

General Specifications

Insacal Conductivity Master Meter

For Pharmaceutical and Medical purposes the quality of water, as an excipient has been defined by the European Pharmacopoeia (EP) as well as the United States Pharmacopoeia (USP). In order to ship/sell your product in Europe or the United States of America, you must be able to prove that these requirements are met.

For Purified Water and Water for Injection (WFI) the USP defines the following requirements:

- Meter reports uncompensated Conductivity or uncompensated Resistivity.
- The display resolution is 0.1 $\mu\text{S}/\text{cm}$ or better.
- The meter reads accurate 1 $\mu\text{S}/\text{cm}$ when a 0.1% precision resistor replaces the sensor (to calibrate/verify the meter).
- The sensor cell constant is calibrated/verified to $\pm 2\%$
- Temperature accurate to 2°C (effective USP 28)

FEATURES

- The Insacal is accurate to 0.37% of reading for cell constant determination with a test accuracy ratio of better than 4:1 (accuracy ranges from 0.25% to 1% depending on user measurement range and calibration option)
- Accredited by Danak with Traceability to DFM Standard Reference Materials SRM
- Compensated and Uncompensated Raw Values and Temperature readings are all simultaneously displayed to ensure accuracy
- Lightweight and portable for use in the Laboratory or in the Field
- Robust and made from suitable materials to ensure long term stability and accuracy



System Configuration



Insacal



Sensors



Calibration Tank



Calibration



Accessories

The Insacal SC450 series is designed to combine the superior functionality of the Yokogawa EXA series with the ease of use offered in pocket computers (PDA).

Truly unique is the Insacal SC450 series in the Human Machine Interface. The high resolution graphical display and the touch screen operation make all information visible to the operator. Configuration with the touch screen is as easy as operating a PDA. Simply choose the language of choice and on screen instructions assure that the best configuration for the application is obtained.

The Insacal SC450 series offers full functionality with PID control on either mA output(s) or on contact output(s). The contact outputs can be selected as pulse frequency controlled or pulse length controlled contact function to control chemical metering pumps or solenoid valves.

The Insacal SC450 is a family of SMART analyzers: In addition to the two mA outputs a digital HART® signal is superimposed on mA1. This signal supplies up to four process variables and many diagnostic data. This information can be used to generate additional current and contact outputs in the HIM monitor and in maintenance optimisation programs like PRM or AMS. Pactware can be downloaded from Yokogawa WEB pages to enable the user to configure SC450 with a PC.

The SC450 offers the best accuracy in the industry by combining the conductivity measurement with advanced temperature compensation functionality, preloaded calibration standards and cell fouling monitoring.

The Insacal SC450 is universal. The analyzer accepts sensors with cell constants ranging from 0,005 till 50/cm; 2-electrode sensors as well as 4-electrode sensors; 5 different temperature compensating elements for accurate temperature compensation.

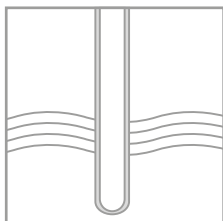
The SC450 offers ultra pure water compensation for demineralised water (default: NaCl), for Steam, Condensate and Boiler water analysis (Cation Conductivity, Ammonia and Morpholine Conductivity) SC450 also offers Matrix compensation and output linearization for accurate analysis of strong acids and alkalis especially for the monitoring of ultra pure water in the pharmaceutical industry the functionality of USP chapter 645, first published in USP23, is implemented.



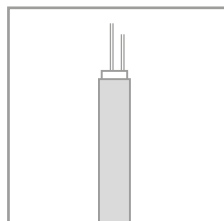
Features

- IP66/NEMA4X 1/2DIN enclosure for Field mounting and Panel mounting.
- Unique HMI with menu structure and high resolution graphical display with touch screen
- Interactive display with choice out of 6 languages: English, French, German, Italian Spanish and Swedish.
- Trending display for up to 2 weeks.
- On-screen logbooks store calibration data, configuration changes and events
- Advanced Process Temperature Compensation
- Cell fouling monitoring

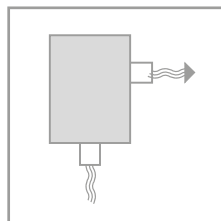
System Configuration



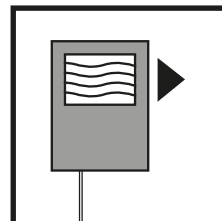
Sensors



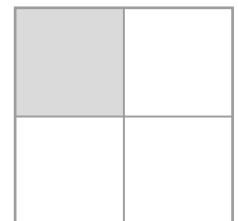
Cables



Fittings



Transmitters



Accessories

A. Input specifications

: Two or four electrodes measurement with square wave excitation, using max 60m (200ft) cable (WU40/WF10) and cell constants from 0.005 to 50.0 cm⁻¹

B. Input ranges

Conductivity : 0.000 μS/cm - 2000 mS/cm
 Minimum : 1μS/cm (underrange 0.00 μS x C)
 Maximum : 200 mS/cm (overrange 2000 mS x C)
 Resistivity : 0.0 Ω x cm - 1000 MΩ x cm
 Minimum : 5 Ω/cm (underrange 0.0 Ω/C)
 Maximum : 1 MΩ/cm (overrange 1000 MΩ/C)
 Temperature : Pt1000 -20 to 250°C (0-500°F)
 : Pt100 -20 to 200°C (0-400°F)
 : Ni100 -20 to 200°C (0-400°F)
 : NTC 8k55 -10 to 120°C (10-250°F)
 : Pb36 (JIS NTC 6k) -20 to 120°C (0-250°F)

C. Accuracy

Conductivity/resistivity : See Calibration options
 Temperature : ≤ 0.3°C (≤ 0.4°C for Pt100)
 mA outputs : ≤ 0.02 mA
 Ambient temperature influence : ± 0.05% /°C
 Step respons : ≤ 4 sec for 90% (for a 2 decade step)

D. Transmission signals

General : Two isolated outputs of 4-20 mA. DC with common negative. Maximum load 600Ω. Bi-directional HART[®] digital communication, superimposed on mA1 (4-20mA) signal.
 Output Function: Linear or Non linear (21-step table) output for pH, temperature, ORP or rH.
 Control function: PID control.
 Burn out function: Burn up (21.0 mA) or burn down (3.6 mA) to signal failure acc. NAMUR NE43.
 : Adjustable damping
 : Expire time
 Hold : The mA-outputs are frozen to the last/fixed value during calibration/ commissioning

E. Contact outputs

General : Four SPDT relay contacts with display indicators. Contact outputs configurable for hysteresis and delay time.
 Switch capacity : Maximum values 100 VA, 250 VAC, 5 Amps. Maximum values 50 Watts, 250 VDC, 5 Amps.
 Status : High/Low process alarms, selected from conductivity, resistivity, concentration or temperature. Configurable delay time and hysteresis. PID duty cycle or pulsed frequency control. FAIL alarm
 Control function : On / Off
 : Adjustable damping
 : Expire time
 Hold : Contact can be used to signal the hold situation.
 Fail safe : Contact S4 is programmed as fail-safe contact.

F. Contact Input : Remote range switching to 10 times the programmed range.

Contact open : If impedance > 100 kΩ: Range 1
 Contact closed : If impedance < 10 Ω: Range 2 (10 x Range 1)

G. Temperature compensation

: Automatic or manual, for temperature ranges mentioned under C (inputs).
 Reference temp.: programmable from 0 to 100°C or 30 - 210 °F (default 25°C).

H. Compensation algorithm

: According IEC 60746-3 NaCl tables (default). Two independent user programmable temperature coefficients, from 0% to 3.5% per °C (°F) by adjustment or calibration.
 Matrix compensation : With conductivity function of concentration and temperature. Choice out of 13 preprogrammed matrixes and 2 100-points user-programmable matrices.

I. Calibration

: Semi-automatic calibration using pre-configured OIML (KCl) buffer tables, with automatic stability check. Manual adjustment to grab sample.

J. Logbook

: Software record of important events and diagnostic data readily available in the display or through HART[®].

K. Display

: Graphical Quarter VGA (320 x 240 pixels) LCD with LED backlight and touchscreen. Plain language messages in English, German, French, Spanish, Italian and Swedish.

L. Shipping details

Package size : 290 x 300 x 290 mm (L x W x D) (11.5 x 11.8 x 11.5 inch)
 Package weight: app. 2.5 kg (5.5lbs)

M. Housing

: Cast aluminium case with chemically resistant coating, cover with flexible polycarbonate window. The colour of the case and cover is silvergrey. Cable entry via six M20 polyamide glands. Cable terminals are provided for up to 2.5 mm² finished wires. Weather resistant to IP66 and NEMA4X standards. Note that the glands must be installed properly. Pipe, wall or panel mounting, using optional hardware.

N. Power supply : 85-265 VAC (±10%). Max 15VA, 47-63Hz, 9,6-30 VDC (±10%), max 10W

O. Regulatory compliance

Safety : EN 61010-1 CSA C22.2 No.61010-1 UL 61010-1 FM3611 Class I, Div.2, Group ABCD,T6 for Ta -20 to 55°C
 EMC : conforms to EN61326 Class A, AS/NZS CIPR 11
 Inst. altitude : 2000 m or less Category based on IEC 61010: II (Note) Pollution degree based on IEC 61010: 2 (Note)

Note: Installation category, called over-voltage category, specifies impulse withstand voltage. Category II is for electrical equipment. Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 is the normal indoor environment.

Stainless steel cells for 2-electrode type with cell constants 0.01 and 0.1 cm⁻¹.

These conductivity sensors have a stainless steel body and PEEK (Poly Ether Ether Ketone) inner insulation for high pressure/temperature applications. A special treatment of the electrodes ensures optimal resistance against polarisation. The sensor includes a built-in resistance thermometer Pt1000 for automatic temperature compensation.

The combination sensor plug and cable socket is watertight and temperature resistant up to 100°C (212 °F). It meets the requirements of IP65.

The dimensions of the sensor are standardised for mounting in the standard fitting program of Yokogawa.

General Specifications

Materials

Wetted parts

- a. Body : Stainless steel AISI 3016L
- b. Insulation : PEEK (Poly Ether Ether Ketone)
- c. Electrode : Stainless steel AISI 316L
- d. Quad-rings, O-rings : Viton
- e. Connector : Gold plated contacts in polyamide plug

Weight and immersion length (L in figure)

- Model SC42-SP24 : 440 gram; 110 mm (L)
- Model SC42-SP34 : 600 gram; 163 mm (L)

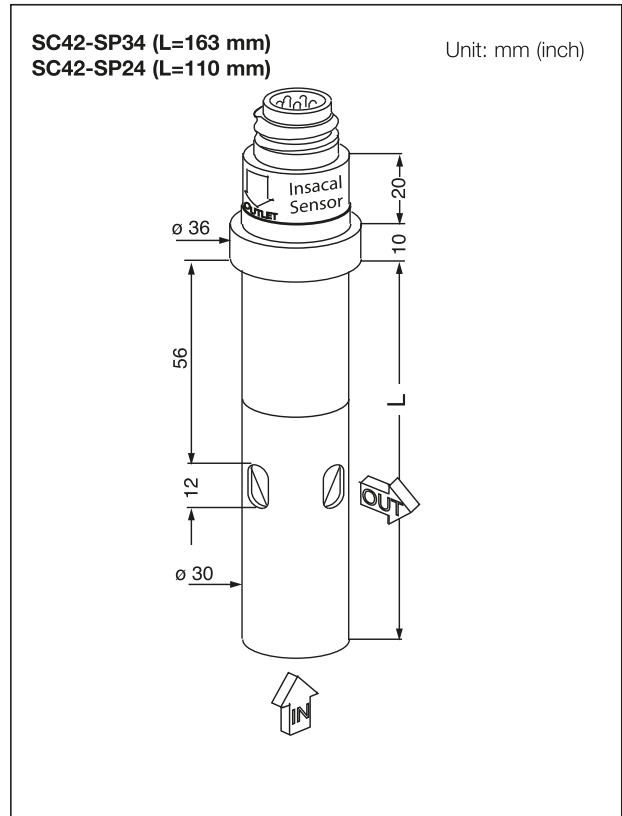


Figure 1 Flow type

Functional Specifications

Model	Temp. element	Cell-constant	Pressure rating	Max. temperature	90% Temp. response	Measurement system
SC42-SP34	Platinum resistor (Pt1000 to DIN)	0.01 cm ⁻¹	10 bar/142 PSIG	150°C/302 °F	< 1 min.	2-electrode system
SC42-SP24	Platinum resistor (Pt1000 to DIN)	0.1 cm ⁻¹	10 bar/142 PSIG	150°C/302 °F	< 3 min.	2-electrode system

The maximum pressure and temperature rating also depend on the actual process conditions. Under certain circumstances it is necessary to test the cell in situ. Additional data is available from Yokogawa.

Note: Stainless steel cells for 2-electrode systems with cell-constants 0.01 and 0.1 cm⁻¹ designed for pressure and temperature ratings of up to 40 bar (PSIG) at 250°C (°F) are available upon request.

Options

- Certificate /Q : Quality inspection certificate
- /M : Material certificate *3.1 Material certificate according EN 10204 is standard delivered with stainless steel version

Epoxy cells for 2- and 4-electrode type with cell-constants 1 and 10 cm⁻¹.

These conductivity sensors have a body of glass-filled epoxy resin. The electrodes are made from graphite impregnated with epoxy resin. This gives the sensors a good chemical resistance and a good reduction of polarisation effects.

Features

- Good chemical resistance.
- Choice in 2- and 4-electrode types.
- Easy installation

General Specifications

Materials

Wetted parts

- a. Body : Glass filled epoxy resin
- b. Electrodes : Graphite impregnated with epoxy resin

Connector plug : /M : Material certificate
 *3.1 Material certificate according EN 10204 is standard delivered with stainless steel version

Weight and immersion length (L in figure)

- Model SC42-EP0. : 270 gram; 193 mm (L)
- Model SC42-EP1. : 220 gram; 160 mm (L)

Options

Certificate /Q : Quality inspection certificate

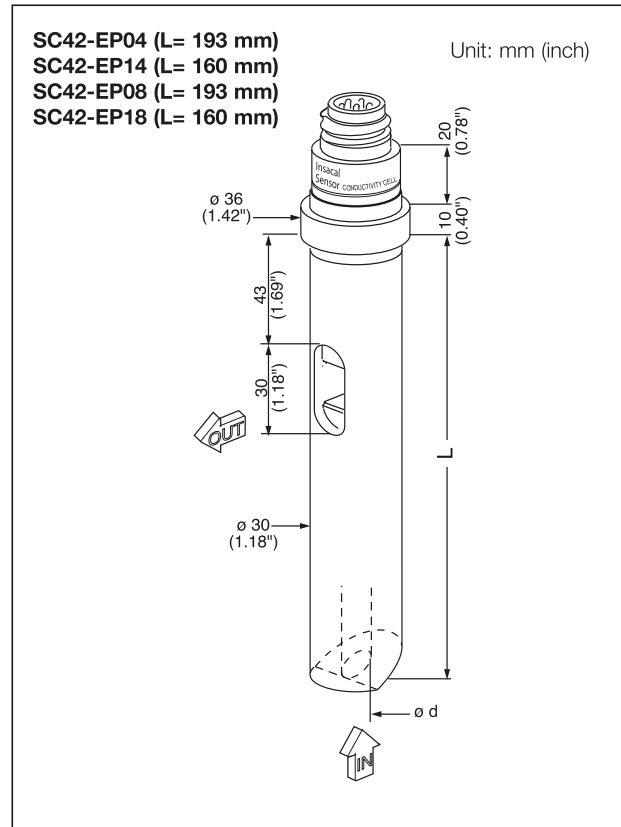


Figure 2 Flow type

Functional Specifications

Model	Temp. element	Cell constant	Pressure rating	Max. temperature	90% Temp. response	Inlet dø	Meas. system
SC42-EP08	Pt1000	10 cm ⁻¹	10 bar/142 PSIG	110°C/230 °F	< 3 min.	5 mm	4-el.ectrode
SC42-EP18	Pt1000	1 cm ⁻¹	10 bar/142 PSIG	110°C/230 °F	< 2 min.	10 mm	4-el.ectrode

The maximum pressure and temperature rating also depend on the actual process conditions. Under certain circumstances it is necessary to test the cell in situ. Additional data is available from Yokogawa.

Features

- High precision of the cell constant (individually calibrated).
- Fast temperature response.
- High pressure/temperature specifications.
- Built-in resistance thermometer, Pt1000 RTD
- Plug-socket cable connection for easy installation and maintenance, meeting IP 65.
- Standardised dimensions for mounting in flow- and immersion fittings.
- Material certificate 3.1 according to EN 10014 are standard included (only wetted metal parts).

Typical Applications

1. Cell constant = 0.01 cm⁻¹

For measurement in very low conductive solutions like pure water, condensate, demineralised water, distilled water, etc.

2. Cell constant = 0.1 cm⁻¹

For measurement of low conductive solutions like boiler feed water, surface water, etc.

Model and Suffix Codes

Model	Suffix	Option	Description
FF40			Flow fitting
Material	-P22 -S22		Polypropylene (PP) Stainless steel (Aisi316L) Polyvinylchloride (PVC)
Options Flange adapters (NPT 1/2" Male lap joint) TC 1 1/2" Triclamp		/FP1 /FP2 /FP3 /FP4 /FS1 /FS2 /FS3 /TC	DN15 PN10 PP DN25 PN10 PP 1/2" ANSI 150lbs PP 1" ANSI 150lbs PP DN15 PN10 SS AISI 316 DN25 PN10 SS AISI 316 1/2" ANSI 150lbs AISI 316 1 1/2" Triclamp 316
Certificate		/M	Material certificate 3.1 according to EN 10024 (For SS wetted parts only)

Parts and Accessories

To connect the conductivity sensors to a transmitter or converter Yokogawa supplies special cables already pretreated and equipped with numbers for easy connection to Yokogawa instruments.

Model	Description	Length
WU40-LH01	Conductivity cable	1.0 m
WU40-LH02	Conductivity cable	2.0 m
WU40-LH05	Conductivity cable	5.5 m
WU40-LH10	Conductivity cable	10 m
WU40-LH15	Conductivity cable	15 m
WU40-LH20	Conductivity cable	20 m
WU40-LH25	Conductivity cable	25 m

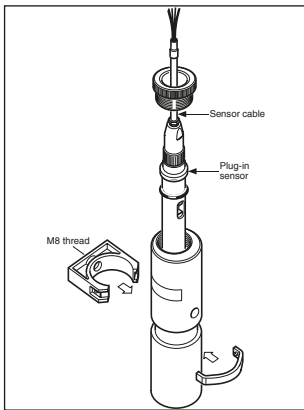
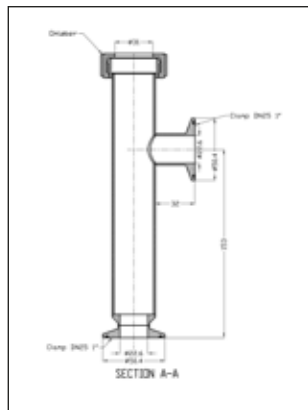
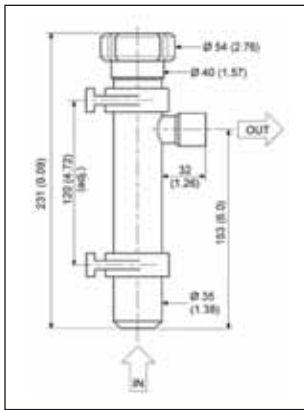


Figure 12 PVC/PP flow fitting

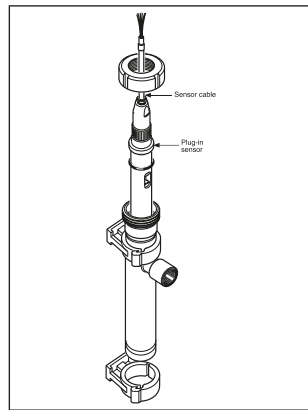
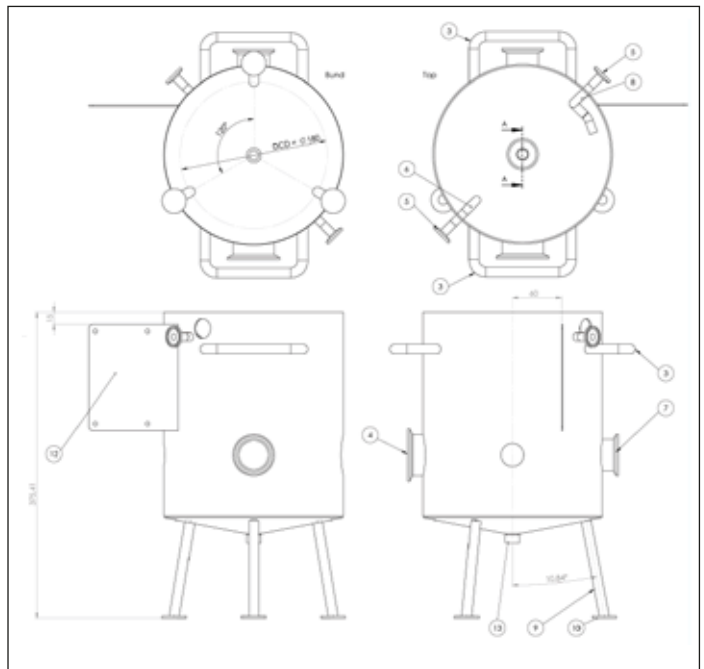


Figure 13 Stainless steel flow fitting



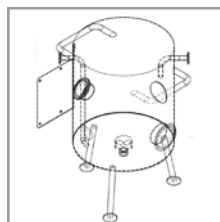
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	std.131.101	Svøb	1
2	std.131.102	Bund	1
3	std.131.103	Håndtag	2
4	std.131.104	2" Clamp Ferrule	1
5	5815010-6	"Beskrivelse"	2
6	std.131.105	"Beskrivelse"	1
7	std.131.106	1 1/2" Clamp Ferrule	1
8	std.131.107	"Beskrivelse"	1
9	std.131.108	Ben	3
10	std.131.109	Fod	3
11	std.131.110		1
12	std.131.111	Beslag	1
13	std.131.112	"Beskrivelse"	1



Cables



Tubing



Calibration Tank



Carry Case



Magnetic Stirers

1. Calibrate In Situ

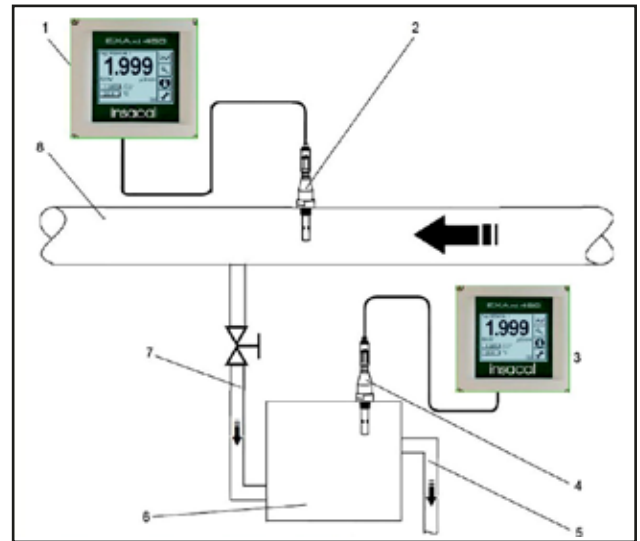
Excellent

Leave in Line, you don't need to break the process line – sanitary sensors

Only a one point calibration – which is all you can do with a conductivity sensor anyway – a cell constant is just a single point

That's absolutely fine if it meets your calibration requirements – cell constant 2% with 4:1 TAR

You can use a decade box or precision resistors to ramp the transmitter up and down also



2. Calibrate By Replicating Install

Use a Recirculation Tank INSATANK T9

Excellent – Best for Open Sensors and Inductive type sensors which are influenced by installation

Simulate the installation of the open sensor as it is in the process.

You can increase and decrease values of conductivity, so multiple point calibration is available.



3. Calibrate By Direct Comparison

In an Agitated Beaker – preferably 1.5 litres or greater (to stop ambient temperature effect)

Excellent – best way to calibrate

The sensors are stable and seeing the exact same sample

You can increase and decrease values of conductivity in the container

You can test the sensor across its full operating range

Do not over agitate – to not ripple surface as CO2 can change sample value



Model	Suffix Code	Option Code	Description
Insacal R-SC4-5			portable conductivity meter in stainless case with handle
	-220		90-220V UK plug
	-110		110V USA version
Sensor			
	-1		SC42-SP34 range 0.0 to 400 uS/cm cc: 0.01cm LOW
	-2		SC42-EP18 range 500uS to 100 mS/cm cc: 1cm MEDIUM
	-3		SC42-EP08 range 500uS to 300mS cc: 10 cm HIGH
Cable			
		c2	WU40-LH02 interconnecting cable
		c5	WU40-LH05 Interconnecting Cable
Flow and Protective Fitting			
		FF40S22NPT	1/2 NPT steel flow fitting
		FF40S22TC	1 1/2 inch Triclamp Flow Fitting electropolished
		FF40P	Polypro Protective holder only
Transport Case			
		I-CASE	Pelican Transit Case with wheels
Calibration Option			
		K5.6 ACR	Full Accredited Calibration of sensor by SRM <0.5% ACCURACY
		K5.7 COMPARISON	Comparison Calibration by reference to other meter <1% ACCURACY
		K5.5 TEMP	5 point temperature calibration
		KF5.9 CALONEL	enhanced ACCURACY by transmitter calibration
Accessories			
	Suffix	Option Code	Description
INSACAL-T9-4			9 LITRE Insacal calibration tank Stainless - with 3 process connections
			Volume: 9 litres
			Electro polished
	-220		Power Supply 220 VAC UK plug
	-110		Power Supply 110 VAC USA USA plug
			Pump Centrifugal pump REC-TL-B11,5
process connection - standard is 1 1/2 inch 2 inch and 2 1/2 triclamp		TC2	Process connection TRI-Clamp 2"
		TC1.5	Process connection TRI-Clamp 1 1/2"
		Ing	Process connection Welding socket PF18 DN25 - OPL 40mm
		pg13.5	Process connection Hamilton Hygienic Socket Sanitært - part no. 242545

Calibration specifications - all carried out at accredited laboratory

Measurement	Measuring Range	Uncertainty	Standard Reference Material Value (SRM)	Method
Temperature	0.01degC to 90 degC	+/- 0.041 degC		KF 5.5
Conductivity - cell constant determination	100 uS/cm	0.34%	DFM 100	KF 5.6
Conductivity - cell constant determination	1 mS/cm 1000 uS/cm	0.27%	DFM 1000	KF 5.6
Conductivity - cell constant determination	10mS/cm	0.26%	DFM 10000	KF 5.6
Conductivity - cell constant determination	100 mS/cm	0.34%	DFM 100000	KF 5.6
Conductivity - by Comparison	1.300 uS to 99.9 uS/cm	0.96%	against reference sensors	KF 5.7
Conductivity - by Comparison	100.0uS to 239 mS/cm	0.53%	against reference sensors	KF 5.7



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