface & Housing)
IP rating	Main unit: IP66 equivalent / Sensor: IP66 equivalent
Sensor cable	Dia. 7 * 5m

# 10. Installation

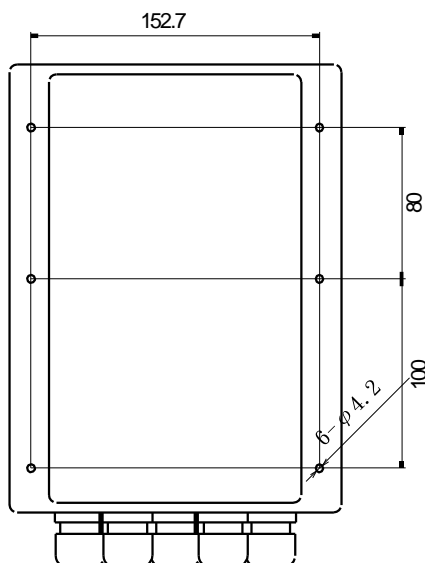
## 10.1 Mounting

- Sensor should be mounted 1/3 the diameter of the vessel from the vessel wall
- Unit should never be closer than 300mm (12) to the liquid surface
- Install the ultrasonic sensor horizontally on the top of the tank.
- Screw in the 1-inch screw of the sensor to install it.



- Install the sensor so that the sensor surface is parallel to the surface of the liquid.
- If the installed sensor is closed to the side wall of the tank or an equivalent, unnecessary reflection wave is detected and the incorrect measurement occurs.
- Do not use unnecessary force to screw in the sensor.
- Prevent the sensor from the direct sun.
- Do not install the multiple sensors in the same tank.
- (Incorrect measurement occurs due to the mutual interference.)

## Main unit installation



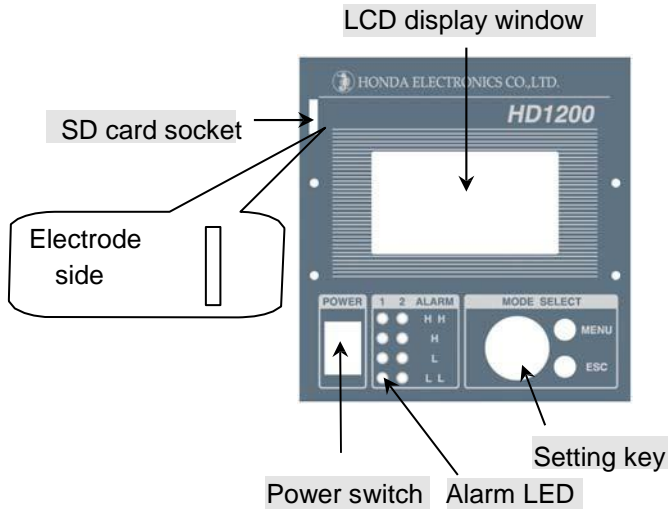
Secure with M4 screws. Screw pitch

152.7 \* 80

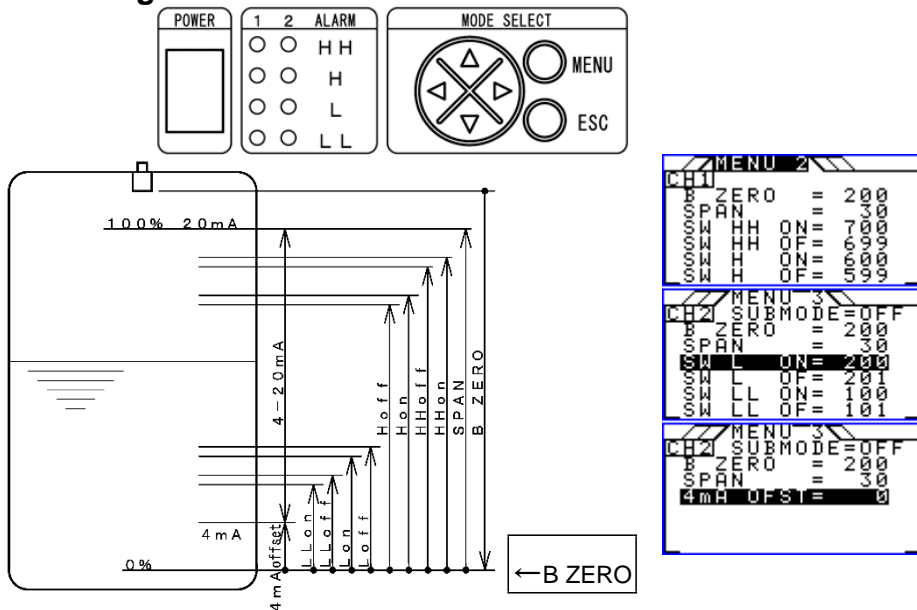
152.7 \* 100

152.7 \* 180

## 10.2 Name of each part of main unit



## 10.3 Settings to match the tank



### CH1 settings (MENU2) CH2 settings (MENU3)

- 1) Press MENU key to indicate MENU.
- 2) Display MENU2 or MENU3 by → key and select the item by ↑ ↓ keys and change the setting by ← → keys.

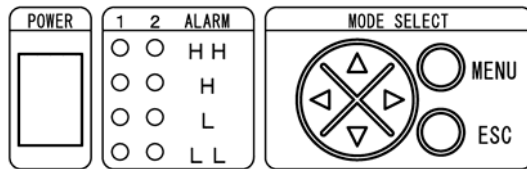
Press MENU key to fix the setting and exit MENU.

To press ESC key not to change the setting and exit MENU.

- 3) B ZERO: Distance from the sensor surface to the tank bottom  
This does not necessarily have to be the distance to the tank bottom as it is the distance to 0%.
- 4) SPAN: Setting of the distance for 0 - 100%  
Set the distance from the tank bottom which is set by B ZERO to 100%.
- 5) SW HH-LL: Setting of the alarm switch level  
Set the level for SW HH - LL.  
Be aware of the relationship of ON and OFF.
- 6) 4mA OFST: Setting of 4mA offset

# 11. Operating Instructions

## 11.1 Instructions



### Basic key operation

Press MENU key to move to MENU display.

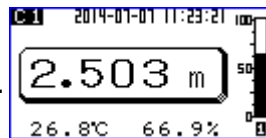
Select the item by  $\uparrow$   $\downarrow$  keys and change the setting by  $\leftarrow$   $\rightarrow$  keys. Press MENU key to exit MENU display.

### How to read the LCD display screen

Select 1 display mode from the following 4 display modes.

#### DISPMODE A

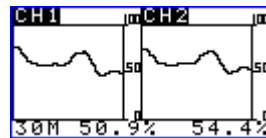
Refer to P12 and P13.



(Standard display)

#### DISPMODE B

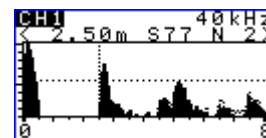
Refer to P14.



(Trend display)

#### DISPMODE C

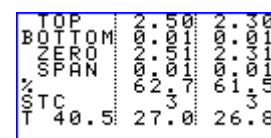
Refer to P15 to P18.



(Ultrasonic A mode display)

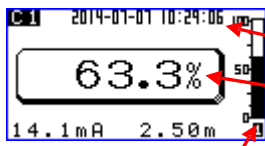
#### DISPMODE D

Refer to P19.



(Character display)

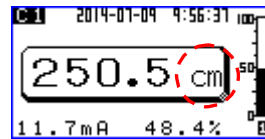
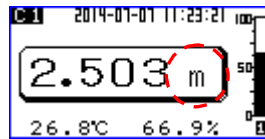
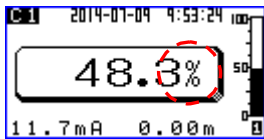
DISPMODE A (Standard display)



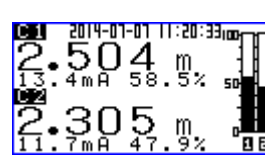
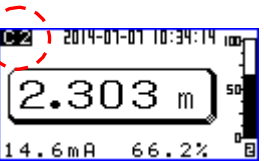
Date and time display  
 Main display: Numerical display of remaining amount in percentage terms, the distance or the level in the tank.

Graphic display of the remaining amount in the tank

Select the unit, %, m or cm by ↑ key.



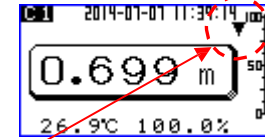
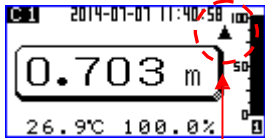
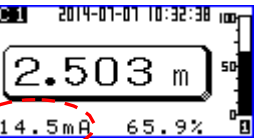
Select the channel, CH1, CH2 or CH1&CH2, by ← → keys.



Select the temperature or 4-20mA the by ↓ key.

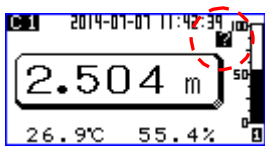
4-20mA

Rising the liquid level Lowering the liquid level



Current output display

Rising/Lowering the liquid level is indicated by the arrow.



? is indicated in case the ultrasonic reflection echo cannot be detected and measurement error happens.

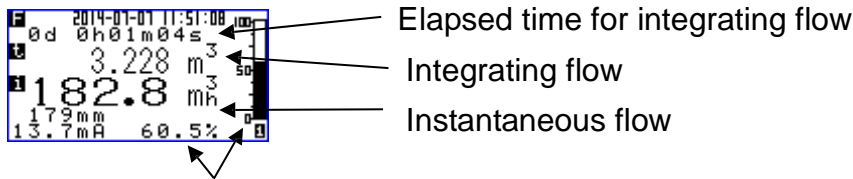
DISPMODE A (Flowmeter standard display)

Flowmeter display

F (Flow) is displayed in case the flowmeter function is worked.

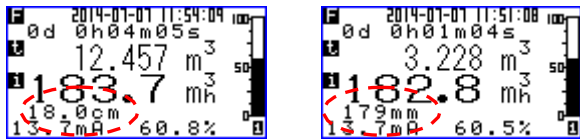
T (Total flow): Integrating flow

i (Instantaneous flow): Instantaneous flow

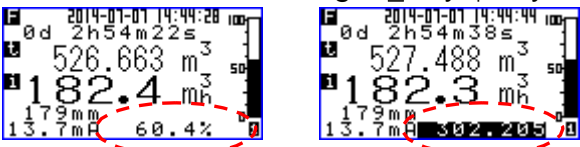


Display of the instantaneous flow in percentage

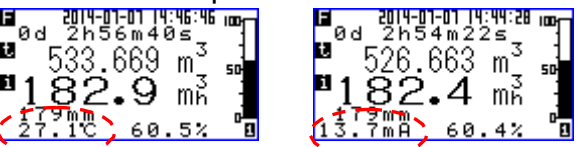
Select cm or mm as the unit of the overflow level at UNIT of MENU1.



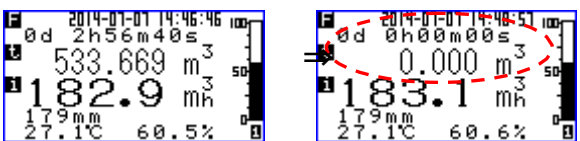
Select % or Max. setting flow by ↑ key.



Select the temperature or the current output value by ↓ key.



Hold down ESC key for 2 seconds to reset the integrating flow and the elapsed time for the integrating flow.

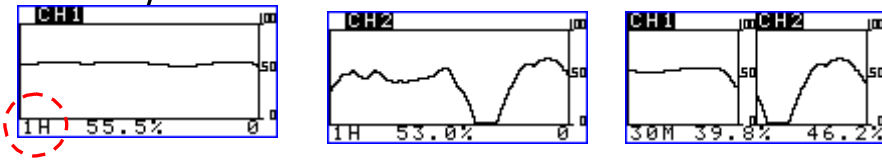




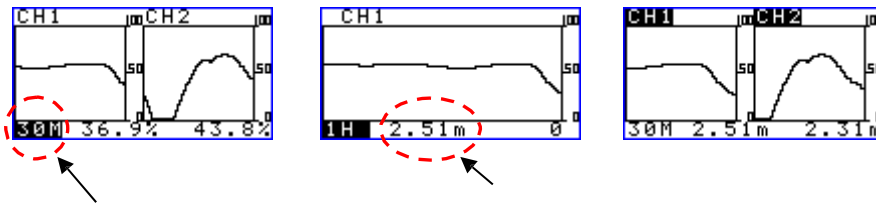
## DISPMODE B (Trend display)

Graphic display of the ratio of the remaining amount

Select CH1, CH2 or CH1&CH2 by ← → keys.



Time graph



Time graph

Distance or the ratio of remaining amount

## How to change the time graph

Select the time display by ↑ ↓ keys.

Select the time graph from 5 min. to 48 hours by ← → keys.

Flowmeter

Level meter

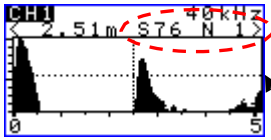


Ratio of the instantaneous flow is displayed in case the flowmeter function is used.

[Caution] Select distance or the ratio of the remaining amount by the main display of DISPMODE A.

DISPMODE C (Ultrasonic A mode display) Ultrasonic reflection echo is displayed.

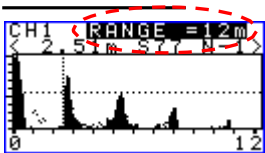
Select CH1 or CH2 by ← →keys, select the item by ↑ ↓ keys and change the setting value by ← → keys.



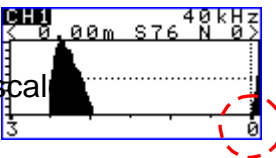
Ultrasonic A mode display: Ultrasonic reflection echo is displayed. (S= Signal intensity, N= Noise value)

Threshold level line

**Display range (RANGE)**



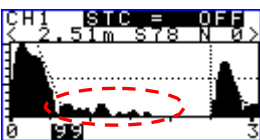
Range of the displayed range is displayed. Setting range: 1 - 20m  
The range is depending on the frequency of the sensor.



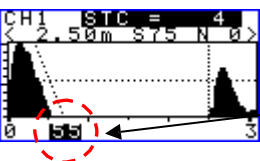
If “bottom” is selected at MENU 1, B ZERO is the basing point of

If top is selected at MENU 1, the sensor surface is the basing point of the scale.

**STC**



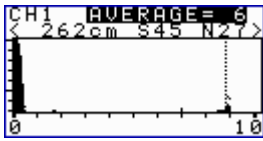
The sensitivity of the position where is close to the sensor is decreased and the undesired reflections from such position is cleared.



OFF ⇔ 1 ⇔ 2 ⇔ 3 ⇔ ... ⇔ 10

Distance of the reverb signal

## Averaging (AVERAGE)

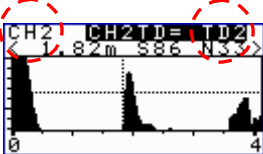


In case the ultrasonic reflection echo is not stable due to the fluctuation of the liquid surface and etc., set AVERAGE to the larger value.

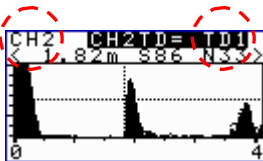
Setting range: 1 – 30

[Caution] The larger the setting value of AVERAGE is, the slower response speed is.

## Selection of ultrasonic sensor of CH2



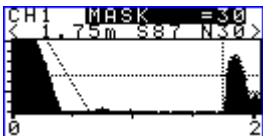
Select either TD1 or TD2 as the sensor for CH2. Normally, select TD2.



Ex) TD1 is selected in case both CH1 and CH2 are used with 1 sensor simultaneously.

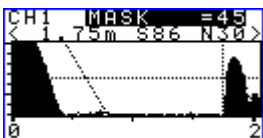
## Reverberation mask setting

In case the distance of the reverb signal prevent the measurement, adjust MASK



to avoid the incorrect measurement.

MASK = 30 cm (Default value)



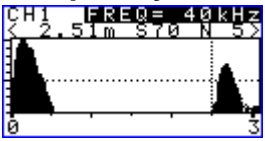
MASK = 45 cm



MASK = 70 cm

[Caution] Dead zone from the sensor is 70 cm.

### Frequency setting

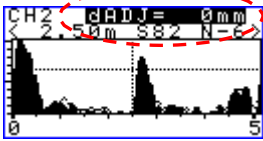


12 ⇔ 21 ⇔ 30 ⇔ 40 ⇔ 50 ⇔ Variable

Press ESC key at Variable to set the frequency at

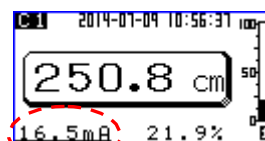
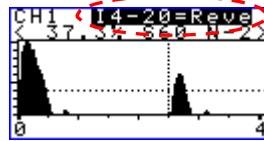
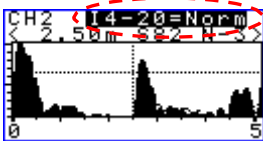
1kHz step from 10kHz to 60kHz.

### Distance correction



Distance correction can be done from -99 to 100mm.

### Inversion of 4-20 mA current output



Inversion of the output current can be done.

4mA ⇒ 20mA 20mA ⇒ 4mA

In case the output current is inverted, the underline is indicated under the displayed current value.

### **Defense function**

This is the function to mask the undesired reflections from the object which don't move at all in the manhole pump system and etc.

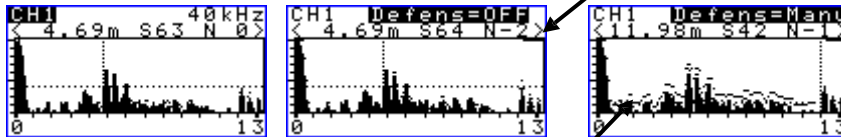
Such undesired reflections is masked in case **MANU** ⇔ **OFF** ⇔ **TRAC** is set.

### **MANUAL setting**

50 cm above from B ZERO is memorized as the masked range in case the setting is changed from OFF to MANU.

Set MANU under the condition that the liquid level is within 50 cm above from B ZERO.

Masked by B ZERO



Mask data line

### **Tracking setting**

Set TRAC from OFF irrespective of liquid level. The moving liquid level is detected.

[Principle]

Mask data is updated at fixed intervals and moving liquid level is excluded from the masked object.

While the mask data is updated, the measurement error happens because all of echoes are masked.

[Caution] In case the undesired reflections and reflections from the measurement object are overlapped, the measurement error happens.

**DISPMODE D** (Character display) The detailed information is displayed.

CH1 CH2

TOP	2.50	2.30
BOTTOM	2.01	2.01
ZERO	2.01	2.01
SPAN	6.27	6.15
%	3	3
STC	40.5	27.0
T	27.0	26.8

TOP : Measurement distance from the surface of the ultrasonic sensor

BOTTOM: Measurement level from B ZERO. ZERO : B

ZERO setting value

SPAN : Setting value of 100% level

% : Measurement ratio of the remaining amount

STC : STC setting value

T : Temperature inside of the tank

(The left one is the temperature inside of EAX30400-C main unit.)

### **Reset and system reset**

All the settings of EAX30400-C main unit can be reset in the following procedures at DISPMODE D.

Press ESC and MENU keys simultaneously to restart EAX30400-C main unit.

Press ESC, MENU and ← keys simultaneously to initialize EAX30400-C main unit.

(Approx. 1 min. will be taken to initialize EAX30400-C main unit.)

## 11.2 Menu setting

Press MENU key to display MENU. Press MENU key to exit MENU.

If there is no key operation for 3 min., at MENU display, the exit from MENU is done automatically.

MENU has MENU 1 to MENU 5 as follows. Press ← → keys to select the desired MENU.

Press ESC key not to change the setting and exit MENU.

While MENU is displayed, the ultrasonic measurement is continued.

### MENU 1

Refer to P26 to P29.

```

MENU 1
DISPMODE= H
UNIT = m
SCALE = top
CONTRAST = 0
RIGHT = Auto
RESPONSE = 10m
485 No = 1
    
```

### MENU 2

Refer to P30 and P31.

```

MENU 2
CH1
ZERO = 251
PAN = 141
HH ON = 7000
HH OF = 6000
HH ON = 6000
HH OF = 5000
    
```

### MENU 3

Refer to P31 and P31

```

MENU 3
CH2
SUBMODE = OFF
ZERO = 2000
PAN = 3000
HH ON = 7000
HH OF = 6000
HH ON = 6000
HH OF = 5000
    
```

### MENU 4

Refer to P32 and P33.

```

MENU 4
PASSWORD = 2357
41200SET = normal
ERRRCON = hold
THRESHO = -20dB
232BAUD = 115200
RLYtest = normal
TIME 2014-07-08 10:40:58
    
```

### MENU 5

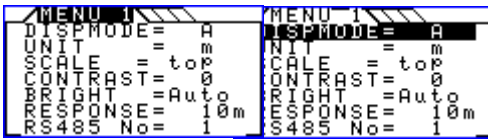
Refer to P34 to P39.

```

MENU 5
FLOWmod = OFF
FLOWdsc = 0
FLOWRO = 0.00004
FLOW = 0.00004
WIDTH = 0.00004
SPAN = 0.10000
    
```

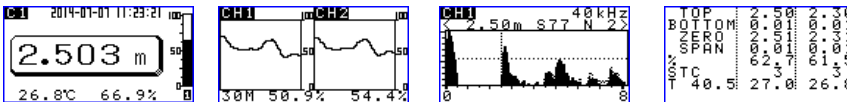
## MENU 1

Select the parameter which setting should be changed by ↓ key.



Select the desired DISPMODE from A to D by ← → key.

DISPMODE A    DISPMODE B    DISPMODE C    DISPMODE D



**UNIT** : Select m or cm.

(In case the flowmeter function is used, m means mm as the unit of the overflow level.)

**SCALE** : Select top or bottom.

Basing point of the measurement can be selected.

top : The sensor surface is the basing point.

bottom : The tank bottom is the basing point.

**CONTRAST** : Select from -10 to 10.

LCD contrast can be adjusted. Standard setting is 0.

**BRIGHT** : Select from OFF, AUTO or ON. Setting of LCD backlight can be set.

AUTO : Backlight is ON for 10 min. after the power activation, and OFF after that.

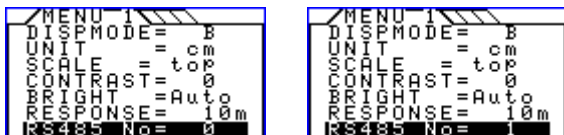
Backlight is ON for 1 hour after any key operation, and OFF after that.

**RESPONSE** : Select from 1000m/min (faster) to 0.01m/min (slower).

The setting of the following speed against the change of the measurement distance can be done.

**RS485No.** : Select from 0 to 99 as ID No. of RS485 (PROFIBUS). If RS485 is not used, set to 0.

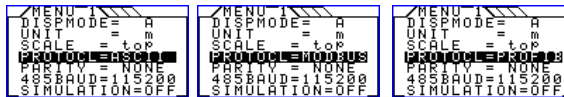
Up to 32 main units can be concatenated even though the setting range is 1 to 99.





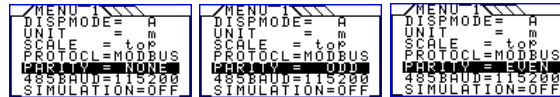
**PROTOCOL :**

Select ASCII, MODBUS or PROFIBUS according to the host computer. MODBUS is RTU mode.



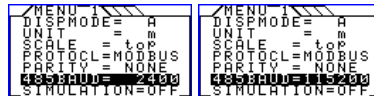
**RS485PARITY :**

Select NONE, ODD or EVEN as PARITY according to the host computer.



**RS485BAUD :**

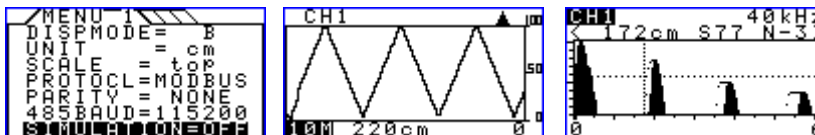
Select from 2400 to 115200 as the baud rate of RS485 according to the host computer. (Unit: bps)



**SIMULATION :**

Select OFF, On1, On2, On3, On4, On1m, On2m, On3m or On4m.

The setting of the simulation function by the spurious echo can be done for the test purpose. 4-20mA, relay and the communication output can be changed according to the spurious echo.



The spurious echo moves within the range of SPAN, 0 - 100% as above. The spurious measurement distance is updated approx. every 2 seconds and the spurious distance is changed as follows depending on the SIMULATION setting.

On1: 2cm, On2: 4cm, On3: 8cm, On4: 16cm

In case the parameter which "m"(On1m, On2m, On3m or On4m) is set, the measurement and the simulation are affected each other.

This function works to test each output.

[Caution] The simulation function becomes invalid once the power is turned off.

[Caution] On the simulation function, SPAN of CH2 is that of CH1 and it cannot be that of CH2.

**SD card data storage function**

Folder name    File name

- A) ECHO\_CH1    EC140511.BIN      Ultrasonic echo data B)
- ECHO\_CH2    EC140511.BIN      Ultrasonic echo data C)
- LOG\_DATA    LD140511.CSV      Measurement log data

The data can be read out by Excel<sup>®</sup> and etc.

- D) LIFT\_DAT    LIFT1532.CSV    Measurement log data

The data can be read out by Excel<sup>®</sup> and etc. Always insert SD card into the slot whenever A), B) or C) is done. Insert SD card into the slot when the data is copied in case D) is done

After SD card is inserted into the slot, change the setting of the necessary item from Idle to WRITE by → key and change the setting of CARD to ACTIVE. Change the setting of CARD to REMOVE to remove SD card.



While the data is written into SD card, W and the card utilization are displayed on the normal display.

[Caution] Do not turn off the power or remove SD card from the slot while the data is written into SD card.

If SD card is removed while the date is written into SD card, EAX30400-C main unit is abended and restarted.

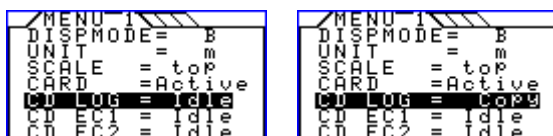
Contents of LOG\_DATA and LIFT\_DAT are the same as those of the data of RS232C on P35.

### **Copy of D) LIFT DAT. the measurement log data**

The measurement log data stored in the flash memory inside of EAX30400-C main unit can be copied into SD card.

CARD = REMOVE ⇒CARD = ACTIVE CD LOG = Idle ⇒CD LOG = Copy

Select Copy by ← key to start to copy the data into SD card. It takes approx. 1 min. to copy the data into SD card.



For 1 hour after the power on, the measurement log data is stored into the flash memory at 1-minute intervals.

After that, the data is stored at 1-hour intervals.

The data for 1.5 year can be stored at the maximum. After the data for 1.5 year is stored, the date of 1.5 year range is updated.

If the power of EAX30400-C is often restored, the data range is shortened.

[Caution] If the power on of EAX30400-C is done many times, the period of the data storage will be shorter than 1.5 year.

## MENU 2

MENU 2	
CH1	
B ZERO	= 200
SPAN	= 30
SW HH ON	= 7000
SW HH OF	= 6999
SW H ON	= 6000
SW H OF	= 5999

MENU 2	
CH1	
B ZERO	= 200
SPAN	= 30
SCALE ONE	= 200
SW L ON	= 201
SW LL ON	= 100
SW LL OF	= 101

MENU 2	
CH1	
B ZERO	= 200
SPAN	= 30
4mA OFST	= 0

## MENU 3

MENU 3	
CH2	SUBMODE=OFF
B ZERO	= 200
SPAN	= 30
SW HH ON	= 7000
SW HH OF	= 6999
SW H ON	= 6000
SW H OF	= 5999

MENU 3	
CH2	SUBMODE=OFF
B ZERO	= 200
SPAN	= 30
SCALE ONE	= 200
SW L ON	= 201
SW LL ON	= 100
SW LL OF	= 101

MENU 3	
CH2	SUBMODE=OFF
B ZERO	= 200
SPAN	= 30
4mA OFST	= 0

MENU 3	
1-2	SUBMODE=ON
B ZERO	= 200
SPAN	= 30
SW HH ON	= 7000
SW HH OF	= 6999
SW H ON	= 6000
SW H OF	= 5999

MENU 2 is the page for CH1 setting. MENU 3 is the page for CH2 setting.

The displayed value is displayed in the selected unit, cm or m.

**SUBMODE** : Select ON or OFF.

Select ON to enable to the difference measurement between CH1 and CH2.

In case ON is selected, select bottom at SCALE at MENU 1. Use the terminals of CH2 for SUBMODE output.

**B ZERO** : Select from 30 – 2030cm or 0.30 – 20.30m.

Set the distance from the sensor surface to the tank bottom or the dam bottom.

The setting value is depending on the frequency.

**SPAN** : Select from 0 – 20000cm or 0.00 – 20.00m.

Set the measurement range or the max. over flow level from the tank bottom. The setting value is depending on the frequency.

The range is equal to the range of 4-20mA output.

[Caution]: In case 4mA OFST is set to 0, the range calculated by subtracting the setting value of 4mA OFST from the range of SPAN is the range of 4-20mA output.

**SW HH ON/OFF** : Select from 0 - 2000cm or 0.00 - 20.00m.

Set the level from the tank bottom which ALARM HH must be ON/OFF.

**SW H ON/OFF** : Select from 0 - 2000cm or 0.00 - 20.00m.

Set the level from the tank bottom which ALARM H must be ON/OFF.

**SW L ON/OFF** : Select 0 - 2000cm or 0.00 - 20.00m

Set the level from the tank bottom which ALARM L must be ON/OFF.

**SW LL ON/OFF** : Select from 0 - 2000cm or 0.00 - 20.00m

Set the level from the tank bottom which ALARM LL must be ON/OFF.

[Caution] Relay mode is determined by the settings of ON and OFF. [Caution] ON and OFF are switched frequently, the difference between ON and OFF must be larger in order to provide the hysteresis.

**4mA OFST** : Select 0 - a value which is the setting value of SPAN or less.

In case 4mA OFST is set to 0, the tank bottom is the level of 4mA output.

[Caution] In case 4mA OFST is set to 0, the range calculated by subtracting the setting value of 4mA OFST from the range of SPAN is the range of 4-20mA output

## MENU 4



**PASSWORD** : Select 2357 to operate everything. Password can be set.

Except 2357, the control can be restricted.

**4-20SET**: Select from normal or i4mA to i20mA. Connection test of 4-20mA output can be done.

In case i4mA is set, 4mA is output from EAX30400-C main unit forcibly.

In case i20mA is set, 20mA is output from EAX30400-C main unit forcibly as well. Normal  
⇔i4mA ⇔i8mA ⇔i12mA ⇔i16mA ⇔i20mA

Both current outputs of CH1 and CH2 are output at the same time.

Once the exit from MENU is done, the setting of 4-20SET returns to normal.

**ERR CON** : Select from hold, i4fix or i20fix.

The current output in case the measurement error happens can be specified.

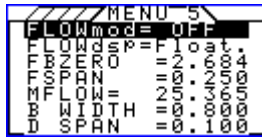
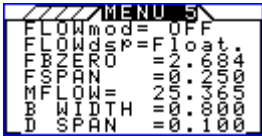
Hold : The current of the previous measurement value before the measurement error happens is hold

and output.

i4fix : 4mA is output in case the measurement error happens. i20fix : 20mA is output in case the measurement error happens.



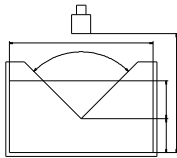
## MENU 5



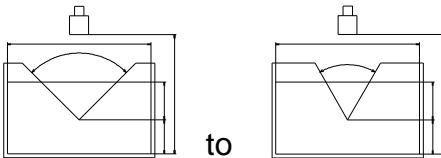
FLOWmod : Select from OFF, 90ang1, AngleV, 60angV or Square1 to Square4.  
 Level meter function: Select OFF for the level meter function.

Flowmeter function: Select from 90ang1, AngleV, 60angV or Square1 to Square4 for the flowmeter function according to the dam type.

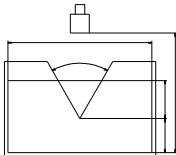
90ang1 for the right-angle triangular dam, JISB8302



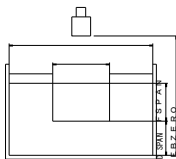
AngleV for the selected angle triangular dam



60angV for 60 deg triangular dam, JISB8302

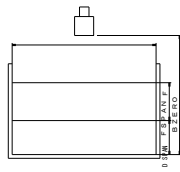


Squar1 for the square dam, JISB8302

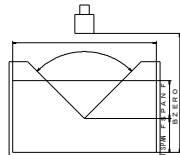




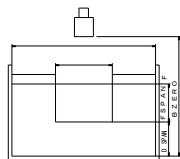
Squar2 for the full width dam, JISB8302



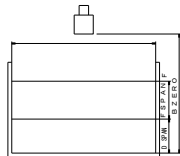
90ang2 for the right-angle triangular dam



Squar3 for the square dam



Squar4 for the full width dam



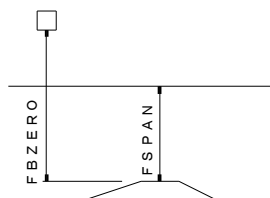
Select the one from the followings for the application of the parshall flume type flowmeter.

PF-1: 1 inch, PF-2: 2 inches, PF-3: 3 inches

PF-6: 6 inches, PF-9: 9 inches, PF-10: 1 foot, PF-15: 1.5 feet,

PF-20: 2 feet, PF-30: 3 feet PF-40: 4 feet, PF-50: 5 feet, PF-60: 6 feet

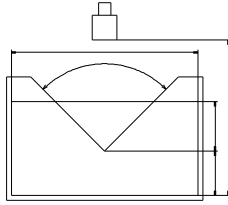
PF-70: 7 feet, PF-80: 8 feet



SENSOR

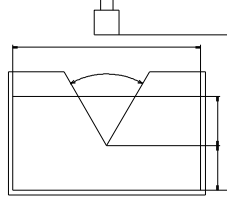
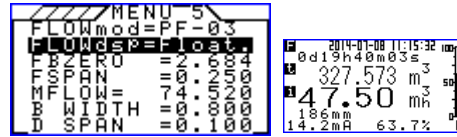
**FLOWdsp** : Select the unit for the flowmeter function.

**Integer display of flow(m<sup>3</sup>)**



Right-angle triangular dam

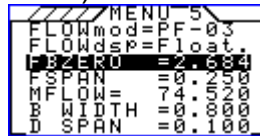
**Decimal point display of flow(m<sup>3</sup>)**



60 deg triangular dam

**FBZERO** : Set the distance from the sensor surface to the bottom.

Setting range: 300 – 500 (Unit: mm)



**FSPAN** : Set the max. depth in case of the max. height of overflow Setting range: 50 - 3000 (Unit: mm)

The setting of MFLOW depends on the setting of FSPAN.



**B WIDTH** : Set the width of the flow channel.

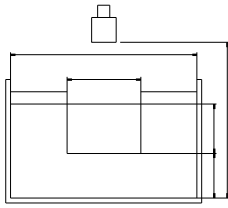
Setting range: 400 – 32000 (Unit: mm)



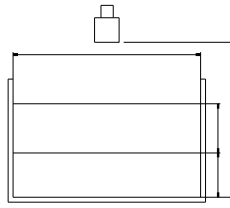
**D SPAN** : Set the distance from the bottom of the flow channel to the lower edge of the dam.

Setting range: 1 – 3500 (Unit: mm)





Square dam



Full width dam

```

MENU 5
sbWIDTH = 0.400
V ANGLE = 90.0
FLOWUNIT = /hour
F CUT OF = 0.0%
PULSE FLW = 1
PULSE WID = 0.10
TFLOW = 00000338
  
```

**sbWIDTH** : Set the width of the cutout of square dam..

**V ANGLE** : Set the arbitrary degree of the triangular dam in case Angle V is selected.

Setting range: 45.0 – 100.0 (Unit: degree)

```

MENU 5
sbWIDTH = 0.400
V ANGLE = 90.0
FLOWUNIT = /hour
F CUT OF = 0.0%
PULSE FLW = 1
PULSE WID = 0.10
TFLOW = 00000339
  
```

**FLOWUNIT** : Set the unit of the instantaneous flow.

$m^3/sec \Leftrightarrow m^3/min \Leftrightarrow m^3/hour \Leftrightarrow m^3/day$

sec

min

hour

day

```

MENU 5
sbWIDTH = 0.400
V ANGLE = 90.0
FLOWUNIT = /hour
F CUT OF = 0.0%
PULSE FLW = 1
PULSE WID = 0.10
TFLOW = 00000340
  
```

```

2014-01-08 11:33:16
0d19h57m45s
341.553 m3
47.11 m3/h
185mm
14.1mA 63.2%
  
```

```

2014-01-08 11:34:18
0d19h58m47s
342.362 m3
0.778 m3/d
184mm
14.0mA 62.7%
  
```

**F CUT OF** : Set the cutoff of the flow.

Setting range: 0.0 – 10.0% of the max. setting flow

```

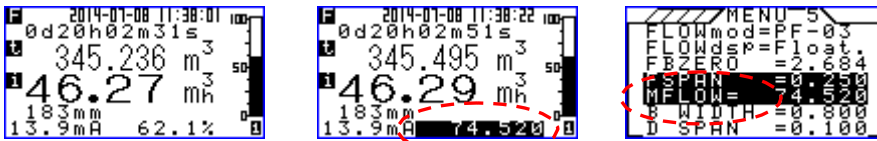
MENU 5
sbWIDTH = 0.400
V ANGLE = 90.0
FLOWUNIT = /hour
F CUT OF = 0.0%
PULSE FLW = 1
PULSE WID = 0.10
TFLOW = 00000344
  
```

Flow which is less than the setting of F CUT OF is shown as 0(no flow).

In this case, 4mA is output as the current output.

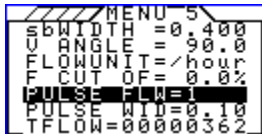
**Confirmation of the max. setting flow (MFLOW)**

Press ↑ key to show the max. setting flow from % display.



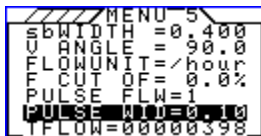
**PULSE FLW** : Set the flow of 1 pulse of the pulse output.

Select from 1000m<sup>3</sup>, 100m<sup>3</sup>, 10m<sup>3</sup>, 1m<sup>3</sup>, 0.1m<sup>3</sup>, 0.01m<sup>3</sup> or 0.001m<sup>3</sup>.



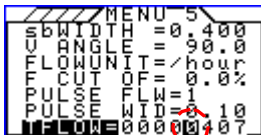
**PULSE WID** : Set the width of 1 pulse of the pulse output as the time of the output pulse output.

Setting range: 0.01 – 2.0 (Unit: sec)



**TFLOW** : Set the desired value as the integrated flow.

Select the digit of value to be change by ← →keys and press ESC to change the value by ← → keys.



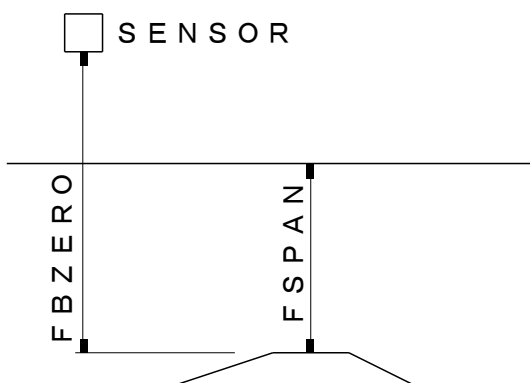
Press ESC key and change the value by ← → keys.



**Parshall flume setting**

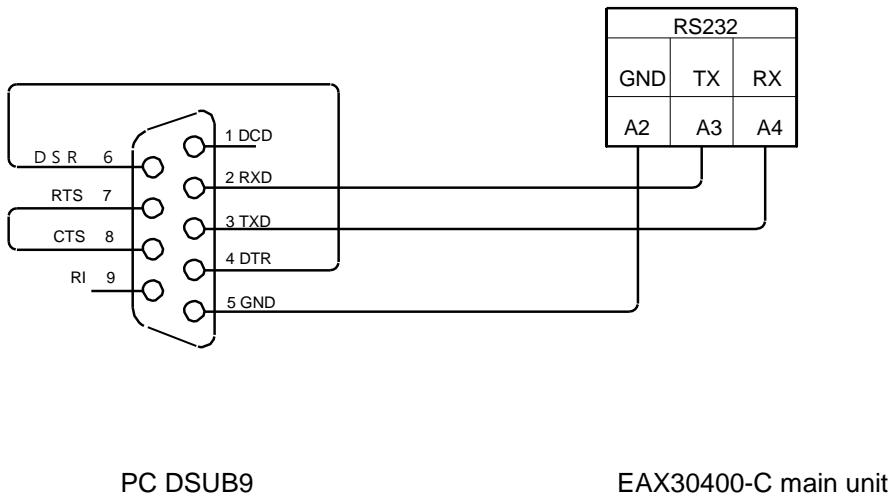
**FBZERO** : Setting of the distance in case of the min. flow

**FSPAN** : Setting of the distance in case of the max. flow



## 12. Connection To The Computer (RS232C)

Connection diagram to the compute



Use the terminal software to monitor the data.

115200 bit/sec 8 but PN STOP 1

The data is output as follows.

\$,25.6,25.2,41.5,250.9,250.4,55.7,57.7,-1,-2, ...

↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑

Number 1 2 3 4 5 6 7 8 9 10

... 222,W0,2,1399820401,97621,

↑ ↑ ↑ ↑ ↑

11 12 13 14 15

1	Start code	9	CH1 noise level
2	CH1 sensor temperature	10	CH2 noise level
3	CH2 sensor temperature	11	Internal system data
4	Internal temperature of the main unit	12	
5	Distance from CH1 sensor	13	
6	Distance from CH2 sensor	14	
7	CH1 ultrasonic reflection level	15	
8	CH2 ultrasonic reflection level		

The data is sent once per approx. 2 sec. (Depending on the frequency)

# 13. Communication To The Computer (RS485)

## Specifications of RS485

	ASCII	MODBUS (RTU)
Electric characteristic	Compliant with EIA RS485	
Communication method	Two-wire and half-duplex (Polling/Selecting method)	
Synchro system	Asynsynchronous communication method	
Transmission rate	Selectable from 2400, 4800, 9600, 19200, 38400, 57600 or 115200.	
Start bit	1 bit	1 bit
Data length	7 bit	8 bit
Parity	Even parity	Selectable parity
Stop bit	2 bit	1 bit
Delimiter	CR+LF	Silent interval for 3.5 characters
Character code	ASCII code	Binary code
Transmission control procedure	No control sequence	
Number of concatenated unit	32 units including the host	
Unit ID	Selectable from 1 to 99.	
Max. cable length	1200m in total	
Error check	BCC checksum	CRC
Response speed	Within 3 sec. at the max.	Within the time for 10 characters

Initial setting of RS485

Initial setting of unit ID of EAX30400-C main unit is 0.

Select from 1 to 99 as the unit ID when RS485 is used as the communication method.

Recommended setting for MODBUS

Protocol	MODBUS
Response speed	115200 bps
Parity	NONE
Unit ID	1 - 99

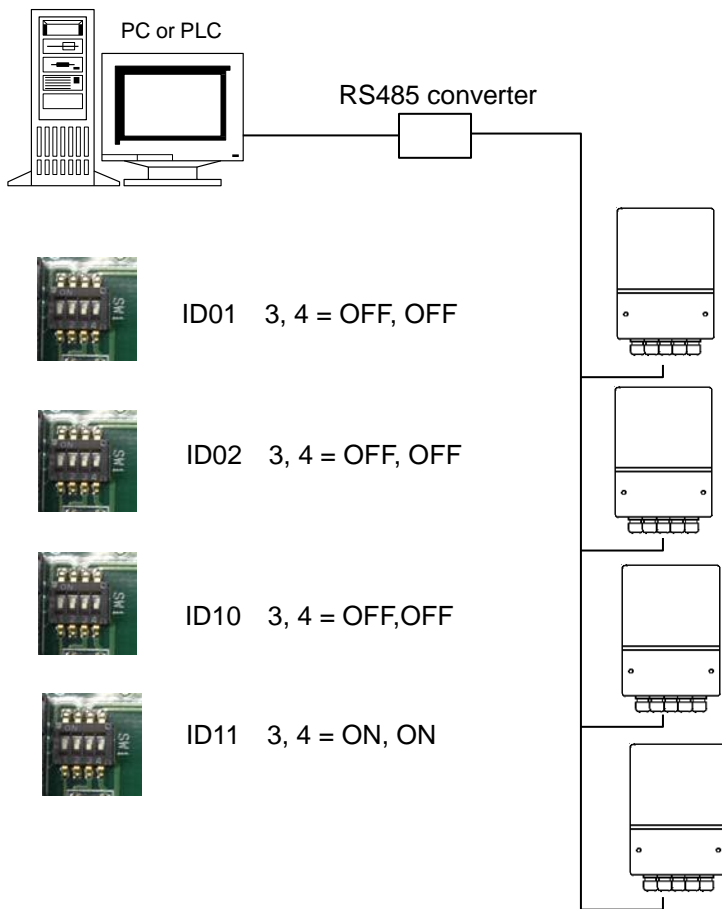
```

MENU 1
DISPMODE= A
UNIT = m
SCALE = top
PROTOCL=MODBUS
PARITY = NONE
485BAUD=115200
SIMULATION=OFF
    
```

```

MENU 1
DISPMODE= A
UNIT = m
SCALE = top
PROTOCL=MODBUS
PARITY = NONE
485BAUD=115200
SIMULATION=OFF
    
```

## Interface



Hook up A(+) terminal of main unit which is hooked up to the host PC to A(+)

terminals of other units.

Hook up B(-) terminal of main unit which is hooked up to the host PC to B(-) of other units.  
Set No. 3 and No. 4 of dip switch of terminated unit to ON (Termination resistor: ON). Set No.3 and No.4 of others to OFF (Termination resistor: OFF)

## Communication format of RS485 ASCII

ASCII code

STX = 02H

ETX = 03H

EOT = 04H

ENQ = 05H

ACK = 06H

LF = 0AH

CR = 0DH

Establishment of communication

Example) In case ID1 and ID10 are used.

Establishment of communication (Specify ID by the host.)	Response to the establishment (Response from the main unit)
ENQ 1 CR LF	ACK 1 CR LF
ENQ 1 0 CR LF	ACK 1 0CR LF

Opening of communication

Opening of communication	Response to opening of communication
EOT CR LF	None

Transmission and receipt of data

Format of transmitted data	Format of response data
STX 1, NORM ETX CB CR LF HEX 20312C4E4F524D03	STX 1, ???, ... ETX BCC CR LF



## Send and reply

Send and reply are started with "STX". Send;

1,NORM CB

Reply; 1, 26.6, 28.1, 42.4, 190, 182, 80.0, 81.0,70,60,27,27,s848,W7192, B9

IDNo,CH1TMP,CH2TMP,INTMP,CH1DIST,CH2DIST,CH1%,CH2%,CH1ECHOLEVEL,CH2ECHOLEVEL,CH1NOISELEVEL,

CH2NOISELEVEL,MEMORYFREE,MEMORYWRITE Send; 1,PRAM 0B

Reply; 1,5,1, 6, 830, 800, 700, 600, 200, 100,1, 6, 830, 800, 700, 600, 200, 100,4, 59

Readout of setting parameters

IDNo,RESPONSE,CH1STC,CH1AVELAGE,CH1ZERO,CH1SPAN,CH1HH,CH1H,CH1L,

CH1LL CH2STC,CH2AVELAGE,CH2ZERO,CH2SPAN,CH2HH,CH2H,CH2L,CH2LL,

THRESHOLD

Send; 1,SYSVER C6

Reply; 1,(c)Copyright HONDA ELECTRONICS CO.,LTD. '00/ 6/23 V2.0

6B IDNo, System version

Send; 1,D\_DUMP 95

LCD image data

Send; 1,ECHO1 0D

CH1 ultrasonic echo data

Send; 1,ECHO2 1D

CH2 ultrasonic echo data

Send; 1,PRAMW,5,1, 6, 830, 800, 700, 600, 200, 100,1, 6, 830, 800, 700, 600, 200, 100,4 C1

Write of setting parameters

IDNo,PRAMW,RESPONSE,CH1STC,CH1AVELAGE,CH1ZERO,CH1SPAN,CH1HH,CH1H,CH1L,CH1LL,CH2STC,CH2AVELAGE,CH2ZERO,CH2SPAN,CH2HH,CH2H,CH2L,CH2LL,THRESHOLD

Send; 1,RESET 30

EAX30400-C is reset.

Send; 1,IRESET C4

EAX30400-C is reset and defaulted.

### RS485 MODBUS communication format

1: In case of no incoming command for 3.5-character-time, EAX30400-C recognizes the completion of incoming command and the command processing is done.

2: Address can be selected from 1 to 99.

### MODBUS RTU command message frame

START 3.5-character-time	ADDRESS 8 bits	FUNCTION 8 bits	DATA N * 8 bits	CRC CHECK 16 bits	END 3.5-character-time
-----------------------------	-------------------	--------------------	--------------------	----------------------	---------------------------

### Correspondent command

03	Read Holding Register	Readout of holding register
04	Read Input Register	Readout of input register
06	Preset Single Register	Write of holding register
08	Diagnostics	Loop-back test

### Command = 04 Readout of input register

Query

Slave Address	Function	Starting Address Hi Lo	No. of Points Hi Lo	CRC
---------------	----------	------------------------	---------------------	-----

Response

Slave Address	Function	Byte Count	Data n Hi Lo	Data n+1 Hi Lo	CRC
---------------	----------	------------	--------------	----------------	-----

Read address	Content	Example	Readout value
0	CH1 distance	2000 mm	2000
1	CH2 distance	2000 mm	2000
2	CH1 level	3000 mm	3000
3	CH2 level	3000 mm	3000
4	CH1 %	100 %	10000
5	CH2 %	100 %	10000
6	CH1 noise value	30	30
7	CH2 noise value	30	30
8	CH1 signal intensity	80	80
9	CH2 signal intensity	80	80
10	CH1 sensor temperature	25.0 deg C	250
11	CH2 sensor temperature	25.0 deg C	250
12	Temperature inside of EAX30400-C	25.0 deg C	250
13	Max. measured flow	100.0 m <sup>3</sup> /h	100
14	Measured flow	20.0 m <sup>3</sup> /h	20
15	Integrated flow	1000.0 m <sup>3</sup> /h	1000
16	Overflow level	255 mm	255
17	Flow rate	100 %	10000
18	Integrated flow (high 16 bits)	1000.0 m <sup>3</sup> /h	1000
19	Integrated flow (low 16 bits)		

**Command = 03 Readout of holding register    Command = 06 Write of holding register**

Query(03,06)

Slave Address	Function	Starting Address Hi Lo	No. of Points Hi Lo	CRC
---------------	----------	------------------------	---------------------	-----

Response(03)

Slave Address	Function	Byte Count	Data n Hi Lo	Data n+1 Hi Lo	CRC
---------------	----------	------------	--------------	----------------	-----

Response(06)

Slave Address	Function	Register Address Hi Lo	Preset Data Hi Lo	CRC
---------------	----------	------------------------	-------------------	-----

Read/Write address	Contents	Readout value (Example)	Write value range
0	RESPONSE	5	0-5
1	THRESHOLD	0	0-8
2	CH1 STC	1	0-10
3	CH1 AVERAGE	6	1-30
4	CH1 BOTTOM ZERO	830	30-2030
5	CH1 SPAN	800	0-2000
6	CH1 SW HH ON	700	0-2000
7	CH1 SW HH OFF	699	0-2000
8	CH1 SW H ON	600	0-2000
9	CH1 SW H OFF	599	0-2000
10	CH1 SW L ON	200	0-2000
11	CH1 SW L OFF	201	0-2000
12	CH1 SW LL ON	100	0-2000
13	CH1 SW LL OFF	101	0-2000
14	CH1 4-20mA OFFSET	0	0-2000
15	CH2 STC	1	0-10
16	CH2 AVERAGE	6	1-30
17	CH2 BOTTOM ZERO	830	30-2030
18	CH2 SPAN	800	0-2000
19	CH2 SW HH ON	700	0-2000
20	CH2 SW HH OFF	699	0-2000
21	CH2 SW H ON	600	0-2000
22	CH2 SW H OFF	599	0-2000
23	CH2 SW L ON	200	0-2000
24	CH2 SW L OFF	201	0-2000
25	CH2 SW LL ON	100	0-2000
26	CH2 SW LL OFF	101	0-2000
27	CH2 4-20mA OFFSET	0	0-2000
28	B WIDTH	800	400-7000
29	bb WIDTH	400	150-5000
30	D SPAN	100	1-3500
31	V ANGLE	900	450-1000
32	FLOW MODE	6	0-22
33	FLOW UNIT	2	0-3
34	PULSE FLOW	3	0-6
35	PULSE WIDTH	10	1-200
36	LOW CUT OFF	0	0-100
37	FLOW ZERO	2000	300-5000
38	FLOW SPAN	200	50-3000
39	TOTAL FLOW RESET	0	When 1 is written, the integrated value is reset.

## 14. Transportation And Storage

To prevent the EAX30400-C Ultrasonic Level Transmitter from damage during the transportation, please keep the packaging condition as how it was when it was shipped from the factory before arriving at the installation site. The storage conditions should meet the following:

- Appropriate rainproof and damp-proof treatment must be conducted .
- Vibration must be reduced and collision with other objects must be prevented during its transportation.
- The storage temperature must be in the range of -40 ~ 70°C
- The humidity should be lower than 80%
- To store the used sensors, clean the tested medium attached on the lining and the electrode, and avoid oxidation by not exposing it to too much air for a long time.
- Outdoor storage may degrade the performance of the flow meter.