# User´s Manual

# Model RAMC
# Short Stroke ROTAMETER
# PROFIBUS PA Communication Type

**addition to**
**IM 01R01B02-00x-E**

IM 01R01B02-01E-E

vigilantplant.™

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# Contents

# 1. INTRODUCTION

This manual contains a description of the RAMC Short Stroke Rotameter with PROFIBUS PA Communication Type. PROFIBUS PA communication type is similar to the HART communication type in terms of basic performance and operation. This manual describes only those topics that are required for operation of the PROFIBUS PA communication type and that are not contained in the basic instruction manual. Refer to RAMC Short Stroke Rotameter instruction manual IM 01R01B02-00E for topics common to the standard type and PROFIBUS PA communication types.

## Regarding This Manual

- This manual should be passed on 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 symbol marks 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.

## 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 process fluid and the interior of the meter.
- All installation work 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) 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.

(d) Explosion Protected Type Instrument

- User of explosion proof instruments should refer first to section 10 (Explosion Protected Type Instrument) of this manual.
- The use of this instrument is restricted to those who have received appropriate training in the device.
- Take care not noto 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 anuny modification made to this instrument by the customer.

# 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. About PROFIBUS PA

## 2.1 Outline

In addition to the RAMC short stroke Rotameter, which is a sophisticated product with outstanding reliability and ease of operation, developed on the basis of decades of field-proven experience.

PROFIBUS is registered trademark of PROFIBUS Nutzerorganisation e.V., Karlsruhe, Germany.

PROFIBUS is a manufacturer-independent and open fieldbus based on the international standards IEC61158 and IEC 61784. It covers a wide range of applications in manufacturing and process control systems. These functionalities Fieldbus is a bi-directional digital communication protocol for field devices, which offers an advancement in implementation technologies for process control systems and is widely employed by numerous field devices.

RAMC PROFIBUS communication type employs the specification standardized by the PNO, and provides interoperability between Yokogawa devices and those produced by other manufacturers. PROFIBUS PA comes with software consisting of AI function block, providing the means to implement a flexible instrumentation system.

## 2.2 Internal Structure of RAMC

RAMC contains three function blocks which are implemented in accordance with Profile3.0.

**(1) Physical block**
- Manages the status of RAMC hardware.
- Automatically informs the host of any detected faults or other problems.

**(2) Transducer block**
- Converts sensor output to flow rate signal and transfers to AI function block.

**(3) AI function block**
- Conditions raw data from the Transducer block.
- Outputs flow rate signals.
- Carries out scaling extraction.

## 2.3 Logical Structure of Each Block

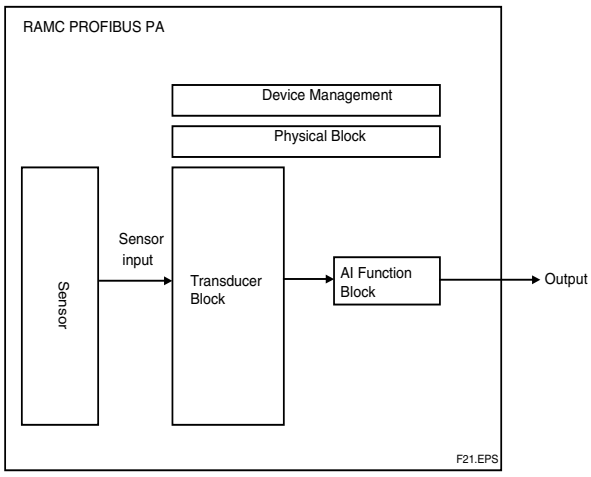



Figure 2.1 Logical Structure of Each Block

Setting of various parameters and station addresses shown in Figure 2.1 is required before starting operation.

# 2.4 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 allow device performance to be fully exhibited.

# 3. GETTING STARTED

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

## 3.1 Connection of Devices

The following instruments are required for use with PROFIBUS PA devices:

- **Terminator:**
  PROFIBUS PA requires two terminators at the end of the segment
- **Segment Coupler:**
  PROFIBUS PA requires the segment coupler which adopts to the RS-485 signals to the IEC 61158-2 signal level.
- **Field devices:**
  Connect RAMC PROFIBUS PA communication type. Two or more RAMC devices or other devices can be connected.
- **Master:**
  Used for accessing field devices. A dedicated master (such as DCS or PLC) is used for an instrumentation line while dedicated communication tools are used for experimental purposes. For operation of the master, refer to the instruction manual for each master. No details of the master are explained in the rest of this manual.
- **Cable:**
  The PROFIBUS specification must be regarded.
  Two-core twisted and shielded cables are recommended, otherwise the EMC- requirements for industrial flow meters can not be guaranteed.
  EN 50170 specifies two types of bus cable. For transmission rates up to 1.5 Mbit/s, cable type A is recommended.

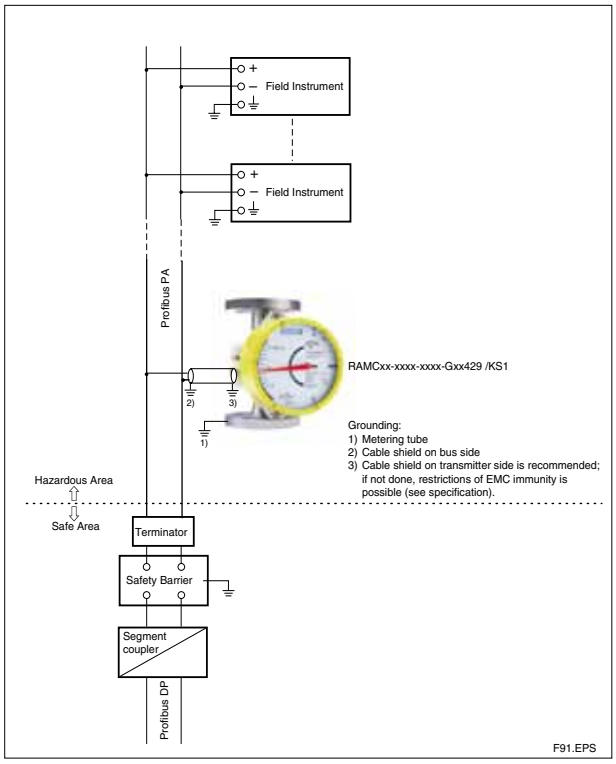


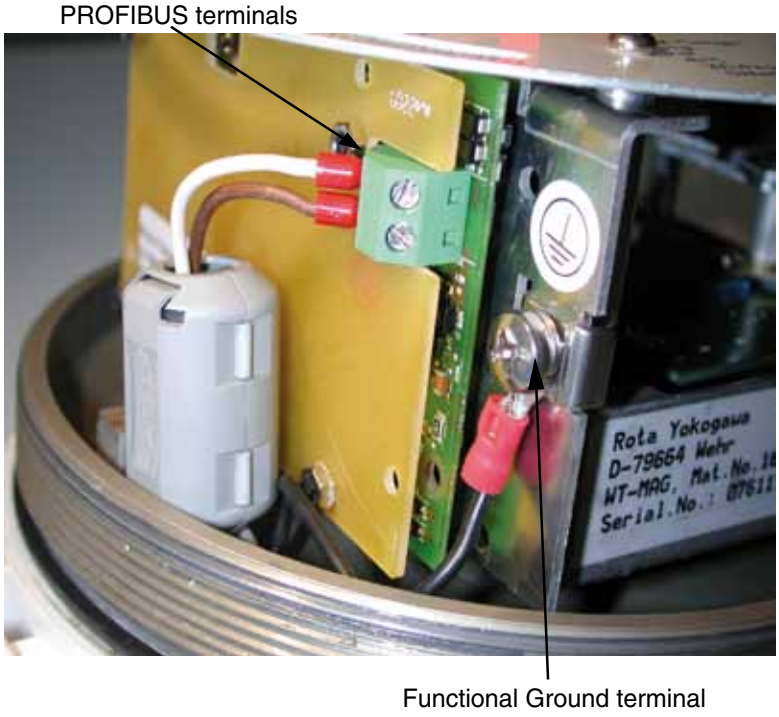

Figure 3.1 Device Connection

The PROFIBUS specification and installation guide must be regarded.
It is recommended to connect the shield on both sides to ground. Compensation currents on ground lines must be avoided. Therefore the shield may be connected to ground on one side (e.g. in control cubicle) via capacitor to ground.
The potential equalization must be connected to the flow meter.
If the shield is only connected on supply- side, reduction of EMC- immunity is possible.

**Cable shield grounded on both sides:**

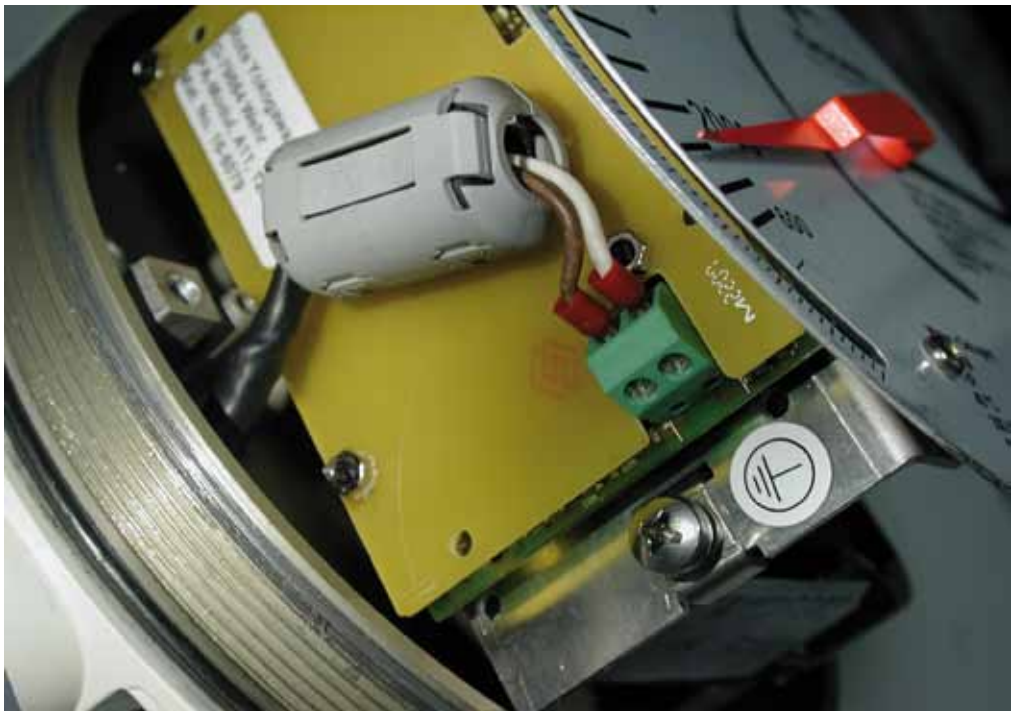
**IMPORTANT**

Outer shield of Profibus cable must be connected to the shown functional ground terminal.




**Cable shield grounded only on bus- side**

If cable shield is only grounded on bus- side the attached ferrite core must be mounted on the cable in RAMC housing as shown in the figure below.



# 3.2 Integration of GSD

PROFIBUS PA system requires GSD file which describes the device parameters such as the transmission rate supported, input, output data, data format and data length.

The following GSD files in the following table are available to RAMC.

Table 3.1 GSD files

| | |
|---|---|
| Profile Ident. Number | 0x9700 |
| Profile GSD file | PA139700.GSD (AIx1) |
| Device Specific Ident. Number | 0x0A45 |
| Device Specific GSD file | YEC0A45.GSD |

# 3.3 Cyclic Data Exchange

To send the volume flow or mass flow value to set the control variables for AI function block cyclically, the cyclic data exchange service must be set. RAMC transmits the following measured values on the cyclic data exchange service.

Table 3.2 Cyclic data exchange

| Parameter | Input / Output | Description |
|---|---|---|
| OUT (AI) | Input | Volumetric flow or mass flow |

Table 3.3 Channel select

| Parameter | Input / Output | Description |
|---|---|---|
| CHANNEL | 0x111<br>0x115 | Volumetric flow<br>Mass flow |

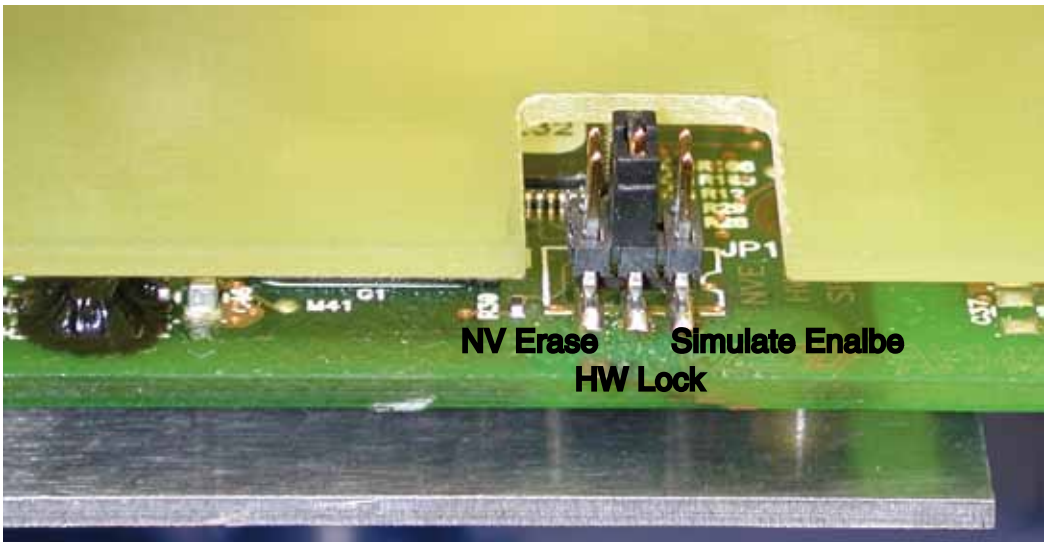
# 3.4 Setting of Write Protect Jumper

A write protection is a function to forbid changing of parameters. It is possible to set the software write protection by parameter setup or the hardware write protection by the hardware jumper. In case of the setting up by parameters, it can be set up in WRITE_LOCKING. When WRITE_LOCKING is "0: Lock", the status of write protect becomes protected mode. And when WRITE_LOCKING is "2457: Disabled", the status becomes unprotected mode.

In case of the setting up by hardware, it can be set up by jumper. When the jumper is not set to "HW Lock" the status becomes protected mode, and when the jumper is plugged the status becomes unprotected mode. The state of the hardware write protection jumper can be checked with the parameter HW_WRITE_PROTECTION. As mentioned above, write protection is available by the setting either of software protection or hardware protection, if one of them is set to protect mode, the status becomes protected mode.

| Setting of Hardware jumper | Displaying of HW_WRITE_PROTECTION | Setting of WRITE_LOCKING | Protect State |
|---|---|---|---|
| Mounted | 0 : Unprotected | 0 : Lock | Protect |
| Mounted | 0 : Unprotected | 2457 : Disabled | Enable |
| Removed | 1 : Protected | 0 : Lock | Protect |
| Removed | 1 : Protected | 2457 : Disabled | Enable |

The below figure shows the position of the Write Protect Switch.




NV Erase : Not used

HW Lock : Write protect function

Simulate Enable: Not used

## 3.5 Using the Keys

In PA devices there is no local operating menu available.
Pressing the "arrow up" button the indication can be changed between flow, totalizer and temperature.
Factory default is totalizer.
Pressing the "arrow right" button an error indication appears on display.
00000000 or 00000000
A detailed explanation see chapter 6.

# 4. BLOCK SETTING

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

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

## 4.1 AI Function Block Parameters

AI Function block parameters can be read or set from the host. For a list of the parameters of blocks held by the RAMC, refer to “List of parameters for each block of the RAMC ” in Appendix 1. The following is a list of important parameters with a guide how to set them.

**TARGET_MODE, MODE_BLK:**

Indicates the three types of function block modes; Out_Of_Service, Manual, and Auto. TARGET_MODE indicates what mode of operation is desired for AI Function block. In Out_Of_Service mode, the AI block does not operate. The Manual mode does not allow values to be updated. The Auto mode causes the measured value to be updated. Under normal circumstances, set the Auto mode to take effect. The Auto mode is the factory default.

**CHANNEL:**

This is the parameter of the transducer block to be input to the AI block. AI block is assigned to volumetric flow rate.

**OUT:**

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.

| d | h | min | s | |
|---|---|---|---|---|
| cm3/d(1514) | cm3/h(1513) | cm3/min(1512) | cm3/s(1511) | |
| ----- | ml/h(1578) | ml/min(1563) | ml/s(1577) | |
| m3/d(1350) | **m3/h(1349)** | **m3/min(1348)** | m3/s(1347) | |
| L/d(1354) | **l/h(1353)** | **l/min(1352)** | l/s (1351) | |
| ft3/d(1359) | **CFH(1358)** | **CFM(1357)** | CFS(1356) | |
| gal(US)/d(1365) | **gal(US)/h(1364)** | **GPM(1363)** | gal(US)/s(1362) | |
| ImpGal/d(1370) | **ImpGal/h(1369)** | **ImpGal/min(1368)** | ImpGal/s(1367) | |
| bbl(USOil)/d(1374) | bbl(US Oil)/h(1373) | bbl(USOil)/min(1372) | bbl(USOil)/s(1371) | |
| Nm3/d (1591) | **Nm3/h (1590)** | **Nm3/min (1589)** | Nm3/s (1588) | |
| Nl/d (1595) | **Nl/h (1594)** | **Nl/min (1593)** | Nl/s(1592) | |
| Sm3/d (1599) | Sm3/h (1598) | Sm3/min (1597) | Sm3/s (1596) | |
| Sl/d (1603) | Sl/h (1602) | Sl/min (1601) | Sl/s (1600) | |
| Scf/d (1605) | **Scf/h (1361)** | **Scf/min (1360)** | Scf/s (1604) | |
| ----- | Sgal/h (1525) | Sgal/min (1524) | ----- | |

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**PV_SCALE:**

Scale of input from the transducer block. The engineering unit of PV_SCALE high and low scale values are direct related to the VOLUME_FLOW_UNIT of the Transducer block. The unit is determined by order and printed on the incicator scale.

**OUT_SCALE:**

Sets the range of output (from 0% to 100%). Available units for OUT_SCALE are the after-mentioned units for VOLUME_FLOW_UNIT and the units shown below.

Table 4.1 FLOW_UNIT (Volume Flow)

| d | h | min | s | |
|---|---|---|---|---|
| cm3/d(1514) | cm3/h(1513) | cm3/min(1512) | cm3/s(1511) | |
| ----- | ml/h(1578) | ml/min(1563) | ml/s(1577) | |
| m3/d(1350) | **m3/h(1349)** | **m3/min(1348)** | m3/s(1347) | |
| L/d(1354) | **l/h(1353)** | **l/min(1352)** | l/s (1351) | |
| ft3/d(1359) | **CFH(1358)** | **CFM(1357)** | CFS(1356) | |
| gal(US)/d(1365) | **gal(US)/h(1364)** | **GPM(1363)** | gal(US)/s(1362) | |
| ImpGal/d(1370) | **ImpGal/h(1369)** | **ImpGal/min(1368)** | ImpGal/s(1367) | |
| bbl(USOil)/d(1374) | bbl(US Oil)/h(1373) | bbl(USOil)/min(1372) | bbl(USOil)/s(1371) | |
| Nm3/d (1591) | **Nm3/h (1590)** | **Nm3/min (1589)** | Nm3/s (1588) | |
| Nl/d (1595) | **Nl/h (1594)** | **Nl/min (1593)** | Nl/s(1592) | |
| Sm3/d (1599) | Sm3/h (1598) | Sm3/min (1597) | Sm3/s (1596) | |
| Sl/d (1603) | Sl/h (1602) | Sl/min (1601) | Sl/s (1600) | |
| Scf/d (1605) | **Scf/h (1361)** | **Scf/min (1360)** | Scf/s (1604) | |
| ----- | Sgal/h (1525) | Sgal/min (1524) | ----- | |

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Table 4.2 FLOW_UNIT (Mass Flow)

| d | h | min | s | |
|---|---|---|---|---|
| | | | | %(1342) |
| t/d(1329) | **t/h(1328)** | **t/min(1327)** | t/s(1326) | |
| kg/d(1325) | **kg/h(1324)** | **kg/min(1323)** | kg/s(1322) | |
| lb(US)/d(1333) | **lb(US)/h(1332)** | **lb(US)/min(1331)** | lb(US)/s(1330) | |
| g/d(1321) | g/h(1320) | g/min(1319) | g/s(1318) | |
| STON/d(1337) | STON/h(1336) | STON/min(1335) | STON/s(1334) | |
| LTON/d(1341) | **LTON/h(13**40) | **LTON/min(1339**) | LTON/s(1338) | |
| ---- | mg/h (1528) | mg/min (1527) | mg/s (1526) | |
| ---- | oz/h (1608) | oz/min (1607) | -------- | |

T42.EPS

**PV_FTIME**

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

# 4.2 Transducer Block Parameters

The transducer block sets functions specific to the flow rate measurement of the RAMC. For a list of the parameters of each block of the RAMC, refer to “List of parameters for each block of the RAMC” in Appendix 1. The following is a list of important parameters with a guide to how to set them.

**NOMINAL_SIZE:**

Shows the size of the flow tube in mm or inches.

**NOMINAL_SIZE_UNIT:**

Sets the unit of the flow tube size (in mm or inches).

**CALIBR_FACTOR:**

Shows the gain compensation factor for the flow meter (Default: 1.000).

**VOLUME_FLOW_UNIT:**

See Table 4.1. The bold printed units can be determined by order. The other units only can be set via Profibus PA.

**LOW_FLOW_CUTOFF:**

Sets low cut range for output. Setting range is 5 to 15%. “ 5%” is factory set.

**VOLUME_FLOW:**

Indicates the current measured value and status as the primary value (volumetric flow). This parameter is default input to the AI Function Block, if a volumetric unit is selected on scale.

**MASS_FLOW_UNIT**

See Table 4.2. The bold printed units can be determined by order. The other units only can be set via Profibus PA.

**MASS_FLOW**

Indicates the current measured value and status as the primary value (mass flow)

This parameter is default input to the AI Function block, if a mass unit is selected on scale.

**DENSITY_UNIT**

Units of DENSITY are shown below in Table 4.3. The bold printed units can be determined by order. The other units only can be set via Profibus PA.

Table 4.3 DENSITY_UNIT

| Description | Symbol | Value |
|---|---|---|
| **kilogram per cubic meter** | **kg/m3** | **1097** |
| megagram per cubic meter | Mg/m3 | 1098 |
| **kilogram per cubic decimeter** | **kg/dm3** | **1099** |
| **gram per cubic centimeter** | **g/cm3** | **1100** |
| gram per cubic meter | g/m3 | 1101 |
| **metric ton per cubic meter** | **t/m3** | **1102** |
| **kilogram per liter** | **kg/l** | **1103** |
| **gram per milliliter** | **g/ml** | **1104** |
| **gram per liter** | **g/l** | **1105** |
| **pound per cubic inch** | **lb/in3** | **1106** |
| **pound per cubic foot** | **lb/ft3** | **1107** |
| **pound per gallon (U.S.)** | **lb/gal** | **1108** |
| short ton per cubic yard | STon/yd3 | 1109 |
| milligram per cubic decimeter | mg/dm3 | 1564 |
| milligram per liter | mg/l | 1558 |
| milligram per cubic meter | mg/m³ | 1566 |
| microgram per liter | µg/l | 1559 |

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**DENSITY**

Indicates the ordered medium‘s density value as selected by DENSITY_UNIT.

This parameter can not be used for cyclic communication on AI Function block.

**TEMPERATURE_UNIT**

Units of TEMPERATURE see Table 4.4.

Table 4.4 TEMPERATURE_UNIT

| Description | Symbol | Value |
|---|---|---|
| degree Celsius | °C | 1001 |
| degree Fahrenheit | °F | 1002 |
| Kelvin | K | 1000 |

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**TEMPERATURE**

Indicates the device temperature value as selected by TEMPERATURE_UNIT.
This parameter can not be used for cyclic communication on AI Function block.

**TOTALIZER_UNIT**

Units of TOTALIZER see Table 4.5. The bold printed units can be determined by order (depending on the selected flow unit). The other units only can be set via Profibus PA.

Table 4.5 TOTALIZER_UNIT

| Description | Symbol | Value |
|---|---|---|
| **cubic meter** | **$m^3$** | **1034** |
| cubic centimeter | $cm^3$ | 1036 |
| **liter** | **l** | **1038** |
| milliliter | ml | 1040 |
| **cubic foot** | **$ft^3$** | **1043** |
| **US gallon** | **US gal** | **1048** |
| **UK gallon** | **Impgal** | **1049** |
| barrel (petrol) | bbl | 1051 |

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| Description | Symbol | Value |
|---|---|---|
| **Normal cubic meter** | **$Nm^3$** | **1573** |
| **Normal liter** | **Nl** | **1574** |
| Standard cubic meter | $Sm^3$ | 1575 |
| Standard liter | Sl | 1576 |
| **Standard cubic foot** | **$sft^3$** | **1053** |
| Standard gallon US | Sgal | 1531 |

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| Description | Symbol | Value |
|---|---|---|
| **metric ton** | **t** | **1092** |
| **kilogram** | **kg** | **1088** |
| **pound** | **lb** | **1094** |
| gram | g | 1089 |
| Short ton | Ston | 1095 |
| **Long ton** | **Lton** | **1096** |
| milligram | mg | 1090 |
| ounce | oz | 1093 |

T48.EPS

**TOTALIZER**

Indicates the totalized volumetric or mass flow depending on the selected CHANNEL.
Changing the channel will cause a reset of the actual totalizer value.
This parameter can not be used for cyclic communication on AI Function block.

# 5. IN-PROCESS OPERATION

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

## 5.1 Mode Transition

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

When the function block mode is changed to “Manual”, the function block suspends updating of output values. Only in this case alone, it is possible to write a value to the “OUT” parameter of the block for output. Note that no parameter status can be changed.

## 5.2 Generation 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 an diagnostic message in the process value (process alarm) is detected, a diagnostic message is issued from each block.

See also instruction manual IM 01R01B02-00x-E.

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# 6. DIAGNOSTIC INFORMATION

Diagnostic information and failures of RAMC are indicated by using parameter DIAGNOSIS (slot 0, index 29) and DIAGNOSIS_EXTENSION (slot:0 index 30) in Physical Block. Each diagnostic information is supported when the corresponding bit in DIAGNOSIS_MASK and DIAGNOSIS_EXTENSION is set.

| Quality | Sub-status | Limit | Alarm | Value |
|---|---|---|---|---|
| bit 6-7 | bit 2-5 | bit 0-1 | | |
| | | | | |
| 2: Good (NC) | 0: OK | 0: Not limited | | 0x80 |
| | | | | |
| 1: Uncertain | 1: Last usable Value | 0: Not limited | flow = 0 (Sensor malfunction) | 0x44 |
| | 4: Sensor Conversion not Accurate | 0: Not limited | flow < Lowcut or flow > 100% | 0x50 |
| | 4: Sensor Conversion not Accurate | 2: High limited | 06: Flow Overrun (>105%) | 0x52 |
| | | | | |
| 0: Bad | 3: Device Failure | 3: Constant | 01: RAM Error | 0x0C |
| | | | 02: ADC Error | |
| | | | 03: Adj-EEPROM Error | |
| | | | 04: Cal-EEPROM Error | |
| | | | 07: EEPROM Error | |
| | | | 09: Temperature Error | |
| | | | 16: Hardware Error | |

| Diagnose Byte | Error description | Bars blinking | Error on Display |
|---|---|---|---|
| DIAGNOSIS_EXTENTION[0] | 01: RAM Error | - - - - - - - - | 00000001 |
| | 02: ADC Error | - - - - - - - - | 00000010 |
| | 03: Adj-EEPROM Error | - - - - - - - - | 00000100 |
| | 04: Cal-EEPROM Error | - - - - - - - - | 00001000 |
| | 05: Totalizer Value False | - - - - - - - - | 00010000 |
| | 06: Flow Overrun | - - - - - - - - | 00100000 |
| | 07: Int. EEPROM Faulty | - - - - - - - - | 01000000 |
| | 08: Reserved | | 10000000 |
| DIAGNOSIS_EXTENTION[1] | 09: Temperature Error | - - - - - - - - | 00000001 |
| | 10: Reseved | | 00000010 |
| | 11: Reseved | | 00000100 |
| | 12: Reseved | | 00001000 |
| | 13: PWR Error | | 00010000 |
| | 14: Reseved | | 00100000 |
| | 15: Reseved | | 01000000 |
| | 16: Hardware Error | - - - - - - - - | 10000000 |

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# 7. GENERAL SPECIFICATIONS

## STANDARD SPECIFICATIONS

**Model code :**
RAMCxx-xxxx-xxxx-Gxx429

**Power supply :**
2-wire bus connection,not polarity sensitive :
9 to 32 V DC acc. to IEC 61158-2 and FISCO model

**Basic current :**
14mA

**Failure current (FDE) :**
10mA additional to basic current

**Transmission rate :**
31.25 kBaud

**Accuracy :**
according used metering tube

**Linearity :** :
± 0.2 % f.s.

**Hysteresis :**
± 0.1 % f.s.

**Repeatabillity :**
± 0.1 % f.s.

**Ambient temperature :**
-25 °C to +70 °C

**Storage temperature :**
-40 °C to +70 °C

**Temperature coefficient of the output signal**
± 0.5 %/10 K f.s.

**Electromagnetic compatibility (EMC) :**
- Acc. EN 61326-1: 2006, Class A, Table 2 and EN 61326-2-3 : 2006 :
  Criterion A, restriction: HF- immunity between 500 MHz and 750 MHz : criterion B
  RAMC with Profibus PA :
  Criterion A: Burst, Surge, HF- Immunity
  Criterion B: ESD
  In case of single sided grounding of the cable shield it is possible that for all tests criterion B is reached.

**Unit safety acc. EN 61010-1: 2010 :**
- Over voltage category : II (acc. VDE 0110 or IEC 664)
- Pollution degree : I
- Safety class : III

**Profibus PA profile :**
- AI block for volume flow or mass flow
- configurable with PDM DD
- supports I&M-functions

**Output signals :**
- Volumetric flow or mass flow

**Alarm Selection Function:**
These informations are indicated in DIAGNOSTICS parameter, which can be handled during normal operation.

## HAZARDOUS AREA SPECIFICATIONS

**Intrinsically safe electronic transmitter with ATEX- certification (option /KS1) :**

**Certificate :**
PTB 96 ATEX 2160X

**Output signal :**
Profibus PA

**Explosion proof :**
Ex ia IIC/IIB T4 Gb

| | IIC | IIB | FISCO |
|---|---|---|---|
| Ui | 24V | 17.5V | acc. |
| Ii | 250mA | 280mA | IEC 60079-27 |
| Li | negligible | negligible | |
| Ci | negligible | negligible | |

## SETTING WHEN SHIPPED

| Item | Settings |
|---|---|
| Tag number (Tag plate, option /BG ) | As specified in order. *1 |
| Software tag (TAG_DESC, option /BT2) | Set to “RAMC_PA” by default unless otherwise specified when ordered.*2 |
| Bus address (option /BT2) | Set to 0x7E (126) by default unless otherwise specified when ordered. *3 |

*1: Specified Tag Number is engraved on the stainless steel plate: Up to 16 letters using any of alphanumerics and symbols of [-}, [.} and [/}.
*2: Specified Software Tag is entered in the amplifier memory: Up to 32 letters using any of alphanumerics and symbols of [-}, [.} and [/}.
*3: Range of bus address: 0x00 to 0x7E (0 to 126). Set by remote configurator or at factory.

| Item | Settings | |
|---|---|---|
| Analog Input Function Block | AI 1 Volume Flow | AI 1 Mass Flow |
| Upper and lower operating range limits and unit (PV_SCALE) | The upper and lower range limit will be set to the range of the scale, specified when ordered. | The upper and lower range limit will be set to the range of the scale, specified when ordered. |
| Upper and lower output range limits and unit (OUT_SCALE) | The upper and lower range limit will be set to 0 to 100 % range. | The upper and lower range limit will be set to 0 to 100 % range. |
| Channel | 0x0111 (273) | 0x0115 (277) |
| Output mode (L-TYPE) | ´Direct´ for the AI block | |

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Explanation of parameters listed above:

(1) PV_SCALE: Defines the input values from the transducer block (input range of sensor) corresponding to 0% and 100% values in the calculation inside the AI function block.

(2) OUT_SCALE: Output scaling parameter. Defines the output values corresponding to 0% and 100% values in the calculation inside the AI function block.

(3) L_TYPE: The value is passed by the transducer block to the AI block with no linearization (Direct).

# 8. EXPLOSION PROTECTED TYPE INSTRUMENTS

**WARNING**

- Only trained persons may use the instrument in industrial location.
- The instrument modification or parts replacement by other than an authorized Representative of Yokogawa is prohibited and will void the certification.
- Electrostatic charge on painted or other non- metallic surfaces may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on painted surface of the indicator or on potting of electronic transmitter.

The electronic transmitter type -G /KS1 is an intrinsically safe device.

**WARNING**

To ensure intrinsic safety it is not permitted to repair or to modify the electronic transmitter, the display or the calibration EEPROM.

In the case of high fluid temperatures, heated metering tubes or heat radiation by heat tracing, make sure that the temperature in the indicator housing does not exceed the permissible maximum ambient temperature of the transmitter (refer to Technical data, chapter 9 of IM 01R01B02-00x-E).

## 8.1 Intrinsically Safe ATEX Certified Instrument (/KS1)

### 8.1.1 Technical data

The electronic transmitter is an intrinsically safe device. This device is certified for hazardous areas of zone 1 (category 2) und zone 2 (category 3). It is not homologated for zone 0 (category 1). The classifications in brackets are given according to EU-Regulation 94/9/EG (ATEX).

EC-Type Examination Certificate Nr.: PTB 96 ATEX 2160X
Identification in accordance with regulation 94/9/EG (ATEX) :

CE 0344 Ex **II 2 G**

Type of protection : Intrinsically safe Ex ia IIB/IIC T4 Gb
Ambient temperature : -25°C ... +70°C
Parameters of PROFIBUS terminal :

| | IIC | IIB | FISCO |
|---|---|---|---|
| Ui | 24V | 17.5V | acc. |
| Ii | 250mA | 280mA | IEC 60079-27 |
| Li | negligible | negligible | |
| Ci | negligible | negligible | |

## 8.1.2 Marking

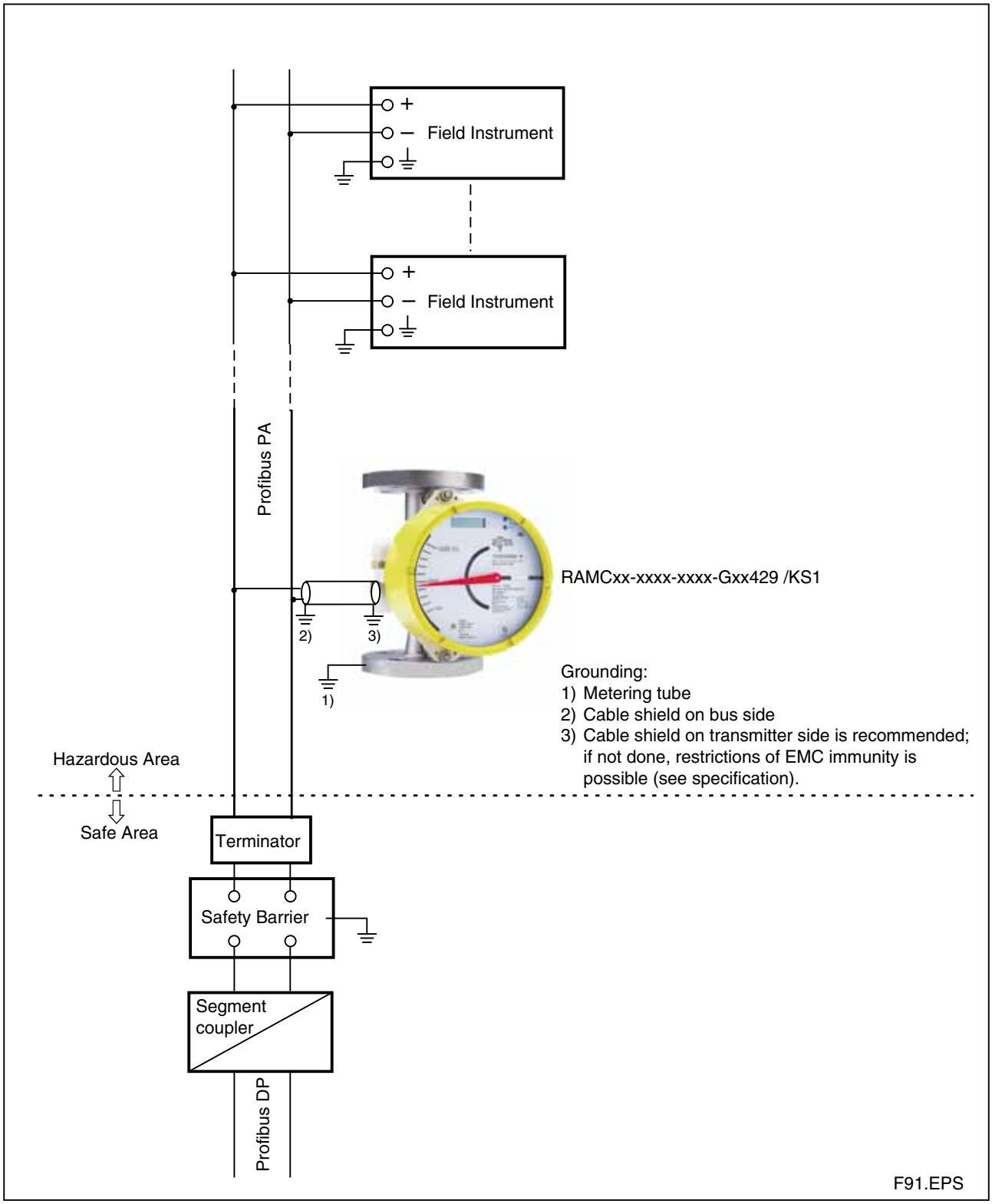
Name plates on electronic transmitter :

| | |
|---|---|
| **Rota Yokogawa**<br>**D-79664 Wehr**<br>**WT-MAG Mat. No. 16-8081**<br>**Serial No, 0711001** | **Ex ia IIB/IIC T4 Gb**<br>**PTB 96 ATEX 2160 X**<br>**see certificate for data**<br>CE 0344 Ex **II 2G** |

## 8.1.3 Installation

Chapter 3.1 for general installation description must be regarded.

Installation diagram :



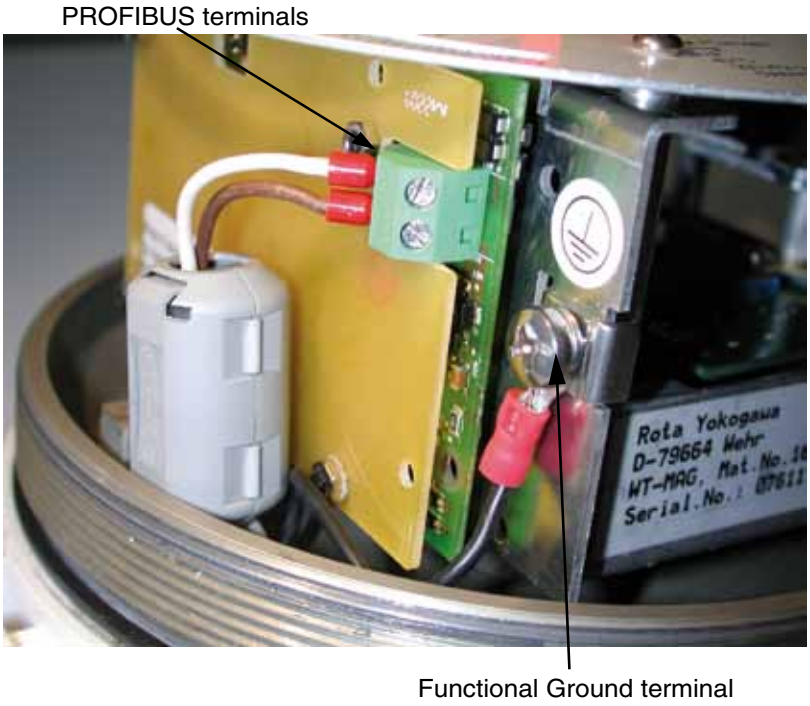

**Connection in RAMC housing :**

Connect the cable conductor of the fieldbus cable to the fieldbus terminals (polarity must not be noticed).

**Cable shield grounded on both sides:**

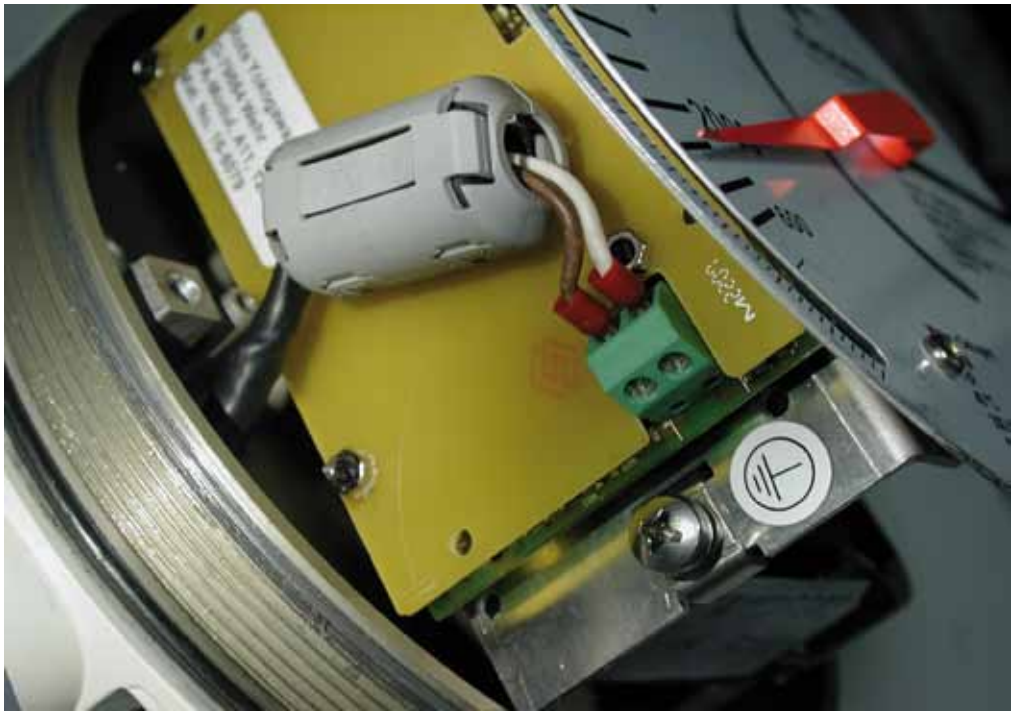
**IMPORTANT**

Outer shield of Profibus cable must be connected to the shown functional ground terminal.




**Cable shield grounded only on bus- side**

If cable shield is only grounded on bus- side the attached ferrite core must be mounted on the cable in RAMC housing as shown in the figure below.



# APPENDIX 1. LIST OF PARAMETERS FOR EACH BLOCK OF RAMC

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..

## A1.1 Physical Block

| Slot | Index | Parameter Mnemonic | | Write Mode | Valid Range | Initial Value | Description |
|---|---|---|---|---|---|---|---|
| 0 | 16 | BLOCK_OBJECT (DS-32) | | -- | | | Information on this block such as Block Tag, DD Revision, Execution Time etc. |
| 0 | 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. |
| 0 | 18 | TAG_DESC | | Auto | | "Specified at the time of order" | The user description of the intended application of the block |
| 0 | 19 | STRATEGY | | Auto | 0 to 65535 | 0 | The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block. |
| 0 | 20 | ALERT_KEY | | Auto | 0 to 255 | 0 | The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. |
| 0 | 21 | TARGET_MODE | | Auto | Auto, O/S | 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. |
| 0 | 22 | MODE_BLK (DS-37) | Actual | -- | Auto, O/S | Auto | The mode parameter is a structured parameter composed of the actual mode, the normal mode and the permitted mode.<br>Actual: Indicates the current operating condition.<br>Permit: Indicates the operating condition that the block is allowed to take.<br>Normal: Indicates the operating condition that the block will usually take. |
| | | | Permitted | -- | Auto, O/S | | |
| | | | Normal | -- | Auto, O/S | | |
| 0 | 23 | ALARM_SUM (DS-42) | Current | -- | -- | 0 | The current alert status, unacknowledged status, unreported status and disabled status of the alarms associated with the function block. |
| | | | Unacknowledged | -- | for future use | 0 | |
| | | | Unreported | -- | for future use | 0 | |
| | | | Disabled | -- | for future use | 0 | |
| 0 | 24 | SOFTWARE_REVISION | | -- | | -- | Revision-number of the software of the field device. |
| 0 | 25 | HARDWARE_REVISION | | -- | | -- | Revision-number of the hardware of the field device. |
| 0 | 26 | DEVICE_MAN_ID | | -- | | 55(0x37) | Identification code of the manufacturer of the field device. |
| 0 | 27 | DEVICE_ID | | -- | | RAMC_PA | Manufacturer specific identification of the field device. |
| 0 | 28 | DEVICE_SER_NUM | | Auto | | Serial No. | Serial number of the field device. |
| 0 | 29 | DIAGNOSIS | | -- | | Variable | Detailed information of the device, bitwise coded. More than one message possible at once. |
| 0 | 30 | DIAGNOSIS_EXTENSION | | -- | | Variable | Additional manufacturer-specific information of the device, bitwise coded. |
| 0 | 31 | DIAGNOSIS_MASK | | -- | | Supported | Definition of supported DIAGNOSIS information-bits.<br>0: Not supported<br>1: Supported |
| 0 | 32 | DIAGNOSIS_MASK_EXTENSION | | -- | | Supported | Definition of supported DIAGNOSIS_EXTENSION information-bits (see chapter 6).<br>0: Not supported<br>1: Supported |

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## APPENDIX 1. LIST OF PARAMETERS FOR EACH BLOCK OF RAMC

| Slot | Index | Parameter Mnemonic | Write Mode | Valid Range | Initial Value | Description |
|---|---|---|---|---|---|---|
| 0 | 33 | DEVICE_CERTIFICATION | - | No information | itm 654 PA 01 | Certification Number of the PNO for this device |
| 0 | 34 | WRITE_LOCKING | Auto | 0: Lock<br>2457: Disabled | 2457 (0x999) | If set, no writes from anywhere are allowed, except to clear WRITE_LOCKING (see chapter 3.4). |
| 0 | 35 | FACTORY_RESET | Auto | 1: Factory Reset<br>2506: Warmstart<br>2712: reset to Addr 126 only | | Allows a manual restart to be initiated:<br>1: Cold Strat of the device to its default values. The bus address is not affected.<br>2506: Warm start of the device. All parameterization remains unchanged.<br>2712: Reset the bus address only to its default value (126). |
| 0 | 36 | DESCRIPTOR | Auto | | Space | User definition text (a string) to describe the device within the application |
| 0 | 37 | DEVICE_MESSAGE | Auto | | Space | User definable MESSAGE (a string) to describe the device within the application or in the plant. |
| 0 | 38 | DEVICE_INSTALL_DATE | Auto | | Space | Date of installation of the device. |
| 0 | 39 | LOCAL_OP_ENABLE | Auto | 1: Allowed | | Limited local operation is allowed (see chapter 3.5) |
| 0 | 40 | IDENT_NUMBER_SELECTOR | Auto | 0: PROFILE ID<br>1: Device Spec ID | 1: Device Spec ID | Each PROFIBUS-PA device shall have an Ident_Number provided by the PNO.<br>0: PROFILE ID<br>1: Device specific ID |
| 0 | 41 | HW_WRITE_PROTECTION | Auto | 0: Unprotected<br>1: Protected | 0: Unprotected | Indicates the position of the write blocking hardware jumper<br>0: Unprotected (jumper mounted)<br>1: Protected (jumper not mounted) |

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# A1.2 AI Function Block

| Slot | Index | Parameter Mnemonic | | Write Mode | Valid Range | Initial Value | Description |
|---|---|---|---|---|---|---|---|
| 1 | 16 | BLOCK_OBJECT (DS-32) | | -- | | | Information on this block such as Block Tag, DD Revision, Execution 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. |
| 1 | 18 | TAG_DESC | | Auto | | Space | The user description of the intended application of the block |
| 1 | 19 | STRATEGY | | Auto | 0 to 65535 | 0 | The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block. |
| 1 | 20 | ALERT_KEY | | Auto | 0 to 255 | 0 | The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. |
| 1 | 21 | TARGET_MODE | | Auto | Auto, O/S | 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. |
| 1 | 22 | MODE_BLK (DS-37) | Actual | -- | | Auto | The mode parameter is a structured parameter composed of the actual mode, the normal mode and the permitted mode.<br>Actual: Indicates the current operating condition.<br>Permit: Indicates the operating condition that the block is allowed to take.<br>Normal: Indicates the operating condition that the block will usually take. |
| | | | Permitted | -- | Auto, O/S | Auto | |
| | | | Normal | -- | Auto, O/S | Auto | |
| 1 | 23 | ALARM_SUM (DS-42) | Current | -- | for future use | 0 | The current alert status, unacknowledged status, unreported status and disabled status of the alarms associated with the function block. |
| | | | Unacknowledged | -- | for future use | 0 | |
| | | | Unreported | -- | for future use | 0 | |
| | | | Disabled | -- | for future use | 0 | |
| 1 | 24 | BATCH (DS-67) | BATCH_ID | Auto | | 0 | Not used |
| | | | RUP | Auto | | 0 | Not used |
| | | | OPERATION | Auto | | 0 | Not used |
| | | | PHASE | Auto | | 0 | Not used |
| 1 | 25 | Not used | | | | | |
| 1 | 26 | OUT (DS-33) | Value | -- | | 0 | This parameter contains the current measurement value from Transducer Block or configuration adjusted engineering unit and the belonging state in AUTO MODE.<br>OUT contains the value and status set by an operator in MAN MODE. |
| | | | Status | -- | | 0 | |
| 1 | 27 | PV_SCALE (Array) | Array1 | O/S | | Specified at the time of order | Conversion of the Process Variable into percent using the high and low scale values.<br>The engineering unit of PV_SCALE high and low scale values are direct related to the PRIMARY_VALUE_UNIT of the configured Transducer Block (configured via Channel parameter). |
| | | | Array2 | O/S | | "Specified at the time of order" | |
| 1 | 28 | OUT_SCALE (DS-68) | EU at 100% | O/S | | "Specified at the time of order" | Scale of the Process Variable<br>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 on the right hand side of the decimal point. |
| | | | EU at 0% | O/S | | "Specified at the time of order" | |
| | | | Units Index | O/S | 1342:% | "Specified at the time of order" | |
| | | | Decimal Point | O/S | | "Specified at the time of order" | |

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## APPENDIX 1. LIST OF PARAMETERS FOR EACH BLOCK OF RAMC

| Slot | Index | Parameter Mnemonic | | Write Mode | Valid Range | Initial Value | Description |
|---|---|---|---|---|---|---|---|
| 1 | 29 | LIN_TYPE | | O/S | 0: No Linearisation<br>250: Not used<br>251: None | 0: No Linearization | The value is passed by the transducer block to the AI block without linearization (Direct). |
| 1 | 30 | CHANNEL | | O/S | 0x0111<br>0x0115 | 0x0111 | Reference to the active Transducer Block which provides the measurement value to the Function Block. |
| 1 | 31 | Not used | | | | | |
| 1 | 32 | PV_FTIME | | Auto | more than 0 sec | 0.000 | Time constant of a single exponential filter for the PV, in seconds. |
| 1 | 33 | FSAFE_TYPE | | Auto | 0:Failsafe Value<br>1:Last Valid OUT Value<br>2:Wrong Calculated Value | 1: Last Valid OUT Value | Defines reaction of device, if a fault is detected.<br>0: VALUE= FSAFE_VALUE<br>1: VALUE= Stored last valid OUT VALUE<br>2: VALUE= Wrong calculated |
| 1 | 34 | FSAFE_VALUE | | Auto | | 0.000 | Default value for the OUT parameter, if sensor or sensor electronic fault is detected. The unit of this parameter is the same like the OUT one. |
| 1 | 35 | ALARM_HYS | | Auto | OUT_SCALE*0.5 | 0.5% of OUT_SCALE | Amount the PV must return within the alarm limits before the alarm condition clears. Alarm Hysteresis is expressed as engineering units of the PV span. |
| 1 | 37 | HI_HI_LIM | | Auto | | +INF | The setting for high high alarm in engineering units. |
| 1 | 39 | HI_LIM | | Auto | | +INF | The setting for high alarm in engineering units. |
| 1 | 41 | LO_LIM | | Auto | | -INF | The setting of the low alarm in engineering units. |
| 1 | 43 | LO_LO_LIM | | Auto | | -INF | The setting of the low low alarm in engineering units. |
| 1 | 46 | HI_HI_ALM (DS-39) | Alarm State | -- | 0: No Alarm<br>1: Alarm Active | 0: No Alarm | 0:Clear alarm<br>1:active alarm |
| | | | Value | -- | | | Out value at the time the alarm was detected or cleared. |
| 1 | 47 | HI_ALM (DS-39) | Alarm State | -- | 0: No Alarm<br>1: Alarm Active | 0: No Alarm | Same as HI_HI_ALM. |
| | | | Value | -- | | | |
| 1 | 48 | LO_ALM (DS-39) | Alarm State | -- | 0: No Alarm<br>1: Alarm Active | 0: No Alarm | Same as HI_HI_ALM. |
| | | | Value | -- | | | |
| 1 | 49 | LO_LO_ALM (DS-39) | Alarm State | -- | 0: No Alarm<br>1: Alarm Active | 0: No Alarm | Same as HI_HI_ALM. |
| | | | Value | -- | | | |
| 1 | 50 | SIMULATE (DS-50) | Simulate_Status | Auto | | 0 | 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. |
| | | | Simulate_Value | Auto | | 0 | |
| | | | Simulate_Enabled | Auto | 0:Disabled,<br>1:Enable | 0:Disabled | Simulate_Enable = 0:Disabled 1: Enabled |
| 1 | 51 | OUT_UNIT_TEXT | | Auto | Character | Space | If a specific unit of OUT parameter is not in the code list the user has the possibility to write the specific text in this parameter. The unit code is then equal "textual unit definition". |

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# A1.3 Transducer Block

| Slot | Index | Parameter Mnemonic | | Write Mode | Valid Range | Initial Value | Description |
|---|---|---|---|---|---|---|---|
| 2 | 16 | BLOCK_OBJECT (DS-32) | | -- | | | Information on this block such as Block Tag, DD Revision, Execution Time etc. |
| 2 | 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. |
| 2 | 19 | STRATEGY | | Auto | 0 to 65535 | 0 | The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block. |
| 2 | 20 | ALERT_KEY | | Auto | 0 to 255 | 0 | The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. |
| 2 | 21 | TARGET_MODE | | Auto | Auto, O/S | 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. |
| 2 | 22 | MODE_BLK (DS-37) | Actual | -- | Auto, O/S | Auto | The mode parameter is a structured parameter composed of the actual mode, the normal mode and the permitted mode.<br>Actual: Indicates the current operating condition.<br>Permit: Indicates the operating condition that the block is allowed to take.<br>Normal: Indicates the operating condition that the block will usually take. |
| | | | Permitted | -- | Auto, O/S | Auto | |
| | | | Normal | -- | Auto, O/S | Auto | |
| 2 | 23 | ALARM_SUM (DS-42) | Current | -- | for future use | 0 | 0 |
| | | | Unacknowledged | -- | for future use | 0 | 0 |
| | | | Unreported | -- | for future use | 0 | 0 |
| | | | Disabled | -- | for future use | 0 | 0 |
| 2 | 24 | CALIBR_FACTOR | | Auto | 1.000 | 1.000 | Gain compensation value for the detector, so that flow indication is accurate.<br>This parameter must not be downloaded by the operator. |
| 2 | 25 | LOW_FLOW_CUTOFF | | Auto | 5 to 15% of PV_SCALE | 0 | Set the low cut range to 5 to 15% of the PV_SCALE. |
| 2 | 26 | MEASUREMENT_MODE | | Auto | 0:Unidirectional<br>1:Bidirectional | 0:Unidirectional | Set the mode of the flow measurement, either unidirectional or bidirectional.<br>If “Bidirectional” is selected, this function has no effect.<br>This parameter must not be downloaded by the operator. |
| 2 | 27 | FLOW_DIRECTION | | Auto | 0:Positive<br>1:Negative | 0:Positive | Assign a positive or negative sign to the measured PV value.<br>If “Negative” is selected, this function has no effect.<br>This parameter must not be downloaded by the operator. |
| 2 | 28 | ZERO_POINT | | Auto | 0.00 | 0.00 | This function shows the current zero point compensation value for the sensor.<br>This parameter must not be downloaded by the operator. |
| 2 | 29 | ZERO_POINT_ADJUST | | Auto | 0:Cancel<br>1:Execute | 0:Cancel | This parameter executes the automatic zero adjustment function:<br>If “Execute” is selected, this function has no effect.<br>This parameter must not be downloaded by the operator. |
| 2 | 30 | ZERO_POINT_UNIT | | Auto | 1062:mm/s | 1062:mm/s | This parameter is used in order to select the unit for zero point. |
| 2 | 31 | NOMINAL_SIZE | | Auto | 0.0 to 100.0 (mm)<br>0.1 to 10.0 (inch) | 100 | This parameter is used to show the size (diameter) of the sensor (flow tube). The value is determined by the model code.<br>This parameter must not be downloaded by the operator. |
| 2 | 32 | NOMINAL_SIZE_UNITS | | Auto | 1013:mm,<br>1019:inch | 1013:mm | This parameter is used to select the unit of size (diameter) of the sensor (flow tube) in "mm" or "inches". |
| 2 | 33 | VOLUME_FLOW (DS-33) | Value | -- | | | Indicates the current measured value and status as the primary value (volumetric flow).<br>This parameter is input to the AI Function Block (Preset by order). |
| | | | Status | -- | | Good | |
| 2 | 34 | VOLUME_FLOW_UNITS | | Auto | Determined by ordered scale | 1349:m3/h | This parameter is used in order to select the unit for VOLUME_FLOW, VOLUME_FLOW_LO_LIMIT and VOLUME_FLOW_HI_LIMIT parameters. |
| 2 | 35 | VOLUME_FLOW_LO_LIMIT | | Auto | The value depends on a volume flow unit. | 0.0 (0.0%) | This parameter is used in order to enter the lower range value for volumetric flow.<br>This parameter must not be downloaded by the operator. |

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| Slot | Index | Parameter Mnemonic | | Write Mode | Valid Range | Initial Value | Description |
|---|---|---|---|---|---|---|---|
| 2 | 36 | VOLUME_FLOW_HI_LIMIT | | Auto | The value depends on a volume flow unit. | Determined by ordered scale (105%) | This parameter is used in order to enter the upper range value for volumetric flow.<br>This parameter must not be downloaded by the operator. |
| 2 | 37 | MASS_FLOW (DS-33) | Value | Auto | Determined by ordered scale | 1328: t/h | Indicates the current measured value and status as the primary value (mass flow).<br>This parameter is input to the AI Function Block by selecting "Mass Flow" in the AI.CHANNEL parameter. |
| | | | Status | | | Good | |
| 2 | 38 | MASS_FLOW_UNITS | | Auto | Determined by ordered scale | 1328: t/h | This parameter is used in order to select the unit for MASS_FLOW, MASS_FLOW_LO_LIMIT and MASS_FLOW_HI_LIMIT parameters. |
| 2 | 39 | MASS_FLOW_LO_LMT | | Auto | The value depends on a volume flow unit. | 0.0 (0.0%) | This parameter is used in order to enter the lower range value for mass flow.<br>This parameter must not be downloaded by the operator. |
| 2 | 40 | MASS_FLOW_HI_LMT | | Auto | The value depends on a volume flow unit. | Determined by ordered scale (105%) | This parameter is used in order to enter the upper range value for mass flow.<br>This parameter must not be downloaded by the operator. |
| 2 | 41 | DENSITY | Value | -- | Determined by ordered scale | 1103:kg/l | Indicates the density value of the medium. |
| | | | Status | | | Good | |
| 2 | 42 | DENSITY_UNITS | | Auto | Determined by ordered scale | 1103: kg/l | Indicates the density unit of the medium.<br>This parameter must not be downloaded by the operator. |
| 2 | 45 | TEMPERATURE | Value | -- | | 1001: °C | Indicates the temperature value of the electronic transmitter. |
| | | | Status | | | Good | |
| 2 | 46 | TEMPERATURE_UNITS | | Auto | 1001: °C<br>1002: °F<br>1000: K | 1001: °C | Indicates the temperature units of the electronic transmitter. |
| 2 | 69 | VISCOSITY | | -- | Determined by ordered scale | -- | Indicates the viscosity value of the medium. |
| 2 | 70 | VICOSITY_UNITS | | -- | | -- | Indicates the viscosity unit of the medium. |
| 2 | 71 | PRESSURE | | -- | | -- | Indicates the pressure value of the medium. |
| 2 | 72 | PRESSURE_UNITS | | -- | | -- | Indicates the pressure unit of the medium. |
| 2 | 73 | PRESS_REF | | -- | | -- | Indicates the pressure reference of the medium. |
| 2 | 74 | PRESS_REF_UNIT | | -- | | -- | Indicates the pressure reference unit of the medium. |
| 2 | 75 | TEMPERATURE | | -- | | -- | Indicates the temperature value of the medium. |
| 2 | 76 | TEMPERATURE_UNITS | | -- | | -- | Indicates the temperature unit of the medium. |
| 2 | 77 | OPER_CONDITIONS | | -- | 0: Absolute<br>1: Gage<br>2: Gage US<br>3: Vacuum | 0: Absolute | Indicates the pressure operation conditions of the medium. |
| 2 | 78 | FLUID_PHASE | | -- | 0:Liquid<br>1: Gas (Operation)<br>2: Gas (Normal condition)<br>3: Gas (Standard condition) | 0: Liquid | Indicates the fluid phase and the operation conditions of the medium. |
| 2 | 79 | FLOW_REFERENCE | | -- | 0:Volume Flow<br>1: Mass Flow | 0:Volume Flow | Indicates the flow reference of the medium. |
| 2 | 80 | COMMISION_NO | | -- | Determined by ordered scale | -- | Indicates the commision number of the device's order. |
| 2 | 81 | MODEL_CODE | | -- | Fixed by order | -- | Indicates the model code of the device. |
| 2 | 82 | FLUID_NAME | | -- | Determined by ordered scale | -- | Indicates the fluid name of the medium. |
| 2 | 83 | TOTALIZER | | -- | Determined by ordered scale | 1034: $m^3$ | Indicates the totalized value of the primary value (volumetric flow or mass flow). |
| 2 | 84 | TOTALIZER_UNITS | | -- | Determined by ordered scale | 1034: $m^3$<br>1092: t | Indicates the totalizer unit. |
| 2 | 85 | TOTALIZER_RESET | | Auto | 0:Cancel<br>1:Execute | 0:Cancel | This parameter executes the totalizer reset function.<br>If "Execute" is selected, the parameter is set to zero. |
| 2 | 86 | RESET_ERROR_BIT | | Auto | 0:Cancel<br>1:Execute | 0:Cancel | This parameter executes the error bit reset function.<br>If "Execute" is selected, the error bits are cleared. |
| 2 | 87 | INDICATOR_VERSION | | -- | 0:Standard<br>1:Distance | 0:Standard | Indicates the version of the mechanical indicator as determined by option A16.. |
| 2 | 88 | SCALE_SPAN_VALUE | | -- | Determined by ordered scale | -- | Indicates the printed scale span value of the medium (100% of flow). |
| 2 | 89 | SOFT_REVISION | | -- | Determined by device | -- | Indicates the software revision of the transmitter electronic. |
| 2 | 90 | HARD_REVISION | | -- | Determined by device | -- | Indicates the hardware revision of the transmitter electronic. |
| 2 | 99 | STATUS HANDLING | | Auto | 0: Normal<br>1: Dis. Low Status<br>2: Dis. High Status<br>3: Dis. Low/High St. | 0: Normal | This parameter is used to select the status handling of the transmitter at upper and lower measurement range (5% to 105%). It can be used to disable low, high and low/high status warning when the limit is reached. |
| 2 | 100 | SCALE_SPAN_UNIT | | -- | Determined by ordered scale | -- | Indicates the printed scale span unit of the medium. |

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# APPENDIX 2. APPLICATION, SETTING AND CHANGE OF BASIC PARAMETERS

## A2.1 Applications and Selection of Basic Parameters

| Setting Item (applicable parameters) | Summary |
|---|---|
| Tag No. | Sets Tag_DESC for each block tag.<br>Up to 32 alphanumeric characters can be set. |
| Calibration range setup<br>(PV_SCALE) | Sets the range of input from the transducer block corresponding to the 0% and 100% points in operation within the AI1 function block. The calibrated range (0% and 100%) is the factory default setting. |
| Output scale setup<br>(OUT_SCALE) | Sets the scale of output corresponding to the 0% and 100% points in operation within the AI function block. It is possible to set a unit and scale that differs from the measurement range.<br>Sets the range unit, input value of the 0% point (lower bound of output scale), input value of the 100% point (upper bound of output scale), and the 4 data at the decimal point. |
| Simulation setup<br>(SIMULATE) | Performs simulation of the AI function block.<br>The input value and status for the calibration range can also be set.<br>It is recommended that this parameter be used for loop checks and other purposes. |
| Output signal low cut setup<br>(LOW_FLOW_LOWCUT) | Sets the low cut value which corresponds to the percent against the large absolute value of PV_SCALE. |



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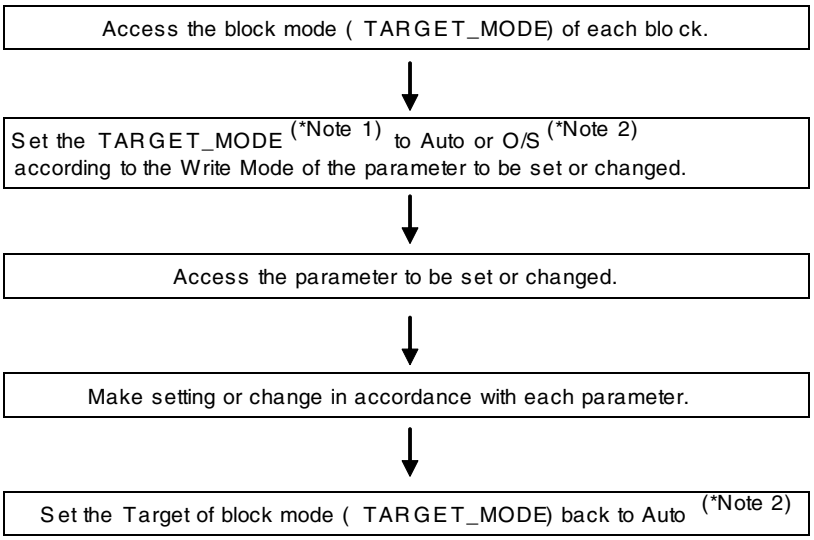
# A2.2 Setting and Change of Basic Parameters

This section describes the procedure taken to set and change the parameters for each block. Obtaining access to each parameter differs depending on the configuration system used. For details, refer to the instruction manual for each configuration system.

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**IMPORTANT**

Do not turn the power OFF immediately after parameter setting. When the parameters are saved to the EEPROM, the redundant processing is executed for the improvement of reliability. If the power is turned OFF within 60 seconds after setting of parameters, changed parameters are not saved and may return to their original values.
When the consecutive parameter setting to the multiple parameters is not executed via the acyclic data exchange, the time inverval between each parameter setting must not be within 2 seconds.
Changed parameters may not be written to the device.

Note 1: Block mode consists of the following four modes that are controlled by the universal parameter that displays the running condition of each block.
TARGET_MODE: Sets the operating condition of the block.
Actual: Indicates the current operating condition.
Permit: Indicates the operating condition that the block is allowed to take.
Normal: Indicates the operating condition that the block will usually take.

Note 2: The followings are the operating conditions which the individual blocks will take.

| | AI Function Block | Transducer Block |
|---|---|---|
| Automatic (Auto) | Yes | Yes |
| Out of Service (O/S) | Yes | Yes |

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Refer to the “List of parameters for each block of the RAMC” for details of the Write Mode for each block.

# A2.3 Setting the AI Function Blocks

The AI function block outputs the flow rate signals.

**(1)Setting the output scale**

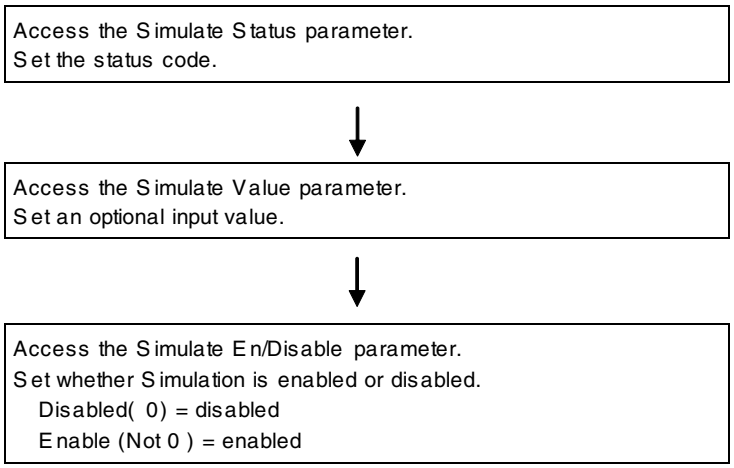
Access the OUT_SCALE parameter.Set the necessary unit of output to Units Index on OUT_SCALE.Set an output value corresponding to the higher range value to EU at 100% on OUT_SCALE. Set an output value corresponding to the lower range value to EU at 0% on OUT_SCALE. Set the decimal position to Decimal Point.

Example:
To set the output to 0.00 to 100.00kg/h,
Set 100 to EU at 100% on OUT_SCALE,
Set 0 to EU at 0% on OUT_SCALE, and
Set kg/h(1324)* to Units Index on OUT_SCALE,
Set 2 to Decimal Point on OUT_SCALE.

* Each unit is expressed using a 4-digit numeric code.
Refer to Section AI Function Block Parameters.

**(2)Simulation**

By optionally setting the input value to the calibration range and status, perform simulation of the AI function block.

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If simulation is enabled, AI block uses Simulate Status and Simulate Value as the input, and if disabled, the AI block uses Transducer Status and Transducer Value as input.

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