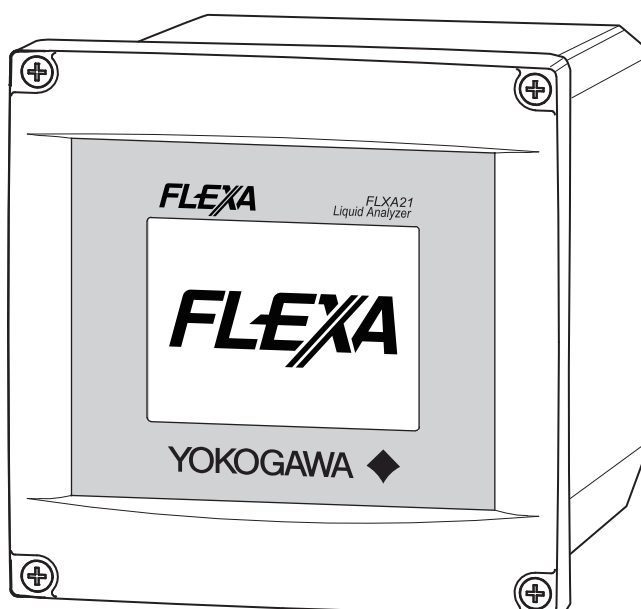


FLXA21
2-Wire Analyzer
FOUNDATION Fieldbus
Communication



IM 12A01A02-71E



◆ 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.

■ 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 -AD -AG -CB -CD -CH -EG -DD | ..... | General purpose for CE, RCM General purpose for CSA General purpose for KC IS for ATEX, IECEx (Note 5) (Note 7) IS for FM, CSA (Note 5) IS for NEPSI (Note 5) IS for KOSHA (Note 5) NI for FM, CSA (Note 6) |
| 1st input | -P1 -C1 -S1 | ..... | pH/ORP (Note 3) Conductivity (SC) 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 Hood Tag plate Conduit adapter | /UM /U /PM /H6 /H7 /H8 /SCT /CB4 /CD4 /CF4 | Universal mounting kit (Note 4) Pipe and wall mounting hardware Panel mounting hardware Hood, stainless steel Hood, stainless steel + urethane coating Hood, stainless steel + epoxy coating Stainless steel tag plate Conduit adapter (G1/2 x 4 pcs) Conduit adapter (1/2NPT x 4 pcs) 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)

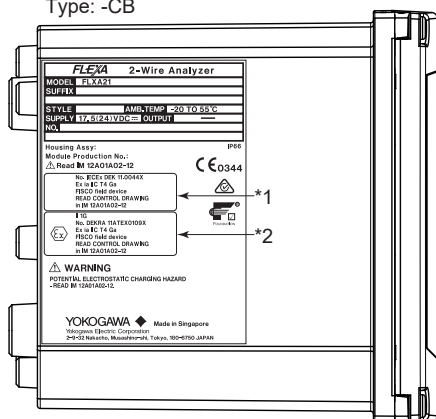
FLXA21-D-P-D-**DD**-□1-NN-F-N-LA-N-NN (FOUNDATION Fieldbus)

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

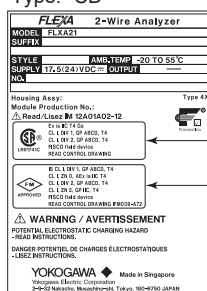
FLXA21-D-P-D-**EG**-□1-NN-F-N-LA-N-NN (FOUNDATION Fieldbus)

-F (FOUNDATION Fieldbus)

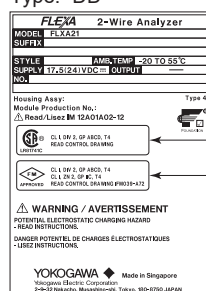
Type: -CB



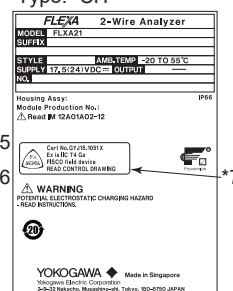
Type: -CD



Type: -DD

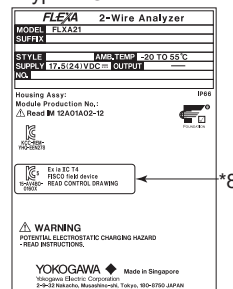


Type: -CH



- *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.

Type: -EG



■ 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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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

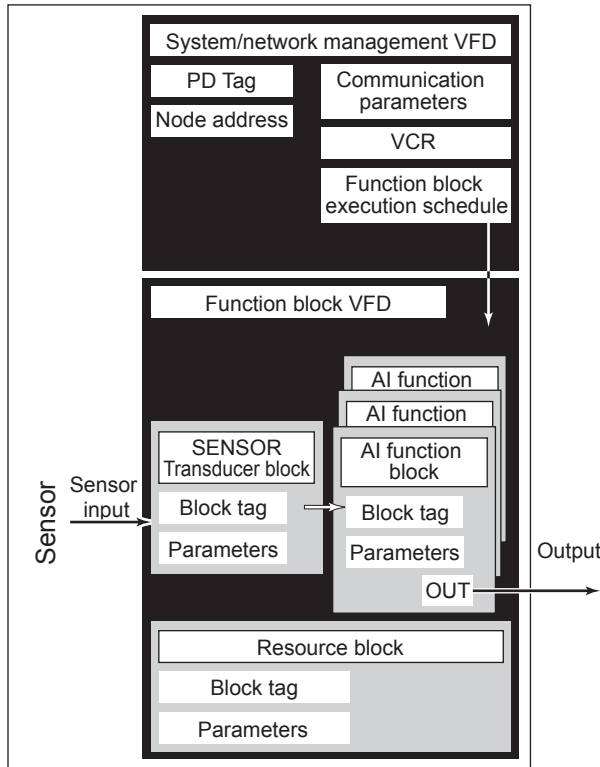


Figure 1.1 Logical Structure of Each Block

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) | Applicable Standard: [Intrinsic safety "ia"] EN 60079-0: 2012 + A11: 2013, EN 60079-11: 2012 Certificate No: DEKRA 11ATEX0109X Marking/Rating:  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) | Applicable Standard: [Intrinsic safety "ia"] 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) | Applicable Standard: [Intrinsically safe / Nonincendive] 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) | Applicable Standard: [Intrinsically safe / Nonincendive] 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 Intrinsically 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.

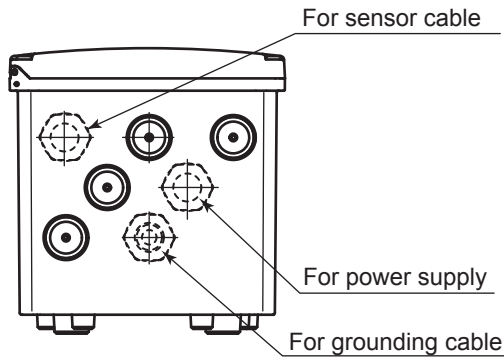


Figure 2.1 Cable gland diagram

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.

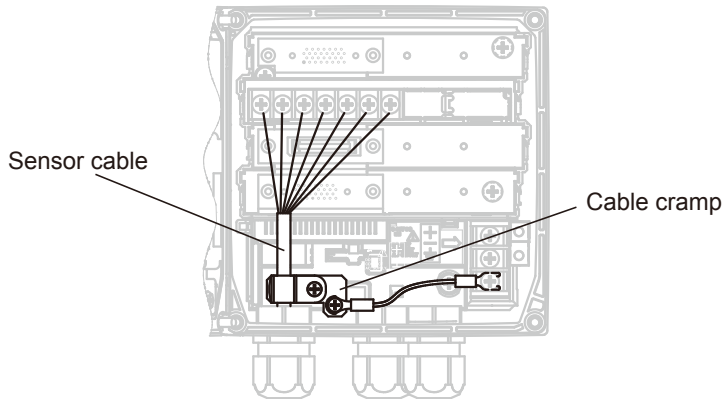


Figure 2.2 When using a SENCOM module

● **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.

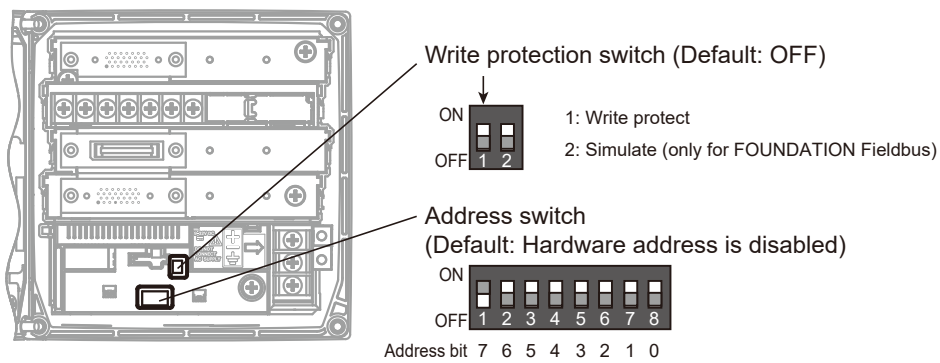


Figure 2.3 DIP switches

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).

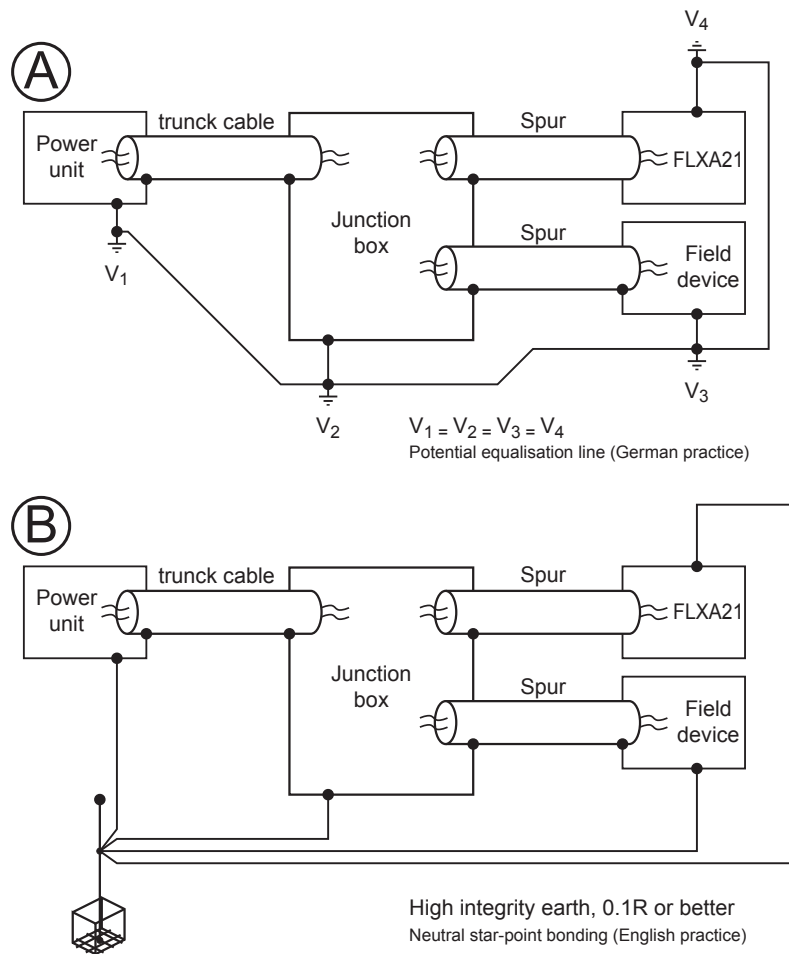


Figure 2.4 Shield and grounding

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.

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.

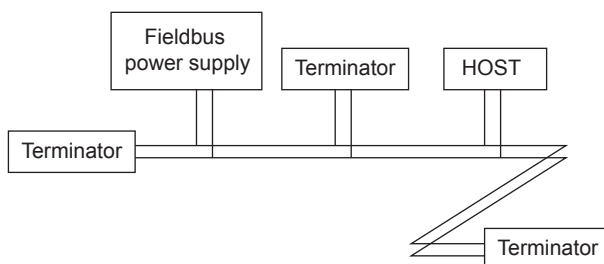


Figure 3.1 Cabling

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

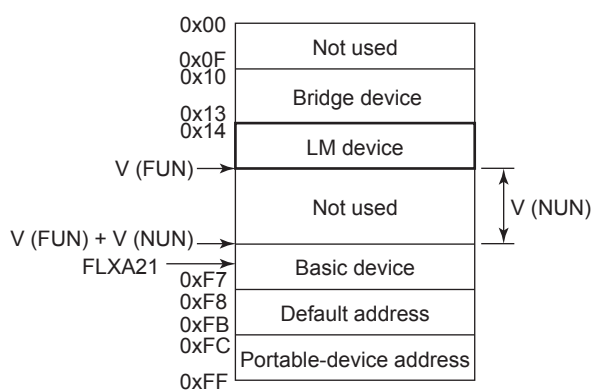
To activate FOUNDATION Fieldbus, the following settings are required for the host.

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 $V (MRD) \times V (ST)$ 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 | | |
|--------------|------------|------------|----------------|
| | 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 significantly 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).

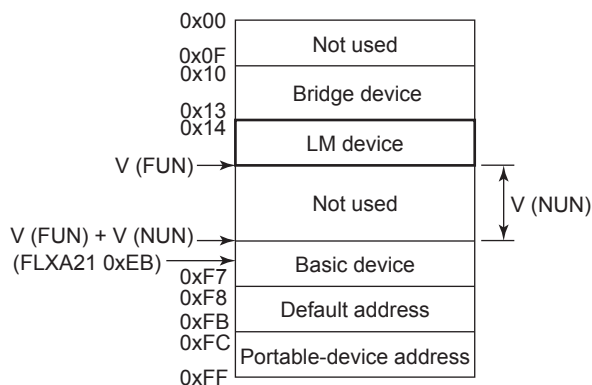
Addresses of basic devices are set in a higher range bigger than V(FUN) + V(NUN).

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.

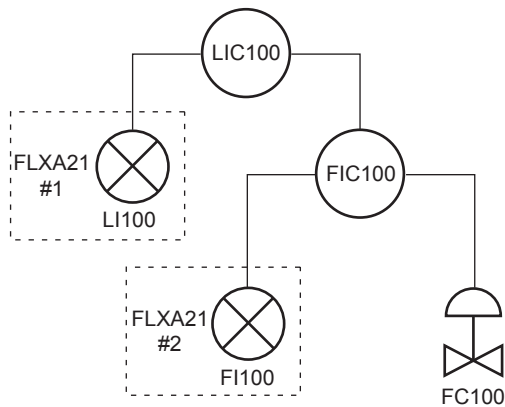


Figure 4.2 Example of Loop Connecting Function Block of Two FLXA21 with Other Instruments

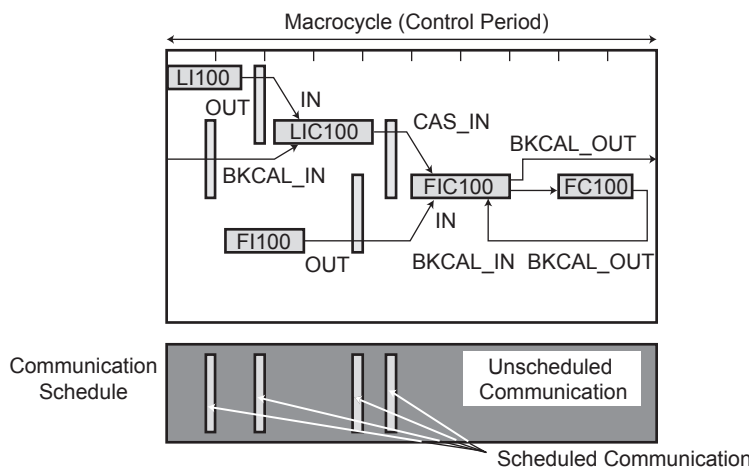


Figure 4.3 Function Block Schedule and Communication Schedule

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.

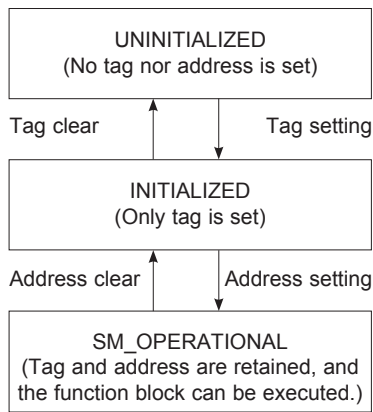


Figure 4.4 Status Transition by Setting PD Tag and Node Address

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 594543083xxxxxxxx. (The xxxxxxxx at the end of the above device ID is a total of 9 alphanumeric characters. The characters displayed on the screen when each instrument is powered on, correspond to the xxxxxxxx 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 | FasDIILocalAddr | Sets the local address to specify VCR in FLXA21. A range of 0x20 to 0xF7 in hexadecimal. |
| 3 | FasDIIConfigured 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 | FasDIISDAP | Specifies the quality of communication. Usually, one of the following types is set. 0x2B: Server 0x01: Source (Alert) 0x03: Source (Trend) 0x91: Publisher |
| 5 | FasDIIMaxConfirm 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 | FasDIIMaxConfirm 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 | FasDIIMaxDlsduSize | Specifies maximum DL Service Data unit Size (DLSDU). Set 256 for Server and Trend VCR, and 64 for other VCRs.. |
| 8 | FasDIIResidual ActivitySupported | Specifies whether connection is monitored. Set TRUE (0xff) for Server. This parameter is not used for other communication. |
| 9 | FasDIITimeliness Class | Not used. |
| 10 | FasDIIPublisherTime WindowSize | Not used. |
| 11 | FasDIIPublisher SynchronizaingDlcep | Not used. |
| 12 | FasDIISubscriberTime WindowSize | Not used. |
| 13 | FasDIISubscriber 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 | RemotelIndex | 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 |

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.

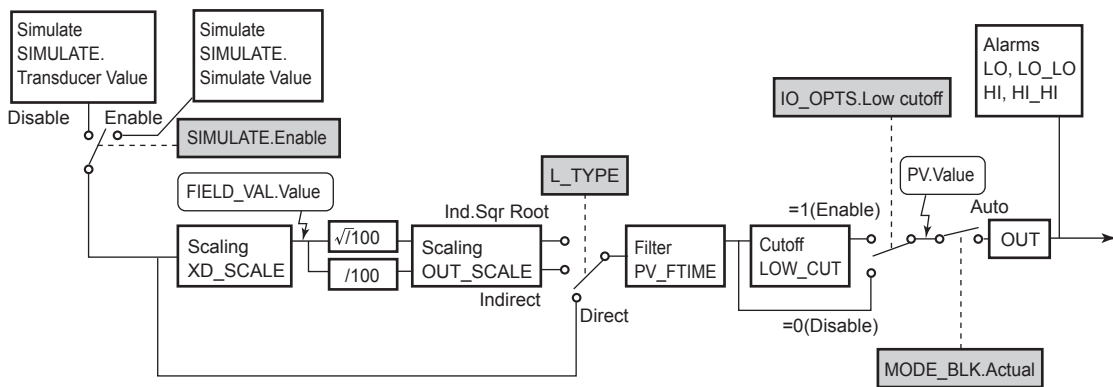


Figure 5.1 Diagram of the AI Functional Block

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, QUATERNARY 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
    
```

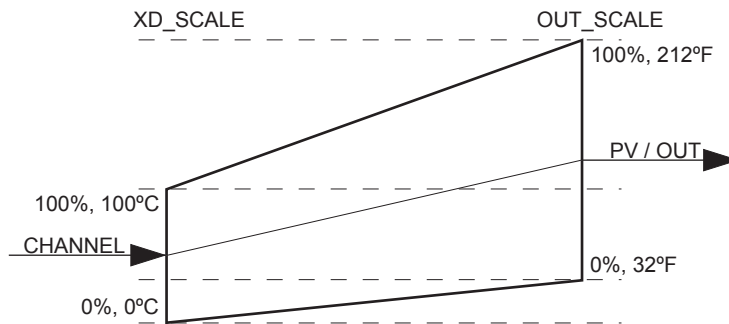


Figure 5.2 Scaling applied to temperature conversion.

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.

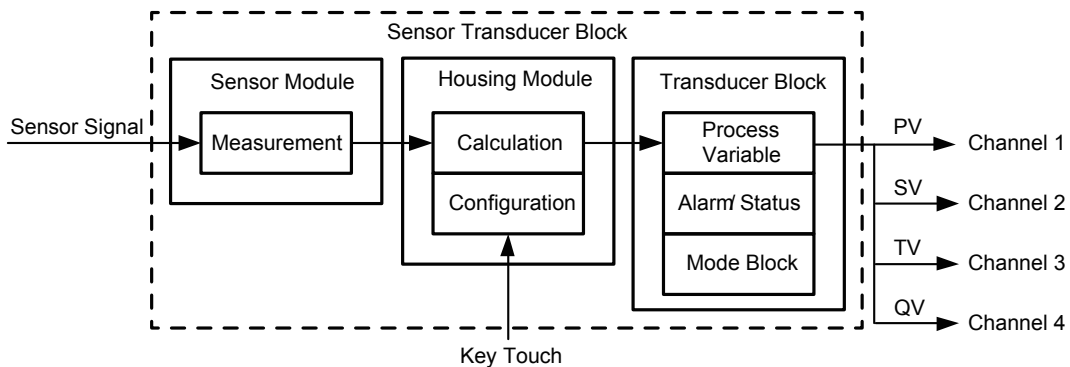


Figure 5.3 Sensor Transducer Block

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. |

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.

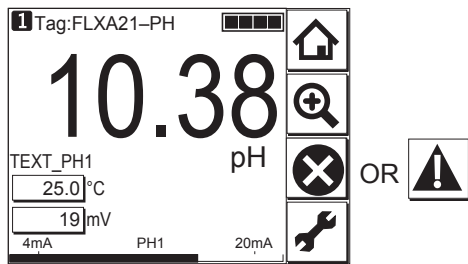


Figure 6.1 Error Identification on Indicator

■ 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).

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 listed in FD_SIMULATE. DiagnosticValue. |
| 73 | 1073 | FD_MAINT_MAP | 0x000003E0 | AUTO | Specifies the bit assigned to FD_MAINT_ACTIVE, a parameter for 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 the FD_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 Input1's impedance. |
| 53 | 2053 | DETC_WELLNESS_IMPEDANCE2 | — | RO | Sensor wellness indicator by Input1'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 | |

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_ERRÖR | Warning | BLOCK ERR | XD_ERRÖR | Warning | BLOCK ERR | XD_ERRÖR | Warning | BLOCK ERR | XD_ERRÖR | Warning | BLOCK ERR | XD_ERRÖR |
| 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.

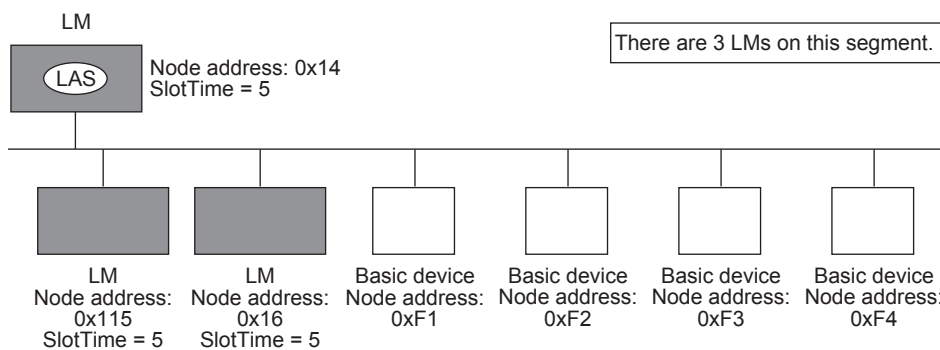


Figure 1 Example of Fieldbus configuration-3 LMs on Same Segment

■ Transfer of LAS

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

- If the LM whose value of $[V(ST) \times V(TN)]$ 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 $[V(ST) \times V(TN)]$ 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.

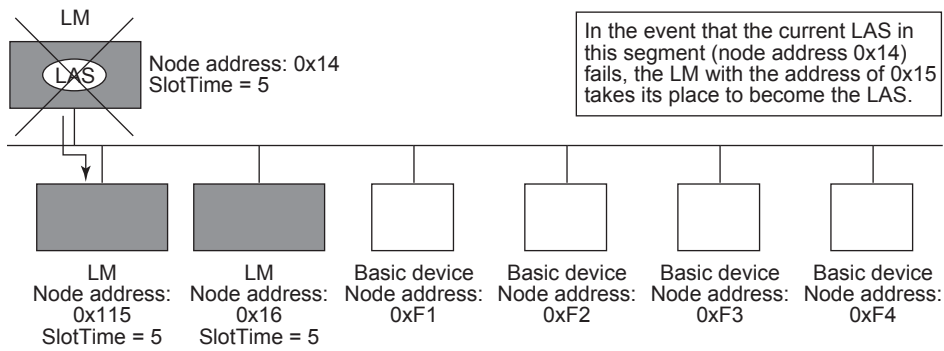


Figure 2 Backup of LAS

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].

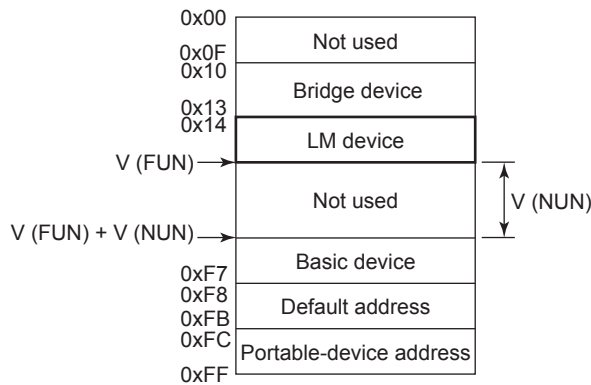


Figure 3 Node Address Ranges

- (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 $[V(ST) \times V(TN)]$ 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 | 0x4900000000000000 | | |
| | | 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 | | |
| | | 2 DefMinTokenDelegTime | 100 | | |
| | | 3 DefTokenHoldTime | 300 | | |
| | | 4 TargetTokenRotTime | 4096 | | |
| | | 5 LinkMaintTokHoldTime | 400 | | |
| | | 6 TimeDistributionPeriod | 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

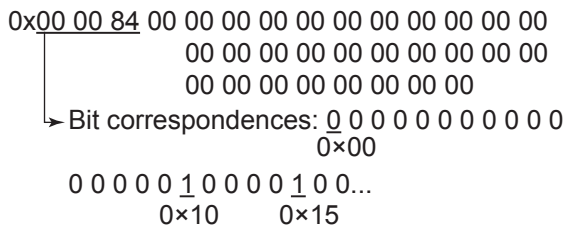
| Subindex | Element | Size [bytes] | Description |
|----------|---|--------------|-------------|
| 1 | MaxSchedulingOverhead | 1 | V(MSO) |
| 2 | DefMinTokenDelegTime | 2 | V(DMDT) |
| 3 | DefTokenHoldTime | 2 | V(DTHT) |
| 4 | TargetTokenRotTime | 2 | V(TTRT) |
| 5 | LinkMaintTokHoldTime | 2 | V(LTHT) |
| 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) DImeBasicInfo

| 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 | RcvEnabled | 1 | 0x01 | Channel 1 is enabled. |
| 5 | PreferredReceiveChannel | 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 StartingTime | 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:

$$\begin{array}{rcl} \text{FLXA21} & & \text{Other LMs} \\ \text{V(ST)} \times \text{V(TN)} & < & \text{V(ST)} \times \text{V(TN)} \end{array}$$

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: DImeBasicInfo

Then, confirm that the following conditions are met:

$$\begin{array}{rcl} \text{FLXA21} & & \text{Problematic Device} \\ \text{V(ST)} & > & \text{V(ST)} \\ \text{V(MID)} & > & \text{V(MID)} \\ \text{V(MRD)} & > & \text{V(MRD)} \end{array}$$

- 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.

$$\begin{array}{rcl} \text{LAS} & & \text{FLXA21} \\ \text{V(ST)} & > & \text{V(ST) 4 or above} \\ \text{V(MID)} & > & \text{V(MID) 4 or above} \\ \text{V(MRD)} & > & \text{V(MRD) 12 or above} \end{array}$$

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.

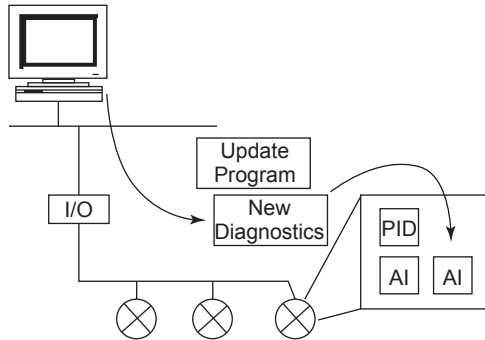


Figure 1 Concept of Software Downloading

■ 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/flid/flid-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.

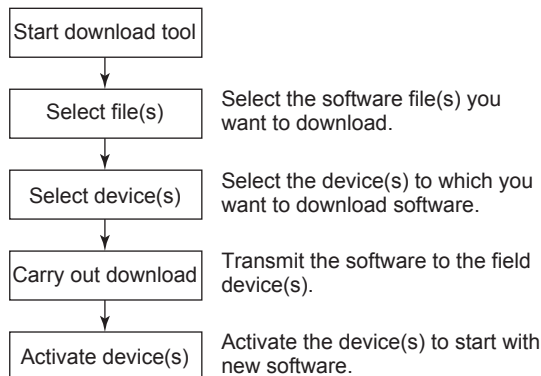


Figure 2 Flow of Software Download Procedure

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 transiently 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, 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 |

| Error Code | Detail |
|------------|---|
| 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 backup after 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

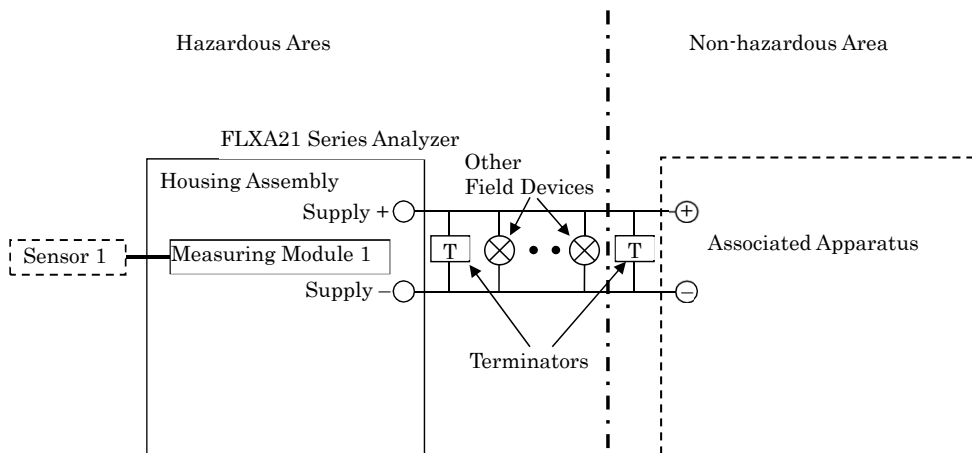
App. 3.1 ATEX and IECEx

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 100k Ω to 100M Ω .

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

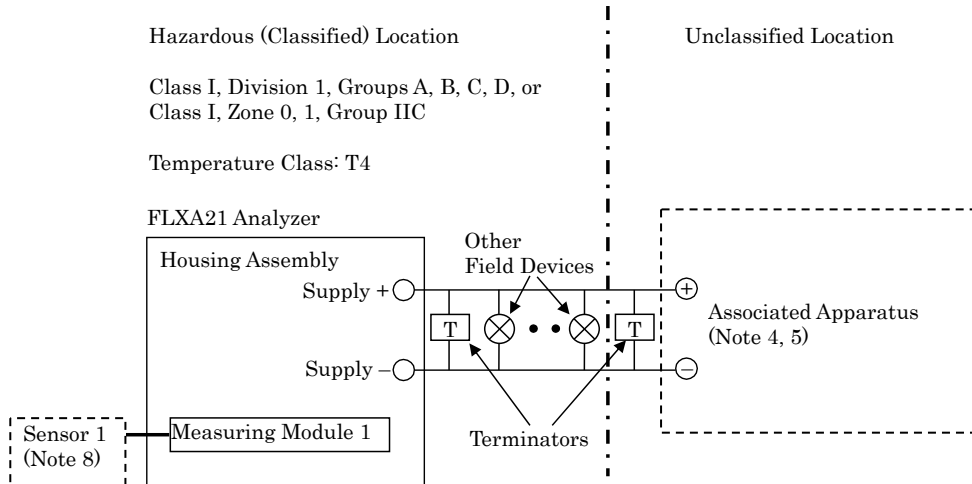
FLXA21: Intrinsic safety, Nonincendive

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
 $U_i: 24\text{ V}$
 $I_i: 250\text{ mA}$
 $P_i: 1.2\text{ W}$
 $C_i: 2.72\text{ nF}$
 $L_i: 0\text{ mH}$

Measuring Module 1 (Note 8):

| | Type of Measuring Module | | |
|-------|--------------------------|---------|------------------|
| | pH, SC, DO | ISC | SENCOM |
| U_o | 11.76 V | 11.76 V | 5.36 V |
| I_o | 116.5 mA | 60.6 mA | 106.16 mA |
| P_o | 0.3424 W | 0.178 W | 0.1423 W |
| C_o | 100 nF | 100 nF | 31 μF |
| L_o | 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

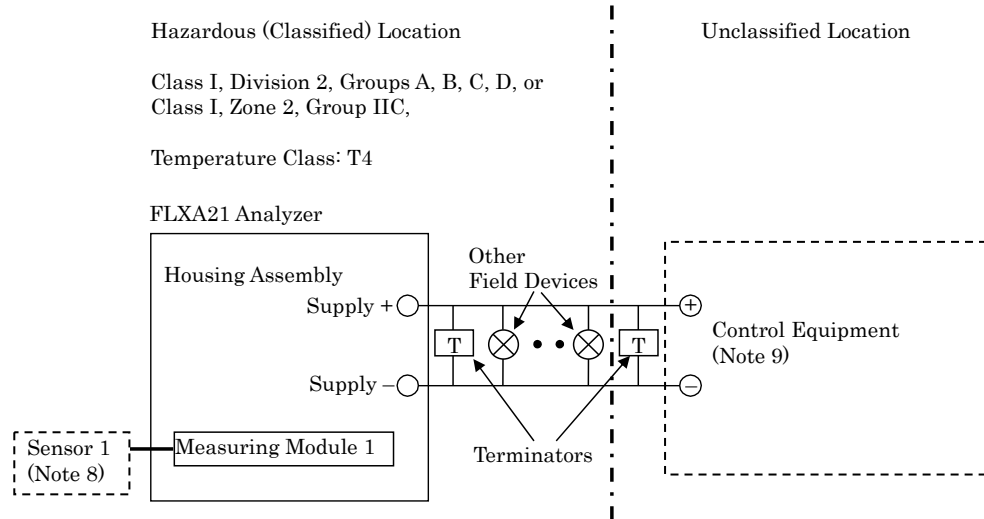
Yokogawa Electric Corporation

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):
 U_i: 24 V
 C_i: 2.72 nF
 L_i: 0 mH

Measuring Module 1 (Note 8):

| | Type of Measuring Module | | |
|----------------|--------------------------|---------|-----------|
| | pH, SC, DO | ISC | SENCOM |
| U _o | 11.76 V | 11.76 V | 5.36 V |
| I _o | 116.5 mA | 60.6 mA | 106.16 mA |
| P _o | 0.3424 W | 0.178 W | 0.1423 W |
| C _o | 100 nF | 100 nF | 31 μF |
| L _o | 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.2

Yokogawa Electric Corporation

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.

$$\begin{aligned}
 U_o \text{ (or } V_{oc}) &\leq U_i \\
 I_o \text{ (or } I_{sc}) &\leq I_i \\
 P_o &\leq P_i \\
 C_o \text{ (or } C_a) &\geq C_i + C_{cable} \\
 L_o \text{ (or } L_a) &\geq L_i + L_{cable}
 \end{aligned}$$

6. Control equipment connected to the associated apparatus must not use or generate a voltage which exceeds U_m 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.

$$\begin{aligned}
 U_i \text{ (or } V_{max}) &\geq U_o \\
 I_i \text{ (or } I_{max}) &\geq I_o \\
 P_i &\geq P_o \\
 C_i &\leq C_o - C_{cable} \\
 L_i &\leq L_o - L_{cable}
 \end{aligned}$$

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.

$$\begin{aligned}
 U_o \text{ (or } V_{oc}) &\leq U_i \\
 C_o \text{ (or } C_a) &\geq C_i + C_{cable} \\
 L_o \text{ (or } L_a) &\geq L_i + L_{cable}
 \end{aligned}$$

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 SUITABILITY FOR DIVISION 2 / ZONE 2.

Rev.

Doc. No.: IFM039-A72 P.3

Yokogawa Electric Corporation

App. 3.3 CSA

FLXA21: Intrinsic safety, Nonincendive

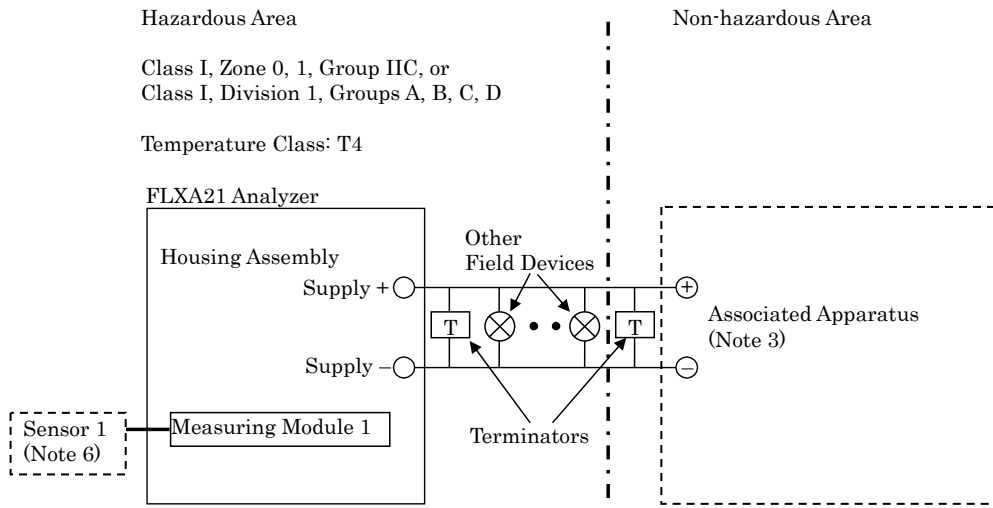
Model: FLXA21 / FLXA202

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
 U_i : 24 V
 I_i : 250 mA
 P_i : 1.2 W
 C_i : 2.72nF
 L_i : 0 mH

Measuring Module 1 (Note 6):

| | Type of Measuring Module | | |
|-------|--------------------------|---------|------------|
| | pH, SC, DO | ISC | SENCOM |
| U_o | 11.76 V | 11.76 V | 5.36 V |
| I_o | 116.5 mA | 60.6 mA | 106.16 mA |
| P_o | 0.3424 W | 0.178 W | 0.1423 W |
| C_o | 100 nF | 100 nF | 31 μ F |
| L_o | 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

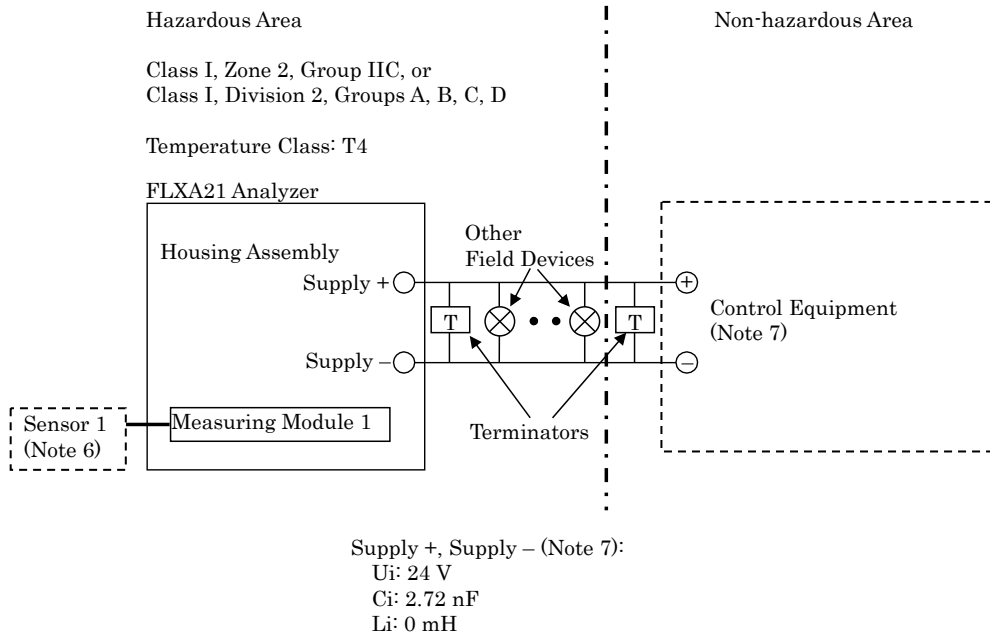
Yokogawa Electric Corporation

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-...



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.2

Yokogawa Electric Corporation

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.

$$\begin{aligned}U_o \text{ (or Voc)} &\leq U_i \\I_o \text{ (or Isc)} &\leq I_i \\P_o &\leq P_i \\C_o \text{ (or Ca)} &\geq C_i + C_{\text{cable}} \\L_o \text{ (or La)} &\geq L_i + L_{\text{cable}}\end{aligned}$$

4. Control equipment connected to the associated apparatus must not use or generate a voltage which exceeds U_m 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.

$$\begin{aligned}U_i \text{ (or Vmax)} &\geq U_o \\I_i \text{ (or Imax)} &\geq I_o \\P_i &\geq P_o \\C_i &\leq C_o - C_{\text{cable}} \\L_i &\leq L_o - L_{\text{cable}}\end{aligned}$$

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.

$$\begin{aligned}U_o \text{ (or Voc)} &\leq U_i \\C_o \text{ (or Ca)} &\geq C_i + C_{\text{cable}} \\L_o \text{ (or La)} &\geq L_i + L_{\text{cable}}\end{aligned}$$

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 INTRINSÈQUE.
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

Yokogawa Electric Corporation

App. 3.4 NEPSI and KOSHA

FLXA21: Intrinsic safety “ia”

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

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- Manual No. : IM 12A01A02-71E

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