General Specifications

Model SA11
Smart Adapter

GS 12A06S01-00EN-P

■ Overview

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 a 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 (≥5x10^{12} Ω) 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	: ±0.001 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 ºC
	Repeatability	: ≤0.1 ºC
	Accuracy	: ≤0.3 ºC
	Step response (t_{90})	: ≤ 1 sec.
	Ambient temp. drift	: ≤ 0.005 °C/°C
Glass/Ref impedance:		
	Accuracy	: 10% ± 0.3kΩ

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	
Temperature:	Automatic (with offset compensation),manual- or external input

Note: The SENCOM 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 µS/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	: ±0.5%
	Repeatability	: ±0.1%
	(for 0...1µS/cm)	: ±0.5%± 0.2nS)
	Accuracy	: ±0.5% ± 0.2nS
	Step response (t90)	: ≤ 1 sec. (2 decades)
		: ≤ 2 sec. (5 decades)
	Ambient temp. drift	: ≤ 100 ppm/°C
Resistivity	Linearity	: ±0.5%
	Repeatability	: ±0.1%
	(1M-10MΩ/ CC.)	: ±0.5%
	Accuracy	: ±0.5%
	Step response (t90)	: ≤ 1 sec. (2 decades)
		: ≤ 2 sec. (5 decades)
	Ambient temp. drift	: ≤ 100 ppm/°C
Temperature	Linearity	: ±0.3 º
	Repeatability	: ±0.1 ºC
	Accuracy	: ±0.3 ºC
	Step response (t90)	: ≤ 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.

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

Table 1 : Regulatory Standards

Equipment ratings			
Item	**Description**	**Values**	
Electrical parameters	Maximum input voltage	Ui= 6.1 VDC	
	Maximum input current	Ii= 200 mA	
	Maximum input power	Pi= 300mW	
	Maximum internal capacitance	Ci= 15µF	
	Maximum internal inductance	Li= 0.01mH	
	Description	**Values**	
		SA11-P1 / -P2	SA11-C1
	Maximum output voltage	Uo= 6.6 VDC	Uo= 7.8 VDC
	Maximum output current	Io= 100 mA	Io= 100 mA
	Maximum output power	Po= 165mW	Po= 195mW
	Maximum external capacitance	Co= 600nF	Co= 600nF
	Maximum external inductance	Lo= 1.78mH	Lo= 1.78mH
Temperature class	T6	-30°C ≤ Ta ≤ +40°C	
	T5	-30°C ≤ Ta ≤ +60°C	
	T4	-30°C ≤ Ta ≤ +80°C	
	T3	-30°C ≤ Ta ≤ +80°C	
Specific conditions of use ⚠ **WARNING**	Potential electrostatic charging hazard: When the equipment is used in hazardous locations, avoid any action which generate electrostatic discharge, such as rubbing with a dry cloth. Potential ignition hazard: 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 When the SA11 has been connected to non-intrinsically safe equipment which exceeds the restrictions regarding the SA11 input circuits, the SA11 is not suitable anymore for intrinsically safe use.		
Regulatory compliances			
Item	**Description, Approval, Certification**		
ATEX (EU, UK)	ATEX approval: FM 20ATEX0001X CE 0344 Ex II 1 G Ex ia IIC T3…T6 Ga Control Drawing: D&E 2019-024-A62 Applied standards: • EN IEC 60079-0 • EN 60079-11		
IECEx	IECEx approval: IECEx FMG 20.0003X Ex ia IIC T3…T6 Ga Applied standards: • IEC 60079-0 • IEC 60079-11		

FM (Canada)	FM approval Canada: FM20CA0002X IS SI CL I, DIV 1, GP ABCD, T3…T6 CL I, ZN 0, Ex ia IIC, T3…T6 Ga Control Drawing: D&E 2019-024-A61 Applied standards: • CAN/CSA-C22.2 No. 60079-0 • CAN/CSA-C22.2 No. 60079-11 • CAN/CSA-C22.2 No. 61010-1
FM (United States)	FM approval United States: FM20US0004X IS CL I, DIV 1, GP ABCD, T3…T6 CL I, ZN 0, AEx ia IIC, T3…T6 Ga Control Drawing: D&E 2019-024-A60 Applied standards: • FM Class 3600 • FM Class 3610 • FM Class 3810 • ANSI/ISA 60079-0 • ANSI/ISA 60079-11 • ANSI/ISA 61010-1
NEPSI (China)	NEPSI approval: GYJ21.2893X Ex ia IIC T3…T6 Ga Applied standards: • GB 3836.1 • GB 3836.4 • GB 3836.20
PESO (India)	PESO approval: PESO approval is based on ATEX approval FM 20ATEX0001X, issue 1 – 07.04.2020 Equipment reference numbers: P501815/1 Applied standards: • EN IEC 60079-0 • EN 60079-11
TS (Taiwan)	TS approval: TS Safety Label is based on IECEx approval IECEx FMG 20.0003X Identification Number: TD04000C Applied standards: • IEC 60079-0 • IEC 60079-11
KCs (Korea)	Korea Ex certificates: Korea Ex certificate is based on IECEx approval IECEx FMG 20.0003X, issue 0 and applicable for the following models: SA11-C1-CG-*-VS-**/*: 21-KA4BO-0159X SA11-P1-CG-*-VS-**/*: 21-KA4BO-0160X SA11-P2-CG-*-VS-**/*: 21-KA4BO-0160X Applied standards: • IEC 60079-0 • IEC 60079-11
EACEx (Russia)	EAC Ex certificate: RU C-NL.AA87.B.00754 0Ex ia IIC T6…T3 Ga X Applied standards: • GOST 31610.0 (IEC 60079-0) • GOST 31610.11 (IEC 60079-11) • GOST IEC 60079-14
Others	

EMC	EU Directive 2014/30/EU (European Union) Electromagnetic Compatibility Regulations 2016 (UK) RCM (Australia/New Zealand) KC (Korea), Registration no. R-R-YPA-SA11 GB 30439 (China)
CE	CE-mark has been affixed on the product in 2018 for the first time
UKCA	The UKCA mark has been affixed on the product in 2022 for the first time.

■ 2. Model and Suffix Codes

Table 2 : Model and suffix codes for SA11

Model	Suffix Code	Option code	Description
SA11			SENCOM Smart Adapter
Measuring parameter	-C1		Contact Conductivity (SC)
	-P1		pH/ORP, conventional
	-P2		pH/ORP, differential
Type	-AA		General purpose
	-CB		IS for ATEX, IECEx, PESO, TS
	-CD		IS for FM-US, FM-Canada
	-CG		IS for KCs
	-CH		IS for NEPSI
	-CR		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. Dimensional Drawings

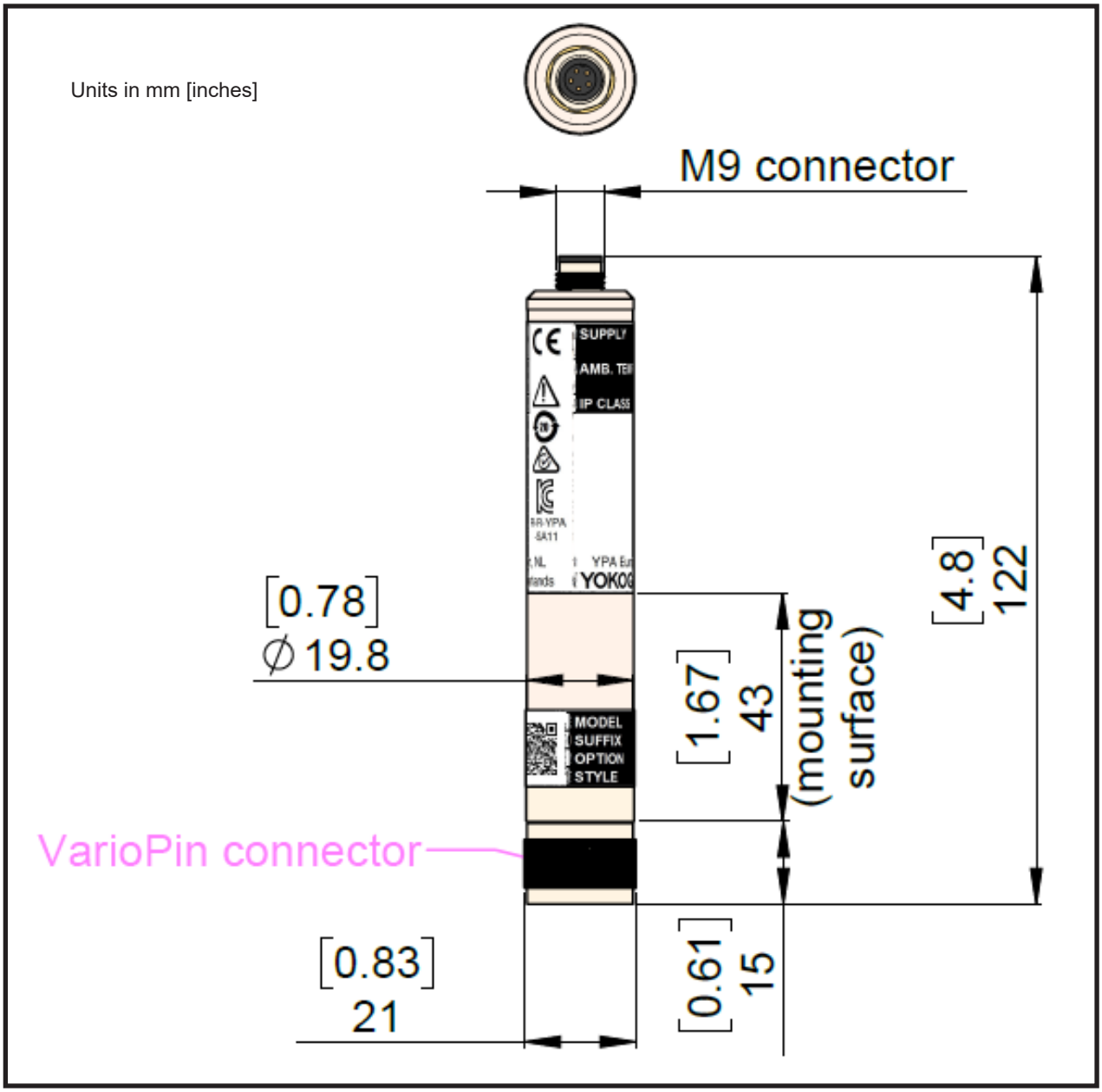


Figure 1 : Dimensions SA11

■ Addendum 1: Typical Installations

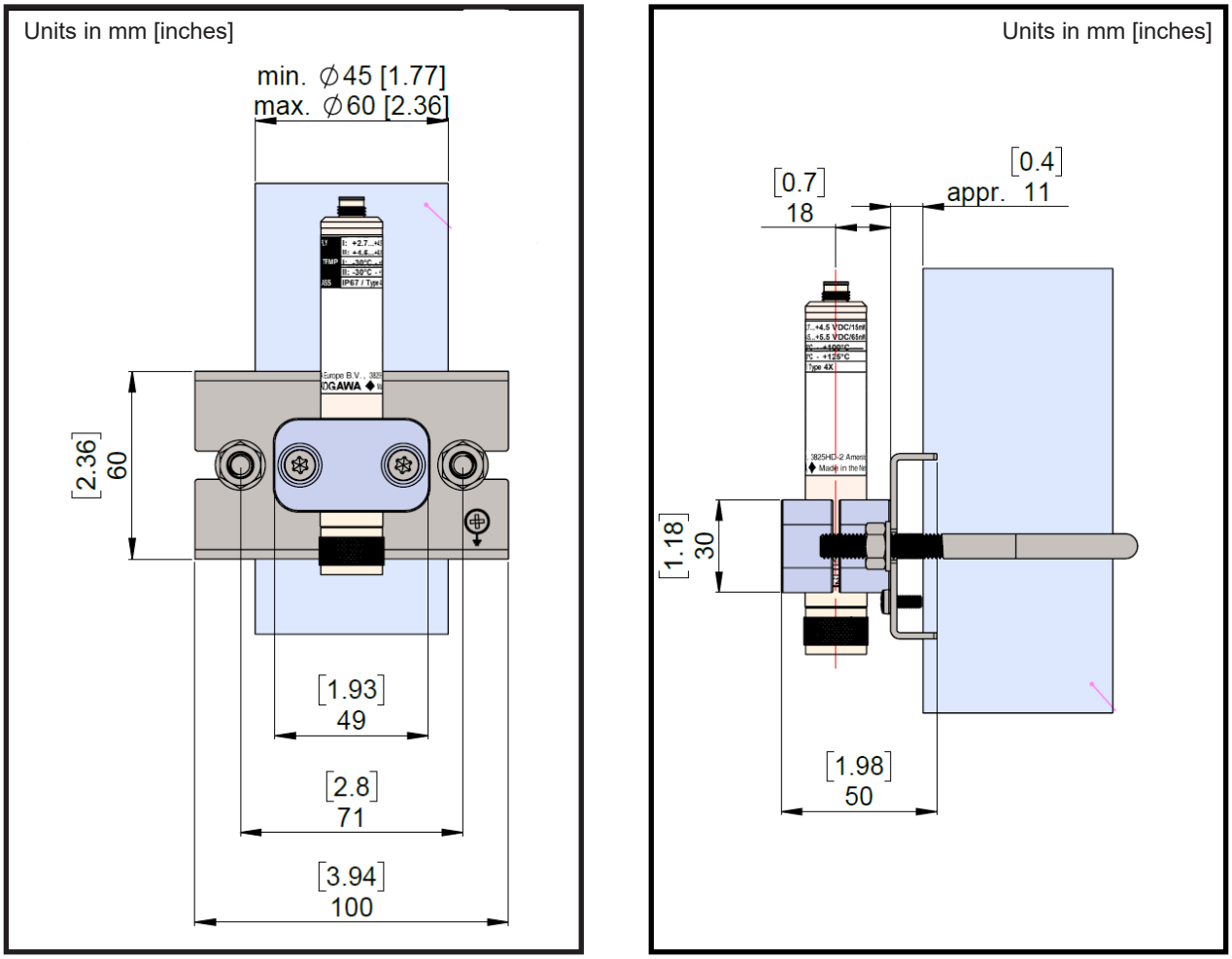


Figure 2: Example pipe mounting using option /UM

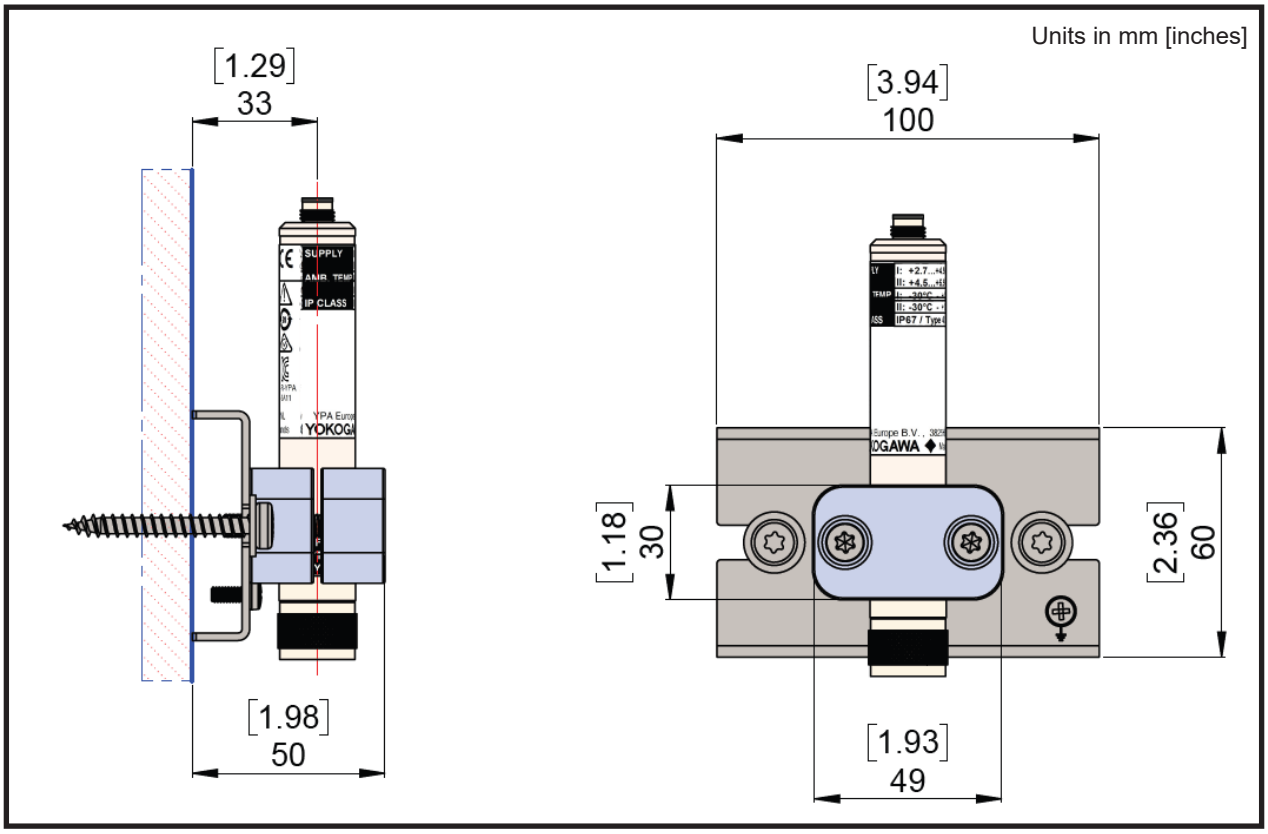


Figure 3: Example wall mounting using /UM

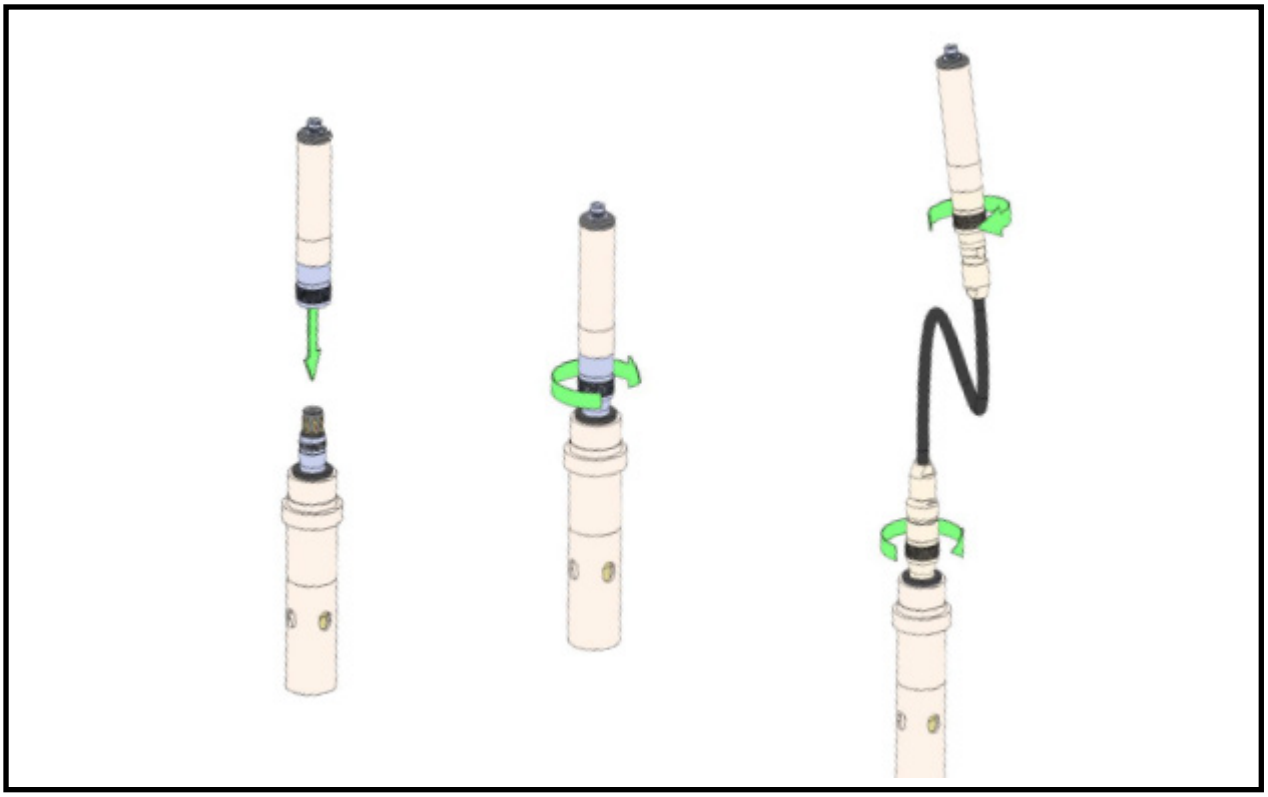


Figure 4: Mounting SA11 on sensor directly or with extension cable

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.

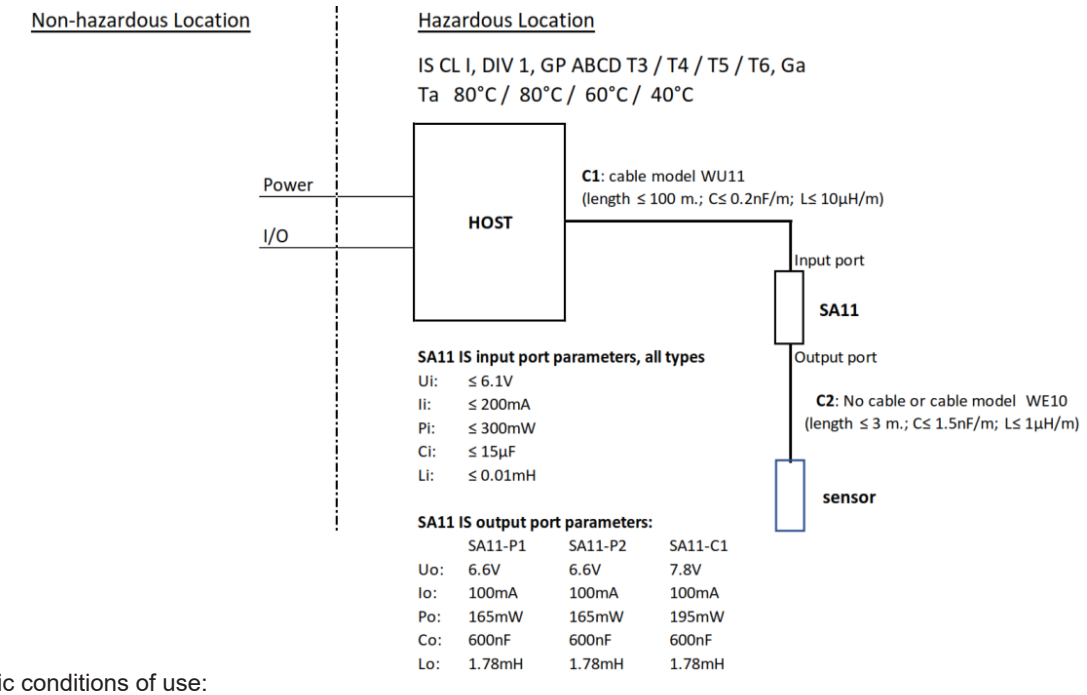
■ Addendum 2: Available Models

Table 3 : 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
SA11-P2-CH-N-VS-NN
SA11-C1-CR-N-VS-NN
SA11-P1-CR-N-VS-NN
SA11-P2-CR-N-VS-NN

■ Addendum 3: Control Drawings

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



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:

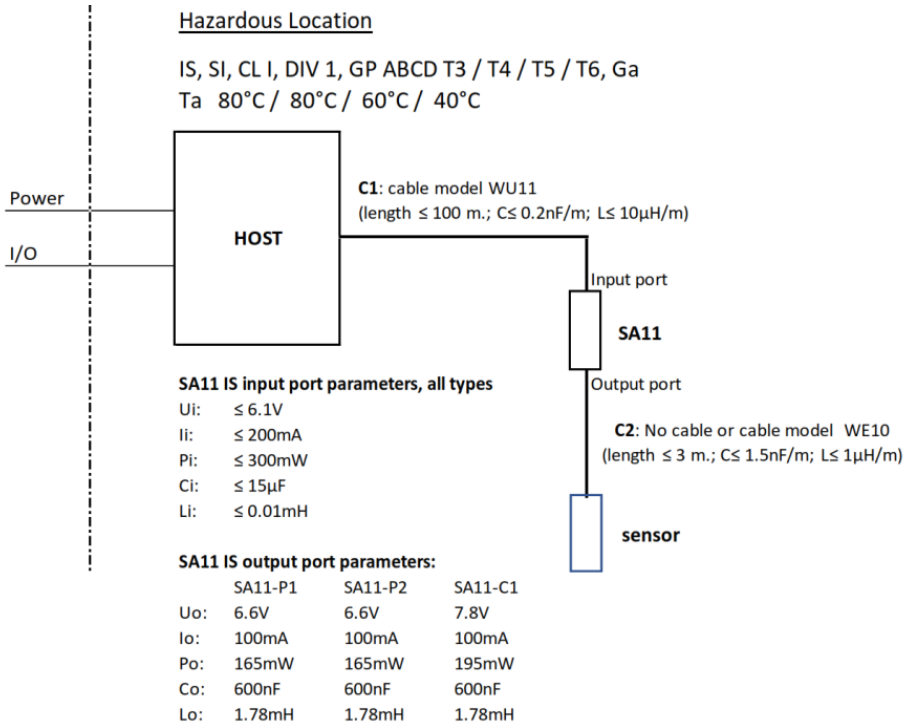
Uo= 6.1 V, Io = 200 mA, Po = 300mW

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

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



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.

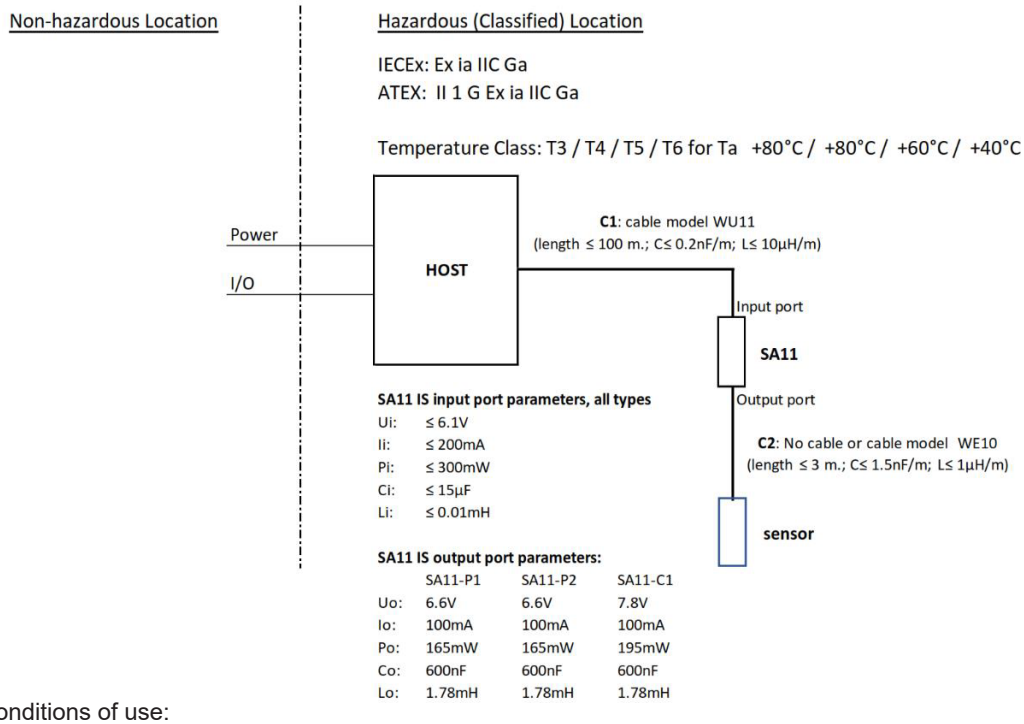
Remarks:

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 - POTENTIONAL ELECTROSTATIC CHARGING HAZARD – SEE INSTRUCTIONS
AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES – VOIR LES INSTRUCTIONS
WARNING - POTENTIONAL 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
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