

General Specifications

Model SA11 Smart Adapter

General

The model *SENCOM* Smart Adapter offers full measuring parameter functionality for analogue Yokogawa sensors equipped with Variopin connector and ID-chip. The re-usable Smart Adapter can be connected directly on top of the sensor or, in case of very high process temperatures, through an extension cable.

Two kinds of measurements are offered, pH/ORP and Contact Conductivity.

The pH/ORP measurement is offered in two different modules, SA11-P1 for conventional type pH sensors and SA11-P2 for differential type pH sensors. The Contact Conductivity measurement has one module, the SA11-C1.

Variety of calculated data is selectable. Data can be accessed by a HOST system using reliable digital communication standard MODBUS protocol.

The *SENCOM* Smart Adapter automatically recognizes the installed sensor and prepares the right configuration, thereby creating a plug and play solution which improves the operational excellence in customer application.

The *SENCOM* Smart Adapter offers the best accuracy in measurement with temperature compensation functionality and calibration functionality. Online sensor diagnostics and sensor wellness (e.g glass break detection for pH and polarization detection for Contact Conductivity) provides added reliability, and the integrated logging of events is a useful information source facilitating optimized maintenance.

The *SENCOM* Smart Adapter is designed for the wide range of industrial environments and is tested against the latest standards.

Features

- Re-usable and detachable
- Ambient temperature ranges from -30°C up to +125°C / -22°F up to +257°F
- Online sensor diagnostics, sensor wellness and predictive maintenance
- Measuring parameter: pH and/ or ORP and Contacting Conductivity
- Connection to analogue sensors (provided with ID-chip) with Variopin connector system and Pt1000 temperature element
- Auto recognition of sensor with plug and play capability
- Offers (calculated) data from sensor measurement
- Calibration functionality by trigger from HOST
- Integrated logbook function
- Useable with cable lengths up to 200 meters
- Galvanic isolated electronics to prevent interference from other measurements



1. General Specifications

pH / ORP / rH

1.1 Basic measurement parameters

- Temperature compensated pH/Oxidation Reduction Potential (pH/ORP)
- Temperature
- Glass- and reference impedance

Note: The *SENCOM* Smart Adapter can be used for analogue Yokogawa pH sensors with Variopin connector equipped with an integrated Pt1000 temperature element and integrated ID-chip.

1.2 Measurement

Input Specification

Dual high impedance input ($\geq 5 \times 10^{12} \Omega$) with liquid earth connection. SA11-P1 type however can operate with pH sensors with or without liquid earth.

Input signal range

pH	: -2 to 16 pH
ORP	: -1500 to +1500 mV
Temperature	: -40°C to +260°C (-40 to +500°F)
Impedance	: 0.1kΩ to 10MΩ

1.3 Performance

The specifications are expressed with simulated inputs.

pH:	Linearity	: ± 0.01 pH
	Repeatability	: ± 0.002 pH
	Accuracy	: ± 0.01 pH
	Step response (t_{90})	: ≤ 1 sec.
	Ambient temp. drift	: ≤ 0.0002 pH/°C
ORP:	Linearity	: ± 1 mV
	Repeatability	: ± 0.1 mV
	Accuracy	: ± 1 mV
	Step response (t_{90})	: ≤ 1 sec.
	Ambient temp. drift	: ≤ 0.01 mV/°C

Temperature:

Linearity	: ± 0.3 °C
Repeatability	: ± 0.1 °C
Accuracy	: ± 0.3 °C
Step response (t_{90})	: ≤ 1 sec.
Ambient temp. drift	: ≤ 0.005 °C/°C

Impedance:

Accuracy	: $\leq 10\% \pm 0.3k\Omega$
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1.4 (Calculated) output functions

These are calculated functions using one or more input signals and/or settings. Availability of these functions depends on type of sensor.

pH	ZERO, SLOPE, ITP (by 1, 2 or 3 points calibration) Temperature compensated pH (none, process, matrix, NEN 6411)
ORP	ZERO, SLOPE (by 1 or 2 points calibration) Standard REF, and/or pH compensated ORP
rH	pH compensated ORP
Temp.	Automatic (with offset compensation), manual- or external input

Note: The *SENCOM* 4.0 Smart Adapter can be set by user in pH or mV for ZERO, mV/pH or percentage (%) for SLOPE and Celsius (°C) or Fahrenheit (°F) for temperature.

Contact Conductivity (SC)

1.5 Basic measurement parameters

- Conductivity/Resistivity
- Temperature
- Polarization

Note: The *SENCOM* Smart Adapter can be used for analogue Yokogawa conductivity sensors with Variopin connector equipped with an integrated Pt1000 temperature element and integrated ID-chip.

1.6 Measurement

Input Specification

Two/Four electrodes measurement with square wave excitation for sensors with cell constants (C.C.) from 0.005 to 50.0 cm⁻¹.

Input signal range

Conductivity	: 0 μ S/cm to 250 mS x C.C. (overrange 5000 mS/cm).
Resistivity	: 0.004 kΩ x C.C. to 10 MΩ x C.C. (overrange 100 MΩ x cm)
Temperature	: -40°C to +260°C (-40 to +500°F)

1.7 Performance

The specifications are expressed with simulated inputs, in % of reading.

Conductivity:	Linearity	: $\pm 0.5\%$
	Repeatability	: $\pm 0.1\%$
	(for 0...1 μ S/cm)	: $\pm 0.5\% \pm 0.2nS$
	Accuracy	: $\pm 0.5\% \pm 0.2nS$
	Step response (t_{90}):	≤ 1 sec. (2 decades) ≤ 2 sec. (5 decades)
	Ambient temp. drift:	≤ 100 ppm/°C
Resistivity:	Linearity	: $\pm 0.5\%$
	Repeatability	: $\pm 0.1\%$
	(1M-10MΩ/ CC.)	: $\pm 0.5\%$
	Accuracy	: $\pm 0.5\%$
	Step response (t_{90}):	≤ 1 sec. (2 decades) ≤ 2 sec. (5 decades)
	Ambient temp. drift:	≤ 100 ppm/°C
Temperature:	Linearity	: ± 0.3 °
	Repeatability	: ± 0.1 °C
	Accuracy	: ± 0.3 °C
	Step response (t_{90}):	≤ 1 sec.
	Ambient temp. drift:	≤ 0.005 °C/°C

1.8 (Calculated) output functions

These are calculated functions using one or more input signals and/or settings. Availability of these functions depends on type of sensor.

Conductivity:	Temperature compensated SC (none, linear, NaCl, matrix)
Resistivity:	Temperature compensated RES (none, linear, NaCl, matrix)

Temperature: Automatic (with offset compensation)
manual- or external input
USP <645>: United States Pharmacopoeia, water
conductivity
Concentration: e.g. Total Dissolved Solids

Note: The *SENCOM* Smart Adapter can be set by user in Celsius (°C) or Fahrenheit (°F) for temperature, and in cm⁻¹ or m⁻¹ for Cell Constant.

All parameters

1.9 Architecture of *SENCOM* Smart Adapter with VP connector

A re-usable and detachable housing assembly which consists of galvanic isolated parameter specific electronics. This is provided with an 8 pins Variopin female connector for connection to the analogue sensor, possibly with an extension cable, and a 5 pins male connector for connection to the HOST.

1.10 Electrical

• Output signal

General : Bi-directional digital communication (RS485, half-duplex) with full MODBUS (RTU) support in slave mode.
Data rate : 9600 b/s (8, E, 1) 19200 b/s (8, N, 2)
Refresh rate : 500 ms. (main parameters)
Isolation : 500VAC against input

• Power supply

Operating : 2.7 to 4.5 VDC /15mW max.
4.5 to 5.5 VDC /65mW max.
Isolation : 500VAC against input

1.11 Mechanical and others

Housing (excluding connectors)

Material : Stainless Steel (SS316L)
Shape/size : Cylindrical, Ø21mmx122 mm
Sealings : EPDM, Viton, FKM
IP class : IP67, NEMA250 type 4X
Mounting : Direct on top of the analogue sensor or via optional VP extension cable (max. length 2.95 meter / 9.7ft.); Wall- and Pipe mounting hardware is optional.
Labelling : Adhesive metallized polyester thermal transfer printable sticker

Connectors

8-pins female Variopin connector for connection to the analogue sensor (pH/ORP).

Material : Nickel-plated brass
Insulation : PEEK, UL94-V0
Contacts : Gold-plated

5-pins M9 male connector for connection to the HOST system (RS485 and power supply).

Material : Nickel-plated brass
Insulation : Polybutylene terephthalate (PBT), UL94-V0
Contacts : Gold-plated

Notes: The *SENCOM* Smart Adapter can withstand temporarily ambient temperature to -40°C (-40°F) or +150°C (+302°F) without permanent damage.

When connected using the WE10 extension cable, the maximum operating temperature of the *SENCOM* Smart Adapter is limited to +55°C (+131°F) for pH/ORP application.


1.12 Environmental Conditions


Installation altitude : 2000 m or less
Storage temperature : -30°C up to +50°C
-22°F up to +122°F
Ambient operating Temperature : -30°C up to +125°C
-22°F up to +257°F

1.13 Shipping details

LxWxH : 300x100x75 mm
11.8x3.9x2.9 inch
Weight : Approximately 120 gr.

1.14 Regulatory Compliance

Model	Suffix	Suffix	Suffix	Suffix
SA11	-C1		-P1	-P2
Installation	Overvoltage Category I Pollution Degree 2 Altitude 2000 m or less			
Intrinsic Safety Input parameters	Ui: 6.1 Vdc Ii: 200 mA Pi: 300 mW Ci: 15µF Li: 0.01 mH			
Output parameters	Uo: 7.8 Vdc Io: 100 mA Po: 195 mW Co: 600 nF Lo: 1.78 mH		Uo: 6.6 Vdc Io: 100 mA Po: 165 mW Co: 600 nF Lo: 1.78 mH	
Certificates	<p>ATEX: Directive: 2014/34/EU Standards: EN IEC 60079-0:2018; EN 60079-11: 2012 (/IS 01: 2014) Certificate no.: FM20ATEX0001X Control Drawing: D&E 2019-024-A62 Rating:  II 1G Ex ia IIC T3...T6 Ga</p> <p>IECEX: Directive: N/A Standards: IEC 60079-0:2017; IEC 60079-11: 2011 Certificate no.: IECEX FMG 20.0003X Control Drawing: D&E 2019-024-A62 Rating: Ex ia IIC T3...T6 Ga</p> <p>FM-United States: Directive: N/A Standards: FM 3600:2018, FM 3610:2018, FM 3810:2018 ANSI/UL 60079-0:2019, ANSI/UL 60079-11:2014 Certificate no.: FM20US0004X Control Drawing: D&E 2019-024-A60 Rating: IS CL I, DIV 1, GP ABCD, T3...T6 CL I, ZN 0, Aex ia IIC, T3...T6, Ga</p> <p>FM-Canada: Directive: N/A Standards: CAN/CSA-C22.2 No. 60079-0:2019 CAN/CSA-C22.2 No. 60079-11:2014 Certificate no.: FM20CA0002X Control Drawing: D&E 2019-024-A62 Rating: IS, SI, CL I, DIV 1, GP ABCD, T3...T6 CL I, ZN 0, Ex ia IIC, T3...T6 Ga</p> <p>NEPSI: Directive: N/A Standards: GB 3836.1-2010, GB 3836.4-2010, GB 3836.20-2010 Certificate no.: GYJ21.2893X Control Drawing: D&E 2019-024-A62 Rating: Ex ia IIC T3...T6 Ga</p>			

<p>Certificates (Cont'd)</p>	<p>PESO: Directive: N/A Standards: EN IEC 60079-0:2018; EN 60079-11: 2012 (/IS 01: 2014) Equipment no.: P501815/1 Control Drawing: D&E 2019-024-A62 Rating:  II 1G Ex ia IIC T3...T6 Ga Remark: PESO approval is based on ATEX approval FM20ATEX0001X, iss. 1 – 07.04.2020</p> <p>TS: Directive: N/A Standards: IEC 60079-0:2017; IEC 60079-11: 2011 ID no.: TD04000C Control Drawing: D&E 2019-024-A62 Rating: Ex ia IIC T3...T6 Ga Remark: TS Safety Label is based on IECEx approval IECEx FMG 20.0003X</p> <p>KCs: Directive: N/A Standards: IEC 60079-0:2017; IEC 60079-11: 2011 Certificates: SA11-C1-CG: 21-KA4BO-0159X SA11-P1-CG: 21-KA4BO-0160X SA11-P2-CG: 21-KA4BO-0160X Control Drawing: D&E 2019-024-A62 Rating: Ex ia IIC T3...T6 Ga Remark: Korea Ex certificate is based on IECEx approval IECEx FMG 20.0003X, iss. 0</p> <p>EAC Ex: Directive: N/A Standards: GOST 31610.0-2014, GOST 31610.11-2014, GOST IEC 60079-14-2013 Certificate: RU C-NL.AA87.B.00754 Control Drawing: D&E 2019-024-A62 Rating: 0Ex ia IIC T6...T3 Ga X Remark: Korea Ex certificate is based on IECEx approval IECEx FMG 20.0003X, iss. 0</p>
<p>Specific conditions of use</p>	<p>WARNING - Potential electrostatic charging hazard – When the equipment is used in hazardous locations, avoid any actions which generate electrostatic discharge, such as rubbing with a dry cloth. AVERTISSEMENT - Risque potentiel de charge électrostatique - Lorsque l'équipement est utilisé dans des zones dangereuses, évitez toute action générant une décharge électrostatique, comme un frottement avec un chiffon sec.</p> <p>WARNING – The Input Port connections incorporate an earthed conductor. Care shall be taken to prevent ignition-capable earth currents resulting from differing earth potentials between the SA11 and Host. Refer to section 5-3 of manufacturer's Start-Up Manual 12A06S01 for instructions concerning earthing and isolation of the SA11. AVERTISSEMENT - Les connexions du port d'entrée comportent un conducteur mis à la terre. Des précautions doivent être prises pour éviter les courants de terre capables d'allumage résultant de potentiels de terre différents entre le SA11 et l'hôte. Reportez-vous à la section 5-3 du manuel de démarrage du fabricant 12A06S01 pour les instructions concernant la mise à la terre et l'isolement du SA11.</p> <p>Ambient temperature conditions depend on the temperature class: T6: $-30^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$ T5: $-30^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$ T4: $-30^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$ T3: $-30^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$</p>

EMC	Directive: Standards:	2014/30/EU EN 61326-1:2013, Class A, Table 2 (for use in industrial locations) EN 55011:2016/A1:2017, AS/NZS CISPR11
LVD	Directive: Standards:	2014/35/EU IEC 61010-1: EN 61010-1:2010 EN 61010-2-030:2010 EN 60529:1991/A1:2000/A2:2013 ANSI/UL 61010-1: 2015 CAN/CSA C22.2 No. 61010-1:2012 (R2017)
RoHS	Directive:	2011/65/EU and Commission Delegated Directive (EU) 2015/863 amending Annex II, per EN-IEC 63000: 2018
Others CE KC RCM	Directive:	768/2008/EC CE-mark has been affixed on the product in 2018 for the first time For Safety requirements EEE; Registration no. R-R-YPA-SA11 For EMC requirements

2. Model and Suffix code

Model	Suffix code	Option code	Description
SA11			SENCOM Smart Adapter
Measuring Parameter	-C1 -P1 -P2		Contact Conductivity (SC) pH/ORP, conventional pH/ORP, differential
Type	-AA -CB -CD -CG -CH -CR		General purpose IS for ATEX, IECEx, PESO, TS IS for FM-US, FM-Canada IS for KCs IS for NEPSI IS for EACEx
Region (Note)	-N		Not specified
Connection type	-VS		Variopin connector
Style (Note)	-NN		Always -NN
Option (Note)		/UM	Pipe and wall mounting hardware

Note: Region code, Style code and Option code is not affecting intrinsic safety (IS)

3. Dimensions

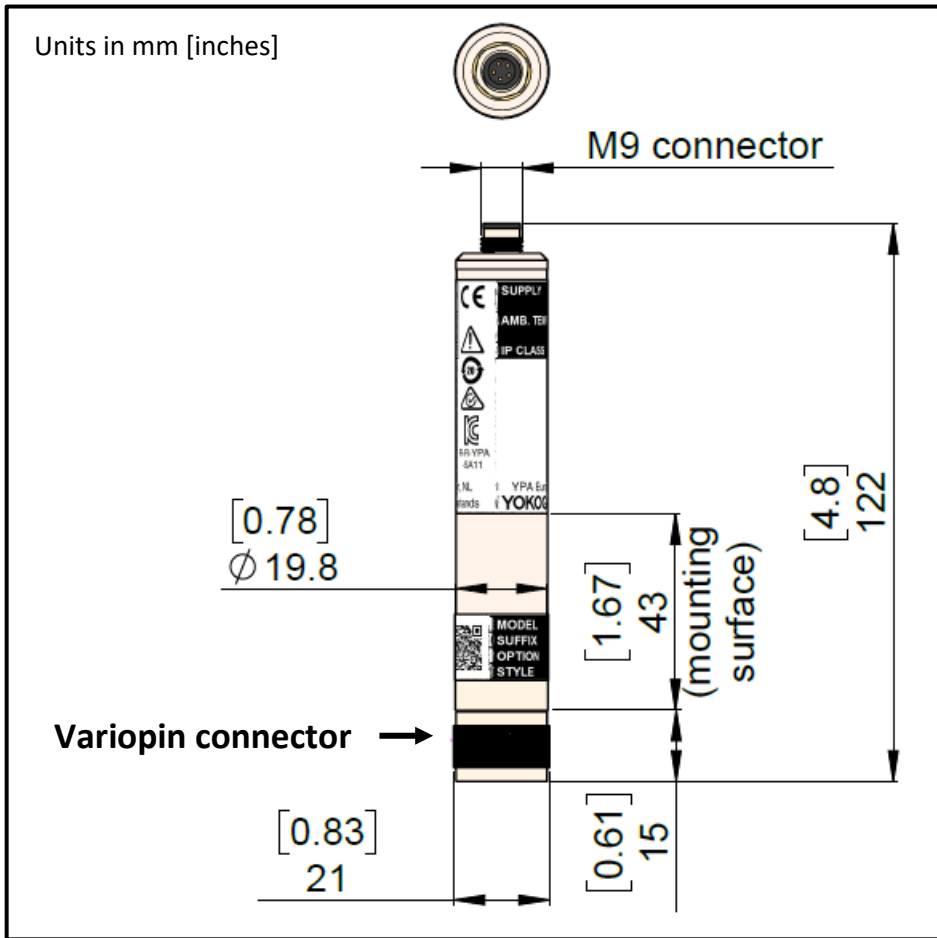


Figure 1: Dimensions SA11

Addendum 1: Typical Installations

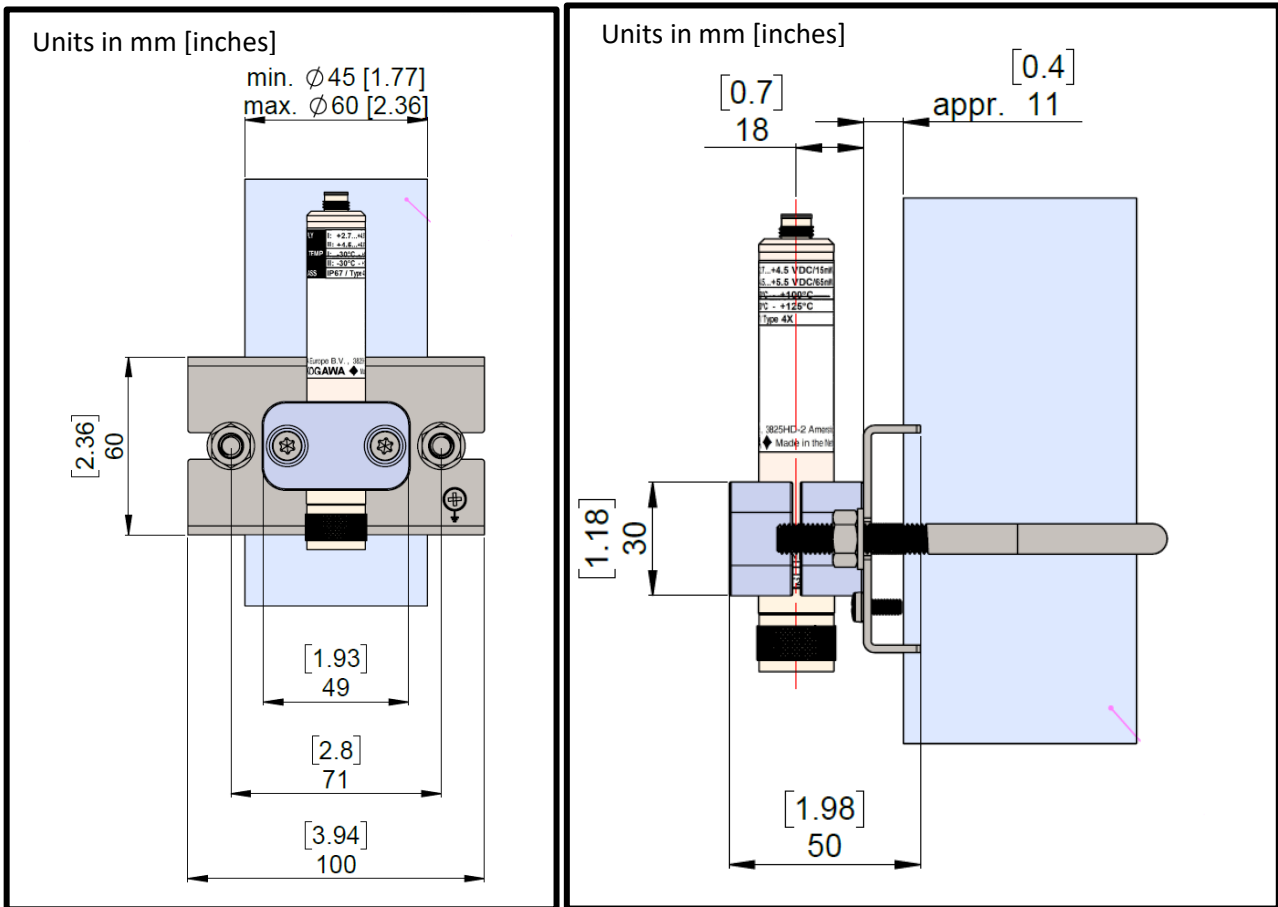


Figure 2: Example pipe mounting using option /UM

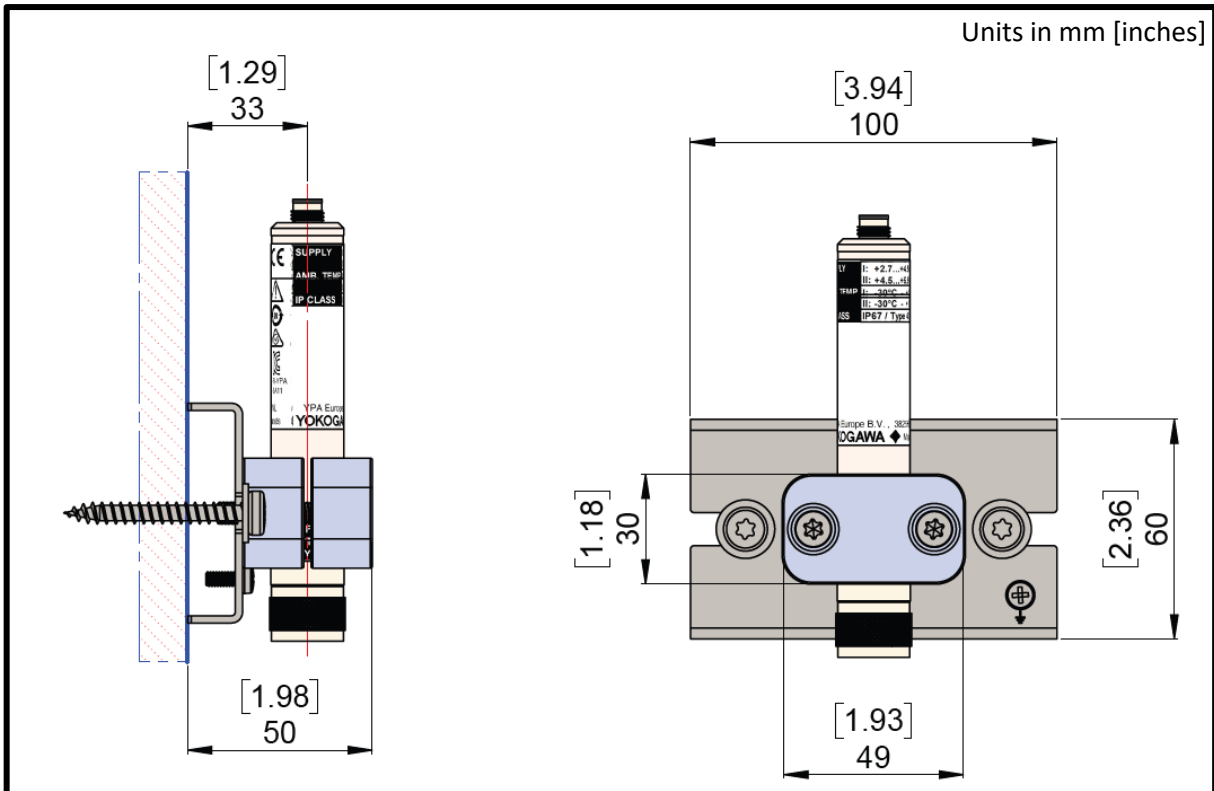


Figure 3: Example wall mounting using option /UM

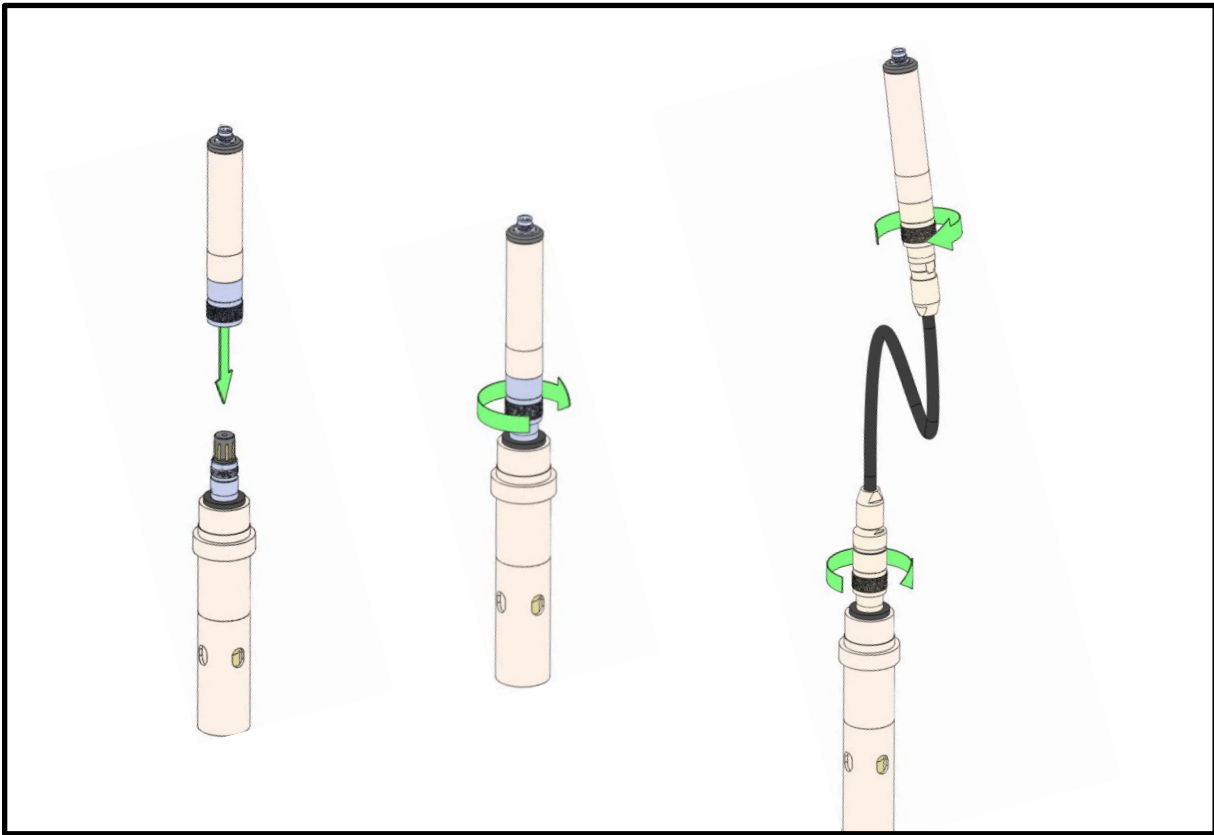


Figure 4: Mounting SA11 on sensor directly or with extension cable

Notes:

SA11-P1 to be used in combination with WE10-H-D-003-V1 cable.

SA11-P2 and SA11-C1 to be used in combination with WE10-H-D-003-V2 cable.

Addendum 2: Available models

MS-code
SA11-C1-AA-N-VS-NN
SA11-P1-AA-N-VS-NN
SA11-P2-AA-N-VS-NN
SA11-C1-CB-N-VS-NN
SA11-P1-CB-N-VS-NN
SA11-P2-CB-N-VS-NN
SA11-C1-CD-N-VS-NN
SA11-P1-CD-N-VS-NN
SA11-P2-CD-N-VS-NN
SA11-C1-CG-N-VS-NN
SA11-P1-CG-N-VS-NN
SA11-P2-CG-N-VS-NN
SA11-C1-CH-N-VS-NN
SA11-P1-CH-N-VS-NN
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SA11-P2-CR-N-VS-NN

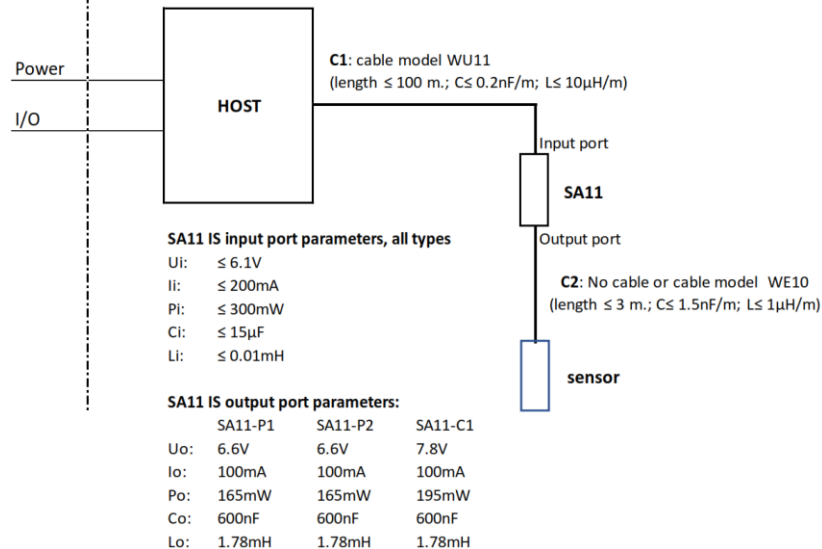
Addendum 3: Control Drawings

D&E 2019-024-A60: Control Drawing United States

Non-hazardous Location

Hazardous Location

IS CL I, DIV 1, GP ABCD T3 / T4 / T5 / T6, Ga
Ta 80°C / 80°C / 60°C / 40°C



Specific conditions of use:

- Potential electrostatic charging hazard – When the equipment is used in hazardous locations, avoid any actions which generate electrostatic discharge, such as rubbing with a dry cloth.
- Potential ignition-capable earth currents – The Input Port connections incorporate an earthed conductor.

Care shall be taken to prevent ignition-capable earth currents resulting from differing earth potentials between the SA11 and Host. Refer to section 5-3 of manufacturer's Start-Up Manual 12A06S01 for instructions concerning earthing and isolation of the SA11.

Remarks:

1. No revision to this drawing without prior approval of FM.
2. Installation must be in accordance with the National Electrical Code (ANSI/NFPA 70), ANSI/ISA-RP12.06.01, and relevant local codes.
3. The SA11 shall be installed to a certified intrinsically safe HOST with the following maximum values:
Uo= 6.1 V, Io = 200 mA, Po = 300mW
4. SA11 Model code:

Model	Suffix Codes	Option Codes
SA11	-ab-cd-e-fg-hi	/j

Ab	Measuring parameter:	C1	Contact Conductivity
		P1	pH/ORP, conventional
		P2	pH/ORP, differential
cd	Type:	CD	IS for FM, CSA
e	Region:		One alphanumeric character (A to Z, 0 to 9 or hyphen)
			Region code specification not affecting intrinsic safety
fg	Connection type:	VS	Variopin connector
hi	Spare code:		Two alphanumeric characters (A to Z, 0 to 9 or hyphen).
			Spare code specification not affecting intrinsic safety
J	Option code:		Up to ten alphanumeric characters (A to Z, 0 to 9 or hyphen)

WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS

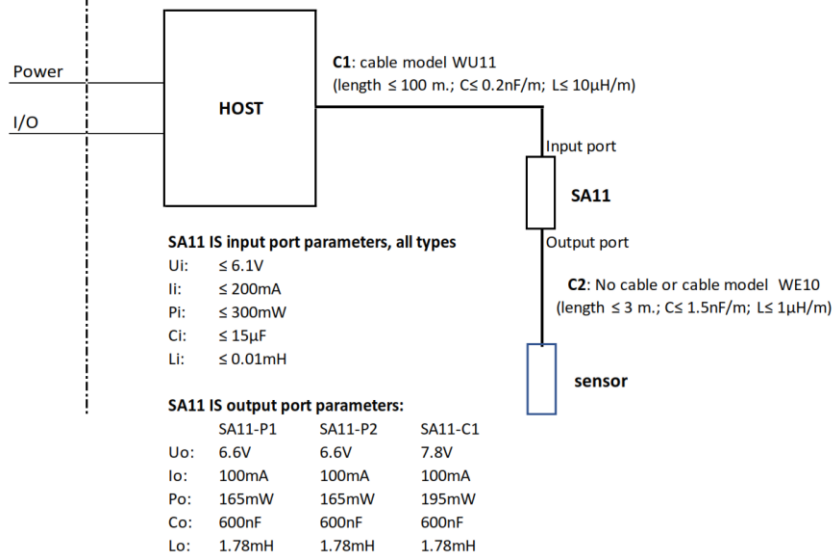
WARNING – POTENTIAL IGNITION-CAPABLE EARTH CURRENTS - SEE INSTRUCTIONS

D&E 2019-024-A61: Control Drawing Canada

Non-hazardous Location

Hazardous Location

IS, SI, CL I, DIV 1, GP ABCD T3 / T4 / T5 / T6, Ga
 Ta 80°C / 80°C / 60°C / 40°C



Specific conditions of use:

- Potential electrostatic charging hazard – When the equipment is used in hazardous locations, avoid any actions which generate electrostatic discharge, such as rubbing with a dry cloth.
- Potential ignition-capable earth currents – The Input Port connections incorporate an earthed conductor. Care shall be taken to prevent ignition-capable earth currents resulting from differing earth potentials between the SA11 and Host. Refer to section 5-3 of manufacturer’s Start-Up Manual 12A06S01 for instructions concerning earthing and isolation of the SA11.

Remarks:

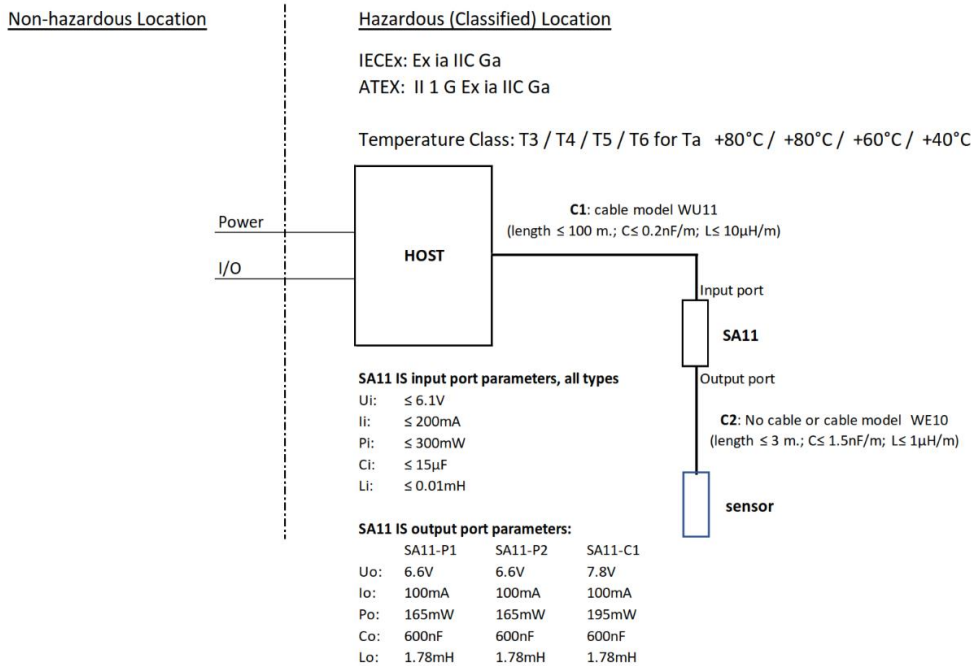
1. No revision to this drawing without prior approval of FM.
2. Installation must be in accordance with Canadian Electrical Code (CEC) CSA C22.1, and relevant local codes.
3. The SA11 shall be installed to a certified intrinsically safe HOST with the following maximum values:
 Uo = 6.1 V, Io = 200 mA, Po = 300mW
4. SA11 Model code:

Model	Suffix Codes	Option Codes
SA11	-ab-cd-e-fg-hi	/j

- ab Measuring parameter: C1 Contact Conductivity
 P1 pH/ORP, conventional
 P2 pH/ORP, differential
- cd Type: CD IS for FM, CSA
- e Region: One alphanumeric character (A to Z, 0 to 9 or hyphen)
 Region code specification not affecting intrinsic safety
- fg Connection type: VS Variopin connector
- hi Spare code: Two alphanumeric characters (A to Z, 0 to 9 or hyphen).
 Spare code specification not affecting intrinsic safety
- j Option code: Up to ten alphanumeric characters (A to Z, 0 to 9 or hyphen)

5. WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE INSTRUCTIONS
 AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES – VOIR LES INSTRUCTIONS
 WARNING – POTENTIAL IGNITION-CAPABLE EARTH CURRENTS - SEE INSTRUCTIONS
 AVERTISSEMENT – COURANTS DE TERRE POTENTIONNELS CAPABLES À L'ALLUMAGE - VOIR LES INSTRUCTIO

D&E 2019-024-A62: Control Drawing ATEX/IECEX



Specific conditions of use:

- Potential electrostatic charging hazard – When the equipment is used in hazardous locations, avoid any actions which generate electrostatic discharge, such as rubbing with a dry cloth.
- Potential ignition-capable earth currents – The Input Port connections incorporate an earthed conductor. Care shall be taken to prevent ignition-capable earth currents resulting from differing earth potentials between the SA11 and Host. Refer to section 5-3 of manufacturer's Start-Up Manual 12A06S01 for instructions concerning earthing and isolation of the SA11.

Remarks:

1. No revision to this drawing without prior approval of FM.
2. Installation must be in accordance with IEC60079-14 and relevant local codes.
3. The SA11 shall be installed to a certified intrinsically safe HOST with the following maximum values:
Uo = 6.1 V, Io = 200 mA, Po = 300mW
4. SA11 Model code:

Model	Suffix Codes	Option Codes
SA11	-ab-cd-e-fg-hi	/j

ab	Measuring parameter:	C1	Contact Conductivity
		P1	pH/ORP, conventional
		P2	pH/ORP, differential
cd	Type:	CB	IS for ATEX, IECEx, PESO, TS
e	Region:	One alphanumeric character (A to Z, 0 to 9 or hyphen) Region code specification not affecting intrinsic safety	
fg	Connection type:	VS	Variopin connector
hi	Spare code:	Two alphanumeric characters (A to Z, 0 to 9 or hyphen). Spare code specification not affecting intrinsic safety	
j	Option code:	Up to ten alphanumeric characters (A to Z, 0 to 9 or hyphen)	

WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
WARNING – POTENTIAL IGNITION-CAPABLE EARTH CURRENTS – SEE INSTRUCTIONS

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