Operating Instructions

**Memograph M, RSG45**

Advanced Data Manager

Additional Instructions for PROFIBUS DP Slave
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1 General information

1.1 Safety symbols

⚠️ **DANGER**
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠️ **WARNING**
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠️ **CAUTION**
This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

⚠️ **NOTICE**
This symbol contains information on procedures and other facts which do not result in personal injury.

ℹ️ The functionality is only possible with a PROFIBUS module, Version V2.15 and higher.

1.2 Scope of delivery

⚠️ **NOTICE**
This manual contains an additional description for a special software option. These additional instructions do not replace the Operating Instructions provided with the delivery!

- Detailed information can be found in the Operating Instructions and the additional documentation.

Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smartphone/tablet: Endress+Hauser Operations App

Here you can also download the correct GSD file for your device.

Alternatively, the GSD file can also be downloaded from the product page on the Internet: www.endress.com/rsg45 → Downloads

1.3 Firmware history

Overview of unit software history:

<table>
<thead>
<tr>
<th>Unit software Version / date</th>
<th>Software modifications</th>
<th>FDM analysis software version</th>
<th>Version of OPC server</th>
<th>Operating Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>V02.00.00 / 08.2015</td>
<td>Original software</td>
<td>V1.3.0 and higher</td>
<td>V5.00.03 and higher</td>
<td>BA01414R/09/EN/01.15</td>
</tr>
<tr>
<td>V2.04.06 / 10.2022</td>
<td>Bug fixes</td>
<td>V1.6.3 and higher</td>
<td>V5.00.07 and higher</td>
<td>BA01414R/09/EN/02.22-00</td>
</tr>
</tbody>
</table>
1.4 Connections

View of the PROFIBUS DP connection on the device

<table>
<thead>
<tr>
<th></th>
<th>Operating mode LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Status LED</td>
</tr>
<tr>
<td>2</td>
<td>PROFIBUS connector DB9F</td>
</tr>
</tbody>
</table>

1.4.1 Operating mode LED

Functional description of the operating mode LED

<table>
<thead>
<tr>
<th>Operating mode LED</th>
<th>Indicator for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Not online/no voltage</td>
</tr>
<tr>
<td>Green</td>
<td>Online, data transfer active</td>
</tr>
<tr>
<td>Green, flashing</td>
<td>Online, data transfer stopped</td>
</tr>
<tr>
<td>Flashing red (one flash)</td>
<td>Parametrization error</td>
</tr>
<tr>
<td>Flashing red (two flashes)</td>
<td>PROFIBUS configuration error</td>
</tr>
</tbody>
</table>

1.4.2 Status LED

Functional description of the status LED

<table>
<thead>
<tr>
<th>Status LED</th>
<th>Indicator for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>No voltage or not initialized</td>
</tr>
<tr>
<td>Green</td>
<td>Initialized</td>
</tr>
<tr>
<td>Red, flashing</td>
<td>Initialized, diagnostics available</td>
</tr>
<tr>
<td>Red</td>
<td>Exception error</td>
</tr>
</tbody>
</table>

1.4.3 PROFIBUS connector (DB9F)

Pin assignment of PROFIBUS connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>B-wire</td>
<td>Positive RxD/TxD, RS485 Level</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>GND Bus</td>
<td>Reference potential</td>
</tr>
<tr>
<td>6</td>
<td>+5V Output</td>
<td>+5V voltage for termination</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>A-wire</td>
<td>Negative RxD/TxD, RS485 Level</td>
</tr>
</tbody>
</table>
### Pin Signal Description

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td></td>
<td>Internally connected to ground via the cable shield filter according to the PROFIBUS standard</td>
</tr>
</tbody>
</table>

1) Any current drawn from this pin will affect the total power consumption of the module.

## 1.5 Terminating resistors

The PROFIBUS module has no internal terminating resistors. However, pin 6 provides isolated 5V voltage for external termination.

To connect to the PROFIBUS, it is advisable to use the 9-pin D-sub plug with integrated bus terminating resistors, as recommended according to IEC 61158 / EN 50170:

![PROFIBUS connector as per IEC 61158 / EN 50170](image1.png)

![Terminating resistors in the PROFIBUS connector](image2.png)
**PROFIBUS connector terminal assignment**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Shielding</td>
<td>Functional ground</td>
</tr>
<tr>
<td>3</td>
<td>B-wire</td>
<td>RxTx (+)</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Reference potential</td>
</tr>
<tr>
<td>6</td>
<td>+5V output</td>
<td>Power supply for terminating resistors</td>
</tr>
<tr>
<td>8</td>
<td>A-wire</td>
<td>RxTx (-)</td>
</tr>
</tbody>
</table>

1.6 **Functional description**

The PROFIBUS module allows the device to be connected to PROFIBUS DP, with the functionality of a DP slave for cyclic data traffic.

Baud rates supported: 9.6k, 19.2k, 45.45k, 93.75k, 187.5k, 500k, 1.5M, 3M, 6M, 12MBaud

1.7 **Checking for the presence of the PROFIBUS module**

Check whether a PROFIBUS module is being used under **Main menu → Diagnostics → Device information → Device options.**
4 Additional information on the PROFIBUS module
2 Data transmission

2.1 General information

The following parameters can be transmitted from the PROFIBUS master to the device:

- Analog values (instantaneous values)
- Digital status

The following parameters can be transmitted from the device to the PROFIBUS master:

- Analog values (instantaneous values)
- Integrated analog values
- Math channels (result: state, instantaneous value, operating time, totalizer)
- Integrated math channels
- Digital status
- Pulse counter (totalizer)
- Operating times
- Operating times with digital status

2.2 Settings in the setup

If a change is made to the setup (configuration) in the device that affects the transmission setup, the PROFIBUS module is reinitialized.

Result: The PROFIBUS module withdraws from the DP bus only to register again seconds later. This generates an "assembly rack failure" in the PLC. Taking the example of the Simatic S7, the PLC switches to the STOP mode and must be manually reset to the RUN mode. By transmitting the assembly rack failure OB 86 to the PLC, it is now possible to hold off the interruption. As a result, the PLC does not switch to the STOP mode, the red LED lights up only briefly, and the PLC continues to operate in the RUN mode.

The slave address is selected under Setup → Advanced setup → Communication → PROFIBUS DP. Please configure a slave address that is lower than 126 in order to assign a fixed address. If slave address 126 is configured, the address must be assigned by the PROFIBUS master. The address is then saved in the event list when the device is switched on and each time the slave address is changed by the PROFIBUS master.

The baud rate is determined automatically.

All universal inputs and digital inputs are enabled and can be used as PROFIBUS DP inputs even if they are not actually available as plug-in cards.
2.3 Analog channels

PROFIBUS master → device:

Under Setup → Advanced setup → Inputs → Universal inputs → Universal input X, the Signal parameter is set to PROFIBUS DP.

The analog channel configured in this way can be selected for cyclic data transfer (module x AO-PA), as described in section 2.6 → 11.

Device → PROFIBUS master:

To transmit an analog channel to the PROFIBUS master, the channel simply needs to be configured as described in section 2.6.1 → 13 (module x AI-PA).

2.4 Math channels

Device → PROFIBUS master:

Math channels are optionally available under Setup → Advanced setup → Application → Math v Math x.

The results can be transmitted to the PROFIBUS master, as explained in section 2.6 → 11.

2.5 Digital channels

PROFIBUS master → Device:

Under Setup → Advanced setup → Inputs → Digital inputs → Digital input X, the Function parameter is set to PROFIBUS DP.

The digital channel configured in this way can be selected for cyclic data transfer (module 8 DO), as described in section 2.6 → 11.
7 Setting digital channel $x$ to the 'PROFIBUS DP' function

The digital status transmitted by the PROFIBUS master has the same function in the device as the status of a digital channel that is actually present.

**Device → PROFIBUS master:**

**Functionality of control input or on/off event**

The digital status of the digital channel configured in this way can be selected for cyclic data transfer (module 8 DI), as described in section 2.6.1 → 13.

**Functionality of pulse counter or operating time**

The totalizer or the total operating time of the digital channel configured in this way can be selected for cyclic data transfer (module $x$ AI-PA).

**Functionality of event + operating time**

The digital status and the totalizer of the digital channel configured in this way can be selected for cyclic data transfer (module 8 DI and $x$ AI-PA).

**Functionality of quantity from time**

The digital status and the totalizer of the digital channel configured in this way can be selected for cyclic data transfer (module 8 DI and $x$ AI-PA).

### 2.6 Structure of the data for cyclic data transfer

The structure of the data for cyclic transfer can be configured under Setup → Advanced setup → Communication → PROFIBUS DP → Slot $x$. 16 slots are available for selection, each of which can contain one module.
Modules can be selected depending on the data volume and content.

The name refers to the read/write direction of the PROFIBUS master and is identical to the module names in the GSD file.

Description of module name:
- The number refers to the number of values to be transmitted.
- AI/DO: Master In (device → PROFIBUS master)
- AO/DO: Master Out (PROFIBUS master → device)
- AI/AO: Transmission of the floating point number + status
- DI/DO: Transmission of digital status
- The -PA suffix means that the data structure consists of 4 bytes for the floating point number (MSB first) and then 1 byte for the status of the measured value.
- The length of the module is given at the end

Description of the PROFIBUS modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI-PA 5 Byte</td>
<td>Analog channel (instantaneous value, totalization)</td>
</tr>
<tr>
<td>AI-PA 10 Byte</td>
<td>Math channel (result: instantaneous value, counter, operating time)</td>
</tr>
<tr>
<td>AI-PA 15 Byte</td>
<td>Digital channel (control input, pulse counter, (event +) operating time, quantity from time)</td>
</tr>
<tr>
<td>AI-PA 10 Word</td>
<td></td>
</tr>
<tr>
<td>DI 2 Byte</td>
<td>Math channel (result: status)</td>
</tr>
<tr>
<td></td>
<td>Digital channel (on/off event, event (+operating time))</td>
</tr>
</tbody>
</table>
## Modules Use

<table>
<thead>
<tr>
<th>Modules</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO-PA 5 Byte</td>
<td>Analog channel (instantaneous value)</td>
</tr>
<tr>
<td>AO-PA 10 Byte</td>
<td></td>
</tr>
<tr>
<td>AO-PA 15 Byte</td>
<td></td>
</tr>
<tr>
<td>AO-PA 10 Word</td>
<td></td>
</tr>
<tr>
<td>DO 2 Byte</td>
<td>Digital channel (control input, on/off event, pulse counter, operating time, event + operating time, quantity from time)</td>
</tr>
</tbody>
</table>

### 2.6.1 Device → PROFIBUS master data transmission

#### Analog channel, totalizer or operating time

Under Setups Advanced setup Communication PROFIBUS DP Slot x, the Master In/Out parameter is set to one of the AI-PA modules, e.g. 4 AI-PA.

Once the byte address has been selected within the module, the desired analog channel is selected. If totalization is activated in the universal input, the user can choose between the instantaneous value and the totalizer (totalization):

![Image](A0011480)

10 Selecting the desired channel (device → PROFIBUS master)

#### Digital channel

Under Setups Advanced setup Communication PROFIBUS DP Slot x, the Master In/Out parameter is set to the 8 DI module.

Once the bit address has been selected within the module, the desired digital channel is selected:
2.6.2  PROFIBUS master → device data transmission

Analog channel

Under Setup → Advanced setup → Communication → PROFIBUS DP → Slot x, the Master In/Out parameter is set to one of the AO-PA modules, e.g. 4 AO-PA.

Once the byte address has been selected within the module, the analog channel to be used is selected. The type (instantaneous value or totalizer (totalization)) is then selected.

Possible only with analog channels which have been assigned the PROFIBUS DP signal type (see section 2.3 → 10).
13 Selecting the analog channel (PROFIBUS master → device)

Digital channel

Under Setup → Advanced setup → Communication → PROFIBUS DP → Slot x, the Master In/Out parameter is set to the 8 DO module.

Once the bit address has been selected within the module, the desired digital channel is selected.

Possible only with digital channels which have been assigned the PROFIBUS DP function type (see section 2.5 → 10).

14 Selecting the desired module (PROFIBUS master → device)

15 Selecting the digital channel (PROFIBUS master → device)
2.6.3 Slot overview

For verification purposes, the module names are listed with information on how they are to be configured in the PROFIBUS master:

![Overview of slots after modification](image)

Empty slots are ignored and do not generate any configuration bytes.

2.6.4 Structure of the individual process values

Device → PROFIBUS master:

**Structure of the individual measured values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Interpretation</th>
<th>Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog value 1-20</td>
<td>32-bit floating point number (IEEE-754) + status</td>
<td>5</td>
</tr>
<tr>
<td>Analog value 1-40 integrated</td>
<td>32-bit floating point number (IEEE-754) + status</td>
<td>5</td>
</tr>
<tr>
<td>Math channel 1-8 instantaneous value result, totalizer, operating time</td>
<td>32-bit floating point number (IEEE-754) + status</td>
<td>5</td>
</tr>
<tr>
<td>Math channel 1-8 integrated</td>
<td>32-bit floating point number (IEEE-754) + status</td>
<td>5</td>
</tr>
<tr>
<td>Digital pulse counter</td>
<td>32-bit floating point number (IEEE-754) + status</td>
<td>5</td>
</tr>
<tr>
<td>Digital operating time</td>
<td>32-bit floating point number (IEEE-754) + status</td>
<td>5</td>
</tr>
<tr>
<td>Digital status</td>
<td>8 bit + status</td>
<td>2</td>
</tr>
<tr>
<td>Math channel status result</td>
<td>8 bit + status</td>
<td>2</td>
</tr>
</tbody>
</table>

PROFIBUS master → device:

**Structure of the individual measured values**

<table>
<thead>
<tr>
<th>Value</th>
<th>Interpretation</th>
<th>Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog value 1-40</td>
<td>32-bit floating point number (IEEE-754) + status</td>
<td>5</td>
</tr>
<tr>
<td>Digital status</td>
<td>8 bit + status</td>
<td>2</td>
</tr>
</tbody>
</table>
32-bit floating point number (IEEE-754)

<table>
<thead>
<tr>
<th>Octet</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Sign</td>
<td>(E) 2^7</td>
<td>(E) 2^6</td>
<td></td>
<td>(E) 2^1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(E) 2^8</td>
<td>(M) 2^-1</td>
<td>(M) 2^-2</td>
<td></td>
<td>(M) 2^-7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(M) 2^-8</td>
<td></td>
<td></td>
<td></td>
<td>(M) 2^-15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>(M) 2^-16</td>
<td></td>
<td></td>
<td></td>
<td>(M) 2^-33</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sign = 0: positive number
Sign = 1: negative number

\[
Zahl = -1^{\text{Sign}} \cdot (1 + M) \cdot 2^{E-127}
\]

E = exponent, M = mantissa

Example:

Value \[= 40 \text{ F0 00 00 h} = 0100 0000 1111 0000 0000 0000 0000 0000 \text{ b}\]

\[= -1^0 \times 2^{129-127} \times (1 + 2^{-1} + 2^{-2} + 2^{-3})\]

\[= 1 \times 2^2 \times (1 + 0.5 + 0.25 + 0.125)\]

\[= 1 \times 4 \times 1.875 = 7.5\]

Status of floating point number

**Device → PROFIBUS master**

- **10H** = e.g. Cable open circuit, do not use value
- **11H** = Value below the valid range
- **12H** = Value above the valid range
- **18H** = Value undefined, do not use
- **48H** = Value uncertain or replacement value
- **49H** = Value uncertain or replacement value, lower limit value or decreasing gradient
- **4AH** = Value uncertain or replacement value, upper limit value or increasing gradient
- **4BH** = Value uncertain or replacement value, upper and lower limit value or increasing/decreasing gradient
- **80H** = Value OK
- **81H** = Value OK, lower limit value or decreasing gradient
- **82H** = Value OK, upper limit value or increasing gradient
- **83H** = Value OK, upper and lower limit value or increasing/decreasing gradient

**PROFIBUS master → device**

- **80H...FFH**: Value OK
- **40H..7FH**: Value uncertain, value is used, but an error is displayed
- **00H..3FH**: Do not use value (invalid)

It is possible to display and check the status directly at the device.

Checking the measured value status (PROFIBUS master → device).
Data transmission

Digital status

A digital status is described by two bits in two bytes.

- Byte 0 bit x = 0: Low status
- Byte 0 bit x = 1: High status
- Byte 1 bit x = 0: Not active
- Byte 1 bit x = 1: Active

Example:

![Image showing the structure of two bytes transmitted in the digital status](image)

Only bit 0 and 1 are valid here (byte 1).

The statuses for this are bit 0 = high and bit 1 = low (byte 0).

2.7 Acyclic data transfer

2.7.1 Transferring texts

Texts can be saved in the device’s event list. The maximum length is 40 characters. The texts must be written via Slot 0 Index 0, (see section 3.4 Acyclic access → 26).

![Image showing a text entered in the event list](image)

2.7.2 Batch data

Batches can be started and stopped. The batch name, batch identifier, batch number and preset counter for stopping the batch can also be set. The maximum length of the texts (ASCII) is 30 characters.

The functions and parameters must be written via Slot 0 Index 1, (see section 3.4 Acyclic access → 26).

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x01</td>
<td>Start batch</td>
<td>Batch 1 to 4, ID, name</td>
</tr>
<tr>
<td>0x02</td>
<td>Stop batch</td>
<td>Batch 1 to 4, ID, name</td>
</tr>
<tr>
<td>0x03</td>
<td>Batch identifier</td>
<td>Batch 1 to 4, text (max. 30 characters)</td>
</tr>
<tr>
<td>0x04</td>
<td>Batch name</td>
<td>Batch 1 to 4, text (max. 30 characters)</td>
</tr>
<tr>
<td>0x05</td>
<td>Batch number</td>
<td>Batch 1 to 4, text (max. 30 characters)</td>
</tr>
<tr>
<td>0x06</td>
<td>Preset counter</td>
<td>Batch 1 to 4, text (max. 8 characters)</td>
</tr>
</tbody>
</table>
Starting a batch

If the user administration function is active, an ID (max. 8 characters) and a name (max. 20 characters) must be transmitted. The ID and name must be separated by ';'.

Example: Start batch 2

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>func</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>no.</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

The entry Batch 2 started is saved in the event list. This message also appears on the screen for a few seconds.

Ending a batch

If the user administration function is active, an ID (max. 8 characters) and a name (max. 20 characters) must be transmitted. The ID and name must be separated by ';'.

Example: Ending batch 2, user administration active (ID: "IDSPS", name "RemoteX")

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>func</td>
<td>49</td>
<td>44</td>
<td>53</td>
<td>50</td>
<td>53</td>
<td>3B</td>
<td>52</td>
<td>65</td>
<td>6D</td>
<td>6F</td>
<td>74</td>
<td>65</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no.</td>
<td>22</td>
<td>3D</td>
<td>52</td>
<td>50</td>
<td>53</td>
<td>3B</td>
<td>52</td>
<td>65</td>
<td>6D</td>
<td>6F</td>
<td>74</td>
<td>65</td>
<td>58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The message Batch 2 ended and Remote (IDSPS) is saved in the event list. This message also appears on the screen for a few seconds.

Setting the batch identifier

Can only be set if the batch has not yet been started. Does not need to be configured if this is not required by the device settings (Direct access 490005)

Example: "Identifier" batch designation for batch 2

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>func</td>
<td>49</td>
<td>64</td>
<td>65</td>
<td>6E</td>
<td>74</td>
<td>69</td>
<td>66</td>
<td>69</td>
<td>65</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no.</td>
<td>32</td>
<td>3D</td>
<td>52</td>
<td>50</td>
<td>53</td>
<td>3B</td>
<td>52</td>
<td>65</td>
<td>6D</td>
<td>6F</td>
<td>74</td>
<td>65</td>
</tr>
</tbody>
</table>

Setting the batch name

Can only be set if the batch has not yet been started. Does not need to be configured if this is not required by the device settings (Direct access 490006).

Example: "Name" batch name for batch 2

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>func</td>
<td>4E</td>
<td>61</td>
<td>6D</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no.</td>
<td>42</td>
<td>3D</td>
<td>52</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Setting the batch number

Can only be set if the batch has not yet been started. Does not need to be configured if this is not required by the device settings (Direct access 490007).
Example: "Num" batch number for batch 2

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>func</td>
<td>no.</td>
<td>4E</td>
<td>75</td>
<td>6D</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>'N'</td>
<td>','</td>
<td>'m'</td>
<td></td>
</tr>
</tbody>
</table>

Setting the preset counter
Can only be set if the batch has not yet been started. Does not need to be configured if this is not required by the device settings (Direct access 490008).
- Maximum 8 characters (including ".")
- Exponential function permitted, e.g. "1.23E-2"
- Only positive numbers

Example: Preset counter to 12.345 for batch 2

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>func</td>
<td>no.</td>
<td>31</td>
<td>32</td>
<td>2E</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>,1'</td>
<td>,2'</td>
<td>,3'</td>
<td>,4'</td>
<td>,5'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reading out the batch status
The status of every batch and the last communication status can be read out here. Slot 0 Index 1 6 Byte must be read out.

Example: Batch 2 started, communication status "OK"

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comm. status</td>
<td>Status batch 1</td>
<td>Status batch 2</td>
<td>Status batch 3</td>
<td>Status batch 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

If, for example, a batch number is set even though the batch is already running, byte 1 would have the value 0x03.

Communication status:
0: OK
1: Not all the required data have been transmitted (mandatory entries)
2: No responsible user is logged in
3: Batch already running
4: Batch not configured
5: Batch controlled by control input
7: Automatic batch number active
9: Error, text contained non-displayable characters, text too long, incorrect batch number
   Function number outside the range

2.7.3 Setting relays
Relays can be set if they have been set to Remote in the device settings. Parameters must be written via Slot 0 Index 2 (see section 3.4 Acyclic access → 26).
Setting relays

Example: Setting relay 6 to the active state

<table>
<thead>
<tr>
<th>Byte</th>
<th>RelNo.</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Reading out the relay status

This reads out the status of every relay. Bit 0 corresponds to relay 1. **Slot 0 Index 2** 2 Byte must be read out.

Example: Relay 1 and relay 6 in active state

<table>
<thead>
<tr>
<th>Byte</th>
<th>Relays 12-9 (hex)</th>
<th>Relays 1-8 (hex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0x21</td>
<td>0</td>
</tr>
</tbody>
</table>

2.7.4 Changing limit values

Limit values can be changed. The functions and parameters must be written via **Slot 0 Index 3**, (see section 3.4 Acyclic access → 26).

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Initialization</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Accept limit values</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Change limit value</td>
<td>Limit value number, value [:;dt] limit value number;value;time span for gradient;delay;value2</td>
</tr>
<tr>
<td>5</td>
<td>Provide reason</td>
<td>Reason text</td>
</tr>
</tbody>
</table>

The following procedure must be followed when changing limit values:

1. Initialize limit value change.
2. Change limit values.
3. Where applicable, give a reason for the change.
4. Accept limit values.

Any changes since the last initialization can be discarded when a subsequent limit value change is initialized.

Initializing limit value changes

This prepares the device for changes to the limit values.

<table>
<thead>
<tr>
<th>Byte</th>
<th>Func</th>
<th>Padding byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2A</td>
</tr>
</tbody>
</table>

Changing limit values

A limit value in the device is changed, but not yet accepted, with this function.
Examples:

<table>
<thead>
<tr>
<th>Func</th>
<th>Limit value</th>
<th>Data</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>5.22</td>
<td>Limit value 1 to 5.22, no span, delay 60 s</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>5.34</td>
<td>Limit value 2 to 5.34</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>;;10</td>
<td>Limit value 3, delay to 10 seconds</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>20;;50</td>
<td>Limit value 4, inband/outband lower limit value 20, upper limit value 50</td>
</tr>
</tbody>
</table>

Example: Changing limit value 1 (upper limit value for universal input) to 90.5

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Func</td>
<td>Limit value</td>
<td>39</td>
<td>30</td>
<td>2E</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>.9'</td>
<td>.0'</td>
<td>..</td>
<td>.5'</td>
<td></td>
</tr>
</tbody>
</table>

Example: Changing limit value 3 (gradient for universal input) to 5.7 within 10 seconds

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Func</td>
<td>Limit value</td>
<td>35</td>
<td>2E</td>
<td>37</td>
<td>3B</td>
<td>31</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>.5'</td>
<td>..</td>
<td>.7'</td>
<td>..</td>
<td>.1'</td>
<td>.0'</td>
<td></td>
</tr>
</tbody>
</table>

Specifying a reason for changing the limit values

Before you save the limit value change, you can enter a reason for the change, which is saved in the event list. If no reason is specified, the message **Limit values were changed** is entered in the event list.

Texts (according to ASCII table) can be transmitted. The maximum length of a text is 30 characters.

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2..n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Func</td>
<td>Padding byte</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accepting limit values

This function is used to accept the modified limit values in the device and save them in the device settings.

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Func</td>
<td>Padding byte</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2A</td>
<td></td>
</tr>
</tbody>
</table>

Reading out the communication status

The status of the last limit value function performed can be read out here. It must be read out via Slot 0 Index 3 1 Byte.
Example: Incorrect function addressed

<table>
<thead>
<tr>
<th>Byte</th>
<th>Comm. status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Communication status:
0: OK
1: Incorrect function number or limit value number
2: Data missing
3: Limit value not active
4: Gradient → two values
5: Function currently not possible
9: Error
3  Integration into Simatic S7

3.1  Network overview

[Diagram of network overview]

3.2  Hardware planning

3.2.1  Installation and preparation

GSD file
In the hardware configuration:
Installation is performed either via Options/Install GSD files in HW config or by copying the GSD and BMP files to the STEP 7 software directory provided.

e.g.:
- c:\\Siemens\\Step7\\S7data\\GSD
- c:\\Siemens\\Step7\\S7data\\NSBMP

[Diagram of device view in hardware catalog]
3.2.2 Configuring the device as a DP slave

In HW config:

1. Drag the **Memograph M** device from the Hardware catalog → PROFIBUS DP → Additional field devices → General into the PROFIBUS DP network.

2. Assign the user address.

Result:

```
A0051597
21 Device connected to the PROFIBUS DP network
```

The configured slave address must match the hardware address that is actually configured.

The module names and sequence must be assigned in accordance with the device parameters.

```
<table>
<thead>
<tr>
<th>Slot</th>
<th>DP ID</th>
<th>Order Number / Designation</th>
<th>I Address</th>
<th>Q Address</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>134</td>
<td>1 AO FA: 5 Byte</td>
<td>10...14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>153</td>
<td>2 AO FA: 10 Byte</td>
<td>15...24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>171</td>
<td>3 AO FA: 15 Byte</td>
<td>25...39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>233</td>
<td>4 AO FA: 10 Word</td>
<td>40...55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>151</td>
<td>8 DO: 2 Byte</td>
<td>60...61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>217</td>
<td>4 AI FA: 10 Word</td>
<td>256...275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>154</td>
<td>1 AO FA: 5 Byte</td>
<td>258...260</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>153</td>
<td>2 AI FA: 10 Byte</td>
<td>276...285</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
A0051598
22 Slots populated with modules
```

3.2.3 Transmitting the configuration

1. Save and compile the configuration.

2. Transmit the configuration to the control system via the **PLC → Upload** menu item.

If the information matches, a symbol appears in the top right-hand corner and alternates with the SD display.

If the **BUSF** LED of the PLC lights up after the transmission of the configuration, the configured network does not match the network that is physically present. Check the project for irregularities.

The following message is output if the configuration does not match:
This example shows that the first two modules have the same configuration bytes but that
the master has defined one module less than required.

### 3.3 Sample program

The following shows the program lines that are needed to record and output the values. The SFC14 and SFC15 modules are used because the data are consistent.

```plaintext
// Reading out four floating point numbers from module 4 AI-PA 10 Word
CALL "DPRT_DAT"  // SFC 14
LADDR :=W#16#107  // input address 263
RECORD :=PM 22.0 BYTE 20  // read out 20 bytes
RET_VAL :=MW20

// Writing a floating point number to module 1 AO-PA 5 byte
CALL "DPWR_DAT"  // SFC 15
LADDR :=W#16#100  // output address 256
RECORD :=PM 44.0 BYTE 5  // write 5 bytes
RET_VAL :=MW42

// Reading out digital statuses
L  EB  261  // digital statuses
T  MB  0   // transfer after flag 0
L  EB  262  // get validity of statuses
T  MB  1   // status after flag 1

// Writing digital statuses
L  MB  2   // digital statuses
T  AB  261  // transfer after output byte 261
L  MB  3   // get validity of statuses
T  AB  262  // transfer after output byte 262
```

### 3.4 Acyclic access

Taking the example of a CPU315-2 DP (315-2AG10-0AB0), the text below describes the
acyclic access to transmit a text via Slot 0, Index 0 (see 2.7.1 → 18) and the readout of
the relay status via Slot 0, Index 2 (see 2.7.3 → 20).
25 Integrating the device into the PROFIBUS network

The diagnostic address, here **2046** is determined under **Properties → General** of the DP slave:

26 Determining the diagnostic address

**DPV1** is set under **Properties → Parameter assignment** of the DP slave:
27 Settings for DPV1

3.4.1 Transmitting a text via Slot 0, Index 0 (see 2.7.1 → 18)
A DB50 data module with a WRREC_DB structure is created:

The text to be transmitted can be entered online in the data block from RECORD[0]:

---

**Diagram:**
- Properties of DP device
- Structure of DB50 data module
- Example table with addresses and descriptions

---

**Diagram:**
- DB50 data module
- Transmitted text

---

**Table:**

<table>
<thead>
<tr>
<th>Address</th>
<th>Name</th>
<th>Type</th>
<th>Assignment</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>DB1</td>
<td>DB64</td>
<td>PWR00</td>
<td>Parameter Übertragung durchführen</td>
</tr>
<tr>
<td>1.0</td>
<td>DB2</td>
<td>DB64</td>
<td>PWR10</td>
<td>Log. Adresse Slave</td>
</tr>
<tr>
<td>16.0</td>
<td>INT</td>
<td>IO</td>
<td></td>
<td>Datenregister</td>
</tr>
<tr>
<td>16.1</td>
<td>INT</td>
<td>IO</td>
<td>LO</td>
<td>Flags</td>
</tr>
<tr>
<td>10.0</td>
<td>DB10</td>
<td>DB64</td>
<td>PWR01</td>
<td>Übertragen wurden</td>
</tr>
<tr>
<td>10.0</td>
<td>DB10</td>
<td>DB64</td>
<td>PWR01</td>
<td>Übertragung ohne boolesche Bedeutung</td>
</tr>
<tr>
<td>10.1</td>
<td>DB10</td>
<td>DB64</td>
<td>PWR01</td>
<td>Schreibzugriff Fehler</td>
</tr>
<tr>
<td>10.2</td>
<td>DB10</td>
<td>DB64</td>
<td>PWR01</td>
<td>Schreibzugriff Fehler</td>
</tr>
<tr>
<td>12.0</td>
<td>DB12</td>
<td>DB64</td>
<td>PWR01</td>
<td>Anfragen / Fehlercode</td>
</tr>
<tr>
<td>14.0</td>
<td>DB14</td>
<td>DB64</td>
<td>PWR01</td>
<td>Daten Block</td>
</tr>
<tr>
<td>14.1</td>
<td>DB14</td>
<td>DB64</td>
<td>PWR01</td>
<td>Daten Block</td>
</tr>
<tr>
<td>15.0</td>
<td>DB15</td>
<td>DB64</td>
<td>PWR01</td>
<td>Daten Block</td>
</tr>
</tbody>
</table>
In OB1 the command for the SFB53 WRREC is implemented which can be used to write a data record to the module addressed.

This SFB command writes the data record ("WRREC_DB".RECORD DB50) with the length 10 ("WRREC_DB".LEN) to the slave with the diagnostic address 0x7FE (2046).

The following VAT is used to start communication:

To start transmission, M11.0 is set to true. Transmission begins. Before another transmission process can be started, M11.0 must first be reset to false.
3.4.2 Reading out the relay status via Slot 0, Index 2 (see 2.7.3 → 20)

To start the read-out process, M12.0 is set to true. Transmission begins. Before another read-out process can be started, M12.0 must first be reset to false.

```
U M 12.0 // Trigger for reading data record
UN M 12.1 // helpflag
    = M 12.2 // edgeflag
U M 12.0
    = M 12.1
CALL SYB 52 , DB52 // READ
REQ :M11.2 // Edgeflag
ID :=DW#16#7FE // Diagnosis address slave (2046)->Slot 0
INDEX :=2 // Index 2
VALID :=M100.1 // VALID data record has been received and is valid
BUSY :=M100.2 // BUSY=1: The reading operation is not completed yet
ERROR :=M100.3 // ERROR=1: An error has occurred while reading
STATUS:=MD101 // STATUS
LEN :=MM110 // Length of data record information read
RECORD:=MM120 // Target area for the data record read
```

The target area must at least be large enough to accept the previously defined data (MLEN). In MW 120, W#16#0008 appears after the read-out operation, which means that relay 4 is active.
4 Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The BUSF LED on the PLC is lit</td>
<td>Configuration of device and PROFIBUS master not identical</td>
<td>Check using the slot overview (see section 2.6.3 Slot overview → 16)</td>
</tr>
<tr>
<td>Slave address not identical</td>
<td></td>
<td>Check the slave address, see: 2.2 Settings in the setup → 9 2.6.3 Slot overview → 16 3.2.2 Configuring the device as a DP slave → 25</td>
</tr>
</tbody>
</table>

4.1 Checking the measured value status (PROFIBUS master → device)

Under Expert → Communication → PROFIBUS DP it is possible to activate the function for displaying and monitoring the measured value status. This function should be used for test purposes only since status changes are also saved in the event list in addition to the displayed value:

The status is then displayed in hexadecimal format after the measured value:

\[2,00(80h)\]

The status changes are saved in the event list (in English):
5 PROFIBUS DP troubleshooting

Solutions to problems

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The BUSF LED on the PLC is lit</td>
<td>Configuration of device and PROFIBUS master not identical</td>
<td>Check using the slot overview (see section 2.6.3 Slot overview → 16)</td>
</tr>
<tr>
<td>Slave address not identical</td>
<td></td>
<td>Check the slave address, see: 2.2 Settings in the setup → 9 2.6.3 Slot overview, web browser → 16 3.2.2 Configuring the device as a DP slave → 25</td>
</tr>
</tbody>
</table>

6 List of abbreviations/definition of terms

**PROFIBUS module:** The PROFIBUS DP slave plug-in module that is plugged into the front of the device.

**PROFIBUS master:** All instruments such as a PLC, PC plug-in cards etc. that perform a PROFIBUS DP master function.
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