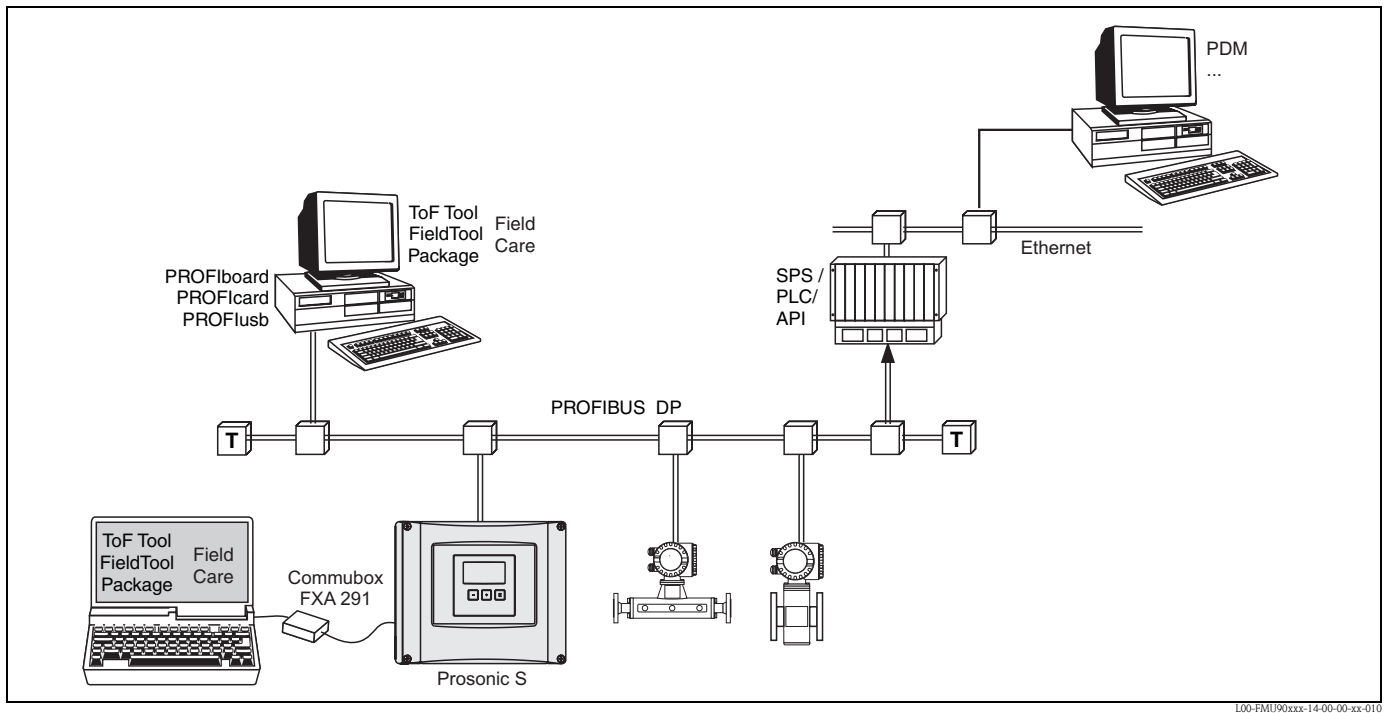


# 1 Operating options



## 1.1 On-site operation

- Display and operating module at the Prosonic S
- Endress+Hauser operating tool ("ToF Tool - FieldTool Package" or "FieldCare") with Commubox FXA291



Note!

Commubox FXA291 is an interface adapter from Endress+Hauser.

## 1.2 Remote operation

- Endress+Hauser operating tool ("ToF Tool – FieldTool Package" or "FieldCare") with PROFicard, PROFiboard or PROFiusb



Note!

PROFiboard, PROFicard and PROFiusb are interface adapters from Endress+Hauser.

### 1.2.1 Acyclic data exchange

Remote operation makes use of the acyclic data exchange, which allows device parameters to be changed independently of the communication between the device and a PLC.

Acyclic data exchange is used

- to transmit device parameters during commissioning and maintenance;
- to display measured values that are not acquired in cyclic traffic.

The Prosonic S supports class 2 masters:

#### Acyclic communication with a Class 2 master (MS2AC)

In the case of MS2AC, a Class 2 master opens a communication channel via a so-called service access point (SAP) in order to access the device. Class 2 masters are for example:

- ToF Tool – FieldTool Package
- FieldCare

Before data can be exchanged via PROFIBUS, however, the Class 2 master must be made aware of the parameters contained within the field device. This can be done by:

- a device description (DD)
- a device type manager (DTM)
- a software component within the master, which accesses the parameters via slot and index addresses.



Note!

- The DD or DTM is supplied by the device manufacturer.
- The Prosonic S has one Service Access Point. Therefore, it can be accessed by one Class 2 master.
- The use of a Class 2 master increases the cycle time of the bus system. This must be taken into consideration when the control system or PLC is programmed.

### 1.2.2 Slot-Index tables

The Slot-Index tables for the general acyclic data exchange are summarized in the document BA333F (can be downloaded from [www.endress.com](http://www.endress.com)).

## 2 Device address

### 2.1 Selecting the device address

- Every PROFIBUS device must be given an address. If the address is not set correctly, the device will not be recognised by the process control system.
- A device address may appear only once within a particular PROFIBUS network.
- Valid device addresses are in the range between 1 and 126. All devices are delivered from the factory with the address 126, which is set by software.
- The default address can be used to check the function of the device and connect it to an operating PROFIBUS system. Afterwards the address must be changed to allow other devices to be connected to the network.

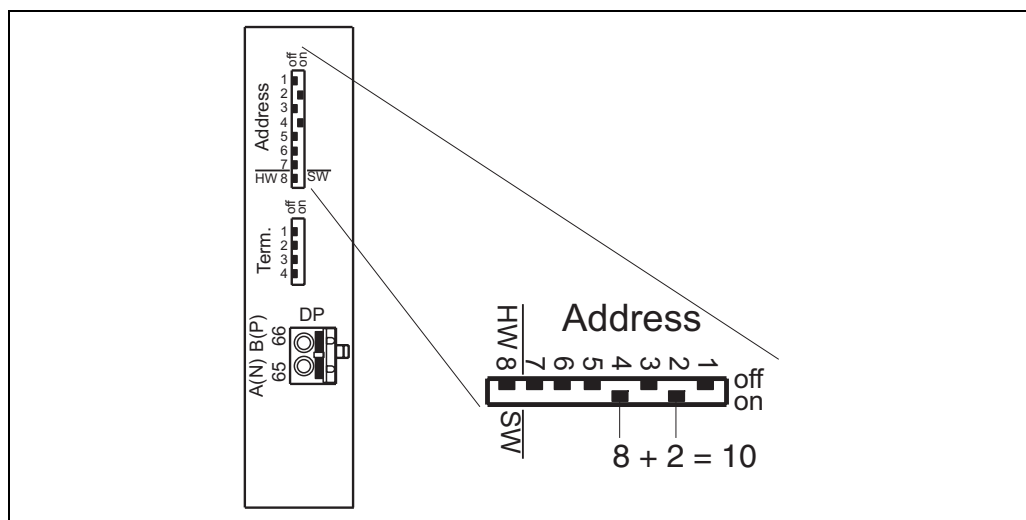
### 2.2 Software addressing

Software addressing comes into operation, when DIP-switch 8 on the Profibus DP terminal area is in the position "ON".

In this case, the address can be set by an operating tool ("FieldCare").

The address is displayed in the function "Output-calculations/Profibus DP/instrument address".

### 2.3 Hardware addressing



L00-FMU90xxx-04-00-00-xx-016

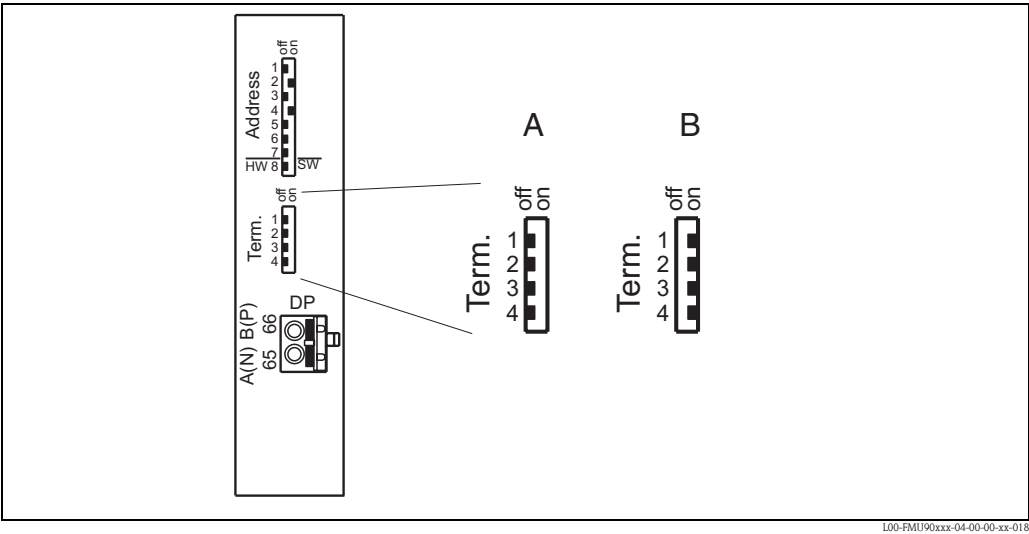
Hardware addressing comes into operation when DIP switch 8 is in the position "HW (OFF)". In this case the address is determined by the position of DIP-switches 1 to 7 according to the following table:

| Switch No.              | 1 | 2 | 3 | 4 | 5  | 6  | 7  |
|-------------------------|---|---|---|---|----|----|----|
| Value in position "OFF" | 0 | 0 | 0 | 0 | 0  | 0  | 0  |
| Value in Position "ON"  | 1 | 2 | 4 | 8 | 16 | 32 | 64 |

The new address becomes valid 10 seconds after switching.

### 3 Bus termination

The termination resistor must be activated for the last instrument on the bus. This is done by setting all four termination switches into the "on" position.



**A:** termination off (factory setting); **B:** termination on

100-FMU90xxx-04-00-00-xx-018

## 4 Device database and type files (GSD)

### 4.1 Meaning of the GSD files

A device database file (GSD) contains a description of the properties of the PROFIBUS device, e.g. the supported transmission rates and the type and format of the digital information output to the PLC. Additional bitmap files are required in order to represent the device by an icon in the network design software. The device database and bitmap files are needed for the commissioning of a PROFIBUS DP network.

### 4.2 Name of the GSD file

Every device is allocated an identity code by the PROFIBUS User Organisation (PNO). This appears in the device data base file name (.gsd).

The FMU90 has the ID number 1540(hex) = 5440 (dec).

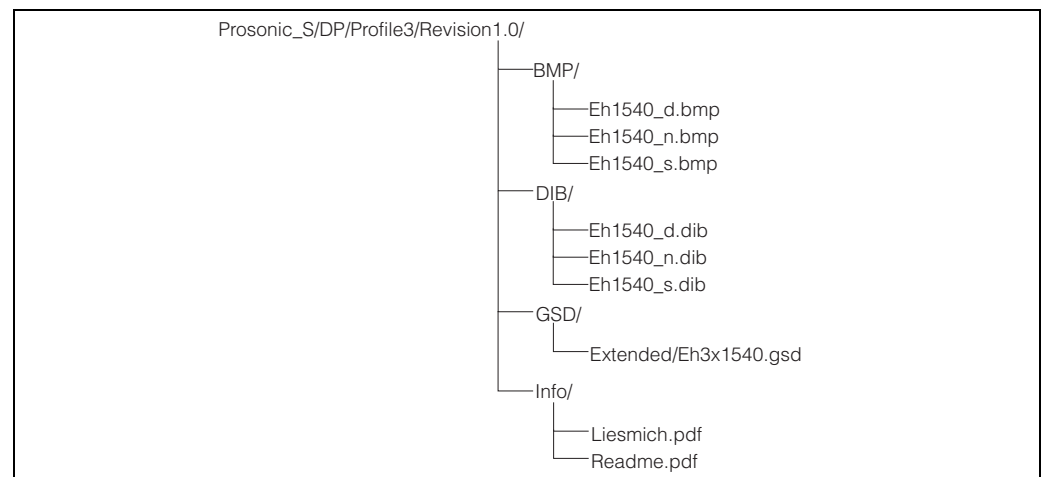
Therefore, the name of the GSD file is: EH3x1540.gsd

### 4.3 Sources of supply

- [www.endress.com](http://www.endress.com)  
click on "Download" and enter "GSD" into the "Text search" field. The "Software" link opens a list containing the links to all available GSD files.
- CD-ROM with GSD files for all E+H devices. Order-Code: 50097200
- GSD library of the PROFIBUS User Organisation (PNO): <http://www.PROFIBUS.com>

### 4.4 Directory structure

The files are organized in the following structure:



L00-FMU90xxx-02-00-00-xx-001

### 4.5 Universal Database File

As an alternative to the device specific GSD file, the PNO provides an universal database file without instrument specific features.

When the universal database file is used, the option "**profile**" must be selected in the "**Output-calculation/Profibus DP/ident number**" parameter.

## **4.6 Usage of the GSD files**

The GSD files must be loaded to a specific subdirectory of the PROFIBUS DP configuration software. Depending on the software, the GSD files must be copied into the directory or an import functionality of the software may be used.

Detailed information about the appropriate file location can be obtained from the manual of the respective configuration software.

## 5 Cyclic Data Exchange



Note!

- Basic information on the cyclic data exchange between the measuring instrument and an automation system (e.g. PLC) are described in Operating Instructions BA034S, "PROFIBUS DP/PA – Guidelines for planning and commissioning"
- Cyclic data exchange is only possible if the appropriate device database files (GSD) have been uploaded to the automation system. For details refer to chapter 6.1.3.

### 5.1 Data format

#### 5.1.1 Analog values

With PROFIBUS DP the cyclic data transfer of analog values to the PLC uses data blocks (modules) of 5 bytes each. The measured value is represented in the first four bytes as a floating point number according to the IEEE standard. The fifth byte contains a standardized information about the instrument status. For details refer to BA034S.

#### 5.1.2 Digital values

With PROFIBUS DP the cyclic data transfer of digital values uses blocks (modules) of 2 bytes each. The first byte contains the digital value. The second byte contains the associated status information. For details refer to BA034S.

### 5.2 Modules for the cyclic data telegram

#### 5.2.1 Analog values (AI)

Every AI block of the Prosonic S FMU90 provides a five byte module for the cyclic data telegram (from the instrument to the PLC). According to the PROFIBUS specifications "Profile for Process Control Devices" there are two options for each of these modules:

- **AI (OUT):** The module is transmitted in the cyclic data telegram.
- **Free Place:** The module **is not part of the cyclic data telegram**.

The option is selected in the configuration tool of the respective PLC. For details refer to the Operating Instructions of the manufacturer-specific configuration tool.

#### 5.2.2 Digital values (DI)

Every DI block of the Prosonic S FMU90 provides a two byte module for the cyclic data telegram (from the instrument to the PLC). According to the PROFIBUS specifications "Profile for Process Control Devices" there are two options for each of these modules:

- **AI(OUT):** The module is transmitted in the cyclic data telegram.
- **Free Place:** The module **is not part of the cyclic data telegram**.

The option is selected in the configuration tool of the respective PLC. For details refer to the Operating Instructions of the manufacturer-specific configuration tool.

#### 5.2.3 Digital values (DO)

Every DO block of the Prosonic S provides a two byte module for the cyclic data telegram (from the PLC to the instrument). According to the PROFIBUS specifications "Profile for Process Control Devices" there are the following options for each of these modules:

- DO (SP\_D)
- DO (SP\_D/CB\_D)
- DO (RCAS\_IN\_D/RCAS\_OUT\_D)
- DO (RCAS\_IN-D/RCAS\_OUT\_D/CB\_D)

■ Free Place

The option is selected in the configuration tool of the respective PLC. For details refer to the Operating Instructions of the manufacturer-specific configuration tool.

## 5.3 Default configuration of the cyclic data telegram

### 5.3.1 1-channel version (FMU90 - \*\*\*\*\*1\*\*\*) Operating mode "level"

| Byte           | Block | Access type | Format      | Measured value <sup>1)</sup> | Unit <sup>2)</sup> |
|----------------|-------|-------------|-------------|------------------------------|--------------------|
| 0, 1, 2, 3     | AI 1  | read        | IEEE754     | Level 1                      | m                  |
| 4              |       |             | Status byte | Status Level 1               | -                  |
| 5, 6, 7, 8     | AI 2  | read        | IEEE754     | Distance 1                   | m                  |
| 9              |       |             | Status byte | Status Distance 1            | -                  |
| 10, 11, 12, 13 | AI 3  | read        | IEEE754     | Temperature 1                | °C                 |
| 14             |       |             | Status byte | Status Temperature 1         | -                  |

1) The measured value allocation can be changed in  
"output/calculations/analog Input/analog Input N/ measured value N" (N = 1 to 10).

2) The unit can be changed in  
"level/level N/basic setup/unit level"  
"device properties/operating param./distance unit"  
"device properties/operating param./temperature unit"

### 5.3.2 1-channel version (FMU90 - \*\*\*\*\*1\*\*\*) Operating mode "flow"

| Byte           | Block | Access type | Format      | Measured value <sup>1)</sup> | Unit <sup>2)</sup> |
|----------------|-------|-------------|-------------|------------------------------|--------------------|
| 0, 1, 2, 3     | AI 1  | read        | IEEE754     | Flow 1                       | customer unit      |
| 4              |       |             | Status byte | Status Flow 1                | -                  |
| 5, 6, 7, 8     | AI 2  | read        | IEEE754     | Distance 1                   | m                  |
| 9              |       |             | Status byte | Status Distance 1            | -                  |
| 10, 11, 12, 13 | AI 3  | read        | IEEE754     | Temperature 1                | °C                 |
| 14             |       |             | Status byte | Status Temperature 1         | -                  |
| 15, 16, 17, 18 | AI5   | read        | IEEE754     | Wert Summenzähler 1          | customer unit      |
| 19             |       |             | Status byte | Status Summenzähler 1        | -                  |
| 20, 21, 22, 23 | AI6   | read        | IEEE754     | Überlauf Summenz. 1          | customer unit      |
| 24             |       |             | Status byte | Status Summenzähler 1        | -                  |
| 25, 26, 27, 28 | AI7   | read        | IEEE754     | Wert Tageszähler 1           | customer unit      |
| 29             |       |             | Status byte | Status Tageszähler 1         | -                  |
| 30, 31, 32, 33 | AI8   | read        | IEEE754     | Überlauf Tagesz. 1           | customer unit      |
| 34             |       |             | Status byte | Status Tageszähler 2         | -                  |

1) The measured value allocation can be changed in  
"output/calculations/analog input/analog input N/ measured value N" (N = 1 to 10).

2) The unit can be changed in  
"flow/flow N/linearisation/flow unit"  
"device properties/operating param./distance unit"  
"device properties/operating param./temperature unit"  
"flow/flow counter/totalizer N/counting unit"  
"flow/flow counter/daily counter N/counting unit"

### 5.3.3 1-channel version(FMU90 - \*\*\*\*\*1\*\*\*) Operating mode "level +flow"

| Byte           | Block | Access type | Format      | Measured value <sup>1)</sup> | Unit <sup>2)</sup> |
|----------------|-------|-------------|-------------|------------------------------|--------------------|
| 0, 1, 2, 3     | AI 1  | read        | IEEE754     | Flow 1                       | customer unit      |
| 4              |       |             | Status byte | Status Flow 1                | -                  |
| 5, 6, 7, 8     | AI2   | read        | IEEE754     | Level 1                      | m                  |
| 9              |       |             | Status byte | Status Level 1               | -                  |
| 10, 11, 12, 13 | AI 3  | read        | IEEE754     | Distance 1                   | m                  |
| 14             |       |             | Status byte | Status Distance 1            | -                  |
| 15, 16, 17, 18 | AI 4  | read        | IEEE754     | Temperature 1                | °C                 |
| 19             |       |             | Status byte | Status Temperature 1         | -                  |
| 20, 21, 22, 23 | AI5   | read        | IEEE754     | Wert Summenzähler 1          | customer unit      |
| 24             |       |             | Status byte | Status Summenzähler 1        | -                  |
| 25, 26, 27, 28 | AI6   | read        | IEEE754     | Überlauf Summenz. 1          | customer unit      |
| 29             |       |             | Status byte | Status Summenzähler 1        | -                  |
| 30, 31, 32, 33 | AI7   | read        | IEEE754     | Wert Tageszähler 1           | customer unit      |
| 34             |       |             | Status byte | Status Tageszähler 1         | -                  |
| 35, 36, 37, 38 | A8    | read        | IEEE754     | Überlauf Tagesz. 1           | customer unit      |
| 39             |       |             | Status byte | Status Tageszähler 1         | -                  |

- 1) The measured value allocation can be changed in  
"output/calculations/analog input/analog input N/ measured value N" (N = 1 to 10).
- 2) The unit can be changed in  
"level/level N/basic setup/unit level"  
"flow/flow N/linearisation/flow unit"  
"device properties/operating param./distance unit"  
"device properties/operating param./temperature unit"  
"flow/flow counter/totalizer N/counting unit"  
"flow/flow counter/daily counter N/counting unit"

### 5.3.4 2-channel version (FMU90 - \*\*\*\*\*2\*\*\*) Operating mode "level"

| Byte           | Block | Access type | Format      | Measured value <sup>1)</sup> | Unit <sup>2)</sup> |
|----------------|-------|-------------|-------------|------------------------------|--------------------|
| 0, 1, 2, 3     | AI 1  | read        | IEEE754     | Level 1                      | m                  |
| 4              |       |             | Status byte | Status Level 1               | -                  |
| 5, 6, 7, 8     | AI 2  | read        | IEEE754     | Level 2                      | m                  |
| 9              |       |             | Status byte | Status Level 2               | -                  |
| 10, 11, 12, 13 | AI 3  | read        | IEEE754     | Distance 1                   | m                  |
| 14             |       |             | Status byte | Status Distance 1            | -                  |
| 15, 16, 17, 18 | AI 4  | read        | IEEE754     | Distance 2                   | m                  |
| 19             |       |             | Status byte | Status Distance 2            | -                  |
| 20, 21, 22, 23 | AI 5  | read        | IEEE754     | Temperature 1                | m                  |
| 24             |       |             | Status byte | Status Temperature 1         | -                  |
| 25, 26, 27, 28 | AI 6  | read        | IEEE754     | Temperature 2                | m                  |
| 29             |       |             | Status byte | Status Temperature 2         | -                  |

- 1) The measured value allocation can be changed in  
"output/calculations/analog input/analog input N/ measured value N" (N = 1 to 10).
- 2) The unit can be changed in  
"level/level N/basic setup/unit level"  
"device properties/operating param./distance unit"  
"device properties/operating param./temperature unit"

### 5.3.5 2-channel version (FMU90 - \*\*\*\*\*2\*\*\*) Operating mode "flow"

| Byte           | Block | Access type | Format      | Measured value <sup>1)</sup> | Unit <sup>2)</sup> |
|----------------|-------|-------------|-------------|------------------------------|--------------------|
| 0, 1, 2, 3     | AI 1  | read        | IEEE754     | Flow 1                       | Kundeneinh.        |
| 4              |       |             | Status byte | Status Flow 1                | -                  |
| 5, 6, 7, 8     | AI 2  | read        | IEEE754     | Flow 2                       | Kundeneinh.        |
| 9              |       |             | Status byte | Status Flow 2                | -                  |
| 10, 11, 12, 13 | AI 3  | read        | IEEE754     | Distance 1                   | m                  |
| 14             |       |             | Status byte | Status Distance 1            | -                  |
| 15, 16, 17, 18 | AI 4  | read        | IEEE754     | Distance 2                   | m                  |
| 19             |       |             | Status byte | Status Distance 2            | -                  |
| 20, 21, 22, 23 | AI 5  | read        | IEEE754     | Temperature 1                | °C                 |
| 24             |       |             | Status byte | Status Temperature 1         | -                  |
| 25, 26, 27, 28 | AI 6  | read        | IEEE754     | Temperature 2                | °C                 |
| 29             |       |             | Status byte | Status Temperature 2         | -                  |
| 30, 31, 32, 33 | AI7   | read        | IEEE754     | Wert Summenzähler 1          | customer unit      |
| 34             |       |             | Status byte | Status Summenzähler 1        | -                  |
| 35, 36, 37, 38 | AI8   | read        | IEEE754     | Überlauf Summenz. 1          | customer unit      |
| 39             |       |             | Status byte | Status Summenzähler 1        | -                  |

| Byte           | Block | Access type | Format      | Measured value <sup>1)</sup> | Unit <sup>2)</sup> |
|----------------|-------|-------------|-------------|------------------------------|--------------------|
| 40, 41, 42, 43 | AI9   | read        | IEEE754     | Wert Summenzähler 2          | customer unit      |
| 44             |       |             | Status byte | Status Summenzähler 2        | –                  |
| 45, 46, 47, 48 | AI10  | read        | IEEE754     | Überlauf Summenz. 2          | customer unit      |
| 49             |       |             | Status byte | Status Summenzähler 2        | –                  |

- 1) The measured value allocation can be changed in  
"output/calculations/analog input/analog input N/ measured value N" (N = 1 to 10).
- 2) The unit can be changed in  
"flow/flow N/linearisation/flow unit"  
"device properties/operating param./distance unit"  
"device properties/operating param./temperature unit"  
"flow/flow counter/totalizer N/counting unit"

### 5.3.6 2-channel version (FMU90 - \*\*\*\*\*2\*\*\*) Operating mode "level + flow"

| Byte           | Block | Access type | Format      | Measured value <sup>1)</sup> | Unit <sup>2)</sup> |
|----------------|-------|-------------|-------------|------------------------------|--------------------|
| 0, 1, 2, 3     | AI 1  | read        | IEEE754     | Flow 1                       | customer unit      |
| 4              |       |             | Status byte | Status Flow 1                | –                  |
| 5, 6, 7, 8     | AI 2  | read        | IEEE754     | Flow 2                       | customer unit      |
| 9              |       |             | Status byte | Status Flow 2                | –                  |
| 10, 11, 12, 13 | AI 3  | read        | IEEE754     | Level 1                      | m                  |
| 14             |       |             | Status byte | Status Level 1               | –                  |
| 15, 16, 17, 18 | AI 4  | read        | IEEE754     | Level 2                      | m                  |
| 19             |       |             | Status byte | Status Level 2               | –                  |
| 20, 21, 22, 23 | AI 5  | read        | IEEE754     | Temperature 1                | °C                 |
| 24             |       |             | Status byte | Status Temperature 1         | –                  |
| 25, 26, 27, 28 | AI 6  | read        | IEEE754     | Temperature 2                | °C                 |
| 29             |       |             | Status byte | Status Temperature 2         | –                  |
| 30, 31, 32, 33 | AI7   | read        | IEEE754     | Wert Summenzähler 1          | customer unit      |
| 34             |       |             | Status byte | Status Summenzähler 1        | –                  |
| 35, 36, 37, 38 | AI8   | read        | IEEE754     | Überlauf Summenz. 1          | customer unit      |
| 39             |       |             | Status byte | Status Summenzähler 1        | –                  |
| 40, 41, 42, 43 | AI9   | read        | IEEE754     | Wert Summenzähler 2          | customer unit      |
| 44             |       |             | Status byte | Status Summenzähler 2        | –                  |
| 45, 46, 47, 48 | AI10  | read        | IEEE754     | Überlauf Summenz. 2          | customer unit      |
| 49             |       |             | Status byte | Status Summenzähler 2        | –                  |

- 1) The measured value allocation can be changed in  
"output/calculations/analog input/analog input N/ measured value N" (N = 1 to 10).

- 2) The unit can be changed in  
"level/level N/basic setup/unit level"  
"flow/flow N/linearisation/flow unit"  
"device properties/operating param./temperature unit"  
"flow/flow counter/totalizer N/counting unit"