Tosilon Automation

Your Global Partner for Engineering

Density Solution

TDS Series

Resonance Tube Density Meter

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TDS Resonance Tube Density Meter is the inline density meter for continuously measurement of the fluid. TDS unit is also available for measuring solid content (%) or concentration (&) based on specific application.

Straight Tube Type

Features

- Available for Measuring & Control
- Continuous Measurement
- Competent to Liquid with Air Bubbles
- Option for Borosilicate Glass Tube
- Auto-Tempt. Compensation
- Free from Maintenance
- Materials include 316L, Hastelloy Alloy
- Competent to Strong Acid Measurement

Borosilicate Glass Tube Type

Working Principles

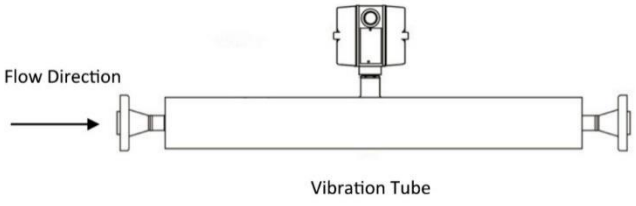
TDS Density Meter adopts vibration tube to measure density value. The resonant frequency is in inverse proportion to fluid density. The changing fluid density will affect the vibration tube which affects the resonant frequency. According to the resonant frequency, TDS unit is able to precisely calculate the density in real time.

$\rho=K0+K1\ T+K\ 2T^2$

ρ - Fluid Density

T - Vibration Period output by Sensor

K0, K1, K2 - Sensor Constant



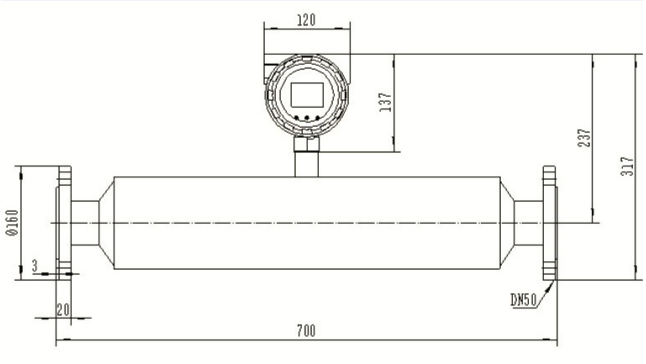
Main Technical Parameters

Performance			
Measuring Range	0~3 g/cm^3 (Straight Tube Type); 0.4~2.0 (Borosilicate Glass Tube Type)	Accuracy	±1.0 kg/m^3
Process Temp. Effects	± 0.0001 g/cc	Repeatability	± 0.1 kg/m^3
Process Pres. Effects	Negligible	Process Tempt.	-50~+150 (Deg. C)
Max. Working Press.	Standard: 1.0 MPa	Ambient Tempt.	-40~+85 (Deg. C)
Ex-Proof	Exd IIC T6 Gb	Protection Class	IP65

Structure Material		
Wetted Part	Standard: 316L	Anti-Corrosion: Hastelloy-C22 Alloy; Borosilicate Glass Tube Type
Electrical Enclosure	Standard: Aluminium Alloy Castings	Anti-Corrosion: Stainless Steel; Plastic
Pipe Polishing	Electro-polishing	

Other Parameters			
Power Supply	24V DC / 220V AC	Output	4-wire; 4-20mA, via HART

Drawing



Straight Tube Type TDS-1

Borosilicate Glass Tube Type TDS-2

Installation

Straight Tube Type

Note

No "Supporting Frame" is required for the TDS-1 Density Meter.

Pipeline Vibration should not be intense where the TDS-1 unit mounted

TDS-1 unit should be keep distance from the pump

Installation Position

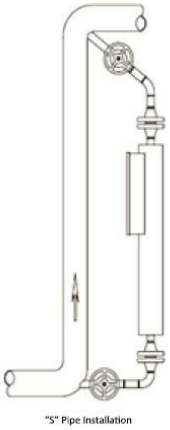
TDS unit should be better installed on "By-Pass Pipe" for easy maintenance

TDS should be better vertically installed with "Upwards Flow Direction"

Ball Valve or Stop Valve should be better installed at the inlet position to control the fluid velocity (≤1m/s)

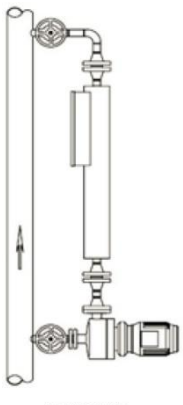
Front Straight Pipe Length should be more than 200mm

Back Straight Pipe Length should be more than 100mm



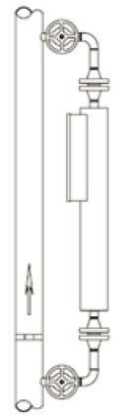
"S" Pipe Installation

Pipe Size	8	15	25	40	50	80	100	150
Restriction orifice Size	6mm	10mm	14mm	22mm	28mm	50mm	65mm	90mm



Pump Pipe Installation

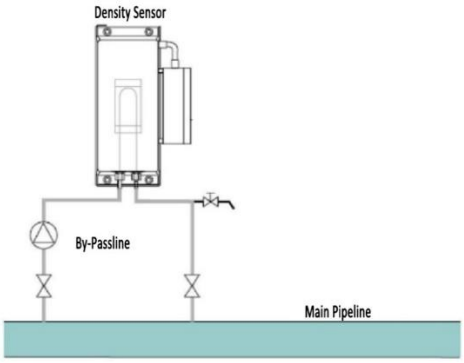
Pipe Size	8	15	25	40	50	80	100	150
Restriction orifice Size	6mm	10mm	14mm	22mm	28mm	50mm	65mm	90mm



Orifice Plate Pipe Installation

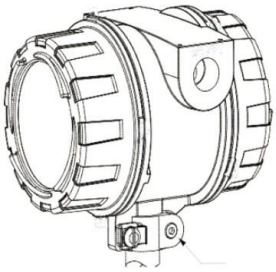
Pipe Size	8	15	25	40	50	80	100	150
Restriction orifice Size	6mm	10mm	14mm	22mm	28mm	50mm	65mm	90mm

Borosilicate Glass Tube Type



Based on actual case, Tosilon will provide the installation drawing accordingly. This chart is for reference

Electrical Connection



After unscrewing the screw marked.

Electrical Enclosure could be rotated

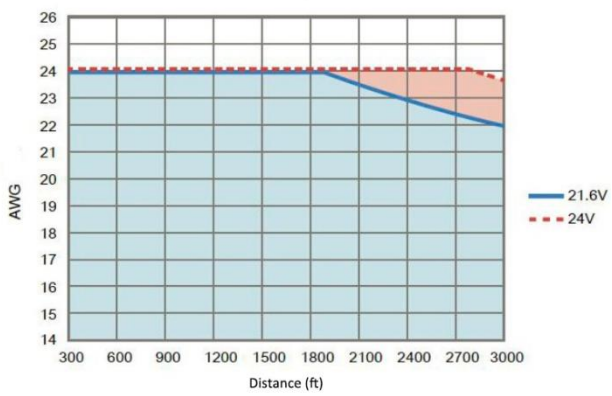
The TDS Transmitter adopts 4-wire design

Note for Power Supply

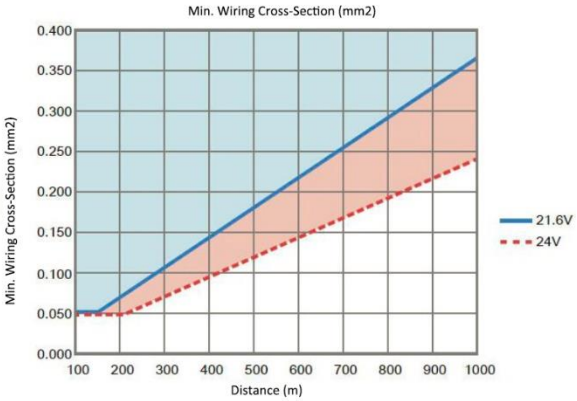
Power Supply: 24V DC; 0.65 W (Max. 1.1W)

Min. Power Supply: 21.6V DC; when 1000 ft 24AWG Cable is applied

Recommendations on Cable for Ex-Proof Instrumentation

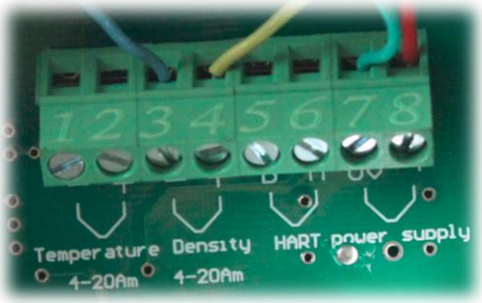


Min. Wiring Cross-Section (mm^2/instrument)



Wiring

The "Wiring Terminals" are placed in an independent chamber inside transmitter enclosure. After unscrewing the enclosure cover, the wiring terminals could be found. The TDS Series Density Meter adopts "4-wire" wiring type. The following chart is the wiring terminal set.



Terminal No.	Description	Remark
"3(-)", "4(+)"	4-20mA; HART	Density / Concentration (Standard)
"7(-)", "8(+)"	24V DC	Power Supply (Standard)
"1", "2"		Blank Terminal
"5", "6"		Blank Terminal

The cable for wired should meet the followings:

• Twisted-Pair Type • 22 AWG or large AWG, Max. Cable Length: 300m

Power Supply

The Density Meter is power by 24V DC; 0.65W (Standard), 1.1W (Max.); 60~100mA (Recommended); 24AWG

Calibration Menu Guide

- The setting and the calibration of the density meter has been processed based on Nameplate parameters.
- The density meter could be directly installed without any calibration and settings.
- In case that the error is beyond the normal value after period of application which depends on the working condition, the density meter needs to re-calibrate and re-set by professional technicians.

Button Function

Button	Function
M	Navigate / Save & Quit
S	Adjust
Z	Shift Key

Press and hold "M" for 5 seconds, the display will turn to "Setting Interface". As picture shown

1	The "Setting Menu" could be navigated by pressing "M".
2	The specific Setting Item is represented by the Number at the lower left-end in the display.
3	Press "S" to confirm the adjustment for the specific "Setting Item".
4	Press "Z" to shift the cursor position. Press "S" to adjust the parameters.
5	When the adjustment is done, press "M" to save.
6	The interface will turn to normal display automatically after 1 minute.

Menus

No.	Menu	Remark
9	Low Point Calibration	
10	High Point Calibration	
0	Normal Display	Ignore
2	Unit (lb/gal)	Ignore
3	Lower Range Value	Density Value - 4mA
4	Upper Range Value	Density Value - 20mA
5	Damping Set	Factory Set: 5s
6	Zero Off-Set	

The "Menu" could be navigated sequentially by pressing "M".

Calibration / Setting Instruction

Low / High Point Calibration

The operation is used for re-calibrate the density meter to eliminate error.

Low Point Calibration (9)

1). Place the measuring tube in the air or in the liquids (A) of known density value.

2). Enter the "Low Point Calibration" interface. (Example: operation deployed in the air)

3). Press "S", the ▲ will be blinking. If the value is not 0.0000, it is required to adjust it by "Z" and "S" buttons.

4). Press "M" to save. The interface will turn back to normal display automatically in 1 minute.

High Point Calibration (10)

Note: Place the measuring tube in the liquids (B) of known density value. The Liquids (B) density must be higher than Liquid (A).

1). Enter the "High Point Calibration" interface.

2). Press "S", the ▲ will be blinking. If the value is not the known density, it is required to adjust the value to known value by "Z" and "S" buttons.

3). Press "M" to save. The interface will turn back to normal display automatically in 1 minute.

Normal Display (0)

The default interface is for "density display". It is no required to make adjustment in the menu.

Unit (lb/gal) (2)

The default unit is "g/cm^3". It is no required to make adjustment in the menu.

Lower Range Value (3) / Upper Range Value (4)

(3) and (4) is used for setting measuring range.

The default value is set based on the nameplate.

If it is required to make the adjusting, please refer to the following steps.

Lower Range Value (3)

1). Enter the "Lower Range Value" interface.

2). Press "S", the ▲ will be blinking

3). Press "Z" and "S" to adjust the value.

4). Press "M" to save. The interface will turn back to normal display automatically in 1 minute.

Upper Range Value (4)

1). Enter the "Upper Range Value" interface.

2). Press "S", the ▲ will be blinking

3). Press "Z" and "S" to adjust the value.

4). Press "M" to save. The interface will turn back to normal display automatically in 1 minute.

Damping Set (5)

The default value is 5 seconds. If it is required to make adjusting, please refer to the following steps:

1).	Enter the “Damping Set” interface.
2).	Press “S”, the ▲ will be blinking
3).	Press “Z” and “S” to adjust the value.
4).	Press “M” to save. The interface will turn back to normal display automatically in 1 minute.

Zero Off-Set (6)

1).	Enter the “Zero Off-Set” interface.
2).	Press “S”, the “No” will be blinking at the lower right-end in the display.
3).	Press “S” and “Yes” will be blinking at the lower right-end in the display.
4).	Press “M” to save. The interface will turn back to normal display automatically in 1 minute.

Note:

- **The Density Meter has been well calibrated and improper calibration may influence the performance of the meter.**
- **The re-calibration should be operated by professional technicians or contact Tosilon for technical guidance if necessary.**

Thanks very much for your support on Tosilon Automation!

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