User's Manual

DPharp EJX™
DPharp EJA™

DPharp PROFIBUS PA Communication Type (EJX□□□A, EJA□□□E)

IM 01C25T04-01EN

DPharp FOR THE DIGITAL WORLD

YOKOGAWA
Yokogawa Electric Corporation

IM 01C25T04-01EN
5th Edition

DPharp
PROFIBUS PA Communication Type

IM 01C25T04-01EN 5th Edition

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Revision Information

1. Introduction

This manual is for the DPharp EJX/EJA Series Differential Pressure/Pressure Transmitter PROFIBUS PA Communication Type "transmitter". The PROFIBUS PA communication type is based on the same silicon resonant sensing technology used in the BRAIN/HART communication type, and is similar to the communication types in terms of basic performance and operation. This manual describes only those topics that are required for operation of the PROFIBUS PA communication type. For information on the installation, wiring, and maintenance of transmitters, refer to the user's manual for each model.

■ Regarding This Manual

- This manual should be provided to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instruments.
- Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- The following safety symbols are used in this manual:

WARNING

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

CAUTION

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

IMPORTANT

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

NOTE

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

■ Trademarks

- 'DPharp', 'EJX', 'EJA', 'FieldMate' and 'BRAIN TERMINAL' are registered trademarks of Yokogawa Electric Corporation. Company names and product names used in this material are registered trademarks or trademarks of their respective owners.
- In this manual, trademarks or registered trademarks are not marked with ™ or ®.

1.1 Safe Use of This Product

For the safety of the operator and to protect the instrument and the system, please be sure to follow this manual's safety instructions when handling this instrument. If these instructions are not heeded, the protection provided by this instrument may be impaired. In this case, Yokogawa cannot guarantee that the instrument can be safely operated. Please pay special attention to the following points:

(a) Installation

- This instrument may only be installed by an engineer or technician who has an expert knowledge of this device. Operators are not allowed to carry out installation unless they meet this condition.
- With high process temperatures, care must be taken not to burn yourself by touching the instrument or its casing.
- Never loosen the process connector nuts when the instrument is installed in a process. This can lead to a sudden, explosive release of process fluids.
- When draining condensate from the pressure detector section, take appropriate precautions to prevent the inhalation of harmful vapors and the contact of toxic process fluids with the skin or eyes.
- When removing the instrument from a hazardous process, avoid contact with the fluid and the interior of the meter.
- All installation shall comply with local installation requirements and the local electrical code.

(b) Wiring

- The instrument must be installed by an engineer or technician who has an expert knowledge of this instrument. Operators are not permitted to carry out wiring unless they meet this condition.
- Before connecting the power cables, please confirm that there is no current flowing through the cables and that the power supply to the instrument is switched off.

(c) Operation

- Wait 5 min. after the power is turned off, before opening the covers.

(d) Maintenance

- Please carry out only the maintenance procedures described in this manual. If you require further assistance, please contact the nearest Yokogawa office.
- Care should be taken to prevent the build up of dust or other materials on the display glass and the name plate. To clean these surfaces, use a soft, dry cloth.

(e) Explosion Protected Type Instrument

- Users of explosion proof instruments should refer first to section 2.1 (Installation of an Explosion Protected Instrument) of this manual.
- The use of this instrument is restricted to those who have received appropriate training in the device.
- Take care not to create sparks when accessing the instrument or peripheral devices in a hazardous location.

(f) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.

(g) Product Disposal

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

(h) Authorized Representative in EEA

- In relation to the CE Marking, The authorised representative for this product in the EEA (European Economic Area) is: Yokogawa Europe B.V. Euroweg 2, 3825 HD Amersfoort,The Netherlands

1.2 Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurring during the warranty period shall basically be repaired free of charge.
- If any problems are experienced with this instrument, the customer should contact the Yokogawa representative from which this instrument was purchased or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- The party responsible for the cost of fixing the problem shall be determined by Yokogawa following an investigation conducted by Yokogawa.
- The purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:

  - Improper and/or inadequate maintenance by the purchaser.
  - Malfunction or damage due to a failure to handle, use, or store the instrument in accordance with the design specifications.
  - Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
  - Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
  - Malfunction or damage from improper relocation of the product in question after delivery.
  - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/ lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

2. Handling Cautions

2.1 Installation of an Explosion-Protected Instrument

If a customer makes a repair or modification to an intrinsically safe or explosionproof instrument and the instrument is not restored to its original condition, its intrinsically safe or explosionproof construction may be compromised and the instrument may be hazardous to operate. Please contact Yokogawa before making any repair or modification to an instrument.

CAUTION

This instrument has been tested and certified as being intrinsically safe or explosionproof. Please note that severe restrictions apply to this instrument's construction, installation, external wiring, maintenance and repair. A failure to abide by these restrictions could make the instrument a hazard to operate.

WARNING

Maintaining the safety of explosionproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair. Please read the following sections very carefully.

WARNING

The range setting switch must not be used in a hazardous area.

IMPORTANT

All the blind plugs which accompany the transmitters upon shipment from the factory are certified by the applicable agency in combination with the transmitters. The plugs which are marked with the symbols "◊ Ex" on their surfaces are certified only in combination with the transmitters.

2.1.1 FM approval

a. FM Explosionproof Type

Caution for FM Explosionproof type

Note 1. The transmitters with optional code /FF1 are applicable for use in hazardous locations:

- Applicable Standard:
  FM3600, FM3615, FM3810, NEMA 250, ANSI/UL 61010-1, ANSI/UL 61010-2-30
- Explosionproof for Class I, Division 1, Groups B, C and D.
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G.
- Enclosure: Type 4X.
- Temperature Class: T6
- Ambient Temperature: –40 to 60°C
- Supply Voltage: 32V dc max.
- Current Draw: 15 mA dc

Note 2. Wiring

- All wiring shall comply with National Electrical Code ANSI/NFPA70 and Local Electrical Codes.
- When installed in Division 1, "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED."

Note 3. Operation

- Keep the "WARNING" nameplate attached to the transmitter.
  WARNING: OPEN CIRCUIT BEFORE REMOVING COVER.
  FACTORY SEALED, CONDUIT SEAL NOT REQUIRED.
  INSTALL IN ACCORDANCE WITH THE USERS MANUAL IM 01C25.
- Take care not to generate mechanical sparking when accessing the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Explosionproof Approval.

b. FM Intrinsically safe and Nonincendive Type

EJX/EJA-E Series pressure transmitters with optional code /FS15 are applicable for use in hazardous locations.

Note 1.

- Applicable Standard:
  FM 3600
  FM 3610
  FM 3611
  FM 3810
  ANSI/ISA-60079-0-2009
  ANSI/ISA-60079-11-2009
  ANSI/ISA-60079-27-2006
  ANSI/UL 121201
  ANSI/ISA-61010-1
  NEMA 250
- Rating
  Intrinsically Safe with Entity/FISCO for
  Class I, II, III Division 1,
  Groups A, B, C, D, E, F, G T4
  Class I Zone 0 AEx ia IIC T4
  Nonincendive field wiring/FNICO for
  Class I, II Division 2
  Groups A, B, C, D, F, G T4
  Class III Division 1 T4
  Class I, Zone 2 Group IIC T4
- Ambient temperature: –55 to 60°C
- Enclosure: Type 4X
- Electrical Connection:
  1/2 NPT female, M20 female

Note 2. Installation

Installation should be in accordance with Control Drawing IFM024-A12.

Note 3. Specific conditions of use

Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.

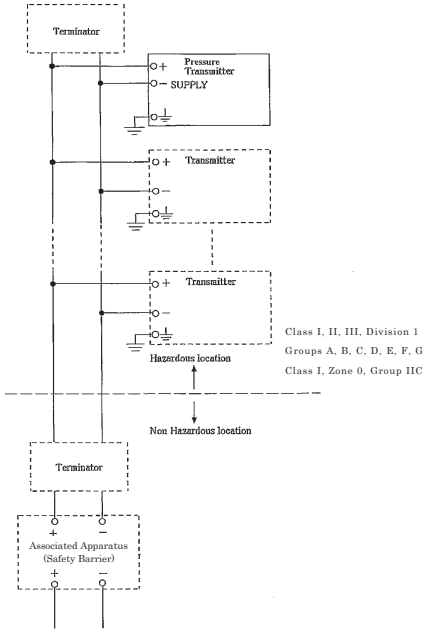
When the enclosure of the Pressure Transmitters is made of aluminum alloy, if it is mounted in Zone 0, it shall be installed such that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.

Note 4. Maintenance and Repair

Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.

Model: EJX-F Series Date: January 27, 2005

Control drawing (intrinsic safety)



Rev.1: July 16, 2019 Doc. No.: IFM024-A12 P.1

Yokogawa Electric Corporation

IFM024

Model: EJX-F Series Date: January 27, 2005

Specific conditions of use:
- Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.
- When the enclosure of the Pressure Transmitters is made of aluminum alloy, if it is mounted in Zone 0, it shall be installed such that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.

Entity parameters [Groups: A, B, C, D, E, F, G, and IIC]
Ui: 24 V
Ii: 250 mA
Pi: 1.2 W
Ci: 3.52 nF
Li: 0 µH
FISCO parameters (1) [Groups: A, B, C, D, E, F, G, and IIC]
Ui: 17.5 V
Ii: 380 mA
Pi: 5.32 W
Ci: 3.52 nF
Li: 0 µH
FISCO parameters (2) [Groups: C, D, E, F, G, and IIB]
Ui: 17.5 V
Ii: 460 mA
Pi: 5.32 W
Ci: 3.52 nF
Li: 0 µH

Notes:
1. Installation must be in accordance with the National Electric Code (NFPA70), ANSI/ISA-RP12.06.01, and relevant local codes.
2. The Associated Apparatus and the Terminators must be FM-approved.
3. The following conditions must be satisfied.
   Voc (or Uo) ≤ Ui
   Isc (or Io) ≤ Ii
   Po ≤ Pi
   Ca (or Co) ≥ Ci + Ccable
   La (or Lo) ≥ Li + Lcable
4. General Purpose Equipment connected to the Associated Apparatus must not use or generate a voltage more than Um of the Associated Apparatus.
5. The control drawing of the Associated Apparatus must be followed when installing the equipment.
6. Dust-tight conduit seals must be used when installed in Class II or Class III environments.
7. WARNING –ELECTROSTATIC CHARGE MAY CAUSE AN EXPLOSION HAZARD. AVOID ANY ACTIONS THAT CAUSE THE GENERATION OF ELECTROSTATIC CHARGE, SUCH AS RUBBING WITH A DRY CLOTH ON COATING FACE OF THE PRODUCT.
8. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY AND SUITABILITY FOR HAZARDOUS LOCATION

Rev.4: July 16, 2019 Doc. No.: IFM024-A12 P.2

Yokogawa Electric Corporation

IFM024

Model: EJX-F Series Date: May 9, 2006

FISCO Rules

The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Ui), the current (Ii) and the power (Pi) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo, Voc or Vt), the current (Io, Isc or It) and the power (Po) which can be provided by the associated apparatus (supply unit). In addition, the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than terminators) connected to the Fieldbus must be less than or equal to 5 nF and 10 µH respectively.
In each I.S. Fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (Uo, Voc or Vt) of the associated apparatus used to supply the bus cable must be limited to the range of 14 V d.c. to 17.5 V d.c. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except a leakage current of 50 µA for each connected device. Separately powered equipment needs galvanic isolation to ensure the intrinsically safe Fieldbus circuit remains passive.
The cable used to interconnect the devices needs to comply with the following parameters:
Loop resistance R': 15....150 Ω/km
Inductance per unit length L': 0.4....1 mH/km
Capacitance per unit length C': 45....200 nF/km C' = C' line/line + 0.5 C' line/screen, if both lines are floating or C' = C' line/line + C'line/screen, if the screen is connected to one line.
Length of spur cable: max. 60 m
Length of trunk cable: max. 1 km in IIC and 5 km in IIB
Length of splice: max = 1 m
Terminators
At the end of each trunk cable an FM Approved line terminator with the following parameters is suitable:
R = 90...100 Ω
C = 0 ....2.2 µF

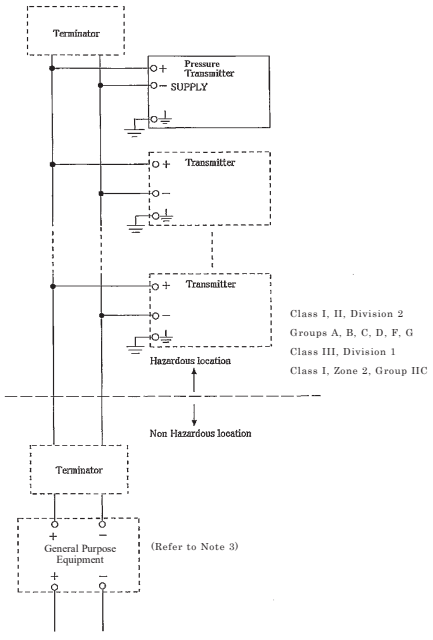
Model: EJX-F Series Date: January 27, 2005

Nonincendive field wiring parameters
Vmax: 32 V
Ci: 3.52 nF
Li: 0 µH

Notes:
1. Installation must be in accordance with the National Electric Code (NFPA70), ANSI/ISA-RP12.06.01, and relevant local codes.
2. The following conditions must be satisfied.
3. In case Nonincendive Field Wiring Concept is used for the interconnection, FM-approved Associated Nonincendive Field Wiring Apparatus, which meets the following conditions, must be used as the General Purpose Equipment. The Terminators also must be FM approved.
Voc (or Uo) ≤ Vmax
Ca (or Co) ≥ Ci + Ccable
La (or Lo) ≥ Li + Lcable
4. Dust-tight conduit seals must be used when installed in Class II or Class III environments.
5. WARNING – SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY AND SUITABILITY FOR HAZARDOUS LOCATION

Model: EJX-F Series Date: January 27, 2005

Control drawing (nonincendive)



Model: EJX-F Series Date: August 19, 2005

FNICO Rules

The FNICO Concept allows the interconnection of nonincendive field wiring apparatus to associated nonincendive field wiring apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (Vmax), the current (Imax) and the power (Pmax), which nonincendive field wiring apparatus can receive and remain nonincendive, must be equal or greater than the voltage (Uo, Voc or Vt), the current (Io, Isc or It) and the power (Po) which can be provided by the associated nonincendive field wiring apparatus (supply unit). In addition the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than terminators) connected to the Fieldbus must be less than or equal to 5 nF and 20 µH respectively.
In each N.I. Fieldbus segment only one active source, normally the associated nonincendive field wiring apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (Uo, Voc or Vt) of the associated nonincendive field wiring apparatus used to supply the bus cable must be limited to the range 14 V d.c. to 17.5 V d.c. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except a leakage current of 50 µA for each connected device. Separately powered equipment needs galvanic isolation to ensure the nonincendive field wiring Fieldbus circuit remains passive.
The cable used to interconnect the devices needs to comply with the following parameters:
Loop resistance R': 15....150 Ω/km
Inductance per unit length L': 0.4....1 mH/km
Capacitance per unit length C': 45....200 nF/km C' = C' line/line + 0.5 C' line/screen, if both lines are floating or C' = C' line/line + C'line/screen, if the screen is connected to one line.
Length of spur cable: max. 60 m
Length of trunk cable: max. 1 km in IIC and 5 km in IIB
Length of splice: max = 1 m
Terminators
At the end of each trunk cable an FM Approved line terminator with the following parameters is suitable:
R = 90...100 Ω
C = 0 ....2.2 µF

2.1.2 CSA Certification

a. CSA Explosionproof Type

Caution for CSA explosionproof type.

Note 1. The transmitters with optional code /CF1 are applicable for use in hazardous locations:

Certificate: 2014354

- Applicable Standard:
  C22.2 No. 25, C22.2 No. 30,
  CAN/CSA-C22.2 No. 94,
  CAN/CSA-C22.2 No. 61010-1-12,
  CAN/CSA-C22.2 No. 61010-2-030-12,
  CAN/CSA-C22.2 No. 60079-0:07,
  CAN/CSA-C22.2 No. 60079-1:07,
  CAN/CSA-C22.2 No. 60529,
  ANSI/ISA-12.27.01
- Explosion-proof for Class I, Groups B, C and D.
- Dustignition-proof for Class II/III, Groups E, F and G.
- Enclosure: Type 4X, IP66/IP67
- Temperature Code: T6...T4
- Ex d IIC T6...T4
- Maximum Process Temperature:
  120°C (T4), 100°C (T5), 85°C (T6)
- Ambient Temperature:
  –50* to 75°C (T4), –50* to 80°C (T5),
  –50* to 75°C (T6)
  * –15°C when /HE is specified.
- Supply Voltage: 32 V dc max.
- Output Signal: 15 mA dc

Note 2. Wiring

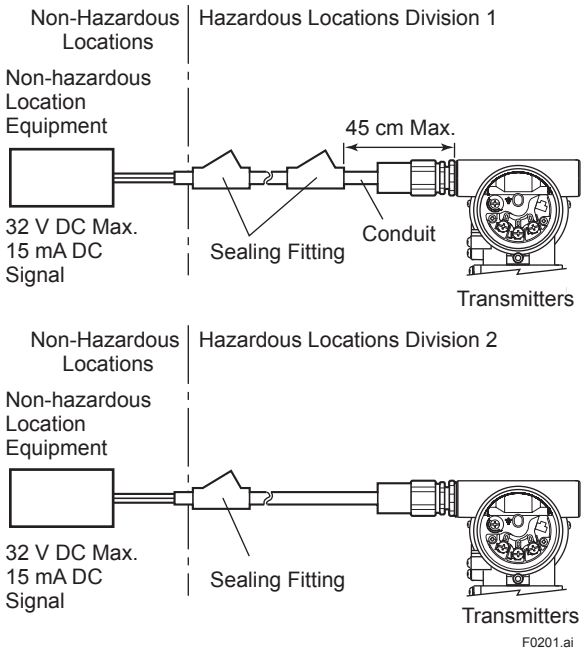
- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in the figure.
- WARNING:
  A SEAL SHALL BE INSTALLED WITHIN 45 cm OF THE ENCLOSURE.
  UN SCELLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 45 cm DU BOÎTIER.
- WARNING:
  WHEN INSTALLED IN CL.I, DIV 2, SEAL NOT REQUIRED.
  UNE FOIS INSTALLÉ DANS CL I, DIV 2, AUCUN JOINT N'EST REQUIS.

Note 3. Operation

- WARNING:
  AFTER DE-ENERGIZING, DELAY 5 MINUTES BEFORE OPENING.
  APRÉS POWER-OFF, ATTENDRE 5 MINUTES AVANT D'OUVRIR.
- WARNING:
  WHEN AMBIENT TEMPERATURE ≥ 65°C, USE THE HEAT-RESISTING CABLES ≥ 90°C.
  QUAND LA TEMPÉRATURE AMBIANTE ≥ 65°C, UTILISEZ DES CÂBLES RÉSISTANTES Á LA CHALEUR ≥ 90°C.
- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation and Yokogawa Corporation of America is prohibited and will void Canadian Standards Explosionproof Certification.



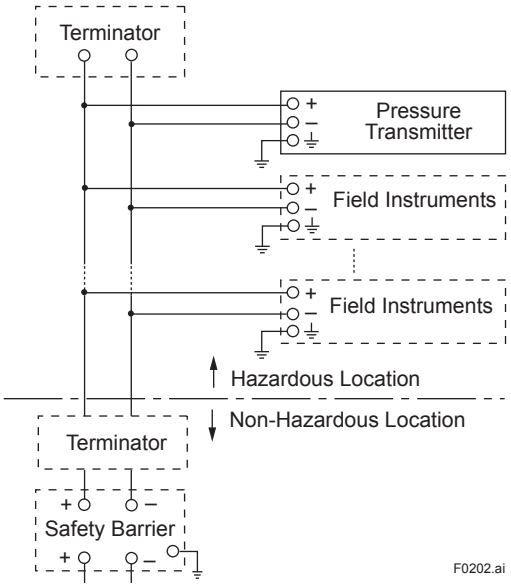
b. CSA Intrinsically safe and Nonincendive Type

The transmitters with optional code /CS15.

- Certificate: 1689689
- Applicable standard: C22.2 No.0, C22.2 No.94, C2.2 No.157, C22.2 No.213, C22.2 No.61010-1, C22.2 No.61010-2-030, CAN/CSA C22.2 60079-0:07, CAN/CSA E60079-11:02, CAN/CSA E60079-15:02, CAN/CSA C22.2 No.60529, ANSI/ISA-12.27.01
- CSA Intrinsically Safe Approval
  Class I, Division 1, Groups A, B, C, & D; Class II, Division 1, Groups E, F & G; Class III; Ex ia IIC T4
  Ambient Temperature: –55* to 60°C
  Type 4X, IP66/IP67
  * –15°C when /HE is specified.
- CSA Nonincendive Approval
  Class I, Division 2, Groups A, B, C, & D; Class II, Division 2, Groups F & G; Class III; Ex nL IIC T4
  Ambient Temperature: –55* to 60°C
  Type 4X, IP66/ IP67
  * –15°C when /HE is specified.

- **Caution for CSA Intrinsically safe type. (Following contents refer to "DOC. No. ICS018)**

Installation Diagram for Intrinsically safe (Division 1 Installation)



Note 1. The safety barrier must be CSA certified.

Note 2. Input voltage of the safety barrier must be less than 250Vrms/Vdc.

Note 3. Installation should be in accordance with Canadian Electrical Code Part I and local Electrical Code.

Note 4. Do not alter drawing without authorization from CSA.

Electrical Data:

• Rating 1 (Entity)
For Groups A, B, C, D, E, F, and G or Group IIC
Ui (vmax) = 24 V dc
Ii (Imax) = 250 mA
Pi (Pmax) = 1.2 W
Ci = 3.52 nF
Li = 0 µH

or

• Rating 2 (FISCO)
For Groups A, B, C, D, E, F, and G or Group IIC
Ui (vmax) = 17.5 V dc
Ii (Imax) = 380 mA
Pi (Pmax) = 5.32 W
Ci = 3.52 nF
Li = 0 µH

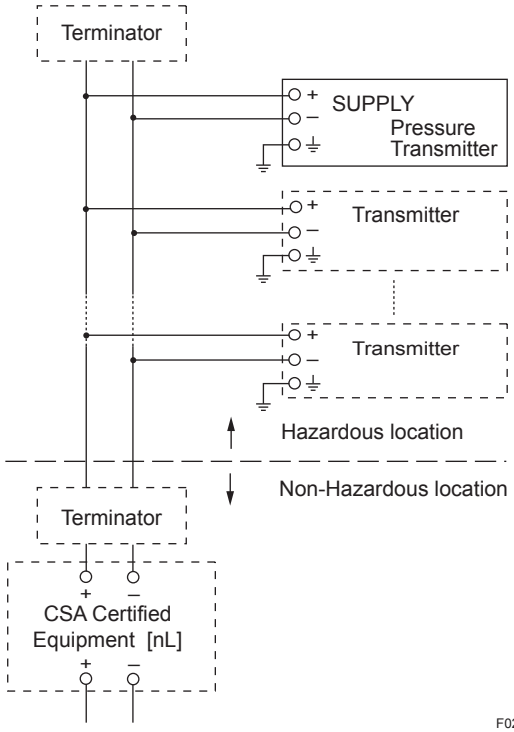
or

• Rating 3 (FISCO)
For Groups C, D, E, F, and G or Group IIB
Ui (vmax) = 17.5 V dc
Ii (Imax) = 460 mA
Pi (Pmax) = 5.32 W
Ci = 3.52 nF
Li = 0 µH

Installation requirements;
Po ≤ Pi Uo ≤ Ui Io ≤ Ii,
Co ≥ Ci + Ccable Lo ≥ Li + Lcable
Vmax ≥ Voc Imax ≥ Isc
Ca ≥ Ci + Ccable La ≥ Li + Lcable
Uo, Io, Po, Co, Lo,Voc, Isc, Ca and La are parameters of barrier.

- **Caution for CSA Non-incendive type. (Following contents refer to "DOC. No. ICS018)**

Installation Diagram for Non-incendive or Type of protection "n" (Division 2 Installation)



Note 1. Installation should be in accordance with Canadian Electrical Code Part I and local Electrical Code.

Note 2. Dust-tight conduit seal must be used when installed in class II and III environments.

Note 3. Do not alter drawing without authorization from CSA.

Electrical Data:

• Rating (including FNICO)
Ui or Vmax = 32 V
Ci = 3.52 nF
Li = 0 µH

2.1.3 ATEX Certification

(1) Technical Data

a. ATEX Flameproof Type

Caution for ATEX flameproof type

Note 1. The transmitters with optional code /KF22 for potentially explosive atmospheres:

- No. KEMA 07ATEX0109X
- Applicable Standard:
  EN IEC 60079-0, EN 60079-1, EN 60079-31
- Type of Protection and Marking Code:
  Ex db IIC T6...T4Gb, Ex tb IIIC T85°C Db
- Group: II
- Category: 2G, 2D
- Enclosure: IP66 / IP67
- Temperature Class for gas-proof:
  T6, T5, and T4
- Ambient Temperature for gas-proof:
  –50 to 75°C (T6), –50 to 80°C (T5), and –50 to 75°C (T4)
- Maximum Process Temperature (Tp.) for gas-proof:
  85°C (T6), 100°C (T5), and 120°C (T4)
- Maximum Surface Temperature for dust-proof:
  T85°C (Tamb.: –30* to 75°C, Tp.: 85°C)
  * –15°C when /HE is specified.

Note 2. Electrical Data

- Supply voltage: 32 V dc max.
  Output current: 15 mA dc

Note 3. For combined approval types

- Once a device of multiple approval type is installed, it should not be re-installed using any other approval types. Apply a permanent mark in the check box of the selected approval type on the certification label on the transmitter to distinguish it from unused approval types.

Note 4. Installation

- All wiring shall comply with local installation requirements.
- In order to prevent the earthing conductor from loosening, the conductor must be secured to the terminal, tightening the screw with appropriate torque. Care must be taken not to twist the conductor.
- Cable glands, adapters and/or blanking elements with a suitable IP rating shall be of Ex d IIC/Ex tb IIIC certified by ATEX and shall be installed so as to maintain the specific degree of protection (IP Code) of the equipment.

Note 5. Operation

- Keep the “WARNING” label attached to the transmitter.
  WARNING: AFTER DE-ENERGIZING, DELAY 5 MINUTES BEFORE OPENING. WHEN THE AMBIENT TEMP.≥65°C, USE HEAT-RESISTING CABLE AND CABLE GLAND≥90°C.
- Take care not to generate mechanical sparking when accessing the instrument and peripheral devices in hazardous location.

Note 6. Maintenance and Repair

- Warning: When maintenance and repair are performed, confirm the following conditions and the then perform works.
  Confirm the power supply is cut off and the voltage of power supply terminal is not supplied.
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment in accordance with the relevant standards: IEC / EN 60079-19 (Equipment repair, overhaul and reclamation) and IEC / EN 60079-17 (Electrical installation inspection and maintenance); otherwise the certification will be voided.

Note 7. Special Conditions for Safe Use

WARNING

- Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on coating face of the product.
- In the case where the enclosure of the Pressure Transmitter is made of aluminium, if it is mounted in an area where the use of category 2D apparatus is required, it shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.
- The fasteners used to fasten the transmitter enclosure onto the sensor capsule is special fastener, and the property class of it is A2-50 (A4-50) or more.
- For transmitters with a membrane made of titanium, ignition hazard due to impact and friction on the membranes shall be avoided.
- Maximum Surface Temperature for dust-proof: T85°C (Tamb.: –30* to 75°C, Tp.: –30* to 85°C)
  * –15°C when /HE is specified.

b. ATEX Intrinsically Safe Ex ia

Caution for ATEX Intrinsically safe type.

Note 1. EJX/EJA-E series pressure transmitters with optional code /KS26 for potentially explosive atmospheres:

Certification Information:

WARNING

A modification of the equipment would no longer comply with the construction described in the certificate documentation.

Certificate Number:
KEMA 04ATEX1116 X

NOTE

The symbol “X” placed after the certificate number indicates that the equipment is subject to specific conditions of use.

Applicable Standard:
EN IEC 60079-0, EN 60079-11

Note 2. Rating

Ex Marking:

Ⓔx II 2 G Ex ia IIC/IIB T4 Ga

Ⓔx II 2 D Ex ia IIIC T85°C T100°C T120°C Db

Temperature Specifications:

Ambient Temperature range and Process Temperature range for Gas:

Ambient temperature range	Process temperature range
–55 to 60°C	–55 to 120°C

Ambient Temperature range and Process Temperature range for Dust:

Maximum surface temperature	Ambient temperature range	Process temperature range	Type of O-ring
T85°C	–30 to 60°C	–30 to 80°C	NBR
	–15 to 60°C	–15 to 80°C	Fluoro-rubber (FKM)
T100°C	–30 to 60°C	–30 to 100°C	NBR
	–15 to 60°C	–15 to 100°C	Fluoro-rubber (FKM)
T120°C	–30 to 60°C	–30 to 120°C	NBR
	–15 to 60°C	–15 to 120°C	Fluoro-rubber (FKM)

Enclosure:

IP66/IP67 in accordance with only EN60529

Electrical Parameters:

Intrinsically safe ratings are as follows:

[Entity]

Ui = 24 V
Ii = 250 mA
Pi = 1.2 W
Ci = 3.52 nF
Li = 0 µH

[FISCO IIC]

Ui = 17.5 V
Ii = 380 mA
Pi = 5.32 W
Ci = 3.52 nF
Li = 0 µH

[FISCO IIB]

Ui = 17.5 V
Ii = 460 mA
Pi = 5.32 W
Ci = 3.52 nF
Li = 0 µH

Note 3. Installation:

- Refer to the control drawing IKE022-A12 P.1 and P.2. (Note 7.)
- The type of threads is indicated at the cable entry, using the following marking.

Screw Size	Marking
ISO M20 × 1.5 female	⚠M
ANSI 1/2 NPT female	⚠A or ⚠N or ⚠W

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- The selected type of the Ex marking on the name plate should be indicated. For this purpose, the tick boxes can be used as follows.

☑ Ex ia IIC/IIB T4 Ga

☐ Ex ia IIIC T85°C T100°C T120°C Db

Note 4. Operation:

- If the pressure transmitter is mounted in an area where explosive atmospheres may be present, it must be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust are avoided.

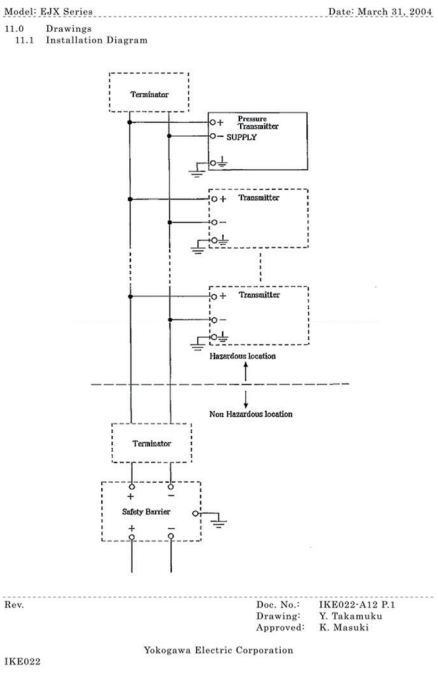
Note 5. Specific conditions of use:

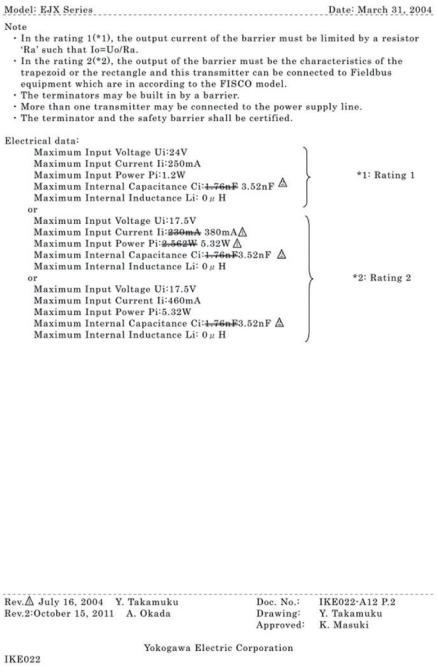
- When the enclosure of the pressure transmitter is made of aluminum alloy, if it is mounted in an area where the use of Category 1 G equipment is required, it shall be installed such that, even in the event of rareincidents, an ignition source due to impact and friction sparks is excluded.
- Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.
- The dielectric strength of at least 500 V of the intrinsically safe circuits of the pressure transmitter is limited only by the overvoltage protection.

Note 6. Maintenance and Repair:

- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.

Note 7. Control drawing





c. ATEX Intrinsically Safe Ex ic

Caution for ATEX Intrinsically safe Ex ic

Note 1. The transmitters with option code /KN26 for potentially explosive atmospheres:
Applicable Standard:
EN IEC 60079-0, EN 60079-11

Note 2. Rating
Ex Marking
Ⓔx II 3 G Ex ic IIC T4 Gc
Temperature specifications:

Ambient temperature range	Process temperature range	Type of O-ring
–30 to 60°C	–30 to 120°C	NBR
–15 to 60°C	–15 to 120°C	Fluoro-rubber (FKM)

IP Code: IP66
Overvoltage Category: I
Electrical Parameters: See control drawing IKE047-A70 (Note 7.)

Note 3. Installation
- See control drawing IKE047-A70. (Note 7.)
- The type of threads is indicated at the cable entry, using the following marking.

Screw Size	Marking
ISO M20 × 1.5 female	⚠M
ANSI 1/2 NPT female	⚠A or ⚠N or ⚠W

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Note 4. Operation
If the pressure transmitter is mounted in an area where explosive atmospheres may be present, it must be installed in such a way that the risk from electrostatic discharges.

Note 5. Specific conditions of use
See control drawing IKE047-A70 (Note 7.)

Note 6. Maintenance and Repair
Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.

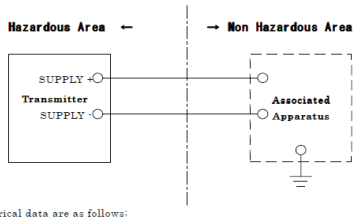
Note 7. Control drawing

Note 7. Control drawing

Model: EJX Series Date: February 28, 2013

14 Control Drawing

Following instructions shall be included in the user's manual, together with the following items:
- a list of the standards in 1, including the issue year:
- specifications in 2:
- marking information in 13.



Electrical data are as follows:
Ui = 32 V
Ci = 3.52 nF
Li = 0 µH

Specific Conditions of Use:
- Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.
- The dielectric strength of at least 500 V a.c. r.m.s between the intrinsically safe circuits and the enclosure of the Pressure Transmitter Model EJX Series,Model EJA***E Series and Model EJA***J Series are limited only by the overvoltage protection.

WARNING:
- POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE USER'S MANUAL.

Note:
- Cable glands, adapters and/or blanking elements shall be of type "n", type "e" or type "d" and shall be installed so as to maintain the specified degree of protection (IP Code) of the equipment.

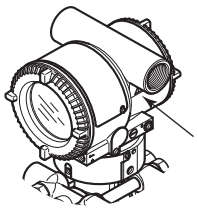
Rev. Doc. No.: IKE047-A70
Drawing: T.Itou
Approved: A.Matsunaga

(2) Electrical Connection

A mark indicating the electrical connection type is stamped near the electrical connection port. These marks are as follows.

Screw Size	Marking
ISO M20 × 1.5 female	⚠M
ANSI 1/2 NPT female	⚠A*1 or ⚠N or ⚠W

*1: Not applicable for option code /KF22.



Location of the mark

F0206.ai

(3) Installation

WARNING

- All wiring shall comply with local installation requirements and the local electrical code.
- There is no need for a conduit seal in Division 1 and Division 2 hazardous locations because this product is sealed at the factory.

(4) Operation

WARNING

- OPEN CIRCUIT BEFORE REMOVING COVER. INSTALL IN ACCORDANCE WITH THIS USER'S MANUAL
- Take care not to generate mechanical sparking when accessing the instrument and peripheral devices in a hazardous location.

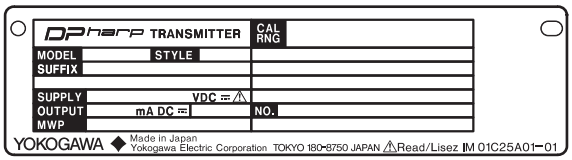
(5) Maintenance and Repair

WARNING

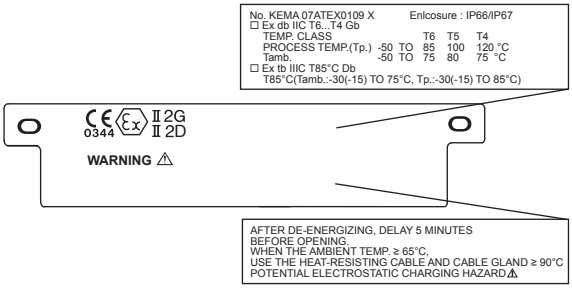
The instrument modification or part replacement by other than an authorized Representative of Yokogawa Electric Corporation is prohibited and will void the certification.

(6) Name Plate

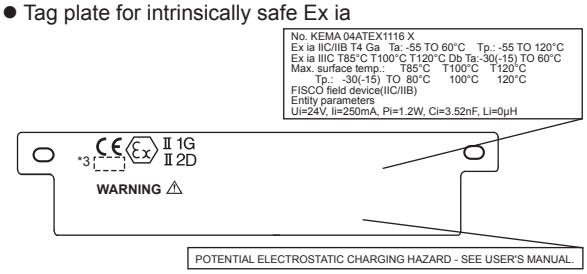
- Name plate



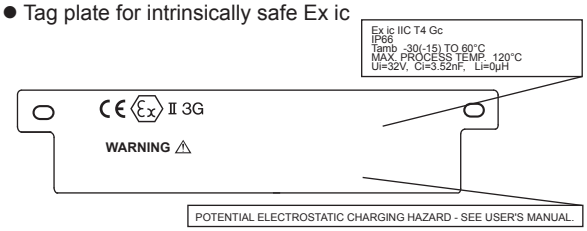
- Tag plate for flameproof type



- Tag plate for intrinsically safe Ex ia



- Tag plate for intrinsically safe Ex ic



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STYLE: Style code.
SUFFIX: Specified suffix code.
SUPPLY: Supply voltage.
OUTPUT: Output signal.
MWP: Maximum working pressure.
CAL RNG: Specified calibration range.
NO.: Serial number and year of production*1.
TOKYO 180-8750 JAPAN:
The manufacturer name and the address*2.

*1: The first digit in the final three numbers of the serial number appearing after "NO." on the name plate indicates the year of production. The following is an example of a serial number for a product that was produced in 2010:

91K819857 032
The year 2010

*2: "180-8750" is the Zip code for the following address.
2-9-32 Nakacho, Musashino-shi, Tokyo Japan
*3: The identification number of Notified Body.

2.1.4 IECEx Certification

a. IECEx Flameproof Type

Caution for IECEx flameproof type.

Note 1. The transmitters with optional code /SF2 are applicable for use in hazardous locations:
- No. IECEx CSA 07.0008
- Applicable Standard: IEC60079-0:2011, IEC60079-1:2007-4
- Flameproof for Zone 1, Ex d IIC T6...T4 Gb
- Enclosure: IP66 and IP67
- Maximum Process Temperature: 120°C (T4), 100°C (T5), 85°C (T6)
- Ambient Temperature: –50 to 75°C (T4), –50 to 80°C (T5), –50 to 75°C (T6)
- Supply Voltage: 32 V dc max.
- Output Signal: 15 mA dc

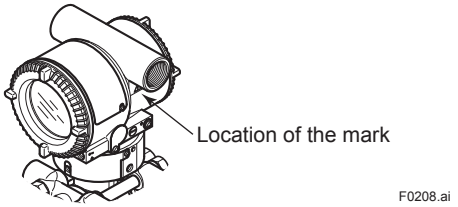
Note 2. Wiring
- In hazardous locations, the cable entry devices shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements.

Note 3. Operation
- WARNING: AFTER DE-ENERGIZING, DELAY 5 MINUTES BEFORE OPENING.
- WARNING: WHEN THE AMBIENT TEMP.≥65°C, USE HEAT-RESISTING CABLE AND CABLE GLAND ≥90°C.
- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.
- Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on coating face of the product.

Note 4. Maintenance and Repair
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void IECEx Certification.
- Electrical Connection
  A mark indicating the electrical connection type is stamped near the electrical connection port. These marks are as follows.

Screw Size	Marking
ISO M20 × 1.5 female	⚠M
ANSI 1/2 NPT female	⚠A*1 or ⚠N or ⚠W

*1: Not applicable for option code /KF22.



b. IECEx Intrinsically Safe Ex ia

Caution for IECEx Intrinsically safe Ex ia.

Note 1. EJX/EJA-E Series pressure transmitters with optional code /SS26 are applicable for use in hazardous locations.

Certification Information:

WARNING

A modification of the equipment would no longer comply with the construction described in the certificate documentation.

Certificate Number:
IECEx DEK 12.0016X

NOTE

The symbol “X” placed after the certificate number indicates that the equipment is subject to specific conditions of use.

Applicable Standard:
IEC 60079-0, IEC 60079-11

Note 2. Rating

Ex Marking: Ex ia IIC/IIB T4 Ga

Temperature specifications:

Ambient Temperature range and Process Temperature range for Gas:

Ambient temperature range	Process temperature range
–55 to 60°C	–55 to 120°C

Electrical Parameters:

Intrinsically safe ratings are as follows:

[Entity]
Ui = 24 V
Ii = 250 mA
Pi = 1.2 W
Ci = 3.52 nF
Li = 0 µH

[FISCO IIC]
Ui = 17.5 V
Ii = 380 mA
Pi = 5.32 W
Ci = 3.52 nF
Li = 0 µH

[FISCO IIB]
Ui = 17.5 V
Ii = 460 mA
Pi = 5.32 W
Ci = 3.52 nF
Li = 0 µH

Note 3. Installation

- Refer to the control drawing IKE022-A12 P.1 and P.2. (Note 7.)
- The type of threads is indicated at the cable entry, using the following marking.

Screw Size	Marking
ISO M20 × 1.5 female	⚠M
ANSI 1/2 NPT female	⚠A or ⚠N or ⚠W

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- The selected type of the Ex marking on the name plate should be indicated. For this purpose, the tick boxes can be used as follows.
  ☑ Ex ia IIC/IIB T4 Ga
  ☐ Ex ic IIC T4 Gc

Note 4. Operation

- If the pressure transmitter is mounted in an area where explosive atmospheres may be present, it must be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust are avoided.

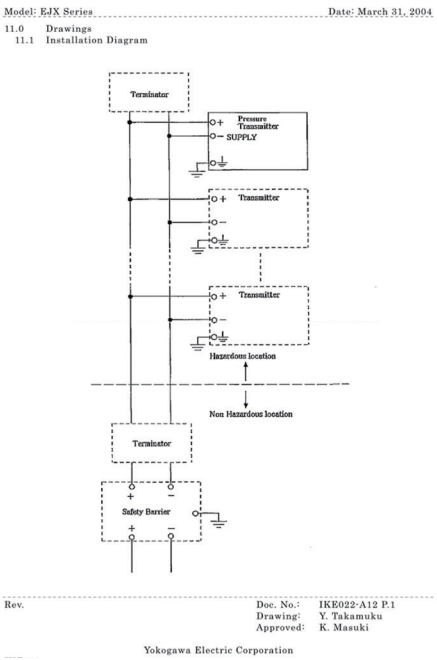
Note 5. Specific conditions of use

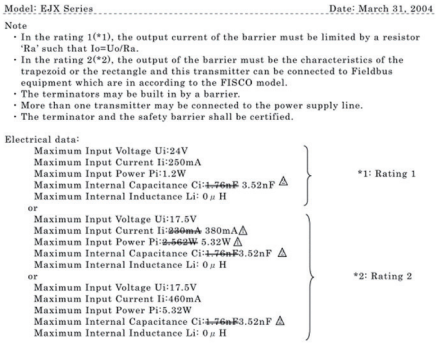
- When the pressure transmitter is made of aluminum alloy, if it is mounted in an area where the use of EPL Ga equipment is required, it shall be installed such that, even in the event of rareincidents, an ignition source due to impact and friction sparks is excluded.
- Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.
- The dielectric strength of at least 500 V of the intrinsically safe circuits of the pressure transmitter is limited only by the overvoltage protection.

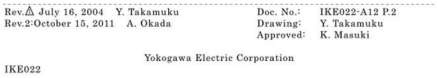
Note 6. Maintenance and Repair

- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.

Note7. Control drawing







c. IECEx Intrinsically Safe Ex ic

Caution for IECEx Intrinsically safe Ex ic.

Note 1. EJX/EJA-E Series pressure transmitters with optional code /SS26 are applicable for use in hazardous locations.

Certification Information:

WARNING

A modification of the equipment would no longer comply with the construction described in the certificate documentation.

Certificate Number: IECEx DEK 13.0064X

NOTE

The symbol "X" placed after the certificate number indicates that the equipment is subject to specific conditions of use.

Applicable Standard:
IEC 60079-0, IEC 60079-11

Note 2. Ratings

Ex Marking: Ex ic IIC T4 Gc

Temperature specifications:

Ambient temperature range	Process temperature range	Type of O-ring
–30 to 60°C	–30 to 120°C	NBR
–15 to 60°C	–15 to 120°C	Fluoro-rubber (FKM)

IP Code: IP66

Overvoltage Category: I

Electrical Parameters: See control drawing IIE020-A70 (Note 7.)

Note 3. Installation

- See control drawing IIE020-A70. (Note 7.)
- The type of threads is indicated at the cable entry, using the following marking.

Screw Size	Marking
ISO M20 × 1.5 female	⚠M
ANSI 1/2 NPT female	⚠A or ⚠N or ⚠W

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- The selected type of the Ex marking on the name plate should be indicated. For this purpose, the tick boxes can be used as follows.
  ☐ Ex ia IIC/IIB T4 Ga
  ☑ Ex ic IIC T4 Gc

Note 4. Operation

- If the pressure transmitter is mounted in an area where explosive atmospheres may be present, it must be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust are avoided.

Note 5. Specific conditions of use
See control drawing IIE020-A70 (Note 7.)

Note 6. Maintenance and Repair

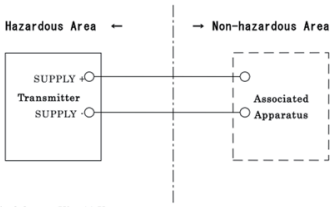
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.

Note 7. Control drawing

Model: EJX Series Date: April 01, 2013

13 Control Drawing

Following instructions shall be included in the user's manual, together with the following items:
- a list of the standards in Section 1 of IIE020-A03, including the issue year;
- specifications in Section 2 of IIE020-A03;
- marking information in IIE020-A60.



Electrical data: Ui = 32 V
Ci = 3.52 nF
Li = 0 µH

Specific Conditions of Use:
- Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.
- The dielectric strength of at least 500 V a.c. r.m.s. between the intrinsically safe circuits and the enclosure of the pressure transmitter is limited only by the overvoltage protection.

WARNING:
- POTENTIAL ELECTROSTATIC CHARGING HAZARD - SEE THE USER'S MANUAL

Notes:
- The pressure transmitter is allowed to be installed in "nL" systems, on condition that the output parameters of the "nL" source (associated energy-limited apparatus) are suitable to the above-mentioned input parameters of the pressure transmitter and the cable parameters.
- Cable glands, adapters and/or blanking elements shall be of Ex "n", Ex "e" or Ex "d" and shall be installed so as to maintain the specified degree of protection (IP Code) of the equipment.
- In case of multiple types of protection, the selected Ex marking on the marking plate shall be checked at the time of installation.

Rev.1: September 02, 2019
Doc. No.: IIE020-A70
Drawing: T.Itou
Approved: A.Matsunaga

Yokogawa Electric Corporation

3. About PROFIBUS PA

3.1 Outline

PROFIBUS PA is a widely used bi-directional digital communication protocol that enables the implementation of technologically advanced process control systems. The DPharp EJX/EJA Series PROFIBUS PA communication type meets the specifications of PROFIBUS Nutzerorganisation e.V. and is interoperable with devices from Yokogawa and other manufacturers.

3.2 Internal Structure of DPharp

3.2.1 Function Block

The transmitter contains five function blocks that share the following functions:

(1) Physical block

- Manages the status of transmitter hardware.

(2) SENSOR Transducer block

- Converts sensor output to pressure, static pressure, and capsule temperature signals, and transfers to the AI function blocks.
- Carries out square root signal characterize extraction.
- Flow rate calculation.

(3) LCD Transducer block

- Controls the display of the integral indicator.

(4) AI (Analog Input) function block

- Condition raw data from the Transducer block.
- Output differential pressure, static pressure and capsule temperature signals setting via the channel.
- Carry out scaling, damping and square root extraction.

(5) Totalizer function block

- Execute totalizer management of signal from AI function block.
- Output totalized signal.

3.3 Logical Structure of Each Block

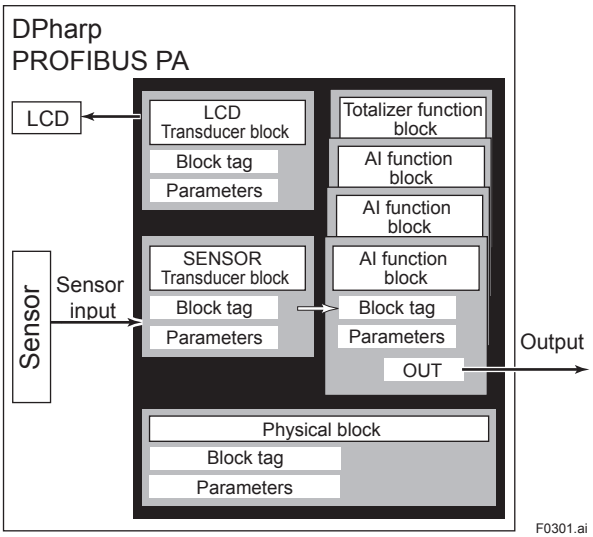


Figure 3.1 Logical Structure of Each Block

Setting of various parameters, Bus addresses, and TAG is required before starting operation.

3.4 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 achieve optimal performance.

4. Getting Started

PROFIBUS PA is fully dependent upon digital communication protocol and differs in operation from conventional 4 to 20 mA transmission.

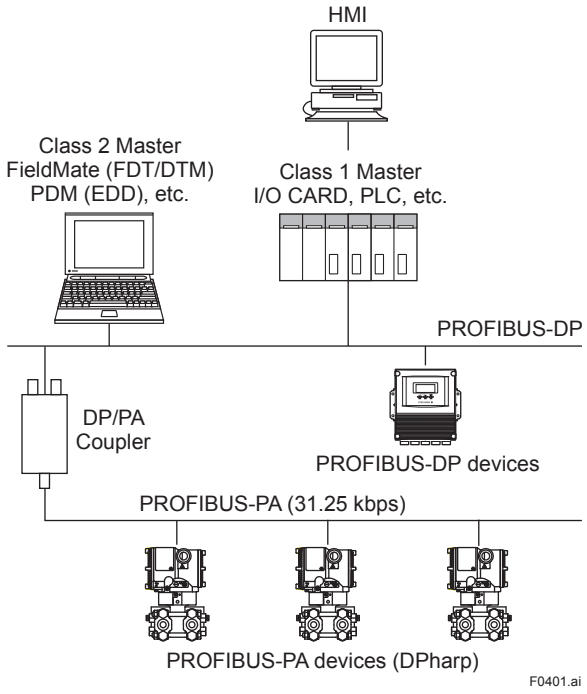


Figure 4.1 Profibus System Construction

4.1 Connection of Devices

The following are required for use with PROFIBUS PA devices:

• Power supply:

PROFIBUS PA 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.
Power is supplied by a DP/PA coupler.

• Terminators:

PROFIBUS PA requires two terminators.
A terminator shall be located at each end of the trunk cable.

• Field devices:

Connect the PROFIBUS PA communication type field device. Two or more transmitters or other field devices can be connected.

• DP/PA Couplers:

PROFIBUS PA requires DP/PA couplers which convert the RS-485 signals to the IEC 61158-2 signal level and power the field devices via the PROFIBUS PA.

• Cable:

Refer to Table 4.1.

Table 4.1 PROFIBUS PA Cables and Transmissible Length

Type of cable	Cable specifications	Max. length of cable (reference value)
Type A: Individually-shielded twisted pair cable	#18AWG (0.82 mm^2)	1,900 m
Type B: Overall-shielded twisted pair cable	#22AWG (0.32 mm^2)	1,200 m
Type C: Unshielded twisted pair cable	#26AWG (0.13 mm^2)	400 m
Type D: Overall-shielded non-twisted cable	#16AWG (1.25 mm^2)	200 m

Note: Yokogawa recommends the use of Type A.
Usage of Type B and D is restricted.
Yokogawa does not recommend the use of Type C.

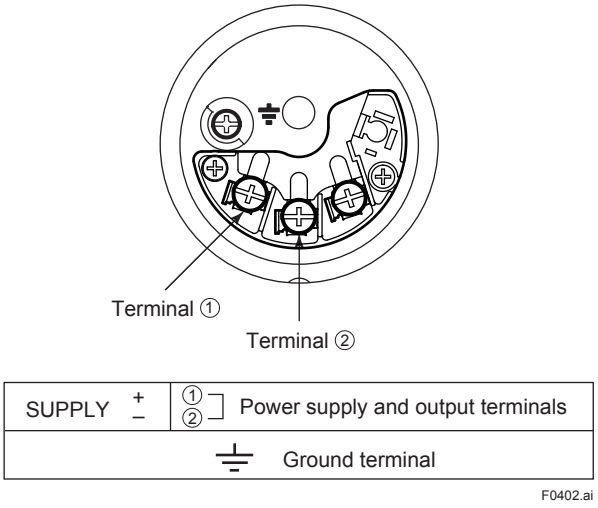
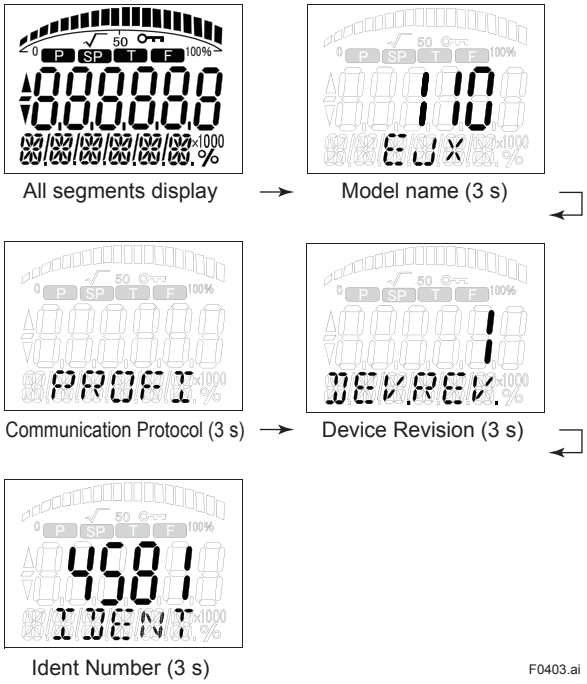


Figure 4.2 Wiring Diagram

4.2 Bus Power ON

Turn on the power of the host and the bus.

For models with the integral indicator code “E”, the display shows all segments in the LCD and then changes to the displays shown below sequentially.



Either “EJX” or “EJA” is displayed on the “Model name” display depends on the model of transmitter.

NOTE

LCD display can be set to all segments display only by changing the following parameter.
LCD Tranceducer Block Power On Information (POWER_ON_INFO)
1:ON(Default)
Show all segments display, Model name, Communication Protocol, Device Revision and Ident Number when powering on.
0:OFF
Show all segments display when powering on.

- Procedure to call up the display

DTM, EDD	Local Display → Power On Information
ON	Enable the power on information
OFF	Disable the power on information

4.3 Confirmation of Device Information

Software Revision, Device Revision and Ident Number can be confirmed by following procedure.

(1) Software Revision

(a) Confirmation by the name plate
Software Revision is marked on the name plate. Refer to Figure 4.3.

(b) Confirmation by parameter
Software Revision can be confirmed from Physical Block parameter Software Revision (SOFTWARE_REVISION).

- Procedure to call up the display

DTM	Physical Block → Identification → Software Revision
EDD	Identification → Device → Software Revision

(2) Device Revision

(a) Confirmation by the name plate
Device Revision is marked on the name plate. Refer to Figure 4.3.

(b) Confirmation by parameter
Device Revision can be confirmed from parameter Device Revision Compatibility or Device Revision. (DEV_REV_COMP, DEV_REV)

- Procedure to call up the display

DTM	[Menu] → Query Device → Query Device PB →
EDD	[Menu] → View → Device Status → General → Physical Block →
→ Device Revision Compatibility	Compatibility of Device Revision
→Device Revision	Device Revision

(3) Ident Number

Refer to section 4.5 for explanation of Ident Number.

(a) Confirmation by the name plate
Device specific Ident Number and Profile Ident number is marked on the name plate. Profile Ident Number is inside [ ]. (9700 to 02(9720), 9740 to 42(9742))
Refer to Figure 4.3.

(b) Confirmation from integral indicator (When the integral indicator code “E”)
Please refer to section 4.2.

(c) Confirmation by parameter
Ident Number can be confirmed from Physical Block parameter Ident Number (IDENT_ NUMBER).

- Procedure to call up the display

DTM	Physical Block → Identification → ID No.
EDD	Identification → Device → ID No.

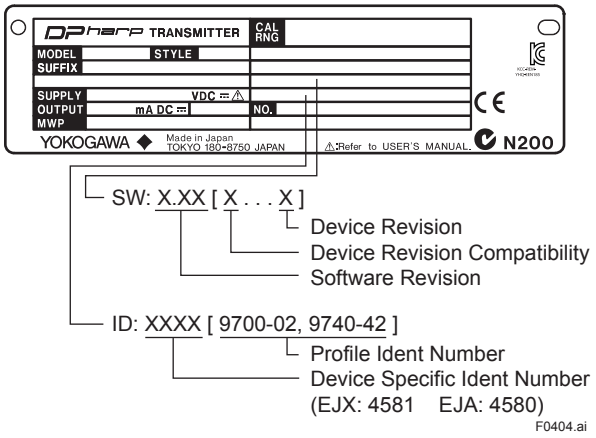


Figure 4.3 Name Plate

4.4 Master Settings

To activate PROFIBUS PA, the following bus parameters must be set for the master.

Table 4.2 Bus Parameters

Symbol	Parameter	Description and Settings
Transmission rate	Transmission Rate	The transmission rate of PROFIBUS PA matches that of the segment coupler. e.g P+F: 93.75 kbps, Siemens: 45.45 kbps
TSL	Slot Time	The maximum time a master station must wait for the complete reception of the first octet of a response (11 bits). e.g: 4095
min TSDR	Min. Station Delay Timer	Sets the minimum time at which a slave can send the first bit of a response back.
max TSDR	Max. Station Delay Time	Sets the maximum time at which a slave can send the first bit of a response back.
TQUI	Quiet Time	Controls the time at which the bus electronics or software of the sender is set to receive mode after a message is sent.
TSET	Setup Time	Sets the maximum allowable time for parameter setting and response by the slave.
HSA	Highest Station Address	Sets the highest station address in the network.
G	Gap update factor	Sets the number of token cycles after which the master will search for a new master.
max. retry limit	Max Retry Limit	Sets the number of retries that are performed after a receiver does not respond to a message.

4.5 Integration of GSD file and IDENT Number

The GSD file and Ident number are necessary for PROFIBUS communication. Before starting communication, the device must be specified by the GSD file in the host system and the Ident number of the device.

The PROFIBUS device has a profile Ident number and a device-specific Ident number. There are GSD files which correspond to each number. The profile GSD file is a general-purpose file which is defined by the kind and number of function blocks of the device. This file helps improve the compatibility among devices.

By setting the PROFIBUS Ident Number (IDENT_NUMBER_SELECTOR) parameter of the physical block or the Ident number at the Local Operation Interface, the Ident number will be linked with the corresponding GSD file. For the setting at the Local Operation Interface, see Chapter 7.5.

Table 4.3 Device specific ID GSD file

Model Name	Device specific Ident Number	Device Specific GSD file
EJX□□□A	0x4581	YEC4581.gsd
EJA□□□E	0x4580	YEC4580.gsd

Table 4.4 Profile ID GSD file

Profile ID	Profile Ident Number	Profile GSD file
AI ×1	0x9700	pa139700.gsd
AI ×2	0x9701	pa139701.gsd
AI ×3	0x9702	pa139702.gsd
AI ×1+TOT	0x9740	pa139740.gsd
AI ×2+TOT	0x9741	pa139741.gsd
AI ×3+TOT	0x9742	pa139742.gsd

4.6 Bus Address Setup

This section describes the procedure to set Bus Address in the transmitter. Every device in PROFIBUS must be assigned a unique address in the range of 0(0x00) to 126(0x7e). If it is not specified at the time of order, 126(0x7e) is the factory default. Do not change to 0, 1 or 2 as these are used by master devices.
There are two ways to set Bus Address: by using communication tools or by Local Operation Interface. Refer to chapter 7.5 for setting procedure by using Local Operation Interface. Below is an example of changing Bus Address from 5 to 20 by using DTM works.

1. In the FieldMate window, click [Segment Viewer] → [User Defined Connection] and click [New FDT Project ...].
2. In the DTM Works window, click [Topology] → [Add].
3. In the Catalog window, click [PROFIBUS DPV1] of Protocol → [PROFIdtm DPV1] and click [Add] button.
4. In the DTM Works window, click [Device] → [Connect].
5. In the DTM Works window, click [Device] → [Additional Functions] → [Set Device Station Address...].
6. Enter [Old Address] to 5 and [New Address] to 20 and click [Set] button.
   “New address successfully set” is displayed in the State field.
7. Click [Close] button and exit DTM works
8. When changing a parameter after changing the Address, click [View] → [Update] in the FieldMate window.

5. Parameter Setting

5.1 Easy Setup

IMPORTANT

After setting and sending data with the configuration tool, wait 30 seconds before turning off the transmitter. If it is turned off too soon, the setting will not be stored in the transmitter.

5.1.1 Tag Number, Descriptor, Message and Installation Date

If there are specified when ordering, the desired Tag No. is set and shipped. Tag No. can be checked as follow.

- Procedure to call up the display

DTM, EDD	Easy Setup → TAG

When Tag No. is changed, input them based on the following limitation.

Item	Limitations
TAG	Up to 32 characters or numbers
Descriptor	Up to 32 characters or numbers
Message	Up to 32 characters or numbers
Installation Date	Up to 16 characters or numbers
Sensor Calibration Date Manufacture Date	yyyy/mm/dd/ hh:mm:ss - yyyy: years (4 digits) - mm: month (2 digits) - dd: days (2 digits) - hh: hours (2 digits) - mm: minutes (2 digits) - ss: seconds (2 digits)

SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	

*: SP shows one-byte space

5.1.2 Pressure Range (Scale In) and Pressure Unit

Sensor Transducer Block Target Mode need to be changed to Out of Service (O/S) before changing range values and pressure unit.

DTM, EDD	Easy Setup → Sensor Transducer Block → Target Mode

(1) Pressure Range (Scale In)

The range values are factory-set as specified by the customer. To change the range, follow the steps below.

- Procedure to call up the display

DTM	Easy Setup → Sensor Transducer Block → Scale In →
LRV	Scale In:Lower Value
URV	Scale In:Upper Value
EDD	Easy Setup → Sensor Transducer Block → Measuring Range – Scale In →
→ LRV	Lower Value
→ URV	Upper Value

(2) Pressure Unit

The unit parameter is set at the factory before shipment if specified at the time of order. Follow the procedure below to change the unit parameter.

- Procedure to call up the display

DTM	Easy Setup → Sensor Transducer Block → Pressure Unit
EDD	Easy Setup → Sensor Transducer Block → Measuring Range – Scale In → Pressure Unit

Available pressure units are shown below.

μPa	inH_2O (68 deg C)	Pag
mPa	mmH_2O	hPaa
Pa	mmH_2O (4 deg C)	hPag
hPa	mmH_2O (68 deg C)	kPaa
kPa	ffH_2O	kPag
MPa	ffH_2O (4 deg C)	MPaa
GPa	ffH_2O (68 deg C)	MPag
mbar	inHg	GPaa
bar	inHg (0 deg C)	GPag
torr	mmHg	psia
atm	mmHg (0 deg C)	psig
psi	μPaa	gf/cm^2a
gf/cm^2	μPag	gf/cm^2g
kgf/cm^2	mPaa	kgf/cm^2a
inH_2O	mPag	kgf/cm^2g
inH_2O (4 deg C)	Paa	

5.1.3 Output Mode (Characterization Type)

The Output Mode (Characterization Type) is set as specified in the order when the instrument is shipped. Follow the procedure below to change the Output Mode. Sensor Transducer Block Target Mode need to be changed to Out of Service (O/S) before changing Output Mode(Characterization Type).

DTM, EDD	Easy Setup → Sensor Transducer Block → Target Mode

- Procedure to call up the display

DTM, EDD	Easy Setup → Sensor Transducer Block → Characterization Type →
→ Linear	Linear output
→ User defined (table)	Signal Characterizer
→ Square root	Square root output

5.1.4 Output Scale (Out Scale) and Unit

Analog Input 1 Function Block Target Mode need to be changed to Out of Service (O/S) before changing Output Scale(Out Scale) and Output Scale Unit.

DTM	Easy Setup → Analog Input 1 → Target Mode
EDD	Easy Setup → Function Block 1 – Analog Input → Target Mode

(1) Output Scale (Out Scale)

- Procedure to call up the display

The Out Scale is factory-set as specified by the customer. To change the range, follow the steps below.

DTM	Easy Setup → Analog Input 1 →
→ LRV	Out Scale:Lower Value
→ URV	Out Scale:Upper Value
EDD	Easy Setup → Function Block 1 – Analog Input → Output Scale
→ LRV	Lower Value
→ URV	Upper Value

(2) Out Scale Unit

The unit parameter is set at the factory before shipment if specified at the time of order. Follow the procedure below to change the unit parameter.

- Procedure to call up the display

DTM	Easy Setup → Analog Input 1 → Out Scale:Unit
EDD	Easy Setup → Function Block 1 – Analog Input → Output Scale → Unit

5.1.5 Damping time constant (Filter Time Const)

The damping time constant is set at the factory before shipment if specified at the time of order with option code /CD. Follow the procedure below to change the damping time constant. Target Mode of Analog Input 1 Function Block need to be changed to Out of Service (O/S).

DTM	Easy Setup → Analog Input 1 → Target Mode
EDD	Easy Setup → Function Block 1 – Analog Input 1 → Target Mode

- Procedure to call up the display

DTM	Easy Setup → Analog Input 1 → Filter Time Const
EDD	Easy Setup → Function Block 1 – Analog Input 1 → Filter Time Const

5.2 Calibration

The transmitter is factory characterized, Factory characterization is the process of comparing a known pressure input with the output of each transmitter sensor module over the entire pressure and temperature operating range. During the characterization process, this comparison information is stored in the transmitter EEPROM. In operation, the transmitter uses this factory-stored curve to produce process variable output (PV), in engineering units, dependent on the pressure input.

The calibration procedure allows you to adjust for local conditions, changing how the transmitter calculates process variables. There are two ways to calibrate: zero point adjustment typically used to compensate for mounting position effects or zero shifts caused by static pressure. A full calibration is a two-point process, in which two accurate end-point pressures are applied (equal to or greater than the range value), and all output is linearized between them.

5.2.1 Pressure Calibration

(1) Zero Point Adjustment

Zero Point Adjustment can be performed in several ways. Choose the optimum method in accordance with the circumstances specified to the application employed.

a. Auto zero adjustment (Lower Calibration Point)

Lower Calibration Point carries out the zero adjustment and automatically sets the applied “0” input values to the output value of “0”, keeping the span constant. Use this setting when the LRV is known to be “0”. Calibration

Target Mode need to be changed to Out of Service (O/S) before zeroing by Lower Calibration Point.

DTM	Zero Point Adjustment → Target Mode
EDD	[Menu] → Device → Zero Point Adjustment → Target Mode

- Procedure to call up the display

DTM	Zero Point Adjustment
EDD	[Menu] → Device → Zero Point Adjustment →
→ Set Zero (Method)	Adjust the lower point

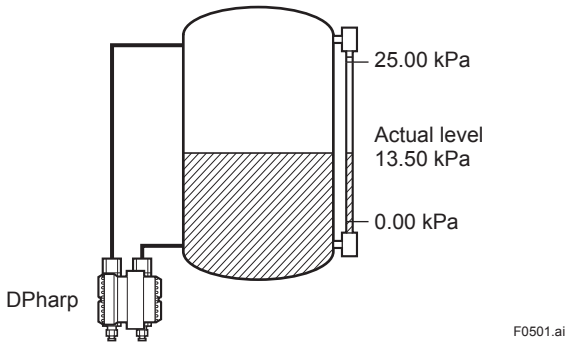
b. Manual zero adjustment (Lower Calibration Deviation)

This zero adjustment calibrates the transmitter output corresponding to the reference pressure. For Tank level measurement for example, enter the actual tank level data which have determined by glass gauge or other level measuring instrument.

- Procedure to call up the display

DTM	Calibration → Pressure Calibration → Calibration →
EDD	[Menu] → Device → Sensor Calibration → Pressure Calibration → Calibration →
→ Lower Calibration Deviation	Adjust the lower point

DPharp span: 0 to 25.00 kPa
Actual level: 13.50 kPa
Transmitter output: 13.83 kPa



c. Zero Point Adjustment by using adjustment Screw

Follow the procedure below to enable or inhibit zero point adjustment by means of the external zero-point adjustment screw on the transmitter. Local Operation setting need to be changed to “Enabled” before adjustment.

- Procedure to call up the display

DTM	Physical Block → Configuration → Local Operation →
EDD	Identification → Device → Local Operation →
→ Enabled	Enable the external zero point adjustment
→ Disenabled	Disenable the external zero point adjustment

(2) Full Adjustment

The full adjustment is a two-point adjustment, and the lower point adjustment should always be performed before the upper point adjustment in order to maintain the pitch between the zero and 100% points within the calibration range.

In the manual method, the reference pressure should also be applied to the transmitter at both the lower and upper points. Without the reference pressure, Lower calibration deviation and Upper calibration deviation may not represent the correct value for each adjustment points.

a. Auto Adjustment

Applying reference pressure of 0% and 100% of the measurement range to the transmitter, adjust the lower and upper points automatically.

- Procedure to call up the display

DTM	Calibration → Pressure Calibration → Calibration →
EDD	[Menu] → Device → Sensor Calibration → Pressure Calibration → Calibration →
→ Lower Calibration Point	Auto adjustment for 0% point
→ Upper Calibration Point	Auto adjustment for 100% point

b. Manual Adjustment

Using the example below, follow the steps to perform the full sensor trim by manually. Suppose that Lower Calibration Deviation and Upper Calibration Deviation represent the previously adjusted values.

Example: For the range of 1000 to 3000 mmH_2O
Lower Calibration Deviation: −4.0 mmH_2O
Upper Calibration Deviation: −3.0 mmH_2O

<1> Call up the Lower Calibration Deviation

- Procedure to call up the display

DTM	Calibration → Pressure Calibration → Calibration →
EDD	[Menu] → Device → Sensor Calibration → Pressure Calibration → Calibration →
→ Lower Calibration Deviation	Adjust the lower point

<2> Suppose that a standard pressure of 1000 mmH_2O is applied and the value of the output signal is 994 mmH_2O. Correct for this output error of 6 mmH_2O by adding 6 mmH_2O to Lower Calibration Deviation.
−4.0+6.0=+2.0

<3> Enter the correction value of “2” to the Lower Calibration Deviation.

<4> Call up the Upper Calibration Deviation

- Procedure to call up the display

DTM	Calibration → Pressure Calibration → Calibration →
EDD	[Menu] → Device → Sensor Calibration → Pressure Calibration → Calibration →
→ Upper Calibration Deviation	Adjust the upper point

<5> Suppose that a standard pressure of 3000 mmH_2O is applied and the value of the output is 3015.0. Firstly, obtain the slope error for the span as follows.

Slope Error=
3000−3015/3000×(3000-1000)=−10

Then correct this slope error of −10 by adding −10 to Upper Calibration Deviation.
−3.0+(−10)=−13

<6> Enter the correction value of “-13” to the Upper Calibration Deviation.

(3) Static Pressure Calibration

For the transmitter, full sensor calibration of the static pressure is performed in the same way as with the differential pressure.

- Procedure to call up the display

DTM	Calibration → Static Pressure Calibration → Calibration →
EDD	[Menu] → Device → Sensor Calibration → Static Pressure Calibration → Calibration →
→ SP Lower Calibration Point	Auto adjustment for 0% point
→ SP Upper Calibration Point	Auto adjustment for 100% point
→ SP Lower Calibration Deviation	Manual adjustment for 0% point
→ SP Upper Calibration Deviation	Manual adjustment for 100% point

(4) Reset Adjustment to Factory Setting

The Clear Calibration method can reset the adjustment to the initial calibrated values that were set. The amount of the adjustment performed with the external zero-adjustment screw is returned the initial setting as well.

- Procedure to call up the display

DTM	Calibration →
EDD	[Menu] → Device → Sensor Calibration → Clear Calibration
→ Clear Calibration (Method)	Reset adjustment to factory setting

5.3 Input Signal Setup

5.3.1 Low Flow Cut Off

Low cut mode can be used to stabilize the output signal near the zero point. Note that this function is only available when Output Mode (Characterization Type) is “Square root”.

Example: Low cut at 20%

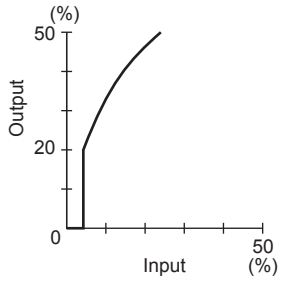


Figure 5.1 Low Flow Cut Off

Follow the procedure below to change the low cut point. Sensor Transducer Block Target Mode needs to be changed to Out of Service (O/S) before changing low cut point.

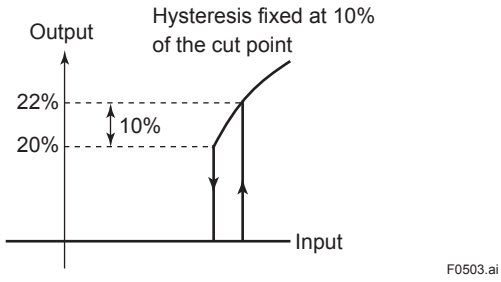
DTM	Input → Target Mode
EDD	Input → Sensor Transducer Block → Target Mode

- Procedure to call up the display

DTM, EDD	Input → Sensor Transducer Block → Characterization → Low Flow Cut Off

The low cut point has hysteresis so that the output around the point is behaved as below figure. (Hysteresis for the cut point: 10% of the cut point)

<Example>
Low cut: 20.00%



5.3.2 Primary Value Scale (Scale Out) and Primary Value Unit

Primary value is measured value available to the function block. Sensor Transducer Block Target Mode needs to be changed to Out of Service (O/S) before changing primary value scale and primary value unit.

DTM	Input → Target Mode
EDD	Input → Sensor Transducer Block → Target Mode

(1) Output Scale (Scale Out)

To change the Output Scale, follow the steps below.

- Procedure to call up the display

DTM	Input → Sensor Transducer Block → Primary Value →
→ LRV	Scale Out:Lower Value
→ URV	Scale Out:Upper Value
EDD	Input → Sensor Transducer Block → Measured Value – Primary Value →
→ LRV	Lower Value
→ URV	Upper Value

(2) Primary Value Unit

Follow the procedure below to change the unit parameter.

- Procedure to call up the display

DTM	Input → Sensor Transducer Block → Primary Value → Primary Value Unit
EDD	Input → Sensor Transducer Block → Measured Value – Primary Value → Unit

5.3.3 Signal Characterizer

Below is the example of performing the signal characterizer as shown in Figure 5.2. Target Mode of Sensor Transducer Block need to be changed to Out of Service (O/S) before setting linearization table. In order to use signal characterizer, "User defined (table)" must be chosen for Characterization Type. Refer to subsection 5.1.3 for changing Characterization Type.

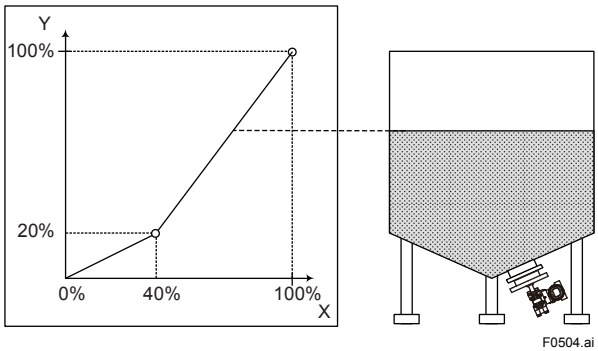


Figure 5.2

<1>Configuration of new linearization table can be performed in "Query Device" in "Device" menu in top section of tool window.

- Procedure to call up the display

DTM	[Device] → Configuration → Characterization → Table Coordinate →
EDD	[Device] → Characterization → Linearization →
→ Operation Mode	Select the transaction of the user defined table

Table 5.1 Operation Mode

Code	Description
0	Not initialized.
1	New operation characteristic, first value.
3	Last value, end of transmission, check table, or swap the old curve with the new curve.
4	Delete point of table.
5	Insert point defined.
6	Replace point of table.

Select "1: New operation characteristic, first value" for new operation.

<2>Enter Lower and Upper Scale In / Out value. Refer to subsection 5.1.2 and 5.3.2 for procedure. For this case, scales should be entered shown as below.

Scale In: Lower Value → 0
Scale In: Upper Value → 100
Scale out: Lower Value → 0
Scale unt: Upper Calue → 100

<3>Enter Coordinate No. and X, Y value

- Procedure to call up the display

DTM	[Device] → Configuration → Characterization → Table Coordinate →
EDD	[Device] → Characterization → Linearization →
→ Coordinate No.	Number of coordinate
→ X Y value couple - X	Input value of linearization table
→ X Y value couple - Y	Output value of linearization table

$X_i=(PrV–ScaleIn_L)/(ScaleIn_U–ScaleIn_L)$
$Y_i=X_i×\{(ScaleOut_U–ScaleOut_L)+ScaleOut_L\}$
(i=1 to 31)

PrV: Pressure Value
ScaleIn_L: Scale In:Lower Value
ScaleIn_U: Scale In:Upper Value
ScaleOut_L: Scale Out:Lower Value
ScaleOut_U: Scale Out:Upper Value

For this case, Coordinate No. and X/ Y values should be entered shown as below.

Coordinate No.: 1
X Y value couple – X : 0.0
X Y value couple – Y : 0.0

Coordinate No.: 2
X Y value couple – X : 0.4
X Y value couple – Y : 0.2

Coordinate No.: 3
X Y value couple – X : 1.0
X Y value couple – Y : 1.0

<4>To definite linearization table, select Code: 3 in Operation Mode shown in procedure <1> and update linearization table.

<5>To confirm entered coordinate.

- Procedure to call up the display

DTM	[Device] → Configuration → Characterization → Table Data
EDD	[Device] → Characterization → Linearization Table

5.3.4 Calculate Coefficient (For flow rate calculation)

Calculate Coefficient is constant mainly for calculation of flow rate output signal. Follow below procedure to set the Calculate Coefficient. Sensor Transducer Block Target Mode needs to be changed to Out of Service (O/S) before enters Calculate Coefficient.

DTM	Input → Target Mode
EDD	Input → Sensor Transducer Block → Target Mode

- Procedure to call up the display

DTM, EDD	Input → Sensor Transducer Block → Calculated Value → Calculate Coefficient

There are two methods for the calculation of the Calculate Coefficient (below Kfactor).

Method 1: Calculating the Kfactor by flow parameters

Method 2: Calculating the Kfactor by means of the flow condition

Method 1. Calculating the Kfactor by flow parameters.

<1>Selection of the flow equation
Select the desired operational expression according to the fluid type and the flow unit category shown in Table 5.2.

<2>Confirming the unit
The unit to be used in this calculation is as follows:
Differential pressure: Pa
Static Pressure: kPa abs
Temperature: K
The dimension of the pressure unit Pa are $M \cdot L^{-1} \cdot S^{-2}$
Where M: mass (Kg)
L: Length (m)
S: Time (second)

<3>Preparation of flow parameters for Kfactor calculation
Each parameter must be expressed in the following units.
d: m,
ρb and ρnorm: Kg/m^3
C, β, ε and K has no dimensions

<4>Calculation of the unit conversion coefficient Nc
The flow rate value does not change automatically when a flow unit parameter is set for the transmitter, and is always output as Kg/s (mass flow). M^3/s (volume flow), Nm^3/s (Normal volume flow.)
In order to obtain a value in your designated unit, it is necessary to set Nc.
Nc is a conversion coefficient for the flow and DP unit that is designated to be used.

<5>Selection of the Kfactor equation and calculation Select the Kfactor expression according to the unit category shown in Table 5.2.
Calculate the Kfactor using the parameters and the expression.

<6>Enter Kfactor as shown in beginning of this section.

IMPORTANT

If either the setting of flow unit or differential pressure unit is changed, Kfactor and Nc must be recalculated.

Table 5.2 Flow Operational Expression

Flow unit Category	Kfactor	Flow
Mass Flow	$Kfactor = \pi/4 \times Nc \times C/\sqrt{1-\beta^4} \times \varepsilon \times d^2 \times \sqrt{2 \times \rho b}$	Qm, Qv or Qv_norm = Kfactor × $\sqrt{\Delta P}$
Normal · Standard Volume Flow	$Kfactor = \pi/4 \times Nc \times C/\sqrt{1-\beta^4} \times \varepsilon \times d^2 \times \sqrt{2 \times \rho b}\ /\rho norm$	
Volume Flow	$Kfactor = \pi/4 \times Nc \times C/\sqrt{1-\beta^4} \times \varepsilon \times d^2 \times \sqrt{2/\rho b}$	

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Table 5.3 Symbols

#	Symbol	Description
1	Nc	Unit convert factor
2	Kfactor	Basic flow Calculation factor
3	C	Discharge Coefficient
4	ε	Expansion Factor
5	β	Diameter Ratio
6	d	Diameter of orifice
7	ρb	Base Density on Tb, SPb Condition
8	ρnorm	Density on Normal, Standard condition

Example 1: Calculation of Nc

(1) When flow unit is changed.
Nc= (Kg/s) /(Mass Flow unit in use)

Table 5.4 Example of Calculated Nc by Flow Unit

Flow unit	Calculation of Nc	Nc
kg/s	(kg/s) / (kg/s) = (1kg/1s) / (1kg/1s)	1
kg/h	(kg/s) / (kg/h) = (1kg/1s) / (1kg/3600s)	3600
lb/s	(kg/s) / (lb/s) = (1kg/1s) / (0.4535924kg/1s)	2.204623
lb/h	(kg/s) / (lb/h) = (1kg/1s) / (0.4535924kg/3600s)	7936.648

(2) When differential pressure unit is changed.
Nc = $\sqrt{(\text{Differential pressure unit})/(\text{Pa})}$

Table 5.5 Example of Calculated Nc by Differential Pressure Unit

Δp unit	Calculation of Nc	Nc
Pa	$\sqrt{(\text{Pa}) / (\text{Pa})} = \sqrt{(1\text{Pa}) / (1\text{Pa})}$	$\sqrt{1} = 1$
kPa	$\sqrt{\text{kPa/Pa}} = \sqrt{1000\text{Pa} / 1\text{Pa}}$	$\sqrt{1000} = 31.62278$
inH2O@68degF	$\sqrt{\text{inH2O@68degF / Pa}} = \sqrt{248.6406\text{Pa} / 1\text{Pa}}$	$\sqrt{248.6406} = 15.76834$

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(3) When both flow unit and differential pressure unit are changed.
Nc =(Kg/s)/(Mass Flow unit of use) × $\sqrt{(\text{Differential pressure unit of use})/(\text{Pa})}$

Example 2: Calculation of Kfactor

Qm unit = kg/s, Differential pressure unit = kPa

$$\text{Kfactor} = \pi/4 \times Nc \times C/\sqrt{1-\beta^4} \times \varepsilon \times d^2 \times \sqrt{2\times\rho b}$$

$$= 0.7853982 \times 31.62278 \times 0.6043 /\sqrt{1-0.1296} \times 0.984 \times 0.03162^2 \times \sqrt{2\times1.250380}$$

$$= 0.02502868$$

$$\fallingdotseq 0.02503$$

Table 5.6 Flow Parameter of Example

Symbol	Value	Description
C	0.6043	Discharge coefficient Orifice Corner Taps [ISO5167-1 1991] ReD 1×10^6
ε	0.984	Expansion factor β=0.6, Δρ=50,000 Pa, SP=1,000,000 Pa abs, κ=1.399502
β	0.6	Diameter ratio
d	0.03162 m	Bore of orifice
D	0.0527 m	Pipe diameter
ρb	1.250380 kg/m^3	Base Density on Tb, SPb Condition (NITROGEN 101,325 Pa abs 273.15 K)
π/4	0.7853982	
Nc	31.62278	Unit convert factor when DP unit is kPa $\sqrt{\text{kPa/Pa}} = \sqrt{1000\text{Pa} / 1\text{Pa}} = 31.62278$

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Example 3: Calculation of Qm

$\Delta p = 50\text{kPa}$,

$$Qm(kg/s) = Kfactor \times \sqrt{\Delta p}$$
$$= 0.02503 \times \sqrt{50}$$
$$= 0.1770\ (kg/s)$$

Method 2. Calculating the Kfactor from differential pressure and flow rate in normal condition

(1) The flow rate and the differential pressure are calculated using the unit set to the transmitter.

(2) Calculation of the Kfactor
Calculate the Kfactor by using the flow rate and the differential pressure.
Kfactor can be calculated from equation shown in below.

$$Kfactor = [Qm / \sqrt{(\Delta p)}] / \sqrt{[(ScaleOut_U - ScaleOut_L) + ScaleOut_L]}$$

(3) Enter kfactor as shown in beginning of this section.

IMPORTANT

If either the setting of flow unit or differential pressure unit is changed, Kfactor must be recalculated.

Example: Kfactor Calculation

Table 5.7 Flow Condition Example

Symbol	Value	Description
Qm	0.3795 kg/s	Flow rate in normal condition
Δp	50 kPa	Differential pressure
ScaleOut_U	100 kPa	Upper valur of ScaleOut
ScaleOut_L	0 kPa	Lower value of ScaleOut

$$Kfactor = [Qm / \sqrt{(\Delta p)}] / \sqrt{[(ScaleOut_U - ScaleOut_L) + ScaleOut_L]}$$
$$= (0.3795 / \sqrt{50}) / \sqrt{[(100 - 0) + 0]}$$
$$= 0.005367$$

5.4 Output Signal Setup

5.4.1 Fail Safe Mode

Fail Safe Mode defines the Output Value and Status (Quality) when status of input signal to AI function block or Totalizer function block is BAD. This function is valid only when Actual Mode of AI function block or Totalizer function block is in "AUTO"

- Procedure to call up the display (AI function block)

DTM	Output → Analog Input (1-3) → Fail Safe Mode
EDD	Output → Function Block (1-3) – Analog Input → Fail Safe Mode → Fail Safe Mode

- Procedure to call up the display (Totalizer function block)

DTM	Output → Totalizer → Fail Safe Mode
EDD	Output → Function Block 4 – Totalizer → Fail Safe Mode

5.4.2 Channel

Channel is the parameter to select the signal which is calculated in SENSOR Transducer Block. Target Mode of each Function Block need to be changed to Out of Service (O/S).

DTM	Output → Analog Input (1-3), Totalizer → Target Mode
EDD	Output → Function Block (1-3) – Analog Input, Function Block 4 - Totalizer → Target Mode

- Procedure to call up the display

DTM	Output → Analog Input (1-3), Totalizer → Channel →
EDD	Output → Function Block (1-3) – Analog Input, Function Block 4 - Totalizer → Channel →
→ Pressure Value	Row pressure value before scaling
→ Primary Value	Differential pressure value
→ Calculated Value	Calculated value
→ Static Pressure (H)	Static pressure value of high pressure side
→ Static Pressure (L)	Static pressure value of low pressure side
→ Capsule Temperature	Capsule temperature value
→ Amplifier Temperature	Amplifier temperature value

5.4.3 Totalizer

This section shows procedure to set Signal Totalizer function. Refer to subsection 5.4.2 for Channel setting of Totalizer Function Block. Follow below procedure to set signal totalizer function.

<1>Set Totalizer Value Set

- Procedure to call up the display

DTM	Output → Totalizer → Totalizer Value Set →
EDD	Output → Function Block 4 – Totalizer → Totalizer Value →
→ Totalize	Normal operation of the totalizer
→ Reset	Assign value 0 to totalizer
→ Preset	Assign value of present value to totalizer

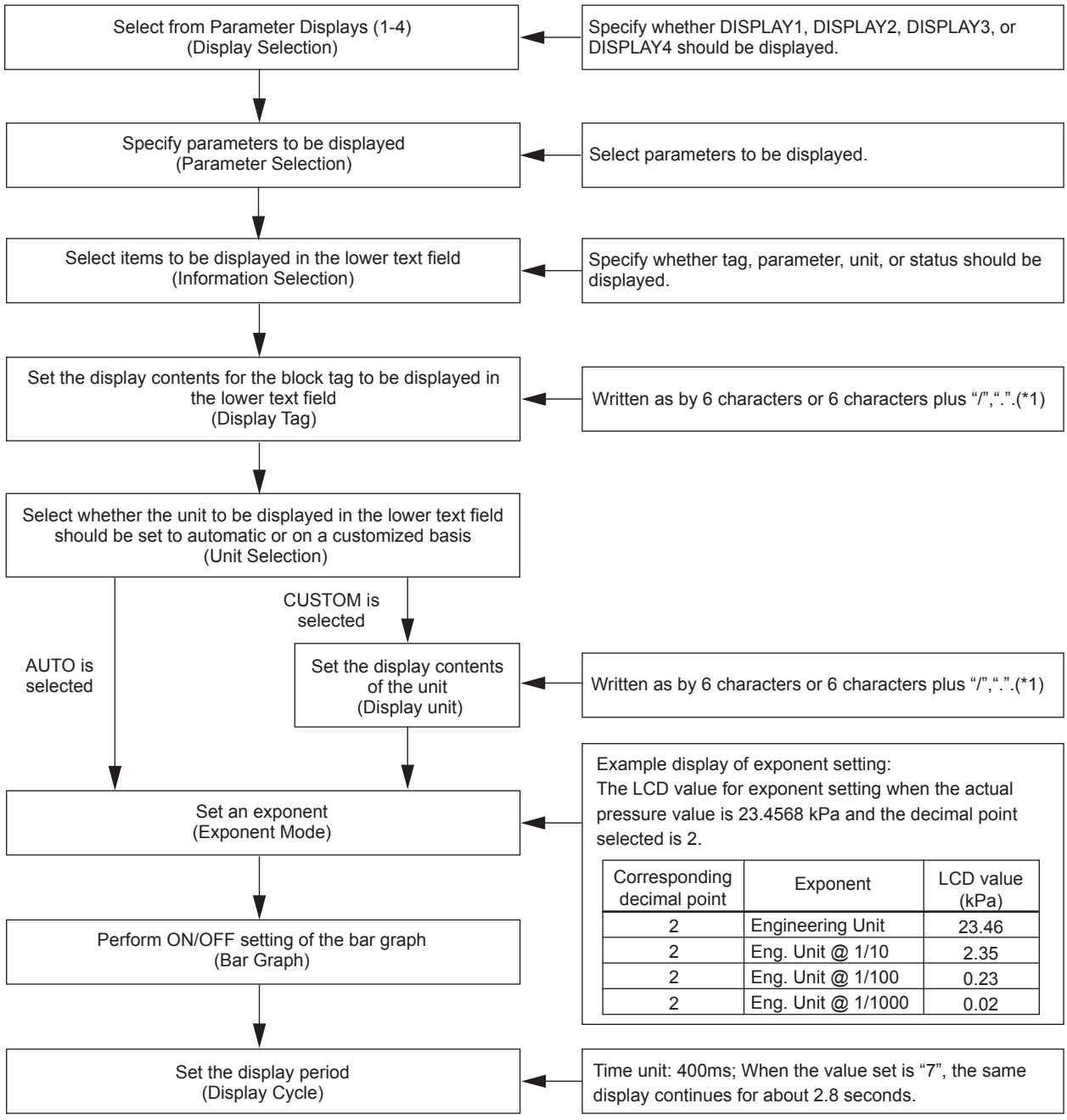
<2>Set Mode

- Procedure to call up the display

DTM	Output → Totalizer → Mode →
EDD	Output → Function Block 4 – Totalizer → Mode →
→ Pos. and neg. value	True arithmetic integration of the incoming rate values
→ Positive value only	Totalization of positive incoming rate value only
→ Negative value only	Totalization of negative incoming rate value only
→ Hold Count	Totalization stopped

5.5 Local Display

5.5.1 Procedure to Set the Integral Indicator



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*1: Combination of up to 6 characters of alphanumeric and the symbols of [/], [.] and [ ] (space) are available.
If the other characters are specified, space will be displayed.
The symbols of [/] and [.] cannot be specified on the head of a string.

Figure 5.3 Procedures to Set the Built-in Display

a. Display Selection

A cycle of up to four displays can be shown by assigning variables to the parameters at **Display Selection**.

- Procedure to call up the display

DTM, EDD	Local Display → Display Selections → Display Selection

b. Parameter Selection

At **Parameter Selection**, select the variable that will display on the integral indicator.

- Procedure to call up the display

DTM, EDD	Local Display → Display (1-4) Selections → Parameter Selection (1-4)
→ Display1	"on" or "off"
→ Display2	"on" or "off"
→ Display3	"on" or "off"
→ Display4	"on" or "off"

Set Parameter Selection 2, Parameter Selection 3 and Parameter Selection 4 in the same way if necessary.

In addition to the above item, "Not used" is also displayed as a selection item.

c. Information Selection

Information Selection parameter specifies whether Display tag, Parameter, Unit or Status should be displayed on bottom part of integral indicator.

- Procedure to call up the display

DTM, EDD	Local Display → Display Selections → Information Selection
→ TAG	"on" or "off"
→ PARAMETER	"on" or "off"
→ UNIT	"on" or "off"
→ STATUS	"on" or "off"

d. Display Tag

At **Display Tag** parameter, user can set display tag of up to 6 alphanumeric characters, slash (/) and period (.).

- Procedure to call up the display

DTM, EDD	Local Display → Display (1-4) Setup → Display Tag (1-4)

e. Unit Selection

Select whether unit to be displayed in the lower text field should be automatically selected or customized by user in parameter **Unit Selection**. Select "Auto" if you want to have unit chosen from specified units and "Custom" for engineering unit which you can input freely.

- Procedure to call up the display

DTM, EDD	Local Display → Display (1-4) Setup → Unit Selection (1-4)
→ Auto	Select unit from the list
→ Custom	Input engineering unit by user

f. Display Unit

Display Unit parameter allows the engineering unit to be displayed. Up to 6 alphanumeric characters and one slash (/) and one period (.) can be input at **Display Unit**; only the first six are displayed on the integral indicator.

- Procedure to call up the display

DTM, EDD	Local Display → Display (1-4) Setup → Display Unit (1-4)

Note that following symbols are not available.

% & < > * : + - , ' ( )

The integral indicator shows "------" when these symbols or more than two slashes are entered.

g. Exponent Mode

User can change the position of decimal point which is shown on the integral indicator. Select from 0, 1, 2, 3 or 4.

- Procedure to call up the display

DTM, EDD	Local Display → Display (1-4) Setup → Exponent Mode (1-4)

Example of exponent setting:

The LCD value for exponent setting when the actual pressure value is 23.4568kPa and the decimal point is selected '2'.

Corresponding decimal point	Exponent	LCD value (kPa)
2	Engineering Unit	23.46
2	Eng. Unit@1/10	2.35
2	Eng. Unit@1/100	0.23
2	Eng. Unit@1/1000	0.02

h. Bar Graph

ON/OFF setting of Bar Graph in upper field of integral indicator can be performed by **Bar Graph** parameter.

- Procedure to call up the display

DTM, EDD	Local Display → Bar Graph →
→ Enable	Enable to indicate bar graph
→ Disable	Disable to indicate bar graph

i. Display Cycle

Displaying period can be set from **Display Cycle** parameter.

- Procedure to call up the display

DTM, EDD	Local Display → Display Cycle →
→ Recommend	Display cycle: 2.8 s Update period of process value is 400 ms
→ 1-10	Display cycle: 400 ms × (Number selected)

6. Explanation of Basic Items

6.1 Outline

This chapter describes brief explanation of the SENSOR transducer block, the LCD transducer block, the AI function block, and the Totalizer function block.

Actual mode

Many parameters require a change of the mode of the function block to O/S (Out of Service) when their data is changed. To change the mode of the function block, its Target Mode (TARGET_MODE) needs to be changed. The Actual Mode (MODE_BLK) is comprised of the three sub-parameters below:

(1) Actual (Actual mode):
Indicates the current operating condition.
(2) Permit (Permitted mode):
Indicates the operating condition that the block is allowed to take.
(3) Normal (Normal mode):
Indicates the operating condition that the block will usually take.

6.2 SENSOR Transducer Block

The SENSOR transducer block is in between the sensor and the AI function blocks. It calculates pressure/differential pressure, static pressure, and capsule temperature from sensor signals. Then it performs damping and range checks for the measured values of these three variables and sends signals to the AI function block.

6.2.1 Functional Block

Figure 6.1 presents the functional block of the SENSOR transducer. The calculated values of pressure/differential pressure, H-side static pressure, L-side static pressure, and capsule temperature are assigned to PRIMARY_VALUE, STATIC_PRESSURE_HIGH_VALUE, STATIC_PRESSURE_LOW_VALUE, TEMPERATURE_VALUE and, AMP_TEMP_VAL respectively. Measured values output to the AI function blocks or Totalizer function block are selected by the Channel parameter of those blocks.

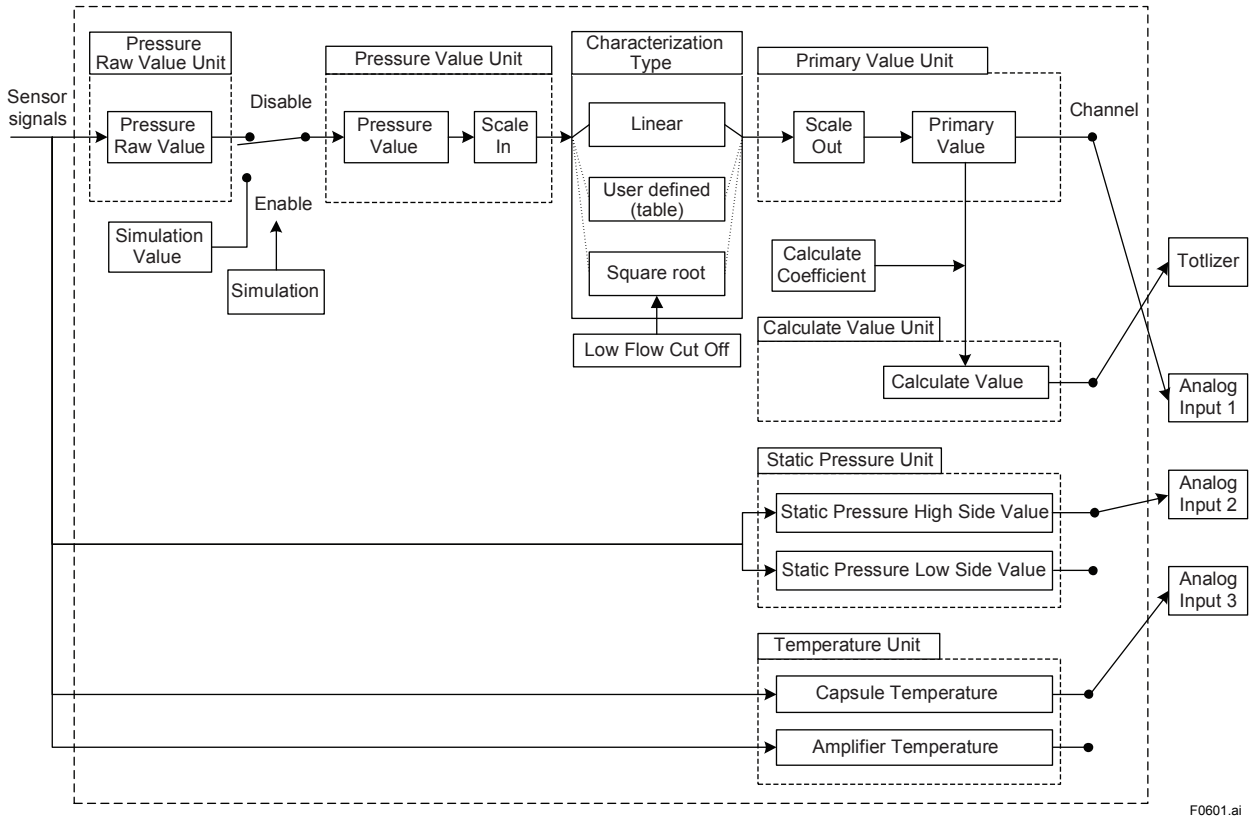


Figure 6.1 SENSOR Transducer Functional Block

6.2.2 Target Mode

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.

6.2.3 Basic Parameter of SENSOR Transducer Block

Scale In (SCALE_IN)

Scale In is the input conversion of pressure using high and low scale. The related unit is the pressure unit. Refer to 5.1.2 for configurations.

Primary Value (PRIMARY_VALUE)

This parameter contains the measured value and status available to the function block.

Calculate Coefficient (CALCULATE_COEF)

Coefficient for calculating Calculate Value (CALCULATE_VALUE). Calculate Coefficient can be considered as Kfactor for flow rate calculation. Refer to Subsection 5.3.4 for Kfactor calculation.

Calculated Value (CALUCULATE_VALUE)

Calculation result of (Primary Value) × (Calculate Coefficient)

Calculated Value Unit (CALCULATE_UNIT)

Unit for Calculate Value.

Characterization Type (LIN_TYPE)

Characterization type of output signal can be select from Linear, user defind (table) or Square root. user defind (table) is used to compensate the output for non-linear applications. For the measured pressure, a maximum of 31 coordinates can be specified between 0 – 100%. Please refer 5.1.3 to for more information.

Low Flow Cut Off (LOW_FLOW_CUTOFF)

This is the point in percent of flow until the output of the flow function is set to Zero. It is used for suppressing low flow values. Refer to 5.3.1 for detail.

6.3 LCD Transducer Block

6.3.1 Outline of the Functions

The LCD transducer block controls alarms and measured values that are displayed on the integral indicator. It displays not only OUT signals from the AI blocks, but also I/O signals of the Installed blocks on the integral indicator.

6.3.2 Target Mode

The Target modes permitted for the LCD transducer block are Automatic (Auto) and Out of Service (O/S). Settings can be changed in the AUTO mode for this block, except the Block tag parameter.

6.3.3 Display Contents of the Integral Indicator

The components of the integral indicator are the bar graph, the title field, the center field for numerical values, the lower text field, and auxiliary characters. The contents and meanings of these components are as follows:

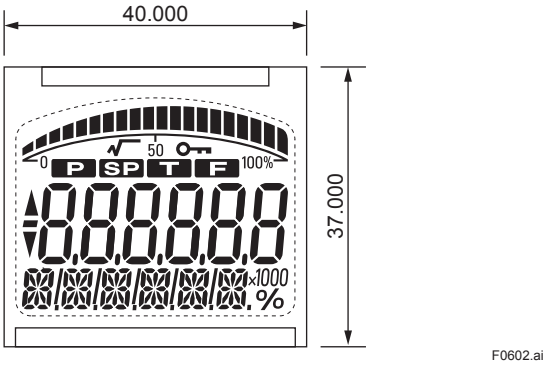
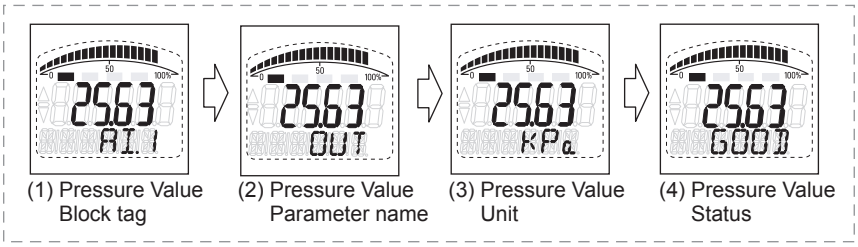


Figure 6.2 Screen Display of the integral indicator

Component name	Contents	
Bar graph	Shows the value displayed in the center field for numerical values scaled in terms of percentage.	
Center field for numerical values	Presents values of inputs and outputs. While the alarm is on, the alarm number alternates with the displayed value here.	
Lower text field	Displays tag, parameter name, unit, and signal status. While the alarm is on, the alarm contents alternate.	
Title field	Depicts the type of the value displayed on the center field for numerical value.	
	P	Flashes when pressure/differential pressure is displayed.
	SP	Flashes when static pressure is displayed.
	T	Flashes when temperature is displayed.
	F	Flashes when flow rate is displayed.
Auxiliary characters	%	Flashes when the center field for numerical values displays a % value.
	√	Flashes when square root display is selected.
	Key mark	Flashes when Write Protect is selected.
	×10, ×100, ×1000	Used when the calculated value displayed in the center field for numerical values is rounded.

6.3.4 Example Displays of the Integral Indicator

Example display of AI1 OUT



(1) Pressure Value Block tag
(2) Pressure Value Parameter name
(3) Pressure Value Unit
(4) Pressure Value Status

F0603.ai

Example display during mechanical failure alarm

Alarm number and
Error Massage (Capsule error)

F0604.ai

Table 6.1 Parameters to be displayed on LCD

Block Name	Parameter	Parameter Selection(1 to 4) (PARAMETER_SEL(1 to 4))	DISPLAY
AI1	OUT	AI1 OUT	OUT
AI2	OUT	AI2 OUT	OUT
AI3	OUT	AI3 OUT	OUT
TOTALIZER	TOTAL	TOTAL	TOTAL
SENSOR TRANSDUCER	SECONDARY_VALUE_1	Pressure Value	SV1
	PRIMARY_VALUE	Primary Value	PV
	CALCULATE_VALUE	Calculated Value	CAL.VAL
	STATIC_PRESSURE_HIGH_VALUE	Static Pressure (H)	SP.HI
	STATIC_PRESSURE_LOW_VALUE	Static Pressure (L)	SP.LO
	TEMPERATURE_VALUE	Capsule Temperature	CAP.TMP
	AMP_TEMP_VAL	Amplifier Temperature	AMP.TMP

6.3.5 Units That Can Be Displayed on the LCD by the Automatic Link Function

Index	Unit	Display
1000	K	Kelvin
1001	°C	degC
1002	°F	degF
1010	m	m
1011	km	km
1012	cm	cm
1013	mm	mm
1018	ft	ft
1019	in	in
1020	yd	yd
1034	m^3	m3
1035	dm3	dm3
1036	cm3	cm3
1037	mm3	mm3
1038	L	L
1039	cL	cl
1040	mL	ml
1041	hL	hl
1042	in3	in3
1043	ft3	ft3
1044	yd3	yd3
1045	mile3	mile3
1046	pint	pint
1047	quart	quart
1048	gal	gal
1049	ImpGal	ImpGal
1050	bushel	bushel
1051	bbl	bbl
1052	bbl (liq)	bblliq
1088	kg	kg
1089	g	g
1090	mg	mg
1091	Mg	Mg
1092	t	t
1094	lb	lb
1097	kg/m3	kg/m3
1101	g/m3	g/m3
1103	kg/L	kg/L
1104	g/mL	g/ml
1105	g/L	g/L
1130	Pa	Pa
1131	Gpa	Gpa
1132	MPa	MPa
1133	kPa	kPa
1134	mPa	mPa
1135	µPa	uPa
1136	hPa	hPa
1137	bar	bar
1138	mbar	mbar
1139	torr	torr
1140	atm	atm
1141	lbf/in2 psi	psi

Index	Unit	Display
1142	lbf/in2a psia	psia
1143	lbf/in2g psig	psig
1144	gf/cm2	g/cm2
1145	kgf/cm2	kg/cm2
1146	inH2O	inH2O
1149	mmH2O	mmH2O
1150	mmH2O (4°C)	mmH2O
1151	mmH2O (68°F)	mmH2O
1152	ftH2O	ftH2O
1153	ftH2O (4°C)	ftH2O
1154	ftH2O (68°F)	ftH2O
1155	inHg	inHg
1156	inHg (0°C)	inHg
1157	mmHg	mmHg
1158	mmHg (0°C)	mmHg
1318	g/s	g/s
1319	g/min	g/min
1320	g/h	g/h
1321	g/d	g/d
1322	kg/s	kg/s
1323	kg/min	kg/min
1324	kg/h	kg/h
1325	kg/d	kg/d
1326	t/s	t/s
1327	t/min	t/min
1328	t/h	t/h
1329	t/d	t/d
1330	lb/s	lb/s
1331	lb/min	lb/min
1332	lb/h	lb/h
1333	lb/d	lb/d
1334	STon/s	STon/s
1335	STon/min	STon/mi
1336	STon/h	STon/h
1337	STon/d	STon/d
1338	LTon/s	LTon/s
1339	LTon/min	LTon/mi
1340	LTon/h	LTon/h
1341	LTon/d	LTon/d
1342	%	%
1347	m3/s	m3/s
1348	m3/min	m3/min
1349	m3/h	m3/h
1350	m3/d	m3/d
1351	L/s	L/s
1352	L/min	L/min
1353	L/h	L/h
1354	L/d	L/d
1355	ML/d	ML/d
1356	ft3/s	ft3/s
1357	ft3/min	ft3/min

Index	Unit	Display
1358	ft3/h	ft3/h
1359	ft3/d	ft3/d
1360	ft3/min std.	SCFM
1361	ft3/h std.	SCFH
1362	gal/s	gal/s
1363	gal/min	gal/min
1364	gal/h	gal/h
1365	gal/d	gal/d
1366	Mgal/d	Mgal/d
1371	bbl/s	bbl/s
1372	bbl/min	bbl/min
1373	bbl/h	bbl/h
1374	bbl/d	bbl/d
1448	µgal/s	ugal/s
1449	mgal/s	mgal/s
1450	kgal/s	kgal/s
1451	Mgal/s	Mgal/s
1452	µgal/min	ugal/mi
1453	mgal/min	mgal/mi
1454	kgal/min	kgal/mi
1455	Mgal/min	Mgal/mi
1456	µgal/h	ugal/h
1457	mgal/h	mgal/h
1458	kgal/h	kgal/h
1459	Mgal/h	Mgal/h
1460	µgal/d	ugal/d
1461	mgal/d	mgal/d
1462	kgal/d	kgal/d
1479	µbbl/s	ubbl/s
1480	mbbl/s	mbbl/s
1481	kbbl/s	kbbl/s
1482	Mbbl/s	Mbbl/s
1483	µbbl/min	ubbl/mi
1484	mbbl/min	mbbl/mi
1485	kbbl/min	kbbl/mi
1486	Mbbl/min	Mbbl/mi
1487	µbbl/h	ubbl/h
1488	mbbl/h	mbbl/h
1489	kbbl/h	kbbl/h
1490	Mbbl/h	Mbbl/h
1491	µbbl/d	ubbl/d
1492	mbbl/d	mbbl/d
1493	kbbl/d	kbbl/d
1494	Mbbl/d	Mbbl/d
1495	µm3/s	um3/s
1496	mm3/s	mm3/s
1497	km3/s	km3/s
1498	Mm3/s	Mm3/s
1499	µm3/min	um3/min
1500	mm3/min	mm3/min
1501	km3/min	km3/min
1502	Mm3/min	Mm3/min
1503	µm3/h	um3/h
1504	mm3/h	mm3/h
1505	km3/h	km3/h

Index	Unit	Display
1506	Mm3/h	Mm3/h
1507	µm3/d	um3/d
1508	mm3/d	mm3/d
1509	km3/d	km3/d
1510	Mm3/d	Mm3/d
1511	cm3/s	cm3/s
1512	cm3/min	cm3/min
1513	cm3/h	cm3/h
1514	cm3/d	cm3/d
1517	kL	kL
1518	kL/min	kL/min
1519	kL/h	kL/h
1520	kL/d	kL/d
1563	ml/min	ml/min
1564	mg/dm3	mg/dm3
1565	mg/L	mg/L
1566	mg/m³	mg/m3
1577	ml/s	ml/s
1578	ml/h	ml/h
1579	ml/d	ml/d
1610	Paa	Paa
1611	Pag	Pag
1612	GPaa	GPaa
1613	GPag	GPag
1614	MPaa	MPaa
1615	MPag	MPag
1616	kPaa	kPaa
1617	kPag	kPag
1618	mPaa	mPaa
1619	mPa g	mPag
1620	µPaa	uPaa
1621	µPag	uPag
1622	hPaa	hPaa
1623	hPag	hPag
1624	gf/cm2a	gf/cm2a
1625	gf/cm2g	g/cm2g
1626	kgf/cm2a	kg/cm2a
1627	kgf/cm2g	kg/cm2g

6.4 AI Function Block

The AI function block is a unit of the software. 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 DPharp.

6.4.1 Function Blocks

The AI function block, via the Channel, incorporates analog signals from the transducer block, performs scaling processing, filtering, signal linearization, fail safe control and alarm processing before outputting. It has the function to generate a discrete output. Figure 6.3 presents the AI function block.

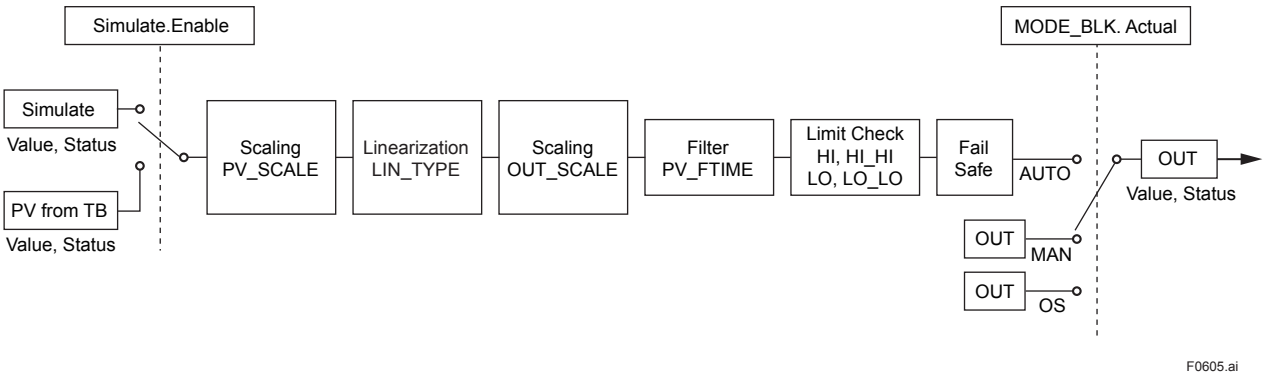


Figure 6.3 Diagram of the AI Functional Block

6.4.2 Target Mode

The Target modes permitted for the AI function block are Automatic (Auto), Manual (Man), and Out of Service (O/S). When the Target mode of PB (Physical Block) is Out of Service (O/S), Actual is Out of Service (O/S) even if Automatic (Auto) or Manual (Man) is written to Target.

6.4.3 Basic Parameter of AI function block

Output Value (OUT)

The function block parameter OUT contains the current measurement value in a vendor specific or configuration adjusted engineering unit and the belonging status in Auto Mode. Also contains the value and status set by an operator in Man Mode.

Simulation (SIMULATE)

Simulation parameter is to simulation mainly for checking arbitrarily set the value and input status from SENSROR Transducer block.

PV Scale (PV_SCALE)

Conversion of the process variable into percent using the high and low scale values.

Linearization type (LIN_TYPE)

Linearization type of output signal can be select from Linear or Square root. Linearization type of AI function block can apply to have different output mode for display and output signal. (For example, Display mode: Square root, Output mode: Linear)

Out Scale (OUT_SCALE)

Scale of the process variable. This parameter contains the values of the lower limit and upper limit effective range, the code number of the engineering unit of process variable and the useful number of digits on the right hand side of the decimal point.

Filter Time Const (PV_FTIME)

Damping time of the process variable.

Fail Safe Mode (FSAFE_TYPE)

Fail Safe Mode is parameter used to define the reaction of the device, if a BAD status of signal to AI function block (OUT.Status and OUT.Value) is detected. This is available only when Target Mode of AI function block is in “Auto”. Refer to 5.4.1 for configuration.

Table 6.2 Fail Safe Mode (Classic Status)

Fail Safe Mode	Output Value and Status (Quality)	
Default value is used as output value	value	Fail Safe Default value
	Status	UNCERTAIN - Substitute Value
Storing last valid output value	value	Last stored valid OUT value
	Status	UNCERTAIN - Last Usable Value
The calculated output value is incorrect	value	wrong calculated value
	Status	BAD - *(* as calculated)

Table 6.3 Fail Safe Mode (Condensed Status)

Fail Safe Mode	Output Value and Status (Quality)	
Default value is used as output value	value	Fail Safe Default value
	Status	BAD - Passivated, Constant *1
		UNCERTAIN - Substitute Set *2
		UNCERTAIN - Process Related *3
		UNCERTAIN - Substitute Set *4
Storing last valid output value	value	Last stored valid OUT value
	Status	BAD - Passivated, Constant *1
		UNCERTAIN - Substitute Set *2
		UNCERTAIN - Process Related *3
		UNCERTAIN - Substitute Set *4
The calculated output value is incorrect	value	wrong calculated value
	Status	BAD - Passivated, Constant *1
		BAD - Maintenance Alarm *2
		BAD - Process Related *3
		BAD -Function Check *4

*1: When input status = BAD - Passivated
*2: When input status = BAD - Maintenance Alarm
*3: When input status = BAD - Process Related
*4: When input status = BAD - Function Check

6.5 Totalizer Function Block

6.5.1 Functional Block

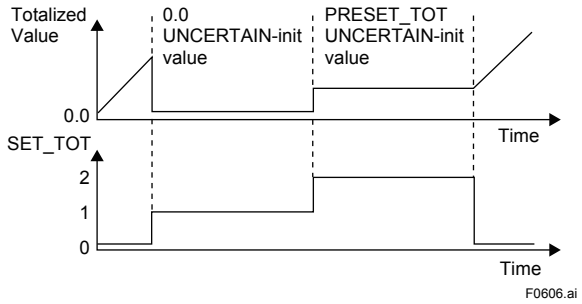
The Totalizer function block, incorporates analog signal from SENSOR transducer block, performs integrate a rate or another quantity to the corresponding integral. And also, this function block can be tailored for different applications or determines the fail-safe behavior.

6.5.2 Target Mode

The Target Mode permitted for the Totalizer function block are Automatic (Auto), Manual (Man), and Out of Service (O/S).

6.5.3 Totalizer Value Set (SET_TOT)

Reset of the internal value of the function block algorithm to 0 or set this value to which configured in Preset Value (PRESET_VALUE). This parameter affects the current totalized value immediately. This function is level sensitive. While this is set to Reset or Preset, the status of the totalized value shall be UNCERTAIN-initial value. The parameter Totalized Value (TOTAL) is affected if the block is in Auto Mode.



The following selections of this function block parameter are possible.

0: Totalize: Normal operation of the Totalizer
1: Reset; Assign value 0 to Totalizer
2: Preset; Assign value of Present Value to Totalizer

6.5.4 Mode (MODE_TOT)

This parameter governs the behavior of the totalization. The following selections are possible:

Pos. and neg. values; True arithmetic integration of the incoming rate values.

Positive values only; Totalization of positive incoming rate values only.

Negative values only; Totalization of negative incoming rate values only.

Hold Count; Totalization stopped.

6.5.5 Fail Safe Mode (FAIL_TOT)

Fail safe mode of the Totalizer function block. This parameter governs the behavior of the function block during the occurrence of input values with BAD status. The following selections are possible.

Run; Totalization is continued using the input values despite the BAD status. The status is ignored.

Hold; Totalization is stopped during occurrence of BAD status of incoming values.

Memory; Totalization is continued based on the last incoming value with GOOD status before the first occurrence of BAD status.

Table 6.4 Fail Safe Mode (Classic Status)

FAIL_TOT mode	TOTAL Value and Status(Quality) *1	
Run	value	Totalization is continued using the input values
	Status	UNCERTAIN - Non Specific
Hold	value	Totalization is stopped
	Status	UNCERTAIN - Last Usable Value
Memory	value	Totalization is continued based on the last incoming value with GOOD status
	Status	UNCERTAIN - Non Specific

*1: When SET_TOT=TOTALIZE & MODE_TOT<>HOLD, input status <> out of serivce

Table 6.5 Fail Safe Mode (Condensed Status)

FAIL_TOT mode	TOTAL Value and Status(Quality) *1	
Run	value	Totalization is continued using the input values
	Status	BAD - *(* same as input)
Hold	value	Totalization is stopped
	Status	BAD - *(* same as input)
Memory	value	Totalization is continued based on the last incoming value with GOOD status
	Status	UNCERTAIN - Substitute set

*1: When SET_TOT=TOTALIZE & MODE_TOT<>HOLD, input status <> BAD - Passivated

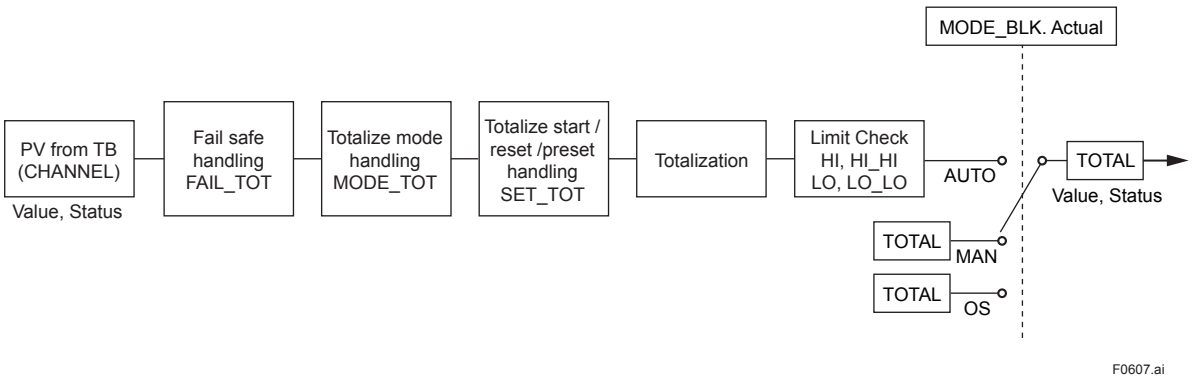


Figure 6.4 Totalizer Function Block

7. In-Process Operation

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

7.1 Mode Transition

When the function block mode is changed to Out_ Of_Service, the function block pauses.

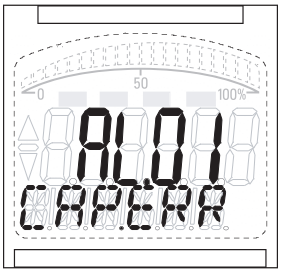
When the function block mode is changed to Manual, the function block suspends updating of output values. In this case alone, it is possible to write a value to the OUT parameter of the block for output.

7.2 Generation of Alarm

7.2.1 Indication of Alarm

When the self-diagnostics function indicates that a device is faulty, a diagnostic message (DIAGNOSIS or DIAGNOSIS_EXTENSION) is issued from the physical block. When a diagnostic message is detected in each function block or a diagnostic message in the process value (process alarm) is detected, a diagnostic message is issued from each block. If an LCD indicator is installed, the error number is displayed as AL.XX.
If two or more alarms are issued, multiple error numbers are displayed.

For details of ALARM, refer to Section 8.2.



F0701.ai

Figure 7.1 Error Identification on Indicator

7.2.2 Status of Each Parameter in Failure Mode

Status has Classic Status and Condensed Status.

Classic Status is a conventional alarm and does not support the NAMUR NE107. Condensed Status is an alarm which was added to PA Profile 3.01 or later and supports the NAMUR NE107.

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.

Classic Status and Condensed Status can be switched by using the Condensed Status/Diagnosis (PB.COND_STATUS_DIAG) parameter.

- Procedure to call up the display

DTM	[Menu] → Device → Configulation → Query Device → Query Device PB → Condensed Status/Diagnosis
EDD	[Menu] → Device → Query Device → Phsical Block → Index 33-51 → Condensed Status/Diagnosis

7.2.3 Alarm Mask Function

Table 7.1 shows the parameters related to the masking of alarms. Users can mask DIAGNOSIS_EXTENSION by setting the Diagnosis Mask Extension RW (DIAGNOSIS_MASK_EXTENSION_RW) parameter. DIAGNOSIS_EXTENSION displays the results of masking.

For details of DIAGNOSIS_EXTENSION, see Table 8.3.

The DIAGNOSIS_MASK and DIAGNOSIS_MASK_EXTENSION are a read-only parameter to display bits which are supported by the device.

- Procedure to call up the display

DTM	[Menu] → Device → Configuration → Query Device → Query Device PB →
EDD	[Menu] → Device → Query Device → Physical Block → Index60 - → Diagnosis Mask Extension RW

Table 7.1 Mask parameter of alarm in the physical block

Index	Parameters	Description	Valid Range	Initial Value
31	DIAGNOSIS_MASK	Supported bit of DIAGNOSIS	Read Only	0x00, 0x98, 0x0f, 0x80
32	DIAGNOSIS_MASK_EXTENSION	Supported bit of DIAGNOSIS_EXTENSION	Read Only	0xff, 0x3c, 0x37, 0xf2, 0x00, 0x00
62	DIAGNOSIS_MASK_EXTENSION_RW	Set masked DIAGNOSIS_EXTENSION. When DIAGNOSIS_MASK_EXTENSION_RW-bit is ON and its alarm or warning occurs, its DIAGNOSIS_EXTENSION-bit is ON.	0: Off, 1: On	0xff, 0x3c, 0x33, 0xf0, 0x00, 0x00

7.3 Simulation Function

It is possible to conduct testing for the downstream function blocks or alarm processes. Following description is how to use and how to set parameters of this function.

A SIMULATE_ENABLE switch is mounted in the transmitter amplifier. This is to prevent the accidental operation of this function. When this is switched on, simulation is enabled. (See Figure7.2.) To initiate the same action from a remote terminal, if REMOTE LOOP TEST SWITCH is written to the SIM_ENABLE_MSG parameter (index 51) of the physical block, the resulting action is the same as is taken when the above switch is on. In the simulation status, an alarm is generated from the physical block, and other device alarms will be masked; for this reason the simulation must be disabled immediately after using this function.

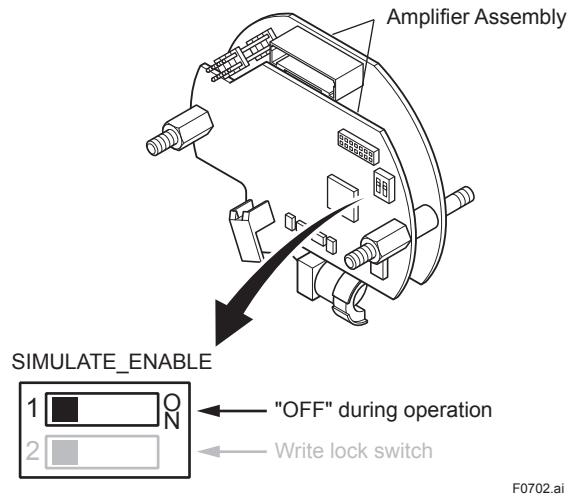


Figure 7.2 SIMULATE_ENABLE Switch Position

7.3.1 Sensor Transducer Block

It is necessary to set parameters as shown in Table 7.2 when the simulation function is used. When SIMULATE MODE in SENSOR Transducer block described at Table 7.2 is set to “1: Pressure Value”, the sensor transducer block uses the simulation value instead of the pressure value “SECONDARY_VALUE_1” before carrying out scaling and linearization.

- Procedure to call up the display

DTM	Diag and Service → Sensor Transducer Block →
EDD	[Menu] → Device → Simulation → Sensor Transducer Block → Simulation (Pressure) →

Table 7.2 Simulation parameters in the transducer block

Index	Parameters	Description	Valid Range	Initial Value
118	SIMULATE_ MODE	Select “1: Pressure Value” when the simulation function is used.	0:Off 1:Pressure Value	0:Off
119	SIMULATE_ VALUE	Set the value to be simulated instead of SECONDARY_ VALUE_1.	None	Value: 0 Status: Bad

7.3.2 AI Function Blocks

When the parameters are set in the transducer block, it is necessary to set parameters as shown in Table 7.3 in the AI function blocks. When Simulate_ Enabled in AI function blocks described at Table 7.3 is set to “1: Enabled”, the each AI function block that set this parameter uses the simulation value instead of the data from the transducer block.

- Procedure to call up the display

DTM	Diag and Service → Analog Input (1-3) →
EDD	[Menu] → Device → Simulation → Function Block (1-3) - Analog Input → Simulation (Measured Value) →

Table 7.3 Simulation parameters in the AI block

Sub-Index	Parameters	Description	Valid Range	Initial Value
1	Simulate_ Status	Set the data status to be simulated.	Unsigned8	0
2	Simulate_ Value	Set the value of the data to be simulated.	Float	0
3	Simulate_ Enabled	Controls the simulation function of this block.	0: Disabled, 1: Enabled	0: Disabled

7.3.3 Physical Block

It is necessary to set alarm parameters as shown in the Physical block when the simulation function is used.

- Procedure to call up the display

DTM	Diag and Service → Physical Block →
EDD	[Menu] → Device → Simulation → Physical Block → Simulation (Diagnosis Extension) →

Table 7.4 Alarm parameters as simulation function in the physical block

Index	Parameters	Description	Valid Range	Initial Value
60	DIAGNOSIS_SIM_ MODE	When the hardware simulation jumper is on, DIAGNOSIS_SIM_ MODE is set to enable, and the bits are set to “on”, the alarms (or warnings) can be modified.	0: Disabled, 1: Enabled	0: Disabled
61	DIAGNOSIS_SIM_ EXTENSION	Definition of supported DIAGNOSIS_EXTENSION information-bits for testing alarms and warnings can be modified.	0: Off, 1: On	0x00, 0x00, 0x00, 0x00, 0x00, 0x00

7.4 Write lock (Write-protect) function

The transmitter is provided with a write lock (write-protect) 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_LOCKING (Physical block index 34) (Soft W Lock).
The CPU assembly of the transmitter is provided with a write lock switch (switch 2 in Figure 7.3). Setting switch 2 to On activates the write lock function.
When the write lock switch is disabled, set 0 (protected) for WRITE_LOCKING (index 34) of the physical block to enable the write lock function.

- Procedure to call up the display

DTM	Physical Block → Configulation → Write Locking →
EDD	[Menu] → Device → Write Locking →
→ On	Write lock enabled
→ Off	Write lock disabled

These parameters and issue shall control the parameter access as defined in Table 7.5.

Table 7.5 Access protection

HARDWARE_WRITE_ PROTECTION	WRITE_LOCKING	Remote access possible
0 (unprotected)	2457 (unprotected)	YES
—	0 (protected)	NO
2 (protected, no manual operation permitted)	—	NO

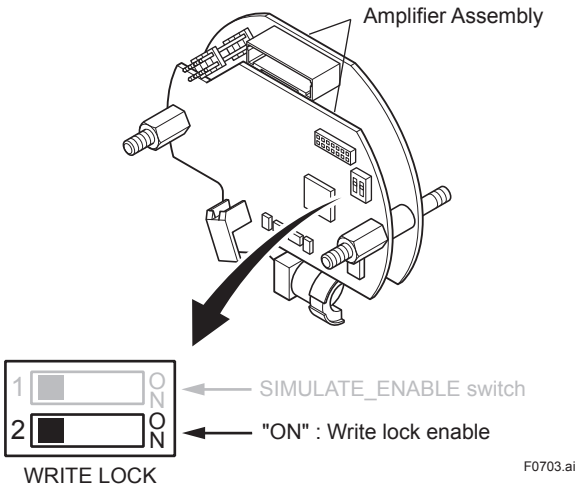


Figure 7.3 Write lock Switch

7.5 Local Operation Interface

WARNING

The local operation switch on LCD must not be used in the hazardous area. When it is necessary to use the switch, operate it in a non-hazardous location.

IMPORTANT

Do not turn off the power to the transmitter immediately after performing parameter setting. Powering off within 30 seconds of performing this procedure will return the parameter to its previous setting.

The zero point can be adjusted and the Ident number and Bus address can be set by using the push button below the LCD display and the adjustment screw on the main body. Before the setting, check the following items at the Local Operation Interface.

- The Write Locking (WRITE_LOCKING) parameter and the hardware write lock switch are both turned off and disabled. For the procedure, see Chapter 7.4. When the Write Locking (WRITE_LOCKING) parameter is enabled, the key mark appears on the LCD display, which indicates that no settings can be made except for zero point adjustment.
- The Local Operation (LOCAL_OP_ENA) parameter is enabled.
- The TEST screen is disabled.
- Communication is set to aperiodic. Even during periodic communication, zero point adjustment is possible.
- The degree of adjustment depends on the speed of turning the adjustment screw. Turn the screw slowly for fine tuning and turn the screw fast for quick tuning.

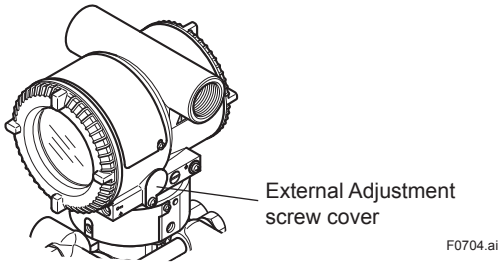


Figure 7.4 External Adjustment Screw

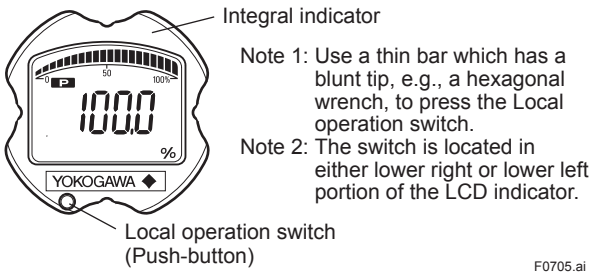


Figure 7.5 Local Operation Switch

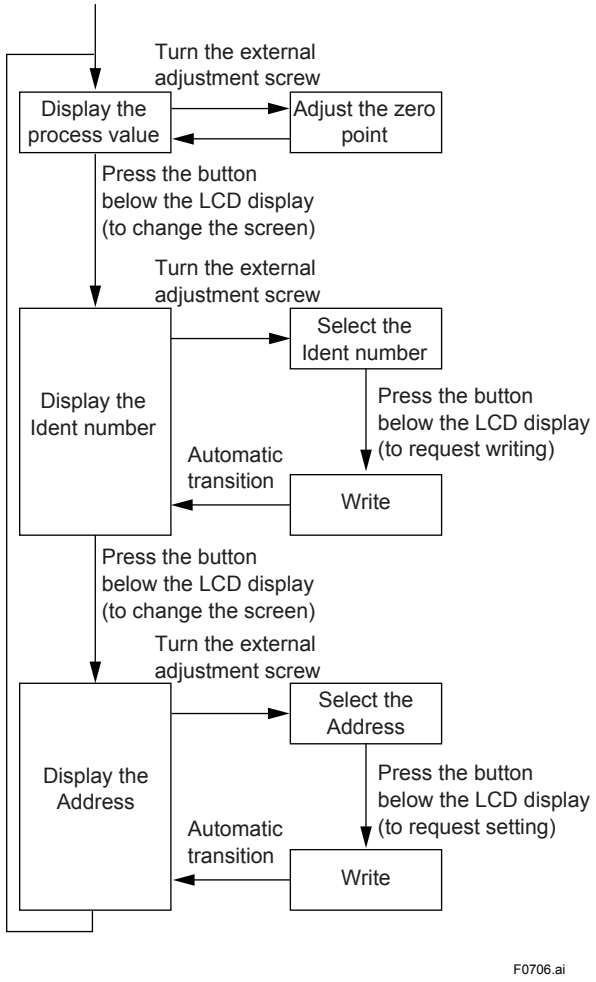


Figure 7.6 Setting flow of Local Operation Interface

7.5.1 Zero Point Adjustment

While the process value screen is displayed, the zero point can be adjusted by using the external adjustment screw. The Local Operation (LOCAL_OP_ENA) parameter can be used to enable or disable the zero point adjustment with the external adjustment screw. To use the external adjustment screw, set the parameter to “Enabled” (default setting is “Enabled”). For the setting procedure, see subsection 5.2.1. Turn the external adjustment screw with a flathead screwdriver to adjust the value to zero. Turning the screw clockwise increases the output and turning it counterclockwise decreases the output. Zero point adjustment can be performed with a resolution of 0.01% of the setting range.

7.5.2 Ident Number Configuration

When the push button below the LCD display is pressed while the process value screen is displayed, the screen changes to the Ident number setting screen. A four-digit value is displayed in the middle of the screen and “IDENT” is shown below it. Turn the external adjustment screw to select a desired number and press the button below the LCD display to set the number. When the number is successfully set, “SAVED” will appear at the bottom of the screen. If the setting is impossible or fails, “FAILED” will appear. In this case, turn the external adjustment screw to select a number to be set and press the button below the LCD display again to set the number.

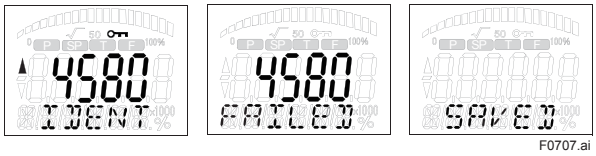


Figure 7.7 Setting screen of Ident Number Configuration

7.5.3 Bus Address Configuration

When the push button below the LCD display on the screen is pressed while the Ident number setting screen is displayed, the screen changes to the Bus Address setting screen. A number from 0 to 125 is displayed in the middle of the screen (the default is 126), and “ADDRS” is shown at the bottom of the screen. Turn the external adjustment screw to select an address to be set and press the button below the LCD display to set the address. When the address is successfully set, “SAVED” will appear at the bottom of the screen and restart. If the setting is impossible or fails, “FAILED” will appear. In this case, turn the external adjustment screw to select a number to be set and press the button below the LCD display again to set the address.

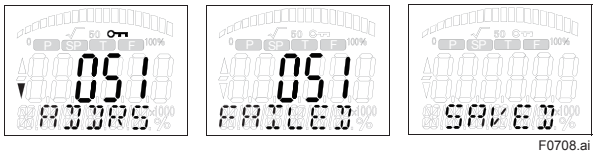


Figure 7.8 Setting screen of Bus Address Configuration

8. Diagnostic Information

8.1 Device Status

Diagnostic information and failures are indicated by using parameter Diagnosis and Diagnosis Extension in the Physical Block.

DIAGNOSIS has Classic DIAGNOSIS and Condensed DIAGNOSIS. Classic DIAGNOSIS is a conventional alarm and does not support the NAMUR NE107. Condensed DIAGNOSIS is an alarm which was added to PA Profile 3.01 or later and supports the NAMUR NE107. For switching the two statuses, see subsection 7.2.2.

Contents of condensed DIAGNOSIS and classic DIAGNOSIS are listed in Table 8.1 and 8.2. Contents of DIAGNOSIS EXTENSION is listed in Table 8.3.

Table 8.1 Contents of Condensed DIAGNOSIS

Octet	Bit	DIAGNOSIS Mnemonic	Description	Remarks	NAMUR NE107 Category
1	0-7	Reserved *2	Reserved for use within the PNO	---	---
2	0-3	Reserved *2	Reserved for use within the PNO	---	---
	3	DIA_WARMSTART*1	New start-up (warm startup) carried out.	Should be set after power-on or after FACTORY_RESET = 2506 has been executed.	---
	4	DIA_COLDSTART *1	Restart (cold startup) carried out.	Should be set after FACTORY_RESET = 1 has been executed.	---
	5	DIA_ MAINTENANCE *2	Maintenance required	---	M
	6	reserved *2		---	---
	7	IDENT_NUMBER_ VIOLATION *2	Set to 1 (one), if the Ident_Number of the running cyclic data transfer and the value of Physical Block IDENT_NUMBER_ SELECTOR parameter do not correspond. If IDENT_NUMBER_SELECTOR = 127 (adaption mode) then the DIAGNOSIS bit IDENT_NUMBER_VIOLATION is cleared / not set.	---	C
3	0	DIA_ MAINTENANCE_ ALARM	Failure of the device or armature	Pressure Sensor Failure (AL.01) Capsule Temp Sensor Failure (AL.01) Capsule EEPROM Failure (AL.01) AMP EEPROM Failure (AL.02) AMP Temp Sensor Failure (AL.02) CPU Board Failure 1 (AL.02) CPU Board Failure 3,4 (AL.02) CPU Board Failure 5 (AL.02)	F
	1	DIA_ MAINTENANCE_ DEMANDED *2	Maintenance demanded	---	M
	2	DIA_FUNCTION_ CHECK	Device is in function check mode or in simulation or under local control e.g. maintenance	Diff Pressure Span /Zero Trim Error (AL.50) Static Pressure Span/Zero Trim Error (AL.51) STB Configuration Error (AL.60) TOT in Man Mode (AL.72) FB Simulation Active (AL.72, 90, 91, 92, 93, 94, 95) STB Simulation Active (AL.96) PB Simulation Active (AL.97)	C
	3	DIA_INV_PRO_ COND	The process conditions do not allow to return valid values. (Set if a value has the quality Uncertain - Process related, no maintenance or Bad - Process related, no maintenance	Diff Pressure Outside Range Limit (AL.10) Static Pressure Outside Range Limit (AL.11) Capsule Temp Outside Range Limit (AL.12) AMP Temp Outside Range Limit (AL.13)	S
	4-7	Reserved *2	Reserved for use within the PNO	---	---
4	0-6	Reserved *2	Reserved for use within the PNO	---	---
	7	EXTENSION_ AVAILABLE	0: There is no more information available 1: More diagnosis information is available in DIAGNOSIS_EXTENSION	---	---

*1: The indication will be automatically restart after 10 s.
*2: Not available for EJX and EJA-E series.

Table 8.2 Contents of Classic DIAGNOSIS

Octet	Bit	DIAGNOSIS Mnemonic	Description	Remarks
1	0	DIA_HW_ELECTR	Hardware failure of the electronic	AMP Temp Sensor Failure (AL.02) CPU Board Failure 1 (AL.02) CPU Board Failure 3,4 (AL.02) CPU Board Failure 5 (AL.02)
	1	DIA_HW_MECH	Hardware failure mechanics	Pressure Sensor Failure (AL.01) Capsule Temp Sensor Failure (AL.01)
	2	DIA_TEMP_MOTOR *2	Motor- temperature too high	---
	3	DIA_TEMP_ELECTR *2	Electronic temperature too high	---
	4	DIA_MEM_CHKSUM	Memory error	Capsule EEPROM Failure (AL.01) AMP EEPROM Failure (AL.02)
	5	DIA_MEASUREMENT *2	Failure in measurement	---
	6	DIA_NOT_INIT *2	Device not initialized (No self calibration)	---
	7	DIA_INIT_ERR *2	Self calibration failed	---
2	0	DIA_ZERO_ERR	Zero point error (limit position)	Diff Pressure Zero Trim Error (AL.50) Static Pressure Zero Trim Error (AL.51)
	1	DIA_SUPPLY *2	Power supply failed (electrical, pneumatic)	---
	2	DIA_CONF_INVAL *2	Configuration not valid	---
	3	DIA_WARMSTART *1	New start-up (warm startup) carried out.	Should be set after power-on or after FACTORY_RESET = 2506 has been executed.
	4	DIA_COLDSTART *1	Restart (cold startup) carried out.	Should be set after FACTORY_RESET = 1 has been executed.
	5	DIA_MAINTAINANCE *2	Maintenance required	---
	6	DIA_CHARACT *2	Characterization invalid	---
	7	IDENT_NUMBER_ VIOLATION *2	Set to 1 (one), if the Ident_Number of the running cyclic data transfer and the value of Physical Block IDENT_NUMBER_SELECTOR parameter do not correspond. If IDENT_ NUMBER_SELECTOR = 127 (adaption mode) then the DIAGNOSIS bit IDENT_NUMBER_ VIOLATION is cleared / not set.	---
3	0-7	Reserved *2	Reserved for use within the PNO	---
4	0-6	Reserved *2	Reserved for use within the PNO	---
	7	EXTENSION_AVAILABLE	More diagnosis information is available	---

*1: The indication will be automatically restart after 10 s.
*2: Not available for EJX and EJA-E series.

Table 8.3 Contents of DIAGNOSIS_EXTENSION

Octet	Bit	Category	Display Message	Description	NAMUR NE107 Category	Default Mask*1
1	0	System Alarm	Pressure Sensor Failure (AL.01)	Pressure sensor problem	F	1
	1		Capsule Temp Sensor Failure (AL.01)	Capsule temperature sensor problem	F	1
	2		Capsule EEPROM Failure (AL.01)	Capsule memory problem	F	1
	3		AMP Temp Sensor Failure (AL.02)	Amplifier temperature sensor problem	F	1
	4		AMP EEPROM Failure (AL.02)	Amplifier memory problem	F	1
	5		CPU Board Failure 3,4 (AL.02)	Amplifier memory problem	F	1
	6		CPU Board Failure 5 (AL.02)	Amplifier memory problem	F	1
	7		CPU Board Failure 1 (AL.02)	Amplifier memory problem	F	1
2	2	Process Alarm	Diff Pressure Outside Range Limit (AL.10)	Input Pressure is outside measurement range limit of capsule	S	1
	3		Static Pressure Outside Range Limit (AL.11)	Static Pressure exceeds limit	S	1
	4		Capsule Temp Outside Range Limit (AL.12)	Capsule Temerature is out of range	S	1
	5		AMP Temp Outside Range Limit (AL.13)	Amplifier Temerature is out of range	S	1
3	0	Setting Alarm	Diff Pressure Span /Zero Trim Error (AL.50)	Trimming range error for differential pressure span	C	1
	1		Static Pressure Span/Zero Trim Error (AL.51)	Trimming range error for static pressure span	C	1
	2		STB Configuration Error (AL.60)	Setting of Sensor TB is abnormal	C	0
	4	Warning	FB Simulation Active (AL.72, 90, 91, 92, 93, 94, 95)	Simulation function of AI1 block is active Simulation function of AI2 block is active Simulation function of AI3 block is active AI1 in MAN mode AI2 in MAN mode AI3 in MAN mode Totalizer block in MAN mode	C	1
	5		STB Simulation Active (AL.96)	Simulation function of Sensor TB is active	C	1
4	1	Mode Alarm	Mode Check (AL.40, 41, 43, 44, 45, 72)	PB in O/S mode Sensor TB in O/S mode AI1 in O/S mode AI2 in O/S mode AI3 in O/S mode	C	0
	4	Process Alarm	AI1 Upper/Lower Limit Alarm (AL.30)	AI1 Hi Hi Alarm occurs AI1 Lo Lo Alarm occurs	---	1
	5		AI2 Upper/Lower Limit Alarm (AL.31)	AI2 Hi Hi Alarm occurs AI2 Lo Lo Alarm occurs	---	1
	6		AI3 Upper/Lower Limit Alarm(AL.32)	AI3 Hi Hi Alarm occurs AI3 Lo Lo Alarm occurs	---	1
	7		Totalizer Upper/Lower Limit Alarm (AL.33)	TOT Hi Hi Alarm occurs TOT Lo Lo Alarm occurs	---	1

*1: Default value of DIAGNOSIS_MASK_EXTENSION_RW.

8.2 Status of Each Parameter in Failure Mode

Following tables summarize the value of parameters when LCD display indicates an Alarm.

Table 8.4 Action of each parameters in failure mode related Sensor Transducer block (Condensed status)

ALARM Display	Cause of Alarm	SENSOR Transducer block								NAMUR NE107 Category
		Pressure Value Primary Value Calculated Value		Static Pressure Value		Capsule Temp		Amplifier Temperature		
		Value	Status	Value	Status	Value	Status	Value	Status	
AL.01 CAP. ERR	Pressure Sensor problem	Measured Value	BAD: Maintenance Alarm, more diagnosis available	Measured Value	BAD: Maintenance Alarm, more diagnosis available	Measured Value	BAD: Maintenance Alarm, more diagnosis available	Measured Value	BAD: Maintenance Alarm, more diagnosis available	F
	Capsule Temperature Sensor problem									
	Capsule memory problem	Hold Value		Hold Value						
AL.02 AMP. ERR	Amplifier Temperature Sensor problem	Measured Value		Measured Value						
	Amplifier memory problem	Hold Value		Hold Value				Hold Value		
	Amplifier problem									
AL.10 PRESS	Input Pressure is outside measurement range limit of capsule	Measured Value	UNCERTAIN: Process related, no maintenance	Measured Value	UNCERTAIN: Process related, no maintenance	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	S
AL.11 ST.PRSS	Static Pressure exceeds limit									
AL.12 CAP. TMP	Capsule Temerature is out of range						UNCERTAIN: Process related, no maintenance			
AL.13 AMP. TMP	Amplifier Temperature is out of range		GOOD (NC): OK		GOOD (NC): OK		GOOD (NC): OK		UNCERTAIN: Process related, no maintenance	
AL.30 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI1 Function block	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	---
AL.31 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI2 Function block									
AL.32 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI3 Function block									
AL.33 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in Totalizer Function block									

ALARM Display	Cause of Alarm	SENSOR Transducer block								NAMUR NE107 Category
		Pressure Value Primary Value Calculated Value		Static Pressure Value		Capsule Temp		Amplifier Temperature		
		Value	Status	Value	Status	Value	Status	Value	Status	
AL.40 PB O/S	Physical block is O/S mode	Measured Value	BAD: passivated (diagnostis alerts inhibited) Constant	Measured Value	BAD: passivated (diagnostis alerts inhibited) Constant	Measured Value	BAD: passivated (diagnostis alerts inhibited) Constant	Measured Value	BAD: passivated (diagnostis alerts inhibited) Constant	---
AL.41 STB O/S	SENSOR Transducer block is O/S mode									
AL.43 AI O/S	AI1 function block is O/S mode		GOOD (NC): OK		GOOD (NC): OK		GOOD (NC): OK		GOOD (NC): OK	
AL.44 AI O/S	AI2 function block is O/S mode									
AL.45 AI O/S	AI3 function block is O/S mode									
AL.72 TOT O/S	Totalizer function block is O/S mode									
AL.50 P.SDEV P.ZDEV	Trimming range error for differential pressure span	Measured Value	BAD: Function Check / Local override, value not usable	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C
AL.51 SP.SDEV SP.ZDEV	Trimming range error for static pressure span		GOOD (NC): OK		BAD: Function Check / Local override, value not usable					
AL.79 LCD. RNG	Displayed value exceeds limit or LCD configuration error	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	---
AL.90 AI SIM	Simulation function of AI1 block is active	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C
AL.91 AI SIM	Simulation function of AI2 block is active									
AL.92 AI SIM	Simulation function of AI3 block is active									

ALARM Display	Cause of Alarm	SENSOR Transducer block								NAMUR NE107 Category
		Pressure Value Primary Value Calculated Value		Static Pressure Value		Capsule Temp		Amplifier Temperature		
		Value	Status	Value	Status	Value	Status	Value	Status	
AL.93 AI MAN	AI1 block is MAN mode	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C
AL.94 AI MAN	AI2 block is MAN mode									
AL.95 AI MAN	AI3 block is MAN mode									
AL.96 STB.SIM	Simulation function of Sensor TB is active		[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end							
AL.97 PB SIM	Simulation function of Physical block is active		GOOD (NC): OK							
AL.72 TOT MAN	Totalizer Functiion block is MAN mode									
AL.60 STB. CFG	SENSOR Transducer block configuration Error	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C

Table 8.5 Action of each parameters in failure mode related Sensor Transducer block (Classic status)

ALARM Display	Cause of Alarm	SENSOR Transducer block								NAMUR NE107 Category
		Pressure Value Primary Value Calculated Value		Static Pressure Value		Capsule Temp		Amplifier Temperature		
		Value	Status	Value	Status	Value	Status	Value	Status	
AL.01 CAP. ERR	Pressure Sensor problem	Measured Value	BAD: Sensor Failure	Measured Value	BAD: Sensor Failure	Measured Value	BAD: Sensor Failure	Measured Value	BAD: Sensor Failure	F
	Capsule Temperature Sensor problem									
	Capsule memory problem	Hold Value	BAD: device failure	Hold Value	BAD: device failure		BAD: device failure		BAD: device failure	
AL.02 AMP. ERR	Amplifier Temperature Sensor problem	Measured Value	BAD: Sensor Failure	Measured Value	BAD: Sensor Failure		BAD: Sensor Failure		BAD: Sensor Failure	
	Amplifier memory problem	Hold Value	BAD: device failure	Hold Value	BAD: device failure		BAD: device failure	Hold Value	BAD: device failure	
	Amplifier problem									
AL.10 PRESS	Input Pressure is outside measurement range limit of capsule"	Measured Value	UNCERTAIN: sensor conversion not accurate	Measured Value	UNCERTAIN: sub normal	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	S
AL.11 ST.PRSS	Static Pressure exceeds limit		UNCERTAIN: sub normal		UNCERTAIN: sensor conversion not accurate					
AL.12 CAP. TMP	Capsule Temerature is out of range				UNCERTAIN: sub normal		UNCERTAIN: sensor conversion not accurate			
AL.13 AMP. TMP	Amplifier Temperature is out of range		GOOD (NC): OK		GOOD (NC): OK		GOOD (NC): OK		UNCERTAIN: sensor conversion not accurate	
AL.30 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI1 Function block	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	---
AL.31 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI2 Function block									
AL.32 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI3 Function block									
AL.33 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in Totalizer Function block									

ALARM Display	Cause of Alarm	SENSOR Transducer block								NAMUR NE107 Category
		Pressure Value Primary Value Calculated Value		Static Pressure Value		Capsule Temp		Amplifier Temperature		
		Value	Status	Value	Status	Value	Status	Value	Status	
AL.40 PB O/S	Physical block is O/S mode	Measured Value	BAD: non specific	Measured Value	BAD: non specific	Measured Value	BAD: non specific	Measured Value	BAD: non specific	---
AL.41 STB O/S	SENSOR Transducer block is O/S mode		BAD: out of service		BAD: out of service		BAD: out of service		BAD: out of service	
AL.43 AI O/S	AI1 function block is O/S mode		GOOD (NC): OK		GOOD (NC): OK		GOOD (NC): OK		GOOD (NC): OK	
AL.44 AI O/S	AI2 function block is O/S mode									
AL.45 AI O/S	AI3 function block is O/S mode									
AL.72 TOT O/S	Totalizer function block is O/S mode									
AL.50 P.SDEV P.ZDEV	Trimming range error for differential pressure span	Measured Value	UNCERTAIN: engineering unit violation	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C
AL.51 SP.SDEV SP.ZDEV	Trimming range error for static pressure span		GOOD (NC): OK		UNCERTAIN: engineering unit violation					
AL.79 LCD. RNG	Displayed value exceeds limit or LCD configuration error	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	---
AL.90 AI SIM	Simulation function of AI1 block is active	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C
AL.91 AI SIM	Simulation function of AI2 block is active									
AL.92 AI SIM	Simulation function of AI3 block is active									
AL.93 AI MAN	AI1 block is MAN mode	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C
AL.94 AI MAN	AI2 block is MAN mode									
AL.95 AI MAN	AI3 block is MAN mode									
AL.96 STB.SIM	Simulation function of Sensor TB is active		UNCERTAIN: Simulated Value							
AL.97 PB SIM	Simulation function of Physical block is active		GOOD (NC): OK							
AL.72 TOT MAN	Totalizer Functiion block is MAN mode									
AL.60 STB. CFG	SENSOR Transducer block configuration Error	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	Measured Value	GOOD (NC): OK	C

Table 8.6 Action of each parameters in failure mode related Function blocks (Condensed status)

ALARM Display	Cause of Alarm	AI1 Output Value (Channel = Primary Value)			Totalizer Value (Channel = Calculate Value)			NAMUR NE107 Category
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	
AL.01 CAP. ERR	Pressure Sensor problem	UNCERTAIN: Substitute Set	UNCERTAIN: Substitute Set	BAD: Maintenance Alarm, more diagnosis available	BAD: Maintenance Alarm, more diagnosis available ok limit	BAD: Maintenance Alarm, more diagnosis available Const limit	UNCERTAIN: Substitute Set ok limit	F
	Capsule Temperature Sensor problem							
	Capsule memory problem							
AL.02 AMP. ERR	Amplifier Temperature Sensor problem							
	Amplifier memory problem							
	Amplifier problem							
AL.10 PRESS	Input Pressure is outside measurement range limit of capsule	UNCERTAIN: Process related, no maintenance	UNCERTAIN: Process related, no maintenance	UNCERTAIN: Process related, no maintenance	UNCERTAIN: Process related, no maintenance	UNCERTAIN: Process related, no maintenance	UNCERTAIN: Process related, no maintenance	S
AL.11 ST.PRSS	Static Pressure exceeds limit							
AL.12 CAP. TMP	Capsule Temerature is out of range							
AL.13 AMP. TMP	Amplifier Temperature is out of range	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.30 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI1 Function block	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	---
AL.31 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI2 Function block	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.32 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI3 Function block							
AL.33 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in Totalizer Function block				GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	

ALARM Display	Cause of Alarm	AI1 Output Value (Channel = Primary Value)			Totalizer Value (Channel = Calculate Value)			NAMUR NE107 Category
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	
AL.40 PB O/S	Physical block is O/S mode	BAD: passivated (diagnostis alerts inhibited) Constant	BAD: passivated (diagnostis alerts inhibited) Constant	BAD: passivated (diagnostis alerts inhibited) Constant	BAD: passivated Constant	BAD: passivated Constant	BAD: passivated Constant	---
AL.41 STB O/S	SENSOR Transducer block is O/S mode							
AL.43 AI O/S	AI1 function block is O/S mode				GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.44 AI O/S	AI2 function block is O/S mode	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.45 AI O/S	AI3 function block is O/S mode							
AL.72 TOT O/S	Totalizer function block is O/S mode				BAD: passivated (diagnostis alerts inhibited) Constant	BAD: passivated (diagnostis alerts inhibited) Constant	BAD: passivated (diagnostis alerts inhibited) Constant	
AL.50 P.SDEV P.ZDEV	Trimming range error for differential pressure span	UNCERTAIN: Substitute Set	UNCERTAIN: Substitute Set	BAD: Function Check / Local override, value not usable	BAD: Function Check / Local override, value not usable ok limit	BAD: Function Check / Local override, value not usable Const limit	UNCERTAIN: Substitute Set ok limit	C
AL.51 SP.SDEV SP.ZDEV	Trimming range error for static pressure span	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.79 LCD. RNG	Displayed value exceeds limit or LCD configuration error	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	---
AL.90 AI SIM	Simulation function of AI1 block is active	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	C
AL.91 AI SIM	Simulation function of AI2 block is active	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.92 AI SIM	Simulation function of AI3 block is active							

ALARM Display	Cause of Alarm	AI1 Output Value (Channel = Primary Value)			Totalizer Value (Channel = Calculate Value)			NAMUR NE107 Category
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	
AL.93 AI MAN	AI1 block is MAN mode	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	C
AL.94 AI MAN	AI2 block is MAN mode	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.95 AI MAN	AI3 block is MAN mode							
AL.96 STB.SIM	Simulation function of Sensor TB is active	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end	
AL.97 PB SIM	Simulation function of Physical block is active	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.72 TOT MAN	Totalizer Functiion block is MAN mode	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	[Simulation start] UNCERTAIN: Simulated value, start [Simulation finished (<10s)] UNCERTAIN: Simulated value, end [Simulation finished (10s<20s)] GOOD(NC): update event	C
AL.60 STB. CFG	SENSOR Transducer block configuration Error	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	C

Table 8.7 Action of each parameters in failure mode related Function blocks (Classic status)

ALARM Display	Cause of Alarm	AI1 Output Value (Channel = Primary Value)			Totalizer Value (Channel = Calculate Value)			NAMUR NE107 Category
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	
AL.01 CAP. ERR	Pressure Sensor problem	UNCERTAIN: Substitute Value	UNCERTAIN: Last Usable Value	BAD: Sensor Failure	UNCERTAIN: Non specific ok limit	UNCERTAIN: Last Usable Value const limit	UNCERTAIN: Non specific ok limit	F
	Capsule Temperature Sensor problem							
	Capsule memory problem			BAD: Device Failure				
AL.02 AMP. ERR	Amplifier Temperature Sensor problem			BAD: Sensor Failure				
	Amplifier memory problem			BAD: Device Failure				
	Amplifier problem							
AL.10 PRESS	Input Pressure is outside measurement range limit of capsule	UNCERTAIN: sensor conversion not accuratre	UNCERTAIN: Sensor Conversion not Accurate	UNCERTAIN: Sensor Conversion not Accurate	UNCERTAIN: sensor conversion not accurate	UNCERTAIN: sensor conversion not accurate	UNCERTAIN: sensor conversion not accurate	S
AL.11 ST.PRSS	Static Pressure exceeds limit	UNCERTAIN: Subnormal	UNCERTAIN: Subnormal	UNCERTAIN: Subnormal	UNCERTAIN: sub normal	UNCERTAIN: sub normal	UNCERTAIN: sub normal	
AL.12 CAP. TMP	Capsule Temerature is out of range							
AL.13 AMP. TMP	Amplifier Temperature is out of range	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.30 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI1 Function block	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	---
AL.31 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI2 Function block	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.32 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in AI3 Function block							
AL.33 HI.HI LO.LO	Hi_Hi or Lo_Lo Alarm occurs in Totalizer Function block				GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	GOOD(NC): Active Critical Alarm High limited or Low Limited	

ALARM Display	Cause of Alarm	AI1 Output Value (Channel = Primary Value)			Totalizer Value (Channel = Calculate Value)			NAMUR NE107 Category
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	
AL.40 PB O/S	Physical block is O/S mode	BAD: Out of Service	BAD: Out of Service	BAD: Out of Service	UNCERTAIN: Non specific ok limit	UNCERTAIN: Last Usable Value const limit	UNCERTAIN: Non specific ok limit	---
AL.41 STB O/S	SENSOR Transducer block is O/S mode	UNCERTAIN: Substitute Value	UNCERTAIN: Last Usable Value	BAD: Non-specific				
AL.43 AI O/S	AI1 function block is O/S mode	BAD: Out of Service Constant	BAD: Out of Service	BAD: Out of Service	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.44 AI O/S	AI2 function block is O/S mode	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.45 AI O/S	AI3 function block is O/S mode							
AL.72 TOT O/S	Totalizer function block is O/S mode				BAD: Out of Service	BAD: Out of Service	BAD: Out of Service	
AL.50 P.SDEV P.ZDEV	Trimming range error for differential pressure span	UNCERTAIN: Engineering Unit Range Violation	UNCERTAIN: Engineering Unit Range Violation	UNCERTAIN: Engineering Unit Range Violation	UNCERTAIN: engineering unit violation	UNCERTAIN: engineering unit violation	UNCERTAIN: engineering unit violation	C
AL.51 SP.SDEV SP.ZDEV	Trimming range error for static pressure span	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.79 LCD. RNG	Displayed value exceeds limit or LCD configuration error	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	---
AL.90 AI SIM	Simulation function of AI1 block is active	UNCERTAIN: Simulated Value	UNCERTAIN: Simulated Value	UNCERTAIN: Simulated Value	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	C
AL.91 AI SIM	Simulation function of AI2 block is active	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.92 AI SIM	Simulation function of AI3 block is active							
AL.93 AI MAN	AI1 block is MAN mode	UNCERTAIN: Simulated Value Constant	UNCERTAIN: Simulated Value Constant	UNCERTAIN: Simulated Value Constant	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	C
AL.94 AI MAN	AI2 block is MAN mode	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK				
AL.95 AI MAN	AI3 block is MAN mode							
AL.96 STB.SIM	Simulation function of Sensor TB is active	UNCERTAIN: Simulated Value	UNCERTAIN: Simulated Value	UNCERTAIN: Simulated Value	UNCERTAIN: Simulated Value	UNCERTAIN: Simulated Value	UNCERTAIN: Simulated Value	
AL.97 PB SIM	Simulation function of Physical block is active	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	
AL.72 TOT MAN	Totalizer Functiion block is MAN mode	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	UNCERTAIN: Simulated Value Constant	UNCERTAIN: Simulated Value Constant	UNCERTAIN: Simulated Value Constant	
AL.60 STB. CFG	SENSOR Transducer block configuration Error	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	GOOD (NC): OK	C

9. Parameter Lists

Note: 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.
—: Read only.

9.1 Physical Block

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
0	16	BLOCK_OBJECT	—	—	Information on this block such as Profile, Profile Rev, etc.
1	17	ST_REV	—	—	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	18	TAG_DESC	AUTO	PT1001	The user description of the intended application of the block.
3	19	STRATEGY	AUTO	0	The strategy field can be used to identify grouping of block. This data is not checked or processed by the block.
4	20	ALERT_KEY	AUTO	0	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	21	TARGET_MODE	AUTO	AUTO	Set the Target of block mode to Auto or O/S according to the write mode of the parameter to be set or changed.
6	22	MODE_BLK	AUTO	—	The mode parameter is a structured parameter composed of the actual mode, the normal mode, and the permitted mode.
7	23	ALARM_SUM	—	—	The current alarm status associated with the function block.
8	24	SOFTWARE_ REVISION	—		Revision number of the software of the field device.
9	25	HARDWARE_ REVISION	—		Revision number of the hardware of the field device.
10	26	DEVICE_MAN_ID	—	Yokogawa	Identification code of the manufacturer of the field device.
11	27	DEVICE_ID	—	EJX: EJX EJA: EJA	Manufacturer specific identification of the field device.
12	28	DEVICE_SER_NUM	—		Serial number of field device.
13	29	DIAGNOSIS	—	0x00, 0x00, 0x00, 0x00	Detailed information of the devices, bitwise coded. More than one message possible at once.
14	30	DIAGNOSIS_ EXTENSION	—	0x00, 0x00, 0x00, 0x00, 0x00, 0x00	Additional manufacture-specific information of the device, bitwise coded.
15	31	DIAGNOSIS_MASK	—	Condensed Status: 0x00, 0x98, 0x0F, 0x80	Definition of supported DIAGNOSIS informatiion-bits. 0: not supported 1: supported
16	32	DIAGNOSIS_MASK_ EXTENSION	—	0xff, 0x3c, 0x37, 0xf2, 0x00, 0x00	Difinition of supported DIAGNOSIS_EXTENSION information-bits. 0: not supported 1: supported
17	33	DEVICE_ CERTIFICATION	—		Not used for the trasnmitter.
18	34	WRITE_LOCKING	AUTO	Off	If set, no writes from anywhere are allowed, except for to clear WRITE_LOCK. Block inputs will continue to be updated. 0: on(Locked) 2457: off(Not Locked)
19	35	FACTORY_RESET	AUTO	1: Factory Reset	Allows a manual restart to be initiated. 1: Factory Reset (Resetting device for default values. The Bus Address setting remains the same.) 2506: Warm start (Warm start of the device. All parameterization remains unchanged.) 2712: Reset Address to '126' (Reset the Bus Address only.)
20	36	DESCRIPTOR	AUTO		User difinition text (a string) to describe the device within the application.
21	37	DEVICE_MESSAGE	AUTO		User difinable MESSAGE (a string) to describe the device within the application or in the plant.

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
22	38	DEVICE_INSTAL_ DATE	AUTO		Date of installation of the device.
23	39	LOCAL_OP_ENA	AUTO	1: Enabled	Local operation enable. 0: Disabled 1: Enabled
24	40	IDENT_NUMBER_ SELECTOR	AUTO	127: Adaptation Mode	The parameter to select Ident number. 0:Profile specific (Transmitter 3 AI) 1:Manufacturer specific (Ident number of DEVICE_ID) 127: Adaptation Mode 128: Profile specific 2 (Transmitter 1 AI) 129: Profile specific 3 (Transmitter 12 AI) 130: Profile specific 4 (Transmitter 1 AI+TOT) 131: Profile specific 5 (Transmitter 2 AI+TOT) 132: Profile specific 6 (Transmitter 3 AI+TOT) 140: Manufacturer specific (If EJA, Ident number of EJX)
25	41	HW_WRITE_ PROTECTION	—	0	Indicates the position of a write blocking mechanism which can not be modified by remote access which protects parameter modification of a device. 0:Unprotected 2:Protected
26	42	FEATURE	—	—	Indicates optional feature implemented in the device and the status of these features which indicates if the feature is supported or not supported.
27	43	COND_STATUS_ DIAG	AUTO	Condensed Status and Diagnosis information is provided	Indicates the mode of a device that can be configured for stats and diagnostic behavior. 0: Status and Diagnosis 1: Condensed Status and Diagnosis information is provided
33	49	SOFT_DESC	—	“2.40 - 4581 - 1.01”	Yokogawa internal use only
34	50	SET_ADDRESS	AUTO	0	For Bus address set up
35	51	SIM_ENABLE_MSG	AUTO		Software switch for simulation function
36	52	DEVICE_STATUS_1	AUTO	0x00000000	Device status
37	53	DEVICE_STATUS_2	AUTO	0x00000000	Device status
38	54	DEVICE_STATUS_3	AUTO	0x00000000	Device status
39	55	DEVICE_STATUS_4	AUTO	0x00000000	Device status
40	56	DEVICE_STATUS_5	AUTO	0x00000000	Device status
41	57	DEVICE_STATUS_6	AUTO	0x00000000	Device status
42	58	DEVICE_STATUS_7	AUTO	0x00000000	Device status
43	59	DEVICE_STATUS_8	AUTO	0x00000000	Device status
44	60	DIAGNOSIS_SIM_ MODE	AUTO	0: Disabled	For testing alarms and warnings can be modified. Switch to enable or disable alarm simulation. When this parameter is set to enable and the hardware simulation jumper is on, all of alarms and warnings in DIAGNOSIS_EXTENSION can be modified with DIAGNOSIS_SIM_EXTENSION. 0: Disabled 1: Enabled
45	61	DIAGNOSIS_SIM_ EXTENSION	AUTO	0x00, 0x00, 0x00, 0x00	For testing alarms and warnings can be modified. When the hardware simulation jumper is on, DIAGNOSIS_SIM_ MODE is set to enable, and the bits are set to “on”, the arlarms (or warnings) can be modified. (0x000000000000)
46	62	DIAGNOSIS_MASK_ EXTENSION_RW	AUTO	0xff, 0x3c, 0x33, 0xf0, 0x00, 0x00	Set masked DIAGNOSIS_EXTENSION. When DIAGNOSIS_MASK_EXTENSION_RW-bit is ON and its alarm or warning occurs, its DIAGNOSIS_ EXTENSION-bit is ON.
47	63	SI_CONTROL_ CODES	—	0	A parameter for switching to make the instrument compatible with SI units.
48	64	IDENT_NUMBER	—	—	Ident number of the device
64	80	PRIVATE_1	—	—	Not used for the transmitter
65	81	PRIVATE_2	—	—	Not used for the transmitter
66	82	PRIVATE_3	—	—	Not used for the transmitter
67	83	PRIVATE_4	—	—	Not used for the transmitter
68	84	PRIVATE_5	—	—	Not used for the transmitter
69	85	PRIVATE_6	—	—	Not used for the transmitter
70	86	PRIVATE_7	—	—	Not used for the transmitter
71	87	PRIVATE_8	—	—	Not used for the transmitter

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
72	88	PRIVATE_9	—	—	Not used for the transmitter
73	89	PRIVATE_10	—	—	Not used for the transmitter
74	90	PRIVATE_11	—	—	Not used for the transmitter

9.2 SENSOR Transducer Block

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
0	16	BLOCK_OBJECT	—	—	Information on this block such as Block Tag, DD Revision, Executiion Time etc.
1	17	ST_REV	—	0	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	18	TAG_DESC	AUTO	Space	The user description of the intended application of the block.
3	19	STRATEGY	AUTO	0	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	20	ALERT_KEY	AUTO	0	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	21	TARGET_MODE	AUTO	AUTO	Set the Target of block mode (MODE_BLK) to Auto or O/S according to the write Mode of the parameter to be set or changed.
6	22	MODE_BLK	—	AUTO	The mode parameter is a structured parameter composed of the actual mode, the normal mode, and the permitted mode.
7	23	ALARM_SUM	—	—	The current alarm status associated with the function block
8	24	SENSOR_VALUE	—	0	Raw sensor value. The uncalibrated measurement value from the sensor.
9	25	SENSOR_HI_LIM	—	100	Sensor upper limit value.
10	26	SENSOR_LO_LIM	—	-100	Sensor lower limit value.
11	27	CAL_POINT_HI	O/S	100	The highest calibrated value.
12	28	CAL_POINT_LO	O/S	0	The lowest calibrated value.
13	29	CAL_MIN_SPAN	—	0.5	The minimum calibration span value allowed.
14	30	SENSOR_UNIT	O/S	1133: kPa	Engineering unit's index code for the calibration value. SENSOR_UNIT must be a subset of the interchangeable part of the Pressure unit. Please refer to ordering instruction for the acceptable units.
15	31	TRIMMED_VALUE	—	—	Sensor value after the trim processing.
16	32	SENSOR_TYPE	—	126: Resonant	The type of sensor
17	33	SENSOR_SERIAL_ NUMBER	—	0	The serial number of sensor
18	34	PRIMARY_VALUE	—	—	Measured value and status available to the Function Block.
19	35	PRIMARY_VALUE_ UNIT	O/S	kPa	Engineering unit code for the primary value according to PRIMARY_VALUE_TYPE.
20	36	PRIMARY_VALUE_ TYPE	O/S	0: Pressure	This parameter contains the application of the pressure device. 0: Pressure 1: Flow 2: Level 3: Volume 128:differential pressure 129:gauge pressure 130:absolute pressure 253: Special
21	37	SENSOR_ DIAPHRAGM_ MATERIAL	O/S	Unknown	Index code for the material of the diaphragm, which comes in contact with the process media.
22	38	SENSOR_FILL_ FLUID	O/S	Unknown	Index code for the fill fluid inside the sensor. The index code is manufacturer specific.
24	40	SENSOR_O_RING_ MATERIAL	O/S	Unknown	Index code for the material of the o-ring between the diaphragm and process connection.

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
25	41	PROCESS_ CONNECTION_TYPE	O/S	Unknown	Index code for the material of the process connection. The coding is in accordance to the Material Codes given in teneral Requirements.
26	42	PROCESS_ CONNECTION_ MATERIAL	O/S	Unknown	Material code for the type of process connection. The index code is manufacturer specific.
27	43	TEMPERATURE	—	—	Temperature with the associated status used within the transducer.
28	44	TEMPERATURE_ UNIT	O/S	1001: deg C	The unit of the temperature.
29	45	SECONDARY_ VALUE_1	—	—	Pressure value and status available to the Function Block.
30	46	SECONDARY_ VALUE_1_UNIT	O/S	kPa	Pressure unit of the SECONDARY_VALUE_1
33	49	LIN_TYPE	O/S	0: Linear	Type of linearization 0: Linear 1: Linearization table 10: Square root
34	50	SCALE_IN	AUTO	—	This is the input conversion using the high and low scale. The related unit is the SECONDARY_VALUE_1_UNIT.
35	51	SCALE_OUT	AUTO		Output conversion of the linearized value using the high and low scale. The related unit is the PRIMARY_VALUE_UNIT. It is in accordance to the table of units codes given in the general requirements.
36	52	LOW_FLOW_ CUTOFF	O/S	0	This is the point in percent of flow until the output of the flow function is set to zero. It is used for suppressing low flow values.
38	54	TAB_ACTUAL_ NUMBER		0	The actual numbers of entries in the table. It shall be calculated after the transmission of the table is finished.
39	55	TAB_ENTRY	O/S	0	This parameter identifies which element of the table is in the TAB_X_Y_VALUE parameter currently
40	56	TAB_MAX_NUMBER		31	Maximum size of the table in the device
41	57	TAB_MIN_NUMBER		2	Minimum size of the table in the device
42	58	TAB_OP_CODE	O/S	0: not initialized	The modification of a table in a device influences the measurement or actuation algorithms of the device. This parameter is to control the transaction of the table.
43	59	TAB_STATUS	—	0	Result of plausibility check in the device
44	60	TAB_X_Y_VALUE	O/S		One value couple of the table
59	75	PRIMARY_VALUE_ URL	—	100	Upper limit of primary value
60	76	PRIMARY_VALUE_ LRL	—	-100	Lower limit of primary value
61	77	SENSOR_SN	—		Serial number of sensor
62	78	SENSOR_CAL_ METHOD	O/S	103: Factory trim standard calibration	The method of the last sensor calibration 100= volumetric 101= static weight 102= dynamic weight 103= factory trim standard calibration 104= user trim standard calibration 105= factory trim special calibration 106= user trim special calibration 255= other
63	79	SENSOR_CAL_LOC	O/S	Space	Set/indicate the location of the last sensor calibration
64	80	SENSOR_CAL_DATE	O/S	—	Set/indicate the date of the last sensor calibration
65	81	SENSOR_CAL_WHO	O/S	Space	Set/indicate the name of the person responsible for the last sensor calibration
66	82	STATIC_PRESSURE_ HIGH_VALUE	—	—	
67	83	STATIC_PRESSURE_ UNIT	O/S	kPa	Unit of static pressure
68	84	CAL_DEVIATION_HI	O/S	0	Deviation value for span adjustment
69	85	CAL_DEVIATION_LO	O/S	0	Deviation value for zero adjustment
70	86	PRIMARY_VALUE_ FTIME	O/S	2	Damping time constant for primary value

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
71	87	STATIC_PRESSURE_LOW_VALUE	—	—	
72	88	SP_VALUE_TYPE	O/S	109: absolute pressure	Select the type of measurement for static pressure, absolute or gauge
73	89	SP_VALUE_URL	—	25000	Upper limit of static pressure value
74	90	SP_VALUE_LRL	—	0	Lower limit of static pressure value
75	91	CAL_SP_POINT_HI	O/S	25000	The highest calibrated value for static pressure
76	92	CAL_SP_POINT_LO	O/S	0	The lowest calibrated value for static pressure
77	93	CAL_SP_MIN_SPAN	—	500	The minimum calibrated span allowed for static pressure
78	94	CAL_SP_DEVIATION_HI	O/S	0	Deviation value for zero adjustment of static pressure
79	95	CAL_SP_DEVIATION_LO	O/S	0	Deviation value for span adjustment of static pressure
80	96	SP_VALUE_FTIME	O/S	2	Damping time constant for static pressure
81	97	ATM_PRESS	O/S	101.325	Atmoshpere pressure value used to obtain gauge pressure value from absolute pressure
82	98	CLEAR_CAL	O/S	0	Reset zero and span adjustment to factory calibrated values for pressure, static pressure and or all
83	99	TEMPERATURE_VALUE_URL	—	130	Upper limit of temperature value
84	100	TEMPERATURE_VALUE_LRL	—	-50	Lower limit of temperature value
85	101	AMP_TEMP_VAL	—	—	Value of amplifier temperature
86	102	AMP_TEMP_URL	—	95	Upper limit of amplifier temperature value
87	103	AMP_TEMP_LRL	—	-50	Lower limit of amplifier temperature value
88	104	CALCULATE_VALUE	—	—	Calculation result of (Primary Value) × (Calculate Coefficient)
89	105	CALCULATE_UNIT	O/S	1347 (m3/s)	Unit of CALCULATE_VALUE
90	106	CALCULATE_COEF	O/S	1	Coefficient for calculating Calculate Value (CALCULATE_VALUE). Calculate Coefficient can be considered as K-factor for flow rate calculation.
91	107	MODEL	—	Space	The model code
92	108	SPECIAL_ORDER_ID	—	Space	Identification number of special order
93	109	MANUFAC_DATE	O/S	0, 0, 0, 0, 0, 0	Date of production
94	110	D_VENT_PLUG	O/S	Unknown	material of drain or vent plug
95	111	REM_SEAL_ISOL_MTL	O/S	Unknown	Material of isolating diaphragm for remote seal
96	112	FLANGE_SIZE	O/S	Unknown	Flange size for remote seal
97	113	REM_SEAL_NUM	O/S	Unknown	Number of remote seal
98	114	REM_SEAL_FILL_FLUID	O/S	Unknown	Type of fill fluid in remote seal
99	115	REM_SEAL_TYPE	O/S	Unknown	Type of remote seal
100	116	AUTO_RECOVERY	O/S	1 (ON)	Permission of auto recovery from sensor errors
101	117	MS_CODE	AUTO	—	Model suffix and code
102	118	SIMULATE_MODE	AUTO	0	Mode of simulation
103	119	SIMULATE_VALUE	AUTO	—	Value written by an operator to simulate Transducer Block value
141	157	CURVE_X	AUTO	—	Parameter for signal charactrization
142	158	CURVE_Y	AUTO	—	Parameter for signal charactrization
158	174	TEST_KEY1	—	—	Not used for the transmitter
159	175	TEST_KEY2	—	—	Not used for the transmitter
160	176	TEST_KEY3	—	—	Not used for the transmitter
161	177	TEST_1	—	—	Not used for the transmitter
162	178	TEST_2	—	—	Not used for the transmitter
163	179	TEST_3	—	—	Not used for the transmitter
164	180	TEST_4	—	—	Not used for the transmitter
165	181	TEST_5	—	—	Not used for the transmitter
173	189	TEST_13	—	—	Not used for the transmitter
174	190	TEST_14	—	—	Not used for the transmitter
175	191	TEST_15	—	—	Not used for the transmitter

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
176	192	TEST_16	—	—	Not used for the transmitter
177	193	TEST_17	—	—	Not used for the transmitter
178	194	TEST_18	—	—	Not used for the transmitter
179	195	TEST_19	—	—	Not used for the transmitter
180	196	TEST_20	—	—	Not used for the transmitter
181	197	TEST_21	—	—	Not used for the transmitter
182	198	TEST_22	—	—	Not used for the transmitter
183	199	TEST_23	—	—	Not used for the transmitter
184	200	TEST_24	—	—	Not used for the transmitter
185	201	TEST_25	—	—	Not used for the transmitter
186	202	TEST_26	—	—	Not used for the transmitter
187	203	TEST_27	—	—	Not used for the transmitter
188	204	TEST_28	—	—	Not used for the transmitter
189	205	TEST_29	—	—	Not used for the transmitter
190	206	TEST_30	—	—	Not used for the transmitter
191	207	TEST_31	—	—	Not used for the transmitter

9.3 LCD Transducer Block

Relative Index	Index	Parameter	Write Mode	Valid Range	Initial Value	Explanation
0	16	BLOCK_OBJECT	—	—	—	Information on this block such as Block Tag, DD Revision, Executiion Time etc.
1	17	ST_REV	—		0	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	18	TAG_DESC	AUTO		Space	The user description of the intended application of the block.
3	19	STRATEGY	AUTO	0-65535	0	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	20	ALERT_KEY	AUTO	0-255	0	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	21	TARGET_MODE	AUTO		AUTO	Set the Target of block mode (MODE_BLK) to Auto, Man or O/S according to the write Mode of the parameter to be set or changed.
6	22	MODE_BLK	—	—	AUTO	The mode parameter is a structured parameter composed of the actual mode, the normal mode, and the permitted mode.
7	23	ALARM_SUM	—	—	—	The current alarm status associated with the function block
8	24	DISPLAY_SEL	AUTO	0x00-0x0F	0x01 (DISPLAY1 ON)	Selection of display 1 to 4 to be shown on LCD Bit0=1:DISPLAY1 ON Bit1=1:DISPLAY2 ON Bit2=1:DISPLAY3 ON Bit3=1:DISPLAY4 ON
9	25	INFO_SEL	AUTO	0x00-0x0F	0x06	Selection of items to be displayed Bit0=1:TAG ON Bit1=1:PARAMETER ON Bit2=1:UNIT ON Bit3=1:STATUS ON
10	26	BLOCK_TAG1	—	—	AI1	Block tag which includes a parameter to be displayed on display1
11	27	PARAMETER_SEL1	AUTO	—	0x010A: AI1. OUT	Selection of a parameter to be displayed on display1. Select a parameter from Table
12	28	DISPLAY_TAG1	AUTO		Space	Name of block tag to be displayed on display1; up to six alphanumeric plus a slash[/] and a period [.]

Relative Index	Index	Parameter	Write Mode	Valid Range	Initial Value	Explanation
13	29	UNIT_SEL1	AUTO	0-1	Space	Selection of unit to be displayed. The unit of the parameter which is selected at PARAMETER SEL1 will be displayed when "Auto" is selected; user-specified unit at DISPLAY UNIT1 will be displayed when "Custom" is selected.
14	30	DISPLAY_UNIT1	AUTO		Space	User specified unit to be displayed on display1, which will be available when "Custom" is selected at UNIT SEL1.
15	31	EXP_MODE1	AUTO	0-3	0: Engineering Unit	Selection of the displayed value in exponent such as x1, x10, x100 and x1000.
16	32	BLOCK_TAG2	—		STB	Block tag which includes a parameter to be displayed on display2
17	33	PARAMETER_SEL2	AUTO		0x0512: Primary Value	Selection of a parameter to be displayed on display2. Select a parameter from Table
18	34	DISPLAY_TAG2	AUTO		Space	Name of block tag to be displayed on display2; up to six alphanumeric plus a slash[/] and a period [.]
19	35	UNIT_SEL2	AUTO	0-1	0: Auto	Selection of unit to be displayed. The unit of the parameter which is selected at PARAMETER SEL2 will be displayed when "Auto" is selected; user-specified unit at DISPLAY UNIT2 will be displayed when "Custom" is selected.
20	36	DISPLAY_UNIT2	AUTO		Space	User specified unit to be displayed on display2, which will be available when "Custom" is selected at UNIT SEL2.
21	37	EXP_MODE2	AUTO	0-3	0: Engineering Unit	Selection of the displayed value in exponent such as x1, x10, x100 and x1000.
22	38	BLOCK_TAG3	—		STB	Block tag which includes a parameter to be displayed on display3
23	39	PARAMETER_SEL3	AUTO		0x0542: Static Pressure(H)	Selection of a parameter to be displayed on display3. Select a parameter from Table
24	40	DISPLAY_TAG3	AUTO		Space	Name of block tag to be displayed on display3; up to six alphanumeric plus a slash[/] and a period [.]
25	41	UNIT_SEL3	AUTO	0-1	0: Auto	Selection of unit to be displayed. The unit of the parameter which is selected at PARAMETER SEL3 will be displayed when "Auto" is selected; user-specified unit at DISPLAY UNIT3 will be displayed when "Custom" is selected.
26	42	DISPLAY_UNIT3	AUTO		Space	User specified unit to be displayed on display3, which will be available when "Custom" is selected at UNIT SEL3.
27	43	EXP_MODE3	AUTO	0-3	0: Engineering Unit	Selection of the displayed value in exponent such as x1, x10, x100 and x1000.
28	44	BLOCK_TAG4	—		STB	Block tag which includes a parameter to be displayed on display4
29	45	PARAMETER_SEL4	AUTO		0x051B: Capsule Temperature	Selection of a parameter to be displayed on display4. Select a parameter from Table
30	46	DISPLAY_TAG4	AUTO		Space	Name of block tag to be displayed on display4; up to six alphanumeric plus a slash[/] and a period [.]
31	47	UNIT_SEL4	AUTO	0-1	0: Auto	Selection of unit to be displayed. The unit of the parameter which is selected at PARAMETER SEL4 will be displayed when "Auto" is selected; user-specified unit at DISPLAY UNIT4 will be displayed when "Custom" is selected.
32	48	DISPLAY_UNIT4	AUTO		Space	User specified unit to be displayed on display4, which will be available when "Custom" is selected at UNIT SEL4.
33	49	EXP_MODE4	AUTO	0-3	0: Engineering Unit	Selection of the displayed value in exponent such as x1, x10, x100 and x1000.
34	50	BAR_GRAPH_ SELECT	AUTO	0-1	1: Enable	Selection of bar graph indicator 0: Disable 1: Enable
35	51	DISPLAY_CYCLE	AUTO		0: 2.8 s	Duration of display cycle. (Time unit: 1=400 ms)
36	52	POWER_ON_INFO	AUTO	0-1	1: ON	Display when powering on.
37	53	LCD_TEST	—	—	—	Not used for the transmitter
38	54	SW_TEST	—	—	—	Not used for the transmitter

9.4 AI Function Block

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanation
0	16	BLOCK_OBJECT	—	—	Information on this block such as Block Tag, DD Revision, Executiion Time etc.
1	17	ST_REV	—	0	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	18	TAG_DESC	AUTO	Space	The user description of the intended application of the block.
3	19	STRATEGY	AUTO	0	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	20	ALERT_KEY	AUTO	0	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	21	TARGET_MODE	AUTO	AUTO	Set the Target of block mode (MODE_BLK) to Auto, Man or O/S according to the write Mode of the parameter to be set or changed.
6	22	MODE_BLK	—	AUTO	The mode parameter is a structured parameter composed of the actual mode, the normal mode, and the permitted mode.
7	23	ALARM_SUM	—	—	The current alarm status associated with the function block
8	24	BATCH	AUTO	—	This parameter is intended to be used in Batch applications in line with IEC 61512.
10	26	OUT	MAN	—	This parameter contains the current measurement value from Transducer Block or configuration adjusted engineering unit and the belonging state in AUTO MODE. OUT contains the value and status set by an operator in MAN MODE.
11	27	PV_SCALE	O/S	—	Conversion of the Process Variable into percent using the high and low scale value.
12	28	OUT_SCALE	O/S	—	Scale of the Process Variable. This parameter contains the values of the lower limit and upper limit effective range, the code number of the engineering unit of Process Variable and the number of digits to the right of the decimal point.
13	29	LIN_TYPE	O/S	0	Type of linearization. 0: no linearization 10: Square root
14	30	CHANNEL	O/S	AI1: Primary Value AI2: Static Pressure (H) AI3: Capsule Temperature	Reference to the active Transducer Block which provides the measurement value to the Functiion Blocks.
16	32	PV_FTIME	AUTO	0.000	Time constant of a signal exponential filter for the PV, in seconds.
17	33	FSAFE_TYPE	AUTO	1	Defines reaction of device, if a fault is detected.
18	34	FSAFE_VALUE	AUTO	0	Defaut value for the OUT parameter, if sensor or sensor electronic fault is detected. The unit of this parameter is the same as that for the OUT one.
19	35	ALARM_HYS	AUTO	0.5	Amount the PV must return within the alarm limits before the alarm condition clears. Alarm Hysteresis is expressed in engineering unit.
21	37	HI_HI_LIM	AUTO	+1.#INF	Value for upper limit alarms.
23	39	HI_LIM	AUTO	+1.#INF	Value for upper limit warnings.
25	41	LO_LIM	AUTO	-1.#INF	Value for lower limit warnings.
27	43	LO_LO_LIM	AUTO	-1.#INF	Value for lower limit alarms.
30	46	HI_HI_ALM	—	—	State of the upper limit of alarms.
31	47	HI_ALM	—	—	State of the upper limit of warnings.
32	48	LO_ALM	—	—	State of the lower limit of warnings.
33	49	LO_LO_ALM	—	—	State of the lower limit of alarms.
34	50	SIMULATE	AUTO	Disabled	For commissioning and test purposes the input value from the Transducer Block in the Analog input Function Block AI-FB can be modified. That means that the Transducer and AI-FB will be disconnected.
35	51	OUT_UNIT_TEXT	—	—	Not used for the transmitter

9.5 Totalizer Function Block

Relative Index	Index	Parameter	Write Mode	Initial Value	Explanition
0	16	BLOCK_OBJECT	—	—	Information on this block such as Profile, Profile Rev, etc.
1	17	ST_REV	—	0	The revision level of the static data associated with the function block. The revision vsalue will be incremented each time a static parameter value in the block is changed
2	18	TAG_DESC	AUTO	Space	The user description of the intended application of the block.
3	19	STRATEGY	AUTO	0	The strategy field can be used to identify grouping of block. This data is not checked or processed by the block.
4	20	ALERT_KEY	AUTO	0	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	21	TARGET_MODE	AUTO	AUTO	Set the Target of block mode to Auto or O/S according to the write mode of the parameter to be set or changed
6	22	MODE_BLK	—	AUTO	The mode parameter is a structured parameter composed of the actual mode, the normal mode, and the permitted mode.
7	23	ALARM_SUM	—	—	The current alarm status associated with the function block
8	24	BATCH	AUTO	—	This parameter is intended to be used in Batch application according to IEX 61512-1.
9	25	TOTAL	MAN	—	This parameter contains the integrated quantity of the rate parameter provided by CHANNEL and the associated status.
10	26	UNIT_TOT	AUTO	1034: m3	Unit of the totalized quantity.
11	27	CHANNEL	O/S	0x0158: Calculate Value	Reference to the active Transducer Block, which provides the measurement value to the Function Block.
12	28	SET_TOT	AUTO	0: TOTALIZE	Reset of the internal value of the FB algorithm to 0 or set this value to PRESET_TOT.
13	29	MODE_TOT	AUTO	3: HOLD	This parameter governs the behavior of the totalization.
14	30	FAIL_TOT	AUTO	0: RUN	Fail-safe mode of the Totalizaer Function Block. This parameter governs the behavior of the Function Block during the occurrence of input value with BAD status.
15	31	PRESET_TOT	AUTO	0	This value is used as present for the internal value of the FB algorithm. The value gets effective if using the SET_TOT function.
16	32	ALARM_HYS	AUTO	0	Amount the PV must return within the alarm limits before the alarm condition clears. Alarm Hysteresis is expressed in engineering unit.
17	33	HI_HI_LIM	AUTO	+1.#INF	Value for upper limit alarms.
18	34	HI_LIM	AUTO	+1.#INF	Value for upper limit warnings.
19	35	LO_LIM	AUTO	-1.#INF	Value for lower limit warnings.
20	36	LO_LO_LIM	AUTO	-1.#INF	Value for lower limit alarms.
21	37	HI_HI_ALM	—	—	State of the upper limit of alarms.
22	38	HI_ALM	—	—	State of the upper limit of warnings.
23	39	LO_ALM	—	—	State of the lower limit of warnings.
24	40	LO_LO_ALM	—	—	State of the lower limit of alarms.

10. General Specifications

10.1 Standard Specifications

For items other than those described below, refer to each User's Manual.

Applicable Model:
All DPharp EJX/EJA series.

Output:
Digital communication signal based on PROFIBUS PA protocol.

Supply Voltage:
9 to 32 V DC for general use, flameproof type, intrinsically safe (Ex ic), or nonincendive
9 to 24 V DC for intrinsically safe type Entity model
9 to 17.5 V DC for intrinsically safe type FISCO model

Communication Requirements:
Supply Voltage: 9 to 32 V DC
Current Draw: 15 mA (max)

Update Period:
Differential Pressure: 100 ms
Static Pressure: 100 ms
Capsule Temperature: 1 s
Amplifier Temperature: 1 s

Integral Indicator (LCD display):
5-digit Numerical Display, 6-digit Unit Display and Bar graph. The indicator is configurable to display one or up to four of the I/O signals periodically.

Functional Specifications:
Functional specifications for PROFIBUS communication conform to the PROFIBUS-PA ver 3.02

Function Block:
Three AI blocks, One Totalizer block.

10.2 Optional Specifications

For items other than those described below, refer to each User's Manual.

Item	Description	Code
Data configuration at factory	Software Damping	**CD**

10.3 Optional Specifications (For Explosion Protected type)

Item	Description	Code
Factory Mutual (FM)	FM Explosionproof *1	**FF1**
	FM Intrinsically safe and Nonincendive *1	**FS15**
ATEX	ATEX Flameproof *1	**KF22**
	ATEX Intrinsically safe [Ex ia]*1	**KS26**
	ATEX Intrinsically safe [Ex ic]*1	**KN26**
Canadian Standards Association (CSA)	CSA Explosionproof *1	**CF1**
	CSA Intrinsically safe *1	**CS15**
IECEx Scheme	IECEx Flameproof *1	**SF2**
	IECEx Intrinsically safe *1	**SS26**

Contact Yokogawa representative for the codes indicated as '-'.
*1: Applicable for Electrical connection code 2, 4, 7, 9, C and D .

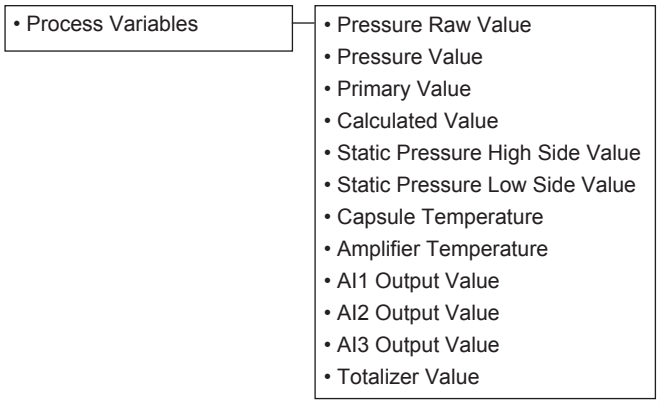
< Factory Setting >

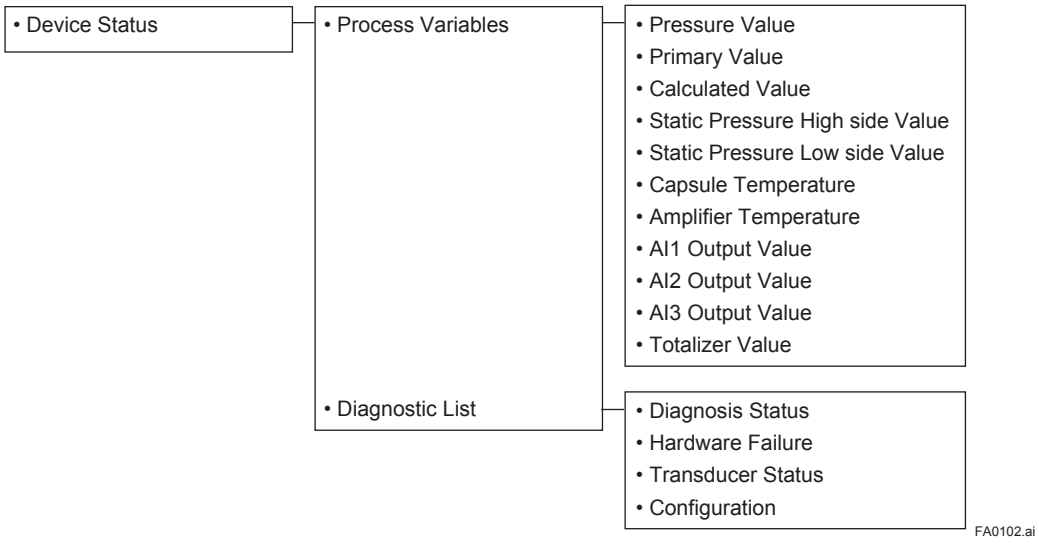
Tag Number (Tag plate)	As specified in order
Software Tag (TAG)	'PT1001' unless otherwise both Tag Number and Software Tag specified in order
Bus Address	'0x7E(126)' unless otherwise specified in order
Output Mode (Characterization Type)	'Linear' unless otherwise specified in order
Calibration Range (Scale In Lower/Upper Value)	As specified in order
Calibration Range Unit	Selected from mmH_2O, mmH_2O(68°F), mmHg, Pa, hPa, kPa, MPa, mbar, bar, gf/cm^2, kgf/cm^2, inH_2O, inH_2O(68°F), inHg, ftH_2O, ftH_2O(68°F) or psi. (Only one unit can be specified)
Output Scale (Out Scale Lower/Upper Value)	'0 to 100%' unless otherwise specified.
Software Damping (Filter Time Const) *1	'2 s' or as specified in order

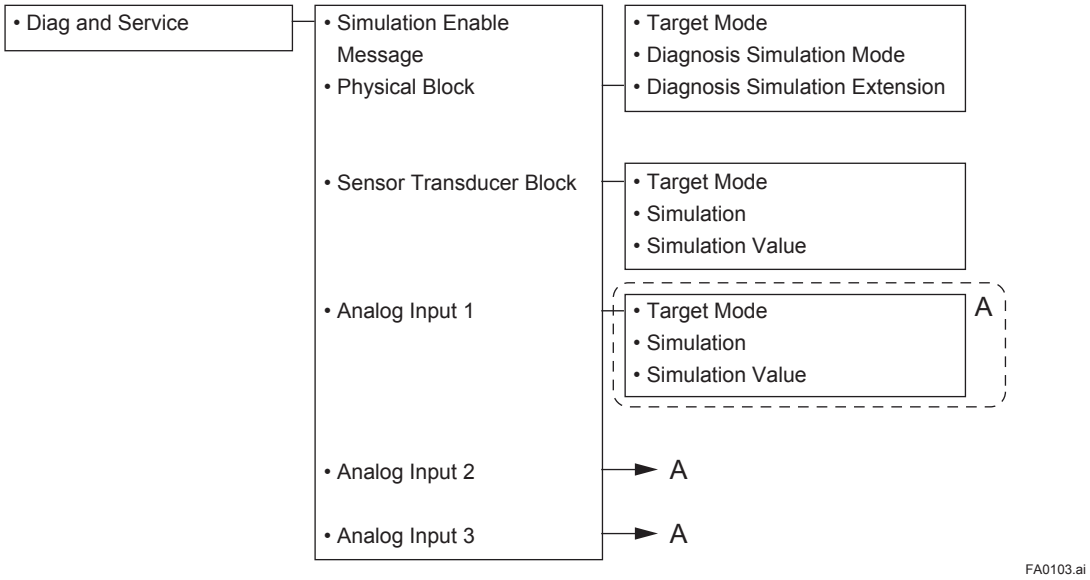
*1: To specify this item, /CD option is required.

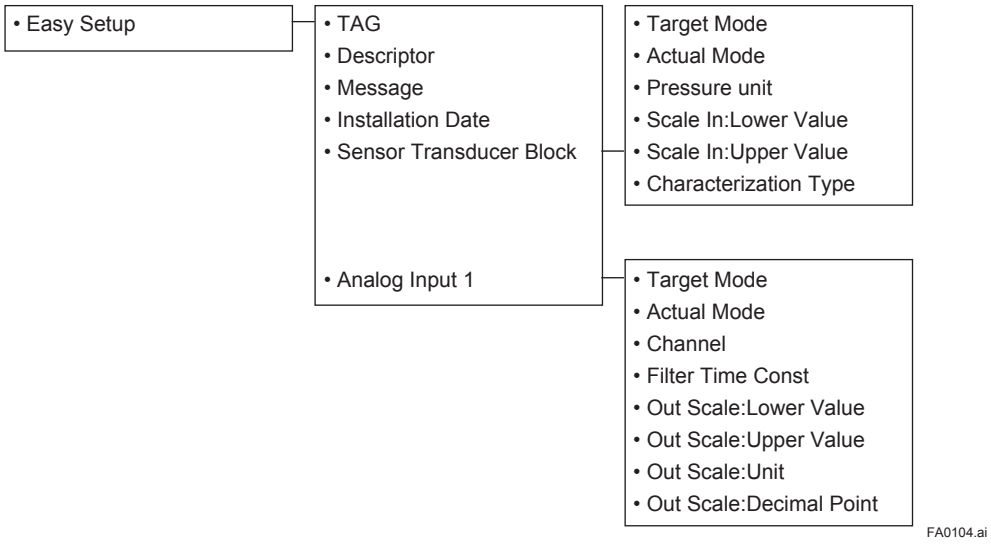
Appendix 1. List of DTM Menu

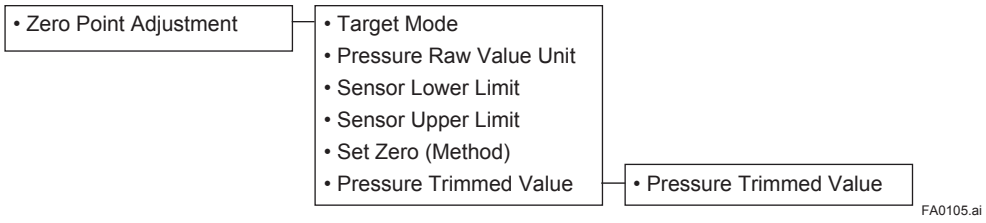
A1.1 Parameter Table

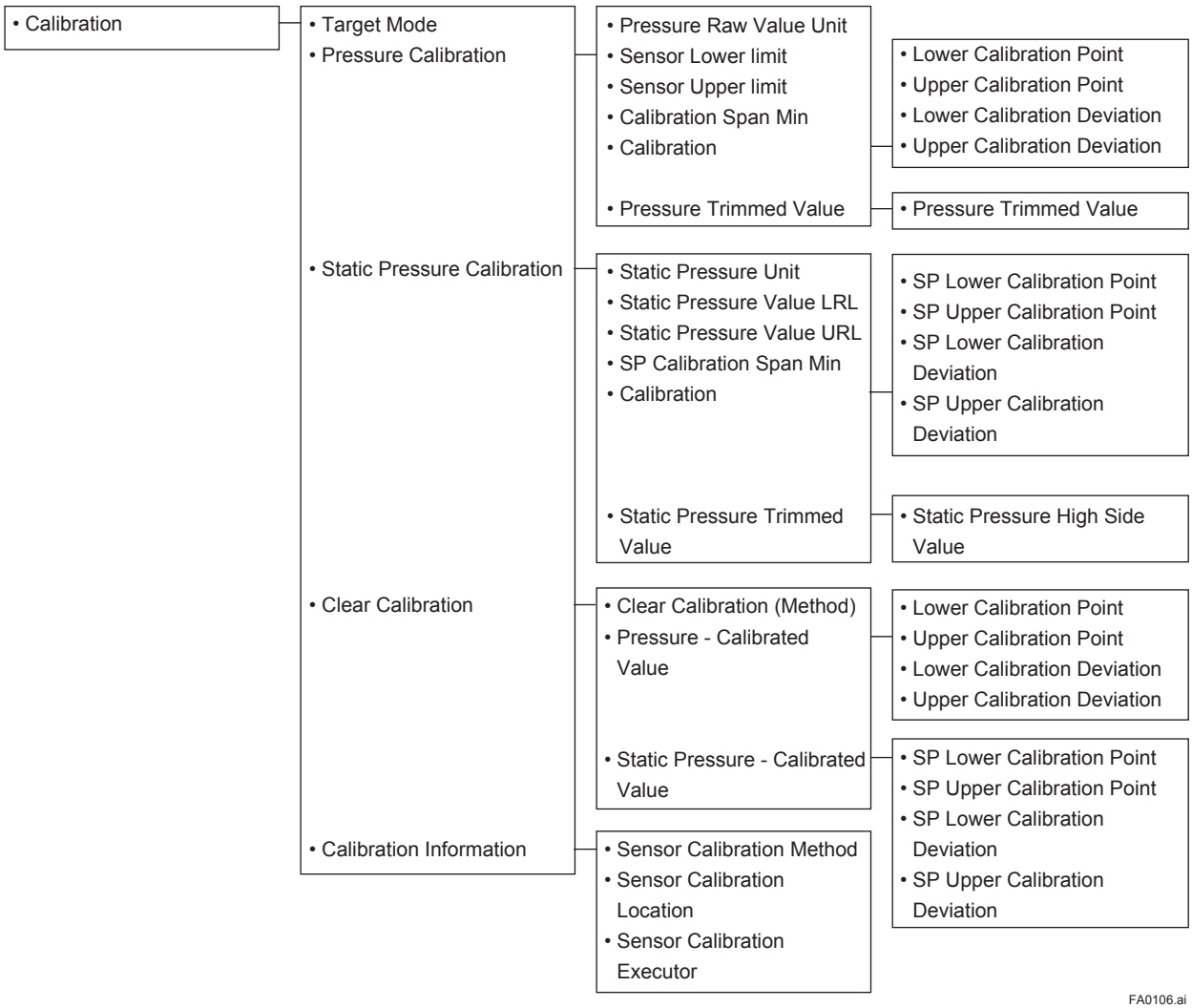


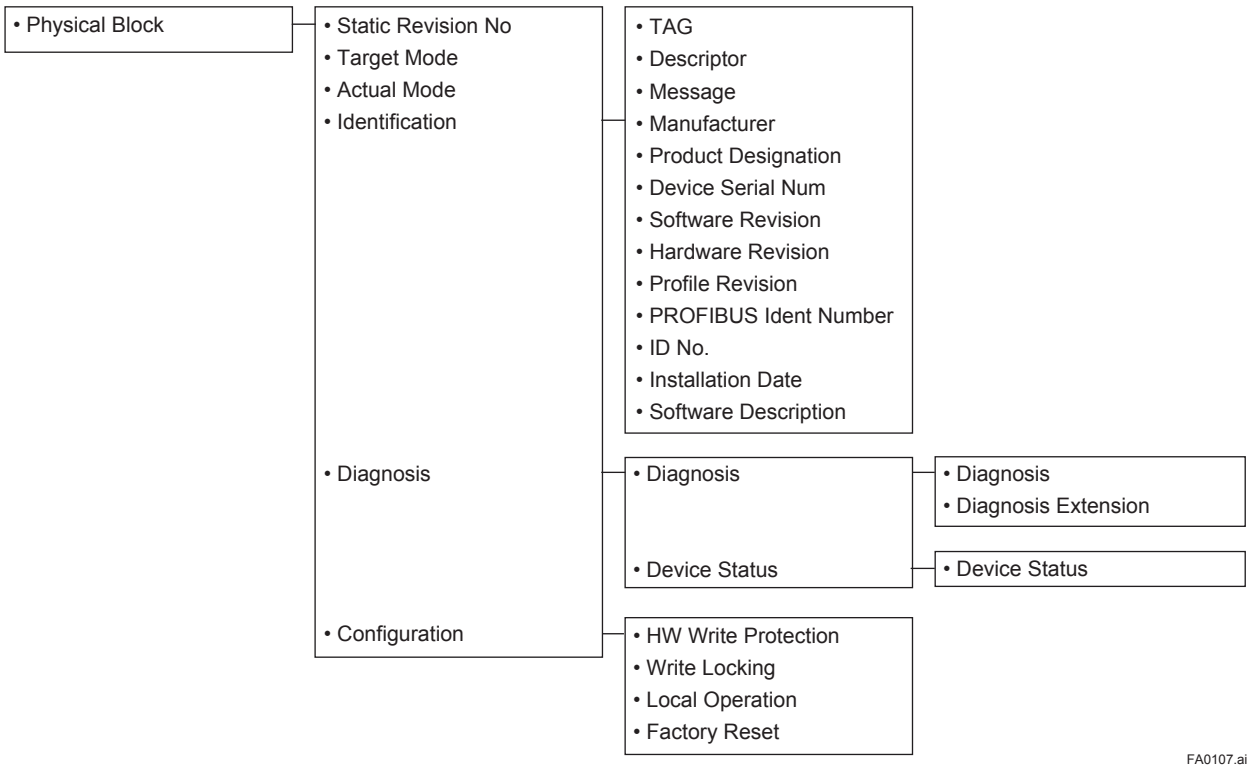


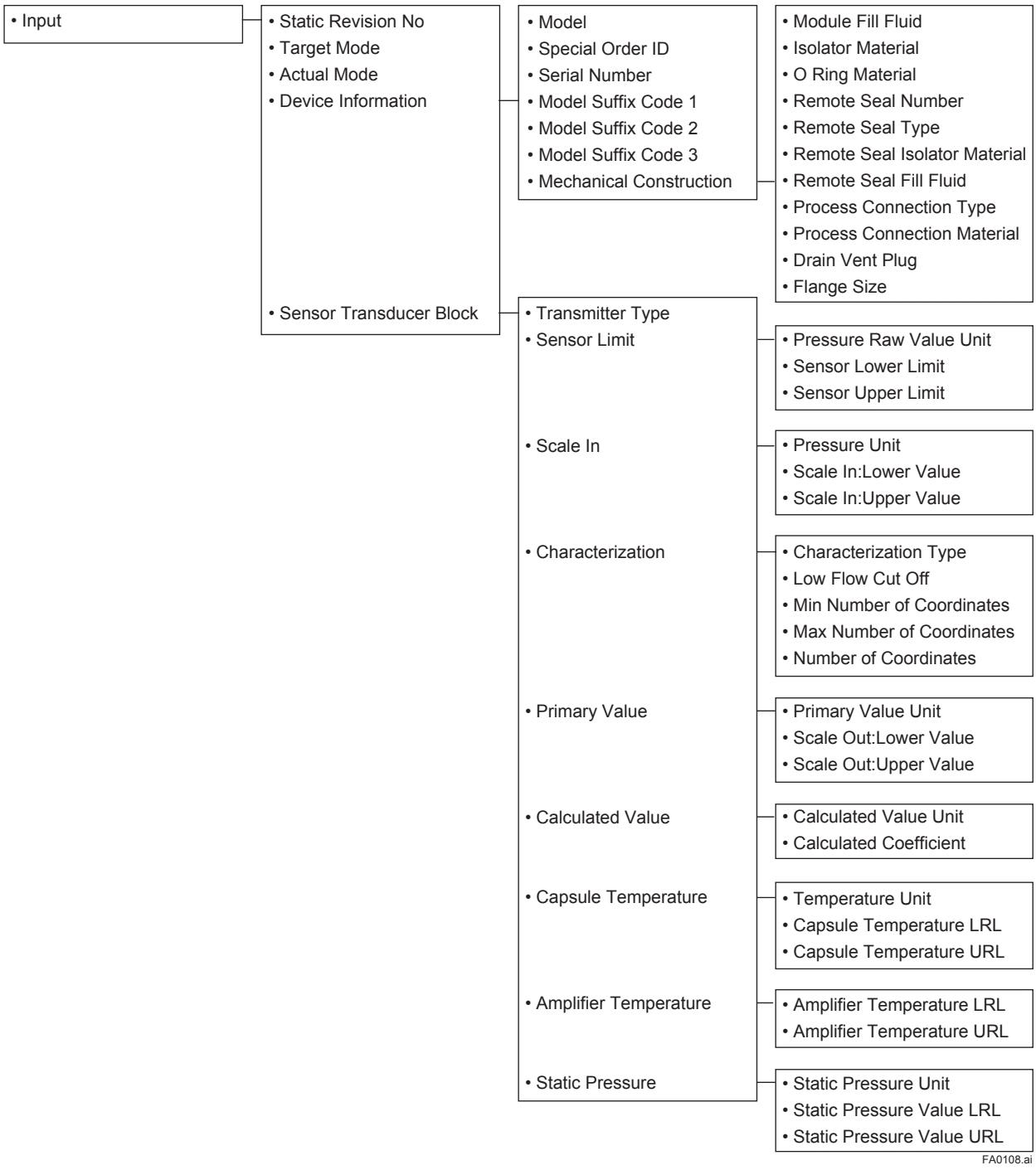


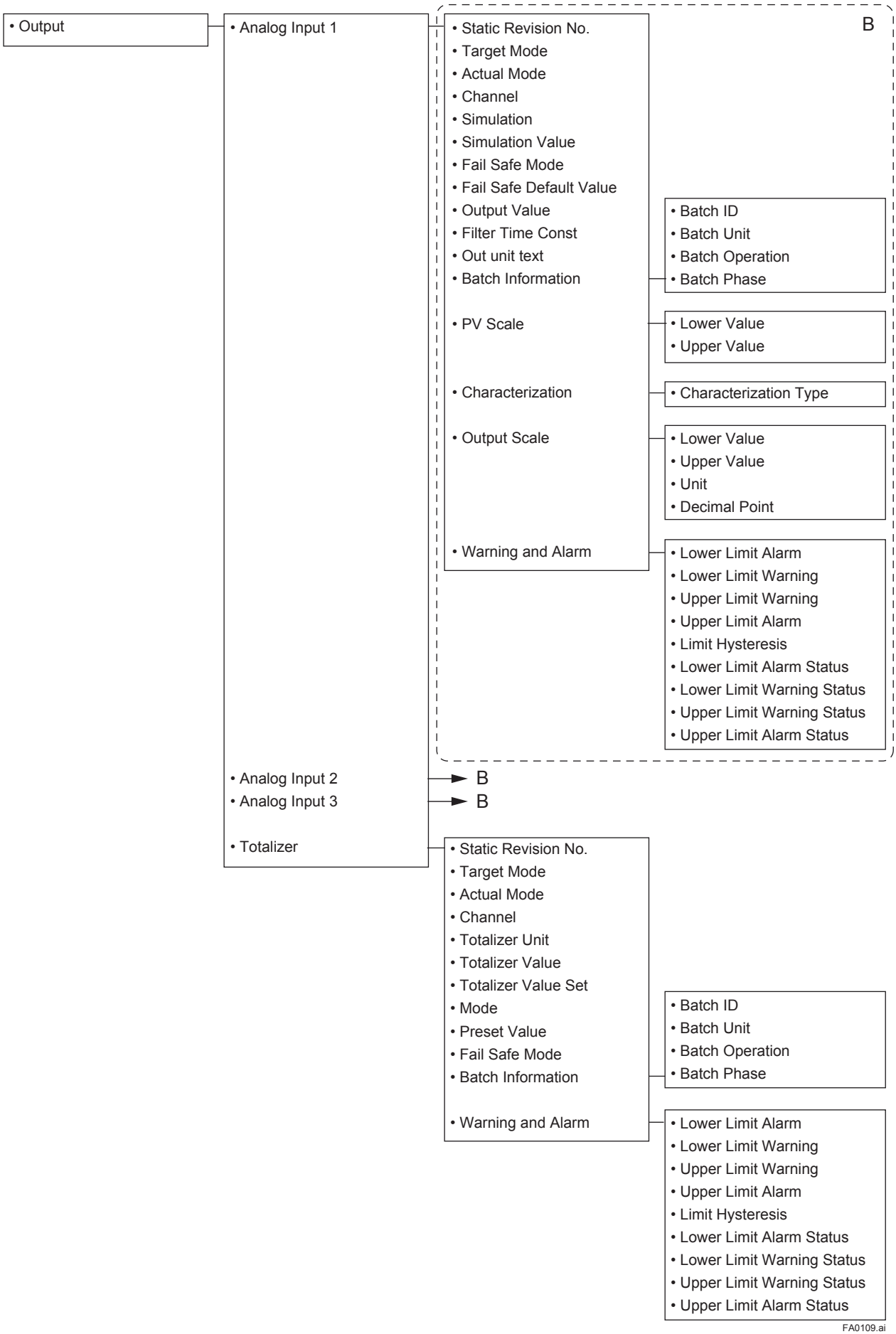

• Easy Setup
• TAG
• Descriptor
• Message
• Installation Date
• Sensor Transducer Block
• Target Mode
• Actual Mode
• Pressure unit
• Scale In:Lower Value
• Scale In:Upper Value
• Characterization Type
• Analog Input 1
• Target Mode
• Actual Mode
• Channel
• Filter Time Const
• Out Scale:Lower Value
• Out Scale:Upper Value
• Out Scale:Unit
• Out Scale:Decimal Point
FA0104.ai


• Zero Point Adjustment
• Target Mode
• Pressure Raw Value Unit
• Sensor Lower Limit
• Sensor Upper Limit
• Set Zero (Method)
• Pressure Trimmed Value
• Pressure Trimmed Value
FA0105.ai


• Calibration
• Target Mode
• Pressure Calibration
• Pressure Raw Value Unit
• Sensor Lower limit
• Sensor Upper limit
• Calibration Span Min
• Calibration
• Lower Calibration Point
• Upper Calibration Point
• Lower Calibration Deviation
• Upper Calibration Deviation
• Pressure Trimmed Value
• Pressure Trimmed Value
• Static Pressure Calibration
• Static Pressure Unit
• Static Pressure Value LRL
• Static Pressure Value URL
• SP Calibration Span Min
• Calibration
• SP Lower Calibration Point
• SP Upper Calibration Point
• SP Lower Calibration Deviation
• SP Upper Calibration Deviation
• Static Pressure Trimmed Value
• Static Pressure High Side Value
• Clear Calibration
• Clear Calibration (Method)
• Pressure - Calibrated Value
• Lower Calibration Point
• Upper Calibration Point
• Lower Calibration Deviation
• Upper Calibration Deviation
• Static Pressure - Calibrated Value
• SP Lower Calibration Point
• SP Upper Calibration Point
• SP Lower Calibration Deviation
• SP Upper Calibration Deviation
• Calibration Information
• Sensor Calibration Method
• Sensor Calibration Location
• Sensor Calibration Executor
FA0106.ai


• Physical Block
• Static Revision No
• Target Mode
• Actual Mode
• Identification
• TAG
• Descriptor
• Message
• Manufacturer
• Product Designation
• Device Serial Num
• Software Revision
• Hardware Revision
• Profile Revision
• PROFIBUS Ident Number
• ID No.
• Installation Date
• Software Description
• Diagnosis
• Diagnosis
• Diagnosis
• Diagnosis Extension
• Device Status
• Device Status
• Configuration
• HW Write Protection
• Write Locking
• Local Operation
• Factory Reset
FA0107.ai


• Input
• Static Revision No
• Target Mode
• Actual Mode
• Device Information
• Sensor Transducer Block
• Model
• Special Order ID
• Serial Number
• Model Suffix Code 1
• Model Suffix Code 2
• Model Suffix Code 3
• Mechanical Construction
• Module Fill Fluid
• Isolator Material
• O Ring Material
• Remote Seal Number
• Remote Seal Type
• Remote Seal Isolator Material
• Remote Seal Fill Fluid
• Process Connection Type
• Process Connection Material
• Drain Vent Plug
• Flange Size
• Transmitter Type
• Sensor Limit
• Pressure Raw Value Unit
• Sensor Lower Limit
• Sensor Upper Limit
• Scale In
• Pressure Unit
• Scale In:Lower Value
• Scale In:Upper Value
• Characterization
• Characterization Type
• Low Flow Cut Off
• Min Number of Coordinates
• Max Number of Coordinates
• Number of Coordinates
• Primary Value
• Primary Value Unit
• Scale Out:Lower Value
• Scale Out:Upper Value
• Calculated Value
• Calculated Value Unit
• Calculated Coefficient
• Capsule Temperature
• Temperature Unit
• Capsule Temperature LRL
• Capsule Temperature URL
• Amplifier Temperature
• Amplifier Temperature LRL
• Amplifier Temperature URL
• Static Pressure
• Static Pressure Unit
• Static Pressure Value LRL
• Static Pressure Value URL
FA0108.ai


• Output
• Analog Input 1
• Static Revision No.
• Target Mode
• Actual Mode
• Channel
• Simulation
• Simulation Value
• Fail Safe Mode
• Fail Safe Default Value
• Output Value
• Filter Time Const
• Out unit text
• Batch Information
• Batch ID
• Batch Unit
• Batch Operation
• Batch Phase
• PV Scale
• Lower Value
• Upper Value
• Characterization
• Characterization Type
• Output Scale
• Lower Value
• Upper Value
• Unit
• Decimal Point
• Warning and Alarm
• Lower Limit Alarm
• Lower Limit Warning
• Upper Limit Warning
• Upper Limit Alarm
• Limit Hysteresis
• Lower Limit Alarm Status
• Lower Limit Warning Status
• Upper Limit Warning Status
• Upper Limit Alarm Status
B
• Analog Input 2
• Analog Input 3
B
B
• Totalizer
• Static Revision No.
• Target Mode
• Actual Mode
• Channel
• Totalizer Unit
• Totalizer Value
• Totalizer Value Set
• Mode
• Preset Value
• Fail Safe Mode
• Batch Information
• Batch ID
• Batch Unit
• Batch Operation
• Batch Phase
• Warning and Alarm
• Lower Limit Alarm
• Lower Limit Warning
• Upper Limit Warning
• Upper Limit Alarm
• Limit Hysteresis
• Lower Limit Alarm Status
• Lower Limit Warning Status
• Upper Limit Warning Status
• Upper Limit Alarm Status

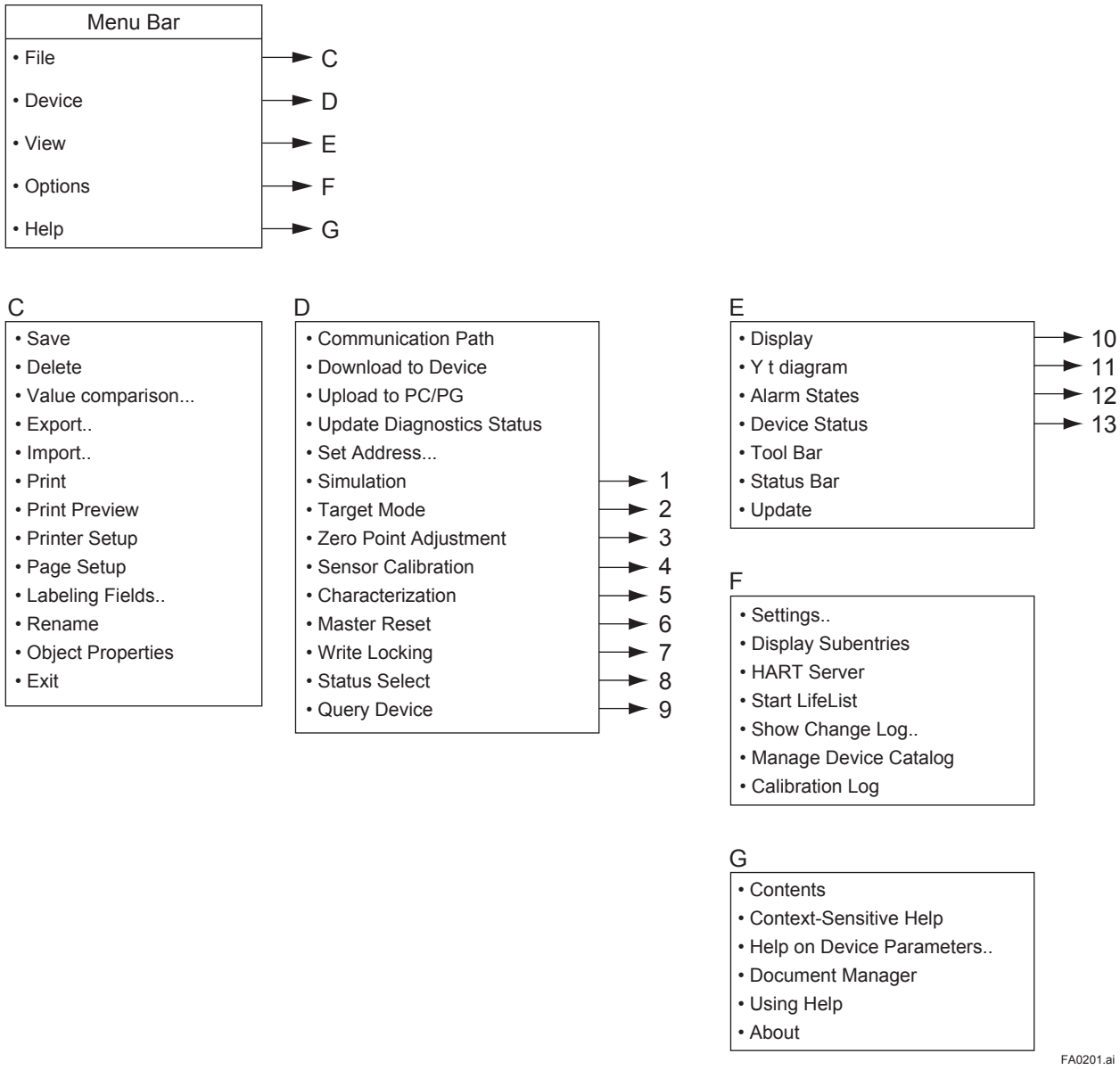
FA0109.ai

- Local Display
  - Static Revision No.
  - Target Mode
  - Actual Mode
  - Bar Graph
  - Display Cycle
  - Power On Information
  - Display Selections
    - Display Selection
    - Information Selection
  - Display 1 Setup
    - Parameter Selection 1
    - Display Tag 1
    - Unit Selection 1
    - Display Unit 1
    - Exponent Mode 1
  - Display 2 Setup
    - Parameter Selection 2
    - Display Tag 2
    - Unit Selection 2
    - Display Unit 2
    - Exponent Mode 2
  - Display 3 Setup
    - Parameter Selection 3
    - Display Tag 3
    - Unit Selection 3
    - Display Unit 3
    - Exponent Mode 3
  - Display 4 Setup
    - Parameter Selection 4
    - Display Tag 4
    - Unit Selection 4
    - Display Unit 4
    - Exponent Mode 4

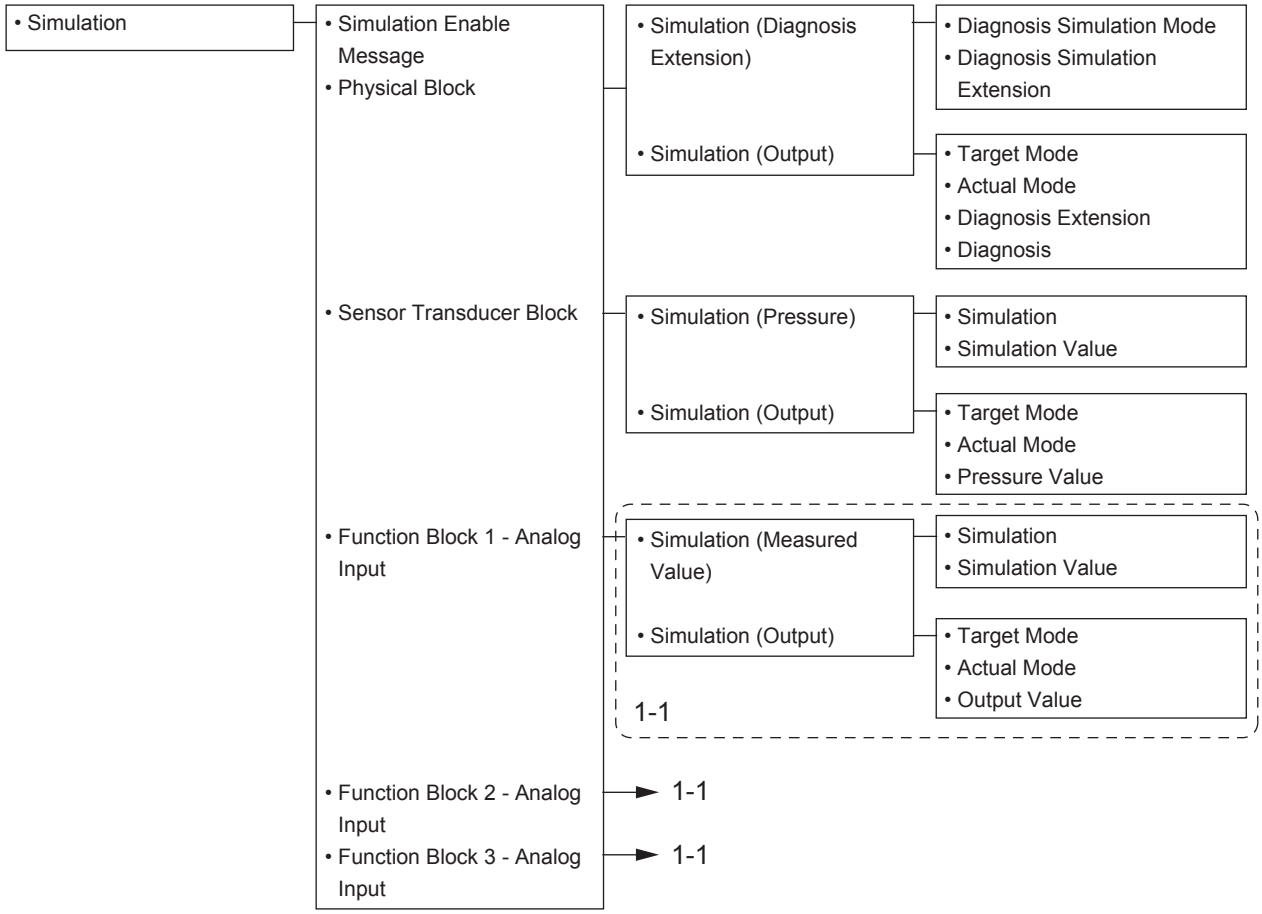
FA0110.ai

Appendix 2. List of PDM (EDD) Menu

A2.1 Menu Bar

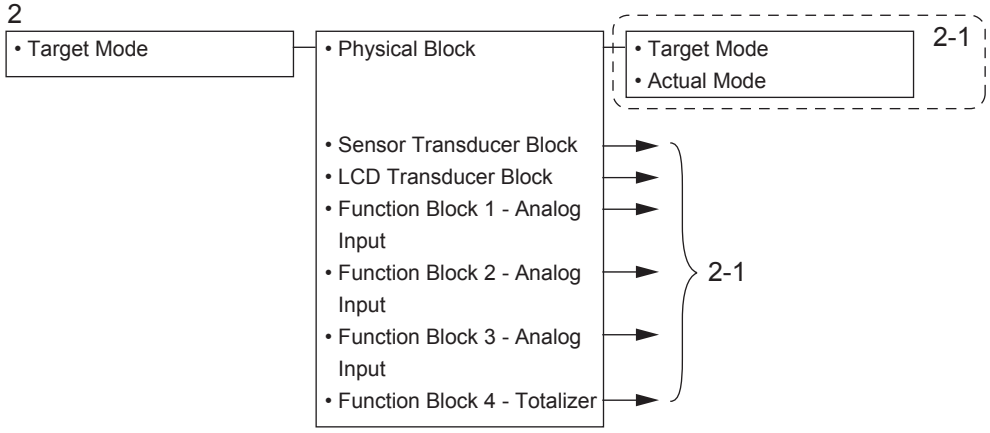


1



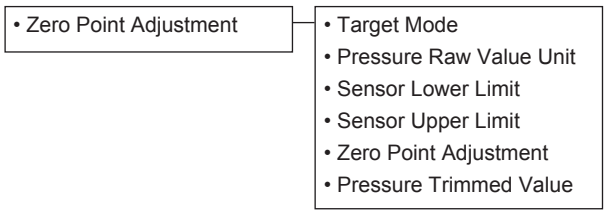
FA0211.ai

2



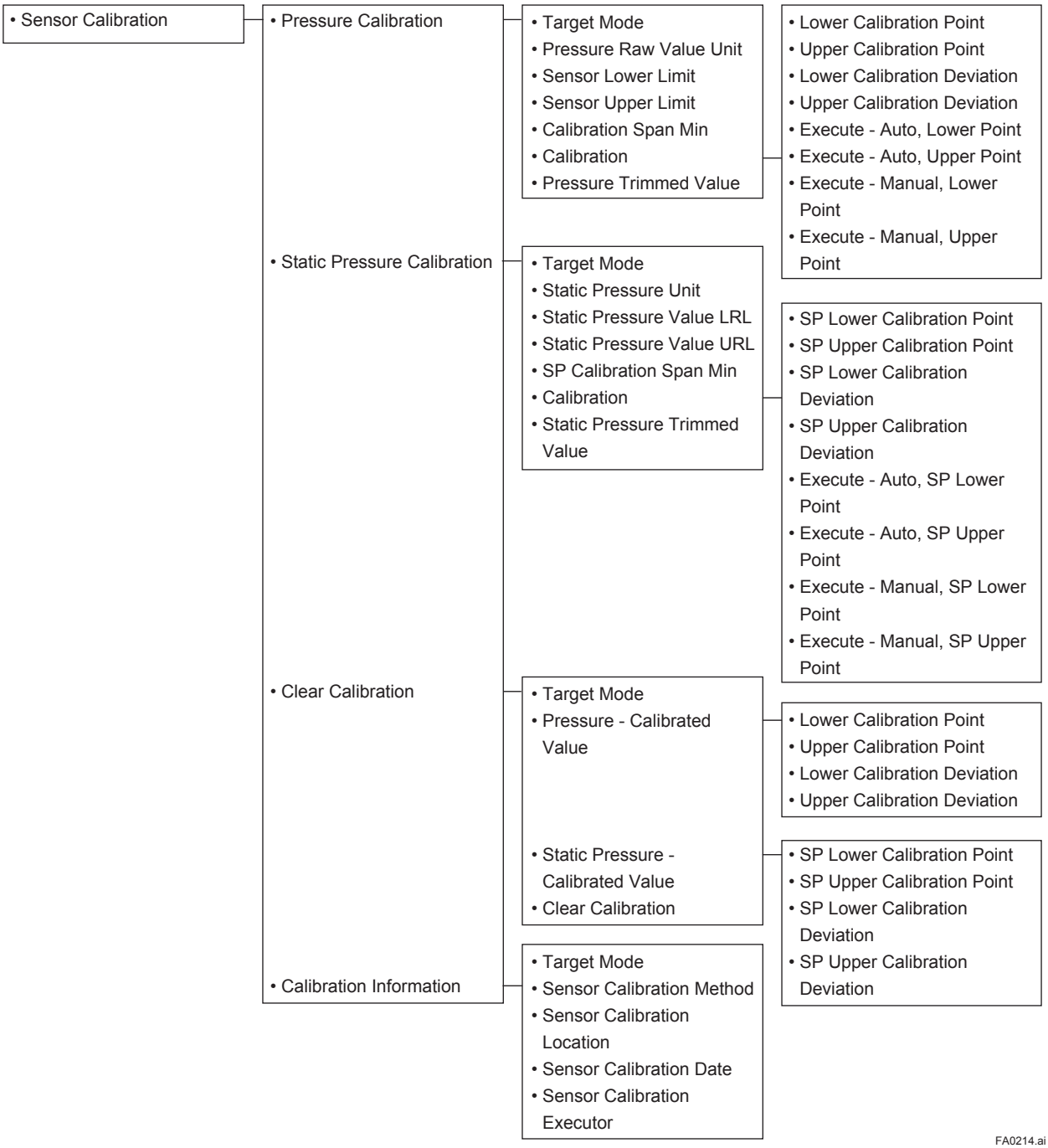
FA0212.ai

3



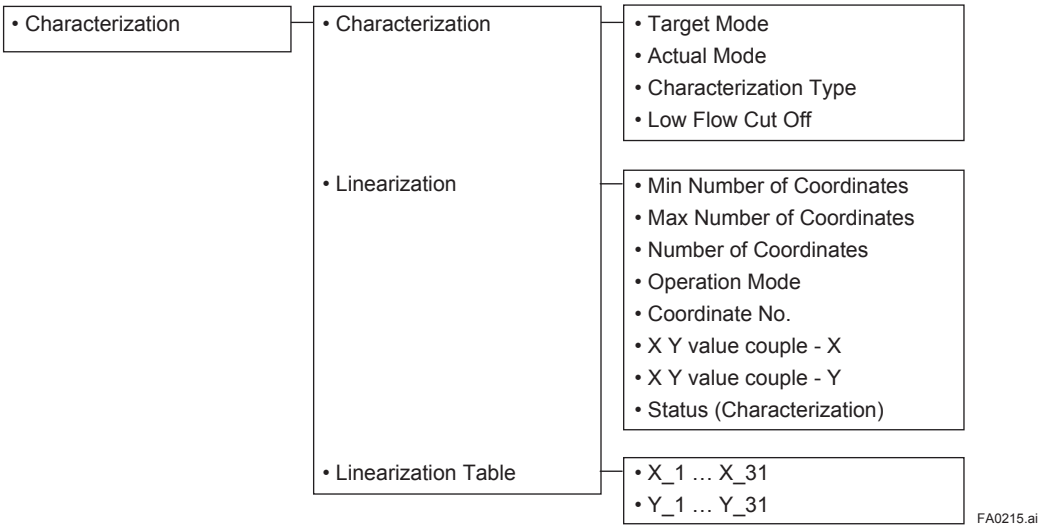
FA0213.ai

4

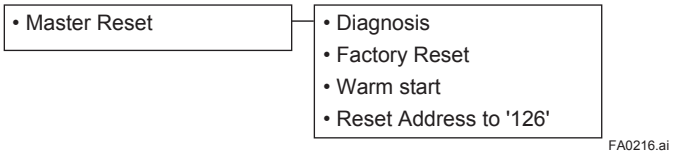

• Sensor Calibration
• Pressure Calibration
• Target Mode
• Pressure Raw Value Unit
• Sensor Lower Limit
• Sensor Upper Limit
• Calibration Span Min
• Calibration
• Pressure Trimmed Value
• Lower Calibration Point
• Upper Calibration Point
• Lower Calibration Deviation
• Upper Calibration Deviation
• Execute - Auto, Lower Point
• Execute - Auto, Upper Point
• Execute - Manual, Lower Point
• Execute - Manual, Upper Point
• Static Pressure Calibration
• Target Mode
• Static Pressure Unit
• Static Pressure Value LRL
• Static Pressure Value URL
• SP Calibration Span Min
• Calibration
• Static Pressure Trimmed Value
• SP Lower Calibration Point
• SP Upper Calibration Point
• SP Lower Calibration Deviation
• SP Upper Calibration Deviation
• Execute - Auto, SP Lower Point
• Execute - Auto, SP Upper Point
• Execute - Manual, SP Lower Point
• Execute - Manual, SP Upper Point
• Clear Calibration
• Target Mode
• Pressure - Calibrated Value
• Lower Calibration Point
• Upper Calibration Point
• Lower Calibration Deviation
• Upper Calibration Deviation
• Static Pressure - Calibrated Value
• Clear Calibration
• SP Lower Calibration Point
• SP Upper Calibration Point
• SP Lower Calibration Deviation
• SP Upper Calibration Deviation
• Calibration Information
• Target Mode
• Sensor Calibration Method
• Sensor Calibration Location
• Sensor Calibration Date
• Sensor Calibration Executor

FA0214.ai

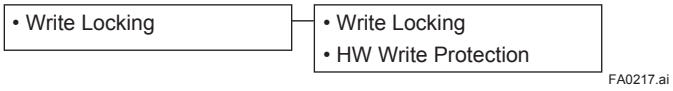
5


• Characterization
• Characterization
• Target Mode
• Actual Mode
• Characterization Type
• Low Flow Cut Off
• Linearization
• Min Number of Coordinates
• Max Number of Coordinates
• Number of Coordinates
• Operation Mode
• Coordinate No.
• X Y value couple - X
• X Y value couple - Y
• Status (Characterization)
• Linearization Table
• X_1 … X_31
• Y_1 … Y_31
FA0215.ai

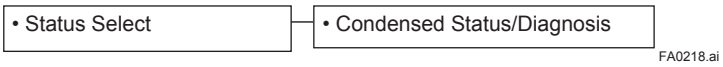
6


• Master Reset
• Diagnosis
• Factory Reset
• Warm start
• Reset Address to '126'
FA0216.ai

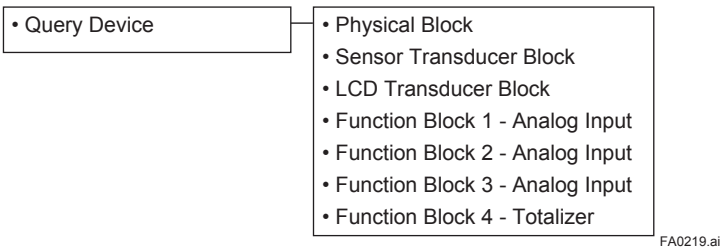
7


• Write Locking
• Write Locking
• HW Write Protection
FA0217.ai

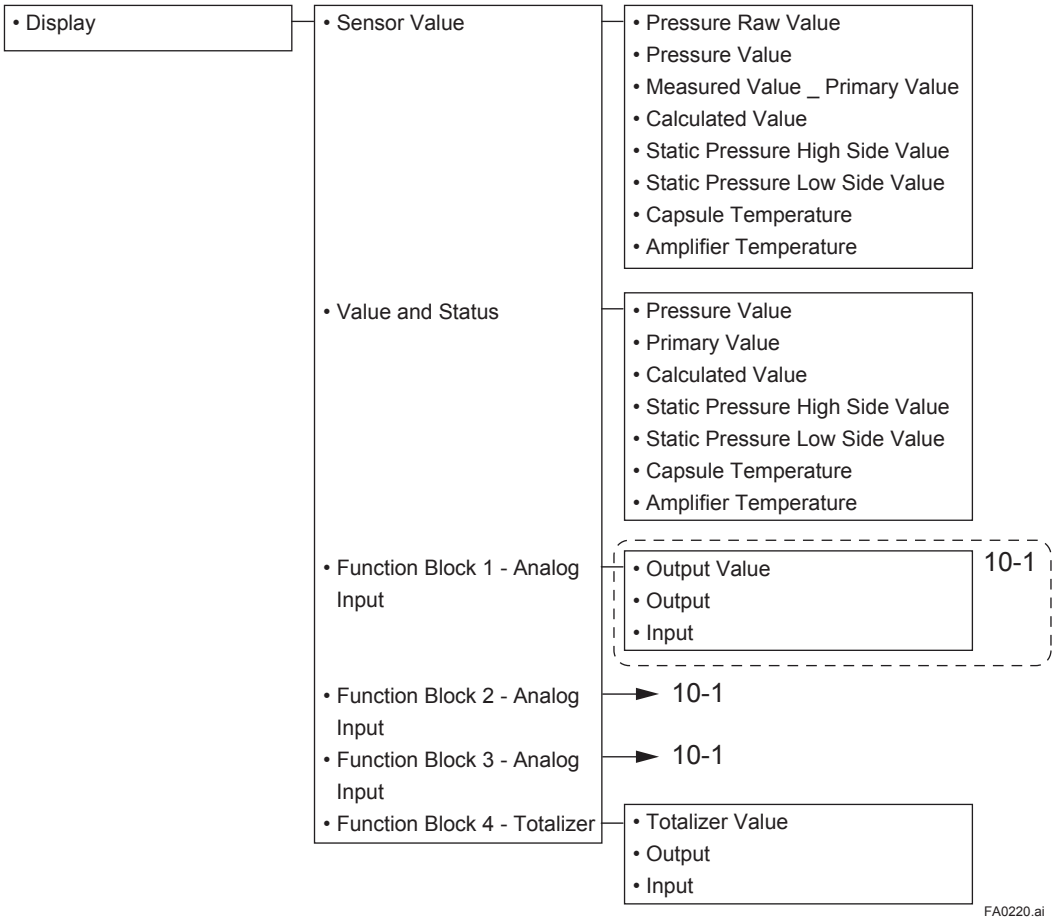
8


• Status Select
• Condensed Status/Diagnosis
FA0218.ai

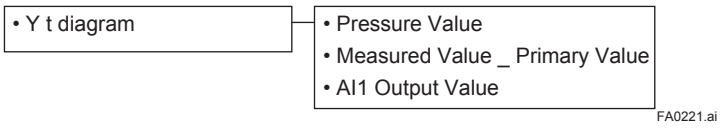
9

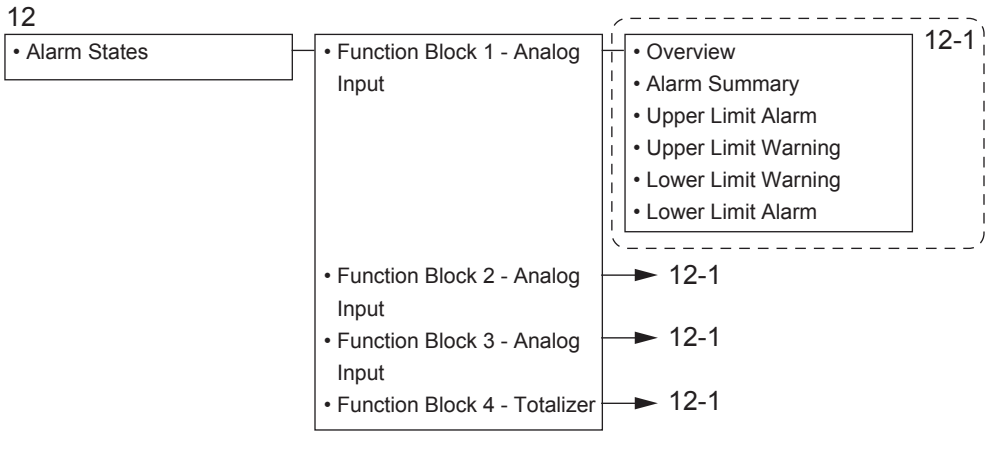

• Query Device
• Physical Block
• Sensor Transducer Block
• LCD Transducer Block
• Function Block 1 - Analog Input
• Function Block 2 - Analog Input
• Function Block 3 - Analog Input
• Function Block 4 - Totalizer
FA0219.ai

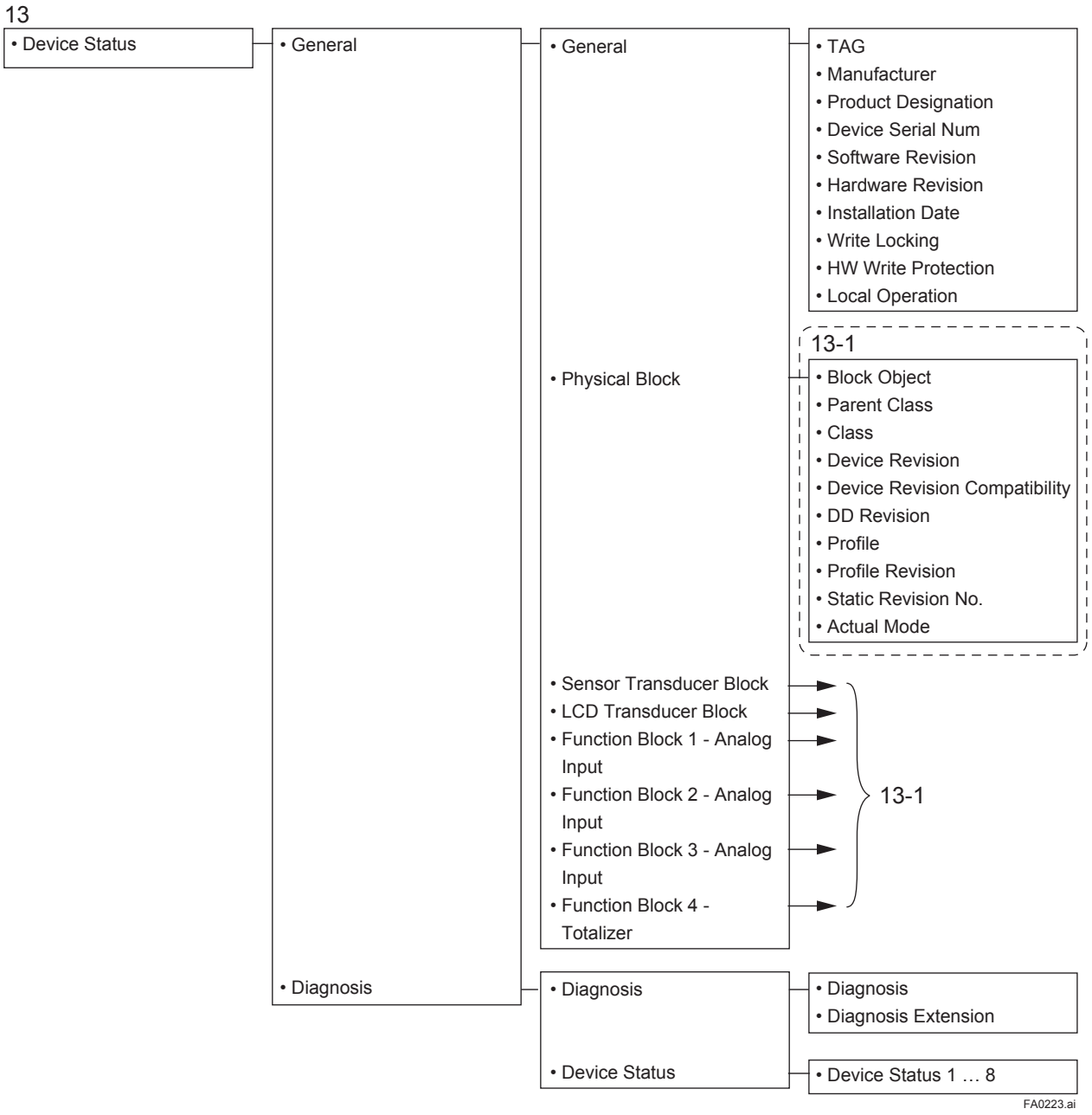
10


• Display
• Sensor Value
• Pressure Raw Value
• Pressure Value
• Measured Value _ Primary Value
• Calculated Value
• Static Pressure High Side Value
• Static Pressure Low Side Value
• Capsule Temperature
• Amplifier Temperature
• Value and Status
• Pressure Value
• Primary Value
• Calculated Value
• Static Pressure High Side Value
• Static Pressure Low Side Value
• Capsule Temperature
• Amplifier Temperature
• Function Block 1 - Analog Input
• Output Value
• Output
• Input
10-1
• Function Block 2 - Analog Input
10-1
• Function Block 3 - Analog Input
10-1
• Function Block 4 - Totalizer
• Totalizer Value
• Output
• Input
FA0220.ai

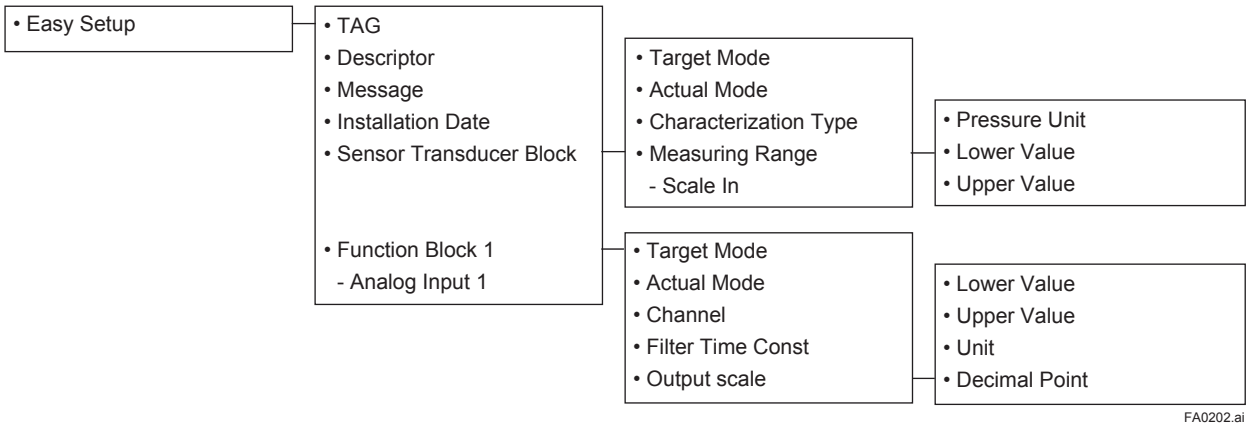
11

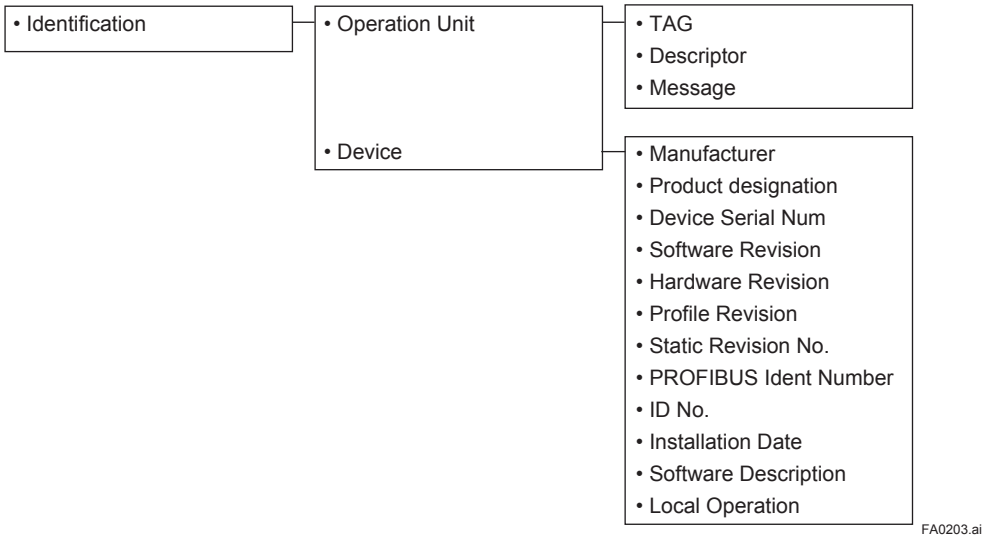

• Y t diagram
• Pressure Value
• Measured Value _ Primary Value
• AI1 Output Value
FA0221.ai

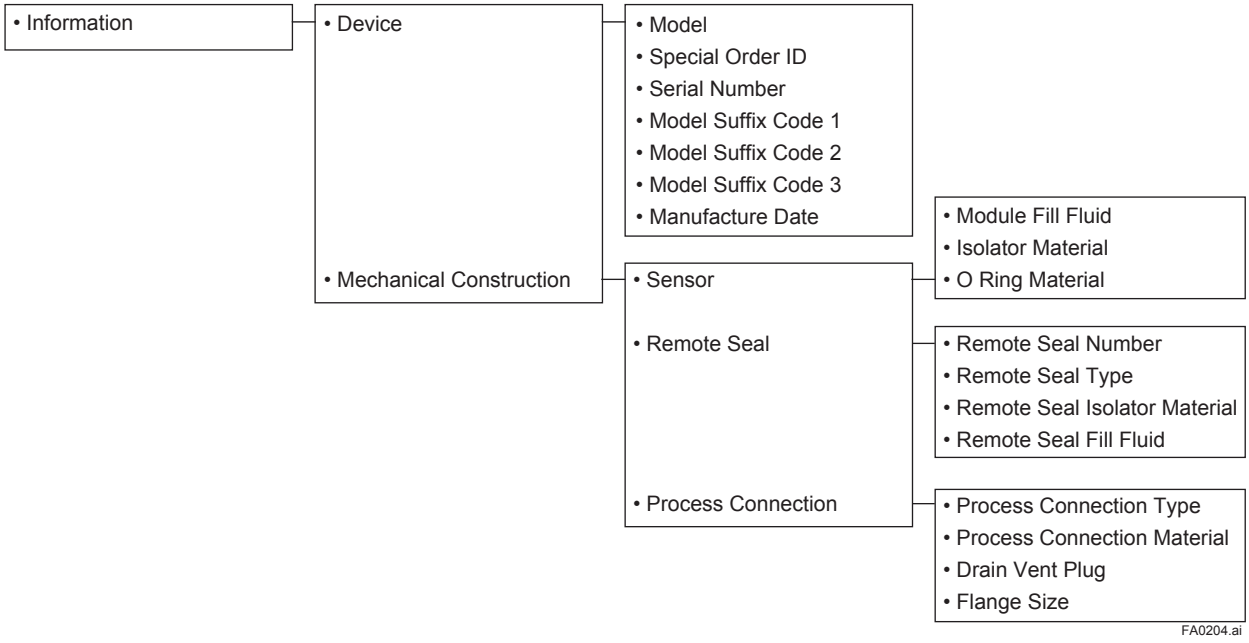

12
• Alarm States
• Function Block 1 - Analog Input
• Overview
• Alarm Summary
• Upper Limit Alarm
• Upper Limit Warning
• Lower Limit Warning
• Lower Limit Alarm
12-1
• Function Block 2 - Analog Input
12-1
• Function Block 3 - Analog Input
12-1
• Function Block 4 - Totalizer
12-1
FA0222.ai

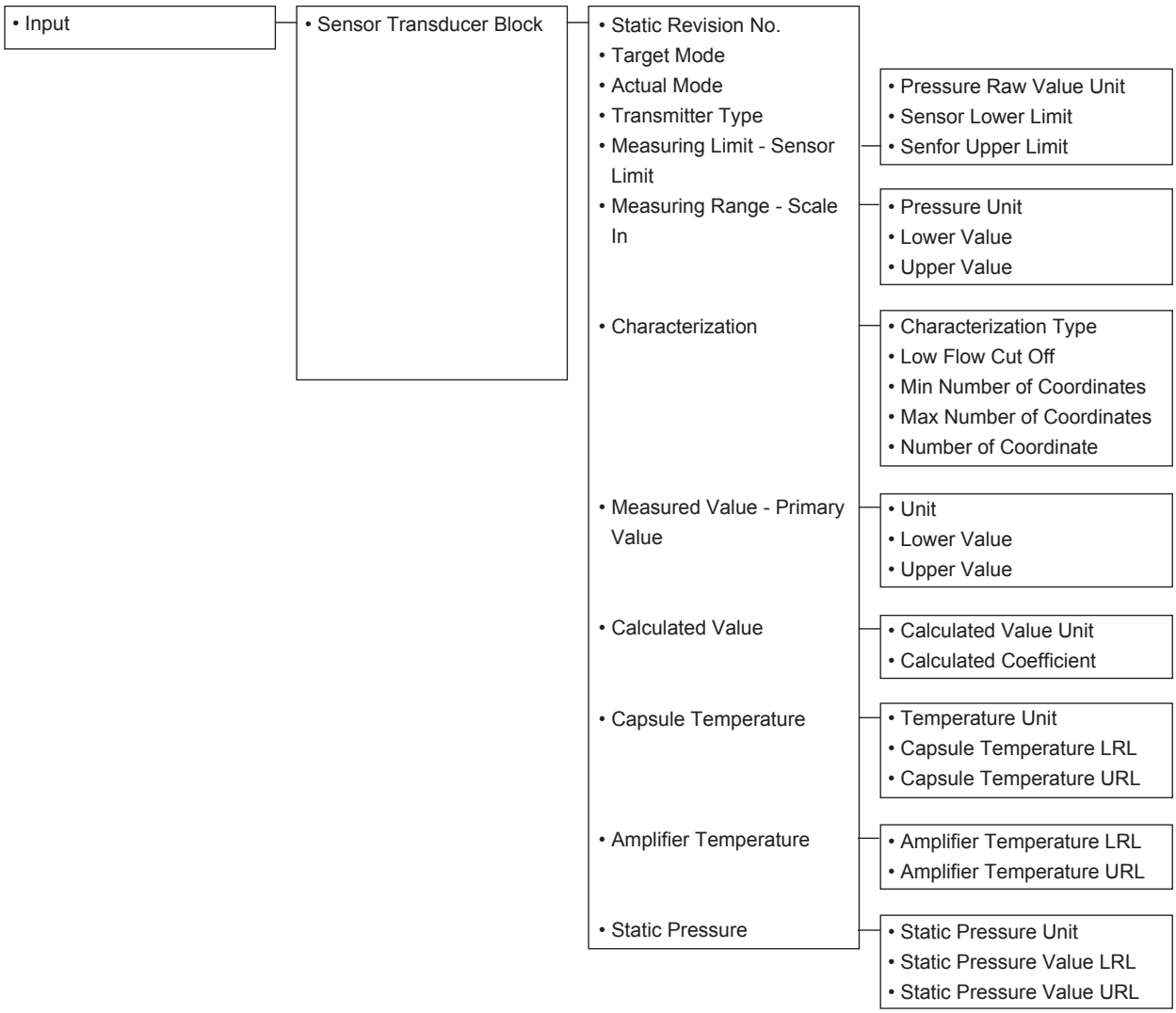

13
• Device Status
• General
• General
• TAG
• Manufacturer
• Product Designation
• Device Serial Num
• Software Revision
• Hardware Revision
• Installation Date
• Write Locking
• HW Write Protection
• Local Operation
• Physical Block
13-1
• Block Object
• Parent Class
• Class
• Device Revision
• Device Revision Compatibility
• DD Revision
• Profile
• Profile Revision
• Static Revision No.
• Actual Mode
• Sensor Transducer Block
• LCD Transducer Block
• Function Block 1 - Analog Input
• Function Block 2 - Analog Input
• Function Block 3 - Analog Input
• Function Block 4 - Totalizer
13-1
• Diagnosis
• Diagnosis
• Diagnosis
• Diagnosis Extension
• Device Status
• Device Status 1 … 8
FA0223.ai

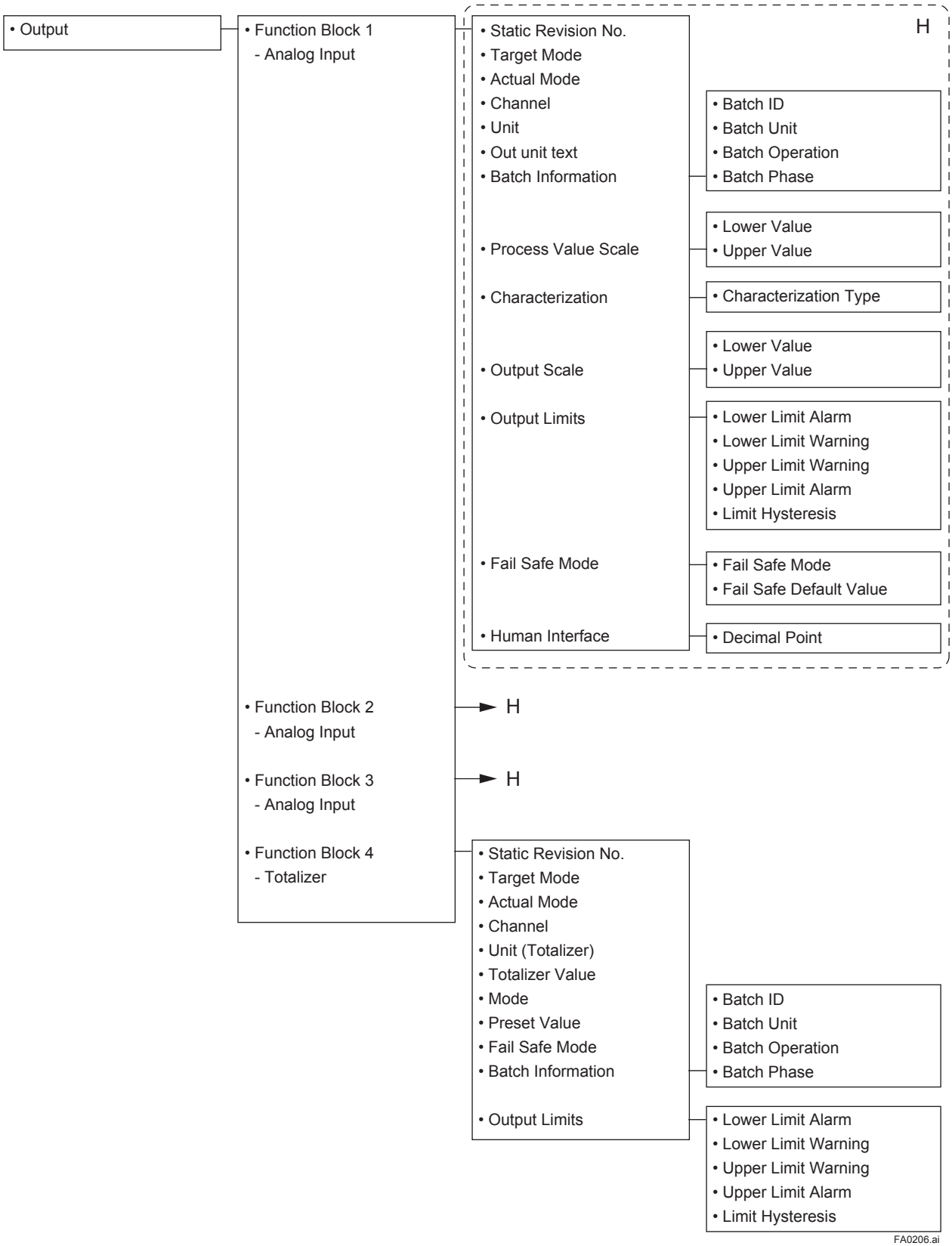
A2.2 Parameter Table

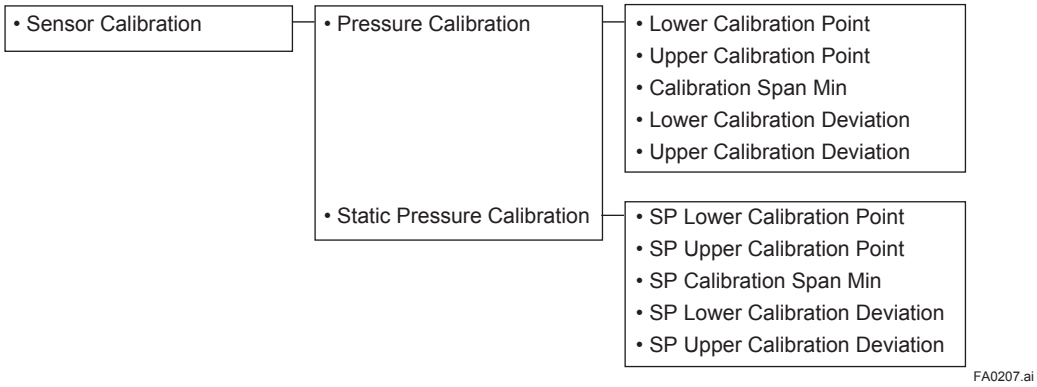


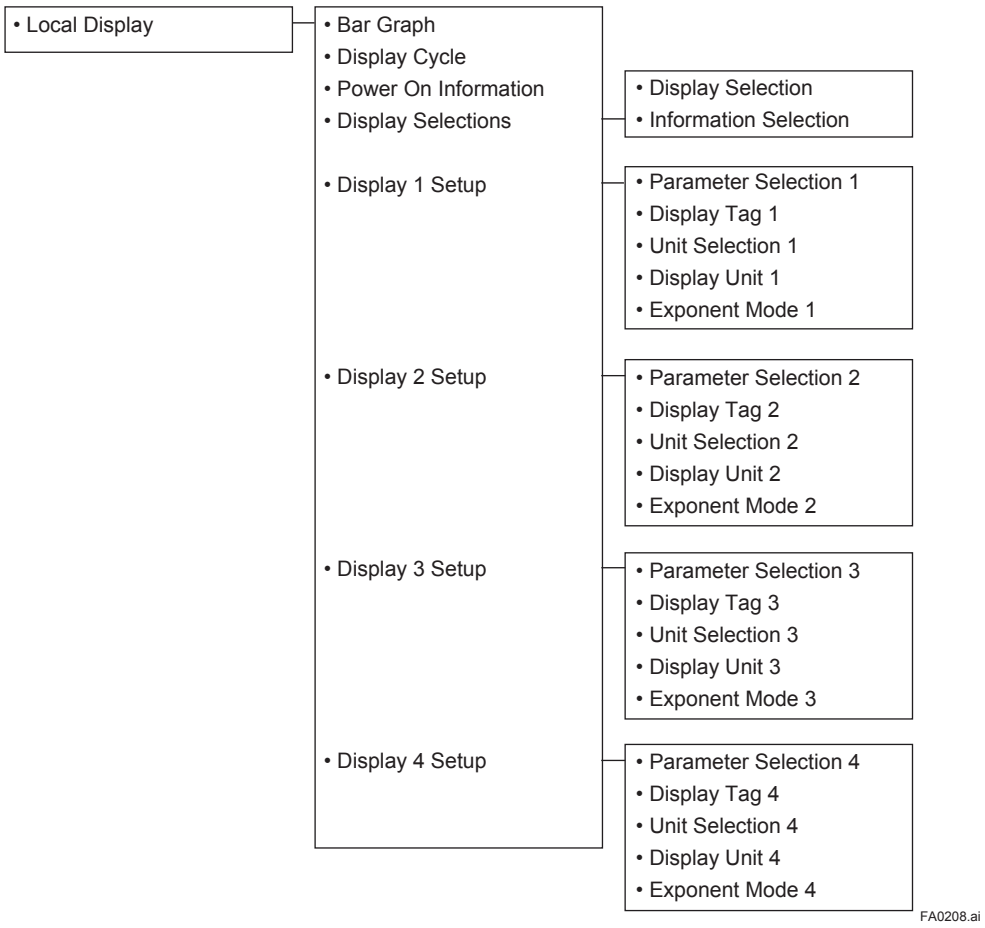


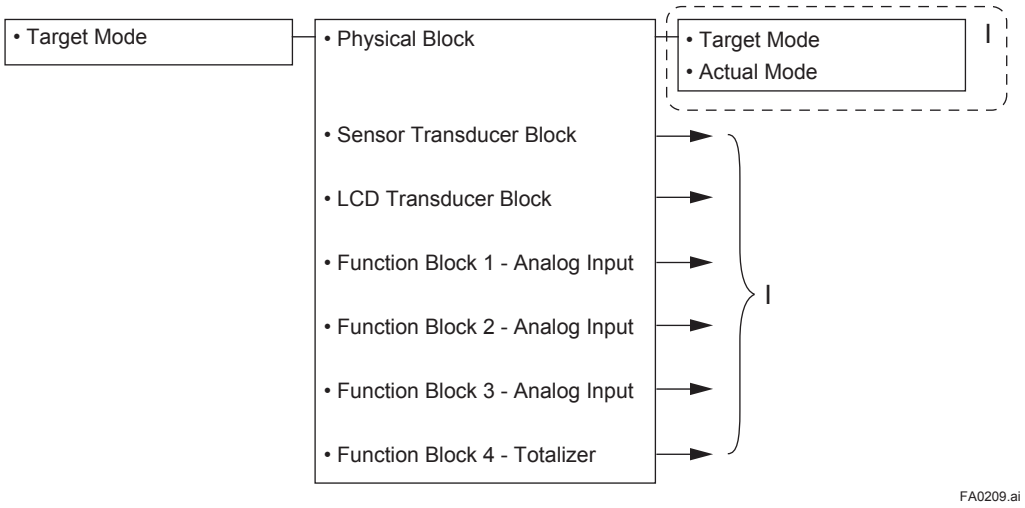



• Input
• Sensor Transducer Block
• Static Revision No.
• Target Mode
• Actual Mode
• Transmitter Type
• Measuring Limit - Sensor Limit
• Pressure Raw Value Unit
• Sensor Lower Limit
• Senfor Upper Limit
• Measuring Range - Scale In
• Pressure Unit
• Lower Value
• Upper Value
• Characterization
• Characterization Type
• Low Flow Cut Off
• Min Number of Coordinates
• Max Number of Coordinates
• Number of Coordinate
• Measured Value - Primary Value
• Unit
• Lower Value
• Upper Value
• Calculated Value
• Calculated Value Unit
• Calculated Coefficient
• Capsule Temperature
• Temperature Unit
• Capsule Temperature LRL
• Capsule Temperature URL
• Amplifier Temperature
• Amplifier Temperature LRL
• Amplifier Temperature URL
• Static Pressure
• Static Pressure Unit
• Static Pressure Value LRL
• Static Pressure Value URL
FA0205.ai


• Output
• Function Block 1
- Analog Input
• Static Revision No.
• Target Mode
• Actual Mode
• Channel
• Unit
• Out unit text
• Batch Information
• Batch ID
• Batch Unit
• Batch Operation
• Batch Phase
• Process Value Scale
• Lower Value
• Upper Value
• Characterization
• Characterization Type
• Output Scale
• Lower Value
• Upper Value
• Output Limits
• Lower Limit Alarm
• Lower Limit Warning
• Upper Limit Warning
• Upper Limit Alarm
• Limit Hysteresis
• Fail Safe Mode
• Fail Safe Mode
• Fail Safe Default Value
• Human Interface
• Decimal Point
H
• Function Block 2
- Analog Input
H
• Function Block 3
- Analog Input
H
• Function Block 4
- Totalizer
• Static Revision No.
• Target Mode
• Actual Mode
• Channel
• Unit (Totalizer)
• Totalizer Value
• Mode
• Preset Value
• Fail Safe Mode
• Batch Information
• Batch ID
• Batch Unit
• Batch Operation
• Batch Phase
• Output Limits
• Lower Limit Alarm
• Lower Limit Warning
• Upper Limit Warning
• Upper Limit Alarm
• Limit Hysteresis
FA0206.ai


• Sensor Calibration
• Pressure Calibration
• Lower Calibration Point
• Upper Calibration Point
• Calibration Span Min
• Lower Calibration Deviation
• Upper Calibration Deviation
• Static Pressure Calibration
• SP Lower Calibration Point
• SP Upper Calibration Point
• SP Calibration Span Min
• SP Lower Calibration Deviation
• SP Upper Calibration Deviation
FA0207.ai


• Local Display
• Bar Graph
• Display Cycle
• Power On Information
• Display Selections
• Display Selection
• Information Selection
• Display 1 Setup
• Parameter Selection 1
• Display Tag 1
• Unit Selection 1
• Display Unit 1
• Exponent Mode 1
• Display 2 Setup
• Parameter Selection 2
• Display Tag 2
• Unit Selection 2
• Display Unit 2
• Exponent Mode 2
• Display 3 Setup
• Parameter Selection 3
• Display Tag 3
• Unit Selection 3
• Display Unit 3
• Exponent Mode 3
• Display 4 Setup
• Parameter Selection 4
• Display Tag 4
• Unit Selection 4
• Display Unit 4
• Exponent Mode 4
FA0208.ai


• Target Mode
• Physical Block
• Target Mode
• Actual Mode
I
• Sensor Transducer Block
• LCD Transducer Block
• Function Block 1 - Analog Input
• Function Block 2 - Analog Input
• Function Block 3 - Analog Input
• Function Block 4 - Totalizer
I
FA0209.ai

Revision Information

- Title : DPharp
  PROFIBUS PA Communication Type
  (EJX□□□A, EJA□□□E)
- Manual No. : IM 01C25T04-01EN

Edition	Date	Page	Revised Item
1st	May 2013	—	New publication
2nd	June 2014	4-1	Change terminal drawing.
3rd	Oct. 2014	2-3 2-7	2.1.3 Revise description in “Note3 Installation.” 2.1.4 Add EPL code. Revise applicable standard. Add note for electro static charge. Add electrical connection.
4th	July 2015	1-1 1-2 2-2 2-5 2-6 2-11 2-12 to 2-13 10-2	Add trademark statement. 1.1 Add (g) and (h). 2.1.1 Add b. 2.1.2 a Add “No.61010-2-030.” 2.1.2 Add b. 2.1.3 (6) Replace nameplate. 2.1.4 Add b and c. 10.3 Add FS15, CS15, and SS26.
5th	April 2020	— 2-1 2-2 2-4 2-5 2-6 to 2-7 2-7 to 2-9 2-9 to 2-10 2-10 2-12 to 2-13 2-13 to 2-14	Delete 1.3 ATEX Documentation 2.1.1 a Update applicable standards. 2.1.1 b Update all the descriptions. 2.1.2 a. Update applicable standards and distance of seal. 2.1.2 b. Update applicable standards and ambient temp. 2.1.3 a. Update applicable standards. Modify Note 4 and 7. Add Note 3 and 6. 2.1.3 b. Update all the descriptions. 2.1.3 c. Update all the descriptions. 2.1.3 (6) Update tag plate. 2.1.4 b. Update all the descriptions. 2.1.4 c. Update all the descriptions.