

SPX510 series Intelligent online densitometer / density transmitter

**MAIN FEATURES**

- The on-line densitometer is suitable for flowing or static liquid and is suitable for pipeline and tank installation.
- Two wire transmitter with integrated structure, no moving parts, easy maintenance.
- It is easy to install and use, and the reading can be displayed by inserting liquid.
- Continuous on-line measurement of liquid density and temperature, without process interruption, can be directly used for production process control.
- Dual four digit LCD, temperature and density parameters can be displayed at the same time
- The intrinsically safe type can be used in hazardous sites, and the hygienic type can be installed in food hygiene







**OVERVIEW**

SPX510 series intelligent on-line densitometer (also called on-line density transmitter) is a kind of equipment for continuous on-line measurement of liquid concentration and density, which can be directly used in industrial production process. The densitometer adopts advanced technology, including a capacitive differential pressure sensor and a pair of pressure repeaters connected with it and inserted into the production process. There is a temperature sensor between the two pressure repeaters to compensate for the temperature change of the process liquid. The intelligent online densitometer is a two-wire density transmitter, which is mainly used for industrial process control. The online densitometer generates a corresponding 4-20mA signal according to the concentration and density. It can be calibrated and monitored remotely through digital communication.

SPX510 series of in-line density meters provides on-line density measurements of a variety of liquid or liquid mixtures. In the petrochemical industry can be widely used in petroleum, oil refining, oil regulation, oil and water interface testing, in the food industry for grape juice, tomato juice, fruit syrup, vegetable oil and soft drink processing and other production sites, dairy industry, paper industry, black pulp, green pulp, white pulp, alkali solution testing; wine alcohol; chemical urea, detergent, ethylene glycol, Testing of acid and alkali and polymer density. It can also be used in mining salt water, potassium, natural gas, lubricants, biopharmaceuticals and other industries.

**WORKING PRINCIPLE**

The working principle of differential pressure on-line densitometer is based on the principle of balance of gravity and buoyancy. No matter what liquid it is placed in, the gravity  $g$  of densitometer remains unchanged. When it floats on the liquid, the buoyancy  $f$  equals to the gravity  $g$ , that is, the buoyancy  $F$  of densitometer remains unchanged. When the density of the liquid that the densitometer sinks is greater, according to Archimedes principle  $f = \rho GV$ , the buoyancy  $F$  and  $G$  remain the same, the greater the density  $\rho$  of the liquid, the smaller the volume  $V$  of the liquid discharged by the object, that is to say, the smaller the volume that the densitometer submerges in the liquid, the lower the scale of the liquid corresponding to the densitometer. If the density of the liquid that the densitometer sinks is smaller, the opposite situation will occur.

Side-mounted type	Pipe type
	
In-line type	Elbow type
	

## SPECIFICATION

### Main technical parameters

Range: 0 ~ 5g / cm<sup>3</sup> (optional intermediate range)  
 Accuracy: 0.001 g / cm<sup>3</sup>  
 Resolution: 0.001g/cm<sup>3</sup>, 0.0005g/cm<sup>3</sup>  
 Output signal:  
 Analog signal: 4-20mA DC two wire system  
 Digital signal: HART Protocol  
 Power supply: 9 ~ 45vdc, 24VDC recommended  
 Display: 4 and a half digits or 5 digits LCD display  
 Damping adjustment: 0-16 seconds; 0-32  
 Humidity range: 0-90%  
 Protection grade: IP65

### Temperature range

0-100 °C, temperature accuracy: 0.5 °C  
 Ambient temperature: - 30 ~ 150 °C (optional)  
 Medium temperature: 0-300 °C (optional)  
 Storage temperature: -40 ~ 100 °C  
 Digital display temperature: -10 ~ 60 °C

### Installation

Side or top flange mounting

### Material of wetted parts

Liquid receiving isolation diaphragm: 316L, 316L + Spray Teflon, tantalum C-276, titanium, tantalum + Spray Teflon, Monel, etc  
 Mounting flange: carbon steel, 304, 316  
 Capillary: stainless steel 304  
 Protection pipe: stainless steel 304  
 Capillary outer sheath: PVC sheath (high temperature type without sheath)

### Material of densimeter body

Isolation diaphragm: Code s, seal ring φ 35 fluororubber O-ring  
 Chamber flange, process connection, drain valve: stainless steel 304

### Material of non wetted part

Bolt: electroplated carbon steel or stainless steel  
 Shell: Polyurethane electrostatic spraying low copper aluminum alloy  
 Flushing liquid: silicone oil within 60 °C of normal temperature  
 Silicone oil at medium temperature within 200C degrees  
 Silicone oil at high temperature within 300 degrees  
 Fluorine oil  
 Other inert liquids  
 Cover sealing ring: Rubber O-ring

### Load

0 ~ 1335 ohms (working state)  
 250 ~ 600 ohms (Digital HART Communication)

### HART communication distance

With multi-core twisted pair, the maximum communication distance can reach 1.5km, which varies according to the cable type.

### Reference accuracy

(including linearity, hysteresis and repeatability from zero)  
 Digital accuracy: + 0.05% FS signal output: + 0.075% FS  
 When the range ratio changes:  
 Accuracy = ± [0.05 + 0.08 (maximum range / set range)]% FS

### Impact of ambient temperature

(impact of ambient temperature per 28 °C)

Capsule above 5kpa  
 ± [0.2 + 0.05 (maximum range / set range)]% FS

### Over voltage effect

± [0.05 + 0.005 (maximum range / set range)]% FS / 6Mpa

### Static pressure effect

Capsule above 5kpa  
 ± [0.25 + 0.09 (maximum range / set range)]% FS / 6Mpa

### Stability

± [0.25 + 0.09 (maximum range / set range)]% FS / 60 months

### Installation position influence

After installation, the zero point can be trimmed without range influence

### Power influence

Less than 0.005% / V (21.6v ~ 32V DC, load resistance 350 Ohm)

### Error alarm

Output state in case of CPU or hardware error: high output: 110% > 21.6ma DC, low output: - 5%% = 3.2mA DC

### RF interference effect

All models less than + 0.1% FS, 20 to 1000 MHz

### Insulation strength

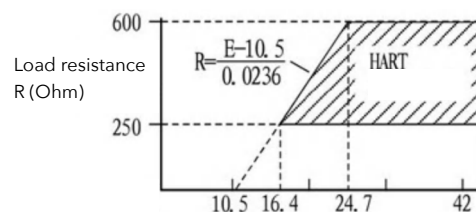
50Hz, 100vpp between positive and negative terminal and shell for 60s without flashover.

### Insulation resistance

100 megohm and above when 100V between positive and negative terminal and shell lasts for 60s.

### Power supply and load conditions

When the power supply voltage is 24V, the maximum load is 570 Ω



**Performance**

Reference conditions: The range starts from zero, the temperature is 25 °C, the atmospheric pressure, the 24V power supply, the silicone oil, and the isolation diaphragm is 316L stainless steel. The data setting range is the same as the upper and lower limits of the range.

Range	Accuracy	Ambient temperature effect (per 10 °C)	Stability (3 months)	Zero static pressure (2) (per 1kgf / cm2)
1	±0.001g/cm3	0.003*10 <sup>-3</sup> g/cm3	0.021*10 <sup>-3</sup> g/cm3	0.001*10 <sup>-3</sup> g/cm3
2	±0.001g/cm3	0.013*10 <sup>-3</sup> g/cm3	0.008*10 <sup>-3</sup> g/cm3	0.004*10 <sup>-3</sup> g/cm3
3	±0.002g/cm3	0.041*10 <sup>-3</sup> g/cm3	0.521*10 <sup>-3</sup> g/cm3	0.007*10 <sup>-3</sup> g/cm3

(1) The accuracy data includes the effects of linearity, lag and repeatability

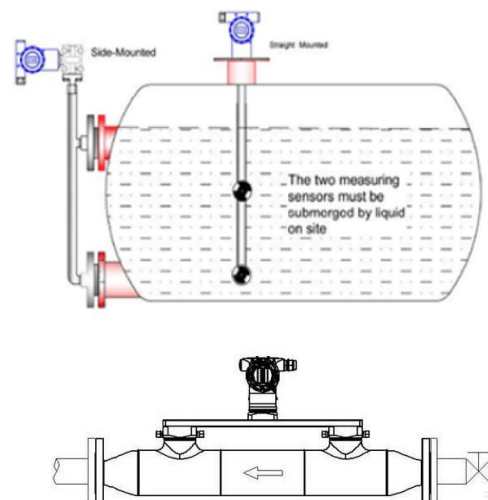
(2) This is a systematic error that can be eliminated by calibration in the working static pressure state

**Installation flange dimension table of densitometer**

Flange	Pipe size	Pipe thickness A	Bolt distribution diameter B	Mounting flange diameter C	Bolt quantity	Bolt hole diameter F	Diameter of extended diaphragm D	Washer plane diameter E	Process side G
ANSI150	2 in 51	28	121	152	4	19	NA	92	54
	3 in 76	33	152	191	4	19	66	127	89
	4 in 102	33	191	229	8	19	89	158	114
ANSI300	2 in 51	32	127	165	8	19	NA	92	54
	3 in 76	38	168	210	8	22	66	127	89
	4 in 102	41	200	254	8	22	89	158	114
ANSI600	2 in 51	28	127	165	8	19	NA	92	54
	3 in 76	35	168	168	8	22	66	127	89
PN10-40	DN50	26	125	165	4	18	NA	102	63
PN25-40	DN80	30	160	200	8	18	65	138	94
	DN100		190	235	8	22	89	158	114
PN10-16	DN100	30	180	220	8	18	89	158	114

**INSTALLATION**

- The principle of online densitometer is double flange differential pressure method based on static pressure. Since the measured liquid is sometimes not static, it is constantly circulating and agitating. Therefore, it is necessary to overcome these effects for the device of measuring density by static pressure principle. In the places that are not suitable for direct measurement, additional test tank shall be added to make the densitometer work in the place where the flow rate and fluctuation are very small, so as to ensure the reading stability of the densitometer.
- The specific installation drawing shall be designed and determined by the technical personnel on site according to the size of the purchased equipment.
- When testing the flowing liquid or the liquid with large vibration, it is necessary to add an auxiliary measuring tank, so as to make the measurement reading stable. When adjusting the flow rate of liquid in the measuring tank, the field operator should consider two requirements: dynamic and reading stability.
- The field installation of the densitometer must ensure that two pressure repeaters are on the same vertical plane, otherwise measurement error will occur.



**ORDER CODE**

SPX510	intelligent on-line densitometer									
	<b>CODE</b>	Construction type								
	<b>S</b>	Side-mounted type								
	<b>I</b>	In-line type								
	<b>E</b>	Elbow type								
	<b>P</b>	Pipe type								
	<b>CODE</b>	Range								
	<b>05</b>	0.5~2 g/cm <sup>3</sup> (Min. Range 0~0.05 g/cm <sup>3</sup> )								
	<b>10</b>	1~2.5 g/cm <sup>3</sup> (Min. Range 0~0.05 g/cm <sup>3</sup> )								
	<b>20</b>	2~5 g/cm <sup>3</sup> (Min. Range 0~0.05 g/cm <sup>3</sup> )								
	<b>CODE</b>	Wetted part material								
	<b>B</b>	316L stainless steel								
	<b>H</b>	Hastelloy								
	<b>C</b>	Tantalum								
	<b>D</b>	Titanium								
	<b>C</b>	More customized								
	<b>CODE</b>	type								
	<b>S</b>	Normal temperature type								
	<b>F</b>	Temperature and pressure compensation type								
	<b>G</b>	High temperature type								
	<b>H</b>	Hygienic type								
	<b>C</b>	More customized								
	<b>CODE</b>	Probe length								
	<b>1</b>	800mm (standard)								
	<b>2</b>	More customized								
	<b>CODE</b>	Process connection								
	<b>H3</b>	3 "clamp								
	<b>H4</b>	4 "clamp								
	<b>D8</b>	DN80 flange								
	<b>D10</b>	DN100 flange								
	<b>C</b>	More customized								
	<b>CODE</b>	Sealing ring material (sanitary type)								
	<b>B</b>	Nitrile rubber								
	<b>V</b>	fluororubber								
	<b>T</b>	Teflon								
	<b>C</b>	More customized								
	<b>CODE</b>	Electrical Interface								
	<b>A</b>	1 / 3-14NPT								
	<b>B</b>	1 / 2-14NPT								
	<b>C</b>	M20 * 1.5								
	<b>CODE</b>	Output								
	<b>0</b>	4 ~ 20mA								
	<b>1</b>	HART								
SPX510	E	10	B	S	1	D8	B	A	0	-