

# Operation manual

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## HD323

Ultrasonic level meter



Read and fully understand the contents of this Operation manual before operating the product.

Keep this manual so that you can check the contents anytime.



## Foreword

Thank you for purchasing this product.

- For safe operation, read and fully understand the contents of this Operation Manual before attempting to operate the equipment.
- Follow the procedure written clearly in this manual and do not take any action described as Danger, Warning and/or Precautions. If any of them is ignored, it will result in a serious incident or damage to the property and etc.
- After reading this manual, store it in a safe and convenient place where it will not become lost or damaged and can be referred to easily when needed.
- We assume absolutely no responsibility if any damage, injury, lost profit and/or demand from the third party result from this product being used in a manner not described in this Operation Manual.
- If you sell or transfer the ownership of this equipment, always provide the new owner with this Operation Manual.
- We assume absolutely no responsibility if any damage, injury, lost profit and/or demand from the third party result from the measuring result.
- Under the provisions of product liability laws, we assume absolutely no responsibility if damage and/or injury results from this product being used in a manner not described in this Operation Manual or if used in erroneous manner.









- Please do not copy this document or any part of it without prior permission.
- Due to our policy of ongoing product improvement, there may be some variations between the contents of this manual and the actual equipment.
- We ask that you contact this company if you feel that the contents of this manual are unclear or erroneous, or if you feel that some information has not been included.










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# 1. Safety precautions (Must Read)

The "Safety precautions" explains extremely important precautions that must be taken to prevent injury to the person using the product as well as to others and to prevent damage to property.

The following is an explanation of the symbols used. . .			
 <b>Danger</b>	This indicates items that if ignored could lead to serious injury or death.		
 <b>Warning</b>	This indicates items that if ignored could lead to slight injury or damage to property.		
Examples of the Indicators			
	: This symbol means "Prohibited".		
	: This symbol means "Must Do".		
			
Disassembly Prohibited	Water Contact Prohibited	Disconnect the power plug	General Information

 <b>Danger</b>	
	If abnormality of product such as fog from the product is seen, turn the power off immediately and contact our distributor for repair.
 Water Contact Prohibited	Never allow water to come in contact with the product. Moreover, never place the product in a location where it will come in contact with water. ● This could cause damage, electrical shock or shorting.
 Disassembly Prohibited	Modification or Disassembly Prohibited. ● Never disassemble, repair or modify the equipment. This could cause fire, electrical shock or injury.
 Prohibited	Never place foreign objects, such as pins, wire or other metal objects, in the opening. ● This could cause electrical shock or shorting.
 Prohibited	Never use the product under the following conditions. * Locations that could cause high temperatures, such as a location in direct sunlight. * Locations where dust, particles or corrosive gases are created. * Locations subject to strong shock or vibration. * Locations subject to water leakage or high levels of humidity. ● If these warnings are ignored, damage to the product could occur and in some cases, this could result in a major accident, such as electrical shock.
 Wet Hands Prohibited	Never touch the plug or operating parts with wet hands. Moreover, never allow the product to come in contact with water. ● This could cause electrical shock. Stop operations immediately when the product does come in contact with water.
 Prohibited	Never bend the power cord excessively, pull on it, twist it, bundle it or place heavy objects on it. ● This could damage the cord and cause damage, fire or electrical shock.
 Prohibited	Never use the product if any cord or plug is damaged or broken. ● This could cause electrical shock, shorting or fire.

 Warning	
	Do not use the product at a place close to other ultrasonic device to avoid the unwanted operation due to the interrelated influence.
	Do not give any strong shock to the product and drop down the product.

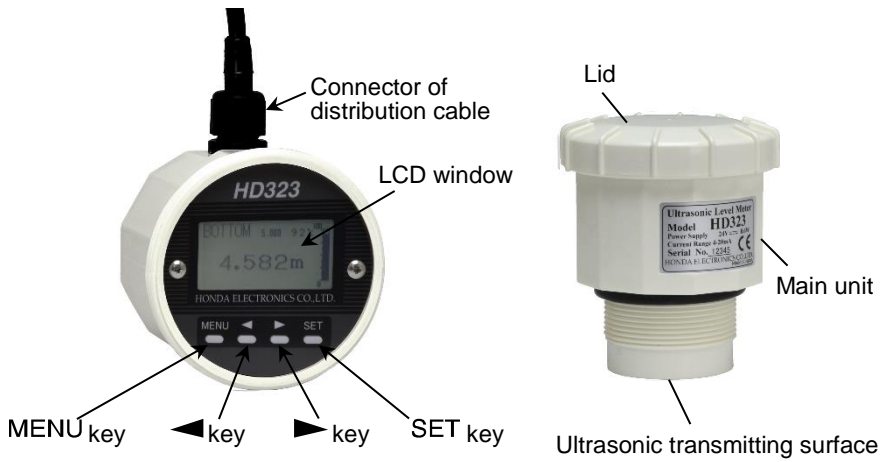
## 2. Components

Confirm all of followings are supplied.

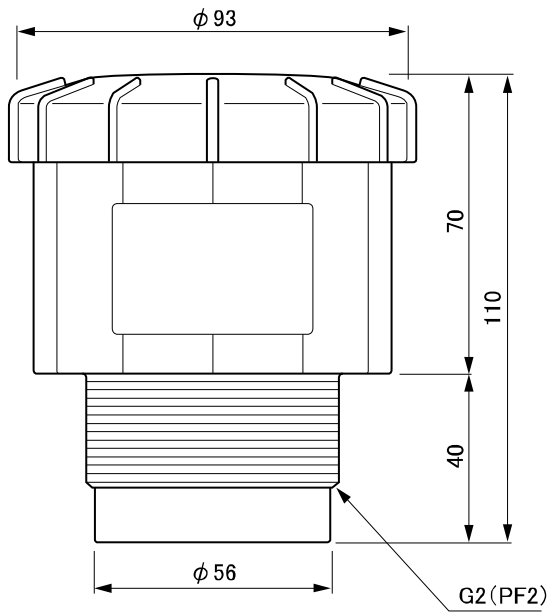
If any of followings is missed, contact the distributor.

HD323 (Main unit)	1
Distribution cable 10m	1
Operation Manual	1

### 3. Names of parts



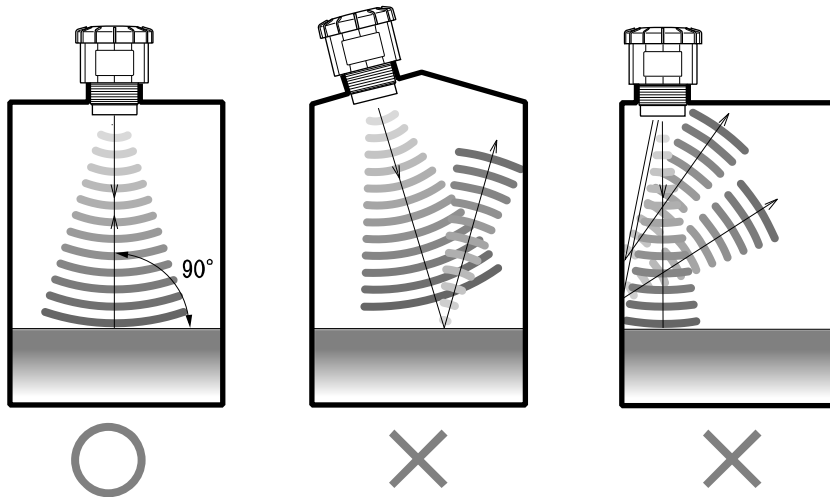
### 4. Dimensional drawing of main unit





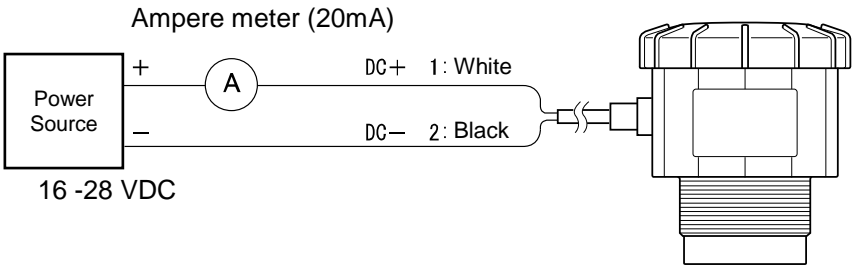
## 5. Installation and precautions

- Install HD323 on the top of tank horizontally.
- Screw in HD323 into the resin flange with G2(PF2) to the tank.
- Do not use metal nut or flange to install HD323 to the tank to avoid the incorrect measurement. Use the resin nut or flange to install HD323 to the tank.



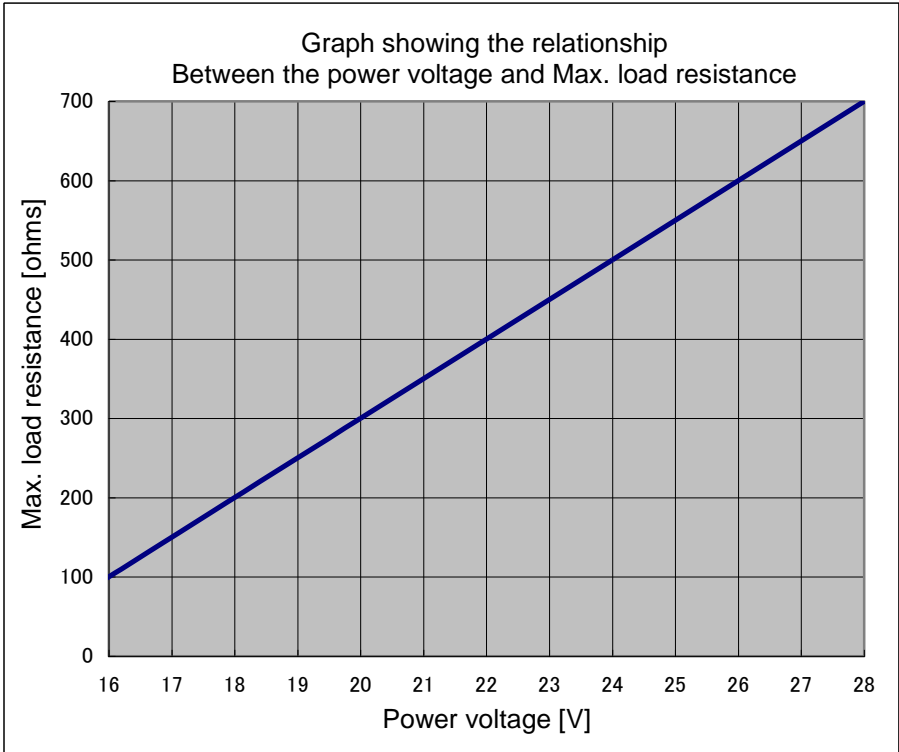
- Install HD323 so that the ultrasonic transmitting surface becomes parallel to the liquid surface.
- Do not install HD323 close to the sidewall of tank to avoid the incorrect measurement due to the undesired reflections from the sidewall.
- Do not screw in HD323 with too much force.
- Avoid the direct sunlight to HD323.
- Do not install the multiple ultrasonic sensors to the same tank. To avoid the mutual interference of ultrasound.

## 6. Wiring and precautions

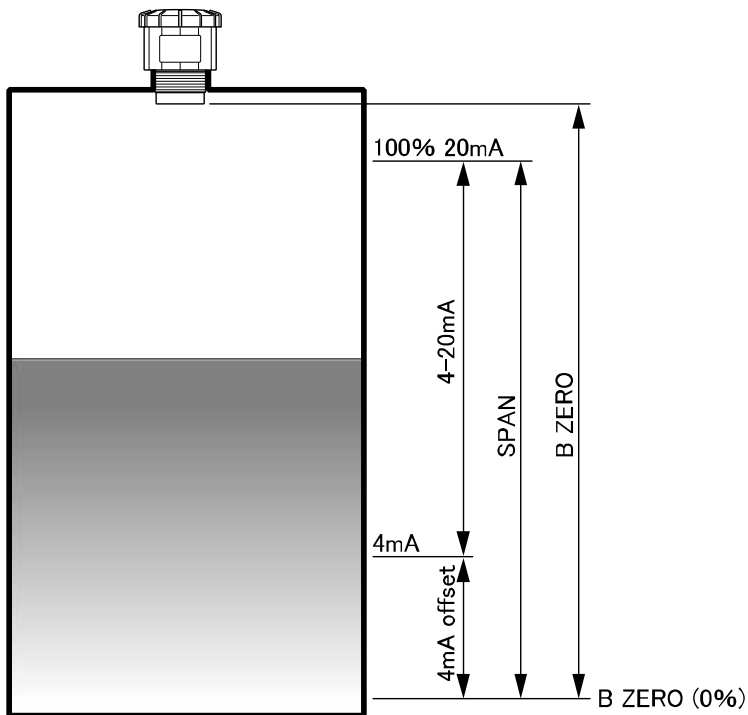


White lead wire Power source DC +  
 Black lead wire Power source DC -

[CAUTION] HD323 doesn't operate at all if polar characters, + and -, are reversed.



## 7. Settings according to the tank



- 1) Press MENU key to indicate MENU.
- 2) Change the indicated parameter by ◀ ▶ keys and select the parameter by SET key. Change the setting value by ◀ ▶ keys. Press SET key again to determine the setting value. Press MENU key not to determine the setting value.
- 3) B ZERO;  
Distance from the ultrasonic transmitting surface to the tank bottom  
B ZERO can be the distance from the ultrasonic transmitting surface to arbitrary 0% level.
- 4) SPAN;  
Level from 0% to 100%  
Set the level from 0% which is set at B ZERO to 100%.
- 5) 4mA OFST;  
Set the offset of 4mA output.

## 8. Operating instructions

### Basic key operation

Press MENU key to indicate MENU.

Change the indicated parameter by ◀ ▶ keys and select the parameter by SET key. Change the setting value by ◀ ▶ keys.

Press SET key again to determine the setting value. Press MENU key not to determine the setting value.

Press MENU key again to escape from MENU.

### Operating mode

There are 2 operating modes, Level meter mode and Weir flowmeter mode. Select the operating mode at 20.FLOWmod in MENU.

### Display mode

Select the display mode from the following 4 modes.

The selectable display modes depend on Level meter mode and Weir flowmeter mode.

#### <Level meter mode>

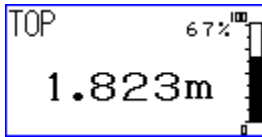
- A..... TOP-based distance display
- B..... BOTTOM-based level display
- C..... % display
- D..... Ultrasonic A mode display

#### <Weir flowmeter mode>

- A..... Weir flowmeter display
- B..... BOTTOM-based level display
- C..... % display
- D..... Ultrasonic A mode display

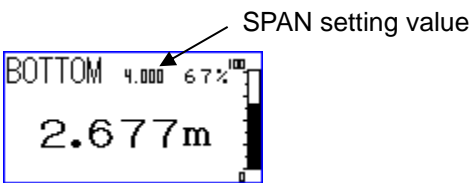
**DISPMODE A - C** <Level meter mode>

DISPMODE A (TOP-based distance display)



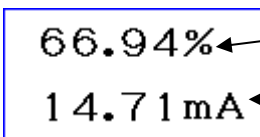
Rate of remaining amount in the tank

DISPMODE B (BOTTOM-based level display)



SPAN setting value

DISPMODE C (% display)

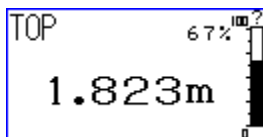


Rate of remaining amount in the tank

Output current value

Switch DISPMODE by ◀ ▶ keys.

<Measurement error indication>



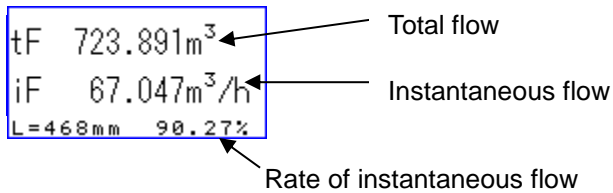
"?" is indicated.

"?" is indicated at the upper right corner when the ultrasonic reflection echo cannot be detected.

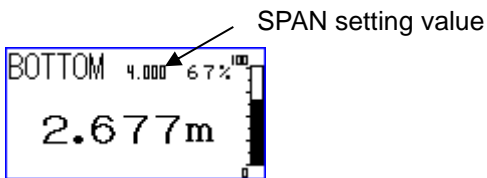
**DISPMODE A - C** <Weir flowmeter mode>

**DISPMODE A** (Weir flowmeter display)

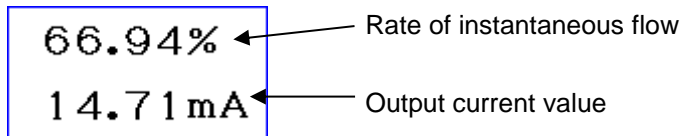
tF: Total flow  
iF: Instantaneous flow



**DISPMODE B** (BOTTOM-based level display)



**DISPMODE C** (% display)



## **DISPMODE D** (Ultrasonic A mode display)

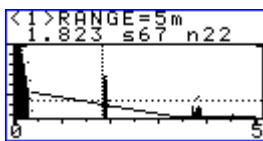
Set the parameters related to the ultrasonic measurement based on the indicated waveform of ultrasonic reflections.

Measured value and setting value are indicated at the bottom of display.

Change the indicated parameter by ◀ ▶ keys and select the parameter by SET key.

(While selecting, underlined characters are indicated.)

Change the setting value by ◀ ▶ keys after the parameter is selected and determine the setting value by SET key.



Threshold level line

Indicated/setting parameters of DISPMODE D

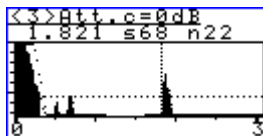
### ● Indicated/Setting parameter

Indicated parameters: 0>: Measured value    s: Signal level    n: Noise level

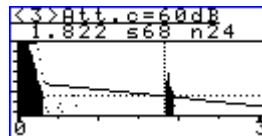
<1> RANGE:    Indicated range scale  
Setting range: Min. 1m - Max. 10m (1m step)

<2> STC:    Sensitivity Time Control  
Sensitivity of close range is decreased to lower the undesired reflections from the close range.  
Setting range: 0 - 10 (Default: 0)  
Larger value: Sensitivity of close range is lower.

<3> Att.c:    Mask level for the entire area  
Mask level gets lower according to the ultrasonic attenuation based on the distance from the sensor.

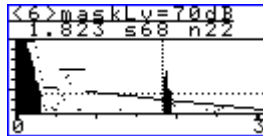
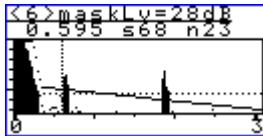


Att.c=0dB

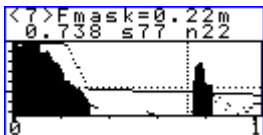


Att.c=60dB

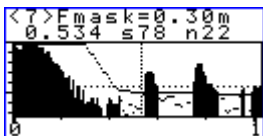
- <4> maskP: Start position of rectangular mask
  - <5> maskW: Rectangular mask width
  - <6> maskLv: Rectangular mask level
- Settings of rectangular mask to avoid the undesired reflections from an obstacle within the measuring range.



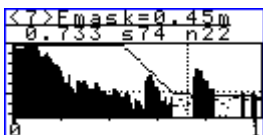
- <7> Fmask: Reverb mask width
- Reverb mask width should be wider to avoid incorrect measurement when the oscillation reverb is too long.



Fmask: 0.22m



Fmask: 0.30m



Fmask: 0.45m

[Caution] Distance within Reverb mask width cannot be measure at all.

- <8> THRESH: Threshold level
- Setting range: -4dB - -36dB (Default: -20dB)  
 Signal at the threshold level and lower is not be detected.  
 Threshold level should be larger when 2 or 3 times that of actual distance is detected caused by the multiple reflections.



<9> FREQ: Ultrasonic frequency  
Setting range: 45 - 55kHz (1kHz step)  
Set the value so that the signal level can be larger.

<10> dADJ: Distance adjustment  
Setting range: -50 - +50mm  
dADJ is the same as -12- Dist Adj in MENU.

## 9. Setting in MENU

Press MENU key to indicate MENU.

Press MENU key again to escape from MENU.

After no key operation for 3 min., the display returns to the main display, automatically.

DISPMODE: A - D

Select the appropriate one.

B ZERO: 0.5 - 10m

Set the distance from the ultrasonic transmitting surface to the tank bottom or the channel floor.

SPAN: 0 - 10m

Set the measuring range from the tank bottom or Max. overflow level.

SPAN is the range of 4-20mA output.

[Caution] If "4mAOFST" is any other than 0, "4mAOFST" to "SPAN" is 4-20mA output range.

RESPONSE: 1000m/min - 0.01m/min

Fast <-> Slow

Set the response speed to the measured distance change.

AVERAGE: 1 - 12

Set the number of averaging procedure of ultrasonic waveform.

When the ultrasonic reflections are unstable, set the larger value.

[Caution] If the larger value is set, the response speed gets slow.

4mA OFST: 0 - SPAN or lower

"4mAOFST=0" means that the tank bottom is the distance/level of 4mA output.

[Caution] If "4mAOFST" is any other than 0, "4mAOFST" to "SPAN" is 4-20mA output range.

I4-20: Norm(Normal) or Reve(Reverse)

Set the basis of 4-20mA output.

Normal: 4mA = 0%, 20mA = 100%

Reverse: 20mA = 0%, 4mA = 100%

\*If any other than 0 is set to [4mA OFST], OFFSET works at 0% side.

BRIGHT: OFF <-> AUTO <-> ON

Set the back light function.

AUTO: ON for 10 min. after power power-on, OFF after 10 min. passes

1 hour: ON for 1 hour after any key operation, OFF after 1 hour passes

4-20SET: normal <-> i4mA - i20mA

Parameter for the connection test of 4-20mA output.

normal: Current of measured value is output.

i4mA: 4mA is output forcibly.

I20mA: 20mA is output forcibly.

normal <-> i4mA <-> i8mA <-> i12mA <-> i16mA <-> i20mA

Once escape from MENU, setting gets "normal".

Dist Adj: -50 - +50mm

Set the value for the distance correction.

Err Cond: hold <-> i4fix <-> i20fix

Set the current output for the measurement error.

Hold: Current output of measured value before measurement error happens is output.

i4fix: 4mA is output when the measurement error happens.

i20fix: 20mA is output when the measurement error happens.

## 10. Weir flowmeter setting

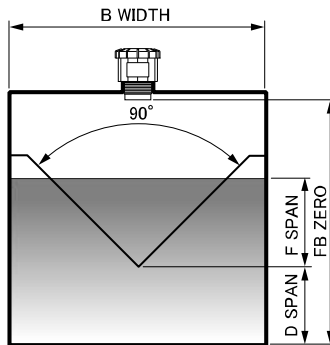
FLOWmod: Selection of Weir flowmeter function

OFF: Level meter mode

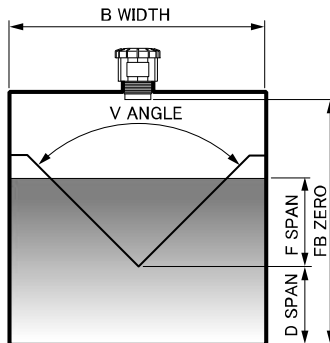
Others: Weir flowmeter mode

Level meter mode: OFF

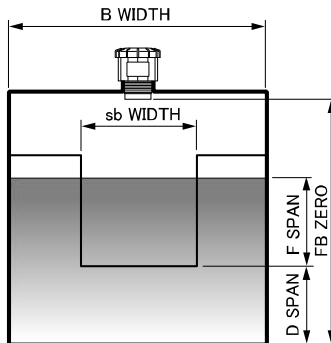
90 deg V-notch weir: 90ang



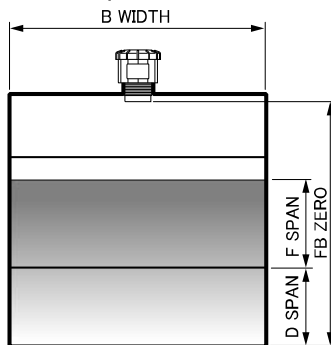
Arbitrary V-notch weir: AngleV



Contracted rectangular weir: Squar1

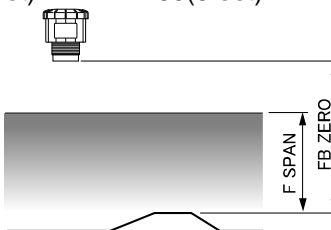


Suppressed rectangular weir: Squar2



Parshall flume flowmeter

- <-> PF-1(1inches) <-> PF-2(2inches) <-> PF-3(3inches)
- <-> PF-6(6inches) <-> PF-9(9inches) <-> PF-10(1feet)
- <-> PF-15(1.5feet) <-> PF-20(2feet) <-> PF-30(3feet)
- <-> PF-40(4feet) <-> PF-50(5feet) <-> PF-60(6feet)
- <-> PF-70(7feet) <-> PF-80(8feet)



FBZERO: Distance from the ultrasonic transmitting surface to the channel floor

Setting range: 0.3 - 5m

FSPAN: Max. overflow level

Setting range: 0.05 - 3m

Max. measurable flow depends on FSPAN.

While FSPAN is set, Max. measurable flow is showed at the bottom of display as "MaxFlow=XX.XXm<sup>3</sup>

B WIDTH: Channel width

Setting range: 0.4 - 32m

D SPAN: Height from the channel floor to the lower edge of weir

Setting range: 0.001 - 3.5m

sbWIDTH: Cutout width of contracted rectangular weir

Setting range: 0.15 - B WIDTH

V ANGLE: Arbitrary angle of V-notch (for AngleV)

Setting range: 45.0 - 100.0 deg

F CUT OF: Low cut OFF of flow

Setting range 0.0 - 10.0% of Max. measurable flow

Flow at F CUT OF or lower is recognized as no flow.

Output current of flow at F CUT OF or lower is 4mA.

While FSPAN is set, Max. measurable flow is showed at the bottom of display as "MaxFlow=XX.XXm<sup>3</sup>

### Parshall flume setting

FBZERO: Distance for Min. flow

FSPAN: Distance for Max. flow

## 11. Setting parameters

No	Parameter	Explanation	Setting range Selectable item
0	DSPMODE	Display mode	A TopDis B BotDis C Percen D Echo
1	B ZERO	Distance from the ultrasonic transmitting surface to the tank bottom	0.5 - 10 Unit [m]
2	SPAN	Level from 0% to 100%	0 - 10 Unit [m]
3	RESPONSE	Response speed to the measured distance change	0.01 - 1,000 Unit [m/min]
4	AVERAGE	Number of averaging procedure of ultrasonic waveform	1 - 12
5	4mA OFST	Offset of 4mA output	0 - SPAN setting value Unit [m]
6	I4-20	Basis of 4-20mA output	Norm, Reve
7	Temp	Sensor temperature	
8	Echo Lv	Signal level	
9	NoiseLv	Noise level	
10	BRIGHT	Back light setting	OFF, Auto, ON
11	4-20SET	Connection test of 4-20mA output	normal, i4mA, i8mA, i12mA, i16mA, i20mA
12	Dist Adj	Distance correction	-50 - +50 Unit [mm]
13	Err Cond	Current output for measurement error	Hold, i4fix, i20fix
14	FLOWmod	Weir flowmeter function	As "Weir flowmeter setting"
15	FBZERO	Distance from the ultrasonic transmitting surface to the channel floor	0.3 - 5 Unit [m]
16	FSPAN	Max. overflow level	0.3 - 5 Unit [m]

No	Parameter	Explanation	Setting range Selectable item
17	B WIDTH	Channel width	0.4 - 32 Unit [m]
18	D SPAN	Height from the channel floor to the lower edge of weir	0.001 - 3.5 Unit [m]
19	sbWIDTH	Cutout width of contracted rectangular weir	0.15 - B WIDTH Unit [m]
20	V ANGLE	Arbitrary angle of V-notch	45 - 100 Unit [deg]
21	F CUT OF	Low cut OFF of flow	0 - 10 Unit [%]
22	Total Flow RST	Total flow reset	
23	SYSTEM RESET	System reset	



## 12. Specifications

Model	HD323
Ultrasonic frequency	50kHz
External dimensions	Dia. 93 x 110mm
Rated power source	24VDC
Permissible power source range	+/- 10% of Rated power source
Max. power consumption	0.6W or lower
Output current	4-20mA +/- 0.02mA DC
Additional function	Weir flowmeter
Measurement range	0.25 - 7.5m
Measurement object	Liquid
Beam angle	14 deg (-6dB) / 10 deg (-3dB)
Memory backup	EEPROM
Display	Graphic LCD (128x64dot)
Setting	Key operation
Resolution	1mm
Temperature compensation sensor	-20 - +70 deg C, Accuracy: Within +/- 2 deg C
Measurement accuracy	+/- 0.25% of F.S.
Installation screw	G2 (PF2)
Material of main unit	PP (Polypropylene)
Housing structure	IP65 equivalent (Without lid: IP20 equivalent)
Weight	350g
Standard	EN61326-1: 2013
Ambient temperature	-20 - +70 deg C (No freeze and condensation)
Ambient humidity	Max. 80% (at 31 deg C)
Storage temperature	-30 - +80 deg C (No freeze and condensation)
Distribution cable	Length of distribution cable: 10m Detachable waterproof connector 2 wires x 0.75mm <sup>2</sup>

## 13. After-the-sale-service

- ◆When after-the-sale-service is required, please contact the seller of product or the manufacturer with the detailed information about the malfunction.





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