User's Manual

ISC40□J Inductive Conductivity Sensors
ISC40F□J Holders, Adapter
BA20 Terminal Box
WF10J Extension Cable

IM 12D06B02-01E

vigilantplant.®

YOKOGAWA
Yokogawa Electric Corporation

IM 12D06B02-01E
4th Edition

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◆ Introduction

Thank you for purchasing our inductive conductivity measurement system.

Contents of This Manual

This manual describes the method of installing, setting the operation conditions.

ISC40□J inductive conductivity sensor

ISC40F□J Holders, Adapter

BA20 junction terminal box, WF10J extension cable

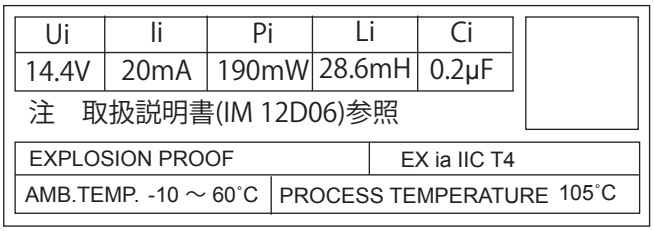
To ensure that this measurement system can be operated safely and also exhibit its full performance, be sure to read this manual before use.

This manual does not describe the units in Table shown below which are the component units of the inductive conductivity transmitter system. Each of these units comes with an instruction manual, so read the applicable manuals for details of the units concerned.

Model	User's manual	Manual number
FLXA21	2-Wire Liquid Analyzer	IM 12A01A02-01E
ISC450G	4-wire Inductive Conductivity Converter	IM 12D06D05-01E
ISC402G	4-wire Inductive Conductivity Converter	IM 12D6D1-E
ISC202G,S	2-wire Inductive Conductivity Transmitter	IM 12D06A03-01E
ISC202SJ	TIIS Type Intrinsic safe Transmitter	IM 12D06A03-11E

Caution for the ISC40SJ-TT explosionproof type sensor shown as below.

The temperature of the sample solution in contact with ISC40SJ-TT sensor should be the range of -10 to +105°C.



◆ For the safe use of this equipment

■ Safety, Protection, and Modification of the Product

- In order to protect the system controlled by the product and the product itself and ensure safe operation, observe the safety precautions described in this user's manual. We assume no liability for safety if users fail to observe these instructions when operating the product.
- If this instrument is used in a manner not specified in this user's manual, the protection provided by this instrument may be impaired.
- Be sure to use the spare parts approved by Yokogawa Electric Corporation (hereafter simply referred to as YOKOGAWA) when replacing parts or consumables.
- Modification of the product is strictly prohibited.
- The following symbols are used in the product and user's manual to indicate that there are precautions for safety:

■ Notes on Handling User's Manuals

- Please hand over the user's manuals to your end users so that they can keep the user's manuals on hand for convenient reference.
- Please read the information thoroughly before using the product.
- The purpose of these user's manuals is not to warrant that the product is well suited to any particular purpose but rather to describe the functional details of the product.
- No part of the user's manuals may be transferred or reproduced without prior written consent from YOKOGAWA.
- YOKOGAWA reserves the right to make improvements in the user's manuals and product at any time, without notice or obligation.
- If you have any questions, or you find mistakes or omissions in the user's manuals, please contact our sales representative or your local distributor.

■ Warning and Disclaimer

The product is provided on an "as is" basis. YOKOGAWA shall have neither liability nor responsibility to any person or entity with respect to any direct or indirect loss or damage arising from using the product or any defect of the product that YOKOGAWA can not predict in advance.

Symbol Marks

Throughout this user's manual, you will find several different types of symbols are used to identify different sections of text. This section describes these icons.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

NOTE

Draws attention to information essential for understanding the operation and features.

SEE ALSO

This symbol identifies a source to be referred to.

◆ After-sales Warranty

■ **Do not modify the product.**

■ **During the warranty period, for repair under warranty consult the local sales representative or service office. Yokogawa will replace or repair any damaged parts. Before consulting for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem would also be appreciated.**

- If we replace the product with a new one, we won't provide you with a repair report.
- Yokogawa warrants the product for the period stated in the pre-purchase quotation Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located outside of the service area, a fee for dispatching the maintenance engineer will be charged to the customer.

■ **In the following cases, customer will be charged repair fee regardless of warranty period.**

- Failure of components which are out of scope of warranty stated in instruction manual.
- Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa Electric did not supply.
- Failure due to improper or insufficient maintenance by user.
- Failure due to modification, misuse or outside-of-specifications operation which Yokogawa does not authorize.
- Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
- Failure caused by any usage out of scope of recommended usage.
- Any damage from fire, earthquake, storms and floods, lightning, disturbances, riots, warfare, radiation and other natural changes.

■ **Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.**

■ **Yokogawa Electric will not bear responsibility when the user configures the product into systems or resells the product.**

■ **Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair for this product, please contact the nearest sales office described in this instruction manual.**

ISC40☐J Inductive Conductivity Sensors
ISC40F☐J Holders, Adapter
BA20 Terminal Box
WF10J Extension Cable

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CONTENTS

1. General

1.1 Features

The model ISC40☐J inductive conductivity sensor is designed for use with the model FLXA21 2-Wire Solution Analyzer, ISC450G, ISC402G / ISC202 converter/transmitter. This revolutionary conductivity measuring system features ±0.5% accuracy over a wide range of conductivity values (1µS/cm to 1,999 mS/cm) and process temperatures (-10 to 130°C, -10 to 105°C for ISC40SJ-TT) without changing cell constant or recalibration.

The model ISC40☐J sensor is rugged steel-backed sensor encapsulated with the highest quality engineering plastic known today (Victrex PEEK) for long service life in both abrasive and chemically corrosive processes.

The stainless steel mounting thread and the Viton gasket allow safe and reliable installation. The long insertion depth allows for installation of the sensor either by a bulkhead mounting through a flange or tank wall, or by using one of the process adapter kits (e.g. for flow-through or immersion service).

The large bore, greater than 16 mm, gives long-term stability, preventing measuring errors caused by coating or plugging. The large bore also offers fast response even at low flow rates.

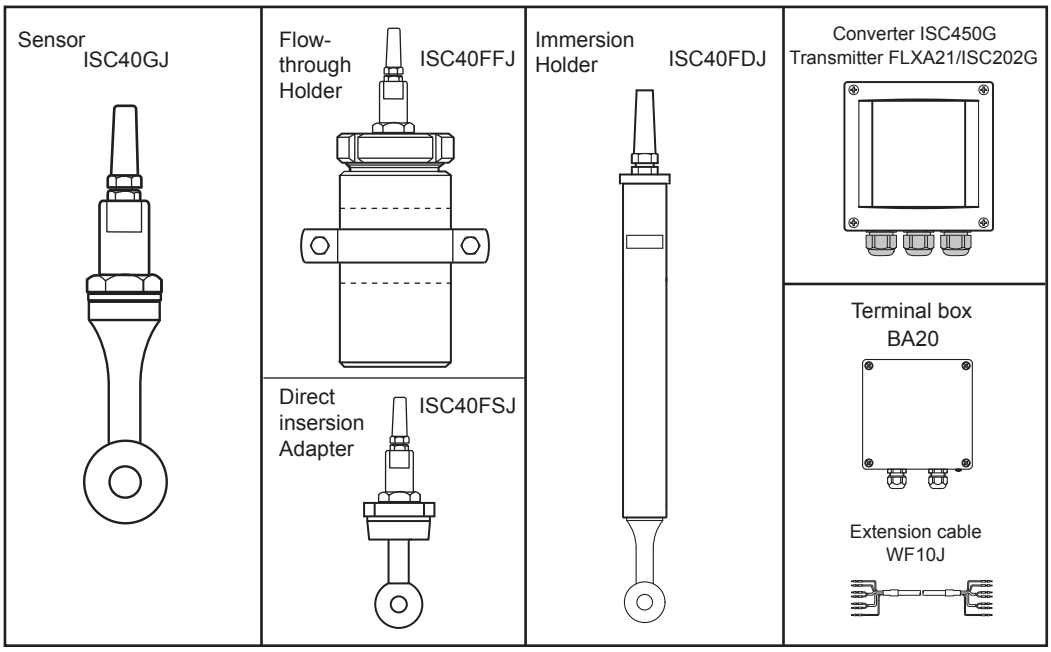

Figure 1.1 Non-explosionproof System

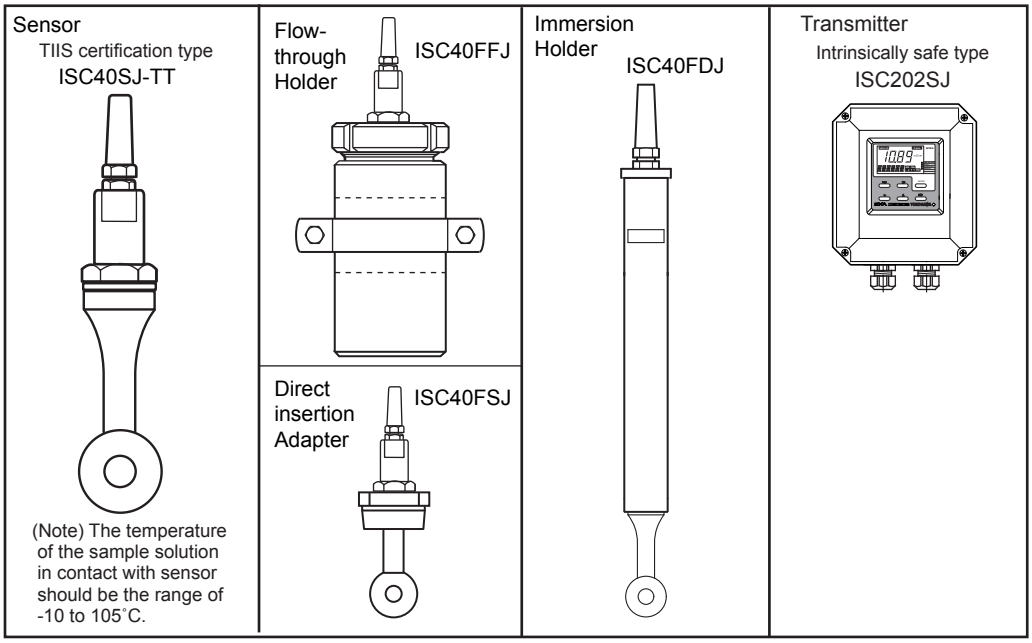

Figure 1.2 Explosionproof System

1.2 Measurement principle

Contrary to contact electrode conductivity, the EXA ISC series analyses the conductivity without any contact between electrodes and process fluid. The measurement is based on inductive coupling of 2 ring transformers (Toroids) by the solution.
The converter supplies a reference voltage at a high frequency to the "drive coil". The core of this coil is of a high permeability magnetic material, and a strong magnetic field is generated in the toroid.
The solution passes through the hole in the toroid and can be considered as a "one turn" secondary winding.
The magnetic field will induce a voltage in this secondary winding. The induced current in the solution winding is proportional to this voltage and the conductance of the solution "one turn winding" is according to Ohm's law.
The conductance (1/R) is proportional to the specific conductivity and a constant factor that is determined by the geometry of the sensor (length divided by surface area of the hole in the toroid) and the installation of the sensor.
There are 2 toroids mounted in the "doughnut" shaped sensor. The solution also flows through the second toroid and therefore the solution turn can be considered as a primary winding of the second ring transformer.
The current in the solution will create a magnetic field in the second toroid. The induced voltage being the result of this magnetic field can be measured as an output.
The output voltage of this "receive coil" is therefore proportional to the specific conductivity of the process solution.

Inductive conductivity measurement principle

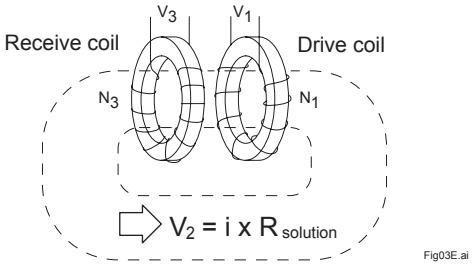

Figure 1.3 Measurement principle

2. Specifications

2.1 General Specifications

2.1.1 ISC40□J Inductive Conductivity Sensor

Compatibility: ISC40GJ is compatible with FLXA21 2-Wire Liquid Analyzer, ISC202 2-Wire Inductive Conductivity Transmitter and ISC402G/ISC450G 4-wire Inductive Conductivity Converter.

ISC40SJ-TT is compatible with ISC202SJ 2-Wire Inductive Conductivity Transmitter.

Measuring Range: 1 µS/cm to 1999 mS/cm

Output Span: Min. 100 µS/cm ; Max. 1999 mS/cm

Process Temperature : -10 to 130°C for continuous exposure. -10 to 105°C for ISC40SJ-TT. Suitable for steam-sterilisable applications. (Note 1 and 2)

Process Pressure: Pressure resistance 2 MPa max. (Note 1)

Note 1: The process temperature and pressure differ depending upon the adapter or holder used.

Note 2: The temperature compensation range of the transmitter is between -10 and 130°C

Process Flow Rate : Max. 5 m/s

Materials Exposed to Process Solution:

Sensor: PEEK (polyether ether ketone)
O-ring: Viton (fluorine rubber) or ethylene propylene rubber
Adapter (additional machining) : SUS316, PVC or PVDF

Materials Not Exposed to Process Solution :

Sensor Screws: SUS304
Retaining Nuts: SUS304
Cables: Weatherproof vinyl

Process Connection: Mounting with G3/4 screw at top of Sensor, or connection using process adapter or holder (flow-through or submersion type)

Process Adapter: JIS 10K 50 RF flange (Material: SUS316)
JIS 10K 50 FF flange (Material: PVC or PVDF)
DIN PNl6 DN50 flange (Material: SUS316)
ANSI Class150 2 flange (Material: SUS316)
Screw-in adapter (R2 screw Material: Can be selected from SUS316, PVC or PVDF)

Cable Length: 5 m, 10 m, 15 m, 20 m
Extension cable of up to 50 m can be used. (sensor cable and extension cable)

Weight: Sensor Approx. 0.6 kg

NOTE

Do not submerge the sensor itself in process water, as the seams between the mold and the metal of the sensor are not waterproof. Since a temperature sensor is imbedded in the PEEK molded sensor, its response speed is not fast, Install another temperature sensor if necessary.

ISC40SJ-TT Intrinsically safe type sensor

TIIS certification sensor should be used with ISC202SJ

Protection Concept and Adapter Group: Ex ia IIC T4

Intrinsic safe rating:

Ui=14.4 V, Ii=20 mA, Pi=190 mW, Li=28.6 mH, Ci=0.2 µF

Environment and operational conditions

The temperature of the sample solution in contact with sensor should be the range of -10 to 105°C.

2.1.2 ISC40FDJ Immersion Holder

Process Temperature : Max. 80°C

Process Pressure : 200 kPa at 20°C, 100 kPa at 80°C

Materials Exposed to Process Solution :

Holder: Heat resistance PVC or SUS316

O-rings : Fluorine rubber (Viton) (option)

Fixing flange : PP or SUS316

Mounting :

Fixing flange mounting (option)

DIN PN10 DN50 (ANSI Class 150 2 with bolt holes): Material PP

JIS 10K 50 RF : Material SUS316

2-inch pipe mounting hardware (option) : Material, zinc-plated steel

2.1.3 ISC40FFJ Flow-through Holder

Process Temperature : ISC40FFJ-SA, -SJ : Max. 150°C
ISC40FFJ-PA, -PJ : Max. 100°C
ISC40FFJ-FA, -FJ : Max. 130°C

Process Pressure: ISC40FFJ-SA, -SJ : Max. 1.0 MPa at 150°C
ISC40FFJ-SA, -PJ : Max. 0.6MPa at 20°C ; Max. 0.1 MPa at l00°C
ISC40FFJ-FA, -FJ : Max. 1.0MPa at 20°C ; Max. 0.1 MPa at 130°C

Materials Exposed to Process Solution :
ISC40FFJ-SA, -SJ : SUS316
ISC40FFJ-PA, -PJ : Polypropylene
ISC40FFJ-FA, -FJ : PVDF
O-ring : Fluorine rubber (Viton) or ethylene propylene rubber

Materials Not Exposed to Process Solution :
Nuts : SUS304
Mounting Bracket : SUS304 (option)
Loose flange adapter : SUS304 (option)

Process Connection : 1/2 NPT or Rc 1/2
DIN PN10 DN25 flange (option)
JIS 10K 25 RF flange (option)

CAUTION

Select the material of wetted parts with careful consideration of process characteristics. Inappropriate selection may cause leakage of process fluids, which greatly affects facilities. Considerable care must be taken particularly in the case of strongly corrosive process fluid such as hydrochloric acid, sulfuric acid, hydrogen sulfide, and sodium hypochlorite. If you have any questions about the wetted part construction of the product, be sure to contact Yokogawa.

2.1.4 ISC40FSJ Direct Insertion Adapters

Process Temperature : ISC40FSJ-STWJ : Max. 110°C
ISC40FSJ-SCWJ, -SCSJ : Max. 150°C
ISC40FSJ-PCS J : Max. 100°C
ISC40FSJ-FCSJ: Max. 130°C

Process Pressure:
ISC40FSJ-STWJ: Max. 1.0MPa at 110°C
ISC40FSJ-SCWJ, -SCSJ : Max. 1.0 MPa at 150°C
ISC40FSJ-PCSJ : Max. 0.6MPa at 20°C; Max. 0.1 MPa at 100°C
ISC40FSJ-FCSJ : Max. 1.0MPa at 20°C ; Max. 0.1 MPa at 130°C

Materials Exposed to Process Solution :
ISC40FSJ-STWJ : SUS316L, silicone rubber
ISC40FSJ-SCWJ, -SCSJ : SUS316, fluorine rubber
ISC40FSJ-PCSJ : Polypropylene, fluorine rubber
ISC40FSJ-FCSJ : PVDF, fluorine rubber

Materials Not Exposed to Process Solution :
ISC40FSJ-STWJ : IDF 3 inch clamp: SCS13
ISC40FSJ-SCWJ, -SCSJ, -PCSJ, -FCSJ : Fixing nut : SUS304

Process Connection :
ISC40FSJ-STWJ : IDF 3 inch clamp welded ferrule
ISC40FSJ-SCWJ : Welded socket
ISC40FSJ-SCSJ, -PCSJ, -FCSJ : R2 screw-in connection

2.1.5 BA20 Terminal Box

Use when the Inductive conductivity transmitter/converter is installed separately at a distance greater than the ISC40GJ sensor's cable length.

Ambient Temperature: -10 to 55°C

Construction: Conforms to IP54

Case Material: Aluminum alloy casting

Electrical Connection Point: Two electrical inlets, PG13.5 cable gland

Weight : 2 kg

(Note) BA20 can not be used with ISC40SJ-TT.

2.1.6 WF10J Extension Cable

Number of Conductors : 6 (without shield)

Finished O.D. : 7.7 mm

Termination Dedicated cable termination

Material : Weatherproof vinyl

(Note) WF10J can not be used with ISC40SJ-TT.

2.2 Model and Suffix Codes

2.2.1 Inductive Conductivity Sensor

Non-explosionproof type

[Style: S1]

Model	Suffix code	Option code	Description
ISC40GJ	- - - - - - -	- - - - -	General purpose inductive conductivity sensor
Construction	**-GG**	- - - - -	Standard type
Temperature sensor	**-T1**	- - - - -	Pt1000 *1
	-T3	- - - - -	Thermistor
Cable length, cable end type	**-05**	- - - - -	5 m (pin terminals) *2
	-10	- - - - -	10 m (pin terminals) *2
	-15	- - - - -	15 m (pin terminals) *2
	-20	- - - - -	20 m (pin terminals) *2
	-X1	- - - - -	5 m (M4 ring terminals) *3
	-X2	- - - - -	10 m (M4 ring terminals) *3
	-X3	- - - - -	15 m (M4 ring terminals) *3
	-X4	- - - - -	20 m (M4 ring terminals) *3
	-Y1	- - - - -	5 m (M3 ring terminals) *4
	-Y2	- - - - -	10 m (M3 ring terminals) *4
	-Y3	- - - - -	15 m (M3 ring terminals) *4
	-Y4	- - - - -	20 m (M3 ring terminals) *4
Option Adapter		**/SFJ**	JIS 10K 50 RF Flange SUS316
		/PFJ	JIS 10K 50 FF Flange PVC
		/FFJ5	JIS 10K 50 FF Flange PVDF
		/SFD	DIN PN16 DN50 Flange SUS316
		/SFA	ANSI Class 150 2 Flange SUS316
		/SSG	R2 screw-in adapter SUS316
		/PSG	R2 screw-in adapter PVC
		/FSJ	R2 screw-in adapter PVDF
O-ring, gasket		**/EP**	Ethylene propylene rubber O-ring or gasket *5

*1 Choose thermistor (-T3) only, when connecting with ISC200G.
*2 Used for connection to FLXA21, ISC202G. When terminal box is used, select BA20.
*3 Used for connection to FLXA21. When terminal box is used, select BA20/XT.
T2.1E.ai
*4 Used for connection to ISC450G, ISC202G/TB. When terminal box is used, select BA20/YT.
*5 For use in highly alkaline solutions, be sure to check the process conditions and contact us.

Explosionproof type

[Style: S2]

Model	Suffix code	Option code	Description
ISC40SJ	- - - - - - -	- - - - -	Intrinsic safe inductive conductivity sensor
Construction	**-GG**	- - - - -	TIIS certification type (for ISC200S)
	-TT	- - - - -	TIIS certification type (for ISC202SJ)
Temperature sensor	**-T1**	- - - - -	Pt1000 *1
	-T3	- - - - -	Thermistor
Cable length, cable end type	**-05**	- - - - -	5 m (pin terminals)
	-10	- - - - -	10 m (pin terminals)
	-15	- - - - -	15 m (pin terminals)
	-20	- - - - -	20 m (pin terminals)
Option Adapter		**/SFJ**	JIS 10K 50 RF Flange SUS316
		/PFJ	JIS 10K 50 FF Flange PVC
		/FFJ5	JIS 10K 50 FF Flange PVDF
		/SFD	DIN PN16 DN50 Flange SUS316
		/SFA	ANSI Class 150 2 Flange SUS316
		/SSG	R2 screw-in adapter SUS316
		/PSG	R2 screw-in adapter PVC
		/FSJ	R2 screw-in adapter PVDF
O-ring, gasket		**/EP**	Ethylene propylene rubber O-ring or gasket *2

*1 Choose thermistor (-T3) only, when connecting with ISC200S.
*2 For use in highly alkaline solutions, be sure to check the process conditions and contact us.
(Note) "TIIS Certification" as a certified explosion approval from the Technology Institution of Industrial Safety.
T2.1E.eps