

Technical Information

SENCOM 4.0 Platform Grounding

TI 12A06S01-01EN-P



■ TABLE OF CONTENTS

Introduction.....	3
1. General.....	4
1.1 What is grounding?.....	4
1.2 Why is Electrical grounding important?.....	4
1.3 SENCOM and grounding.....	4
2. Wiring and installation.....	6
2.1 Wired connection.....	6
2.2 Connection in daisy chain concept.....	6
2.3 Connection concept UM33A-S.....	7
2.4 Wireless connection.....	7
3. Typical installations.....	8
3.1 Installation SA11 with IB100 in a laboratory environment.....	8
3.2 Typical installation SA11 with FLXA402.....	8
3.3. Typical installations FLXA402 (multiple parameters).....	9
4. Grounding.....	10
4.1 Grounding with wired HOST system.....	10
4.2 Grounding when having different ground potentials (Ground loop currents).....	10
4.3 Grounding when having no different ground potentials.....	11
4.4 Grounding with wireless HOST system.....	12
5. Related documents.....	13
5.1 General Specifications.....	13
5.2 User's Manual.....	13
5.3 Technical Information.....	13

■ INTRODUCTION

This technical information will focus only on the grounding of the SENCOM smart adapter SA11 installations and various hosts.

SENCOM 4.0 PLATFORM

Yokogawa is a recognized leader for providing reliable and creditable measurement solutions for process control applications. Building on this experience, Yokogawa has developed a new analyzer solutions platform featuring superior measurement technology to deliver enhanced value throughout the product lifecycle.

To facilitate optimal processes and improve efficiency of personnel, Yokogawa has placed a strong focus on our Digital SMART Sensor SENCOM 4.0 Platform.

This innovative analyzer platform provides full visualization and enhanced process uptime by optimizing maintenance, reducing configuration time, and simplifying in-field maintenance and calibration.

Following Yokogawa’s commitment to co-innovation, this generation of process control solutions was made in collaboration with our customers. Yokogawa’s next-generation solutions combine measurement, control, and information for more connected technologies that achieve results like never before.

Sencom Smart adapter SA11

Conventional SMART sensors come with integrated electronics on top of an analog sensor. Once the sensor reaches the end of its lifetime, the still functioning electronics must also be thrown away, adding to global waste.

The SENCOM 4.0 platform consists of a reusable SMART adapter, requiring only the analog sensor to be disposed of when it reaches the end of its lifetime. With the SENCOM 4.0 platform, Yokogawa delivers reduced costs and waste while contributing to its long-term business goals of a sustainable future for all.

The reusable smart adapter, SA11, offers full measuring parameter functionality of analog sensors equipped with a Variopin connector and Yokogawa ID chip. The SA11 automatically recognizes the installed sensor and prepares the right configuration.



NOTE

No part of the Technical Information may be transferred or reproduced without prior written consent from Yokogawa. Yokogawa reserves the right to make changes in the Technical Information and product at any time without notice or obligation.

1. GENERAL

1.1 What is grounding?

Grounding is a common term used in the electrical industry to mean both “equipment grounding” and “system grounding”. Equipment grounding means the connection of earth ground to non-current carrying conductive materials such as conduit, cable trays, junction boxes, enclosures, and motor frames.

Electricity describes the flow of electrons through metal circuits and wires. This electricity is always following the shortest possible route to ground. Grounding refers to an electrical contact directly to ground. It prevents undesired potential differences and prevents power surges causing electrical hazards.

Electrical grounding is a backup pathway that provides an alternative route for the current to the ground if there is a fault in the wiring system.

1.2 Why is Electrical grounding important?

One of the most important reasons for grounding electrical currents is that it protects the equipment and those working with it from surges in electricity. Additionally, to this, grounding facilitates current flow directly to earth preventing damage to the equipment and helps stabilize voltage levels ensuring a stable measurement

a. Protect against electrical overloads

In the case of a power surge high electrical currents can damage instruments. Grounding facilitates current flow directly to earth instead of damaging the equipment connected to the system.

b. Stabilizes the voltage levels

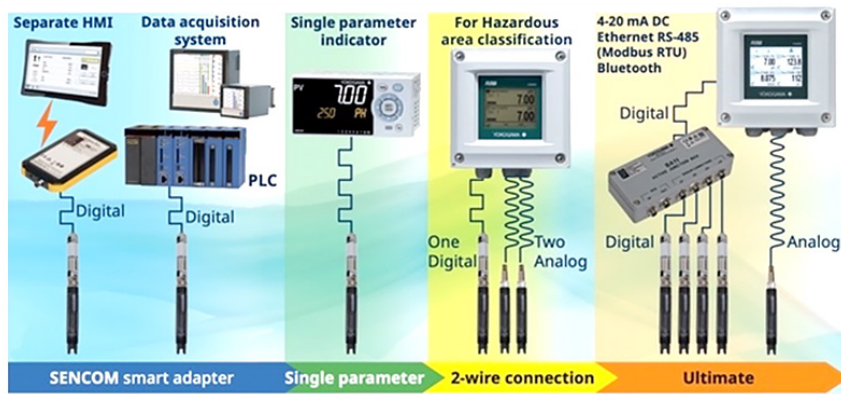
The earth can be considered as a common reference for the voltage sources in any electrical system. This helps in providing stabilized voltage levels throughout an electric system. Fluctuating voltage levels may result in unstable (pH-, Conductivity-, etc.) measurements and the process control will be difficult.

c. Earth conducts with Least resistance

The Earth is a great conductor and it can conduct electricity with least resistance. When an electrical system is grounded undesired current flows through the instruments are prevented.

d. Prevents damage and Death

Unwanted high voltages or current flows may damage instruments beyond repair. Even worse, it can result in fire- or explosion hazards, putting property and life’s at risk.



1.3 SENCOM and grounding

This technical information will focus only on the grounding of installations with the SENCOM smart adapter SA11 and various hosts

The SENCOM platform consists of a reusable SMART adapter, requiring only the analog sensor to be disposed of when it reaches the end of its lifetime. With the SENCOM platform, Yokogawa delivers reduced costs and waste while contributing to its long-term business goals of a sustainable future for all.

The reusable smart adapter, SA11, offers full measuring parameter functionality of analog sensors equipped with a Variopin connector and Yokogawa ID chip. The SA11 automatically recognizes the installed sensor and prepares the right configuration. With SENCOM, the electronics are separated from the sensor, creating reusability of electronics and positively contributing to the sustainable of our future and lowering the total cost of ownership.

The SENCOM smart adapter can be operated as a stand-alone analyzer, connecting directly to a DCS, PLC or data acquisition system.

To guarantee an accurate, reliable and stable measurement, the SA11 SENCOM smart adapter has been equipped with full galvanically isolation.

Galvanic Isolation is used when two or more electric circuits must communicate, but their grounds may be at different potentials. It is an effective method of breaking ground loops by preventing unwanted current from flowing between two units sharing a ground conductor.

2. WIRING AND INSTALLATION

2.1 Wired connection

A YOKOGAWA HOST system is connected to the SA11 using the WU11 type S interconnection cable with at one end wired terminals and on the other end a M9 connector. This cable is specially designed to be installed in heavy-duty industrial environments. It is specified for reliable transfer of digital signals in IP67 applications, allowing it to be submerged as a whole. The double shielded cable will protect the connected devices for interferences from high voltages and currents in the surrounding environment. The WU11 type S cable is available length up to a maximum of 100 meters (328ft).

When cable lengths other than standard specified by MS-code are required, two different WU11 types (-WP and -CN) can be combined to any length up to 100 meters.

Table 1: Model and suffix code WU11 cable for SENCOM

Model	Suffix	Description
WU11		SENCOM cable
Conn. type	-M9	M9 female conn. for sensor connection
Cable length	-001	1 meter (only available with WP finishing with suffix -S)
	-002	2 meter (only available with CN finishing)
	-003	3 meter (only available with WP finishing)
	-005	5 meter
	-010	10 meter
	-020	20 meter
	-030	30 meter
	-100	100 meter* (only available with suffix -S)
Finishing	-WP	Wire pin for terminal connection
	-CN	Straight connector M9 male
Jacket material	-V	PVC
	-S	PVC, shielded connector(s)

* Non-stock item, therefore long lead time.

Note: Suffix -V is for FU20F, FU24F and SC25F
 Suffix -S is for SENCOM SA11, BA11 and IB100

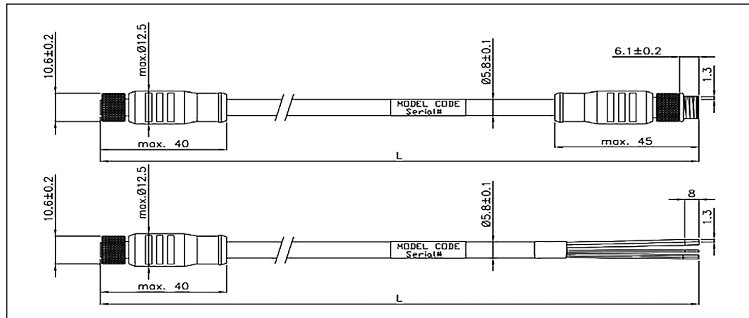


Figure 1: Suffix -CN and suffix -WP dimensional drawing

2.2 Connection in daisy chain concept

The YOKOGAWA HOST system model FLXA402 can be connected to a maximum of five SA11 devices. In case of more than two SA11 devices connected, the BA11 Active Junction Box must be used. The connection between the FLXA402 and BA11 is made by using the WU11-WP type -S interconnection cable. The Connection between the BA11 and the SA11 is made by using the WU11-CN type -S interconnection cable. In both cases, the maximum length is 100 meters (328 ft) and a total length of 200 meters (656 ft).

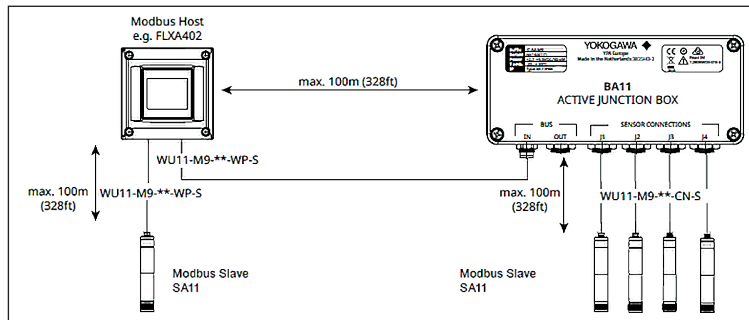


Figure 2: Schematic overview daisy chain concept FLXA402

● 2.3 Connection concept UM33A-S

The YOKOGAWA HOST system model UM33A-S can be connected to only one SA11 device. The Connection between the UM33A-S and SA11 is made by a WU11-WP type -S interconnection cable. The maximum cable length is 100 meters (328ft).

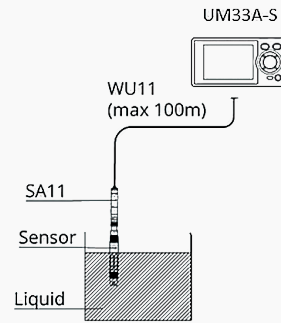


Figure 3: Connection concept UM33A-S

Table 2: Model and suffix code of the UM33A-S

Model	Suffix code	Optional suffix code	Description
UM33A			Digital Indicator with Alarms
Type 1: Basic	-S		Dedicated to SENCOM HMI (provided with SENCOM smart adapter Interface and retransmission output)
Type 2: Functions	0		Always "0"
Type 3: Open networks	0		Always "0"
Display language	-1		English (Default. Can be switched to other language by the setting.)
Case color	0		White (Light gray)
	1		Black (Light charcoal gray)
Optional suffix codes		/DC	Power supply 24 V AC/DC
		/CT	Coating ¹
		/CV	Terminal cover
		/NS	Limited standards certification ²

● 2.4 Wireless connection

In laboratory environments the HOST FieldMate system can be connected to the SA11 using the YOKOGAWA Bluetooth device Model IB100.

The connection in between the IB100 and SA11 is made using the WU11-M9-xxx-CN-S interconnection cable.

The wireless communication between the FieldMate system and IB100 is limited to 10 meters.

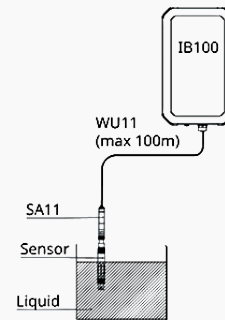


Figure 4: SA11 with wireless HOST

Table 3: Model and suffix code IB100

Model code	Suffix code	Option code	Description
IB100			Interface Box
Type	-AB		General purpose for EU, USA, CAN, AUS/NZL, JPN, KOR, CHN
	-CB		Associated intrinsically safe for EU, USA, CAN, AUS/NZL
Options *		/CV2	CABLE ASSY: 2m connection cable, WU11-M9-02-CN-V
		/CS2	CABLE ASSY: 2m connection cable, WU11-M9-02-CN-S

NOTE

The intrinsically safe model of the SA11 must be connected to the intrinsically safe model IB100 to guarantee safe installation. For installation details see user manual IB100.

3. TYPICAL INSTALLATIONS

3.1 Installation SA11 with IB100 in a laboratory environment

Problems with noise causing unstable readings are often caused by unwanted electrostatic discharges in the environment. When this is observed it is recommended to ground the process liquid. This will for instance reduce the effect of electrostatic interferences caused by human proximity.

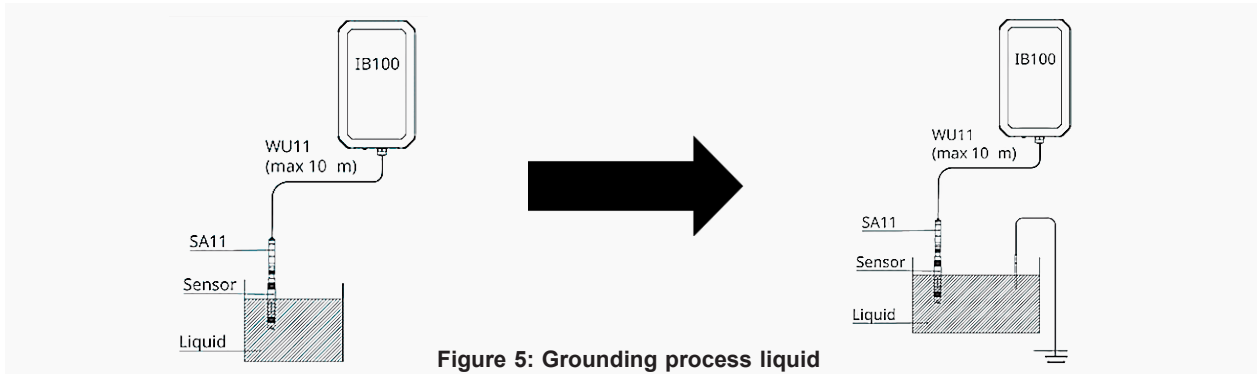


Figure 5: Grounding process liquid

When there is still an issue with unstable readings, it is recommended to ground the host as well.

This can be done by using option /UM for the SA11 (see Chapter 4.4).

This is mandatory for meeting all statutory requirements.

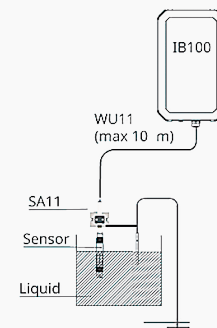


Figure 6: Grounding of the liquid and HOST

3.2 Typical installation SA11 with FLXA402

A typical installation comprises of:

- FLXA402 with SENCOM module (-S5)
- WU11 cable
- SA11 - SENCOM smart adapter
- pH or conductivity sensor with ID-chip

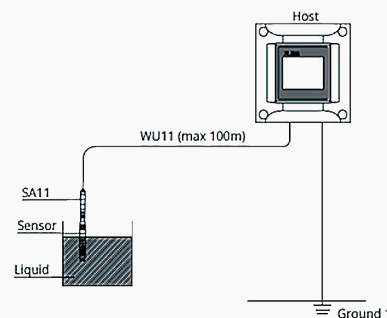


Figure 7: Typical installation FLXA402 with SA11

● 3.3. Typical installations FLXA402 (multiple parameters)

The FLXA402 offers multiple connection possibilities, eliminating the need for multiple analyzers and providing greater flexibility. This analyzer can connect up to five sensors, realizing interruption-free measurement even during maintenance. Multiple sensor measurement offers additional functionalities including a variety of calculated data as well as the option to program the analyzer as a redundant system.

With its modular design, the FLXA402 analyzer offers a range of measurement choices with the respective sensor module, including pH/ORP, resistivity/conductivity (SC), inductive conductivity (ISC), percent concentration, dissolved oxygen (DO), and 4-20mA input. Dual sensor measurements offer additional functionalities, such as a calculated data function that can be customized.

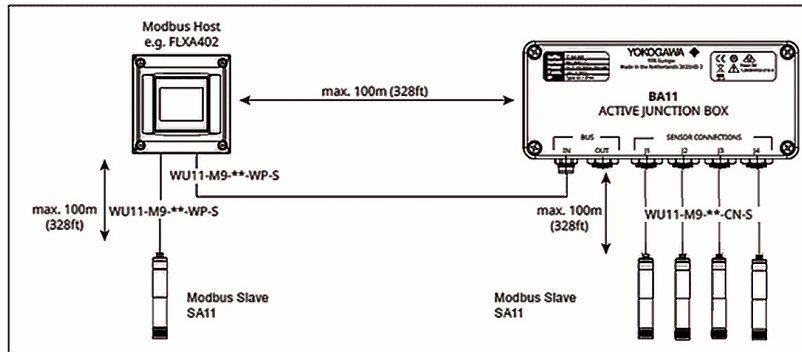


Figure 8: Typical installation for FLXA02 with multiple inputs and parameters

4. GROUNDING

4.1 Grounding with wired HOST system

The measuring system must always be connected to a class D ground (a ground resistance of 100 Ohm or less), preferably done at the HOST side.

The SA11 is protected (grounded) against electromagnetic and electrostatic interferences or common mode when all wires of the WU11 type -S cable are connected at the HOST.

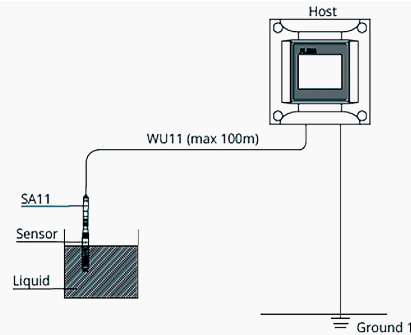


Figure 9: Standard wiring with wired HOST system

To ensure correct measurements, it is strongly recommended to ground the process liquid.

When having problems with unstable readings caused by unwanted electrostatic discharges in the environment it is recommended to ground the process liquid. This will for instance reduce the effect of electrostatic interferences caused by human proximity.

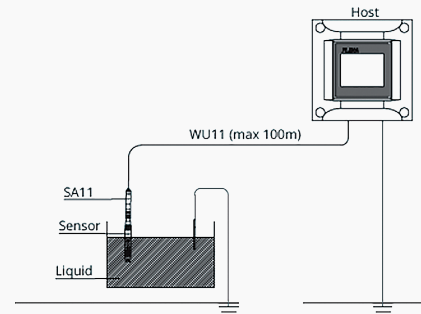


Figure 10: Wiring HOST and process liquid

When having different ground potentials (Ground loop currents) special care need to be taken, for example by using mounting bracket option /UM.

For details please see chapter 4.2.

Note: In case of a long distance between the host and the measuring point ground potential difference can occur. This can be caused for example by current leakage from high voltage machines like pumps, stirrers etc.

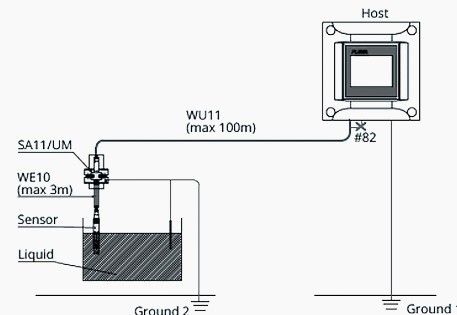


Figure 11: Grounding Smart adapter

NOTE

In case of a long distance between the host and the measuring point ground potential difference can occur. This can be caused for example by current leakage from high voltage machines like pumps, stirrers, etc.

4.2 Grounding when having different ground potentials (Ground loop currents)

The HOST and SA11 may be connected to different physical grounds. This might result in different ground potentials.

(see Figure 10, a schematic is given of this example)

To prevent ground loop currents caused by these different potentials it is necessary to disconnect one of the ground references. This can be done at the HOST side by:

- disconnecting wire #82 of the WU11 type S cable.
- connecting wire #82 to the NC terminal on the SA module in the FLXA402.

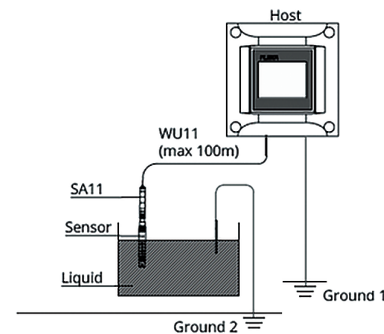


Figure 12: Ground 1 ≠ Ground 2

- Connecting contact of #82 wire from terminals and metal housing, when SA11 is connected to another host. Deze zin is volkomen onduidelijk
- Installing the SA11 device using the optional pipe and wall mounting hardware (/UM). Place a ground wire between the ground terminal of the mounting bracket and the ground reference of the process (see Figure 13).

An alternate way to prevent ground loop currents is to isolate the SA11 & mounting plate from ground 2 and keep the wire to terminal 82 connected.

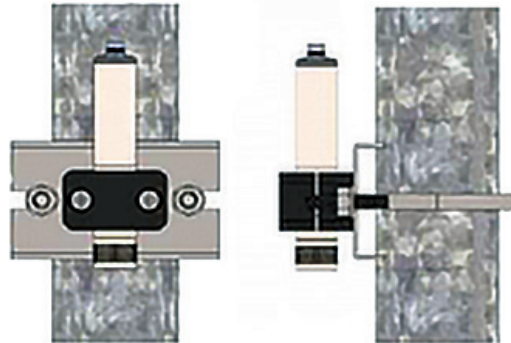


Figure 13: Wall mounting hardware SA11 (/UM)

Table 4: Overview description and wiring number WU11 cable

Signal Description	Wire color	Wire number
Supply +	brown	87
Supply Gnd	white	86
Data +	green	84
Data -	yellow	83
Shield	black	82

Table 5: Model and suffix code SA11 SENCOM Smart adapter

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		General purpose
Region	-N		Not specified
Connection type	-VS		Variopin connector for SENCOM ID-chip in sensor
Style	-NN		Always -NN
Option		/UM	Pipe and wall mounting hardware

● 4.3 Grounding when having no different ground potentials

In case the ground references at the host side (Ground 1) and process side (Ground 2) have no potential difference the shield wire #82 of the WU11 cable can stay connected to the ground terminal at the HOST.

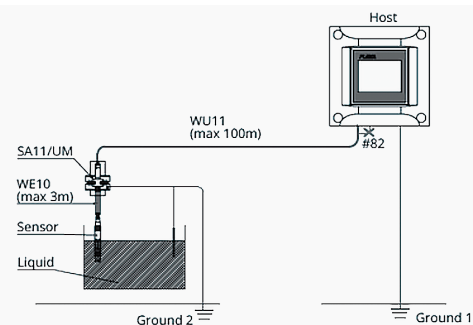


Figure 14: No potential different in ground SA11

● 4.4 Grounding with wireless HOST system

It may be needed to meet statutory regulations with a HOST which does not have a grounding terminal. In such a case it is necessary to ground either the SA11 enclosure (e.g. by using the option /UM) or (if possible) ground the shield of the cable.

(see Figure 15, which shows an example of grounding the SA11 in combination with the IB100)

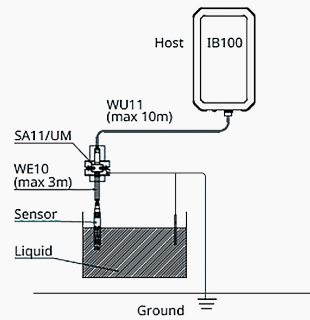


Figure 15: Grounding SA11 with IB100

5. RELATED DOCUMENTS

NOTE

When using Yokogawa products please consult the relevant documents for those products. They are shipped with the product or can be downloaded from the Yokogawa website.

5.1 General Specifications


Document name	Document no.
SA11 Smart adapter	GS 1206S01-00EN-P
IB100 Interface box	GS 12B06J09-01E-E
WU11 Interconnection cable	GS 12B06W02-03E-E
WU10 and WE10 VP cable and extension cable	GS 12B06W02-02E
BA11 active junction box	GS 12B06W03-01E-E
FLXA402 4-wire Converter	GS 12A01F01-01EN
UM33A-S Digital Indicator	GS 05P09D21-01EN

5.2 User's Manual

Document name	Document no.
SA11 Smart adapter Start-up Manual	IM12A06S01-01EN-P
SA11 Smart adapter User's Manual	IM12A06S01-00EN-P
IB100 Interface box	IM12B06J09-01E-E
WU11 Interconnection cable	IM 12B06W02-03E-E
WU10 and WE10 VP cable and extension cable	IM 12B06W02-02E-E
BA11 active junction box	IM 12B06W03-01E-E
FLXA402 4-wire Converter Installation and Wiring	IM 12A01F01-02EN
UM33A-S	GS05P09D21-01EN

5.3 Technical Information

Document name	Document no.
SA11 Smart Adapter	TI 12A06S01-00EN-P
FLXA402 4-wire Converter MODBUS communication	TI 12A01F01-62EN

<p>YOKOGAWA ELECTRIC CORPORATION World Headquarters9-32, Nakacho 2-chome, Musashino-shi Tokyo 180-8750 Japan www.yokogawa.com</p> <p>YOKOGAWA CORPORATION OF AMERICA 2 Dart RoadNewnan GA 30265 USA www.yokogawa.com/us</p> <p>YOKOGAWA EUROPE BV Euroweg 2 3825 HD AMERSFOORT The Netherlands www.yokogawa.com/eu</p>	<p>YOKOGAWA ELECTRIC ASIA Pte. LTD.5 Bedok South Road Singapore 469270 Singapore www.yokogawa.com/sg</p> <p>YOKOGAWA CHINA CO. LTD. 3F Tower D Cartelo Crocodile Building No.568 West Tianshan Road Changing District Shanghai, China www.yokogawa.com/cn</p> <p>YOKOGAWA MIDDLE EAST B.S.C.(c) P.O. Box 10070, Manama Building 577, Road 2516, Busaiten 225 Muharraq, Bahrain www.yokogawa.com/bh</p>	<p>Yokogawa has an extensive sales and distribution network. Please refer to the European website (www.yokogawa.com/eu) to contact your nearest representative.</p>  <p>YOKOGAWA ◆</p>
---	--	--