CONCENTRATION PROBE

SD-2000

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SD-2000

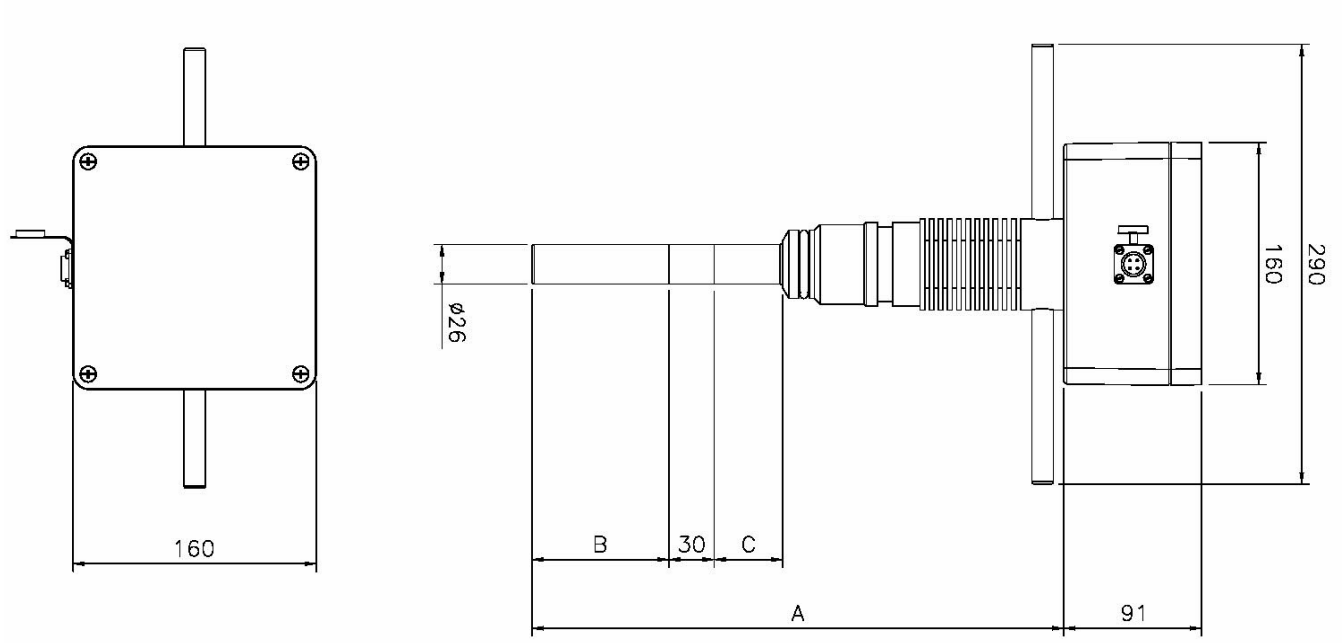
Application

The SD-2000 is a proportional to concentration signal transmitter, with automatic temperature compensation, designed for sugar production process, among others.
Using radio frequency techniques, SD-2000 supplies two different signals, which are proportional to mass resistance and capacitance.
Its design avoids maintenance when used in non-continuous boiling process, and ease cleaning when used in continuous boiling processes.
The sensitive part is built in a stainless steel (316) case, and the electronic circuit is encapsulated in an aluminum case, providing mounting support.

Technical data

Type	Condition in test
Measurement range	60 – 95 º Brix (other ranges on request)
Output	Capacitance: 4 – 20 mA Resistance : 4 – 20 mA
Voltage	24 Vdc / 300 mA
Load resistance	Max. 500 Ohm
Temperature range	Max. 70 ºC (environment) Max. 100ºC (sensitive part)
Stick length	320 mm (long) or 165 mm (short)
Sensitive part diameter	24 mm
Connection	Quick clamp
Construction	Circuit in aluminum casting case, and the sensitive part encapsulated in a stainless steel (316) case
Installation	Connection sleeve
Protection	IP-65
Weight	3 Kg

Dimensions (millimeters)



Dimensões	SD-2000/L1	SD-2000/L2	SD-2000/L3
A (mm)	300	350	505
B (mm)	40	90	90
C (mm)	45	45	200

Wiring

Wire connections are the following

Color	Description
Red	Voltage input (24 Vdc)
Black	Common (GND)
White	Resistance output (4-20 mA) – RS
Blue	Capacitance output (4-20 mA) – XS
Mesh	Case grounding (armor)

Figure 1 - Conector

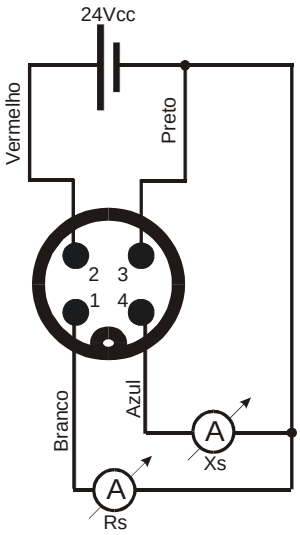


Figure 2 - Eletric Conexion

Operation

The SD-2000 probe measures surrounding product's concentration using electric principles. The product's electric characteristic depends on a variety of factors, and concentration is one of them. Product's concentration is determined measuring its capacitance and resistance. SD-2000 measure both and supplies them through two 4-20 mA current outputs. The RS 4-20 mA current output is proportional to resistance. The other output, the XS, is proportional to capacitance. See Figure 3.

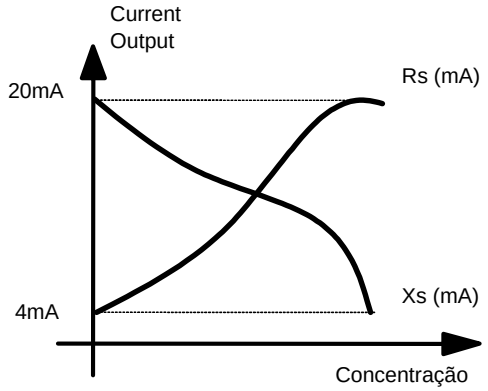


Figure 3 - SD-2000 operation

Both outputs can be used in control systems. Experience shows that Xs output is less affected by impurities. RS output, although more affected by impurities, is recommended for low concentrations.

It's important to point out that the XS output is inverted. That means that when the concentration increases, the 4-20 mA output decreases. Some control processes require this signal to be inverted.

Probe output varies according resistance and capacitance. But these function aren't linear when compared to concentration.

Concentration set

The SD-2000 main feature is the ease to adapt to any process. SD-2000 doesn't supply an absolute value, unless vacuum and temperature measurement devices. In a given process, the resistance measured value represents one concentration. In any other process, the same value could represent other concentration.
It's same for XS capacitance value.

Then, the absolute concentration value, depending on the RS and XS outputs, shall be measured and set experimentally.

Once the RS x concentration or XS x concentration relations are determined, they are unchanging and show little variation during process.

Installation

SD-2000 concentration probe can be used in sugar production process. But it can also used in other industrial processes, for example, jam production, citrus, etc.

The probe can be installed where the boiling process is taking place or in the tubing.

In the boiling pot (sugar production process), the probe can be installed in the bottom or in one of the sides of the pot. Make sure that the probe is to be installed where it can measure a homogeneous mass.

It's recommended to install the probe 0.5 meters from any other metallic part (including mixer blades)

This guarantees that the probe calibration will not be affected by metallic parts.

The probe shall not be installed where bubbles can be formed, because this could affect the output signal.

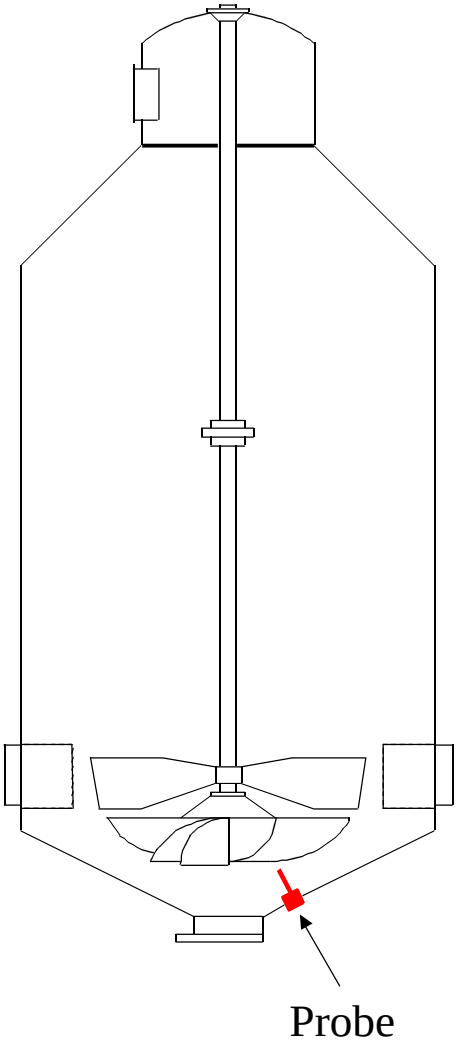


Figure 4 - Probe location

For probe calibration, a portable calibrator is required. It should be attached to the probe, using two clamps between measurement points. A key located in the upper part simulates two measurement situations.

A reliable tester is also required.

Calibration points:

Point	Function
VR1	Trimpot for span capacitance output adjustment
VR2	Trimpot for capacitance and resistance relation adjustment (factory set)
VR3	Trimpot for capacitance ZERO adjustment
VR4	Trimpot for resistance ZERO adjustment
VR5	Trimpot for resistance SPAN adjustment
VR6	Trimpot for Phase control set point adjustment (factory set)
VC1	Trimmer (variable capacitor) (factory set)
TP1 – TP6	Measurement points
SW1 e SW2	Dip switch with (8) switchs
RS	Resistance output (4-20 mA)
XS	Capacitance output (4-20 mA)
+	Voltage input 24 Vdc
-	Common (GND)

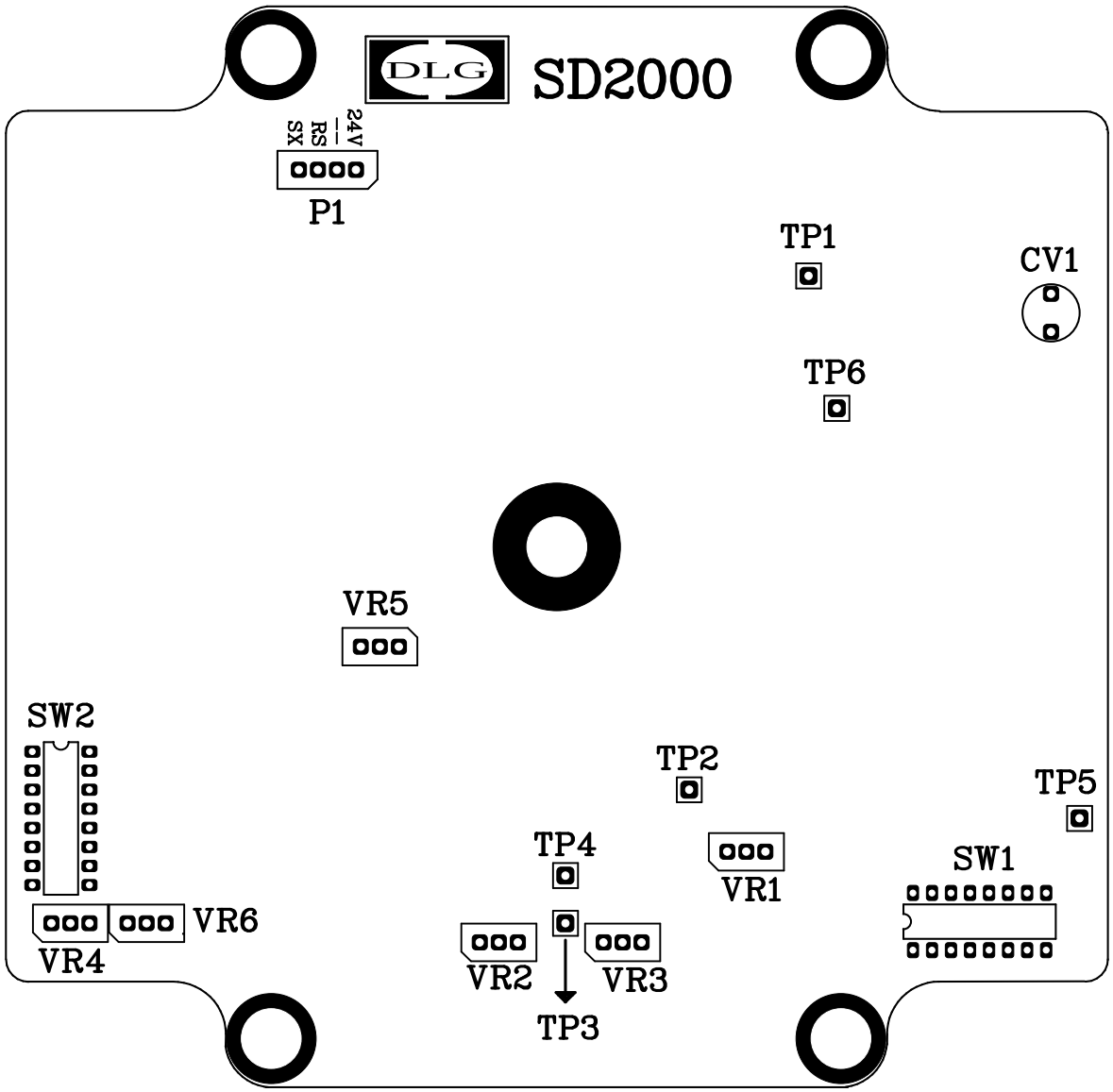


Figure 5 - Calibration points

When calibrating equipment, connect negative tester probe to GND (-)

Calibration

1	Adjust VR1 trimpot until TP2 reachs 500Ω
2	Set SW1.8 to OFF and the others SW1.1 to SW1.7 to ON. (factory set)
3	Adjust CV1 (trimmer) to obtain minimun voltage on TP6. (factory set)
4	Set SW2.4 and SW2.6 to ON and the others to OFF
5	Set SW1.6 to ON and the others to OFF and adjust the RS output to 4 mA changing VR4
6	Set SW1.4 to ON and the others to OFF and adjust the RS output to 20 mA changing VR5
7	Repeat steps 5 e 6 until ZERO and SPAN are calibrated
8	Set SW1.8 to ON and the others SW1.1 to SW1.7 to OFF
9	Connect the calibrator in the probe and set its switch in position number 1
10	Adjust VR2 until TP4 reach 10 volts
11	Adjust VR3 until TP3 reach 6 volts
12	Adjust VR6 for lowest RS output current value (factory set)
13	Put the calibrator in position number 1
14	Adjust VR3 to 10,0 mA in XS
15	Put the calibrator in position number 2
16	Adjust VR1 to 15,4 mA in XS
17	Put the calibrator in position number 1
18	Adjust VR5 to 15,4 mA in RS
19	Put the calibrator in position number 2
20	Adjust VR4 to 10,0 mA in RS

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