Sitron Capacitive Level Sensors

Models:

- SC404
- SC120+CN200
- SC400+LV400
- SC700

Introduction

Capacitive Level Sensors, also referred to as Radio Frequency (RF) level sensors, are used for measuring process level at a specific point, multiple points, or continuously over the entire vessel height. Capacitance Level Sensors have the ability to detect and measure both conductive and non-conductive mediums such as water and oil, or solids (molasses, pastes, powder and grains), as well as a variety of other materials. In addition, this method is also applicable for detecting level when there are interfaces between liquids (such as oil/water). Selecting the appropriate model and installing it in the proper location are key factors in successfully applying Capacitive Level Sensors. That is why Sitron offers many level measurement and control solutions. Sitron's Capacitive Level Sensors are broken into two types:

1. Continuous Level Measurement (Models SC404, SC120 + CN200)
2. Point Level Detection (Models SC400+LV400 and SC700)

Like all of Sitron's products, the Capacitive Level Sensors can be made in a wide variety of process connections. They feature easy installation, as well as maintenance free reliability within a compact design.

Technology

Three elements are needed to form a capacitor: Two plates and a dielectric. The capacitance electrode (the probe) is one plate, the vessel wall is the other plate, and the medium is the dielectric. If the vessel is non-metallic, a conductive ground reference must be inserted into the vessel or a metallic tubular sheath can be placed over the probe's capacitance electrode to form the second plate.

A Capacitive Level Sensor measures level by applying a radio frequency (RF) signal between the capacitance electrode (the probe) and the electrically conductive vessel wall. The RF output creates a small amount of electrical current that flows through the medium (the dielectric) from the probe to the vessel wall. When the level increases or decreases the dielectric constant, or the capacitance reading, increases or decreases. In other words, the level change results in a variation of the capacitance value around the probe, depending upon the degree of immersion. For point level detection, the probe's electronics detect the change in the RF signal and then alter the state of the level switch. For continuous level detection, the probe's electronics convert the RF signal into a 4-20mA-output signal that is proportional to the change of the level.

Features

- Wide range of applications/industries
- I.e. water, oils, corrosives, solids, powders, grains, etc.
- Functions on conductive as well as non-conductive medias
- No moving parts
- Rugged construction
- Easy economical installation
- Accurate and reliable measurement
- Unaffected by coating media or aggressive products
- Can operate at high temperatures and pressure
- 3A approved

Required information to specify the correct type of electronic module for your application:

1) Provide the generic name of the material, even if it is a mix of several products.
2) Specify whether liquid, slurry, solid, interface, granular or powder.
3) Inform viscosity, density and describe consistency in such terms as "watery," "oily," "like a batter" or "like molasses." If this information is not available, a sample for evaluation is required.
4) Give process information describing if it is nominal, minimum and maximum temperature and pressure ranges. If turbulence is present, indicate its degree.
5) Describe tank material and its shape.
6) Describe area classification: non-hazardous, hazardous or corrosive.
7) Provide a schematic diagram showing desired probe mounting and location, zero percent and 100 percent of level as well as the presence of an agitator or other internal obstructions.

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1. Capacitive Continuous (RF) Level Measurement

Models:

- ↗ SC404
- ↗ SC120 + CN200

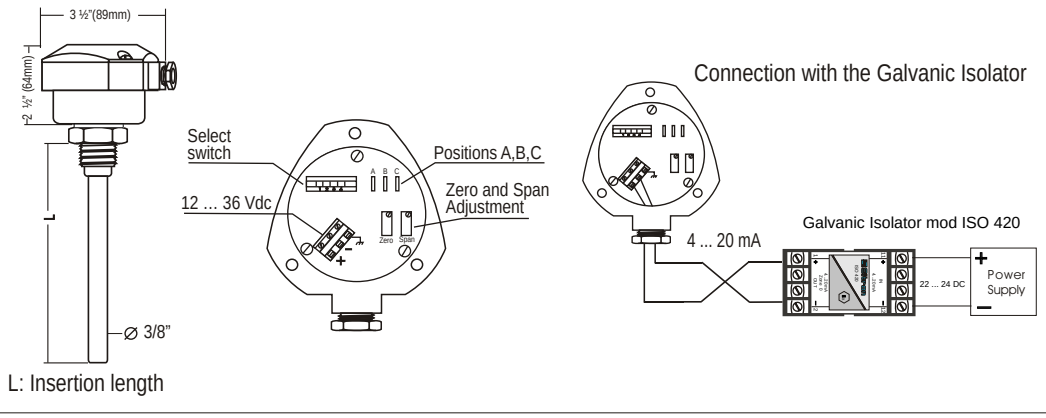
SC404

The **SC404** Continuous Level Measurement probe is one of the most flexible, as well as cost effective, level solutions for a great variety of applications.
The built in (one-piece) electronic module provides a 4-20mA output (2 wire) signal that is proportional to the level.
The SC404 features a potentiometer for Zero and Span adjustment and a select switch to account for varying sensitivity according to the medium or product, tank dimensions, rod's length, position of installation as well as other application features. In addition, the SC404 also allows for a long distance application, by utilizing optional armored cables to avoid interference.

Note:

- Rods can be coated with PTFE or other materials as required and upon request.
- A Galvanic Isolator mod. ISO420 must be sold along with all SC404 probes with nylon enclosure.
- For applications with non-metallic tanks we recommend the use of a sheath as a reference.

DIMENSIONS	WIRING DIAGRAM



SC120 Probe + CN200 Transducer

The **SC120** probe controls and measures level along with the **CN200** level transducer. This set is also a RF capacitance transmitter system for measurement of level in a variety of products. The SC120 probe sends an mV signal to the CN200 transducer, which converts the (mV) signal into a 4-20mA signal.

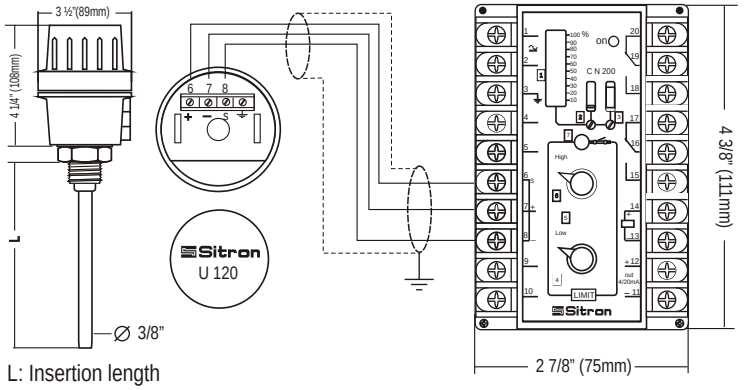
Unlike the SC 404, the SC120 working with the CN200 transducer has two adjustable level controls in a scale of 0-100% with a bar graph level indication, as well as a Zero and Span adjustment own enclosure.

The SC120 and CN200 set as well as the other RF capacitive models have a wide range of applications; they can be used in conductive and non-conductive liquids, solids and slurries. Sitron's SC120 probes and CN200 transducers provide reliability, easy use and installation.

Note:

- Rods can be coated with PTFE or other materials as required and upon request.
- For applications with non-metallic tanks we recommend the use of a sheath as a reference.

DIMENSIONS



L: Insertion length

WIRING DIAGRAM

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2. Capacitive (RF) Point Level Detection

Models:

- SC700
- SC400 + LV400/2

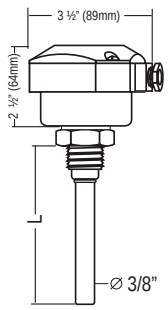
SC700
SC700AC
SC700U

The **SC700** is a capacitance switch ideal for low and high level detection for both liquid and solids. The SC700 can also detect level without being in contact with the product through a sight glass. Unlike other capacitance probes, the SC700 can detect any type of conductive, non-conductive or low dielectric materials with extremely accurate performance, almost complete immunity from build up, temperature changes or condensation. In applications with plastic or concrete tanks the SC700 does not require an external reference.

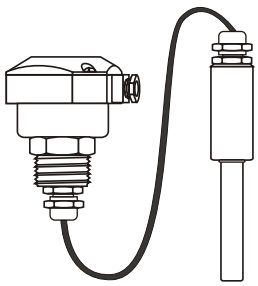
The sensor operates in a manner that is similar to a simple capacitor. A high frequency oscillator is located within the tip of the probe. When the tip of the probe comes in contact with the medium, the frequency of the oscillation reaches a preset point and the detection circuit signals the switch to change state.
The SC700 is a compact switch that can be made with many types of process connections, such as; threaded, flange or sanitary. The SC700 is made with rigid rod or cable and both can be supplied in extended versions. The rigid rod is made with a strong and durable plastic (polyacethal delrin) for standard units or upon request the rods can be made with PTFE. Probes are available in AC, DC and Universal Power Supply versions.

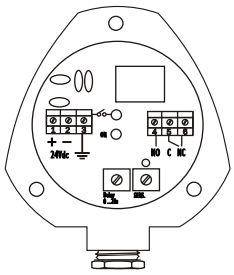
DIMENSIONS	WIRING DIAGRAM

SC700



SC700 with Cable





Model:

↗ SC400 + LV400/2

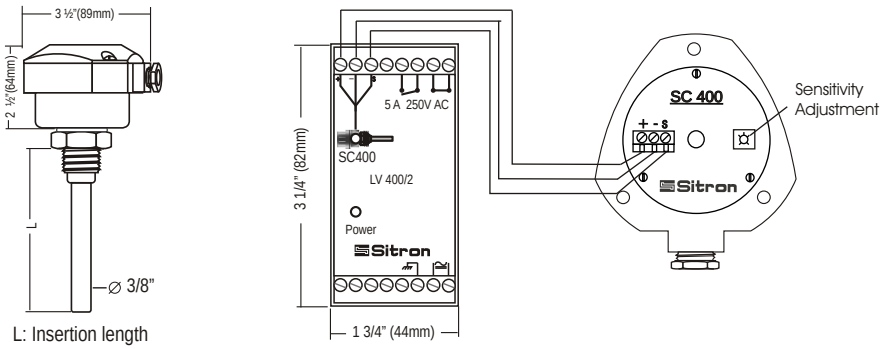
SC400 + LV400/2

The **SC400** point level probe, along with the **LV400/2** controller, are designed to detect and/or control the level of a wide variety of dry bulk and liquid materials, from conductive and non-conductive liquids and slurries to solids and oils. The SC400's sensing capability provides reliable point level indication in high-pressure tanks, as well as in extreme high/low temperature ranges.

The SC400 is a very compact switch, made with 316 S.S, and available in threaded, flanged or sanitary process connections.

The LV400/2 controller is available with 24 VDC, 115 VAC or 230 VAC supply voltage, and relay output. Sitron's SC400 probe and LV 400/2 controller provide excellent reliability, easy use and installation.

DIMENSIONS	WIRING DIAGRAM



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SC200

Capacitance Point Level Switch

SPECIFICATIONS

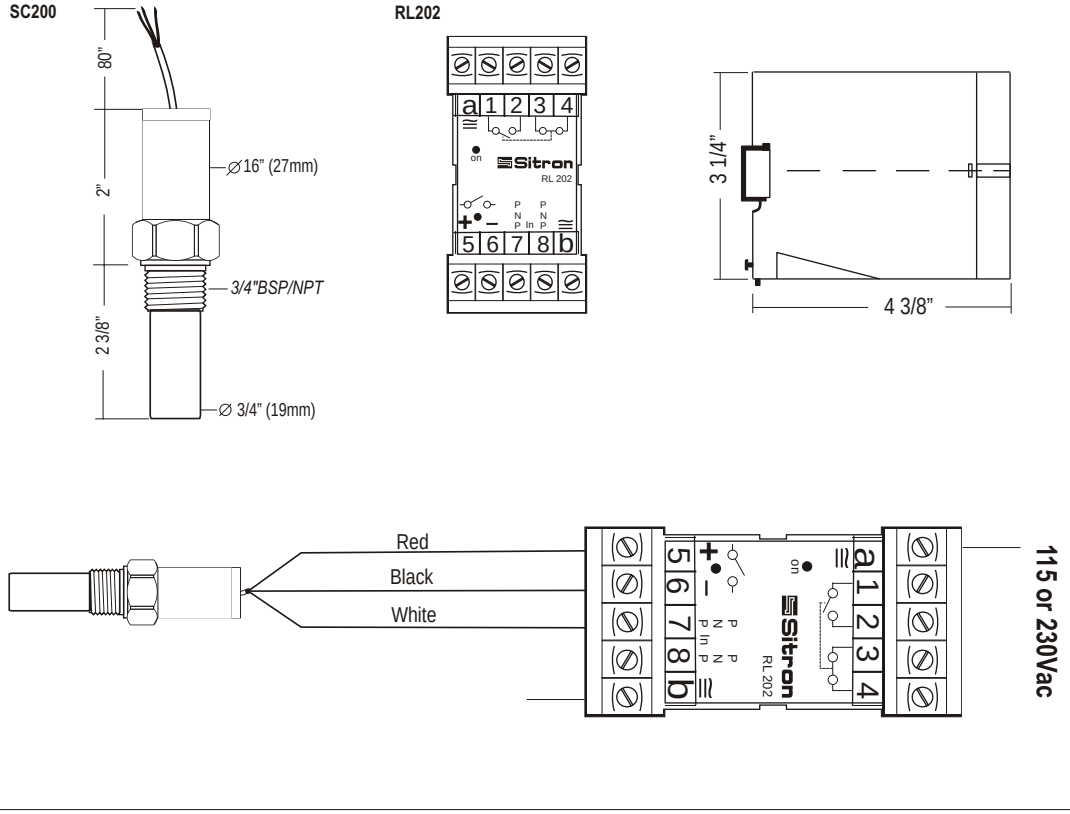
SC200

Operating Voltage:	12...30Vdc
Current Consumption:	3mA
Adjustment	Potentiometer switch point
Output:	PNP (3 wire)
Operating Temperature:	14 to 176ºF

RL202

Operating Voltage:	115 or 230Vac (50/60Hz)
Output:	1 SPDT (5A - 250Vac)
Operating Temperature:	14 to 140ºF

DIMENSIONS AND WIRING DIAGRAM



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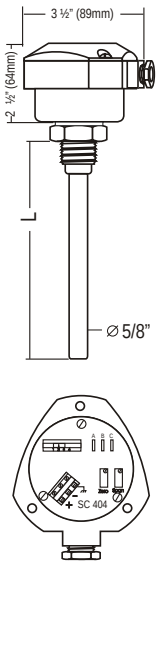
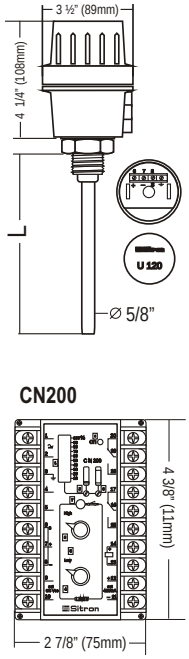
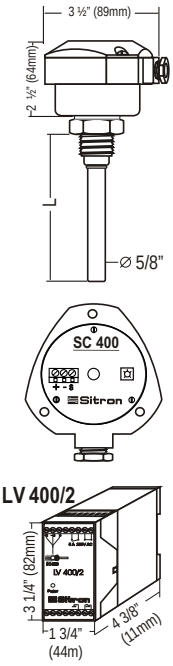
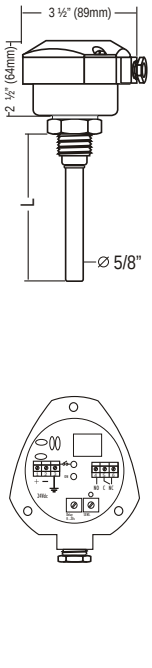
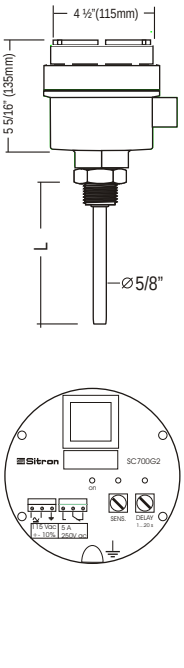
SPECIFICATIONS

MODELS	SC404	SC120	SC400	SC700	SC700AC SC700U
					
Application	Continuous level measurement for liquids solids and granular	Continuous level measurement for liquids solids and granular	Level switch for liquids solids and granular	Level switch for liquids solids and granular	Level switch for liquids solids and granular
Operating Voltage	12...30 Vdc	Controller CN 200 115 or 230Vac (50/60Hz) 24 Vdc (+/- 10%)	Controller LV 400/2 115 or 230 Vac (50/60Hz) 24 Vdc (+/- 10%)	12...30 Vdc	SC700AC: 115 or 230Vac SC700U: 24...230Vac/dc
Current Consumption	Max. 22mA	4 VA	2 VA	2 VA	4 VA
Output	4...20mA (2 wire)	2 Relay (SPDT) 5A/ 250Vac and 4...20mA (2 wire)	Relay (NO + NC) 5A max (250Vac)	Relay (SPDT) 5A max (250Vac)	Relay (SPDT) 5A max (250Vac)
Adjustment	Zero & Span Potentiometer	Zero & Span and 2 Switch point Potentiometer	Potentiometer switch point	Potentiometer switch point	Potentiometer switch point
Time Delay	--	--	--	1 to 20 seconds adjustable	1 to 20 seconds adjustable
Range of sensibility	100 to 5500pF	50 to 10000pF	0.1 to 5pF	--	--
Frequency oscilation	400K Hz	--	--	5MHz	5MHz
Level indication	--	Display bargraph	Led status on/off	Led status on/off	Led status on/off
Electrical connection	Cable gland - ½"NPT cond. entry or M12 connector	Cable gland - ½"NPT cond. entry or M12 connector	Cable gland - ½"NPT cond. entry or M12 connector	Cable gland - ½"NPT cond. entry or M12 connector	Cable gland - ½"NPT cond. entry or M12 connector
Process connection	3/4" to 1 1/2" BSP or NPT flange or sanitary connections	3/4" to 1 1/2" BSP or NPT flange or sanitary connections	3/4" to 1 1/2" BSP or NPT flange or sanitary connections	3/4" to 1 1/2" BSP or NPT flange or sanitary connections	3/4" to 1 1/2" BSP or NPT flange or sanitary connections
Wetted material	316 Stainless steel	316 Stainless Steel	316 Stainless Steel	Sensor: Polyacethal - stand. PTFE optional	Sensor: Polyacethal - stand. PTFE optional
Enclosure material	Glass filled nylon	Aluminum	Glass filled nylon	Glass filled nylon	Aluminum
Max pressure	725PSI (50 Bar)	725PSI (50 Bar)	725PSI (50 Bar)	145 PSI (10 Bar)	145 PSI (10 Bar)
Operating temperature	14 to 248º F (-10 to 120ºC)	Probe: 14...248ºF (-10...120ºC) Contr.: 14...140ºF (-10 ...60ºC)	Probe: 14...248ºF (-10...120ºC) Contr.: 14...140ºF (-10 ...60ºC)	14 to 176º F (-10 to 80ºC)	14 to 176º F (-10 to 80ºC)
Class Protection	NEMA 4 (IP 65)	Probe: NEMA 4 (IP65) Controller: IP 40	NEMA 4 (IP 65)	NEMA 4 (IP 65)	NEMA 4 (IP 65)

EXAMPLES OF APPLICATIONS

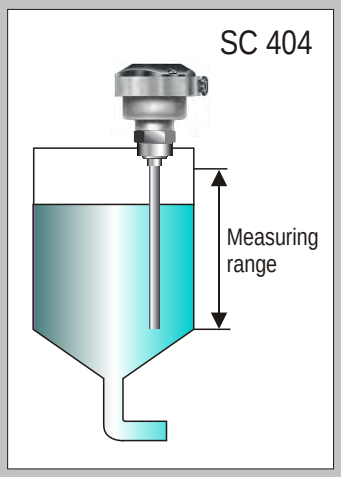


Fig. 1
Continuous level measurement

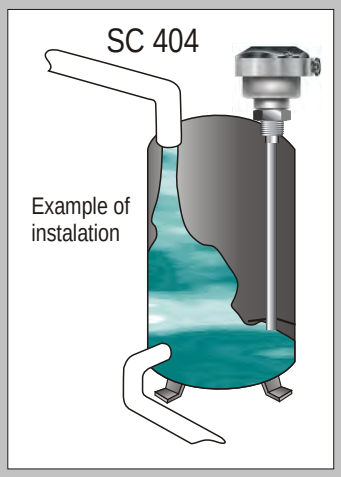


Fig. 2
It is recomended to install the probe away from the tank´s feeder

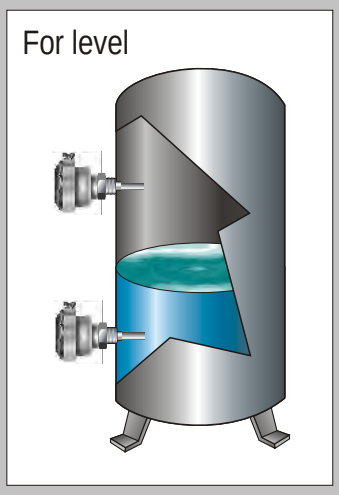


Fig. 3
High and low level detection

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Order Codes - Capacitance Continuous SC120

MODEL	SIZE	PROCESS CONNECTION	TYPE OF ROD OR CABLE	COATING/TUBING	INSERTION LENGTH	HOUSING	ELECTRICAL CONNECTION	OPTIONS
SC120	4 3/4"	B BSP	R RIGID ROD: - 1/2" (12.7mm) 316SS	S NONE	L SPECIFY	A1 316 Stainless Steel	1 1/2" BSP	MT 50mm Neck: 80-150°C
	5 1"	D Flange ANSI 150# - Carbon Steel Painted		H HALAR Coated		G1 Small Aluminum	2 CABLE GLAND W/ 1/2" BSP	
SCT120	6 1 1/2"		U RIGID ROD + REFERENCE ROD: -1/2" (12.7mm) 316SS - 1/4" (6.3mm) 316SS	N NYLON-11 Coated	NOTE: Sheath cost must be calculated in addition to cost of insertion length.			HT 100mm Neck: 80-200°C
	7 2"	E Flange ANSI 150# - 316SS		T PTFE tubed (UP TO 120°C)			4 3/4" BSP	
	9 3"	F Flange ANSI 150# - PVC	MU STEEL CABLE (6mm) + REFERENCE Cable				5 CABLE GLAND W/ 3/4" BSP	0 NONE
	Q 4"	K Flange ANSI 150# - 304SS		T1 PTFE tubed (Cable)				
	X OTHER	N NPT	C RIGID ROD + REFERENCE SHEATH	X OTHER - specify			6 1/2" NPT	
		T TRI-CLAMP	D RIGID ROD: - 5/8" (16mm) 316SS	M PTFE tubed for HIGH TEMP (UP TO 200°C)			7 CABLE GLAND W/ 1/2" NPT	
		X OTHER - specify					9 3/4" NPT	
			M STEEL CABLE - 6.0mm				C CABLE GLAND W/ 3/4" NPT	
							P Metal Cable Gland - M20	

CONTROLLER	SPECIFICATIONS
CN200-24	Supply: 24VDC +/- 10% Output: 4...20mA + 2 Relays
CN200-11	Supply: 115 VAC (50/60 Hz) Output: 4...20mA + 2 Relays (5A-250 VAC)
CN200-23	Supply: 230 VAC (50/60 Hz) Output: 4...20mA + 2 Relays (5A-250 VAC)
CN205-24	Supply: 24VDC +/- 10% Output: 5 Relays (5A-250 VAC)
CN205-11	Supply: 115 VAC (50/60 Hz) Output: 5 Relays (5A-250 VAC)
CN205-23	Supply: 230 VAC (50/60 Hz) Output: 5 Relays (5A-250 VAC)
CN202-24	Supply: 24VDC +/- 10% Output: 4...20mA
CN202-11	Supply: 115 VAC (50/60 Hz) Output: 4...20mA
CN202-23	Supply: 230 VAC (50/60 Hz) Output: 4...20mA

General Notes:

SC120AT - 100mm High Temperature Neck (up to 200C or 392F)

SC120MT - 50mm High Temperature Neck (up to 150C or 300F)

1. The ***minimum*** process connection size for an SC120 with a reference rod is ***1-1/2"*** (NPT/BSP)
2. The ***minimum*** process connection size for an SC120 with a rod and sheath is ***1"*** (NPT/BSP)
3. ***Halar coating*** rated up to ***150°C*** (or 300°F)
4. ***PTFE tubed*** rods/cable rated up to ***120°C*** (or 248°F)
5. ***PTFE*** tubing for ***high temperatures*** rated up to ***200°C*** (or 392°F)
6. For ***conductive mediums*** , the rod or ground must be ***isolated*** from the medium.
7. ***Minimum Length L=500mm***
8. ***Maximum Length L= 3m***
8. ***Cable connections*** available starting ***from 1-1/2"*** (NPT/BSP)

Order Code - Point Level Capacitance SC200

Model	Size	Process Connection Type	Type of Rod or Cable	Insertion Length	Electrical Connection
SC200	4 3/4"	B BSP	K THREAD & BODY 316SS - PTFE TIP	L60 60mm - STANDARD	T Potted w/ 2m PVC Cable
SC200N		N NPT	G THREAD & BODY 316SS - PVC TIP		M M12 Connector
		X OTHER - SPECIFY	I BODY AND TIP IN NYLON		
			V BODY AND TIP IN PVC		

Controller	Specification
RL202-11	115 VAC (50/60 Hz) 1 SPDT (5A-250 VAC)
RL202-23	230 VAC (50/60 Hz) 1 SPDT (5A-250 VAC)

General Notes:

1. The ***SC200*** comes standard w/ ***PNP*** Transistor ouput
2. The ***SC200N*** comes standard w/ ***NPN*** Transistor ouput
3. ***Nylon body and tip*** only available with an ***NPT*** connection.

Order Codes - Capacitance Continuous SC404

MODEL	Size	Process Connection	TYPE OF ROD OR CABLE	Coating/Tubing	Insertion Length	HOUSING	Electrical Connection	Options
SC404	4 3/4"	B BSP	R RIGID ROD: - 1/2" (12.7mm) 316SS - 5/8" (16mm) 316SS	S NONE	L SPECIFY	N1 SMALL NYLON	1 1/2" BSP	0 NONE
	5 1"	D ANSI 150# FLG - CARBON STEEL Painted		H HALLAR Coated		N2 LARGE NYLON	2 CABLE GLAND W/ 1/2" BSP	MT 50mm Neck
	6 1 1/2"			N NYLON 11 Coated		G1 SMALL ALUMINUM		AT 100mm Neck
	7 2"	E ANSI 150# FLG - 316 SS	U RIGID ROD + REFERENCE ROD: - 1/2" (12.7mm) 316SS - 1/4" (6.3mm) 316SS	T PTFE tubed (up to 120°C)		G2 LARGE ALUMINUM	4 3/4" BSP	
	9 3"	F ANSI 150# FLG - PVC		T1 PTFE tubed (Cable)		NOTE: large Aluminum and large Nylon Housings include built-in Galvanic Isolator.	5 CABLE GLAND W/ 3/4" BSP	
	Q 4"	K ANSI 150# FLG - 304 SS		X OTHER - specify			6 1/2" NPT	
	X OTHER	N NPT	M STEEL CABLE- 6.0mm	M PTFE tubed for HIGH TEMP (up to 200°C)			7 CABLE GLAND W/ 1/2" NPT	
		T TRI-CLAMP	C Rod (1/2") & Sheath	E Epoxy			9 3/4" NPT	
		X OTHER - specify					C CABLE GLAND W/ 3/4" NPT	

____	_	_	_	___		__	_	_

Model	Description
ISO420	Galvanic Isolator

SC404AT - 100mm High Temperature Neck (up to 200°C)

SC404MT - 50mm High Temperature Neck (up to 150°C)

SC404RF - with Built-In Reference Rod

SC404CM - with Sheath

General Notes:

1. The ***minimum process connection*** size for an SC404 with a ***reference rod*** is ***1-1/2" NPT/BSP***
2. The ***minimum process connection*** size for an SC404 with a ***sheath*** is ***1" NPT/BSP***
3. ***Halar/Tefzel*** coating rated up to ***150 °C***
4. ***Nylon 11*** coating rated up to ***120°C*** and ***not*** recommended as an Isolator for ***water*** applications
5. ***PTFE*** tubed rods/cable rated up to ***120°C***
6. ***PTFE*** tubing for ***high temperatures*** rated up to ***200°C***
7. The ***ISO420*** requires a ***24VDC*** power supply
8. For ***conductive mediums*** , the ***rod or ground*** must be ***isolated*** from the medium.
9. When connecting a capacitance probe through a ***PLC without*** using a ***Galvanic Isolator*** , the probe may become damaged or will ***not funtion properly*** .
10. ***Minimum length L=500***
11. ***Maximum L= 3m***
12. ***Cable connections*** available starting ***from 1-1/2" BSP or NPT***
13. ***Epoxy*** coating is ***Resicoat R4*** .

Order Codes - Point Level Capacitance SC700

Model	Size	Process Connection	Type of Rod or Cable	Coating/Tubing	Insertion Length	Housing	Electrical Connection
SC700	4 ¾"	B BSP	J POLYACETHAL DELRIN TIP - FIXED ROD 316 SS	S NONE	L120 Standard = 4¾" (120mm)	N1 SMALL NYLON (DC only)	1 ½" BSP
	5 1"	E FLANGE ANSI 150# - 316 SS		T CABLE PTFE TUBED		N2 LARGE NYLON	2 CABLE GLAND W/ ½" BSP
SC700AC1	6 1½"	F FLANGE ANSI 150# - PVC	K PTFE TIP - FIXED ROD 316 SS		L SPECIFY	G2 LARGE ALUMINUM	4 ¾" BSP
	7 2"	K FLANGE ANSI 150# - 304 SS	G PVC TIP - FIXED ROD 316 SS				5 CABLE GLAND W/ ¾" BSP
SC700AC2	9 3"	N NPT	P POLYURETHANE CABLE with POLYACETHAL DELRIN TIP				6 ½" NPT
	Q 4"	T TRI-CLAMP					7 CABLE GLAND W/ ½" NPT
SC700U	X OTHER	X OTHER - specify	V RIGID ROD AND TIP IN PVC				9 ¾" NPT
			Y POLYURETHANE CABLE with PTFE TIP				C CABLE GLAND W/ ¾" NPT

General Notes:

1. ***SC700*** - supply Voltage 24VDC
2. ***SC700AC1*** and ***SC700AC2*** available in the ***large Nylon*** or ***Aluminum*** housing only.
3. ***SC700U*** - ***universasl power supply*** (85 to 240VAC OR 24VDC). Available in the ***large Nylon*** or ***Aluminum*** housing only.
4. ***Triclamp*** connections start at ***1-1/2"***
5. ***Maximum Length*** for ***rigid rod - 3m*** (cable starting from that length)