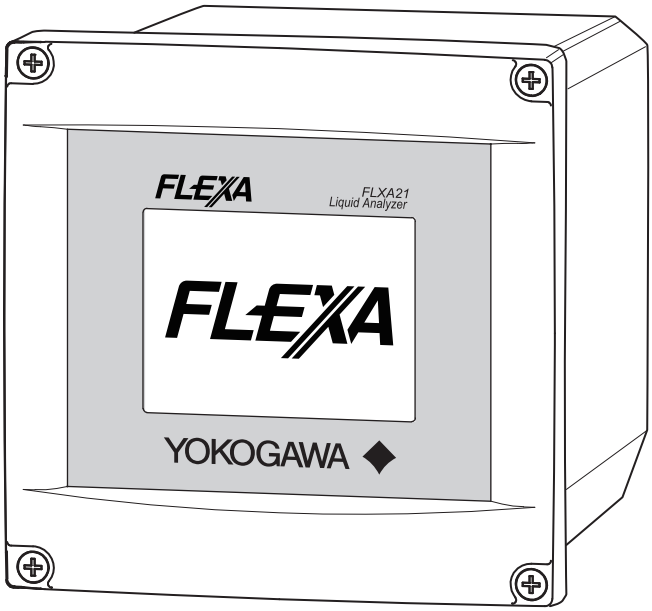
User's Manual

FLXA21
2-Wire Analyzer
FOUNDATION Fieldbus
Communication

IM 12A01A02-71E



YOKOGAWA
Yokogawa Electric Corporation

IM 12A01A02-71E
3rd Edition

Introduction

Thank you for purchasing the FLXA™21 2-Wire Analyzer.

Please read the following respective documents before installing and using the FLXA21.

This manual describes only those topics that are required for operation of the FOUNDATION Fieldbus communications.

For information about the FLXA21 other than FOUNDATION Fieldbus, refer to the User's Manual (IM 12A01A02-01E).

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.

Drawing Conventions

Some drawings may be partially emphasized, simplified, or omitted, for the convenience of description.

Some screen images depicted in the user's manual may have different display positions or character types (e.g., the upper / lower case). Also note that some of the images contained in this user's manual are display examples.

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Model Name used in this Manual

The model names, FLXA21-PH and FLXA21-SC, are used in this manual.

The FLXA21-PH means the FLXA21 with the output of FOUNDATION Fieldbus communication and with measurement of pH and/or ORP. The exact model & style code is as follows;

FLXA21-D-P-D-□□**-P1**-NN-F-N-LA-N-NN (1st input: pH/ORP)
or
FLXA21-D-P-D-□□**-S1**-NN-F-N-LA-N-NN (1st input: pH/ORP (SENCOM™ sensor))

And, the FLXA21-SC means the FLXA21 with the output of FOUNDATION Fieldbus communication and with measurement of conductivity. The exact model & style code is as follows;

FLXA21-D-P-D-□□**-C1**-NN-F-N-LA-N-NN (1st input: Conductivity (SC))

Model & Suffix Codes

Model	Suffix code	Option code	Description
FLXA21	·····	·····	2-Wire Analyzer
Power supply	**-D**	·····	Always -D
Housing	**-P**	·····	Plastic
Display	**-D**	·····	Anti-glare LCD
Type	**-AB**	·····	General purpose for CE, RCM
	-AD	·····	General purpose for CSA
	-AG	·····	General purpose for KC
	-CB	·····	IS for ATEX, IECEx (Note 5) (Note 7)
	-CD	·····	IS for FM, CSA (Note 5)
	-CH	·····	IS for NEPSI (Note 5)
	-EG	·····	IS for KOSHA (Note 5)
	-DD	·····	NI for FM, CSA (Note 6)
1st input	**-P1**	·····	pH/ORP (Note 3)
	-C1	·····	Conductivity (SC)
	-S1	·····	pH/ORP (SENCOM sensor)
2nd input	**-NN**	·····	Without input
Output (Note 1)	**-F**	·····	**FOUNDATION Fieldbus**
—	**-N**	·····	Always -N
Language set (Note 2)	**-LA**	·····	English and 11 languages
Country	**-N**	·····	Global except Japan
—	**-NN**	·····	Always -NN
Option	Mounting hardware	**/UM**	Universal mounting kit (Note 4)
		/U	Pipe and wall mounting hardware
		/PM	Panel mounting hardware
	Hood	**/H6**	Hood, stainless steel
		/H7	Hood, stainless steel + urethane coating
		/H8	Hood, stainless steel + epoxy coating
	Tag plate	**/SCT**	Stainless steel tag plate
	Conduit adapter	**/CB4**	Conduit adapter (G1/2 x 4 pcs)
		/CD4	Conduit adapter (1/2NPT x 4 pcs)
		/CF4	Conduit adapter (M20 x 1.5 x 4 pcs)

Notes:
1: The FLXA21 has another output type of "4-20 mA + HART" (suffix code: -A). Refer to IM 12A01A02-01E.
2: These languages are message languages on the analyzer's display.
One analyzer has English and 11 languages.
All languages are as follows; English, Chinese, Czech, French, German, Italian, Japanese, Korean, Polish, Portuguese, Russian and Spanish.
3: This input is to be come from an analog pH/ORP sensor.
4: The universal mounting kit contains the pipe and wall mounting hardware (/U) and the panel mounting hardware (/PM).
5: Type "-CB", "-CD", "-CH", "-EG" are intrinsic safety (IS).
6: Type "-DD" is nonincendive (NI).
7: Product registration is done by Yokogawa Taiwan Corporation as an importer in Taiwan.

◆ Safety Precautions

■ 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.
- If any protection or safety circuit is required for the system controlled by the product or for the product itself, prepare it separately.
- 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 words are used this manual.

CAUTION

This symbol gives information essential for understanding the operations and functions.

NOTE

This symbol indicates information that complements the present topic.

■ 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.

FLXA21

- The FLXA21 should only be used with equipment that meets the relevant IEC, American, Canadian, and Japanese standards. Yokogawa accepts no responsibility for the misuse of this unit.
- Don't install "general purpose type" instruments in the hazardous area.
- The Instrument is packed carefully with shock absorbing materials, nevertheless, the instrument may be damaged or broken if subjected to strong shock, such as if the instrument is dropped. Handle with care.

CAUTION

Electrostatic discharge

The FLXA21 contains devices that can be damaged by electrostatic discharge.

When servicing this equipment, please observe proper procedures to prevent such damage.

Replacement components should be shipped in conductive packaging. Repair work should be done at grounded workstations using grounded soldering irons and wrist straps to avoid electrostatic discharge.

CAUTION

- Do not use an abrasive or organic solvent in cleaning the instrument.
- Substitution of components may impair suitability for Division 2.

  Do not remove or replace while circuit is live unless area is known to be non-hazardous.

  Explosion Hazard – Do not disconnect equipment unless area is known to be nonhazardous.

  Do not reset circuit breaker unless power has been removed from the equipment or the area is known to be non-hazardous.

CAUTION

This instrument is a EN61326-1 Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.

CAUTION

When you open the front panel, make sure the screws are completely out of the screw holes, and then open the front panel slowly in order not to damage the threaded parts on the housing. If the threaded parts are damaged and the screws cannot be tightened, the waterproof performance will deteriorate.

CAUTION

Be careful to touch the concentrated sulfuric acid.

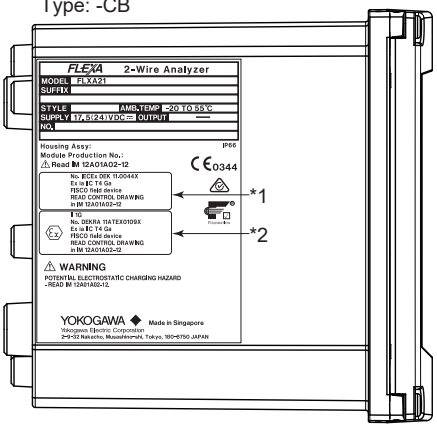
Mark position of intrinsic safety

The mark position of intrinsic safety is shown as follows

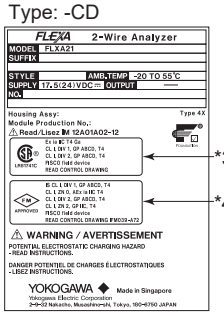
FLXA21-D-P-D-**CB**-□1-NN-F-N-LA-N-NN (FOUNDATION Fieldbus)
FLXA21-D-P-D-**CD**-□1-NN-F-N-LA-N-NN (FOUNDATION Fieldbus)
FLXA21-D-P-D-**DD**-□1-NN-F-N-LA-N-NN (FOUNDATION Fieldbus)
FLXA21-D-P-D-**CH**-□1-NN-F-N-LA-N-NN (FOUNDATION Fieldbus)
FLXA21-D-P-D-**EG**-□1-NN-F-N-LA-N-NN (FOUNDATION Fieldbus)

-F (FOUNDATION Fieldbus)

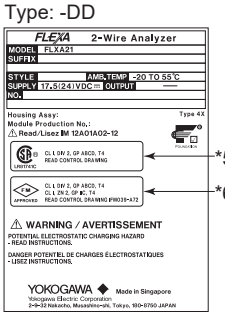
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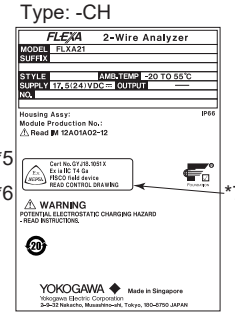
Type: -CD



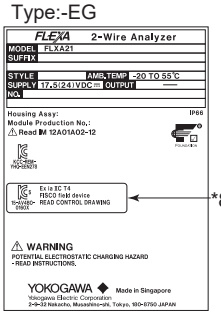
Type: -DD



Type: -CH



Type:-EG



*1: This marking conforms to Intrinsic safety of IECEx.
*2: This marking conforms to Intrinsic safety of ATEX.
*3: This marking conforms to Intrinsic safety of CSA.
*4: This marking conforms to Intrinsic safety of FM.
*5: This marking conforms to nonincendive of CSA.
*6: This marking conforms to nonincendive of FM.
*7: This marking conforms to Intrinsic safety of NEPSI.
*8: This marking conforms to Intrinsic safety of KOSHA.

Product Disposal:

The instrument should be disposed of in accordance with local and national legislation/ regulations.

Warranty and service

Yokogawa products and parts are guaranteed free from defects in workmanship and material under normal use and service for a period of (typically) 12 months from the date of shipment from the manufacturer.

Individual sales organisations can deviate from the typical warranty period, and the conditions of sale relating to the original purchase order should be consulted. Damage caused by wear and tear, inadequate maintenance, corrosion, or by the effects of chemical processes are excluded from this warranty coverage.

In the event of warranty claim, the defective goods should be sent (freight paid) to the service department of the relevant sales organisation for repair or replacement (at Yokogawa discretion). The following information must be included in the letter accompanying the returned goods:

- Part number, model code and serial number
- Original purchase order and date
- Length of time in service and a description of the process
- Description of the fault, and the circumstances of failure
- Process/environmental conditions that may be related to the failure of the device.
- A statement whether warranty or nonwarranty service is requested
- Complete shipping and billing instructions for return of material, plus the name and phone number of a contact person who can be reached for further information.

Returned goods that have been in contact with process fluids must be decontaminated/ disinfected before shipment. Goods should carry a certificate to this effect, for the health and safety of our employees.

Material safety data sheets should also be included for all components of the processes to which the equipment has been exposed.

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◆ CE marking products

■ Authorised Representative in EEA

The Authorised Representative for this product in EEA is Yokogawa Europe B.V. (Euroweg 2, 3825 HD Amersfoort, The Netherlands).

■ Identification Tag

This manual and the identification tag attached on a packing box are essential parts of the product.

Keep them together in a safe place for future reference.

■ Users

This product is designed to be used by a person with specialized knowledge.

■ How to dispose the batteries:

This is an explanation about the EU Battery Directive. This directive is only valid in the EU.

Batteries are included in this product. Batteries incorporated into this product cannot be removed by yourself. Dispose them together with this product.

When you dispose this product in the EU, contact your local Yokogawa Europe B.V.office. Do not dispose them as domestic household waste.

Battery type: Manganese dioxide lithium battery



Notice:

The symbol (see above) means they shall be sorted out and collected as ordained in the EU Battery Directive.

■ Information of the WEEE Directive

This product is purposely designed to be used in a large scale fixed installations only and, therefore, is out of scope of the WEEE Directive. The WEEE Directive does not apply. This product should be disposed in accordance with local and national legislation/regulations.

The WEEE Directive is only valid in the EU.

FLXA21
2-Wire Analyzer
FOUNDATION Fieldbus Communication

IM 12A01A02-71E 3rd Edition

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Revision Record i

1. About FOUNDATION Fieldbus

FOUNDATION Fieldbus is a bi-directional digital communication protocol for field devices, which offers an advancement implementation technologies for process control systems and is widely employed by numerous field devices.

FLXA21 FOUNDATION Fieldbus communication type employs the specification standardized by The FOUNDATION Fieldbus, and provides interoperability between Yokogawa devices and those produced by other manufacturers. FOUNDATION Fieldbus comes with software consisting of three AI function blocks, providing the means to implement flexible instrumentation system.

For information on other features, engineering, design, construction work, startup and maintenance of FOUNDATION Fieldbus, refer to http://www.yokogawa.com/fbs/fbs-index.htm.

1.1 Internal Structure of FLXA21

The FLXA21 contains two virtual field devices (VFD) that share the following functions.

System/network Management VFD

- Sets node addresses and Physical Device tags (PD Tag) necessary for communication
- Controls the execution of function blocks
- Manages operation parameters and communication resources (Virtual Communication Relationship: VCR)

Function Block VFD

Resource block

- Manages the status of FLXA21 hardware
- Automatically informs the host of any detected faults or other problems

Sensor Transducer block

- Converts sensor output to process values and transfers to AI function block by channels

AI1, AI2, AI3 function block

- Conditions raw data from the Sensor Transducer block
- Outputs conditioned process values
- Carries out scaling, damping and square root extraction

1.2 Logical Structure of Each BLOCK

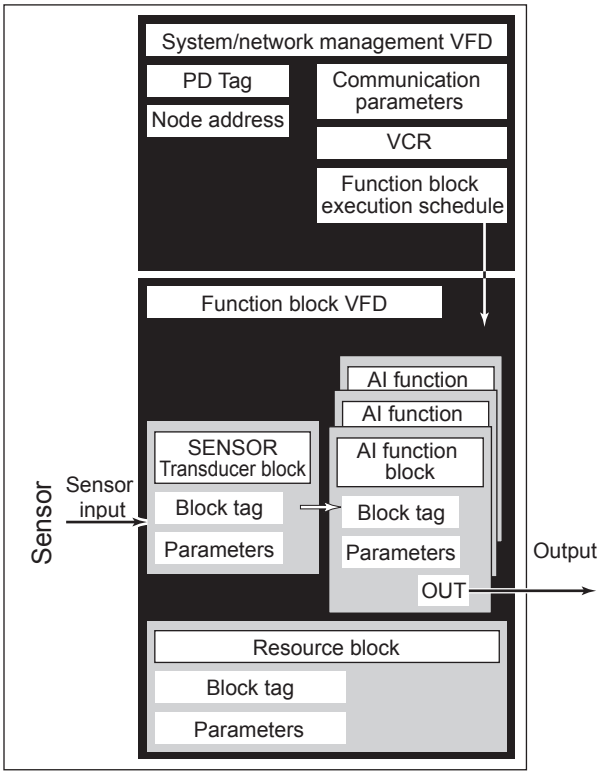


Figure 1.1 Logical Structure of Each Block

Setting of various parameters, node addresses, and PD Tags shown in Figure 1.1 is required before starting operation.

1.3 Wiring System Configuration

The number of devices that can be connected to a single bus and the cable length vary depending on system design. When constructing systems, both the basic and overall design must be carefully considered to allow device performance to be fully exhibited.

1.4 Regulatory Compliance

- **Safety, EMC and RoHS Compliance**

Safety: UL 61010-1
UL 61010-2-030
CAN/CSA-C22.2 No.61010-1
CAN/CSA-C22.2 No.61010-2-030
EN61010-1
EN61010-2-030

EMC: EN61326-1 Class A, Table 2 (For use in industrial locations)
Influence of immunity environment (Criteria A): Output shift is specified within ± 25% of F.S.
EN61326-2-3
EN61326-2-5
RCM: EN61326-1 Class A, Table 2

Korea Electromagnetic Conformity Standard Class A 한국 전자파적합성 기준

A급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

RoHS: EN 50581: 2012 (Style 3.03 or newer)
Installation altitude: 2000 m or less
Category based on IEC 61010: I (Note 1)
Pollution degree based on IEC 61010: 2 (Note 2)

Note 1: Installation category, called over-voltage category, specifies impulse withstand voltage. Equipment with "Category I" (ex. two-wire transmitter) is used for connection to circuits in which measures are taken to limit transient over-voltages to an appropriately low level.

Note 2: 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.

Explosion Protected Type Compliance

Item	Description	'Type' in MS code
Europe (ATEX)	[Intrinsic safety "ia"] Applicable Standard: EN 60079-0: 2012 + A11: 2013, EN 60079-11: 2012 Certificate No: DEKRA 11ATEX0109X Marking/Rating: ⟨Ex⟩ II 1 G Ex ia IIC T4 Ga, FISCO field device Ambient Temperature: -20 to 55°C Control Drawing: Refer to App. 3.1	-CB
International (IECEx)	[Intrinsic safety "ia"] Applicable Standard: IEC 60079-0: 2011, IEC 60079-11: 2011 Certificate No: IECEx DEK 11.0044X Marking/Rating: Ex ia IIC T4 Ga, FISCO field device Ambient Temperature: -20 to 55°C Control Drawing: Refer to App. 3.1	
United States (FM)	[Intrinsically safe / Nonincendive] Applicable Standard: Class 3600: 2011, Class 3610: 2010, Class 3611: 2004, Class 3810:2005, NEMA 250: 2014, ANSI/ISA 60079-0: 2013, ANSI/ISA 60079-11: 2014 Certificate No: 3039632 Marking/Rating: IS CL I, DIV 1, GP ABCD CL I, ZN 0, AEx ia IIC NI CL I, DIV 2, GP ABCD CL I, ZN 2 IIC FISCO field device T4: for ambient temperature: -20 to 55°C Enclosure: Type 4X Control Drawing: Refer to App. 3.2	-CD
Canada (CSA)	[Intrinsically safe / Nonincendive] Applicable Standard: C22.2 No.0-10 (R2015), CAN/CSA-C22.2 No.94-M91 (R2011), C22.2 No.213-M1987 (R2013), CAN/CSA-C22.2 No.60079-0:11, CAN/CSA-C22.2 No.60079-11:14, CAN/CSA-C22.2 No.61010-1-12, CAN/CSA-C22.2 No.61010-2-030-12 Certificate No: 2425510 Marking/Rating: Ex ia IIC T4 Ga, FISCO field device Intrinsicaly safe for Class I, Division 1, Groups A, B, C, D, T4 Nonincendive for Class I, Division 2, Groups A, B, C, D, T4 Ambient Temperature: -20 to 55°C Ambient Humidity: 0 – 100% (No Condensation) Enclosure: IP66, NEMA 4X Control Drawing: Refer to App. 3.3	

Item	Description	'Type' in MS code
United States (FM)	[Nonincendive] Applicable Standard: Class 3600: 2011, Class 3611: 2004, Class 3810: 2005, NEMA 250: 2014 Certificate No: 3039632 Marking/Rating: NI CL I, DIV 2, GP ABCD ZN 2 IIC T4: for ambient temperature: -20 to 55°C Control Drawing: Refer to App. 3.2	-DD
Canada (CSA)	[Nonincendive] Applicable Standard: C22.2 No.0-10 (R2015), CAN/CSA-C22.2 No.94-M91 (R2011), C22.2 No.213-M1987 (R2013), CAN/CSA-C22.2 No.61010-1-12, CAN/CSA-C22.2 No.61010-2-030-12 Certificate No: 2425510 Marking/Rating: Nonincendive for Class I, Division 2, Groups A, B, C, D, T4 Ambient Temperature: -20 to 55°C Ambient Humidity: 0 – 100% (No Condensation) Enclosure: IP66, NEMA 4X Control Drawing: Refer to App. 3.3	
China (NEPSI)	[Intrinsic safety “ia”] Applicable Standard: GB3836.1-2010, GB3836.4-2010, GB 3836.20-2010 Certificate No: GYJ18.1051X Marking/Rating: Ex ia IIC T4 Ga, FISCO field device Ambient Temperature: -20 to 55°C Control Drawing: Refer to App. 3.4	-CH
Korea (KOSHA)	[Intrinsic safety “ia”] Applicable Standard: Notice of Ministry of Labor No. 2016-54 Certificate No: 15-AV4BO-0160X Marking/Rating: Ex ia IIC T4, FISCO field device Ambient Temperature: -20 to 55°C Control Drawing: Refer to App. 3.4	-EG

2. Preparation

The FLXA21 FOUNDATION Fieldbus is provided with three cable glands. The first is used for the electrode wiring as the other is used for the power wiring shown in Figure 2.1.

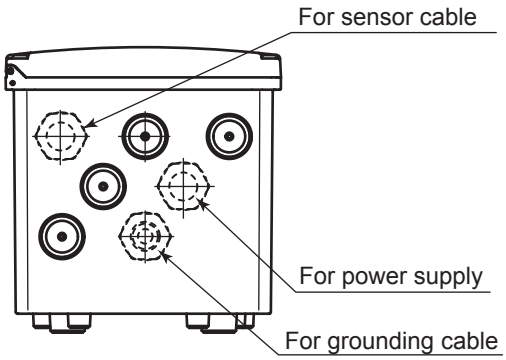


Figure 2.1 Cable gland diagram

2.1 Cables, terminals and glands for FOUNDATION Fieldbus

Wire and install the system by referring to chapter 2 in the FLXA21 instruction manual (IM 12A01A02-01E).

The FOUNDATION Fieldbus power supply is 9 to 32 V DC. The wiring is the same.

However, for the FOUNDATION Fieldbus cables, see Table 2.1.

Table 2.1 FOUNDATION Fieldbus Cables and transmissible Length

Parameters	Conditions	Type A	Type B	Type C	Type D
Max DC Resistance, Ω/km	per conductor	22	56	132	20
Max Attenuation, dB/km	1.25 f, (39 kHz)	3.0	5.0	8.0	8.0
Gauge	—	#18 AWG (0.82 mm^2)	#22 AWG (0.32 mm^2)	#26 AWG (0.13 mm^2)	#16 AWG (1.25 mm^2)
Max Length, meters	—	1,900	1,200	400	200

Note: 1900 m is trunk + sum of Spurs (Max length type A cable)

Yokogawa recommends the use of Type A.

Usage of Type B and D is restricted.

Yokogawa does not recommend the use of Type C.

Table 2.2 Recommended length of Spur Cables

Number of spur cables	Length of a non-intrinsically safe spur cable
15-16	60 m
13-14	90 m
1-12	120 m

Note: • 1 device per spur.
• Keep as short as possible (min 1 m)

When using a SENCOM module

When using a SENCOM module, you need to use the supplied cable clamp to fix the sensor cables in place. Attach the supplied cable clamp as shown in Figure 2.2.

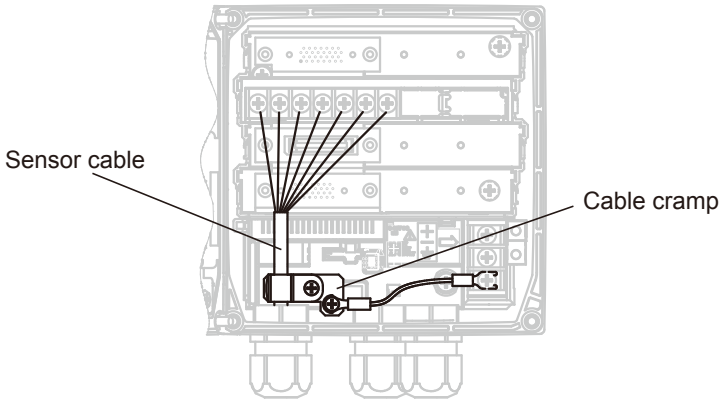


Figure 2.2 When using a SENCOM module

DIP switches

Figure 2.3 shows the DIP switches for setting the address and write protection.
Normally, you do not have the change them from the default settings.

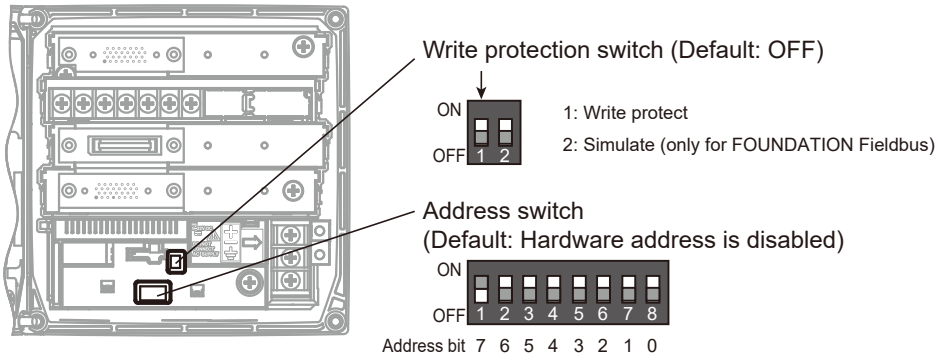


Figure 2.3 DIP switches

2.2 Shielding and grounding

Grounding and shielding of FLXA21 is necessary for a safe and reliable operation. Please use one of the following schemes (A or B) as these will give proper shielding and grounding. One should pay special attention to instruments that required an external power supply (besides the 9 to 32 V supplied by the bus).

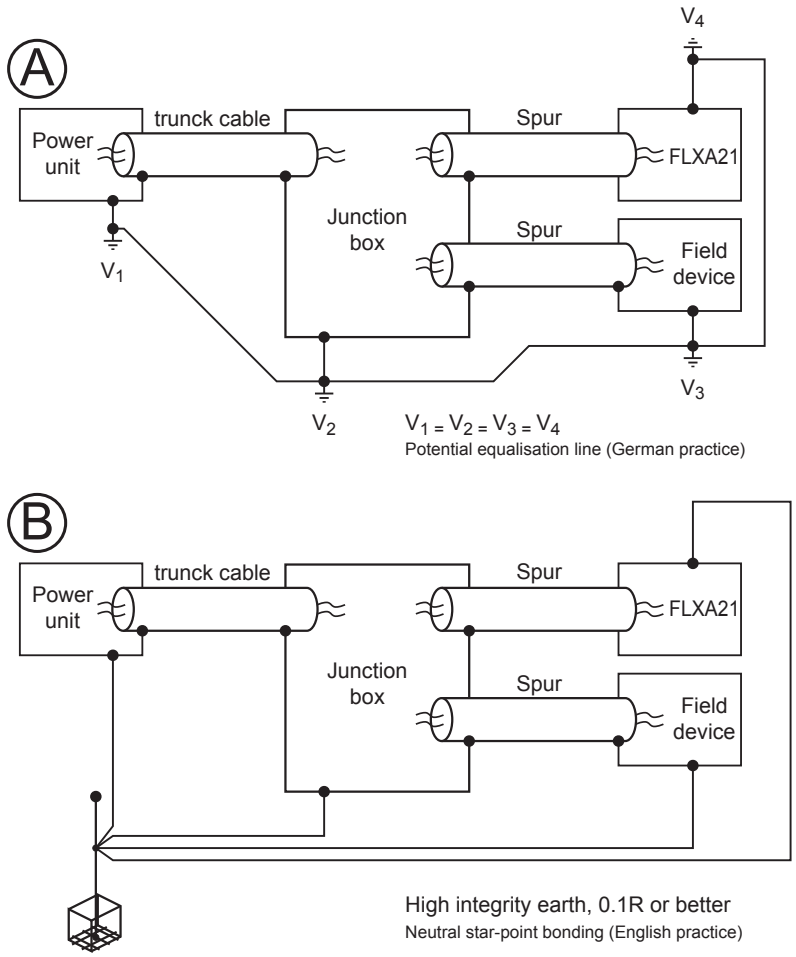


Figure 2.4 Shield and grounding

2.3 How to download DD for CFF

If you do not have the DD or Capability file (CFF) files, you can download them from our web site.

http://www.yokogawa.com/an/download/an-dl-fieldbus-001en.htm

*: This address is subject to change without prior notice. If the above address cannot be accessed, consult your nearest sales office or the agency from which you purchased the product.

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3. Getting started

FOUNDATION Fieldbus is fully dependent upon digital communication protocol and differs in operation from conventional 4 to 20 mA transmission communication protocol. It is recommended that novice users use field devices in accordance with the procedures described in this section. The procedures assume that field devices will be set up on a bench or an instrument shop.

3.1 Connection of Devices

The following instruments are required for use with FOUNDATION Fieldbus devices:

- **Power supply**

  FOUNDATION Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as is.

- **Terminator**

  FOUNDATION Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field devices**

  Connect FLXA21 FOUNDATION Fieldbus communication type.

  Two or more FLXA21 devices or other devices can be connected.

- **Host**

  Used for accessing field devices. A dedicated host (such as DCS) is used for an instrumentation line while dedicated communication tools are used for experimental purposes. For operation of the host, refer to the instruction manual for each host. No details of the host are explained in the rest of this material.

- **Cable**

  Used for connecting devices. Refer to “Fieldbus Technical Information” (TI 38K03A01-01E) for details of instrumentation cabling.

  FOUNDATION Fieldbus uses twisted pair wires. To meet the Electro Magnetic Interference standards a shielded twisted pair is obligated.

Refer to Yokogawa when making arrangements to purchase the recommended equipment.

Connect the devices as shown in Figure 3.1. Connect the terminators at both ends of the trunk, with a minimum length of the spur laid for connection.

The polarity of signal and power must be maintained.

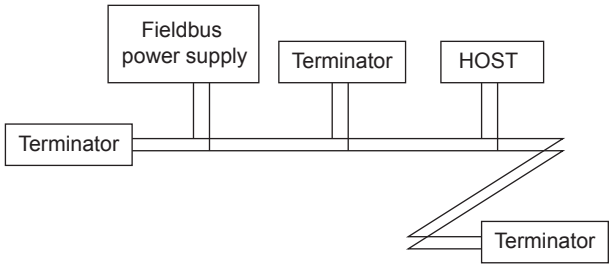


Figure 3.1 Cabling

NOTE

Before using a FOUNDATION Fieldbus configuration tool other than the existing host, confirm it does not affect the loop functionality in which all devices are already installed in operation. Disconnect the relevant control loop from the bus if necessary.

CAUTION

Connecting a FOUNDATION Fieldbus configuration tool to a loop with its existing host may cause communication data scrambles resulting in a functional disorder or a system failure.

3.2 Host Setting

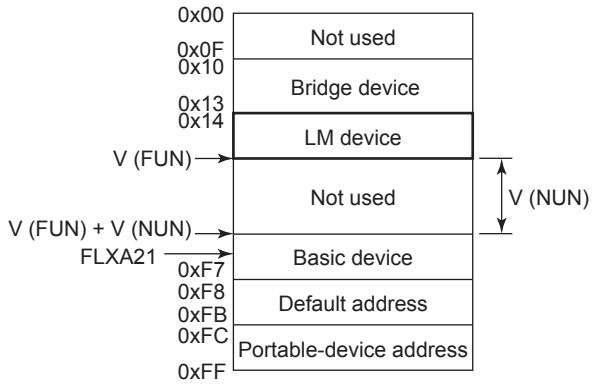
To activate FOUNDATION Fieldbus, the following settings are required for the host.

CAUTION

Do not turn off the power immediately after setting. When the parameters are saved to the EEPROM, the redundant processing is executed for an improvement of reliability. If the power is turned off within 60 seconds after setting is made, the modified parameters are not saved and the settings may return to the original values.

Table 3.1 Operation Parameters

Symbol	Parameter	Description and Settings
V (ST)	Slot-Time	Indicates the time necessary for immediate reply of the device. Unit of time is in octets (256 µs). Set maximum specification for all devices. For FLXA21, set a value of 4 or greater.
V (MID)	Minimum-Inter-PDU-Delay	Minimum value of communication data intervals. Unit of time is in octets (256 µs). Set the maximum specification for all devices. For FLXA21, set a value of 4 or greater.
V (MRD)	Maximum-Response-Delay	The worst case time elapsed until a reply is recorded. The unit is Slot-time; set the value so that V (MRD) × V (ST) is the maximum value of the specification for all devices. For FLXA21, the setting must be a value of 12 or greater.
V (FUN)	First-Unpolled-Node	Define the first address that can be used by the host. Set 0x15 or greater.
V (NUN)	Number-of-consecutive-Unpolled-Node	This sets the number of consecutive unpolled nodes. FLXA21 address is factory-set to 0xEB. Set this address to be within the range of the BASIC device in Figure 3.2.



Note 1: LM device: with bus control function (Link Master function)

Note 2: BASIC device: without bus control function

Figure 3.2 Available Address Range

3.3 Bus Power ON

Turn on the power of the host and the bus. First all segments of the display are lit, then the display begins to operate. If the indicator is not lit, check the polarity of the power supply.

Using the host device display function, check that the FLXA21 is in operation on the bus.

Unless otherwise specified, the following settings are in effect when shipped from the factory.

Table 3.2

	FLXA21-PH	FLXA21-SC
PD tag	PH1001	SC1001
Node addr.	232	233
DEV_TYPE	0x0402	0x0403

If no FLXA21 is detected, check the available address range and the polarity of the power supply. If the node address and PD tag are not specified when ordering, default value is factory set. If two or more FLXA21's are connected at a time with default value, only one FLXA21 will be detected from the host as FLXA21's have the same initial address.

Separately connect each FLXA21 and set a different address for each.

3.4 Integration of DD

If the host supports DD (Device Description), the DD of the FLXA21 needs to be installed. Check if host has the following directory under its default DD directory.

594543\DEV_TYPE

(594543 is the manufacturer number of Yokogawa Electric Corporation, and DEV_TYPE is the FLXA21 device number, respectively. Refer to Table 3.2.)

If this directory is not found, DD of FLXA21 has not been included. Create the above directory and copy the DD file (0m0n.ffo,0m0n.sym) (m, n is a numeral) (to be supplied separately) into the directory.

Once the DD is installed in the directory, the name and attribute of all parameters of the FLXA21 are displayed.

Off-line configuration is possible by using Capability file (CFF).

3.5 Set the parameters using DTM

When configure the parameters using FieldMate, use the DTM (Device Type Manager) shown in the Table 3.3.

Table 3.3 DTM

DTM	Analyzers		
Name	Model Name	DeviceType	DeviceRevision
FLEXA FF DTM	FLXA21-PH	0x0402	1
	FLXA21-SC	0x0403	1

"Field Diagnostics" function (refer to IM 01R01A15-01EN) is available on FLXA21-PH or FLXA21-SC DTM Revision 3.4.0.21 or later.

The DTM corresponding to the above is included in Yokogawa Device DTM Library 5.2/Device Files R 3.5.2.8 or later.

3.6 Reading the Parameters

To read FLXA21 parameters, select the AI1 block of the FLXA21 from the host screen and read the OUT parameter.

The current process value is displayed. Check that MODE_BLOCK of the function block and resource block is set to AUTO, and change the signal input and read the parameter again. A new designated value should be displayed.

3.7 Continuous Record of Values

If the host has a function of continuously recording the indications, use this function to list the indications (values). Depending on the host being used, it may be necessary to set the schedule of Publish (the function that transmits the indication on a periodic basis).

3.8 Generation of Alarm

Generation of an alarm can be attempted from the FLXA21. Block alarm, Output limit alarm, and Update alarm are informed to the host. When generating alarm, a Link Object and a VCR Static Entry need to be set. For details of Link Object and VCR Static Entry, refer to “4.6.1 Link Object” and “4.5.1 VCR Setting”.

3.9 PRIMARY/SECONDARY/TERTIARY/ QUATERNARY_VALUE Value Assignment

Measurement values are assigned to PRIMARY_VALUE, SECONDARY_VALUE, TERTIARY_ VALUE, and QUATERNARY_VALUE from the device screen.

To set PRIMARY_VALUE, choose Commissioning > Output setup > Output, and then set the Process parameter item on the mA (Output) screen.

For others, choose Commissioning > Advanced setup > Communication > HART, and on the HART setup screen, set SECONDARY_VALUE with the SV item, TERTIARY_VALUE with the TV item, and QUATERNARY_VALUE with the QV item.

CAUTION

Be sure to use the default values for the following settings.

Changing them may disrupt communication.

Commissioning > Advanced setup > Communication screen
Default value: HART

Commissioning > Advanced setup > Communication > HART setup screen
Item name: Network address
Default value: 0

If you want to change the settings from the device, first change Sensor Transducer Block Mode (refer also to tables in chapter 6 because not all parameters need OS to allow a change) to Out of Service.

If you want to load the factory settings or change the language, first change Physical Block Mode (refer also to tables in chapter 6 because not all parameters need OS to allow a change) to Out of Service.

Note that when you do, the FLXA21 will restart.

4. Configuration

This chapter contains information on how to adapt the function and performance of the FLXA21 to suit specific applications. Because two or more devices are connected to FOUNDATION Fieldbus, settings including the requirements of all devices need to be determined. Practically, the following steps must be taken.

(1) Network design

Determines the devices to be connected to FOUNDATION Fieldbus and checks the capacity of the power supply.

(2) Network definition

Determines the tag and node addresses for all devices.

(3) Definition of combining function blocks

Determines the method for combination between each function block.

(4) Setting tags and addresses

Sets the PD Tag and node addresses one by one for each device.

(5) Communication setting

Sets the link between communication parameters and function blocks.

(6) Block setting

Sets the parameters for function blocks.

The following section describes each step of the procedure in the order given. Using a dedicated configuration tool allows the procedure to be signifi-cantly simplified. This section describes the procedure to be assigned for a host which has relatively simple functions.

4.1 Network Design

Select the devices to be connected to the FOUNDATION Fieldbus network. The following instruments are necessary for operation of FOUNDATION Fieldbus.

- **Power supply**

  FOUNDATION Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as is. A power conditioner is required.

- **Terminator**

  FOUNDATION Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field devices**

  Connect the field devices necessary for instrumentation.

  FLXA21 has passed the interoperability test conducted by The FOUNDATION Fieldbus. In order to properly start FOUNDATION Fieldbus, it is recommended that the devices used satisfy the requirements of the above test.

- **Host**

  Used for accessing field devices. A minimum of one device with bus control function is needed.

- **Cable**

  Used for connecting devices. Refer to “Fieldbus Technical Information” for details of instrumentation cabling. Provide a cable sufficiently long to connect all devices. For field branch cabling, use terminal boards or a connection box as required.

First, check the capacity of the power supply. The power supply capacity must be greater than the sum of the maximum current consumed by all devices to be connected to FOUNDATION Fieldbus. The maximum current consumed (power supply voltage 9 to 32 V) for FLXA21 is 26.0 mA. The cable must have the spur in a minimum length with terminators installed at both ends of the trunk.

4.2 Network Definition

Before connection of devices with FOUNDATION Fieldbus, define the FOUNDATION Fieldbus network. Allocate PD Tag and node addresses to all devices (excluding such passive devices as terminators).

The PD Tag is the same as the conventional one used for the device. Up to 32 alphanumeric characters may be used for definition. Use a hyphen as a delimiter as required.

The node address is used to specify devices for communication purposes. Because data is too long for a PD Tag, the host uses the node address in place of the PD Tag for communication.

A range of 20 to 247 (or hexadecimal 0x14 to 0xF7) can be set.

Addresses of devices with Link Master capabilities are set in a low address range smaller than V(FUN).

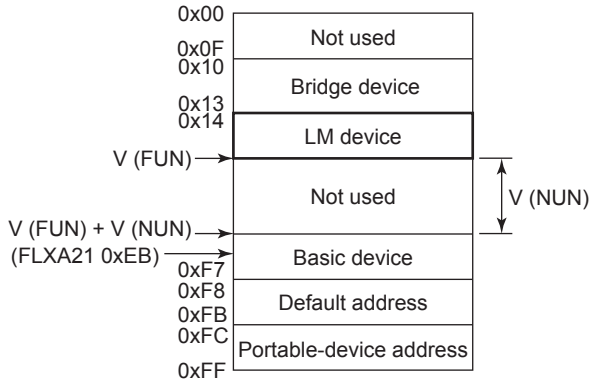
Addresses of basic devices are set in a higher range bigger than V(FUN) + V(NUN).

Specify the address range used by setting the following two parameters in the LM-device:

Table 4.1 Parameters for Setting Address Range

Symbol	Parameters	Description
V (FUN)	First-Unpolled-Node	Indicates the address next to the address range used for the host or other LM device.
V (NUN)	Number-of-consecutive-Unpolled-Nodes	Unused address range

The devices within the address range written as “Not used” in Figure 4.1 cannot be used on a FOUNDATION Fieldbus. For other address ranges, the range is periodically checked to identify when a new device is connected. Care must be taken not to allow the address range to become wider, which can lead to exhaustive consumption of FOUNDATION Fieldbus communication performance.



Note 1: LM device: with bus control function (Link Master function)

Note 2: BASIC device: without bus control function

Figure 4.1 Available Range of Node Addresses

To ensure stable operation of FOUNDATION Fieldbus, determine the operation parameters and set them to the LM devices. While the parameters in Table 4.2 are to be set, the worst-case values of all the devices to be connected to the same FOUNDATION Fieldbus must be used. Refer to the specification of each device for details. Table 4.2 lists FLXA21 specification values.

Table 4.2 Operation Parameter Values of the FLXA21 to be Set to LM Devices

Symbol	Parameters	Description and Settings
V (ST)	Slot-Time	Indicates the time necessary for immediate reply of the device. Unit of time is in octets (256 μs). Set maximum specification for all devices. For FLXA21, set a value of 4 or greater.
V (MID)	Minimum-Inter-PDU-Delay	Minimum value of communication data intervals. Unit of time is in octets (256 μs). Set the maximum specification for all devices. For FLXA21, set a value of 4 or greater.
V (MRD)	Maximum-Response-Delay	The worst case time elapsed until a reply is recorded. The unit is Slot-time; set the value so that V (MRD) 3V (ST) is the maximum value of the specification for all devices. For FLXA21, the setting must be a value of 12 or greater.

4.3 Definition of Combining Function Blocks

The input/output parameters for function blocks are combined. For the FLXA21, three AI blocks output parameter (OUT) are subject to combination. They are combined with the input of the control block as necessary.

Practically, setting is written to the FLXA21 link object with reference to “4.6 Block setting” for details. It is also possible to read values from the host at proper intervals instead of connecting the FLXA21 block output to other blocks.

The combined blocks need to be executed synchronously with other blocks on the communications schedule. In this case, change the FLXA21 schedule according to the following table. Enclosed values in the table are factory-settings.

Table 4.3 Execution Schedule of the FLXA21 Function Blocks

Index	Parameters	Setting (Enclosed is factory-setting)
269(SM)	MACROCYCLE_DURATION	Cycle (MACROCYCLE) period of control or measurement. Unit is 1/32 ms. (32000 = 1 s)
276(SM)	FB_START_ENTRY.1	AI1 block startup time. Elapsed time from the start of MACROCYCLE specified in 1/32 ms. (0 = 0 s)
277(SM) to 289(SM)	FB_START_ENTRY.2 to 14	Not used.

A maximum of 29 ms is taken for execution of an AI block. Executions of AI blocks should be scheduled sequentially. In no case should two AI function blocks of the FLXA21 be executed at the same time (execution time is overlapped). 29 ms after AI block execution start the out value is available for further processing.

Figure 4.3 shows an example of schedule based on the loop shown in Figure 4.2.

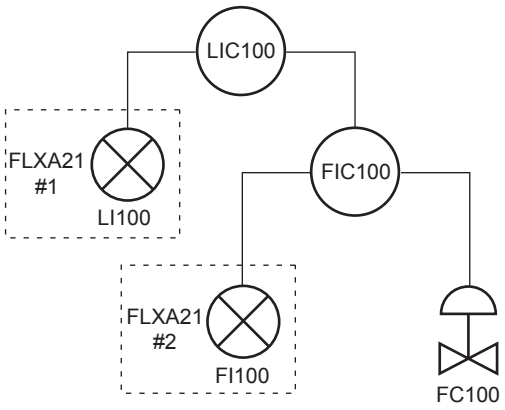


Figure 4.2 Example of Loop Connecting Function Block of Two FLXA21 with Other Instruments

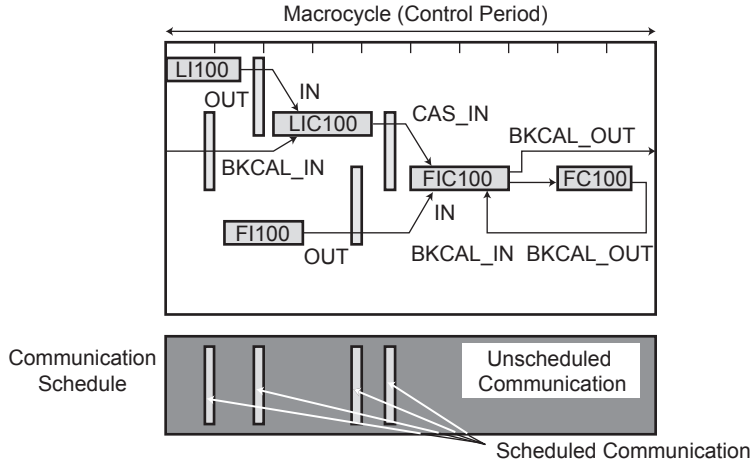


Figure 4.3 Function Block Schedule and Communication Schedule

When the macrocycle is set to more than 4 seconds, set the following intervals to be more than 1% of the macrocycle.

- Interval between “end of block execution” and “start of sending CD from LAS”
- Interval between “end of block execution” and “start of the next block execution”

4.4 Setting of Tags and Addresses

This section describes the steps in the procedure to set PD Tags and node addresses in the FLXA21.

There are three states of FOUNDATION Fieldbus devices as shown in Figure 4.4, and if the state is other than SM_OPERATIONAL state, no function block is executed. FLXA21 must be transferred back to this state after a tag or address is changed.

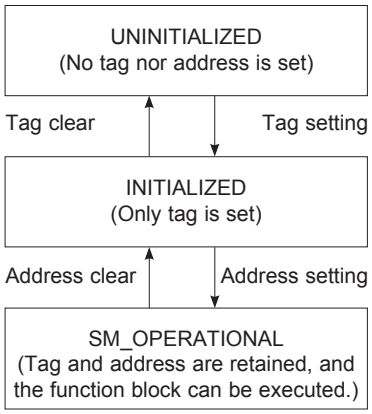


Figure 4.4 Status Transition by Setting PD Tag and Node Address

FLXA21 has a PD Tag and node address that are set upon shipment from the factory unless otherwise specified. To change only the node address, clear the address once and then set a new node address. To set the PD Tag, first clear the node address and clear the PD Tag, then set the PD Tag and node address again.

Devices whose node address was cleared will await the default address (randomly chosen from a range of 248 to 251, or from hexadecimal F8 to FB). It is necessary to confirm the device ID in **order to correctly** specify the device. The device ID of the FLXA21 is 594543083xxxxxxxxx. (The xxxxxxxxx at the end of the above device ID is a total of 9 alphanumeric characters. The characters displyed on the screen when each instrument is powered on, correspond to the xxxxxxxxx and if necessary, should be recorded.)

4.5 Communication Setting

To set the communication function, it is necessary to change the database residing in SM-VFD.

4.5.1 VCR Setting

Set VCR (Virtual Communication Relationship), which specifies the called party for communication and resources. FLXA21 has 33 VCRs whose application can be changed, except for the first VCR, which is used for management.

FLXA21 has VCRs of 3 types:

Publisher(-Subscriber) VCR

Publisher-Subscriber VCR's are designed to link Function Blocks. When a publishing Function Block runs, its output data is stored in the buffer of the Publisher VCR. Then the LAS (LM) sends a CD to this VCR to force it to transfer the data. Subscriber VCRs receive this data and gives this to the subscribing Function Blocks. Typical example is a linkage from an output of an Analog Input (AI) block to the process value input of the PID control block.

Publisher-Subscriber model is one-to-many one-way Communication. Subscribers are able to know whether data is updated since the last publish. This mechanism is important because Data Link Layer transfers data as scheduled regardless the publishing Function Block updates the data in the buffer.

(Client-)Server Model

Client-Server model is universal and used in many communication technologies. An application called "Client" requests another application called "Server" to do a specific action. When the Server finishes the requested action, its result is transferred back to the Client. It is an one-to-one two-way communication.

Typical example is a human-machine interface (Client) to read data of a Function Block (Server). The Client sends a Read request to the Server and then the Server sends back the data to the Client. This communication is unscheduled and is handled during the unscheduled interval in the macrocycle. A Client may want to issue many requests at a time. A Client-Server VCR has a queue to store those requests and sends the requests one by one when the node has the token.

Source(-Sink) Model

A Source-Sink VCR is designed to broadcast messages. It is one-to-many one-way communication without any schedule. This model is sometimes called “Report Distribution Model.” A Source VCR transfers a message in the queue to an assigned global address when the device has the token. Sink VCRs are set to the same global address and receive the same message from a Source. Foundation devices use this model for two specific purposes. One is to report alarms or events detected in the Source and the other is to transmit trends of Source Function Blocks. Alarms are acknowledged through a Client-Server VCR. It is desirable for an alarm logger to receive alarms from all devices with just one VCR. A Sink can receive messages from many Sources if the Sources are configured to send messages to the same global address.

A Source VCR transmits data without established connection. A Sink (QUU) VCR on another device can receive it if the Sink is configured so. A Publisher VCR transmits data when LAS requests so. An explicit connection is established from VCR(s) so that a Subscriber knows the format of published data.

Each VCR has the parameters listed in Table 4.4. Parameters must be changed together for each VCR because modification for each parameter may cause inconsistent operation.

Table 4.4 VCR Static Entry

Sub-index	Parameter	Description
1	FasArTypeAndRole	Indicates the type and role of communication (VCR). The following 3 types are used for FLXA21. 0x32: Server (Responds to requests from host.) 0x44: Source (Transmits alarm or trend.) 0x66: Publisher (Sends AI block output to other blocks.)
2	FasDllLocalAddr	Sets the local address to specify VCR in FLXA21. A range of 0x20 to 0xF7 in hexadecimal.
3	FasDllConfigured RemoteAddr	Sets the node address of the called party for communication and the address (DLSAP or DLCEP) used to specify VCR in that address. For DLSAP or DLCEP, a range of 0x20 to 0xF7 in hexadecimal is used. Addresses in Subindex 2 and 3 need to be set to the same contents of the VCR as the called party (local and remote are reversed).
4	FasDllSDAP	Specifies the quality of communication. Usually, one of the following types is set. 0x2B: Server 0x01: Source (Alert) 0x03: Source (Trend) 0x91: Publisher
5	FasDllMaxConfirm DelayOnConnect	To establish connection for communication, a maximum wait time for the called party's response is set in ms. Typical value is 60 seconds (60000).
6	FasDllMaxConfirm DelayOnData	For request of data, a maximum wait time for the called party's response is set in ms. Typical value is 60 seconds (60000).
7	FasDllMaxDlsduSize	Specifies maximum DL Service Data unit Size (DLSDU). Set 256 for Server and Trend VCR, and 64 for other VCRs..
8	FasDllResidual ActivitySupported	Specifies whether connection is monitored. Set TRUE (0xff) for Server. This parameter is not used for other communication.
9	FasDllTimeliness Class	Not used.
10	FasDllPublisherTime WindowSize	Not used.
11	FasDllPublisher SynchronizaingDlcep	Not used.
12	FasDllSubsriberTime WindowSize	Not used.
13	FasDllSubscriber SynchronizationDlcep	Not used.
14	FmsVfdId	Sets VFD for FLXA21 to be used. 0x1: System/network management VFD 0x1234: Function block VFD
15	FmsMaxOutstanding ServiceCalling	Set 0 to Server. It is not used for other applications.
16	FmsMaxOutstanding ServiceCalled	Set 1 to Server. It is not used for other applications.
17	FmsFeatures Supported	Indicates the type of services in the application layer. In FLXA21, it is automatically set according specific applications.

33 VCRs are factory-set as shown in the table 4.5.

Table 4.5 VCR List

Index (SM)	VCR Number	Factory Setting
303	1	For system management (Fixed)
304	2	Server (LocalAddr = 0xF3)
305	3	Server (LocalAddr = 0xF4)
306	4	Server (LocalAddr = 0xF7)
307	5	Trend Source (LocalAddr = 0x07, Remote Address=0x111)
308	6	Not set
309	7	Alert Source (LocalAddr = 0x07, Remote Address=0x110)
310	8	Server (LocalAddr = 0xF9)
311 to 325	9 to 23	Not set

4.5.2 Function Block Execution Control

According to the instructions given in Section 4.3, set the execution cycle of the function blocks and schedule of execution.

4.6 Block Setting

Set the parameter for function block VFD.

4.6.1 Link Object

Link object combines the data voluntarily sent by the function block with VCR. The FLXA21 has 40 link objects.

A single link object specifies one combination.

Each link object has the parameters listed in Table 4.6.

Parameters must be changed together for each VCR because the modifications made to each parameter may cause inconsistent operation.

Table 4.6 Link Object Parameters

Sub-index	Parameter	Description
1	LocalIndex	Sets the index of function block parameters to be combined; set “0” for Trend and Alert.
2	VcrNumber	Sets the index of VCR to be combined. If set to “0”, this link object is not used.
3	RemoteIndex	Not used in FLXA21. Set to “0”.
4	ServiceOperation	Set one of the following. Only one link object is used for Alert and/or Trend. 0: Undefined 2: Publisher 6: Alert 7: Trend
5	StaleCountLimit	Set the maximum number of consecutive stale input values which may be received before the input status is set to BAD. To avoid the unnecessary mode transition caused when the data is not correctly received by subscriber, set this parameter to “2” or more.

Set link objects as shown in Table 4.7.

Table 4.7 Factory-Settings of Link Objects (example)

Index	Link Object#	Factory Settings
30000 to 30039	1 to 40	Not used

4.6.2 Trend Object

It is possible to set the parameter so that the function block automatically transmits Trend. The FLXA21 has ten Trend objects: eight for trends of analog parameters and two for discrete parameters. A single Trend object specifies the trend of one parameter.

Each Trend object has the parameters listed in Table 4.8. The first four parameters are the items to be set. Before writing to a Trend object, it is necessary to release the WRITE_LOCK parameter.

Table 4.8 Parameters for Trend Objects

Sub-index	Parameter	Description
1	Block Index	Sets the leading index of the function block that takes a trend.
2	Parameter Relative Index	Sets the index of parameters taking a trend by a value relative to the beginning of the function block. In FLXA21 AI block, the following three types of trends are possible. 7: PV 8: OUT 19: FIELD_VAL
3	Sample Type	Specifies how trends are taken. Choose one of the following 2 types: 1:Sampled upon execution of a function block. 2:The average value is sampled.
4	Sample Interval	Specifies sampling intervals in units of 1/32 ms. Set the integer multiple of the function block execution cycle.
5	Last Update	The last sampling time.
6 to 21	List of Status	16 samples of status.
21 to 37	List of Samples	16 samples of data.

Ten trend objects are factory-set as shown Table 4.9.

Table 4.9 Trend Object are Factory-Set

Index	Parameters	Factory Settings
32000 to 32005	TREND_FLT.1 to TREND_FLT.6	Not used.
32006	TREND_DIS.1	Not used.

4.6.3 View Object

This is the object to form groups of parameters in a block. One advantage of forming groups of parameters is the reduction of load for data transaction. The FLXA21 has four View Objects for each Resource block, Sensor Transducer block and AI1, AI2, AI3 function block, and each View Object has the parameters listed in Table 4.12 to 4.15.

Table 4.10 Purpose of Each View Object

	Description
VIEW_1	Set of dynamic parameters required by operator for plant operation. (PV, SV, OUT, Mode etc.)
VIEW_2	Set of static parameters which need to be shown to plant operator at once. (Range etc.)
VIEW_3	Set of all the dynamic parameters
VIEW_4	Set of static parameters for configuration or maintenance.

Table 4.11 Indexes of View for Each Block

	VIEW_1	VIEW_2	VIEW_3	VIEW_4
Resource Block	40100	40101	40102, 40103	40104, 40105
Sensor Transducer Block	40200	40201	40202	40203
AI1 Function Block	40400	40401	40402	40403
AI2 Function Block	40410	40411	40412	40413
AI3 Function Block	40420	40421	40422	40423

Table 4.12 View Object for Resource Block

Relative Index	Parameter	View					
		1	2	3	3_2	4	4_2
1	ST_REV	2	2	2	2	2	2
2	TAG_DESC						
3	STRATEGY					2	
4	ALERT_KEY					1	
5	MODE_BLK	4		4			
6	BLOCK_ERR	2		2			
7	RS_STATE	1		1			
8	TEST_RW						
9	DD_RESOURCE						
10	MANUFAC_ID					4	
11	DEV_TYPE					2	
12	DEV_REV					1	
13	DD_REV					1	
14	GRANT_DENY		2				
15	HARD_TYPES					2	
16	RESTART						
17	FEATURES					2	
18	FEATURE_SEL		2				
19	CYCLE_TYPE					2	
20	CYCLE_SEL		2				
21	MIN_CYCLE_T					4	
22	MEMORY_SIZE					2	
23	NV_CYCLE_T		4				
24	FREE_SPACE		4				
25	FREE_TIME	4		4			
26	SHED_RCAS		4				
27	SHED_ROUT		4				
28	FAULT_STATE	1		1			
29	SET_FSTATE						
30	CLR_FSTATE						
31	MAX_NOTIFY					1	
32	LIM_NOTIFY		1				
33	CONFIRM_TIME		4				
34	WRITE_LOCK		1				
35	UPDATE_EVT						
36	BLOCK_ALM						
37	ALARM_SUM	8		8			
38	ACK_OPTION					2	
39	WRITE_PRI					1	
40	WRITE_ALM						
41	ITK_VER					2	
42	SOFT_REV						
43	SOFT_DESC						
44	SIM_ENABLE_MSG						
45	DEVICE_STATUS_1			4			
46	DEVICE_STATUS_2			4			
47	DEVICE_STATUS_3			4			
48	DEVICE_STATUS_4			4			
49	DEVICE_STATUS_5			4			
50	DEVICE_STATUS_6			4			
51	DEVICE_STATUS_7			4			
52	DEVICE_STATUS_8			4			
53	SOFTDWN_PROTECT					1	
54	SOFTDWN_FORMAT					1	

Relative Index	Parameter	View					
		1	2	3	3_2	4	4_2
55	SOFTDWN_COUNT					2	
56	SOFTDWN_ACT_AREA			1			
57	SOFTDWN_MOD_REV			16			
58	SOFTDWN_ERROR			2			
59	SOFTDWN_HISTORY						
60	SOFTDWN_HIST_INDEX						
61	COMPATIBILITY_REV			1			
62	CAPABILITY_LEV			1			
63	CAPABILITY_CONFIG			2			
64	WRITE_LOCK_LEVEL		1				
65	SI_CONTROL_CODES		1				
66	FD_VER					2	
67	FD_FAIL_ACTIVE	4			4		
68	FD_OFFSPEC_ACTIVE	4			4		
69	FD_MAINT_ACTIVE	4			4		
70	FD_CHECK_ACTIVE	4			4		
71	FD_FAIL_MAP					4	
72	FD_OFFSPEC_MAP					4	
73	FD_MAINT_MAP					4	
74	FD_CHECK_MAP					4	
75	FD_FAIL_MASK					4	
76	FD_OFFSPEC_MASK					4	
77	FD_MAINT_MASK					4	
78	FD_CHECK_MASK					4	
79	FD_FAIL_ALM						
80	FD_OFFSPEC_ALM						
81	FD_MAINT_ALM						
82	FD_CHECK_ALM						
83	FD_FAIL_PRI					1	
84	FD_OFFSPEC_PRI					1	
85	FD_MAINT_PRI					1	
86	FD_CHECK_PRI					1	
87	FD_SIMULATE				9		
88	FD_RECOMMEN_ACT	2			2		
89	FD_EXTENDED_ACTIVE_1				4		
90	FD_EXTENDED_ACTIVE_2				4		
91	FD_EXTENDED_ACTIVE_3				4		
92	FD_EXTENDED_ACTIVE_4				4		
93	FD_EXTENDED_ACTIVE_5				4		
94	FD_EXTENDED_ACTIVE_6				4		
95	FD_EXTENDED_ACTIVE_7				4		
96	FD_EXTENDED_ACTIVE_8				4		
97	FD_EXTENDED_MAP_1						4
98	FD_EXTENDED_MAP_2						4
99	FD_EXTENDED_MAP_3						4
100	FD_EXTENDED_MAP_4						4
101	FD_EXTENDED_MAP_5						4
102	FD_EXTENDED_MAP_6						4
103	FD_EXTENDED_MAP_7						4
104	FD_EXTENDED_MAP_8						4
105	PRIVATE_1						
106	PRIVATE_2						
107	PRIVATE_3						
108	PRIVATE_4						
109	PRIVATE_5						

Relative Index	Parameter	View					
		1	2	3	3_2	4	4_2
110	PRIVATE_6						
111	PRIVATE_7						
112	PRIVATE_8						
113	PRIVATE_9						
114	PRIVATE_10						
115	PRIVATE_11						
116	DEVICE_CONDITION_ACTIVE_1						4
117	DEVICE_CONDITION_ACTIVE_2						4
118	DEVICE_CONDITION_ACTIVE_3						4
119	DEVICE_CONDITION_ACTIVE_4						4
120	DEVICE_CONDITION_ACTIVE_5						4
121	DEVICE_CONDITION_ACTIVE_6						4
122	DEVICE_CONDITION_ACTIVE_7						4
123	DEVICE_CONDITION_ACTIVE_8						4
TOTALS(#BYTES)		40	32	77	61	73	66

Table 4.13 View Object for AI1.AI2.AI3 Function Block

Relative Index	Parameter	View			
		1	2	3	4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV	5		5	
8	OUT	5		5	
9	SIMULATE				
10	XD_SCALE		11		
11	OUT_SCALE		11		
12	GRANT_DENY		2		
13	IO_OPTS				2
14	STATUS_OPTS				2
15	CHANNEL				2
16	L_TYPE				1
17	LOW_CUT				4
18	PV_FTIME				4
19	FIELD_VAL	5		5	
20	UPDATE_EVT				
21	BLOCK_ALM				
22	ALARM_SUM	8		8	
23	ACK_OPTION				2
24	ALARM_HYS				4
25	HI_HI_PRI				1
26	HI_HI_LIM				4
27	HI_PRI				1
28	HI_LIM				4
29	LO_PRI				1
30	LO_LIM				4
31	LO_LO_PRI				1
32	LO_LO_LIM				4
33	HI_HI_ALM				
34	HI_ALM				
35	LO_ALM				
36	LO_LO_ALM				
TOTALS(#BYTES)		31	26	31	46

Table 4.14 View Object for Sensor Transducer Block PH/SENCOM PH

Relative Index	PARAMETER NAME	View			
		1	2	3	4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	UPDATE_EVT				
8	BLOCK_ALM				
9	TRANSDUCER_DIRECTORY				
10	TRANSDUCER_TYPE	2	2	2	2
11	XD_ERROR	1		1	
12	COLLECTION_DIRECTORY				
13	ALARM_SUM	8		8	
14	PRIMARY_VALUE_TYPE				
15	PRIMARY_VALUE	5		5	
16	PRIMARY_VALUE_UNIT				
17	SENSOR_TYPE_PH				
18	PH_ZERO1				
19	PH_ZERO2				
20	PH_ZERO_UNIT				
21	PH_SLOPE1				
22	PH_SLOPE2				
23	PH_SLOPE_UNIT				
24	PH_3POINT_CALIBRATION				
25	ISOPOTENTIAL_PH				
26	SENSOR_CALIBRATION_DATE				
27	SENSOR_CALIBRATION_DUE_DATE				
28	SENSOR_TEMP_COMPENSATION				
29	SENSOR_TEMP_MANUAL_VALUE				
30	REFERENCE_TEMP				
31	PROCESS_TEMP_COMPENSATION				
32	PH_TEMP_COEFFICIENT				
33	SECONDARY_VALUE_TYPE				
34	SECONDARY_VALUE	5		5	
35	SECONDARY_VALUE_UNIT				
36	SENSOR_TYPE_TEMP				
37	TEMP_UNIT				
38	TERTIARY_VALUE_TYPE				
39	TERTIARY_VALUE	5		5	
40	TERTIARY_VALUE_UNIT				
41	ORP_ZERO				
42	ORP_SLOPE				
43	QUATERNARY_VALUE_TYPE				
44	QUATERNARY_VALUE	5		5	
45	QUATERNARY_VALUE_UNIT				
46	SENSOR_MV				
47	ORP_SENSOR_MV				
48	IMPEDANCE1				
49	IMPEDANCE2				
50	DETC_WELLNESS_ZERO				
51	DETC_WELLNESS_SLOPE				
52	DETC_WELLNESS_IMPEDANCE1				
53	DETC_WELLNESS_IMPEDANCE2				
54	DETC_WELLNESS_HEAT_CYCLE				

Relative Index	PARAMETER NAME	View			
		1	2	3	4
55	DETC_WELLNESS_PROG_TIME				
56	MODULE_PDN				
57	MODULE_SOFTREV				
58	HOUSING_PDN				
59	HOUSING_SOFTREV				
60	SENSOR_TYPE_MODEL				
61	SENCOM_MAX_TEMP				
62	SENCOM_HIGH_PH_TOTAL				
63	SENCOM_LOW_PH_TOTAL				
64	SENCOM_STERILIZATION				
65	SENCOM_STERILIZATION_LAST_DATE				
66	SENCOM_HIGH_TEMP1_TOTAL				
67	SENCOM_HIGH_TEMP1_LAST_DATE				
68	SENCOM_HIGH_TEMP2_TOTAL				
69	SENCOM_HIGH_TEMP2_LAST_DATE				
70	SENCOM_MODEL_CODE				
71	SENCOM_SOFTREV				
72	SENCOM_ASSYREV				
73	SENCOM_SERIAL_NO				
74	SENCOM_FACT_DATE				
75	ERR_CONFIG_PH_TOO_HIGH				
76	ERR_CONFIG_PH_TOO_LOW				
77	ERR_CONFIG_TEMP_TOO_HIGH				
78	ERR_CONFIG_TEMP_TOO_LOW				
79	ERR_CONFIG_ORP_TOO_HIGH				
80	ERR_CONFIG_ORP_TOO_LOW				
81	ERR_CONFIG_RH_TOO_HIGH				
82	ERR_CONFIG_RH_TOO_LOW				
83	ERR_CONFIG_MATRIX_CONFIG_ERROR				
84	ERR_CONFIG_CALIB_TIME_EXCEEDED				
85	ERR_CONFIG_IMPEDANCE1_TOO_HIGH				
86	ERR_CONFIG_IMPEDANCE1_TOO_LOW				
87	ERR_CONFIG_IMPEDANCE2_TOO_HIGH				
88	ERR_CONFIG_IMPEDANCE2_TOO_LOW				
89	ERR_CONFIG_SENCOM_SENSOR_CHANGED				
90	IMPEDANCE1_LOW_LMT				
91	IMPEDANCE1_HIGH_LMT				
92	IMPEDANCE2_LOW_LMT				
93	IMPEDANCE2_HIGH_LMT				
94	DIAG_SETTING_IMPEDANCE1				
95	DIAG_SETTING_IMPEDANCE1_FINE				
96	DIAG_SETTING_IMPEDANCE2				
97	DIAG_SETTING_IMPEDANCE2_FINE				
98	DIAG_SETTING_PROG_TIME				
99	DIAG_SETTING_PROG_TIME_BAD_LMT				
100	DIAG_SETTING_HEAT_CYCLE				
101	DIAG_SETTING_HEAT_CYCLE_BAD_LMT				
102	HEAT_CYCLE_TEMP				
103	HEAT_CYCLE_TIME				
104	SENCOM_STERILIZATION_TEMP				
105	SENCOM_STERILIZATION_TIME				
106	SENCOM_HIGH_TEMP1				
107	SENCOM_HIGH_TEMP2				
108	SENCOM_LOW_PH				
109	SENCOM_HIGH_PH				

Relative Index	PARAMETER NAME	View			
		1	2	3	4
110	TRANSMITTER_TIME				
111	RESERVE_PARAMETER_1				
112	RESERVE_PARAMETER_2				
113	RESERVE_PARAMETER_3				
114	RESERVE_PARAMETER_4				
115	RESERVE_PARAMETER_5				
116	RESERVE_PARAMETER_6				
117	RESERVE_PARAMETER_7				
118	RESERVE_PARAMETER_8				
119	RESERVE_PARAMETER_9				
120	RESERVE_PARAMETER_10				
121	RESERVE_PARAMETER_11				
122	RESERVE_PARAMETER_12				
123	RESERVE_PARAMETER_13				
124	RESERVE_PARAMETER_14				
125	RESERVE_PARAMETER_15				
126	RESERVE_PARAMETER_16				
127	RESERVE_PARAMETER_17				
128	RESERVE_PARAMETER_18				
129	RESERVE_PARAMETER_19				
130	RESERVE_PARAMETER_20				
131	RESERVE_PARAMETER_21				
132	RESERVE_PARAMETER_22				
133	RESERVE_PARAMETER_23				
134	RESERVE_PARAMETER_24				
135	RESERVE_PARAMETER_25				
136	RESERVE_PARAMETER_26				
137	RESERVE_PARAMETER_27				
138	RESERVE_PARAMETER_28				
139	RESERVE_PARAMETER_29				
140	TEST_1				
141	TEST_2				
142	TEST_3				
143	TEST_4				
144	TEST_5				
145	TEST_6				
146	TEST_7				
147	TEST_8				
148	TEST_9				
149	TEST_10				
TOTALS(#BYTES)		39	4	39	7

Table 4.15 View Object for Sensor Transducer Block SC

Relative Index	PARAMETER NAME	View			
		1	2	3	4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	UPDATE_EVT				
8	BLOCK_ALM				
9	TRANSDUCER_DIRECTORY				
10	TRANSDUCER_TYPE	2	2	2	2
11	XD_ERROR	1		1	
12	COLLECTION_DIRECTORY				
13	ALARM_SUM	8		8	
14	PRIMARY_VALUE_TYPE				
15	PRIMARY_VALUE	5		5	
16	PRIMARY_VALUE_UNIT				
17	SENSOR_TYPE_SC				
18	CELL_CONST_FACTORY				
19	CELL_CONST_ADJUST				
20	MEASURING_TYPE				
21	MEASURING_UNIT				
22	SENSOR_CALIBRATION_DATE				
23	SENSOR_CALIBRATION_DUE_DATE				
24	SENSOR_TEMP_COMPENSATION				
25	SENSOR_TEMP_MANUAL_VALUE				
26	REFERENCE_TEMP				
27	TEMP_COMPENSATION1				
28	TEMP_COMPENSATION2				
29	TEMP_COEFFICIENT1				
30	TEMP_COEFFICIENT2				
31	SECONDARY_VALUE_TYPE				
32	SECONDARY_VALUE	5		5	
33	SECONDARY_VALUE_UNIT				
34	SENSOR_TYPE_TEMP				
35	TEMP_UNIT				
36	TERTIARY_VALUE_TYPE				
37	TERTIARY_VALUE	5		5	
38	TERTIARY_VALUE_UNIT				
39	QUATERNARY_VALUE_TYPE				
40	QUATERNARY_VALUE	5		5	
41	QUATERNARY_VALUE_UNIT				
42	CONC_ADDITIONAL_TABLE				
43	CONC_UNIT				
44	CONC_TABLE_CONCENTRATION_1				
45	CONC_TABLE_CONCENTRATION_2				
46	CONC_TABLE_CONCENTRATION_3				
47	CONC_TABLE_CONCENTRATION_4				
48	CONC_TABLE_CONCENTRATION_5				
49	CONC_TABLE_CONCENTRATION_6				
50	CONC_TABLE_CONCENTRATION_7				
51	CONC_TABLE_CONCENTRATION_8				
52	CONC_TABLE_CONCENTRATION_9				
53	CONC_TABLE_CONCENTRATION_10				
54	CONC_TABLE_CONCENTRATION_11				

Relative Index	PARAMETER NAME	View			
		1	2	3	4
55	CONC_TABLE_CONCENTRATION_12				
56	CONC_TABLE_CONCENTRATION_13				
57	CONC_TABLE_CONCENTRATION_14				
58	CONC_TABLE_CONCENTRATION_15				
59	CONC_TABLE_CONCENTRATION_16				
60	CONC_TABLE_CONCENTRATION_17				
61	CONC_TABLE_CONCENTRATION_18				
62	CONC_TABLE_CONCENTRATION_19				
63	CONC_TABLE_CONCENTRATION_20				
64	CONC_TABLE_CONCENTRATION_21				
65	CONC_TABLE_CONDUCTIVITY_1				
66	CONC_TABLE_CONDUCTIVITY_2				
67	CONC_TABLE_CONDUCTIVITY_3				
68	CONC_TABLE_CONDUCTIVITY_4				
69	CONC_TABLE_CONDUCTIVITY_5				
70	CONC_TABLE_CONDUCTIVITY_6				
71	CONC_TABLE_CONDUCTIVITY_7				
72	CONC_TABLE_CONDUCTIVITY_8				
73	CONC_TABLE_CONDUCTIVITY_9				
74	CONC_TABLE_CONDUCTIVITY_10				
75	CONC_TABLE_CONDUCTIVITY_11				
76	CONC_TABLE_CONDUCTIVITY_12				
77	CONC_TABLE_CONDUCTIVITY_13				
78	CONC_TABLE_CONDUCTIVITY_14				
79	CONC_TABLE_CONDUCTIVITY_15				
80	CONC_TABLE_CONDUCTIVITY_16				
81	CONC_TABLE_CONDUCTIVITY_17				
82	CONC_TABLE_CONDUCTIVITY_18				
83	CONC_TABLE_CONDUCTIVITY_19				
84	CONC_TABLE_CONDUCTIVITY_20				
85	CONC_TABLE_CONDUCTIVITY_21				
86	POLARIZATION				
87	SENSOR_OHMS				
88	USP				
89	DETC_WELLNESS_POLARIZATION				
90	DETC_WELLNESS_CELL_CONST				
91	DETC_WELLNESS_HEAT_CYCLE				
92	DETC_WELLNESS_PROG_TIME				
93	MODULE_PDN				
94	MODULE_SOFTREV				
95	HOUSING_PDN				
96	HOUSING_SOFTREV				
97	ERR_CONFIG_COND_OR_CONC_TOO_HIGH				
98	ERR_CONFIG_COND_OR_CONC_TOO_LOW				
99	ERR_CONFIG_TEMP_TOO_HIGH				
100	ERR_CONFIG_TEMP_TOO_LOW				
101	ERR_CONFIG_POLARIZATION_DETECT				
102	ERR_CONFIG_CALIB_TIME_EXCEEDED				
103	ERR_CONFIG_USP_LMT_EXCEED				
104	ERR_CONFIG_1ST_COMP_MATRIX				
105	ERR_CONFIG_2ND_COMP_MATRIX				
106	ERR_CONFIG_CONC_TABLE				
107	MEASUREMENT_HIGH_LMT				
108	MEASUREMENT_LOW_LMT				
109	USP_SAFETY_MARGIN				

Relative Index	PARAMETER NAME	View			
		1	2	3	4
110	DIAG_SETTING_PROG_TIME				
111	DIAG_SETTING_PROG_TIME_BAD_LMT				
112	DIAG_SETTING_HEAT_CYCLE				
113	DIAG_SETTING_HEAT_CYCLE_BAD_LMT				
114	HEAT_CYCLE_TEMP				
115	HEAT_CYCLE_TIME				
116	TRANSMITTER_TIME				
117	RESERVE_PARAMETER_1				
118	RESERVE_PARAMETER_2				
119	RESERVE_PARAMETER_3				
120	RESERVE_PARAMETER_4				
121	RESERVE_PARAMETER_5				
122	RESERVE_PARAMETER_6				
123	RESERVE_PARAMETER_7				
124	RESERVE_PARAMETER_8				
125	RESERVE_PARAMETER_9				
126	RESERVE_PARAMETER_10				
127	RESERVE_PARAMETER_11				
128	RESERVE_PARAMETER_12				
129	RESERVE_PARAMETER_13				
130	RESERVE_PARAMETER_14				
131	RESERVE_PARAMETER_15				
132	RESERVE_PARAMETER_16				
133	RESERVE_PARAMETER_17				
134	RESERVE_PARAMETER_18				
135	RESERVE_PARAMETER_19				
136	RESERVE_PARAMETER_20				
137	RESERVE_PARAMETER_21				
138	RESERVE_PARAMETER_22				
139	RESERVE_PARAMETER_23				
140	TEST_1				
141	TEST_2				
142	TEST_3				
143	TEST_4				
144	TEST_5				
145	TEST_6				
146	TEST_7				
147	TEST_8				
148	TEST_9				
149	TEST_10				
TOTALS(#BYTES)		39	4	39	7

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5. Explanation of Basic Items

Function block parameters can be read from the host or can be set. For a list of the parameters of blocks held by the FLXA21, refer to Chapter 7. The following is a list of important parameters with a guide how to set them.

5.1 AI Function Block

The AI function block is a unit of the software and executed according to the system schedule. During execution, it incorporates data from the Sensor transducer block. After execution, it updates analog outputs and processes newly generated alarms. AI function blocks can provide a discrete output which shows the status of LO, LO_LO, HI, or HI_HI. In terms of function, there is no difference between the three AI function blocks provided in FLXA21.

5.1.1 Function Blocks

The AI function block, via the Channel, incorporates analog signals from the Sensor transducer block, performs scaling processing, filtering, low-cut, and alarm processing before outputting. It has the function to generate a discrete output. Figure 5.1 presents the AI function block.

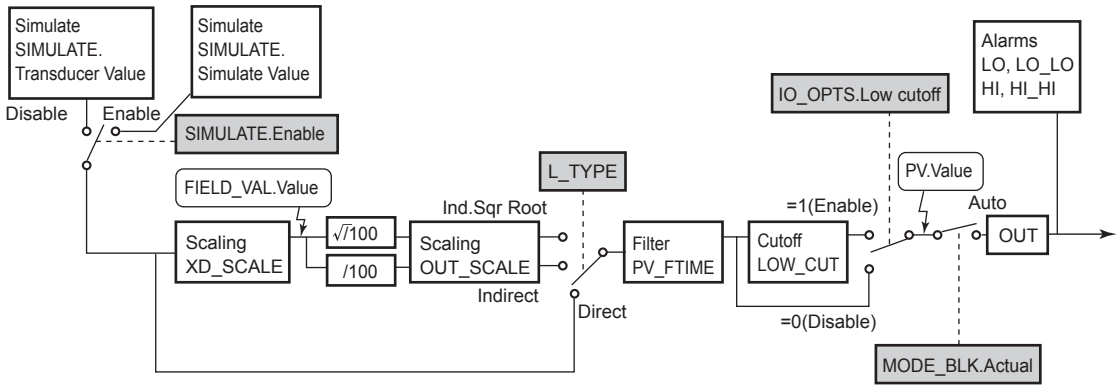


Figure 5.1 Diagram of the AI Functional Block

5.1.2 MODE_BLK

This mode parameter is very important as it gives the state of the block. In O/S (Out_Of_Service) mode the block is out of operation. In this mode it is allowed to update parameters. Manual mode gives the operator the possibility to manually update a selected number of parameters (values, scaling e.g.) in order to test the system. In automatic mode the function block is executed and block parameters are automatically updated.

Under normal operating circumstances, set the Auto mode for normal operation. Auto mode is the factory default.

NOTE

The actual mode is changed by setting the target mode. When the resource block mode is set to OOS all function blocks in the VFD are set to OOS mode.

5.1.3 CHANNEL

Channel is the parameter to select the signal which is calculated in Sensor Transducer Block. The values are assigned to channels.

For the FLXA21 four channels are available.

For the FLXA21, you can select from the PRIMARY, SECONDARY, TERTIARY, QUATENARY values assigned to the Sensor Transducer Block.

For details on how to assign measurement items to parameters, refer to “3.9 PRIMARY/ SECONDARY/TERTIARY/QUATERNARY_VALUE Value Assignment”.

The following table shows the measurement items that you can select and their default values.

FLXA21-PH

Channel	Selectable TB value	Default	Selectable values
1	Primary Value	pH1	pH1, Temperature1, ORP1, rH1
2	Secondary Value	Temperature1	pH1, Temperature1, ORP1, rH1, Ref. impedance1, Empty
3	Tertiary Value	PH: Empty SENCOM: ORP1	
4	Quaternary Value	Empty	

FLXA21-SC

Channel	Selectable TB value	Default	Selectable values
1	Primary Value	Conduct1-TC1	Conduct1-TC1, Temperature1, Resist1-TC1, Concent1-TC1, Conduct1-TC2, Resist1-TC2, Concent1-TC2
2	Secondary Value	Temperature1	Conduct1-TC1, Temperature1, Resist1-TC1, Concent1-TC1, Conduct1-TC2, Resist1-TC2, Concent1-TC2, USP1, Empty
3	Tertiary Value	Empty	
4	Quaternary Value	Empty	

5.1.4 XD_SCALE/OUT_SCALE

Scaling information is used for two purposes. Display devices need to know the range for bar graphs and trending, as well as the units code. Control blocks need to know the range to use internally as percent of span, so that the tuning constants may remain dimensionless. This is converted back to a number with units by using the range of OUT_SCALE. The AI block has the parameter XD_SCALE to define the units expected from the transducer.

Transducer scaling (XD_SCALE) is applied to the value from the channel to produce the FIELD_ VAL in percent. The XD_SCALE units code must match the channel units code.

If L_TYPE is set to Indirect or Ind Sqr Root, OUT_SCALE determines the conversion from FIELD_VAL to the output. PV and OUT always have identical scaling. OUT_SCALE provides scaling for PV. The PV is always the value that the block will place in OUT if the mode is Auto.

5.1.5 L_TYPE

Specifies the operation function of the AI block. If set to “Direct”, the input delivered to CHANNEL is directly reflected on OUT. If set to “Indirect”, scaling by XD_SCALE and OUT_SCALE is carried out and is reflected on OUT. If set to “Indirect SQRT”, after scaling by XD_SCALE, the square root is extracted and the value scaled by OUT_SCALE is reflected on OUT.

Example:

Channel range is defined as 0 to 100 °C but °F units is required for HOST display.

Set the following parameters:

XD_SCALE:	EU@0% = 0 °C
	EU@100% = 100 °C
	Unit = °C
	Decimal point = 2
OUT_SCALE:	EU@0% = 32 °F
	EU@100% = 212 °F
	Unit = °F
	Decimal point = 2

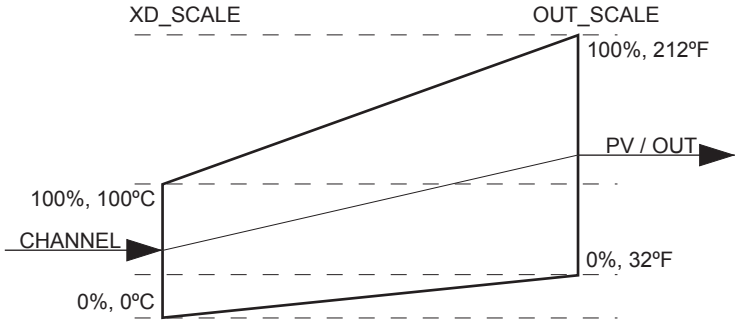


Figure 5.2 Scaling applied to temperature conversion.

5.1.6 PV_FTIME

Sets the time constant of the damping function within AI block (primary delay) in seconds.

5.1.7 Alarm Priority

Indicates the priority of the process alarm. If a value of 3 or greater is set, an alarm is transmitted.

The factory default is 0.

Four types of alarm can be set: HI_PRI, HI_HI_PRI, LO_PRI, and LO_LO_PRI.

5.1.8 Alarm Threshold

Sets the threshold at which a process alarm is generated. The factory default setting is a value that does not generate an alarm.

Four types of alarm can be set: HI_LIM, HI_HI_LIM, LO_LIM, and LO_LO_LIM.

5.1.9 IO_OPTS

IO_OPTS is a parameter used to select whether options regarding input and output signals should be enabled or disabled. In the case of the AI function block, the only available option is “Low cutoff”. When enabling the low cut function for outputs, set this option.

5.1.10 STATUS_OPT

STATUS_OPT is a parameter to select options regarding the status of signals. The AI function block offers four options: Propagate Fault Forward, Uncertain if Limited, BAD if Limited, and Uncertain if Man mode.

■ Propagate Fault Forward

If the status from the sensor is Bad, Device failure or Bad, Sensor failure, propagate it to OUT without generating an alarm. The use of these sub-statuses in OUT is determined by this option. Through this option, the user may determine whether alarming (sending of an alert) will be done by the block or propagated downstream for alarming.

■ Uncertain if Man mode

When the “Uncertain if Man” is enabled and the Actual mode is Man, the OUT signal status should be “Uncertain”.

5.2 Sensor Transducer Block

The Sensor transducer block is in between the sensor and the AI function blocks.

Figure 5.3 presents the functional block of the SENSOR transducer. The sensor module receives and measures the acquired sensor signal. The housing module uses the measured signal to calculate measured values (FLXA21-PH: pH, Temperature, ORP, rH, Ref. Impedance. FLXA21-SC: Conductivity, Temperature, Resistivity, Concentration, UPS). Further, key touch can be used to configure and change various operations. The transducer block assigns the calculated measured values to four process variables (PRIMARY_VALUE, SECONDARY_VALUE, TERTIARY_VALUE and QUATERNARY_VALUE) and includes the diagnosis information detected during the measurement process as status information. Measured values output to the AI function blocks are selected by the Channel parameter of those blocks.

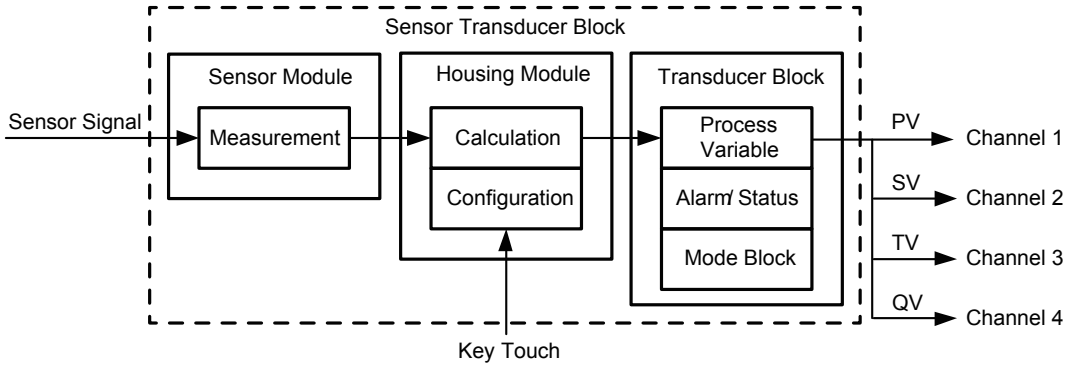


Figure 5.3 Sensor Transducer Block

5.2.1 MODE_BLK

The Block modes permitted for the Sensor transducer block are Automatic (Auto) and Out of Service (O/S). The mode must be set to Auto under normal operating conditions, and to O/S when making changes to an important parameter. For parameters that can only be changed in the Auto and O/S modes, refer to the parameter list for the Sensor Transducer block in Chapter 7.

5.2.2 BLOCK_ERR

BLOCK_ERR presents the cause of an error in the block. The Sensor transducer block checks the following causes and sets the relevant bits.

BLOCK_ERR

Bit	Error	Cause
1	other	Differential pressure adjusted by zero/span adjustment out of measurement range, Static pressure adjusted by zero/span adjustment out of measurement range
15	Out-of-Service	MODE_BLK.Target is O/S

5.2.3 XD_ERROR

XD_ERROR is a parameter that contains codes for the most significant errors that can occur in the Sensor transducer block. The errors of XD_ERROR supported by FLXA21 and their causes are presented in the table below. When multiple errors occur and their error codes are different, the error with a larger code value is stored first.

XD_ERROR

Bit	Error	Cause
15	Out of Service	Sensor TB is in O/S mode.
17	General error	An error has occurred that could not be classified as one of the errors below.
19	Configuration error	An error occurred during configuration of the device or a configuration error has been detected during operation of the device.
20	Electronics Failure	An electronic component has failed.
22	I/O Failure	An I/O failure has occurred.

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6. In-process operation

This chapter describes the procedure performed when changing the operation of the function block of the FLXA21 in process.

6.1 Mode Transition

When the function block mode is changed to Out_Of_Service, the function block pauses and a block alarm is issued.

When the function block mode is changed to Manual, the function block suspends updating of output values.

In this case alone, it is possible to write a value to the OUT parameter of the block for output. Note that no parameter status can be changed.

6.2 Generation of Alarm

Indication of Alarm

When the self-diagnostics function indicates that a device is faulty, an alarm (device alarm) is issued from the resource block. When an error (block error) is detected in each function block or an error in the process value (process alarm) is detected, an alarm is issued from each block.

For details of ALARM, refer to Section 8.1.

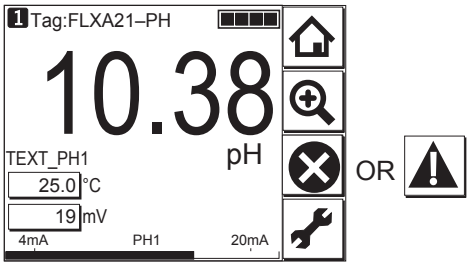


Figure 6.1 Error Identification on Indicator

Alarms and Events

The following alarms or events can be reported by the FLXA21 if Link object and VCR static entry are set.

Analog Alerts

(Generated when a process value exceeds threshold)

By AI1, AI2, AI3 Block	Hi-Hi Alarm, Hi Alarm, Low Alarm, Low-Low Alarm

Discrete Alerts

(Generated when an abnormal condition is detected)

By Resource Block	Block Alarm, Write Alarm
By Sensor Transducer Block	Block Alarm
By AI1, AI2, AI3 Blocks	Block Alarm

Update Alerts

(Generated when a important (restorable) parameter is updated)

By Resource Block Update Event

By Sensor Transducer Block Update Event

By AI1, AI2, AI3 Blocks Update Event

Field Diagnostic Alerts

(Generated when an abnormal condition in field device is detected)

By Resource Block Check Alarm, Failure Alarm, Maintenance Alarm, and off specification Alarm.

An alert has following structure:

Table 6.1 Alert Object

Subindex				Parameter Name	Explanation
Analog Alert	Discrete Alert	Update Alert	Field Diagnostic Alert		
1	1	1	1	Block Index	Index of block from which alert is generated
2	2	2	2	Alert Key	Alert Key copied from the block
3	3	3	3	Standard Type	Type of the alert
4	4	4	4	Mfr Type	Alert Name identified by manufacturer specific DD
5	5	5	5	Message Type	Reason of alert notification
6	6	6	6	Priority	Priority of the alarm
7	7	7	7	Time Stamp	Time when this alert is first detected
8	8		8	Subcode	Enumerated cause of this alert
9	9		9	Value	Value of referenced data
10	10		10	Relative Index	Relative index of referenced data
		8		Static Revision	Value of static revision (ST_REV) of the block
11	11	9		Unit Index	Unit code of referenced data
			11	Source Block Index	Relative index of the block that triggered the alert

Standard categories for NAMUR NE-107 instrument diagnostics alarms

The following standard categories of instrument diagnostics are defined for the NAMUR NE-107.

F (Failed):

An alarm category that indicates a failure has occurred in the instrument or in its peripheral devices.

C (Check Function):

An alarm category that indicates that a detected failure is a temporary event.

S (Off Specification):

An alarm category that indicates that the detected failure was caused by the instrument being used outside of its range or because a discrepancy has occurred between the set value and measured value. The alarm was caused either by the instrument or process state.

M (Maintenance):

An alarm category for a detected failure that has a low level of urgency but is a failure that could develop into a problem causing restrictions in instrument functionality in some environments.

Alarms displayed by DEVICE_STATUS_1 to DEVICE_STATUS_8 resource block parameters in their default setting are categorized as described in “NAMUR NE-107 Alarm Categories” in the DEVICE_STATUS table in section 8.1. When an alarm occurs, a character string that corresponds to an alarm category is assigned to FD_*_ACTIVE (index 1067 to 1070) [* indicates FAIL, OFF SPEC, MAINT or CHECK]. (For example, an F category alarm is assigned to FD_FAIL_ACTIVE) Similarly, procedures for processing alarms are assigned to FD_RECOMMEN_ACT. For details on alarm displays and how to deal with them, refer to Table 6.2.

The DTM-based “Field Diagnostics” function on FieldMate R2.06 or later makes configuration or checking of alarm classified on NE-107 easier.

For the detailed usage of “Field Diagnostics” function, refer to FieldMate user’s manual: IM 01R01A15-01EN.

Table 6.2 Field Diagnostic Alert

bit	Indication of FD_*_ACTIVE	Indication of FD_RECOMMEN_ACT	Solution
32	Electronics failure	Repair electronics	Replace electrical parts e.g. amplifier. Or contact sales office or service center.
31	Sensor/Actuator failure	Repair Sensor/Actuator	Replace mechanics e.g. sensor or actuator. Or contact sales office or service center.
30	Potential failure	Investigate failure	Perform reconfiguration, cleaning, wiring/connector or electrical board check. If alarm still persists, contact sales office or service center.
27	Backup function in operation	Repair primary side	Repair primary sensor before backup sensor fails.
25	Firmware update error	Retry updating firmware	Retry firmware update. Check cause of the failure if alarm persists.
24	Communication configuration error	Configure communication correctly	Correct configuration of communication.
23	Non-operating-state	Wait for a while	Wait for a while. Check cause of the failure if alarm persists.
22	Calibration warning	Check calibration	Investigate cause of failure and recalibrate device.
21	Device configuration error	Configure device correctly	Correct configuration relating to sensor or actuator.
20	Function restricted	Confirm the state	Check if this is right state.
19	Simulation mode	Confirm the state	Check if this is right state.
18	Manual mode	Confirm the state	Check if this is right state.
17	Function Block notice	Check Function Block status	Check conditions of function blocks. In order to avoid alarm from unused function blocks, configure RESOURCE2.FD_EXTENDC_MAP_n (n: 1 to 3) parameter.
14	Sensor/Actuator out of range	Check specification	Check specification of sensor and actuator. Or process conditions may be temporarily non-conforming.
13	Out of operating limit	Check environment	Check environment specification of sensor and actuator. Or process environment may be temporarily non-conforming.
10	Temporal decrease of value quality	Check process or peripherals	Check process and peripherals conditions.
9	Deterioration estimated by Time Based Maintenance	Check deterioration	Check if maintenance is required.
8	Deterioration estimated by Condition Based Maintenance	Check deterioration	Check if maintenance is required.
4	Optional function configuration error	Check optional configuration	Check configuration of optional functions.
3	Alarm related information	Confirm information	Check the alarm related information.
2	Process alarm	Check process	Check process conditions.
1	CHECK	CHECK	Check mode for the Sensor transducer block is AUTO.

6.3 Simulation Function

The simulation function simulates the input of a function block and lets it operate as if the data was received from the Sensor transducer block. It is possible to conduct testing for the downstream function blocks or alarm processes.

A SIMULATE_ENABLE switch is mounted on the FF PCB assembly. This is to prevent the accidental operation of this function. When this is switched on, simulation is enabled. (See Table 6.3) To initiate the same action from a remote terminal, if REMOTE LOOP TEST SWITCH is written to the SIM_ENABLE_MSG parameter (index 1044) of the resource block, the resulting action is the same as is taken when the above switch is on. Note that this parameter value is lost when the power is turned OFF. In simulation enabled status, an alarm is generated from the resource block, and other device alarms will be masked; for this reason the simulation must be disabled immediately after using this function.

The SIMULATE parameter of AI block consists of the elements listed in Table 6.3 below.

Table 6.3 SIMULATE Parameter

Sub-index	Parameters	Description
1	Simulate Status	Sets the data status to be simulated.
2	Simulate Value	Sets the value of the data to be simulated.
3	Transducer Status	Displays the data status from the Sensor transducer block. It cannot be changed.
4	Transducer Value	Displays the data value from the Sensor transducer block. It cannot be changed.
5	Simulate En/Disable	Controls the simulation function of this block. 1: Simulation disabled (standard) 2: Simulation started

When Simulate En/Disable in Table 6.3 above is set to 2, the applicable function block uses the simulation value set in this parameter instead of the data from the Sensor transducer block. This setting can be used for propagation of the status to the trailing blocks, generation of a process alarm, and as an operation test for trailing blocks.

6.4 Write lock (Write-protect) function

FLXA21 is provided with a write lock (writeprotect) function to restrict write operations to blocks and prevent inadvertent writing of parameter data. To enable this function, use the write lock switch (Hard W Lock) or the WRITE_LOCK (index 1034) (Soft W Lock).

The CPU assembly of FLXA21 is provided with a write lock switch (switch 2 in Figure 2.3).

Setting switch 2 to On activates the write lock function, to prevent changes to block parameters of WRITE_LOCK_LEVEL (index 1064). Table 6.4 shows how WRITE_LOCK_LEVEL relates to the block targeted by write lock. In the factory default setting, WRITE_LOCK_LEVEL is “2” (preventing writing to the Sensor transducer block, resource block and function block). To enable the switch lock function, set “Hard W Lock” (bit 4) of FEATURE_SEL (index 1018) to “1” (On). (The factory default for “Hard W Lock” (bit 4) is “0” (Off).

Table 6.4 Relationship between WRITE_LOCK_LEVEL and block targeted by write lock

WRITE_LOCK_LEVEL (index 1064)	Block targeted by Write lock
0	All parameters for the Sensor transducer block and FEATURE_SEL and WRITE_LOCK_LEVEL parameter settings for FEATURE_SEL
1	All parameters for the Sensor transducer block and resource block
2 (Factory default)	All function block parameters in addition to WRITE_LOCK_LEVEL “1”
3	MIB and VCR in addition to WRITE_LOCK_LEVEL “2”

When the write lock switch is disabled, set 2 (enabled) for WRITE_LOCK (index 1034) of the resource block to enable the write lock function. To enable the write lock function using the WRITE_LOCK setting, FEATURE_SEL (index 1018) of the resource block must be returned to its factory default. (In the factory default setting, “Hard W Lock” (bit 4) is “0” (Off) and “Soft W Lock” (bit 3) is “1” (On).

Table 6.5 FEATURE_SEL, write lock switch and WRITE_LOCK parameter relationship

FEATURE_SEL (index 1018)		Write lock switch	WRITE_LOCK (index 1034)
Hard W Lock (bit4)	Soft W Lock (bit3)		
0 (OFF)	0 (OFF)	Disabled	Unavailable (“1” (Write lock disabled))
	1 (ON)		1 (Write lock disabled) (Factory default)
			2 (Write lock enabled)
1 (ON)	0 (OFF)	Enabled	Unavailable (depends on write lock switch)

* When “Hard W Lock” and “Soft W Lock” are both 1 (On), the “Hard W Lock” setting takes precedence and “Soft W Lock” is automatically set to 0 (Off).

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7. List of parameters for each block of the FLXA21

Note for sections 7.1 to 7.3

The “Write Mode” column contains the modes in which each parameter is write enabled.

- O/S: Write enabled in O/S mode.
- MAN: Write enabled in Man mode and O/S mode.
- AUTO: Write enabled in Auto mode, Man mode, and O/S mode.
- RO: Read Only.

The “Factory Default” column contains initial values

- —: Dynamic data or no description

Parameter names and display of data depend on the HOST system.

7.1 Resource Block

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
0	1000	Block Header	TAG:“RS”	Block Tag =O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	1001	ST_REV	0	RO	The revision level of the static data associated with the resource block. The revision value is incremented each time a static parameter value in this block is changed.
2	1002	TAG_DESC	Blank	AUTO	The user description of the intended application of the block.
3	1003	STRATEGY	1	AUTO	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	1004	ALERT_KEY	0	AUTO	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	1005	MODE_BLK	—	AUTO	The actual, target, permitted, and normal modes of the block. 0x80: O/S 0x08: AUTO
6	1006	BLOCK_ERR	—	RO	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	1007	RS_STATE	1 (StartRestart)	RO	State of the resource block state machine. 0: Uninitialized 1: StartRestart 2: Initialization 3: Online Linking 4: Online 5: Standby 6: Failure
8	1008	TEST_RW	—	AUTO	Read/write test parameter-used only for conformance testing and simulation.
9	1009	DD_RESOURCE	Blank	RO	String identifying the tag of the resource which contains the Device Description for this resource.
10	1010	MANUFAC_ID	0x00594543	RO	Manufacturer identification number-used by an interface device to locate the DD file for the resource.
11	1011	DEV_TYPE	FLXA21-PH: 0x0402 FLXA21-SC: 0x0403	RO	Manufacturer’s model number associated with the resource used by interface devices to locate the DD file for the resource. 0x0402: FLXA21 PH 0x0403: FLXA21 SC
12	1012	DEV_REV	FLXA21-PH: 1 FLXA21-SC: 1	RO	Manufacturer revision number associated with the resource used by an interface device to locate the DD file for the resource.
13	1013	DD_REV	1	RO	Revision of the DD associated with the resource-used by an interface device to locate the DD file for the resource.

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
14	1014	GRANT_DENY	—	AUTO	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
15	1015	HARD_TYPES	Scalar input	RO	The types of hardware available as channel numbers. bit0: Scalar input bit1: Scalar output bit2: Discrete input bit3: Discrete output
16	1016	RESTART	1 (Run)	AUTO	Allows a manual restart to be initiated. Several degrees of restart are possible. 1: Run: Run 2: Resource: Restart resource 3: Defaults: Restart with initial value specified in FF functional spec.(*1) 4: Processor: Restart processor *1: FF-891 Foundation™ Specification Function Block Application Process Part 2.
17	1017	FEATURES	Reports Fault state Soft W Lock Hard W Lock Multi_bit Alarm support	RO	Used to show supported resource block options.
18	1018	FEATURE_SEL	Report Fault state Soft W Lock	AUTO	Used to select resource block options defined in FEATURES.
19	1019	CYCLE_TYPE	Scheduled	RO	Identifies the block execution methods available for this resource. bit0: Scheduled bit1: Event driven bit2: Manufacturer specified
20	1020	CYCLE_SEL	0x0000 (Blank)	AUTO	Used to select the block execution method for this resource.
21	1021	MIN_CYCLE_T	3200 (100 ms)	RO	Time duration of the shortest cycle interval of which the resource is capable.
22	1022	MEMORY_SIZE	0	RO	Available configuration memory in the empty resource. To be checked before attempting a download.
23	1023	NV_CYCLE_T	0	RO	Interval between writing copies of nonvolatile parameters to non-volatile memory. Zero means never.
24	1024	FREE_SPACE	0	RO	Percent of memory available for further configuration. FLXA21 has zero which means a preconfigured resource.
25	1025	FREE_TIME	0	RO	Percent of the block processing time that is free to process additional blocks. FLXA21 does not support this.
26	1026	SHED_RCAS	640000 (20 S)	AUTO	Time duration at which to give up on computer writes to function block RCas locations. Supported only with PID function.
27	1027	SHED_ROUT	640000 (20 S)	AUTO	Time duration at which to give up on computer writes to function block ROut locations. Supported only with PID function.

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
28	1028	FAULT_STATE	1 (Clear)	RO	Condition set by loss of communication to an output block, failure promoted to an output block or a physical contact. When fail-safe condition is set, then output function blocks will perform their FSAFE actions.
29	1029	SET_FSTATE	1 (Off)	AUTO	Allows the fail-safe condition to be manually initiated by selecting Set.
30	1030	CLR_FSTATE	1 (Off)	AUTO	Writing a Clear to this parameter will clear the device fail-safe state if the field condition, if any, has cleared.
31	1031	MAX_NOTIFY	128	RO	Maximum number of unconfirmed notify messages possible.
32	1032	LIM_NOTIFY	4	AUTO	Maximum number of alarm information which FLXA21 can transfer at the same time. Setting of this parameter restrict number of alarm transfer to the HOST and prevent HOST from overflow.
33	1033	CONFIRM_TIM	640000 (20 s)	AUTO	The minimum time between retries of alert reports.
34	1034	WRITE_LOCK	1 (Not locked)	AUTO	If set, no writes from anywhere are allowed, except to clear WRITE_ LOCK. Block inputs will continue to be updated 1: Not Locked 2: Locked
35	1035	UPDATE_EVT	—	AUTO	This alert is generated by any change to the static data.
36	1036	BLOCK_ALM	—	AUTO	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
37	1037	ALARM_SUM	—	AUTO	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
38	1038	ACK_OPTION	0	AUTO	Selection of whether alarms associated with the block will be automatically acknowledged.
39	1039	WRITE_PRI	0	AUTO	Priority of the alarm generated by clearing the write lock.
40	1040	WRITE_ALM	—	AUTO	This alert is generated if the write lock parameter is cleared.
41	1041	ITK_VER	6	RO	Version number of interoperability test by FOUNDATION Fieldbus applied to FLXA21.
42	1042	SOFT_REV	Rn.nn	RO	FLXA21 software revision number.
43	1043	SOFT_DESC	FLXA21-PH: n.nn-0402-n.nn FLXA21-SC: n.nn-0403-n.nn	RO	Yokogawa internal use.

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
44	1044	SIM_ENABLE_ MSG	Blank	AUTO	Software switch for simulation function.
45	1045	DEVICE_ STATUS_1	—	RO	Device status For details, refer to Table 8.1
46	1046	DEVICE_ STATUS_2	—	RO	Device status For details, refer to Table 8.2
47	1047	DEVICE_ STATUS_3	—	RO	Device status For details, refer to Table 8.3
48	1048	DEVICE_ STATUS_4	—	RO	Device status For details, refer to Table 8.4
49	1049	DEVICE_ STATUS_5	—	RO	Device status For details, refer to Table 8.5
50	1050	DEVICE_ STATUS_6	—	RO	Device status For details, refer to Table 8.6
51	1051	DEVICE_ STATUS_7	—	RO	Device status For details, refer to Table 8.7
52	1052	DEVICE_ STATUS_8	—	RO	Device status For details, refer to Table 8.8
53	1053	SOFTDWN_ PROTECT	0x01 (Unprotected)	AUTO	Defines whether to accept software downloads. 0x01: Unprotected 0x02: Protected
54	1054	SOFTDWN_ FORMAT	0x01 (FF Standard)	AUTO	Selects the software download method. 0x01: FF Standard 0x02: YOKOGAWA Standard
55	1055	SOFTDWN_ COUNT	0	RO	Indicates the number of times the internal FlashROM was erased.
56	1056	SOFTDWN_ACT_ AREA	—	RO	Indicates the ROM number of the currently working FlashROM. 0: FlashROM #0 working 1: FlashROM #1 working
57	1057	SOFTDWN_MOD_ REV	—	RO	Indicates the software module revision.
58	1058	SOFTDWN_ ERROR	0	RO	Indicates the error during a software download. Refer Table 4 in Appendix 2.
59	1059	SOFTDWN_ HISTORY	Blank	RO	Not used for FLXA21.
60	1060	SOFTDWN_HIST_ INDEX	1	AUTO	Not used for FLXA21.
61	1061	COMPATIBILITY_ REV	1	RO	Indicates the smallest Rev value compatible with device DevRev.
62	1062	CAPABILITY_LEV	0x00	RO	Indicates the capability level of instrument interior.
63	1063	CAPABILITY_ CONFIG	0x0000	RO	A parameter corresponding to AP_CONF or DEV_OPTIONS before the addition of parameter CAPABILITY_LEV.
64	1064	WRITE_LOCK_ LEVEL	2 (Level: A (All FBAP)	AUTO	Specifies blocks that activates Write Lock. 0: Level: C (TB) 1: Level: B (TB+RB) 2: Level: A (All FBAP) 3: Level: AA (MIB+All FBAP)
65	1065	SI_CONTROL_ CODES	0 (No restrictions)	RO	A parameter for switching to make the instrument compatible with SI units. 0: No restrictions 1: SI Units only

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
66	1066	FD_VER	0	RO	Indicates value of major version of instrument diagnostics specifications (FF-912).
67	1067	FD_FAIL_ACTIVE	—	RO	A parameter that corresponds to ”Failed” in the NAMUR NE-107 category.
68	1068	FD_OFFSPEC_ ACTIVE	—	RO	A parameter that corresponds to ”Off Specification” in the NAMUR NE-107 category.
69	1069	FD_MAINT_ ACTIVE	—	RO	A parameter that corresponds to ”Maintenance” in the NAMUR NE-107 category.
70	1070	FD_CHECK_ ACTIVE	—	RO	A parameter that corresponds to ”Check Function” in the NAMUR NE-107 category.
71	1071	FD_FAIL_MAP	0xFC000000	AUTO	Specifies the bit assigned to FD_FAIL_ACTIVE, a parameter for indicating ”Failed,” a 32-bit alarm listed in FD_SIMULATE. DiagnosticValue.
72	1072	FD_OFFSPEC_ MAP	0x00003800	AUTO	Specifies the bit assigned to FD_ OFFSPEC_ACTIVE, a parameter for indicating ”Off Specification,” a 32-bit alarm listedin FD_ SIMULATE. DiagnosticValue.
73	1073	FD_MAINT_MAP	0x000003E0	AUTO	Specifies the bit assigned to FD_ MAINT_ACTIVE, a parameterfor indicating ”Maintenance,” a 32-bit alarm listed in FD_SIMULATE. DiagnosticValue.
74	1074	FD_CHECK_MAP	0x01FF8008	AUTO	Specifies the bit assigned to FD_ CHECK_ACTIVE, a parameter for indicating ”Check Function,” a 32-bit alarm listed in FD_SIMULATE. DiagnosticValue.
75	1075	FD_FAIL_MASK	0x00000000	AUTO	Specifies the bit that notifies the host of 32-bit ”Failed” alarms listed in FD_FAIL_ACTIVE.
76	1076	FD_OFFSPEC_ MASK	0x00000000	AUTO	Specifies the bit that notifies the host of 32-bit ”Off Specification” alarms listed in FD_OFFSPEC_ ACTIVE.
77	1077	FD_MAINT_MASK	0x00000000	AUTO	A parameter that specifies the bit that notifies the host of 32-bit ”Maintenance” alarms listed in FD_MAINT_ACTIVE. A parameter set by the user.
78	1078	FD_CHECK_MASK	0x00000000	AUTO	Specifies the bit that notifies the host of 32-bit ”Check Function”alarms listed in FD_ CHECK_ACTIVE.
79	1079	FD_FAIL_ALM	—	AUTO	Indicates alarm information for alarms categorized under ”Failed.”
80	1080	FD_OFFSPEC_ ALM	—	AUTO	Indicates alarm information for alarms categorized under ”Off Specification.”
81	1081	FD_MAINT_ALM	—	AUTO	Indicates alarm information for alarms categorized under ”Maintenance”.
82	1082	FD_CHECK_ALM	—	AUTO	Indicates alarm information for alarms categorized under ”Check Function”.

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
83	1083	FD_FAIL_PRI	0	AUTO	Indicates the FD_FAIL_ALM priority for an alarm.
84	1084	FD_OFFSPEC_PRI	0	AUTO	Indicates the FD_OFFSPEC_ALM priority for an alarm.
85	1085	FD_MAINT_PRI	0	AUTO	Indicates theFD_MAINT_ALM priority for an alarm.
86	1086	FD_CHECK_PRI	0	AUTO	Indicates the FD_CHECK_ALM priority for an alarm.
87	1087	FD_SIMULATE	—	AUTO	A parameter for simulating an alarm. 0: Uninitialized 1: Disabled 2: Active
88	1088	FD_RECOMMEN_ACT	1 (No Action Required)	RO	Indicates procedures for handling essential alarms.
89	1089	FD_EXTENDED_ACTIVE_1	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
90	1090	FD_EXTENDED_ACTIVE_2	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
91	1091	FD_EXTENDED_ACTIVE_3	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
92	1092	FD_EXTENDED_ACTIVE_4	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
93	1093	FD_EXTENDED_ACTIVE_5	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
94	1094	FD_EXTENDED_ACTIVE_6	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
95	1095	FD_EXTENDED_ACTIVE_7	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
96	1096	FD_EXTENDED_ACTIVE_8	—	RO	A parameter serving as a starting point for alarms handled by FF-912.
97	1097	FD_EXTENDED_MAP_1	0x0708FFFF	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_1 to FD_EXTENDED_ACTIVE_1.
98	1098	FD_EXTENDED_MAP_2	0x0001000F	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_2 to FD_EXTENDED_ACTIVE_2.
99	1099	FD_EXTENDED_MAP_3	FLXA21-PH: 0xF0FF07FF FLXA21-SC: 0x00300F3F	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_3 to FD_EXTENDED_ACTIVE_3.
100	1100	FD_EXTENDED_MAP_4	0x00050000	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_4 to FD_EXTENDED_ACTIVE_4.
101	1101	FD_EXTENDED_MAP_5	FLXA21-PH: 0xF8FF6400 FLXA21-SC: 0xFCF00C00	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_5 to FD_EXTENDED_ACTIVE_5.
102	1102	FD_EXTENDED_MAP_6	0x00000003	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_6 to FD_EXTENDED_ACTIVE_6.
103	1103	FD_EXTENDED_MAP_7	0x00000080	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_7 to FD_EXTENDED_ACTIVE_7.
104	1104	FD_EXTENDED_MAP_8	0x014E4E4E	AUTO	A parameter set by the user as a mask from DEVICE_STATUS_8 to FD_EXTENDED_ACTIVE_8.
105	1105	PRIVATE_1	—	RO	Not used for FLXA21.
106	1106	PRIVATE_2	—	RO	Not used for FLXA21.
107	1107	PRIVATE_3	—	RO	Not used for FLXA21.
108	1108	PRIVATE_4	—	RO	Not used for FLXA21.
109	1109	PRIVATE_5	—	RO	Not used for FLXA21.

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
110	1110	PRIVATE_6	—	RO	Not used for FLXA21.
111	1111	PRIVATE_7	—	RO	Not used for FLXA21.
112	1112	PRIVATE_8	—	RO	Not used for FLXA21.
113	1113	PRIVATE_9	—	RO	Not used for FLXA21.
114	1114	PRIVATE_10	—	RO	Not used for FLXA21.
115	1115	PRIVATE_11	—	RO	Not used for FLXA21.
116	1116	DEVICE_ CONDITION_ ACTIVE_1	—	RO	FD_EXTENDED_ACTIVE_1 & FD_EXTENDED_MAP_1
117	1117	DEVICE_ CONDITION_ ACTIVE_2	—	RO	FD_EXTENDED_ACTIVE_2 & FD_EXTENDED_MAP_2
118	1118	DEVICE_ CONDITION_ ACTIVE_3	—	RO	FD_EXTENDED_ACTIVE_3 & FD_EXTENDED_MAP_3
119	1119	DEVICE_ CONDITION_ ACTIVE_4	—	RO	FD_EXTENDED_ACTIVE_4 & FD_EXTENDED_MAP_4
120	1120	DEVICE_ CONDITION_ ACTIVE_5	—	RO	FD_EXTENDED_ACTIVE_5 & FD_EXTENDED_MAP_5
121	1121	DEVICE_ CONDITION_ ACTIVE_6	—	RO	FD_EXTENDED_ACTIVE_6 & FD_EXTENDED_MAP_6
122	1122	DEVICE_ CONDITION_ ACTIVE_7	—	RO	FD_EXTENDED_ACTIVE_7 & FD_EXTENDED_MAP_7
123	1123	DEVICE_ CONDITION_ ACTIVE_8	—	RO	FD_EXTENDED_ACTIVE_8 & FD_EXTENDED_MAP_8

7.2 Analog input Block

Relative Index	Index AI1	Index AI2	Index AI3	Parameter Name	Factory Default	Write Mode	Explanation
0	4000	4100	4200	Block Header	TAG: “AI1” or “AI2” or “AI3”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	4001	4101	4201	ST_REV	0	RO	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
2	4002	4102	4202	TAG_DESC	Blank	AUTO	The user description of the intended application of the block.
3	4003	4103	4203	STRATEGY	1	AUTO	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	4004	4104	4204	ALERT_KEY	0	AUTO	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	4005	4105	4205	MODE_BLK	—	AUTO	The actual, target, permitted, and normal modes of the block.
6	4006	4106	4206	BLOCK_ERR	—	RO	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	4007	4107	4207	PV	—	RO	Either the primary analog value for use in executing the function, or a process value associated with it. May also be calculated from the READBACK value of an AO block.
8	4008	4108	4208	OUT	—	Value = MAN	The primary analog value calculated as a result of executing the function.
9	4009	4109	4209	SIMULATE	—	AUTO	Allows the transducer analog input or output to the block to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track the actual value and status.
10	4010	4110	4210	XD_SCALE	EU at 100%: 100 EU at 0%: 0 FLXA21-PH AI1: Unit Index: 1422 (pH) AI2: Unit Index: 1001 (degC) AI3: Unit Index: 1243 (mV) FLXA21-SC AI1: Unit Index: 1680 (S/m) AI2: Unit Index: 1001 (degC) AI3: Unit Index: 1680 (S/m) Decimal Point: 2	O/S	The high and low scale values, engineering units code, and number of digits to the right of the decimal point used with the value obtained from the transducer for a specified channel.

Relative Index	Index AI1	Index AI2	Index AI3	Parameter Name	Factory Default	Write Mode	Explanation
11	4011	4111	4211	OUT_ SCALE	EU at 100%: 100 EU at 0%: 0 Unit Index: 1342 (%) Decimal Point: 2	O/S	The high and low scale values, engineering units code, and number of digits to the right of the decimal point to be used in displaying the OUT parameter and parameters which have the same scaling as OUT.
12	4012	4112	4212	GRANT_DENY	0 (Blank)	AUTO	Options for controlling access of host computers and local control panels to operating, tuning and alarm parameters of the block.
13	4013	4113	4213	IO_OPTS	0 (Blank)	O/S	Options which the user may select to alter input and output block processing
14	4014	4114	4214	STATUS_OPTS	0 (Blank)	O/S	Options which the user may select in the block processing of status
15	4015	4115	4215	CHANNEL	AI1: 1 (PRIMARY_ VALUE) AI2: 2 (SECONDARY_ VALUE) AI3: 3 (TERTIALY_ VALUE)	O/S	The number of the logical hardware channel that is connected to this I/O block. This information defines the transducer to be used going to or from the physical world. 1: PRIMARY_VALUE 2: SECONDARY_VALUE 3: TERTIALY_VALUE 4: QUATERNARY_VALUE
16	4016	4116	4216	L_TYPE	1 (Direct)	MAN	Determines if the values passed by the Sensor transducer block to the AI block may be used directly (Direct) or if the value is in different units and must be converted linearly (Indirect), or with square root (Ind Sqr Root), using the input range defined by the transducer and the associated output range. 1: Direct 2: Indirect 3: Indirect Sq Root
17	4017	4117	4217	LOW_CUT	0 (%)	AUTO	Limit used in square root processing. A value of zero percent of scale is used in block processing if the transducer value falls below this limit. This feature may be used to eliminate noise near zero for a flow sensor. The setting is in an engineering unit of OUT_SCALE.
18	4018	4118	4218	PV_FTIME	0 (sec)	AUTO	Time constant of a single exponential filter for the PV, in seconds.
19	4019	4119	4219	FIELD_VAL	—	RO	Raw value of the field device in percent of the PV range, with a status reflecting the Transducer condition, before signal characterization (L_TYPE) or filtering (PV_FTIME).
20	4020	4120	4220	UPDATE_EVT	—	RO	This alert is generated by any change to the static data.

Relative Index	Index AI1	Index AI2	Index AI3	Parameter Name	Factory Default	Write Mode	Explanation
21	4021	4121	4221	BLOCK_ALM	—	RO	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
22	4022	4122	4222	ALARM_SUM	—	AUTO	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
23	4023	4123	4223	ACK_OPTION	0 (Blank)	AUTO	Selection of whether alarms associated with the block will be automatically acknowledged.
24	4024	4124	4224	ALARM_HYS	0.5 (%)	AUTO	Amount the PV must return within the alarm limits before the alarm condition clears. Alarm Hysteresis is expressed as a percent of the PV span.
25	4025	4125	4225	HI_HI_PRI	0	AUTO	Priority of the high high alarm.
26	4026	4126	4226	HI_HI_LIM	+INFINITE	AUTO	The setting for high high alarm in engineering units.
27	4027	4127	4227	HI_PRI	0	AUTO	Priority of the high alarm.
28	4028	4128	4228	HI_LIM	+INFINITE	AUTO	The setting for high alarm in engineering units.
29	4029	4129	4229	LO_PRI	0	AUTO	Priority of the low alarm.
30	4030	4130	4230	LO_LIM	-INFINITE	AUTO	The setting for the low alarm in engineering units.
31	4031	4131	4231	LO_LO_PRI	0	AUTO	Priority of the low low alarm.
32	4032	4132	4232	LO_LO_LIM	-INFINITE	AUTO	The setting of the low low alarm in engineering units.
33	4033	4133	4233	HI_HI_ALM	—	RO	The status for high high alarm and its associated time stamp.
34	4034	4134	4234	HI_ALM	—	RO	The status for high alarm and its associated time stamp.
35	4035	4135	4235	LO_ALM	—	RO	The status of the low alarm and its associated time stamp.
36	4036	4136	4236	LO_LO_ALM	—	RO	The status of the low low alarm and its associated time stamp.

7.3 Sensor Transducer Block

(1)Sensor Transducer Block FLXA21-PH

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
0	2000	SENSOR_ TRANSDUCER_ BLOCK	TAG: “STB”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	2001	ST_REV	0	RO	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
2	2002	TAG_DESC	Blank	AUTO	The user description of the intended application of the block
3	2003	STRATEGY	1	AUTO	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	2004	ALERT_KEY	0	AUTO	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	2005	MODE_BLK	—	AUTO	The actual, target, permitted, and normal modes of the block.
6	2006	BLOCK_ERR	—	RO	This parameter reflects the error status associated with hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	2007	UPDATE_EVT	—	RO	This alert is generated by any change to the static data.
8	2008	BLOCK_ALM	—	RO	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute.
9	2009	TRANSDUCER_ DIRECTORY	—	RO	A directory that specifies the number and starting indices of the transducers.
10	2010	TRANSDUCER_ TYPE	110 (Standard pH / ORP)	RO	Identifies transducer.
11	2011	XD_ERROR	—	RO	The error code in transducer. Refer to 5.2.4 XD_ERROR.
12	2012	COLLECTION_ DIRECTORY	—	RO	A directory that specifies the number, starting indices, and DD Item Ids of the data collections in each transducer within a Sensor transducer block.
13	2013	ALARM_SUM	—	AUTO	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
14	2014	PRIMARY_VALUE_ TYPE	111 (PH)	RO	Item of Primary value.
15	2015	PRIMARY_VALUE	—	RO	Primary value
16	2016	PRIMARY_VALUE_ UNIT	1422 (pH)	RO	Unit of Primary Value

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
17	2017	SENSOR_TYPE_PH	PH: 158 (pH) SENCOM: 160 (pH+ORP)	RO	Type of pH sensor.
18	2018	PH_ZERO1	0.0	O/S	Calibrated sensor offset of pH.
19	2019	PH_ZERO2	0.0	O/S	Calibrated secondary sensor offset of pH. Only available after 3 points calibration
20	2020	PH_ZERO_UNIT	1243 (mV)	RO	Unit of PH_ZERO1/2
21	2021	PH_SLOPE1	100.0	O/S	Calibrated efficiency of pH sensor.
22	2022	PH_SLOPE2	100.0	RO	Calibrated secondary efficiency of pH sensor. Only available after 3 points calibration.
23	2023	PH_SLOPE_UNIT	1342 (%)	RO	Unit of PH_SLOPE1/2
24	2024	PH_3POINT_CALIBRATION	0 (none)	RO	Method of executed 3 points calibration.
25	2025	ISOPOTENTIAL_PH	7.0	RO	Isothermal point of pH calculation
26	2026	SENSOR_CALIBRATION_DATE	—	RO	Date on which the last sensor calibration was performed.
27	2027	SENSOR_CALIBRATION_DUE_DATE	—	RO	Date when the calibration must be done next.
28	2028	SENSOR_TEMP_COMPENSATION	2	O/S	Temperature compensation method of the Nernst equation.
29	2029	SENSOR_TEMP_MANUAL_VALUE	25.0	O/S	Temperature used on the Nernst equation when temperature compensation method is Manual.
30	2030	REFERENCE_TEMP	25.0	O/S	Temperature to which the measured pH value must be compensated.
31	2031	PROCESS_TEMP_COMPENSATION	0 (None)	O/S	Method of process temperature compensation.
32	2032	PH_TEMP_COEFFICIENT	0.0	O/S	Coefficient of TC(Linear compensation function)
33	2033	SECONDARY_VALUE_TYPE	104 (Temperature)	RO	Item of Secondary value.
34	2034	SECONDARY_VALUE	—	RO	Secondary value.
35	2035	SECONDARY_VALUE_UNIT	1001 (degC)	RO	Unit of secondary value
36	2036	SENSOR_TYPE_TEMP	148 (Pt1000)	RO	Temperature sensor
37	2037	TEMP_UNIT	1001 (degC)	RO	Unit of temperature
38	2038	TERTIARY_VALUE_TYPE	PH: 65535 (Empty) SENCOM: 114 (ORP1)	RO	Item of Tertiary value
39	2039	TERTIARY_VALUE	—	RO	Tertiary value
40	2040	TERTIARY_VALUE_UNIT	PH: 1588 (Blank) SENCOM: 1243 (mV)	RO	Unit of Tertiary value
41	2041	ORP_ZERO	0.0	O/S	Calculated sensor offset of ORP
42	2042	ORP_SLOPE	0.0	RO	Calibrated efficiency of ORP sensor.
43	2043	QUATERNARY_VALUE_TYPE	65535 (Empty)	RO	Item of Quaternary value
44	2044	QUATERNARY_VALUE	—	RO	Quaternary value
45	2045	QUATERNARY_VALUE_UNIT	1588 (Blank)	RO	Unit of Quaternary value
46	2046	SENSOR_MV	—	RO	Voltage from sensor.
47	2047	ORP_SENSOR_MV	—	RO	Voltage from sensor for ORP.
48	2048	IMPEDANCE1	—	RO	Electrical resistance of Input1.
49	2049	IMPEDANCE2	—	RO	Electrical resistance of Input2.

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
50	2050	DETC_ WELLNESS_ZERO	—	RO	Sensor wellness indicator by Zero value.
51	2051	DETC_ WELLNESS_ SLOPE	—	RO	Sensor wellness indicator by Slope value.
52	2052	DETC_ WELLNESS_ IMPEDANCE1	—	RO	Sensor wellness indicator by Imput1's impedance.
53	2053	DETC_ WELLNESS_ IMPEDANCE2	—	RO	Sensor wellness indicator by Imput1's impedance.
54	2054	DETC_ WELLNESS_ HEAT_CYCLE	—	RO	Sensor wellness indicator by heat cycle.
55	2055	DETC_ WELLNESS_ PROG_TIME	—	RO	Sensor wellness indicator by elapsed time.
56	2056	MODULE_PDN	Production no.	RO	Product number of Sensor module.
57	2057	MODULE_ SOFTREV	Rn.nn	RO	Software revision of Sensor module.
58	2058	HOUSING_PDN	Production no.	RO	Product number of Housing module.
59	2059	HOUSING_ SOFTREV	Rn.nn	RO	Software revision of Housing module.
60	2060	SENSOR_TYPE_ MODEL	—	RO	1:analog sensor 2:SENCOM sensor
61	2061	SENCOM_MAX_ TEMP	—	RO	Max temperature sensor has been exposed. Available on SENCOM.
62	2062	SENCOM_HIGH_ PH_TOTAL	—	RO	Total time during which pH value has been higher than upper limit. Available on SENCOM.
63	2063	SENCOM_LOW_ PH_TOTAL	—	RO	Total time during which pH value has been higher than upper limit. Available on SENCOM.
64	2064	SENCOM_ STERILIZATION	—	RO	Number of heat sterilization judged by preset temperature and time. Available on SENCOM.
65	2065	SENCOM_ STERILIZATION_ LAST_DATE	—	RO	The last date of heat sterilization judged by preset temperature and time. Available on SENCOM.
66	2066	SENCOM_HIGH_ TEMP1_TOTAL	0	RO	Total time during which temperature has been higher than preset temperature 1. Available on SENCOM.
67	2067	SENCOM_HIGH_ TEMP1_LAST_ DATE	—	RO	The last date when temperature has been higher than preset temperature 1. Available on SENCOM.
68	2068	SENCOM_HIGH_ TEMP2_TOTAL	0	RO	Total time during which temperature has been higher than preset temperature 2. Available on SENCOM.
69	2069	SENCOM_HIGH_ TEMP2_LAST_ DATE	—	RO	The last date when temperature has been higher than preset temperature 2. Available on SENCOM.
70	2070	SENCOM_ MODEL_CODE	—	RO	Model code of SENCOM sensor. Available on SENCOM.
71	2071	SENCOM_ SOFTREV	Rn.nn	RO	Software revision of SENCOM sensor. Available on SENCOM
72	2072	SENCOM_ ASSYREV	Rn.nn	RO	Assembly revision of SENCOM sensor. Available on SENCOM.
73	2073	SENCOM_ SERIAL_NO	Serial no.	RO	Serial number of SENCOM sensor. Available on SENCOM.

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
74	2074	SENCOM_FACT_ DATE	—	RO	Manufacturing date of SENCOM sensor. Available on SENCOM.
75	2075	ERR_CONFIG_ PH_TOO_HIGH	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
76	2076	ERR_CONFIG_ PH_TOO_LOW	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
77	2077	ERR_CONFIG_ TEMP_TOO_HIGH	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
78	2078	ERR_CONFIG_ TEMP_TOO_LOW	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
79	2079	ERR_CONFIG_ ORP_TOO_HIGH	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
80	2080	ERR_CONFIG_ ORP_TOO_LOW	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
81	2081	ERR_CONFIG_ RH_TOO_HIGH	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
82	2082	ERR_CONFIG_ RH_TOO_LOW	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
83	2083	ERR_CONFIG_ MATRIX_CONFIG_ ERROR	3 (Fault)	O/S	Category of error status(Fault/ Warning/Off)
84	2084	ERR_CONFIG_ CALIB_TIME_ EXCEEDED	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
85	2085	ERR_CONFIG_ IMPEDANCE1_ TOO_HIGH	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
86	2086	ERR_CONFIG_ IMPEDANCE1_ TOO_LOW	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
87	2087	ERR_CONFIG_ IMPEDANCE2_ TOO_HIGH	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
88	2088	ERR_CONFIG_ IMPEDANCE2_ TOO_LOW	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
89	2089	ERR_CONFIG_ SENCOM_ SENSOR_ CHANGED	2 (Warning)	O/S	Category of error status(Warning/ Off) Available on SENCOM.
90	2090	IMPEDANCE1_ LOW_LMT	1000.0	O/S	Low limit of Input 1 impedance.
91	2091	IMPEDANCE1_ HIGH_LMT	200000.0	O/S	High limit of Input 1 impedance.
92	2092	IMPEDANCE2_ LOW_LMT	1000.0	O/S	Low limit of Input 2 impedance.
93	2093	IMPEDANCE2_ HIGH_LMT	200000.0	O/S	High limit of Input 2 impedance.
94	2094	DIAG_SETTING_ IMPEDANCE1	0 (Disable)	O/S	Enable or Disable of sensor wellness by input1 impedance.
95	2095	DIAG_SETTING_ IMPEDANCE1_ FINE	10000000	O/S	Limit for diagnostic when input1 impedance method set to High.
96	2096	DIAG_SETTING_ IMPEDANCE2	0 (Disable)	O/S	Enable or disable of sensor wellness by input2 impedance.
97	2097	DIAG_SETTING_ IMPEDANCE2_ FINE	10000000	O/S	Limit for diagnostic when input2 impedance method set to High.
98	2098	DIAG_SETTING_ PROG_TIME	0 (Disable)	O/S	Enable or Disable of sensor wellness by elapsed time.

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
99	2099	DIAG_SETTING_ PROG_TIME_ BAD_LMT	2000	O/S	Limit for sensor wellness by elapsed time.
100	2100	DIAG_SETTING_ HEAT_CYCLE	0 (Disable)	O/S	Enable or Disable of sensor wellness by heat cycle.
101	2101	DIAG_SETTING_ HEAT_CYCLE_ BAD_LMT	500	O/S	Limit for sensor wellness by heat cycle.
102	2102	HEAT_CYCLE_ TEMP	50.0	O/S	Limit of temperature for sensor wellness by heat cycle.
103	2103	HEAT_CYCLE_ TIME	10.0	O/S	Limit of time for sensor wellness by heat cycle.
104	2104	SENCOM_ STERILIZATION_ TEMP	155.0	O/S	Limit temperature for checking sterilization.
105	2105	SENCOM_ STERILIZATION_ TIME	100.0	O/S	Limit time for checking sterilization.
106	2106	SENCOM_HIGH_ TEMP1	155.0	O/S	Limit value for checking high temperature 1.
107	2107	SENCOM_HIGH_ TEMP2	155.0	O/S	Limit value for checking high temperature 2.
108	2108	SENCOM_LOW_ PH	1.0	O/S	Limit value for checking low pH.
109	2109	SENCOM_HIGH_ PH	13.0	O/S	Limit value for checking high pH.
110	2110	TRANSMITTER_ TIME	—	O/S	Time of Housing module.
111	2111	RESERVE_ PARAMETER_1	—	RO	Not used for FLXA21.
112	2112	RESERVE_ PARAMETER_2	—	RO	Not used for FLXA21.
113	2113	RESERVE_ PARAMETER_3	—	RO	Not used for FLXA21.
114	2114	RESERVE_ PARAMETER_4	—	RO	Not used for FLXA21.
115	2115	RESERVE_ PARAMETER_5	—	RO	Not used for FLXA21.
116	2116	RESERVE_ PARAMETER_6	—	RO	Not used for FLXA21.
117	2117	RESERVE_ PARAMETER_7	—	RO	Not used for FLXA21.
118	2118	RESERVE_ PARAMETER_8	—	RO	Not used for FLXA21.
119	2119	RESERVE_ PARAMETER_9	—	RO	Not used for FLXA21.
120	2120	RESERVE_ PARAMETER_10	—	RO	Not used for FLXA21.
121	2121	RESERVE_ PARAMETER_11	—	RO	Not used for FLXA21.
122	2122	RESERVE_ PARAMETER_12	—	RO	Not used for FLXA21.
123	2123	RESERVE_ PARAMETER_13	—	RO	Not used for FLXA21.
124	2124	RESERVE_ PARAMETER_14	—	RO	Not used for FLXA21.
125	2125	RESERVE_ PARAMETER_15	—	RO	Not used for FLXA21.
126	2126	RESERVE_ PARAMETER_16	—	RO	Not used for FLXA21.

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
127	2127	RESERVE_ PARAMETER_17	—	RO	Not used for FLXA21.
128	2128	RESERVE_ PARAMETER_18	—	RO	Not used for FLXA21.
129	2129	RESERVE_ PARAMETER_19	—	RO	Not used for FLXA21.
130	2130	RESERVE_ PARAMETER_20	—	RO	Not used for FLXA21.
131	2131	RESERVE_ PARAMETER_21	—	RO	Not used for FLXA21.
132	2132	RESERVE_ PARAMETER_22	—	RO	Not used for FLXA21.
133	2133	RESERVE_ PARAMETER_23	—	RO	Not used for FLXA21.
134	2134	RESERVE_ PARAMETER_24	—	RO	Not used for FLXA21.
135	2135	RESERVE_ PARAMETER_25	—	RO	Not used for FLXA21.
136	2136	RESERVE_ PARAMETER_26	—	RO	Not used for FLXA21.
137	2137	RESERVE_ PARAMETER_27	—	RO	Not used for FLXA21.
138	2138	RESERVE_ PARAMETER_28	—	RO	Not used for FLXA21.
139	2139	RESERVE_ PARAMETER_29	—	RO	Not used for FLXA21.
140	2140	TEST_1	—	RO	Used by a vender’s serviceperson
141	2141	TEST_2	—	RO	
142	2142	TEST_3	—	RO	
143	2143	TEST_4	—	RO	
144	2144	TEST_5	—	RO	
145	2145	TEST_6	—	RO	
146	2146	TEST_7	—	RO	
147	2147	TEST_8	—	RO	
148	2148	TEST_9	—	RO	
149	2149	TEST_10	—	RO	

(2)Sensor Transducer Block FLXA21-SC

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
0	2000	SENSOR_ TRANSDUCER_ BLOCK	TAG: “STB”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	2001	ST_REV	0	RO	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
2	2002	TAG_DESC	Blank	AUTO	The user description of the intended application of the block
3	2003	STRATEGY	1	AUTO	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	2004	ALERT_KEY	0	AUTO	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	2005	MODE_BLK	—	AUTO	The actual, target, permitted, and normal modes of the block.
6	2006	BLOCK_ERR	—	RO	This parameter reflects the error status associated with hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	2007	UPDATE_EVT	—	RO	This alert is generated by any change to the static data.
8	2008	BLOCK_ALM	—	RO	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute.
9	2009	TRANSDUCER_ DIRECTORY	—	RO	A directory that specifies the number and starting indices of the transducers.
10	2010	TRANSDUCER_ TYPE	111 (Standard conductivity)	RO	Identifies transducer.
11	2011	XD_ERROR	—	RO	The error code in transducer. Refer to 5.2.4 XD_ERROR.
12	2012	COLLECTION_ DIRECTORY	—	RO	A directory that specifies the number, starting indices, and DD Item Ids of the data collections in each transducer within a Sensor transducer block.
13	2013	ALARM_SUM	—	AUTO	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
14	2014	PRIMARY_VALUE_ TYPE	65527 (Conductivity1-TC1)	RO	Item of Primary value.
15	2015	PRIMARY_VALUE	—	RO	Primary value
16	2016	PRIMARY_VALUE_ UNIT	1680 (S/cm)	RO	Unit of Primary Value
17	2017	SENSOR_TYPE_ SC	146 (2 electrodes)	RO	Sensor type

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
18	2018	CELL_CONST_ FACTORY	0.1	RO	Cell constant (factory setting).
19	2019	CELL_CONST_ ADJUST	0.1	RO	Cell constant (adjusted)
20	2020	MEASURING_ TYPE	1 (Conductivity1-TC1)	RO	Measuring type.
21	2021	MEASURING_UNIT	65534 (/cm)	RO	Measuring unit
22	2022	SENSOR_ CALIBRATION_ DATE	—	RO	Date on which the last sensor calibration was performed.
23	2023	SENSOR_ CALIBRATION_ DUE_DATE	—	RO	Date when the calibration must be done next.
24	2024	SENSOR_TEMP_ COMPENSATION	2 (Auto)	O/S	Temperature compensation method.
25	2025	SENSOR_TEMP_ MANUAL_VALUE	25.0	O/S	Temperature used when temperature compensation method is Manual.
26	2026	REFERENCE_ TEMP	25.0	O/S	Temperature to which the measured value must be compensated.
27	2027	TEMP_ COMPENSATION1	2 (NaCl)	O/S	Temperature compensation method 1
28	2028	TEMP_ COMPENSATION2	0 (None)	O/S	Temperature compensation method 2
29	2029	TEMP_ COEFFICIENT1	2.1	O/S	Coefficient of TC (Linear compensation function) 1
30	2030	TEMP_ COEFFICIENT2	2.1	O/S	Coefficient of TC (Linear compensation function) 2
31	2031	SECONDARY_ VALUE_TYPE	104 (Temperature)	RO	Item of Secondary value.
32	2032	SECONDARY_ VALUE	—	RO	Secondary value.
33	2033	SECONDARY_ VALUE_UNIT	1001 (degC)	RO	Unit of secondary value
34	2034	SENSOR_TYPE_ TEMP	148 (Pt1000)	RO	Temperature sensor
35	2035	TEMP_UNIT	1001 (degC)	RO	Unit of temperature
36	2036	TERTIARY_ VALUE_TYPE	65535 (Empty)	RO	Item of Tertiary value
37	2037	TERTIARY_VALUE	—	RO	Tertiary value
38	2038	TERTIARY_ VALUE_UNIT	1588 (Blank)	RO	Unit of Tertiary value
39	2039	QUATERNARY_ VALUE_TYPE	65535 (Empty)	RO	Item of Quaternary value
40	2040	QUATERNARY_ VALUE	—	RO	Quaternary value
41	2041	QUATERNARY_ VALUE_UNIT	1588 (Blank)	RO	Unit of Quaternary value
42	2042	CONC_ ADDITIONAL_ TABLE	0 (Disable)	O/S	Disable means that the concentration can be obtained from the temperature compensation matrix. Enable means that the concentration can be obtained from additional concentration table.
43	2043	CONC_UNIT	1342 (%)	O/S	Unit of concentration.
44	2044	CONC_TABLE_ CONCENTRATION_1	NOT A NUMBER	O/S	Concentration 1 in the additional concentration table.
45	2045	CONC_TABLE_ CONCENTRATION_2	NOT A NUMBER	O/S	Concentration 2 in the additional concentration table.

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
46	2046	CONC_TABLE_ CONCENTRATION_3	NOT A NUMBER	O/S	Concentration 3 in the additional concentration table.
47	2047	CONC_TABLE_ CONCENTRATION_4	NOT A NUMBER	O/S	Concentration 4 in the additional concentration table.
48	2048	CONC_TABLE_ CONCENTRATION_5	NOT A NUMBER	O/S	Concentration 5 in the additional concentration table.
49	2049	CONC_TABLE_ CONCENTRATION_6	NOT A NUMBER	O/S	Concentration 6 in the additional concentration table.
50	2050	CONC_TABLE_ CONCENTRATION_7	NOT A NUMBER	O/S	Concentration 7 in the additional concentration table.
51	2051	CONC_TABLE_ CONCENTRATION_8	NOT A NUMBER	O/S	Concentration 8 in the additional concentration table.
52	2052	CONC_TABLE_ CONCENTRATION_9	NOT A NUMBER	O/S	Concentration 9 in the additional concentration table.
53	2053	CONC_TABLE_ CONCENTRATION_10	NOT A NUMBER	O/S	Concentration 10 in the additional concentration table.
54	2054	CONC_TABLE_ CONCENTRATION_11	NOT A NUMBER	O/S	Concentration 11 in the additional concentration table.
55	2055	CONC_TABLE_ CONCENTRATION_12	NOT A NUMBER	O/S	Concentration 12 in the additional concentration table.
56	2056	CONC_TABLE_ CONCENTRATION_13	NOT A NUMBER	O/S	Concentration 13 in the additional concentration table.
57	2057	CONC_TABLE_ CONCENTRATION_14	NOT A NUMBER	O/S	Concentration 14 in the additional concentration table.
58	2058	CONC_TABLE_ CONCENTRATION_15	NOT A NUMBER	O/S	Concentration 15 in the additional concentration table.
59	2059	CONC_TABLE_ CONCENTRATION_16	NOT A NUMBER	O/S	Concentration 16 in the additional concentration table.
60	2060	CONC_TABLE_ CONCENTRATION_17	NOT A NUMBER	O/S	Concentration 17 in the additional concentration table.
61	2061	CONC_TABLE_ CONCENTRATION_18	NOT A NUMBER	O/S	Concentration 18 in the additional concentration table.
62	2062	CONC_TABLE_ CONCENTRATION_19	NOT A NUMBER	O/S	Concentration 19 in the additional concentration table.
63	2063	CONC_TABLE_ CONCENTRATION_20	NOT A NUMBER	O/S	Concentration 20 in the additional concentration table.
64	2064	CONC_TABLE_ CONCENTRATION_21	NOT A NUMBER	O/S	Concentration 21 in the additional concentration table.
65	2065	CONC_TABLE_ CONDUCTIVITY_1	NOT A NUMBER	O/S	Conductivity 1 in the additional concentration table.
66	2066	CONC_TABLE_ CONDUCTIVITY_2	NOT A NUMBER	O/S	Conductivity 2 in the additional concentration table.
67	2067	CONC_TABLE_ CONDUCTIVITY_3	NOT A NUMBER	O/S	Conductivity 3 in the additional concentration table.
68	2068	CONC_TABLE_ CONDUCTIVITY_4	NOT A NUMBER	O/S	Conductivity 4 in the additional concentration table.
69	2069	CONC_TABLE_ CONDUCTIVITY_5	NOT A NUMBER	O/S	Conductivity 5 in the additional concentration table.
70	2070	CONC_TABLE_ CONDUCTIVITY_6	NOT A NUMBER	O/S	Conductivity 6 in the additional concentration table.
71	2071	CONC_TABLE_ CONDUCTIVITY_7	NOT A NUMBER	O/S	Conductivity 7 in the additional concentration table.
72	2072	CONC_TABLE_ CONDUCTIVITY_8	NOT A NUMBER	O/S	Conductivity 8 in the additional concentration table.
73	2073	CONC_TABLE_ CONDUCTIVITY_9	NOT A NUMBER	O/S	Conductivity 9 in the additional concentration table.
74	2074	CONC_TABLE_ CONDUCTIVITY_10	NOT A NUMBER	O/S	Conductivity 10 in the additional concentration table.
75	2075	CONC_TABLE_ CONDUCTIVITY_11	NOT A NUMBER	O/S	Conductivity 11 in the additional concentration table.

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
76	2076	CONC_TABLE_ CONDUCTIVITY_12	NOT A NUMBER	O/S	Conductivity 12 in the additional concentration table.
77	2077	CONC_TABLE_ CONDUCTIVITY_13	NOT A NUMBER	O/S	Conductivity 13 in the additional concentration table.
78	2078	CONC_TABLE_ CONDUCTIVITY_14	NOT A NUMBER	O/S	Conductivity 14 in the additional concentration table.
79	2079	CONC_TABLE_ CONDUCTIVITY_15	NOT A NUMBER	O/S	Conductivity 15 in the additional concentration table.
80	2080	CONC_TABLE_ CONDUCTIVITY_16	NOT A NUMBER	O/S	Conductivity 16 in the additional concentration table.
81	2081	CONC_TABLE_ CONDUCTIVITY_17	NOT A NUMBER	O/S	Conductivity 17 in the additional concentration table.
82	2082	CONC_TABLE_ CONDUCTIVITY_18	NOT A NUMBER	O/S	Conductivity 18 in the additional concentration table.
83	2083	CONC_TABLE_ CONDUCTIVITY_19	NOT A NUMBER	O/S	Conductivity 19 in the additional concentration table.
84	2084	CONC_TABLE_ CONDUCTIVITY_20	NOT A NUMBER	O/S	Conductivity 20 in the additional concentration table.
85	2085	CONC_TABLE_ CONDUCTIVITY_21	NOT A NUMBER	O/S	Conductivity 21 in the additional concentration table.
86	2086	POLARIZATION	—	RO	Degree of polarization of the sensor.
87	2087	SENSOR_OHMS	—	RO	Non-compensated resistance of the sensor.
88	2088	USP	—	RO	Margin of safety for the water for injection defined by USP<645>.
89	2089	DETC_ WELLNESS_ POLARIZATION	—	RO	Sensor wellness indicator by Polarization.
90	2090	DETC_ WELLNESS_ CELL_CONST	—	RO	Sensor wellness indicator by Cell Constant.
91	2091	DETC_ WELLNESS_ HEAT_CYCLE	—	RO	Sensor wellness indicator by heat cycle.
92	2092	DETC_ WELLNESS_ PROG_TIME	—	RO	Sensor wellness indicator by elapsed time.
93	2093	MODULE_PDN	Production no.	RO	Product number of Sensor module.
94	2094	MODULE_ SOFTREV	Rn.nn	RO	Software revision of Sensor module.
95	2095	HOUSING_PDN	Production no.	RO	Product number of Housing module.
96	2096	HOUSING_ SOFTREV	Rn.nn	RO	Software revision of Housing module.
97	2097	ERR_CONFIG_ COND_OR_ CONC_TOO_HIGH	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
98	2098	ERR_CONFIG_ COND_OR_ CONC_TOO_LOW	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
99	2099	ERR_CONFIG_ TEMP_TOO_HIGH	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
100	2100	ERR_CONFIG_ TEMP_TOO_LOW	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
101	2101	ERR_CONFIG_ POLARIZATION_ DETECT	2 (Warning)	O/S	Category of error status(Fault/ Warning/Off)
102	2102	ERR_CONFIG_ CALIB_TIME_ EXCEEDED	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
103	2103	ERR_CONFIG_ USP_LMT_ EXCEED	1 (Off)	O/S	Category of error status(Fault/ Warning/Off)
104	2104	ERR_ CONFIG_1ST_ COMP_MATRIX	3 (Fault)	O/S	Category of error status(Fault/ Warning/Off)
105	2105	ERR_ CONFIG_2ND_ COMP_MATRIX	3 (Fault)	O/S	Category of error status(Fault/ Warning/Off)
106	2106	ERR_CONFIG_ CONC_TABLE	3 (Fault)	O/S	Category of error status(Fault/ Warning/Off)
107	2107	MEASUREMENT_ HIGH_LMT	0.25	O/S	High limit for checking “Conductivity too high” or low limit for checking “Resistivity too low”.
108	2108	MEASUREMENT_ LOW_LMT	0.000001	O/S	Low limit for checking “Conductivity too low” or high limit for checking “Resistivity too high”.
109	2109	USP_SAFETY_ MARGIN	0.0	O/S	Percentage of the limit value of USP<645> serves as a safety margin.
110	2110	DIAG_SETTING_ PROG_TIME	0 (Disable)	O/S	Enable or Disable of sensor wellness by elapsed time.
111	2111	DIAG_SETTING_ PROG_TIME_ BAD_LMT	2000	O/S	Limit for sensor wellness by elapsed time.
112	2112	DIAG_SETTING_ HEAT_CYCLE	0 (Disable)	O/S	Enable or Disable of sensor wellness by heat cycle.
113	2113	DIAG_SETTING_ HEAT_CYCLE_ BAD_LMT	500	O/S	Limit for sensor wellness by heat cycle.
114	2114	HEAT_CYCLE_ TEMP	50.0	O/S	Limit of temperature for sensor wellness by heat cycle.
115	2115	HEAT_CYCLE_ TIME	10.0	O/S	Limit of time for sensor wellness by heat cycle.
116	2116	TRANSMITTER_ TIME	—	O/S	Time of Housing module.
117	2117	RESERVE_ PARAMETER_1	—	RO	Not used for FLXA21.
118	2118	RESERVE_ PARAMETER_2	—	RO	Not used for FLXA21.
119	2119	RESERVE_ PARAMETER_3	—	RO	Not used for FLXA21.
120	2120	RESERVE_ PARAMETER_4	—	RO	Not used for FLXA21.
121	2121	RESERVE_ PARAMETER_5	—	RO	Not used for FLXA21.
122	2122	RESERVE_ PARAMETER_6	—	RO	Not used for FLXA21.
123	2123	RESERVE_ PARAMETER_7	—	RO	Not used for FLXA21.
124	2124	RESERVE_ PARAMETER_8	—	RO	Not used for FLXA21.
125	2125	RESERVE_ PARAMETER_9	—	RO	Not used for FLXA21.
126	2126	RESERVE_ PARAMETER_10	—	RO	Not used for FLXA21.
127	2127	RESERVE_ PARAMETER_11	—	RO	Not used for FLXA21.
128	2128	RESERVE_ PARAMETER_12	—	RO	Not used for FLXA21.

Relative Index	Index	Parameter name	Factory Default	Write Mode	Description
129	2129	RESERVE_ PARAMETER_13	—	RO	Not used for FLXA21.
130	2130	RESERVE_ PARAMETER_14	—	RO	Not used for FLXA21.
131	2131	RESERVE_ PARAMETER_15	—	RO	Not used for FLXA21.
132	2132	RESERVE_ PARAMETER_16	—	RO	Not used for FLXA21.
133	2133	RESERVE_ PARAMETER_17	—	RO	Not used for FLXA21.
134	2134	RESERVE_ PARAMETER_18	—	RO	Not used for FLXA21.
135	2135	RESERVE_ PARAMETER_19	—	RO	Not used for FLXA21.
136	2136	RESERVE_ PARAMETER_20	—	RO	Not used for FLXA21.
137	2137	RESERVE_ PARAMETER_21	—	RO	Not used for FLXA21.
138	2138	RESERVE_ PARAMETER_22	—	RO	Not used for FLXA21.
139	2139	RESERVE_ PARAMETER_23	—	RO	Not used for FLXA21.
140	2140	TEST_1	—	RO	Used by a vender’s serviceperson
141	2141	TEST_2	—	RO	
142	2142	TEST_3	—	RO	
143	2143	TEST_4	—	RO	
144	2144	TEST_5	—	RO	
145	2145	TEST_6	—	RO	
146	2146	TEST_7	—	RO	
147	2147	TEST_8	—	RO	
148	2148	TEST_9	—	RO	
149	2149	TEST_10	—	RO	

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8. Diagnostic Information

8.1 DEVICE STATUS

Device setting status and failures of FLXA21 are indicated by using parameter DEVICE_STATUS_1, DEVICE_STATUS_2, DEVICE_STATUS_3, DEVICE_STATUS_4, DEVICE_STATUS_5, DEVICE_STATUS_6, DEVICE_STATUS_7, and DEVICE_STATUS_8 (index 1045, 1046, 1047, 1048, 1049, 1050, 1051, and 1052) in Resource Block.

Table 8.1 Contents of DEVICE_STATUS_1 for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
1-31	Write Unlocked	Writing to parameters is Unlocked. [Action]: Change the RB Write Lock(RB. WRITE_LOCK) to Locked or turn on the hardware write lock switch.	130	—
1-30	Hard Write Lock SW OFF	Hardware write lock switch is OFF. [Action]: Turn on the hardware write lock switch.	129	—
1-29	Write Locked	Writing to parameters is locked. [Action]: Change the RB Write Lock(RB. WRITE_LOCK) to Not Locked or turn off the hardware write lock switch.	128	—
1-28	Hard Write Lock SW ON	Hardware write lock switch is ON. [Action]: Turn off the hardware write lock switch.	127	—
1-27	Abnormal Boot Process	Abnormal boot processing was detected at the starting. [Action]: Check the cables, power and RB Software download error(RB.SOFTDWN_ ERROR).	126	F
1-26	SoftDL Failure	Software download has failed. [Action]: Check the download file and RB Software download error(RB.SOFTDWN_ ERROR).	125	C
1-25	SoftDL Incomplete	Software download is incomplete. [Action]: Check the cables, power supply and RB Software download error(RB. SOFTDWN_ERROR).	124	C
1-24	Simulation Switch ON	Software or hardware simulation switch is ON. [Action]: Delete the value of RB Sim Enable Message(RB.SIM_ENABLE_ MSG) or turn off the hardware simulation switch.	123	—
1-23	RB in O/S Mode	Resource Block is in O/S mode. [Action]: Change the RB Block Mode. Target(RB.MODE_BLK.TARGET) to Auto mode.	122	—
1-22	Simulation Switch OFF	Software or hardware simulation switch is OFF. [Action]: Write REMOTE LOOP TEST SWITCH on RB Sim Enable Message(RB.SIM_ENABLE_MSG) or turn on the hardware simulation switch.	121	—
1-20	Amp EEPROM Failure	Amplifier EEPROM failed. [Action]: Replace electrical parts such as the amplifier. Or replace the device.	119	F
1-16	Link Obj. 1/17/33 Not Open	Link object 1, 17 or 33 is not open. [Action]: Check the Link Object.	115	C
1-15	Link Obj. 2/18/34 Not Open	Link object 2, 18 or 34 is not open. [Action]: Check the Link Object.	114	C
1-14	Link Obj. 3/19/35 Not Open	Link object 3, 19 or 35 is not open. [Action]: Check the Link Object.	113	C
1-13	Link Obj. 4/20/36 Not Open	Link object 4, 20 or 36 is not open. [Action]: Check the Link Object.	112	C
1-12	Link Obj. 5/21/37 Not Open	Link object 5, 21 or 37 is not open. [Action]: Check the Link Object.	111	C
1-11	Link Obj. 6/22/38 Not Open	Link object 6, 22 or 38 is not open. [Action]: Check the Link Object.	110	C
1-10	Link Obj. 7/23/39 Not Open	Link object 7, 23 or 39 is not open. [Action]: Check the Link Object.	109	C
1-09	Link Obj. 8/24/40 Not Open	Link object 8, 24 or 40 is not open. [Action]: Check the Link Object.	108	C

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
1-08	Link Obj. 9/25 Not Open	Link object 9 or 25 is not open. [Action]: Check the Link Object.	107	C
1-07	Link Obj. 10/26 Not Open	Link object 10 or 26 is not open. [Action]: Check the Link Object.	106	C
1-06	Link Obj. 11/27 Not Open	Link object 11 or 27 is not open. [Action]: Check the Link Object.	105	C
1-05	Link Obj. 12/28 Not Open	Link object 12 or 28 is not open. [Action]: Check the Link Object.	104	C
1-04	Link Obj. 13/29 Not Open	Link object 13 or 29 is not open. [Action]: Check the Link Object.	103	C
1-03	Link Obj. 14/30 Not Open	Link object 14 or 30 is not open. [Action]: Check the Link Object.	102	C
1-02	Link Obj. 15/31 Not Open	Link object 15 or 31 is not open. [Action]: Check the Link Object.	101	C
1-01	Link Obj. 16/32 Not Open	Link object 16 or 32 is not open. [Action]: Check the Link Object.	100	C

Table 8.2 Contents of DEVICE_STATUS_2 (CPU Fault from Housing) for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
2-18	Wash response time failure	Half-value recovery time too long. [Action]: Check cleaning system. Adjust timing parameters. Replace measuring sensor.	217	—
2-17	Calibration Due	System was not maintained within the preset period. [Action]: Perform maintenance. Increase Calibr. Interval.	216	M
2-15	Outputs in HOLD	[Action]: Press HOLD in main display. Contact your local sales office in case the HOLD flag reappears.	214	—
2-12	mA output burn high	Upscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	211	—
2-11	mA output burn low	Downscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	210	—
2-10	Error in mA table	mA table is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	209	—
2-09	mA calculation error	Problem with calculating a mA value. [Action]: Check the 'Process parameter' for mA.	208	—
2-04	mA configuration error	Problem with mA and Process parameter. [Action]: Select a correct 'Process parameter' for mA on the display of FLXA21.	203	C
2-03	Internal com. Error	[Action]: Contact your local sales office.	202	F
2-02	Chksum err.(CPU AS)	[Action]: Contact your local sales office.	201	F
2-01	EEPROM err.(CPU AS)	Write or read error in the EEPROM. [Action]: Contact your local sales office.	200	F

Table 8.3 Contents of DEVICE_STATUS_3 (Sensor Fault from Housing) for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
3-32	pH too high	pH reading above the higher limit. [Action]: Check connections and cable. Replace sensor.	331	F
3-31	pH too low	pH reading below the lower limit. [Action]: Check connections and cable. Replace sensor.	330	F
3-30	Temperature too high	Measured process temperature exceeds the lower limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	329	F
3-29	Temperature too low	Measured process temperature exceeds the upper limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	328	F
3-24	ORP too high	ORP reading above 1500mV. [Action]: Check connections and cable. Replace sensor.	323	F
3-23	ORP too low	ORP reading below -1500mV. [Action]: Check connections and cable. Replace sensor.	322	F
3-22	rH too high	rH reading above 100rH. [Action]: Check connections and cable. Replace sensor.	321	F
3-21	rH too low	rH reading below 0rH. [Action]: Check connections and cable. Replace sensor.	320	F
3-20	Impedance 1 too high	Sensor fouled. Liquid earth disconnected. Sensor not immersed. Insufficient electrolyte. [Action]: Clean or replace sensor. Check sensor immersion. Check electrolyte tank.	319	F
3-19	Impedance 1 too low	Sensor broken. Damaged or damp connections. [Action]: Check impedance settings. Replace sensor.	318	F
3-18	Impedance 2 too high	Sensor fouled. Liquid earth disconnected. Sensor not immersed. Insufficient electrolyte. [Action]: Clean or replace sensor. Check sensor immersion. Check electrolyte tank.	317	F
3-17	Impedance 2 too low	Sensor broken. Damaged or damp connections. [Action]: Check impedance settings. Replace sensor.	316	F
3-11	Temp. comp. matrix error	Temp. comp. matrix is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	310	C
3-10	Checksum error in SENCOM (Manufacturing data)	Software problem in SENCOM (Manufacturing data) [Action]: Contact your local sales office.	309	F
3-09	Checksum error in SENCOM (Setting data)	[Action]: Contact your local sales office.	308	F
3-08	EEPROM error in SENCOM	Write or read error in the EEPROM. [Action]: Contact your local sales office.	307	F

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
3-07	SENCOM comm. error	SENCOM communication is not correct. [Action]: Check connection of SENCOM sensor.	306	F
3-06	Checksum error	[Action]: Contact your local sales office.	305	F
3-05	Sensor type not correct	SENCOM sensor type is not correct. [Action]: Change SENCOM sensor type on the display of FLXA21.	304	C
3-04	Internal error in SENCOM	[Action]: Replace SENCOM sensor.	303	F
3-03	SENCOM not connected	SENCOM sensor is not connected. [Action]: Check connection of SENCOM sensor.	302	F
3-02	EEPROM error	Write or read error in the EEPROM. [Action]: Contact your local sales office.	301	F
3-01	Sens. mod. not work	[Action]: Contact your local sales office.	300	F

Table 8.4 Contents of DEVICE_STATUS_4 (CPU Warning from Housing) for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
4-19	Log Book (almost) full	Logbook is more than 95% full. [Action]: Erase logbooks. Turn logbook "full" warning off.	418	M
4-18	Wash response time failure	Half-value recovery time too long. [Action]: Check cleaning system. Adjust timing parameters. Replace measuring sensor.	417	—
4-17	Calibration Due	System was not maintained within the preset period. [Action]: Perform maintenance. Increase Calibr. Interval.	416	M
4-15	Outputs in HOLD	[Action]: Press HOLD in main display. Contact your local sales office in case the HOLD flag reappears.	414	—
4-12	mA output burn high	Upscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	411	—
4-11	mA output burn low	Downscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	410	—
4-10	Error in mA table	mA table is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	409	—
4-09	mA calculation error	Problem with calculating a mA value. [Action]: Check the 'Process parameter' for mA.	408	—

Table 8.5 Contents of DEVICE_STATUS_5 (Sensor Warning from Housing) for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
5-32	pH too high	pH reading above the higher limit. [Action]: Check connections and cable. Replace sensor.	531	S
5-31	pH too low	pH reading below the lower limit. [Action]: Check connections and cable. Replace sensor.	530	S
5-30	Temperature too high	Measured process temperature exceeds the lower limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	529	S
5-29	Temperature too low	Measured process temperature exceeds the upper limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	528	S
5-28	Temp. comp. error(pH)	Uncompensated value outside matrix limits. [Action]: Check pH temp. compensation configuration.	527	S
2-24	ORP too high	ORP reading above 1500mV. [Action]: Check connections and cable. Replace sensor.	523	S
5-23	ORP too low	ORP reading below -1500mV. [Action]: Check connections and cable. Replace sensor.	522	S
5-22	rH too high	rH reading above 100rH. [Action]: Check connections and cable. Replace sensor.	521	S
5-21	rH too low	rH reading below 0rH. [Action]: Check connections and cable. Replace sensor.	520	S
5-20	Impedance 1 too high	Sensor fouled. Liquid earth disconnected. Sensor not immersed. Insufficient electrolyte. [Action]: Clean or replace sensor. Check sensor immersion. Check electrolyte tank.	519	M
5-19	Impedance 1 too low	Sensor broken. Damaged or damp connections. [Action]: Check impedance settings. Replace sensor.	518	M
5-18	Impedance 2 too high	Sensor fouled. Liquid earth disconnected. Sensor not immersed. Insufficient electrolyte. [Action]: Clean or replace sensor. Check sensor immersion. Check electrolyte tank.	517	M
5-17	Impedance 2 too low	Sensor broken. Damaged or damp connections. [Action]: Check impedance settings. Replace sensor.	516	M
5-15	SENCOM Initializing	SENCOM is being initialized. [Action]: Please wait.	514	C
5-14	SENCOM Logbook (almost) full	Calibration logbook is more than 95% full. [Action]: Erase logbooks. Turn logbook "full" warning off.	513	M
5-12	SENCOM sensor changed	SENCOM sensor changed. [Action]: Go to "New sensor?" on the display of FLXA21. Reset wellness data by selecting 'Yes' or only cancel warning by selecting 'No'.	511	—

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
5-11	Temp. comp. matrix error	Temp. comp. matrix is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	510	C

Table 8.6 Contents of DEVICE_STATUS_6 for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
6-02	HART Failure	[Action]: Check HART settings on the display of FLXA21. Contact your local sales office.	601	F
6-01	Maintenance	Someone maintenances on the display of FLXA21. [Action]: Check it.	600	C

Table 8.7 Contents of DEVICE_STATUS_7 for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
7-08	No FB Scheduled	No Function Block is scheduled. [Action]: Check the LAS communication or Schedule Function Block.	707	C
7-03	AI3 Not Scheduled	AI3 Block is not scheduled. [Action]: Schedule AI3 Block.	702	C
7-02	AI2 Not Scheduled	AI2 Block is not scheduled. [Action]: Schedule AI2 Block.	701	C
7-01	AI1 Not Scheduled	AI1 Block is not scheduled. [Action]: Schedule AI1 Block.	700	C

Table 8.8 Contents of DEVICE_STATUS_8 for FLXA21-PH

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
8-25	TB in O/S Mode	Sensor Transducer Block is in O/S mode. [Action]: Change the STB Block Mode. Target(STB.MODE_BLK.TARGET) to Auto mode.	824	C
8-24	AI3 Empty	AI3 Block connected no channel. [Action]: Check the AI3 Channel(AI3. CHANNEL). Check selected process value.	823	C
8-23	AI3 Hi Hi Alarm	High High Alarm has occurred. [Action]: Check the AI3 Output.Value (AI3. OUT.VALUE) and configuration of AI3 Hi Hi Lim (AI3.HI_HI_LIM), AI3 Hi Hi Pri (AI3. HI_HI_PRI).	822	—
8-22	AI3 Hi Alarm	High Alarm has occurred. [Action]: Check the AI3 Output.Value (AI3. OUT.VALUE) and configuration of AI3 Hi Lim (AI3.HI_LIM), AI3 Hi Pri (AI3.HI_PRI).	821	—
8-21	AI3 Lo Alarm	Low Alarm has occurred. [Action]: Check the AI3 Output.Value (AI3. OUT.VALUE) and configuration of AI3 Lo Lim (AI3.LO_LIM), AI3 Lo Pri (AI3. LO_PRI).	820	—
8-20	AI3 Lo Lo Alarm	Low Low Alarm has occurred. [Action]: Check the AI3 Output.Value (AI3. OUT.VALUE) and configuration of AI3 Lo Lo Lim (AI3.LO_LO_LIM), AI3 Lo Lo Pri (AI3.LO_LO_PRI).	819	—
8-19	AI3 Simulate Active	AI3 Block is in simulation mode. [Action]: Change the AI3 Simulation En/ Disable (AI3.SIMULATE.SIMULATE_ ENABLE) to Disabled.	818	C
8-18	AI3 in MAN Mode	AI3 Block is in Man mode. [Action]: Change the AI3 Block Mode. Target (AI3.MODE_BLK.TARGET) to Auto or other mode.	817	C
8-17	AI3 in O/S Mode	AI3 Block is in O/S mode. [Action]: Change the AI3 Block Mode. Target (AI3.MODE_BLK.TARGET) to Auto or other mode.	816	C
8-16	AI2 Empty	AI2 Block connected no channel. [Action]: Check the AI2 Channel (AI2. CHANNEL). Check selected process value.	815	C
8-15	AI2 Hi Hi Alarm	High High Alarm has occurred. [Action]: Check the AI2 Output.Value (AI2. OUT.VALUE) and configuration of AI2 Hi Hi Lim (AI2.HI_HI_LIM), AI2 Hi Hi Pri (AI2. HI_HI_PRI).	814	—
8-14	AI2 Hi Alarm	High Alarm has occurred. [Action]: Check the AI2 Output.Value (AI2. OUT.VALUE) and configuration of AI2 Hi Lim (AI2.HI_LIM), AI2 Hi Pri (AI2.HI_PRI).	813	—
8-13	AI2 Lo Alarm	Low Alarm has occurred. [Action]: Check the AI2 Output.Value (AI2. OUT.VALUE) and configuration of AI2 Lo Lim (AI2.LO_LIM), AI2 Lo Pri (AI2. LO_PRI).	812	—
8-12	AI2 Lo Lo Alarm	Low Low Alarm has occurred. [Action]: Check the AI2 Output.Value (AI2. OUT.VALUE) and configuration of AI2 Lo Lo Lim (AI2.LO_LO_LIM), AI2 Lo Lo Pri (AI2.LO_LO_PRI).	811	—

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
8-11	AI2 Simulate Active	AI2 Block is in simulation mode. [Action]: Change the AI2 Simulation En/Disable (AI2.SIMULATE.SIMULATE_ENABLE) to Disabled.	810	C
8-10	AI2 in MAN Mode	AI2 Block is in Man mode. [Action]: Change the AI2 Block Mode. Target (AI2.MODE_BLK.TARGET) to Auto or other mode.	809	C
8-09	AI2 in O/S Mode	AI2 Block is in O/S mode. [Action]: Change the AI2 Block Mode. Target (AI2.MODE_BLK.TARGET) to Auto or other mode.	808	C
8-08	AI1 Empty	AI1 Block connected no channel. [Action]: Check the AI1 Channel (AI1.CHANNEL). Check selected process value.	807	C
8-07	AI1 Hi Hi Alarm	High High Alarm has occurred. [Action]: Check the AI1 Output.Value (AI1.OUT.VALUE) and configuration of AI1 Hi Hi Lim (AI1.HI_HI_LIM), AI1 Hi Hi Pri (AI1.HI_HI_PRI).	806	—
8-06	AI1 Hi Alarm	High Alarm has occurred. [Action]: Check the AI1 Output.Value (AI1.OUT.VALUE) and configuration of AI1 Hi Lim (AI1.HI_LIM), AI1 Hi Pri (AI1.HI_PRI).	805	—
8-05	AI1 Lo Alarm	Low Alarm has occurred. [Action]: Check the AI1 Output.Value (AI1.OUT.VALUE) and configuration of AI1 Lo Lim (AI1.LO_LIM), AI1 Lo Pri (AI1.LO_PRI).	804	—
8-04	AI1 Lo Lo Alarm	Low Low Alarm has occurred. [Action]: Check the AI1 Output.Value (AI1.OUT.VALUE) and configuration of AI1 Lo Lo Lim (AI1.LO_LO_LIM), AI1 Lo Lo Pri (AI1.LO_LO_PRI).	803	—
8-03	AI1 Simulate Active	AI1 Block is in simulation mode. [Action]: Change the AI1 Simulation En/Disable (AI1.SIMULATE.SIMULATE_ENABLE) to Disabled.	802	C
8-02	AI1 in MAN Mode	AI1 Block is in Man mode. [Action]: Change the AI1 Block Mode. Target (AI1.MODE_BLK.TARGET) to Auto or other mode.	801	C
8-01	AI1 in O/S Mode	AI1 Block is in O/S mode. [Action]: Change the AI1 Block Mode. Target (AI1.MODE_BLK.TARGET) to Auto or other mode.	800	C

● FLXA21-SC

DEVICE_STATUS_1: Same as FLXA21-PH. Refer to Table 8.1.
DEVICE_STATUS_2: Table 8.9
DEVICE_STATUS_3: Table 8.10
DEVICE_STATUS_4: Table 8.11
DEVICE_STATUS_5: Table 8.12
DEVICE_STATUS_6: Same as FLXA21-PH. Refer to Table 8.6.
DEVICE_STATUS_7: Same as FLXA21-PH. Refer to Table 8.7.
DEVICE_STATUS_8: Same as FLXA21-PH. Refer to Table 8.8.

Table 8.9 Contents of DEVICE_STATUS_2 (CPU Fault from Housing) for FLXA21-SC

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 Category
2-17	Calibration Due	System was not maintained within the preset period. [Action]: Perform maintenance. Increase Calibr. Interval.	216	M
2-15	Outputs in HOLD	[Action]: Press HOLD in main display. Contact your local sales office in case the HOLD flag reappears.	214	—
2-12	mA output burn high	Upscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	211	—
2-11	mA output burn low	Downscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	210	—
2-10	Error in mA table	mA table is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	209	—
2-09	mA calculation error	Problem with calculating a mA value. [Action]: Check the 'Process parameter' for mA.	208	—
2-04	mA configuration error	Problem with mA and Process parameter. [Action]: Select a correct 'Process parameter' for mA on the display of FLXA21.	203	C
2-03	Internal com. Error	[Action]: Contact your local sales office.	202	F
2-02	Chksum err.(CPU AS)	[Action]: Contact your local sales office.	201	F
2-01	EEPROM err.(CPU AS)	Write or read error in the EEPROM. [Action]: Contact your local sales office.	200	F

Table 8.10 Contents of DEVICE_STATUS_3 (Sensor Fault from Housing) for FLXA21-SC

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
3-32	Conductivity too high	Conductivity exceeds high limit. or Resistivity exceeds low limit. [Action]: Check connections and cable. Replace sensor. Adjust limits parameter MEASUREMENT_HIGH_LMT	331	F
3-31	Conductivity too low	Conductivity exceeds low limit. or Resistivity exceeds high limit. [Action]: Check connections and cable. Replace sensor. Adjust limits parameter MEASUREMENT_LOW_LMT	330	F
3-30	Temperature too high	Measured process temperature exceeds the lower limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	329	F
3-29	Temperature too low	Measured process temperature exceeds the upper limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	328	F
3-25	Measurement unstable	Measurement unstable [Action]: Check cable and connections. Cable must not be able to 'vibrate'. Check fluid stream for air bubbles.	324	F
3-24	Polarization detected	Sensor surface fouled. Conductivity above sensor specification. [Action]: Clean or replace sensor. Adjust process.	323	F
3-23	USP limit exceeded	Conductivity exceeds USP limit. [Action]: Check ionic exchangers.	322	S
3-22	USP margin exceeded	Conductivity exceeds USP margin. Poor water quality. [Action]: Check ionic exchangers.	321	S
3-21	Conc. table error	Concentration table is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	320	C
3-12	2nd comp. matrix error	Problem with calculating T.C. or uncompensated value outside matrix limits. [Action]: Check temp. compensation configuration on the display of FLXA21.	311	C
3-11	1st comp. matrix error	Problem with calculating T.C. or uncompensated value outside matrix limits. [Action]: Check temp. compensation configuration on the display of FLXA21.	310	C
3-06	Checksum error	[Action]: Contact your local sales office.	305	F
3-02	EEPROM error	Write or read error in the EEPROM. [Action]: Contact your local sales office.	301	F
3-01	Sens. mod. not work	[Action]: Contact your local sales office.	300	F

Table 8.11 Contents of DEVICE_STATUS_4 (CPU Warning from Housing) for FLXA21-SC

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
4-19	Log Book (almost) full	Logbook is more than 95% full. [Action]: Erase logbooks. Turn logbook "full" warning off.	418	M
4-17	Calibration Due	System was not maintained within the preset period. [Action]: Perform maintenance. Increase Calibr. Interval.	416	M
4-15	Outputs in HOLD	[Action]: Press HOLD in main display. Contact your local sales office in case the HOLD flag reappears.	414	—
4-12	mA output burn high	Upscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	411	—
4-11	mA output burn low	Downscale burnout situation. Indication of sensor fault. [Action]: Check measured process values.	410	—
4-10	Error in mA table	mA table is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	409	—
4-09	mA calculation error	Problem with calculating a mA value. [Action]: Check the 'Process parameter' for mA.	408	—

Table 8.12 Contents of DEVICE_STATUS_5 (Sensor Warning from Housing) for FLXA21-SC

Field Diagnostic	Display through DD	Description	DeviceViewer AL-XXX	NAMUR NE-107 category
5-32	Conductivity too high	Conductivity exceeds high limit. or Resistivity exceeds low limit. [Action]: Check connections and cable. Replace sensor. Adjust limits parameter MEASUREMENT_HIGH_LMT	531	S
5-31	Conductivity too low	Conductivity exceeds low limit. or Resistivity exceeds high limit. [Action]: Check connections and cable. Replace sensor. Adjust limits parameter MEASUREMENT_LOW_LMT	530	S
5-30	Temperature too high	Measured process temperature exceeds the lower limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	529	S
5-29	Temperature too low	Measured process temperature exceeds the upper limit. [Action]: Check process temperature. Check programmed sensor type. Check connections and cable.	528	S
5-28	1st temp. comp. error	Temp. comp. matrix is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	527	S
5-27	2nd temp. comp. error	Temp. comp. matrix 2 is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	526	S
5-24	Polarization detected	Sensor surface fouled. Conductivity above sensor specification. [Action]: Clean or replace sensor. Adjust process.	523	M
5-23	USP limit exceeded	Conductivity exceeds USP limit. [Action]: Check ionic exchangers.	522	S
5-22	USP margin exceeded	Conductivity exceeds USP margin. Poor water quality. [Action]: Check ionic exchangers.	521	S
5-21	Conc. table error	Concentration table is not properly defined. [Action]: Execute 'Check values' on the display of FLXA21.	520	C
5-12	2nd comp. matrix error	Problem with calculating T.C. or uncompensated value outside matrix limits. [Action]: Check temp. compensation configuration on the display of FLXA21.	511	C
5-11	1st comp. matrix error	Problem with calculating T.C. or uncompensated value outside matrix limits. [Action]: Check temp. compensation configuration on the display of FLXA21.	510	C

8.2 Status of each parameter in failure mode FLXA21-PH

Following tables summarize the value of FLXA21 parameters when LCD display indicates an Alarm or status has some problems.

Resource Block

Action of each parameters in failure mode related Resource block.

Field Diagnostic		BLOCK_ERR
Bit	Display through DD	
1-24	Simulation Switch ON	Simulate Active
1-23	RB in O/S Mode	Out-of-Service
1-20	Amp EEPROM Failure	Lost Static Data, Device Needs Maintenance Now

Analog Input Block

Action of each parameters in failure mode related Analog Input block.

Field Diagnostic		BLOCK_ERR	OUT.Status
Bit	Display through DD		
7-03	AI3 Not Scheduled	—	HOLD
7-02	AI2 Not Scheduled	—	HOLD
7-01	AI1 Not Scheduled	—	HOLD
8-24	AI3 Empty	—	BAD-Configuration Error (from STB status)
8-23	AI3 Hi Hi Alarm	—	Depends on alarm priority
8-22	AI3 Hi Alarm	—	Depends on alarm priority
8-21	AI3 Lo Alarm	—	Depends on alarm priority
8-20	AI3 Lo Lo Alarm	—	Depends on alarm priority
8-19	AI3 Simulate Active	Simulate active	Specified Status
8-18	AI3 in MAN Mode	—	Depends on setting condition of STATUS_OPT Limit Status: Constant
8-17	AI3 in O/S Mode	Out of service	BAD-Out of service
8-16	AI2 Empty	—	BAD-Configuration Error (from STB status)
8-15	AI2 Hi Hi Alarm	—	Depends on alarm priority
8-14	AI2 Hi Alarm	—	Depends on alarm priority
8-13	AI2 Lo Alarm	—	Depends on alarm priority
8-12	AI2 Lo Lo Alarm	—	Depends on alarm priority
8-11	AI2 Simulate Active	Simulate active	Specified Status
8-10	AI2 in MAN Mode	—	Depends on setting condition of STATUS_OPT Limit Status: Constant
8-09	AI2 in O/S Mode	Out of service	BAD-Out of service
8-08	AI1 Empty	—	BAD-Configuration Error (from STB status)
8-07	AI1 Hi Hi Alarm	—	Depends on alarm priority
8-06	AI1 Hi Alarm	—	Depends on alarm priority
8-05	AI1 Lo Alarm	—	Depends on alarm priority
8-04	AI1 Lo Lo Alarm	—	Depends on alarm priority
8-03	AI1 Simulate Active	Simulate active	Specified Status
8-02	AI1 in MAN Mode	—	Depends on setting condition of STATUS_OPT Limit Status: Constant
8-01	AI1 in O/S Mode	Out of service	BAD-Out of service

Sensor Transducer Block (Fault)

Action of each parameters in failure mode related Sensor Transducer block.

These become effective when ERR_CONFIG_n (TB: 2075 to 2089) is set to Fault.

Field Diagnostic		pH			Temperature			ORP		
Bit	Display through DD	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR
3-32	pH too high	BAD-Sensor Failure	Other	I/O Failure	—	—	—	—	—	—
3-31	pH too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—	—	—	—
3-30	Temperature too high	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	—	—	—
3-29	Temperature too low	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	—	—	—
3-24	ORP too high	—	—	—	—	—	—	BAD-Sensor Failure	Other	I/O Failure
3-23	ORP too low	—	—	—	—	—	—	BAD-Sensor Failure	Other	I/O Failure
3-22	rH too High	—	—	—	—	—	—	—	—	—
3-21	rH too low	—	—	—	—	—	—	—	—	—
3-20	Impedance 1 too high	BAD-Sensor Failure	Other	I/O Failure	—	—	—	BAD-Sensor Failure	Other	I/O Failure
3-19	Impedance 1 too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—	BAD-Sensor Failure	Other	I/O Failure
3-18	Impedance 2 too high	BAD-Sensor Failure	Other	I/O Failure	—	—	—	BAD-Sensor Failure	Other	I/O Failure
3-17	Impedance 2 too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—	BAD-Sensor Failure	Other	I/O Failure
3-11	Temp. comp. matrix error	BAD-Configuration Error	Other	Configuration Error	—	—	—	—	—	—
3-10	Checksum error in SENCOM (Manufacturing data)	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure
3-09	Checksum error in SENCOM (Setting data)	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure
3-08	EEPROM error in SENCOM	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure
3-07	SENCOM comm. Error	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure
3-06	Checksum error	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure
3-05	Sensor type not correct	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error

Field Diagnostic		pH			Temperature			ORP		
Bit	Display through DD	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR
3-04	Internal error in SENCOM	BAD- Sensor Failure	Other	I/O Failure	BAD- Sensor Failure	Other	I/O Failure	BAD- Sensor Failure	Other	I/O Failure
3-03	SENCOM not connected	BAD- Sensor Failure	Other	I/O Failure	BAD- Sensor Failure	Other	I/O Failure	BAD- Sensor Failure	Other	I/O Failure
3-02	EEPROM error	BAD- Device Failure	Other	:I/O Failure	BAD- Device Failure	Other	:I/O Failure	BAD- Device Failure	Other	:I/O Failure
3-01	Sens, mod. Not work	BAD- Device Failure	Other	I/O Failure	BAD- Device Failure	Other	I/O Failure	BAD- Device Failure	Other	I/O Failure
2-17	Calibration Due	BAD- Nonspecific	Other	General Error	—	—	—	BAD- Nonspecific	Other	General Error
2-04	mA configuration error	BAD- Configuration Error	Other	Configuration Error	BAD- Configuration Error	Other	Configuration Error	BAD- Configuration Error	Other	Configuration Error
2-03	Internal com. Error	BAD- Device Failure	Other	I/O Failure	BAD- Device Failure	Other	I/O Failure	BAD- Device Failure	Other	I/O Failure
2-02	Chksum err.(CPU AS)	BAD- Device Failure	Other	Electronics Failure	BAD- Device Failure	Other	Electronics Failure	BAD- Device Failure	Other	Electronics Failure
2-01	EEPROM err.(CPU AS)	BAD- Device Failure	Other	Electronics Failure	BAD- Device Failure	Other	Electronics Failure	BAD- Device Failure	Other	Electronics Failure
6-02	HART Failure	BAD- Device Failure	Other	I/O Failure	BAD- Device Failure	Other	I/O Failure	BAD- Device Failure	Other	I/O Failure
1-20	Amp EEPROM Failure	BAD- Device Failure	Other	Electronics Failure	BAD- Device Failure	Other	Electronics Failure	BAD- Device Failure	Other	Electronics Failure

Field Diagnostic		rH			Ref. Impedance			Empty		
Bit	Display through DD	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR
3-32	pH too high	BAD-Sensor Failure	Other	I/O Failure	—	—	—	When "Empty" is selected, status become "BAD-Configuration Error" regardless of faults and warnings. However, Only when "Internal com. error" and "Amp EEPROM Failure" occur, status become BAD-Device Failure.	—	—
3-31	pH too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-30	Temperature too high	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-29	Temperature too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-24	ORP too high	—	—	—	—	—	—		—	—
3-23	ORP too low	—	—	—	—	—	—		—	—
3-22	rH too High	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-21	rH too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-20	Impedance 1 too high	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-19	Impedance 1 too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-18	Impedance 2 too high	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-17	Impedance 2 too low	BAD-Sensor Failure	Other	I/O Failure	—	—	—		—	—
3-11	Temp. comp. matrix error	—	—	—	—	—	—		—	—
3-10	Checksum error in SENCOM (Manufacturing data)	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure		Other	Failure
3-09	Checksum error in SENCOM (Setting data)	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure		Other	Failure
3-08	EEPROM error in SENCOM	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure		Other	Failure
3-07	SENCOM comm. Error	BAD-Sensor Failure	Other	Failure	BAD-Sensor Failure	Other	Failure		Other	Failure
3-06	Checksum error	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure
3-05	Sensor type not correct	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error		Other	Configuration Error
3-04	Internal error in SENCOM	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure		Other	I/O Failure

Field Diagnostic		rH			Ref. Impedance			Empty		
Bit	Display through DD	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR	Fault	BLOCK_ ERR	XD_ ERROR
3-03	SENCOM not connected	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	When "Empty" is selected, status become "BAD-Configuration Error" regardless of faults and warnings. However, Only when "Internal com. error" and "Amp EEPROM Failure" occur, status become BAD-Device Failure.	Other	I/O Failure
3-02	EEPROM error	BAD-Device Failure	Other	:I/O Failure	BAD-Device Failure	Other	:I/O Failure		Other	:I/O Failure
3-01	Sens, mod. Not work	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure		Other	I/O Failure
2-17	Calibration Due	BAD-Nonspecific	Other	General Error	—	—	—		—	—
2-04	mA configuration error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error		Other	Configuration Error
2-03	Internal com. Error	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure		Other	I/O Failure
2-02	Chksum err.(CPU AS)	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure
2-01	EEPROM err.(CPU AS)	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure
6-02	HART Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure		Other	I/O Failure
1-20	Amp EEPROM Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure

Sensor Transducer Block (Warning)

Action of each parameters in warning mode related Sensor Transducer block.

These become effective when ERR_CONFIG_n (TB: 2075 to 2089) is set to Warning.

Field Diagnostic		pH			Temperature			ORP		
Bit	Display through DD	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR
5-32	pH too high	Uncertain-Sensor Conversion	—	—	—	—	—	—	—	—
5-31	pH too low	Uncertain-Sensor Conversion	—	—	—	—	—	—	—	—
5-30	Temperature too high	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	—	—	—
5-29	Temperature too low	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	—	—	—
5-28	Temp. comp. error(PH)	Uncertain Non-specific	—	—	—	—	—	—	—	—
5-24	ORP too high	—	—	—	—	—	—	Uncertain-Sensor Conversion	—	—
5-23	ORP too low	—	—	—	—	—	—	Uncertain-Sensor Conversion	—	—
5-22	rH too High	—	—	—	—	—	—	—	—	—
5-21	rH too low	—	—	—	—	—	—	—	—	—
5-20	Impedance 1 too high	Uncertain-Sensor Conversion	—	—	—	—	—	Uncertain-Sensor Conversion	—	—
5-19	Impedance 1 too low	Uncertain-Sensor Conversion	—	—	—	—	—	Uncertain-Sensor Conversion	—	—
5-18	Impedance 2 too high	Uncertain-Sensor Conversion	—	—	—	—	—	Uncertain-Sensor Conversion	—	—
5-17	Impedance 2 too low	Uncertain-Sensor Conversion	—	—	—	—	—	Uncertain-Sensor Conversion	—	—
5-15	SENCOM initializing	BAD-Nonspecific	—	—	—	—	—	BAD-Nonspecific	—	—
5-11	Temp. comp. matrix error	Uncertain-Non specific	—	—	—	—	—	—	—	—
4-19	Logbook (almost) full	—	—	—	—	—	—	—	—	—
4-18	Wash response time failure	—	—	—	—	—	—	—	—	—
4-17	Calibration Due	Uncertain-Non specific	—	—	—	—	—	Uncertain-Non specific	—	—
1-20	Amp EEPROM Failure	—	—	—	—	—	—	—	—	—

Field Diagnostic		rH			Ref. Impedance			Empty		
Bit	Display through DD	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR
5-32	pH too high	Uncertain-Sensor Conversion	—	—	—	—	—	When “Empty” is selected, status become ”BAD-Configuration Error” regardless of faults and warnings. However, Only when “Internal com. error” and “Amp EEPROM Failure” occur, status become BAD-Device Failure.	—	—
5-31	pH too low	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-30	Temperature too high	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-29	Temperature too low	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-28	Temp. comp. error(PH)	Uncertain Non-specific	—	—	—	—	—		—	—
5-24	ORP too high	—	—	—	—	—	—		—	—
5-23	ORP too low	—	—	—	—	—	—		—	—
5-22	rH too High	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-21	rH too low	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-20	Impedance 1 too high	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-19	Impedance 1 too low	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-18	Impedance 2 too high	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-17	Impedance 2 too low	Uncertain-Sensor Conversion	—	—	—	—	—		—	—
5-15	SENCOM initializing	BAD-Nonspecific	—	—	—	—	—		—	—
5-11	Temp. comp. matrix error	—	—	—	—	—	—		—	—
4-19	Logbook (almost) full	—	—	—	—	—	—		—	—
4-18	Wash response time failure	—	—	—	—	—	—		—	—
4-17	Calibration Due	Uncertain-Non specific	—	—	—	—	—		—	—
1-20	Amp EEPROM Failure	—	—	—	—	—	—		—	—

8.3 Status of each parameter in failure mode FLXA21-SC

Following tables summarize the value of FLXA21 parameters when LCD display indicates an Alarm or status has some problems.

Resource Block

Action of each parameters in failure mode related Resource block.

Field Diagnostic		BLOCK_ERR
Bit	Display through DD	
1-24	Simulation Switch ON	Simulate Active
1-23	RB in O/S Mode	Out-of-Service
1-20	Amp EEPROM Failure	Lost Static Data, Device Needs Maintenance Now

Analog Input Block

Action of each parameters in failure mode related Analog Input block.

Field Diagnostic		BLOCK_ERR	OUT.Status
Bit	Display through DD		
7-03	AI3 Not Scheduled	—	HOLD
7-02	AI2 Not Scheduled	—	HOLD
7-01	AI1 Not Scheduled	—	HOLD
8-24	AI3 Empty	—	BAD-Configuration Error (from STB status)
8-23	AI3 Hi Hi Alarm	—	Depends on alarm priority
8-22	AI3 Hi Alarm	—	Depends on alarm priority
8-21	AI3 Lo Alarm	—	Depends on alarm priority
8-20	AI3 Lo Lo Alarm	—	Depends on alarm priority
8-19	AI3 Simulate Active	Simulate active	Specified Status
8-18	AI3 in MAN Mode	—	Depends on setting condition of STATUS_OPT Limit Status: Constant
8-17	AI3 in O/S Mode	Out of service	BAD-Out of service
8-16	AI2 Empty	—	BAD-Configuration Error (from STB status)
8-15	AI2 Hi Hi Alarm	—	Depends on alarm priority
8-14	AI2 Hi Alarm	—	Depends on alarm priority
8-13	AI2 Lo Alarm	—	Depends on alarm priority
8-12	AI2 Lo Lo Alarm	—	Depends on alarm priority
8-11	AI2 Simulate Active	Simulate active	Specified Status
8-10	AI2 in MAN Mode	—	Depends on setting condition of STATUS_OPT Limit Status: Constant
8-09	AI2 in O/S Mode	Out of service	BAD-Out of service
8-08	AI1 Empty	—	BAD-Configuration Error (from STB status)
8-07	AI1 Hi Hi Alarm	—	Depends on alarm priority
8-06	AI1 Hi Alarm	—	Depends on alarm priority
8-05	AI1 Lo Alarm	—	Depends on alarm priority
8-04	AI1 Lo Lo Alarm	—	Depends on alarm priority
8-03	AI1 Simulate Active	Simulate active	Specified Status
8-02	AI1 in MAN Mode	—	Depends on setting condition of STATUS_OPT Limit Status: Constant
8-01	AI1 in O/S Mode	Out of service	BAD-Out of service

Sensor Transducer Block (Fault)

Action of each parameters in failure mode related Sensor Transducer block.

These become effective when ERR_CONFIG_n (TB: 2097 to 2106) is set to Fault.

Field Diagnostic		Conductivity-TC1			Conductivity-TC2			Temperature			Concentration-TC1			Concentration-TC2		
Bit	Display through DD	Warning	BLOCK_ERR	XD_ERROR	Warning	BLOCK_ERR	XD_ERROR	Warning	BLOCK_ERR	XD_ERROR	Warning	BLOCK_ERR	XD_ERROR	Warning	BLOCK_ERR	XD_ERROR
6-02	HART Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure
3-32	Conductivity too high	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	—	—	—	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure
3-31	Conductivity too low	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	—	—	—	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure
3-30	Temperature too high	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure
3-29	Temperature too low	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure
3-25	Measurement unstable	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure
3-24	Polarization detected.	BAD-Nonspecific	Other	I/O Failure	BAD-Nonspecific	Other	I/O Failure	BAD-Nonspecific	Other	I/O Failure	BAD-Nonspecific	Other	I/O Failure	BAD-Nonspecific	Other	I/O Failure
3-23	USP limit exceeded.	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error
3-22	USP margin exceeded	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error
3-21	Conc. Table error	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3-12	2nd comp. matrix error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	—	—	—	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error
3-11	1st comp. matrix error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	—	—	—	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error
3-06	Checksum error	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure
3-02	EEPROM error	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure
3-01	Sens, mod. not work	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure
2-17	Calibration Due	"BAD-Nonspecific (Uncertain-Non specific)"	Other	General Error	"BAD-Nonspecific (Uncertain-Non specific)"	Other	General Error	—	—	—	BAD-Nonspecific (Uncertain-Non specific)	Other	General Error	BAD-Nonspecific (Uncertain-Non specific)	Other	General Error
2-04	mA configuration error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error
2-03	Internal com. Error	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure

Field Diagnostic		Conductivity-TC1			Conductivity-TC2			Temperature			Concentration-TC1			Concentration-TC2		
Bit	Display through DD	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR
2-02	Chksum err.(CPU AS)	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure
2-01	EEPROM err.(CPU AS)	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure
1-20	AMP EEPROM Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure

Field Diagnostic		Resistivity-TC1			Resistivity-TC2			USP			Empty		
Bit	Display through DD	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR
6-02	HART Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	When "Empty" is selected, status become "BAD-Configuration Error" regardless of faults and warnings. However, Only when "Internal com. error" and "Amp EEPROM Failure" occur, status become BAD-Device Failure.	Other	I/O Failure
3-32	Conductivity too high	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure		—	—
3-31	Conductivity too low	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure		—	—
3-30	Temperature too high	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure		—	—
3-29	Temperature too low	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure		—	—
3-25	Measurement unstable	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure	BAD-Sensor Failure	Other	I/O Failure		—	—
3-24	Polarization detected.	BAD-Nonspecific	Other	I/O Failure	BAD-Nonspecific	Other	I/O Failure	BAD-Nonspecific	Other	I/O Failure		—	—
3-23	USP limit exceeded.	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error		—	—
3-22	USP margin exceeded	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error	BAD-Nonspecific	Other	General Error		—	—
3-21	Conc. Table error	BAD-Configuration Error	Other	Configuration Error	—	—	—	—	—	—		—	—
3-12	2nd comp. matrix error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	—	—	—		—	—
3-11	1st comp. matrix error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	—	—	—		—	—
3-06	Checksum error	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure
3-02	EEPROM error	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure		Other	I/O Failure
3-01	Sens, mod. not work	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure		Other	I/O Failure
2-17	Calibration Due	BAD-Nonspecific (Uncertain-Non specific)	Other	General Error	BAD-Nonspecific (Uncertain-Non specific)	Other	General Error	BAD-Nonspecific (Uncertain-Non specific)	Other	General Error		—	—
2-04	mA configuration error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error	BAD-Configuration Error	Other	Configuration Error		Other	Configuration Error
2-03	Internal com. Error	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure	BAD-Device Failure	Other	I/O Failure		Other	I/O Failure
2-02	Chksum err.(CPU AS)	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure

Field Diagnostic		Resistivity-TC1			Resistivity-TC2			USP			Empty		
Bit	Display through DD	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR
2-01	EEPROM err.(CPU AS)	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure
1-20	AMP EEPROM Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure	BAD-Device Failure	Other	Electronics Failure		Other	Electronics Failure

Sensor Transducer Block (Warning)

Action of each parameters in warning mode related Sensor Transducer block.

These become effective when ERR_CONFIG_n (TB: 2097 to 2106) is set to Warning.

Field Diagnostic		Conductivity-TC1			Conductivity-TC2			Temperature			Concentration-TC1			Concentration-TC2		
Bit	Display through DD	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR
5-32	Conductivity too high	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	—	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—
5-31	Conductivity too low	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	—	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—
5-30	Temperature too high	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—
5-29	Temperature too low	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—
5-28	1st temp. comp. error	Uncertain-Non specific	—	—	—	—	—	—	—	—	Uncertain-Non specific	—	—	—	—	—
5-27	2nd temp. comp. error	—	—	—	Uncertain-Non specific	—	—	—	—	—	—	—	—	Uncertain-Non specific	—	—
5-24	Polarization detected.	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—
5-23	USP limit exceeded.	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—
5-22	USP margin exceeded	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—
5-21	Conc. Table error	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5-12	2nd comp. matrix error	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	—	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—
5-11	1st comp. matrix error	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	—	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—
4-17	Calibration Due	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	—	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—

Field Diagnostic		Resistivity-TC1			Resistivity-TC2			USP			Empty		
Bit	Display through DD	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR	Warning	BLOCK_ ERR	XD_ ERROR
5-32	Conductivity too high	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	When "Empty" is selected, status become "BAD-Configuration Error" regardless of faults and warnings. However, Only when "Internal com. error" and "Amp EEPROM Failure" occur, status become BAD-Device Failure.	—	—
5-31	Conductivity too low	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—		—	—
5-30	Temperature too high	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—		—	—
5-29	Temperature too low	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—	Uncertain-Sensor Conversion	—	—		—	—
5-28	1st temp. comp. error	Uncertain-Non specific	—	—	—	—	—	—	—	—		—	—
5-27	2nd temp. comp. error	—	—	—	Uncertain-Non specific	—	—	—	—	—		—	—
5-24	Polarization detected.	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—		—	—
5-23	USP limit exceeded.	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—		—	—
5-22	USP margin exceeded	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—		—	—
5-21	Conc. Table error	Uncertain-Non specific	—	—	—	—	—	—	—	—		—	—
5-12	2nd comp. matrix error	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	—	—	—		—	—
5-11	1st comp. matrix error	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	—	—	—		—	—
4-17	Calibration Due	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—	Uncertain-Non specific	—	—		—	—

Appendix 1 Link Master Functions

Link Active Scheduler

A link active scheduler (LAS) is a deterministic, centralized bus scheduler that can control communications on an H1 fieldbus segment. There is only one LAS on an H1 fieldbus segment.

FLXA21 supports the following LAS functions.

- PN transmission: Identifies a fieldbus device newly connected to the same fieldbus segment. PN is short for Probe Node.
- PT transmission: Passes a token governing the right to transmit, to a fieldbus device on the same segment. PT is short for Pass Token.
- CD transmission: Carry out a scheduled transmission to a fieldbus device on the same segment. CD is short for Compel Data.
- Time synchronization: Periodically transmits the time data to all fieldbus devices on the segment and returns the time data in response to a request from a device.
- Live list equalization: Sends the live list data to link masters on the same segment.
- LAS transfer: Transfers the right to be the LAS on the segment to another link master.

Link Master

A link master (LM) is any device containing a link active scheduler. There must be at least one LM on a segment. When the LAS on a segment has failed, another LM on the same segment starts working as the LAS.

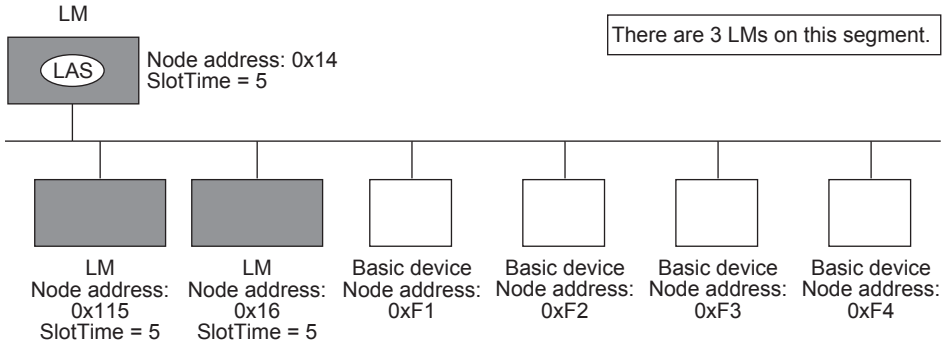


Figure 1 Example of Fieldbus configuration-3 LMs on Same Segment

Transfer of LAS

There are two procedures for an LM to become the LAS:

- If the LM whose value of [V(ST)×V(TN)] is the smallest on a segment, with the exception of the current LAS, judges that there is no LAS on the segment, in such a case as when the segment has started up or when the current LAS has failed, the LM declares itself as the LAS, then becomes the LAS. (With this procedure, an LM backs up the LAS as shown in the following figure.)
- The LM whose value of [V(ST)×V(TN)] is the smallest on a segment, with the exception of the current LAS, requests the LAS on the same segment to transfer the right of being the LAS, then becomes the LAS.

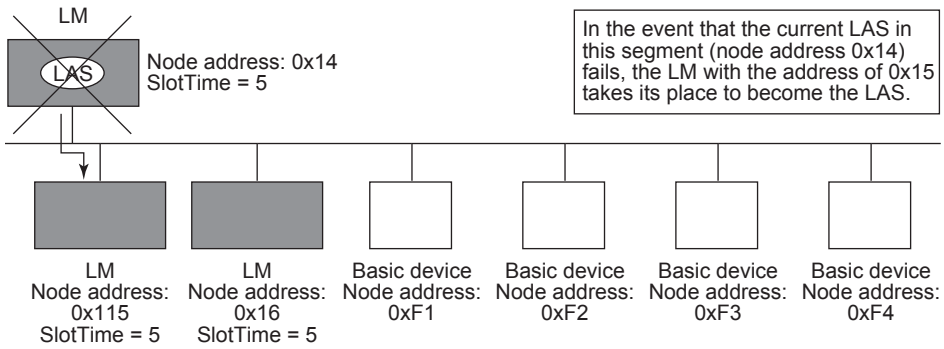


Figure 2 Backup of LAS

To set up the FLXA21 as a device that is capable of backing up the LAS, follow the procedure below.

NOTE

When changing the settings in the FLXA21, add the FLXA21 to the segment in which an LAS is running. After making changes to the settings, do not turn off the power to the FLXA21 for at least 30 seconds.

(1) Set the node address of the FLXA21. In general, use an address from 0x10 to [V(FUN) - 1].

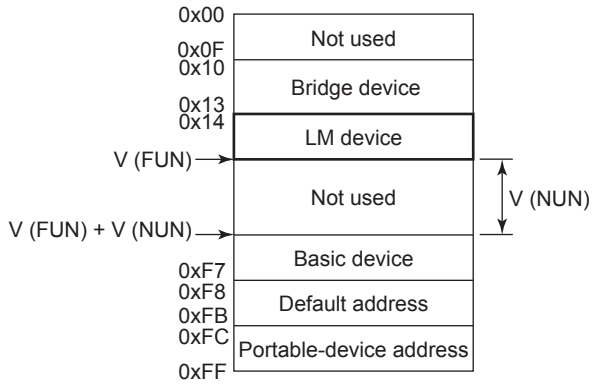


Figure 3 Node Address Ranges

(2) In the LAS settings of the FLXA21, set the values of V(ST), V(MRD), and V(MID) to the same as the respective lowest capability values in all the devices within the segment. An example is shown below.

DlmeBasicInfo (Index 374 (SM))

Subindex	Element	FLXA21	Device 1	Device 2	Device 3	Description
1	SlotTime	4	8	10	20	Capability value for V(ST)
3	MaxResponse Delay	3	6	3	5	Capability value for V(MRD)
6	MinInterPdu Delay	4	8	12	10	Capability value for V(MID)

In this case, set SlotTime, MaxResponseTime, and MinInterPduDelay as follows:

ConfiguredLinkSettingsRecord (Index 385 (SM))

Subindex	Element	Setting (Default)	Description
1	SlotTime	20 (4095)	V (ST)
3	MaxResponse Delay	6 (5)	V (MRD)
6	MinInterPdu Delay	12 (12)	V (MID)

(3) In the LAS settings of the FLXA21, set the values of V(FUN) and V(NUN) so that they include the node addresses of all nodes within the same segment. (See also Figure 3.)

ConfiguredLinkSettingsRecord (Index 385 (SM))

Subindex	Element	Setting (Default)	Description
4	FirstUnpolledNodeId	0x25	V (FUN)
7	NumConsecUnpolledNodeId	0xBA	V (NUN)

■ LM Functions

No.	Function	Description
1	LM initialization	When a fieldbus segment starts, the LM with the smallest [V(ST) × V(TN)] value within the segment becomes the LAS. At all times, each LM is checking whether or not a carrier is on the segment.
2	Startup of other nodes (PN and Node Activation SPDU transmissions)	Transmits a PN (Probe Node) message, and Node Activation SPDU message to devices which return a new PR (Probe Response) message.
3	PT transmission (including final bit monitoring)	Passes a PT (Pass Token) message to devices included in the live list sequentially, and monitors the RT (Return Token) and final bit returned in reply to the PT.
4	CD transmission	Transmits a CD (Compel Data) message at the scheduled times.
5	Time synchronization	Supports periodic TD (Time Distribution) transmissions and transmissions of a reply to a CT (Compel Time).
6	Domain download server	Sets the schedule data. The schedule data can be equalized only when the Domain Download command is carried out from outside the LM in question. (The version of the schedule is usually monitored, but no action takes place, even when it changes.)
7	Live list equalization	Transmits SPDU messages to LMs to equalize live lists.
8	LAS transfer	Transfers the right of being the LAS to another LM.
9	Reading/writing of NMIB for LM	See Section “■ LM Parameter”.
10	Round Trip Delay Reply (RR) Reply to DLPDU	Not yet supported in the current version.
11	Long address	Not yet supported in the current version.

LM Parameters

LM Parameter List

The tables below show LM parameters.

Meanings of Access column entries: RW = read/write possible; R = read only

Index (SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Factory Setting	Access	Remarks
375	PLME_BASIC_ CHARACTERISTICS	0		R	
		1 ChannelStatisticsSupported	0x00		
		2 MediumAndDataRatesSupported	0x 4900000000000000		
		3 IecVersion 1 (0x1)	1 (0x1)		
		4 NumOfChannels	1 (0x1)		
		5 PowerMode	0 (0x0)		
376	CHANNEL_ STATES	0		R	
		1 channel-1	0 (0x0)		
		2 channel-2	128 (0x80)		
		3 channel-3	128 (0x80)		
		4 channel-4	128 (0x80)		
		5 channel-5	128 (0x80)		
		6 channel-6	128 (0x80)		
		7 channel-7	128 (0x80)		
		8 channel-8	128 (0x80)		
377	PLME_BASIC_ INFO	0		R	
		1 InterfaceMode	0 (0x0)		
		2 LoopBackMode	0 (0x0)		
		3 XmitEnabled	1 (0x1)		
		4 RcvEnabled	1 (0x1)		
		5 PreferredReceiveChannel	1 (0x1)		
		6 MediaTypeSelected	73 (0x49)		
		7 ReceiveSelect	1 (0x1)		
378	DLME_LINK_MASTER_CAPABILITIES_VARIABLE		0x04	RW	
379	DLME_LINK_ MASTER_INFO_ RECORD	0		RW	
		1 MaxSchedulingOverhead 0	0		
		2 DefMinTokenDelegTime 100	100		
		3 DefTokenHoldTime 300	300		
		4 TargetTokenRotTime 4096	4096		
		5 LinkMaintTokHoldTime 400	400		
		6 TimeDistributionPeriod 5000	5000		
		7 MaximumInactivityToClaimLasDelay	2		
		8 LasDatabaseStatusSpduDistributionPeriod	6000		
380	PRIMARY_LINK_MASTER_FLAG_VARIABLE		0	RW	LAS: True = 0xFF; non-LAS: False = 0x00
381	LIVE_LIST_STATUS_ARRAY_VARIABLE		0	R	
382	MAX_TOKEN_ HOLD_TIME_ ARRAY	0		RW	
		1 Element1	0x0000(x16), 0x012C(x16)		
		2 Element2	0x012C(x5), 0x0000(x27)		
		3 Element3	0x0000(x32)		
		4 Element4	0x0000(x32)		
		5 Element5	0x0000(x32)		
		6 Element6	0x0000(x32)		
		7 Element7	0x0000(x31), 0x012C(x1)		
		8 Element8	0x0000(x32)		
383	BOOT_OPERAT_FUNCTIONAL_CLASS		Specified at the time of order	RW	0x01 (basic device); 0x02 (LM)

Index (SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Factory Setting	Access	Remarks
384	CURRENT_ LINK_SETTING_ RECORD	0		R	Settings for LAS
		1 SlotTime	0		
		2 PerDlpduPhlOverhead	0		
		3 MaxResponseDelay	0		
		4 FirstUnpolledNodeId	0		
		5 ThisLink	0		
		6 MinInterPduDelay	0		
		7 NumConseeUnpolledNodeId	0		
		8 PreambleExtension	0		
		9 PostTransGapExtension	0		
		10 MaxInterChanSignalSkew	0		
		11 TimeSyncClass	0		
385	CONFIGURED_ LINK_SETTING_ RECORD	0		RW	
		1 SlotTime	4095		
		2 PerDlpduPhlOverhead	4		
		3 MaxResponseDelay	5		
		4 FirstUnpolledNodeId	37		
		5 ThisLink	0		
		6 MinInterPduDelay	12		
		7 NumConseeUnpolledNodeId	186		
		8 PreambleExtension	2		
		9 PostTransGapExtension	1		
		10 MaxInterChanSignalSkew	0		
		11 TimeSyncClass	4		
386	LINK_SCHEDULE_ACTIVATION_VARIABLE		0 (0x0)	RW	
387	LINK_ SCHEDULE_LIST_ CHARACTERISTICS_ RECORD	0		R	
		1 NumOfSchedules	2		
		2 NumOfSubSchedulesPerSchedule	5		
		3 ActiveScheduleVersion	0		
		4 ActiveSheduleOdIndex	0		
		5 ActiveScheduleStartingTime	0		
388	DLME_ SCHEDULE_ DESCRIPTOR.1	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
389	DLME_ SCHEDULE_ DESCRIPTOR.2	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
390	DOMAIN.1				Read/write impossible. Get-OD possible.
391	DOMAIN.2				Read/write impossible. Get-OD possible.

● Descriptions for LM Parameters

The following describes LM parameters of the FLXA21.

NOTE

Do not turn off the power to the FLXA21 for 60 seconds after making a change to its parameter settings.

(1)DlmeLinkMasterCapabilitiesVariable

Bit Position	Meaning	Description	Value
B3: 0x04	LAS Schedule in Non-volatile Memory	Whether the LAS schedule can (= 1) or cannot (= 0) be saved to the non-volatile memory	1
B2: 0x02	Last Values Record Supported	Whether to support (= 1) or not to support (= 0) LastValuesRecord.	0
B1: 0x01	Link Master Statistics Record Supported	Whether to support (= 1) or not to support (= 0) DlmeLinkMasterStatisticsRecord.	0

(2)DlmeLinkMasterInfoRecord

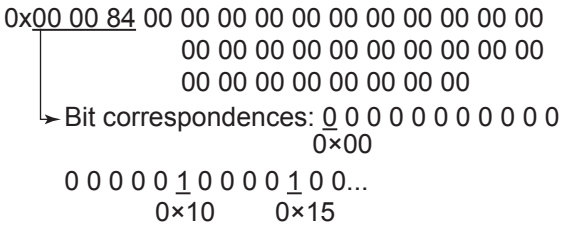
Subindex	Element	Size [bytes]	Description
1	MaxSchedulingOverhead	1	V(MSO)
2	DefMinTokenDelegTime	2	V(DMDT)
3	DefTokenHoldTime	2	V(DTHT)
4	TargetTokenRotTime	2	V(TTRT)
5	LinkMaintTokHoldTime	2	V(LTHT)
6	TimeDistributionPeriod	4	V(TDP)
7	MaximumInactivityToClaimLasDelay	2	V(MICD)
8	LasDatabaseStatusSpduDistributionPeriod	2	V(LDDP)

(3)PrimaryLinkMasterFlagVariable

Explicitly declares the LAS. Writing “true” (0xFF) to this parameter in a device causes that device to attempt to become the LAS. However, a request of writing “true” to this parameter in a device is rejected if the value of the same parameter in any other device that has a smaller node address within the same segment is true.

(4)LiveListStatusArrayVariable

A 32-byte variable, in which each bit represents the status of whether a device on the same segment is live or not. The leading bit corresponds to the device address 0x00, and final bit to 0xFF. The value of LiveListStatusArrayVariable in the case where devices having the addresses 0x10 and 0x15 in the fieldbus segment is shown below.



(5)MaxTokenHoldTimeArray

An 8 (64 byte array variable, in which each set of 2 bytes represents the delegation time (set as an octet time) assigned to a device. The delegation time denotes a time period that is given to a device by means of a PT message sent from the LAS within each token circulation cycle.

The leading 2 bytes correspond to the device address 0x00, and the final 2 bytes to the device address 0xFF. Specify the subindex to access this parameter.

(6)BootOperatFunctionalClass

Writing 1 to this parameter in a device and restarting the device causes the device to start as a basic device. On the contrary, writing 2 to this parameter and restarting the device causes the device to start as an LM.

(7)CurrentLinkSettingRecord and ConfiguredLinkSettingsRecord

CurrentLinkSettingRecord indicates the bus parameter settings currently used. ConfiguredLinkSettingsRecord indicates the bus parameter settings to be used when the device becomes the LAS. Thus, when a device is the LAS, its CurrentLinkSettingRecord and ConfiguredLinkSettingsRecord have the same values.

Subindex	Element	Size [bytes]	Description
1	SlotTime	2	V(ST)
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	V(MRD)
4	FirstUnpolledNodeId	1	V(FUN)
5	ThisLink	2	V(TL)
6	MinInterPduDelay	1	V(MID)
7	NumConsecUnpolledNodeId	1	V(NUN)
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)
11	TimeSyncClass	1	V(TSC)

(8)DlmeBasicInfo

Subindex	Element	Size [bytes]	Description
1	SlotTime	2	Indicates the capability value for V(ST) of the device.
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	Indicates the capability value for V(MRD) of the device.
4	ThisNode	1	V(TN), node address
5	ThisLink	2	V(TL), link-id
6	MinInterPduDelay	1	Indicates the capability value for V(MID) of the device.
7	TimeSyncClass	1	Indicates the capability value for V(TSC) of the device.
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)

(9)PlmeBasicCharacteristics

Subindex	Element	Size [bytes]	Value	Description
1	Channel Statistics Supported	1	0	Statistics data are not supported.
2	Medium AndData Rates Supported	8	0x49 00 00 00 00 00 00 00	Wire medium, voltage mode, and 31.25 kbps are supported.
3	IceVersion	2	1	IEC Physical Layer Entity Version
4	NumOf Channels	1	1	
5	Power Mode	1	0	0: Bus-powered; 1: Self-powered

(10) ChannelStates

Subindex	Element	Size [bytes]	Value	Description
1	Channel 1	1	0x00	In Use, No Bad since last read, No Silent since last read, No Jabber since last read, Tx Good, Rx Good
2	Channel 2	1	0x80	Unused
3	Channel 3	1	0x80	Unused
4	Channel 4	1	0x80	Unused
5	Channel 5	1	0x80	Unused
6	Channel 6	1	0x80	Unused
7	Channel 7	1	0x80	Unused
8	Channel 8	1	0x80	Unused

(11) PlmeBasicInfo

Subindex	Element	Size [bytes]	Value	Description
1	InterfaceMode	1	0	0: Half duplex; 1: Full duplex
2	LoopBackMode	1	0	0: Disabled; 1: MAU; 2: MDS
3	XmitEnabled	1	0x01	Channel 1 is enabled.
4	RcvEnebled	1	0x01	Channel 1 is enabled.
5	PreferredReceive Channel	1	0x01	Channel 1 is used for reception.
6	MediaType Selected	1	0x49	Wire medium, voltage mode, and 31.25 kbps are selected.
7	ReceiveSelect	1	0x01	Channel 1 is used for reception.

(12) LinkScheduleActivationVariable

Writing the version number of an LAS schedule, which has already been downloaded to the domain, to this parameter causes the corresponding schedule to be executed. On the other hand, writing 0 to this parameter stops execution of the active schedule.

(13) LinkScheduleListCharacteristicsRecord

Subindex	Element	Size [bytes]	Description
1	NumOf Schedules	1	Indicates the total number of LAS schedules that have been downloaded to the domain.
2	NumOfSub SchedulesPer Schedule	1	Indicates the maximum number of sub-schedules an LAS schedule can contain. (This is fixed to 1 in the Yokogawa communication stacks.)
3	ActiveSchedule Version	2	Indicates the version number of the schedule currently executed.
4	ActiveSchedule OdIndex	2	Indicates the index number of the domain that stores the schedule currently executed.
5	ActiveSchedule StaringTime	6	Indicates the time when the current schedule began being executed.

(14) DlmeScheduleDescriptor

This parameter exists for the same number as the total number of domains, and each describes the LAS schedule downloaded to the corresponding domain. For the domain to which a schedule has not yet been downloaded, the values in this parameter are all zeros.

Subindex	Element	Size [bytes]	Description
1	Version	2	Indicates the version number of the LAS schedule downloaded to the corresponding domain.
2	Macrocycle Duration	4	Indicates the macro cycle of the LAS schedule downloaded to the corresponding domain.
3	TimeResolution	2	Indicates the time resolution that is required to execute the LAS schedule downloaded to the corresponding domain.

(15) Domain

Read/write: impossible; get-OD: possible

Carrying out the GenericDomainDownload command from a host writes an LAS schedule to Domain.

CAUTION

When downloading a LAS schedule to the FLXA21, maximum allowable linkages between devices are 25.

■ FAQs

Q1. When the LAS stops, the FLXA21 does not back it up by becoming the LAS. Why?

A1-1. Is that FLXA21 running as an LM? Check that the value of BootOperatFunctionalClass (index 383) is 2 (indicating that it is an LM).

A1-2. Check the values of V(ST) and V(TN) in all LMs on the segment and confirm that the following condition is met:

FLXA21		Other LMs
V(ST)×V(TN)	<	V(ST)×V(TN)

Q2. How can I make the FLXA21 become the LAS?

A2-1. Check that the version numbers of the active schedules in the current LAS and the FLXA21 are the same by reading:

LinkScheduleListCharacteristicsRecord (index 387 for the FLXA21)

- ActiveScheduleVersion (subindex 3)

A2-2. Make the FLXA21 declare itself as and become the LAS by writing:

- 0x00 (false) to PrimaryLinkMasterFlagVariable in the current LAS; and
- 0xFF (true) to PrimaryLinkMasterFlagVariable (index 380) in the FLXA21.

Q3. On a segment where the FLXA21 works as the LAS, another device cannot be connected. How come?

A3-1. Check the following bus parameters that indicate the bus parameter as being the LAS for the FLXA21 and the capabilities of being the LAS for the device that cannot be connected:

- V(ST), V(MID), V(MRD) of the FLXA21: ConfiguredLinkSettingsRecord (index 385)
- V(ST), V(MID), V(MRD) of problematic device: DlmeBasicInfo

Then, confirm that the following conditions are met:

FLXA21		Problematic Device
V(ST)	>	V(ST)
V(MID)	>	V(MID)
V(MRD)	>	V(MRD)

A3-2. Check the node address of the problematic device is not included in the V(FUN)+V(NUN) of the FLXA21.

Q4. "AL.20" is kept shown on LCD.

The LAS does not exist or is not identified in the fieldbus network, or the FLXA21 is not able to establish communication with the LAS.

A4-1. Check that the LAS is connected on the network. When using the FLXA21 as the LAS, follow the steps described in "■ Transfer of LAS."

A4-2. Adjust the parameters of the LAS to that of the FLXA21. Refer to "5.2 Sensor Transducer Block" for details.

LAS		FLXA21
V(ST)	>	V(ST) 4 or above
V(MID)	>	V(MID) 4 or above
V(MRD)	>	V(MRD) 12 or above

A4-3. Check that the correct Node Address is used for the FLXA21. Refer to “5.2 Sensor Transducer Block” for details.

Confirm that the Node Address of FLXA21 should be out of the parameters of the LAS of V (FUN) ~ V (FUN)+V (NUN)

Confirm that the Node Address is not within the default address (0xF8 to 0xFB).

Appendix 2 Software Download

Benefits of Software Download

This function enables you to download software to field devices via a FOUNDATION Fieldbus to update their software. Typical uses are to add new features such as function blocks and diagnostics to existing devices, and to optimize existing field devices for your plant.

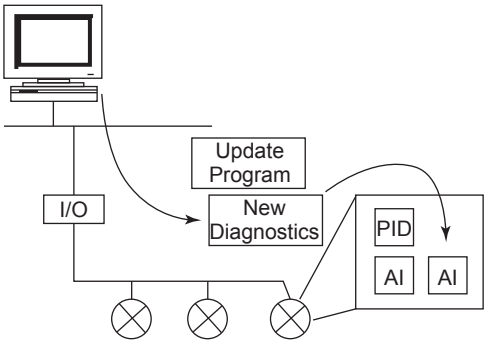


Figure 1 Concept of Software Downloading

Specifications

Current Draw (Steady-state): 24 mA (max)

Current Draw (Software Download state): 24mA (max)

Current during FlashROM blanking time: About 15 minutes

Based on Fieldbus Foundation Specification Download class: Class 1

NOTE

Class 1 devices can continue the specified measurement and/or control actions even while software is being downloaded to them. Upon completion of a download, however, the devices will be reset internally to make the new, downloaded software take effect, and this will halt fieldbus communication and function block executions for about one minute.

Preparations for Software Downloading

For software downloading, you need to prepare the following:

- Software download tool
- Software for downloading file for each of the target field devices

For the software download tool, use only a program developed for that purpose. For details, see the software's User's Manual. For information about updates of software binary files for field devices and how to obtain them, visit the following web site.

http://www.yokogawa.com/fld/fld-top-en.htm

CAUTION

Do not hook up the software download tool to a fieldbus segment while the plant is in operation, as it may temporarily disturb the communication. Always connect the tool before starting operation.

NOTE

The download tool can not execute downloading during other system connects to the system/ network management VFD of the device.

■ Software Download Sequence

The flowchart below outlines the software download procedure. Although the time taken for the entire procedure varies depending on the size of the field bus device's software, it generally take about 20 minutes where there is a one-to-one connection between a fieldbus device and download tool, and longer when multiple field devices are connected to the fieldbus.

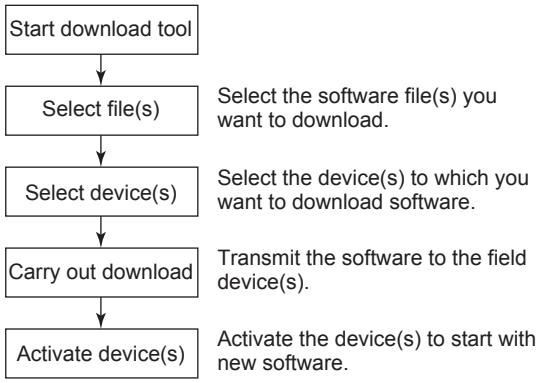


Figure 2 Flow of Software Download Procedure

CAUTION

Carrying out a software download leaves the PD tag, node address, and Sensor transducer block calibration parameters that are retained in the nonvolatile memory inside the target device, but may reset other parameters to the defaults (except a minor update that does not change the number of parameters). Hence, where necessary, save the parameters using an engineering tool, parameter setting utility, or the like before carrying out a software download, and then reconfigure the field device(s) after the download. For details, see ■ Steps after Activating a Field Device.

CAUTION

The current dissipation of the target field device increases transitorily immediately after a download due to erasing of the FlashROM's contents. Use a fieldbus power supply which has sufficient capacity to cover such increases in feed current.

CAUTION

Upon completion of the activation, the target fieldbus device performs resetting internally, which temporarily halts fieldbus communication and function block executions. Be especially careful about a valve positioner; the output air pressure will fall to the minimum level (i.e., zero).

CAUTION

Do not turn off the power to a field device or disconnect the download tool during a download or activation. The device may fail as a result.

NOTE

Be careful about the noise on the fieldbus link. If the fieldbus is noisy, the downloading may take a very long time or fail.

Download Files

Download files have the following filenames (with the filename extension of ".ffd"). Take care to choose the correct download file for the target field device:

"594543" + device family + "_" + device type + "_" + domain name + "_" + software name + "_" + software revision + ".ffd"

For example, the name of the download file for FLXA21-PH may have the following name:

5945430402_0402_FLXA21PH_ORIGINAL_R101.ffd

Refer to (3) DOMAIN_HEADER in page App.2-8 about each keyword of the file name.

The device type is "0402" for FLXA21-PH, and is "0403" for FLXA21-SC.

The software name is "ORIGINAL" or "UPDATE." The former indicates an original file and the latter an update file. Whenever performing a download to update the device revision, obtain the original file. In general, an addition to the parameters or blocks requires a device revision update.

Steps after Activating a Field Device

When the communication with a field device has recovered after activating the device, check using the download tool that the software revision of the field device has been updated accordingly. The value of SOFT_REV of the resource block indicates the software revision.

The PD tag, node address, and Sensor transducer block calibration parameters that are retained in the nonvolatile memory inside the target device will remain unchanged after a software download. However, after a software update which causes an addition to the block parameters or blocks, or to the system/network management VFD parameters, some parameters may be reset to the defaults, thus requiring parameter setup and engineering again. For details, see the table below.

Also note that a change in the number of parameters or blocks requires the DD and capabilities files corresponding to the new software revision.

Table 1 Actions after Software Update

Contents of Software Update	Action
Does not change the number of parameters.	Re-setup of parameters not needed.
Adds a block parameter.	Setup of the added parameter needed.
Adds a block.	Reengineering and setup of the added block's parameters needed.
Changes the number of system/network management VFD parameters.	Reengineering needed.

Troubleshooting

For information on the download tool's error messages, see also the software's User's Manual.

Table 2 Problems after Software Update

Symptom	Cause	Remedy
An error occurs before starting a download, disabling the download.	The selected download file is not for the selected field device.	Check SOFTDWN_ERROR in the resource block and obtain the correct file.
An error occurs after starting a download, disabling the download.	You attempted to update the device revision by downloading a file which is not an original file.	Check SOFTDWN_ERROR in the resource block and obtain the original file.
	The selected field device does not support software downloading.	Check whether the option code /EE is included in the model and suffix codes of the device.
	The voltage on the fieldbus segment falls below the specified limit (9 volts).	Check the capacity of the field bus power supply used and the voltage at the terminal.
	There was an error in a checksum or the number of transmission bytes.	Check SOFTDWN_ERROR in the resource block and obtain the correct file.
	The download tool does not allow download with same software revision.	Check the setting of the download tool.
The download takes far longer than expected or fails frequently.	The fieldbus segment is noisy.	Check the noise level on the fieldbus segment.
An error occurs after activation.	Transient error caused by the internal resetting of the field device.	Check whether communication with the field device has recovered after a while.
The new software does not work after the activation.	The file of the current revision was downloaded.	Obtain the correct file.
	Failure of the memory in field device, etc.	Check SOFTDWN_ERROR in the resource block, and re-try downloading. If fails, place a service call.

Resource Block's Parameters Relating to Software Download

Table 3 Additional Parameters of Resource Block

Relative Index	Index	Parameter Name	Default (Factory Set)	Write Mode	Description
53	1053	SOFTDWN_ PROTECT	0x01		Defines whether to accept software downloads. 0x01: Unprotected 0x02: Protected
54	1054	SOFTDWN_ FORMATSOFTDWN_ FORMAT	0x01		Selects the software download method. 0x01: Standard
55	1055	SOFTDWN_COUNT	0	—	Indicates the number of times the internal FlashROM was erased.
56	1056	SOFTDWN_ACT_ AREA	0	—	Indicates the ROM number of the currently working FlashROM. 0: FlashROM #0 working 1: FlashROM #1 working
57	1057	SOFTDWN_MOD_ REV	1, 0, 0, 0, 0, 0, 0, 0	—	Indicates the software module revision.
58	1058	SOFTDWN_ERROR	0	—	Indicates an error during a software download. See Table 4.

Table 4 Download Error Codes

Error Code	Detail
0	No error
32768	Unsupported header version
32769	Abnormal header size
32770	Abnormal manufacturer ID
32771	Abnormal device family
32772	Abnormal device revision
32773	Abnormal vendor specification version
32774	Abnormal number of modules
32775	Abnormal number of bytes in module 1
32776	Abnormal number of bytes in module 2
32777	Device error in module 1
32778	Checksum error in module 1
32779	Checksum error in file
32780	Unused
32781	Write-prohibited area in FlashROM
32782	Verification error during FlashROM writing
32783	Polling error during FlashROM erasing
32784	Polling time-out during FlashROM erasing
32785	Polling error during FlashROM writing
32786	Polling time-out during FlashROM writing
32787	FlashROM driver undefined number error
32788	File endcode error
32789	File type error (UPDATE, ORIGINAL)
32790	FlashROM driver undefined number error
32791	On-start state error (other than DWNLD_NOT_READY)
32792	Start segment error in module 1
32793	Binary file error
32794	Binary file error
32795	Device error in module 2
32796	Detection of EEPROM state other than backupafter activation
32797	Checksum error in module 2
32798	Not in DWNLD_READY state when receiving GenericDomainInitiate
32799	Not in DWNLD_OK state when receiving GenericDomainTerminate
32800	Not in DOWNLOADING state when receiving GenericDomainSegment
32801	Firmware error
36863	Unused

System/Network Management VFD Parameters Relating to Software Download

Table 5 System/Network Management VFD Parameters

Write Mode: R/W = read/write; R = read only

Index (SM)	Parameter Name	Sub Index	Sub-parameter Name	Default (Factory Set)	Write Mode	Remarks
400	DWNLD_PROPERTY	0			R	
		1	Download Class	1		
		2	Write Rsp Returned For ACTIVATE	1		
		3	Write Rsp Returned For PREPARE	1		
		4	Reserved	0		
		5	ReadyForDwnld Delay Secs	300		
		6	Activation Delay Secs	60		
410	DOMAIN_ DESCRIPTOR	0			R/W	Read/write-permitted only for sub-index 1
		1	Command	3		
		2	State	1		
		3	Error Code	0		
		4	Download Domain Index	440		
		5	Download Domain Header Index	420		
		6	Activated Domain Header Index	430		
		7	Domain Name	(Device name)		
420	DOWNLOAD_ DOMAIN_HEADER.1	0			R	
		1	Header Version Number	0		
		2	Header Size	0		
		3	Manufacturer ID			
		4	Device Family			
		5	Device Type			
		6	Device Revision	0		
		7	DD Revision	0		
		8	Software Revision			
		9	Software Name			
		10	Domain Name			
430	DOWNLOAD_ DOMAIN_HEADER.2	0			R	
		1	Header Version Number	1		
		2	Header Size	44		
		3	Manufacturer ID	0x594543		
		4	Device Family	(DEV_TYPE of RB)		
		5	Device Type	(DEV_TYPE of RB)		
		6	Device Revision	(DEV_REV of RB)		
		7	DD Revision	(DD_REV of RB)		
		8	Software Revision	(SOFT_REV of RB)		
		9	Software Name	ORIGINAL		
		10	Domain Name	(Device name)		
440	DOMAIN					Read/write: prohibited Get-OD: permitted

Comments on System/Network Management VFD Parameters Relating to Software Download

IMPORTANT

Do not turn off the power to a field device immediately after changing parameter settings. Data writing actions to the EEPROM are dual redundant to ensure reliability. If the power is turned off within 60 seconds after setup, the parameters may revert to the previous settings.

(1)DWNLD_PROPERTY

Sub Index	Element	Size (Bytes)	Description
1	Download Class	1	Indicates the download class. 1: Class 1
2	Write Rsp Returned For ACTIVATE	1	Indicates whether a write response is returned to the ACTIVATE command. 1: Write Response Returned
3	Write Rsp Returned For PREPARE	1	Indicates whether a write response is returned to the PREPARE command. 1: Write Response Returned
4	Reserved	1	(Reserved)
5	ReadyForDwnld Delay Secs	2	Indicates the maximum delay after receipt of the PREPARE_FOR_DWNLD command to proceed to transition from DWNLD_NOT_READY to DWNLD_READY.
6	Activation Delay Secs	2	Indicates the maximum delay after receipt of the ACTIVATE command to proceed to transition from DWNLD_OK to DWNLD_NOT_READY.

(2)DOMAIN_DESCRIPTOR

Sub Index	Element	Size (Bytes)	Description
1	Command	1	Reads/writes software download commands. 1: PREPARE_FOR_DWNLD (instruction of download preparation) 2: ACTIVATE (activation instruction) 3: CANCEL_DWNLD (instruction of download cancellation)
2	State	1	Indicates the current download status. 1: DWNLD_NOT_READY (download not ready) 2: DWNLD_PREPARING (download under preparation) 3: DWNLD_READY (ready for download) 4: DWNLD_OK (download complete) 5: DOWNLOADING (download underway) 6: CHECKSUM_FAIL (not used in this product) 7: FMS_DOWNLOAD_FAIL (failure during download) 8: DWNLD_INCOMPLETE (download error detected at restart) 9: VCR_FAIL (not used in this product) 10: OTHER (download error other than 6 and 7 detected)
3	Error Code	2	Indicates the error during a download and activation. 0: success, configuration retained (download successfully completed) 32768 - 65535: Download error (See Table 4 for error codes.)
4	Download Domain Index	4	Indicates the index number of the domain for software downloading.
5	Download Domain Header Index	4	Indicates the index number of the domain header to which the download is performing.
6	Activated Domain Header Index	4	Indicates the index numbers of the domain header currently running.
7	Domain Name	8	Indicates the domain name. With this product, Domain Name indicates the field device name.

(3)DOMAIN_HEADER

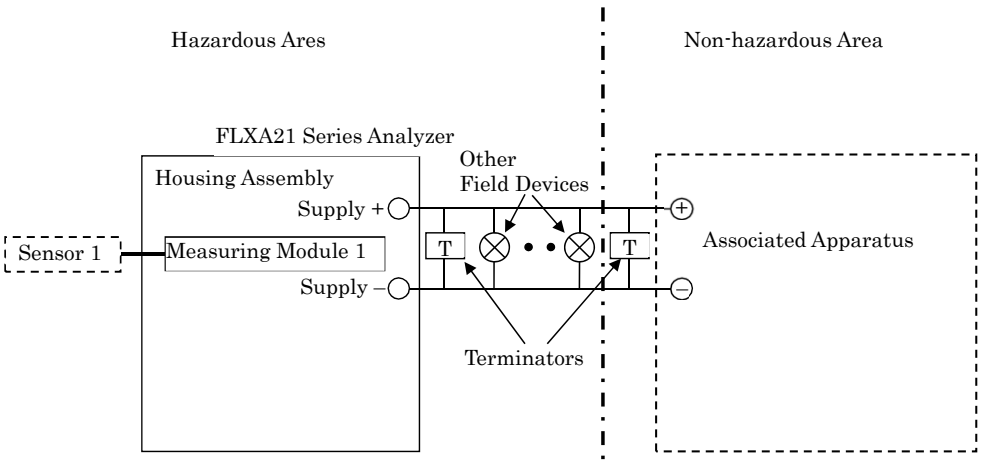
Sub Index	Element	Size (Bytes)	Description
1	Header Version Number	2	Indicates the version number of the header.
2	Header Size	2	Indicates the header size.
3	Manufacturer ID	6	Indicates the value of resource block's MANUFAC_ID (manufacturer ID) as character string data.
4	Device Family	4	Indicates the device family. With this product, Device Family indicates the value of resource block's DEV_TYPE as character string data.
5	Device Type	4	Indicates the value of resource block's DEV_TYPE as character string data.
6	Device Revision	1	Indicates the value of resource block's DEV_REV.
7	DD Revision	1	Indicates the value of resource block's DD_REV.
8	Software Revision	8	Indicates the value of resource block's SOFT_REV.
9	Software Name	8	Indicates the attribute of the binary file. With this product, Software Name indicates either of the following: "ORIGINAL" followed by one space: Original file "UPDATE" followed by two spaces: Update file
10	Domain Name	8	Indicates the domain name. With this product, Domain Name indicates the field device name.

Appendix 3 Control Drawings

App. 3.1 ATEX and IECEx
FLXA21: Intrinsic safety “ia”

Model: FLXA21 /FLXA202 Date: July 25, 2016

11.2 Control Drawing (FOUNDATION Fieldbus / PROFIBUS PA Type)



Supply +, Supply –
FISCO field device, or the following parameters
Ui: 24 V
Ii: 250 mA
Pi: 1.2 W
Ci: 2.72 nF
Li: 0 mH

Measuring Module 1

	Type of Measuring Module		
	pH, SC, DO	ISC	SENCOM
Uo	11.76 V	11.76 V	5.36 V
Io	116.5 mA	60.6 mA	106.16 mA
Po	0.3424 W	0.178 W	0.1423 W
Co	100 nF	100 nF	31 µF
Lo	1.7 mH	8 mH	0.45 mH

Doc. No.: IKE039-A12 P.1-2

Yokogawa Electric Corporation

Model: FLXA21 /FLXA202 Date: July 25, 2016

Specific Conditions of Use

- When operating FLXA21 through the display window or touching the non-metallic part of the enclosure of FLXA21, take following measures to minimize the risk of explosion from electrostatic discharge.
  Also, avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth.

  To avoid electrostatic charge on the operator,
  - Earth the operator through a wrist-strap, or
  - Operate FLXA21 on the conductive floors, wearing anti-static work clothes and electrostatic safety shoes, or
  - Neutralize the operator and FLXA21 by a static elimination bar which has a metal part earthed through resistor from 100kΩ to 100MΩ.

  In case that those measures cannot be taken or static electricity cannot be suppressed, bring a gas detector and make sure there is no ignition capable atmosphere around FLXA21 before the operation.

Notes:

1. The associated apparatus must be a linear source or a FISCO power supply.
2. Sensor 1 may be simple apparatus or intrinsically safe apparatus.
3. WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD – SEE USER'S MANUAL

Doc. No.: IKE039-A12 P.1-3

Yokogawa Electric Corporation

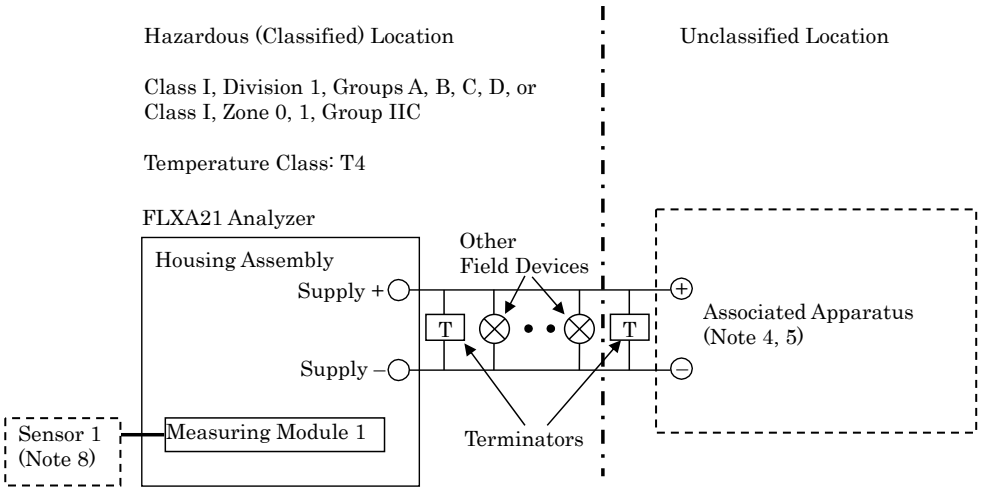
App. 3.2 FM
FLXA21: Intrinsic safety, Nonincendive

Model: FLEXA Series Date: April 17, 2015

Control drawing (FOUNDATION Fieldbus / PROFIBUS PA type)

Installation for Division 1 / Zone 0, 1

Applicable models: FLXA21-D-x-x-CD-xx-xx-F-..., FLXA21-D-x-x-CD-xx-xx-P-...



Supply +, Supply – (Note 5):
FISCO field device
or
Ui: 24 V
Ii: 250 mA
Pi: 1.2 W
Ci: 2.72nF
Li: 0 mH

Measuring Module 1 (Note 8):

	Type of Measuring Module		
	pH, SC, DO	ISC	SENCOM
Uo	11.76 V	11.76 V	5.36 V
Io	116.5 mA	60.6 mA	106.16 mA
Po	0.3424 W	0.178 W	0.1423 W
Co	100 nF	100 nF	31 µF
Lo	1.7 mH	8 mH	0.45 mH

Specific condition of use
- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.

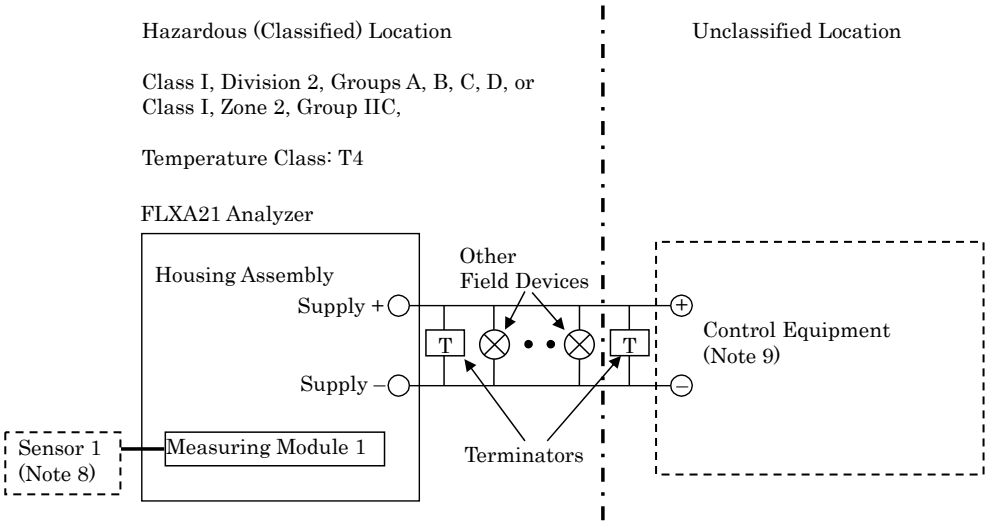
Rev.1: May 29, 2017 Doc. No.: IFM039-A72 P.1

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Model: FLEXA Series Date: April 17, 2015

Installation for Division 2 / Zone 2

Applicable models: FLXA21-D-x-x-CD-xx-xx-F-..., FLXA21-D-x-x-CD-xx-xx-P-...
FLXA21-D-x-x-DD-xx-xx-F-..., FLXA21-D-x-x-DD-xx-xx-P-...



Supply +, Supply – (Note 9):
Ui: 24 V
Ci: 2.72 nF
Li: 0 mH

Measuring Module 1 (Note 8):

	Type of Measuring Module		
	pH, SC, DO	ISC	SENCOM
Uo	11.76 V	11.76 V	5.36 V
Io	116.5 mA	60.6 mA	106.16 mA
Po	0.3424 W	0.178 W	0.1423 W
Co	100 nF	100 nF	31 µF
Lo	1.7 mH	8 mH	0.45 mH

Specific condition of use:
- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.

Model: FLEXA Series Date: May 29, 2017

Notes:

1. No revision to this drawing without prior approval of FM.
2. Installation must be in accordance with the National Electric Code (NFPA 70), ANSI/ISA-RP12.06.01 and relevant local codes.
3. FISCO installation must be in accordance with ANSI/UL-60079-25.
4. The associated apparatus must be FM-approved.
5. The associated apparatus must be a FISCO power supply or a linear source meeting the following conditions.

   Uo (or Voc) ≤ Ui
   Io (or Isc) ≤ Ii
   Po ≤ Pi
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

6. Control equipment connected to the associated apparatus must not use or generate a voltage which exceeds Um of the associated apparatus.
7. The control drawing of the associated apparatus must be followed when installing the equipment.
8. When installed in Division 1, Zone 0 or Zone 1, Sensor 1 may be a simple apparatus or an intrinsically safe apparatus meeting the conditions below.
   When installed in Division 2 or Zone 2, Sensor 1 may be a simple apparatus or a nonincendive field wiring apparatus meeting the conditions below, or alternatively, it may be equipment suitable for Division 2 or Zone 2 respectively, if a suitable wiring method other than nonincendive field wiring is employed.

   Ui (or Vmax) ≥ Uo
   Ii (or Imax) ≥ Io
   Pi ≥ Po
   Ci ≤ Co – Ccable
   Li ≤ Lo – Lcable

9. The control equipment must be an FM-approved FISCO power supply, FNICO power supply or an associated nonincendive field wiring apparatus meeting the conditions below. Alternatively, it may be general-purpose equipment, if a suitable wiring method other than nonincendive field wiring is employed.

   Uo (or Voc) ≤ Ui
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

10. 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.

11. WARNING – IN THE CASE WHERE THE ENCLOSURE OF THE ANALYZER IS MADE OF ALUMINUM, IF IT IS MOUNTED IN ZONE 0, IT MUST BE INSTALLED SUCH THAT, EVEN IN THE EVENT OF RARE INCIDENTS, IGNITION SOURCES DUE TO IMPACT AND FRICTION SPARKS ARE EXCLUDED

12. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY AND SUITABITLITY FOR DIVISION 2 / ZONE 2.

Rev. Doc. No.: IFM039-A72 P.3

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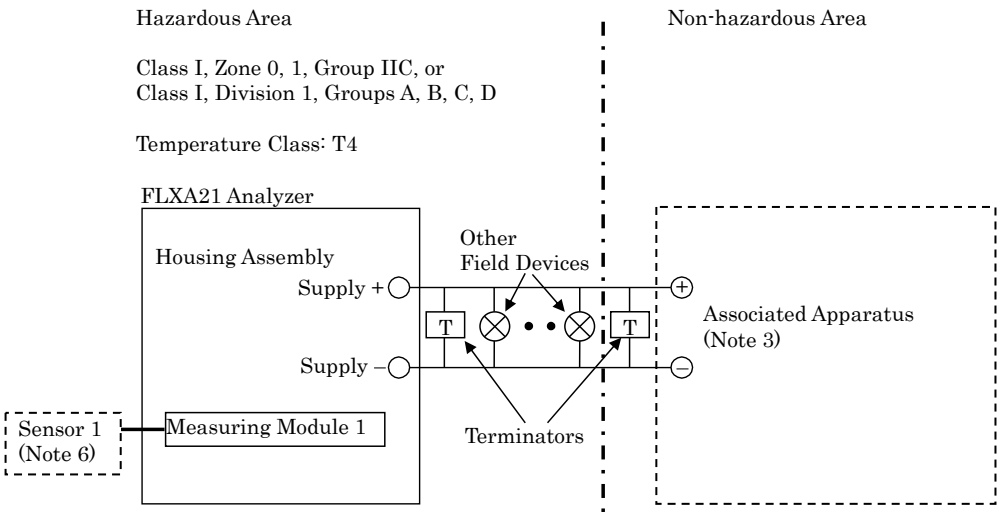
App. 3.3 CSA
FLXA21: Intrinsic safety, Nonincendive

Model: FLXA21 / FLXA202 Date: May 29, 2017

Control drawing (FOUNDATION Fieldbus / PROFIBUS PA type)

Installation for Zone 0, 1 / Division 1

Applicable models: FLXA21-D-x-x-CD-xx-xx-F-..., FLXA21-D-x-x-CD-xx-xx-P-...



Supply +, Supply – (Note 3):
FISCO field device
or
Ui: 24 V
Ii: 250 mA
Pi: 1.2 W
Ci: 2.72nF
Li: 0 mH

Measuring Module 1 (Note 6):

	Type of Measuring Module		
	pH, SC, DO	ISC	SENCOM
Uo	11.76 V	11.76 V	5.36 V
Io	116.5 mA	60.6 mA	106.16 mA
Po	0.3424 W	0.178 W	0.1423 W
Co	100 nF	100 nF	31 µF
Lo	1.7 mH	8 mH	0.45 mH

Specific condition of use
- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.

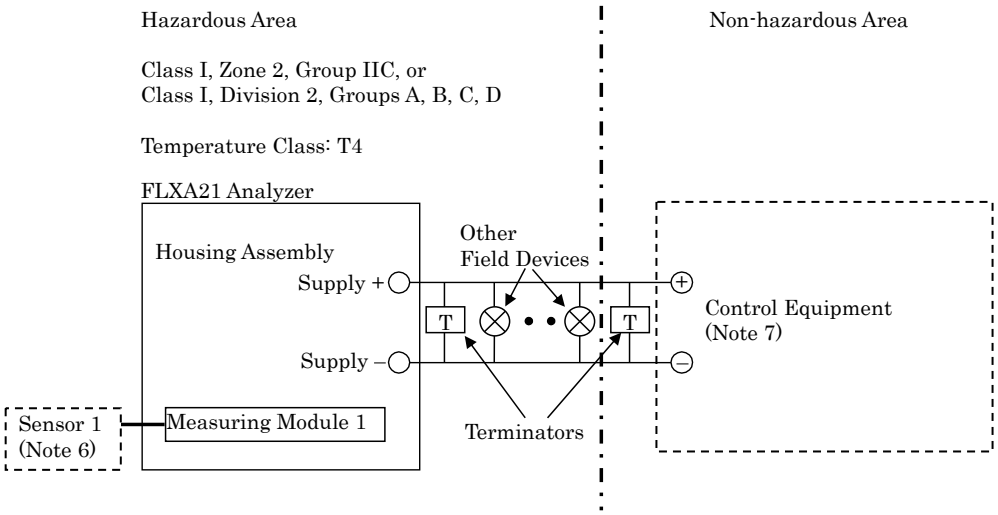
Rev. Doc. No.: ICS032-A72 P.1

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Model: FLXA21 / FLXA202 Date: May 29, 2017

Installation for Zone 2 / Division 2

Applicable models: FLXA21-D-x-x-CD-xx-xx-F-..., FLXA21-D-x-x-CD-xx-xx-P-...
FLXA21-D-x-x-DD-xx-xx-F-..., FLXA21-D-x-x-DD-xx-xx-P-...



Supply +, Supply – (Note 7):
Ui: 24 V
Ci: 2.72 nF
Li: 0 mH

Measuring Module 1 (Note 6):

	Type of Measuring Module		
	pH, SC, DO	ISC	SENCOM
Uo	11.76 V	11.76 V	5.36 V
Io	116.5 mA	60.6 mA	106.16 mA
Po	0.3424 W	0.178 W	0.1423 W
Co	100 nF	100 nF	31 µF
Lo	1.7 mH	8 mH	0.45 mH

Specific condition of use
- Electrostatic charges on the non-metallic or coated parts of the two wire analyzer shall be avoided.

Model: FLXA21 / FLXA202 Date: May 29, 2017

Notes:

1. Installation must be in accordance with the Canadian Electric Code Part I (C22.1), ANSI/ISA-RP12.06.01 and relevant local codes.
2. FISCO installation must be in accordance with CAN/CSA-C22.2 No. 60079-25.
3. The associated apparatus must be a FISCO power supply or a linear source meeting the following conditions.

   Uo (or Voc) ≤ Ui
   Io (or Isc) ≤ Ii
   Po ≤ Pi
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

4. Control equipment connected to the associated apparatus must not use or generate a voltage which exceeds Um of the associated apparatus.
5. The control drawing of the associated apparatus must be followed when installing the equipment.
6. When installed in Zone 0 or 1, or Division 1, Sensor 1 may be a simple apparatus or an intrinsically safe apparatus meeting the conditions below.
   When installed in Zone 2 or Division 2, Sensor 1 may be a simple apparatus or a non-incendive field wiring apparatus meeting the conditions below, or alternatively, it may be equipment suitable for Zone 2 or Division 2 respectively, if a suitable wiring method other than non-incendive field wiring is employed.

   Ui (or Vmax) ≥ Uo
   Ii (or Imax) ≥ Io
   Pi ≥ Po
   Ci ≤ Co – Ccable
   Li ≤ Lo – Lcable

7. The control equipment must be a FISCO power supply, FNICO power supply or an associated non-incendive field wiring apparatus meeting the conditions below. Alternatively, it may be general-purpose equipment, if a suitable wiring method other than non-incendive field wiring is employed.

   Uo (or Voc) ≤ Ui
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

8. WARNING – POTENTIAL ELECTROSTATIC CHARGING HAZARD
   AVERTISSEMENT – DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES
9. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY
   AVERTISSEMENT – LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÉQUE.
10. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR ZONE 2 / DIVISION 2.
    AVERTISSEMENT –LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATÉRIEL INACCEPTABLE POUR LES EMPLACEMENTS DE ZONE 2 / DIVISION 2.

Rev. Doc. No.: ICS032-A72 P.3

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App. 3.4 NEPSI and KOSHA FLXA21: Intrinsic safety “ia”

(Refer to App. 3.1 ATEX and IECEx Control Drawing)

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http://www.yokogawa.com/

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