

# SIPROTEC4

## Multifunction protection with control 7SJ62 / 7SJ63

Communication module

Modbus

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**Non-liability clause**

Although we have checked the contents of this publication for conformance with the hardware and software described we cannot guarantee complete conformance since differences cannot be ruled out.

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Your suggestions are welcome.

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# Preface

## Contents of this manual

The manual is divided into the following topics:

- Bus specific parameters
- Supported Modbus functions
- Exception responses of the Modbus slave
- Annunciations to the Modbus master
- Data type definitions
- Modbus register map
- Technical data

## Additional literature

This manual describes the operation the register map organization and the hardware interface of the Modbus slave for the SIPROTEC devices 7SJ61, 7SJ62, 7SJ63 and 6MD63.

The following additional manuals inform you about the function, operation, assembly and commissioning of the SIPROTEC devices:

| <i>Manual</i>   | <i>Contents</i>  | <i>Order number</i> |
|---|--|---------------------|
| Overcurrent, overload and motor protection with control<br>SIPROTEC 7SJ61 | Function, operation, assembly and commissioning of the SIPROTEC device 7SJ61 | C53000-G1140-C118-2 |
| Multifunction protection with control<br>SIPROTEC 7SJ62                   | Function, operation, assembly and commissioning of the SIPROTEC device 7SJ62 | C53000-G1140-C121-2 |
| Multifunction protection with control<br>SIPROTEC 7SJ63                   | Function, operation, assembly and commissioning of the SIPROTEC device 7SJ63 | C53000-G1140-C120-2 |
| Input/output unit with local control<br>SIPROTEC 6MD63                    | Function, operation, assembly and commissioning of the SIPROTEC device 6MD63 | C53000-C1840-C101-2 |

The Modbus specification with a detailed explanation of the Modbus protocol is contained in:

- Modicon  
Modbus Protocol  
Reference Guide  
PI-MBUS-300 Rev. J  
June 1996, Modicon, Inc

**Notes to this manual**

This manual provides you with the following aids to make it easier to locate the information you are looking for:

- At the beginning of this manual you will find a complete table of contents plus separate lists of figures and tables contained in this manual.
- In the individual chapters, you will find information in the left margin of each page which will give you an overview of the contents of that particular paragraph.
- Following the last chapter of this manual, you will find a glossary containing definitions of technical terms and abbreviations used in this manual.
- At the end of this manual, you will find a comprehensive index for fast access to the information you need.

**Validity**

This manual is valid for

- SIPROTEC devices 7SJ61, 7SJ62, 7SJ63 and 6MD63 with firmware version 4.2 and Modbus communication module.

**Training courses**

See our catalog of courses for a list of available courses or contact our training center in Nuremberg.

**Questions**

If you have questions to the SIPROTEC devices, contact your Siemens representative.

# Revision index

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|----------------------------------|----------------|--|
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# 1

## Bus specific parameters

The following settings for the serial communication between the Modbus master and the Modbus slave of the SIPROTEC device have to be defined when programming the device using the parameterization system DIGSI.

|                                    |   |
|------------------------------------|---|
| <b>Slave address</b>               | Permissible slave addresses are in the range between 1 and 247.   |
| <b>Modbus mode</b>                 | <p>The Modbus slave of the SIPROTEC device supports the two serial transmission modes ASCII and RTU:</p> <ul style="list-style-type: none"><li>• In <i>ASCII mode</i> each byte in a Modbus message is sent as two ASCII characters. For error checking a Longitudinal Redundancy Check (LRC) is used.</li><li>• When the Modbus slave is setup to communicate on a Modbus network using <i>RTU mode</i> each byte in a Modbus message contains two hexadecimal characters. In <i>RTU mode</i> a Cyclical Redundancy Check (CRC) is applied for frame checking.</li></ul> |
| <b>Baud rate</b>                   | <p>The following baud rates are available:</p> <ul style="list-style-type: none"><li>• 300, 600, 1200, 2400, 4800, 9600, 19200 Bit/s.</li></ul>   |
| <b>Parity</b>                      | <p>The parity is adjustably to:</p> <ul style="list-style-type: none"><li>• even or odd parity bit (EVEN, ODD) in <i>ASCII mode</i>,</li><li>• none, even or odd parity bit (NONE, EVEN, ODD) in <i>RTU mode</i>.</li></ul>   |
| <b>Maximum slave response time</b> | <p>The maximum response time determines the time interval within which the Modbus slave may respond to enquiries from the master.</p> <p>This value is indicated into milliseconds unities and must be coordinated with the time-out of the Modbus master.</p> <p>The following formula is valid:</p> $T_{bus} < (T_{max} + T_{bus}) < T_{master}$ <p><math>T_{bus}</math> - Transmission time of the slave response on the bus line,<br/><math>T_{master}</math> - Time-out of the Modbus master,<br/><math>T_{max}</math> - Maximum slave response time.</p>            |

**Processing of  
broadcast  
messages**

If one of the Modbus messages "Force Single Coil", "Preset Single Register", "Force Multiple Coil" or "Preset Single Regs" (ref. to chap. 2) is transmitted from the Modbus master to the Modbus slaves using slave address 0 all Modbus slaves recognize this message as a broadcast message and process it.

For every Modbus slave of a SIPROTEC device can be decided whether broadcast messages are accepted for coil status registers and/or holding registers.

Per default this option is enabled and all broadcast messages are processed.



---

**Note**

Modbus Plus is not supported by the Modbus slave of the SIPROTEC devices 7SJ61, 7SJ62, 7SJ63 and 6MD63.

---

# Supported Modbus functions

# 2

The following Modbus functions are supported by the Modbus slave of the SIPROTEC device:

| <b>Function code</b> | <b>Function name</b>                    | <b>Description</b>  | <b>Broadcast supported?<sup>1</sup></b> |
|----------------------|---|---|---|
| 1                    | Read Coil Status<br>(0x-Register)       | Reading one or several coil status registers of the Modbus slave. A maximum of 1970 registers can be read with one message. The coil status registers reflect the ON/OFF status of discrete outputs of the SIPROTEC device.   | no                                      |
| 2                    | Read Input Status<br>(1X-Register)      | Reading one or several input status registers of the Modbus slave. A maximum of 1970 registers can be read with one message. The input status registers reflect the ON/OFF status of discrete inputs and the status of the protection function of the SIPROTEC device.  | no                                      |
| 3                    | Read Holding Registers<br>(4X-Register) | Reading one or several holding registers of the Modbus slave. A maximum of 125 registers can be read with one message. The holding registers contain device status annunciations, measured values – mean values and metered measurands.   | no                                      |
| 4                    | Read Input Registers<br>(3X-Register)   | Reading one or several input registers of the Modbus slave. A maximum of 125 registers can be read with one message. The input registers contain recorded measured values.  | no                                      |
| 5                    | Force Single Coil<br>(0x-Register)      | Writing (force to ON or OFF) one coil status register (and binary output of the SIPROTEC device assigned with that).<br>Use function code 15 to force multiple coil status registers.   | yes                                     |
| 6                    | Preset Single Register<br>(4X-Register) | Function presets a value into a single holding register.<br>Use function code 16 to preset multiple holding registers.<br>There are none writable holding registers for the SIPROTEC devices at present.  | yes                                     |
| 7                    | Read Exception Status                   | This function responses the value of the eight exception status coils to the Modbus master.<br>The Modbus slave of the SIPROTEC device uses coil status register 257..264 as exception coils.   | no                                      |
| 8                    | Diagnostics                             | This function provides diagnostic values to the Modbus master.<br><br>Subfunctions 0 and 2 are implemented. <ul style="list-style-type: none"> <li>• Funktion 0:<br/>The data passed in the query data field of the message to the slave is to be returned (looped-back) in the response.</li> <li>• Funktion 2:<br/>The contents of the diagnostic register is returned in the response to the master. For this the contents of the holding register 129 is used.</li> </ul> | no                                      |

<sup>1</sup> Broadcast messages from Modbus master to the Modbus slaves using slave address 0 in the modbus message (ref. to paragraph "Processing of broadcast messages" in chap. 1).

| <b>Function code</b> | <b>Function name</b>               | <b>Description</b>   | <b>Broadcast supported?</b> |
|----------------------|------------------------------------|--|-----------------------------|
| 15                   | Force Multiple Coils (0X-Register) | Writing (force to ON or OFF) one or several coil status registers (and binary outputs of the SIPROTEC device assigned with these). A maximum of 1970 registers can be written with one message.        | yes                         |
| 16                   | Preset Multiple Regs (4X-Register) | Function presets one or several holding registers register. A maximum of 125 registers can be written with one message. There are none writable holding registers for the SIPROTEC devices at present. | yes                         |

Table 2-1 Supported Modbus functions

# Exception responses of the Modbus slave

# 3

If the Modbus slave receives a query from the Modbus master which cannot be processed (e.g. a request to read a non-existent register), then the slave answers with an exception response message.

The following exception codes are signaled in a exception response message to the Modbus master by the Modbus slave of the SIPROTEC device:

- Exception code 01**    ILLEGAL\_FUNCTION
- The function code used in the query by the Modbus master is not supported by the Modbus slave of the SIPROTEC device.
- Ref to chap. 2 for a list of supported Modbus functions.
- Exception code 02**    ILLEGAL\_DATA\_ADDRESS
- The Modbus master addresses in the query a register for which:
- no mapping entry exist (i.e. a non-existent register),
  - the access is not enabled since the addressed register is part of a complex bus object which uses more than one registers and can be read only completely.
- Exception code 03**    ILLEGAL\_DATA\_VALUE
- The Modbus master tried to write to a register for which only read access is permitted.
- Exception code 06**    SLAVE\_DEVICE\_BUSY
- The Modbus slave has no valid mapping data or the Modbus registers still have not been initialized and enabled by the SIPROTEC device (after initial start or restart of the device).
- Exception code 08**    NEGATIVE\_ACKNOWLEDGE
- If at the diagnostic query (Modbus function code 8) another subfunction than 00 or 02 is requested, then this is rejected with NEGATIVE\_ACKNOWLEDGE.





# Annunciations to the Modbus master

# 4



---

**Note**

When analysing the annunciations of the SIPROTEC device in the Modbus master, it should be noted that due to the cycle period of the Modbus system (period between two following queries of the same data of the Modbus slave) temporary changes of an annunciation's value (ON and OFF within one cycle) may eventually not be recognized.

This applies in the first place for protection annunciations.

---

**Protection pickup**

Protection annunciations which indicate the status protection pickup are active only for the period of time of the protection pickup.

**Protection TRIP**

The parameter **MINIMUM DURATION OF TRIP COMMAND** (parameter address = 210) allows setting of the minimum duration of the TRIP command.

This time setting applies to all protection functions which may cause a TRIP signal. After a protection TRIP, the corresponding protection annunciations transmit the value ON for the programmed minimum time duration.



# Data type definitions

# 5

Following data types are used for storage of variables in Modbus registers:

- Single-point indications
- Single commands
- Double-point indications
- Double commands
- Measured values (signed integer)
- Metered measurands (unsigned long)



---

## Note

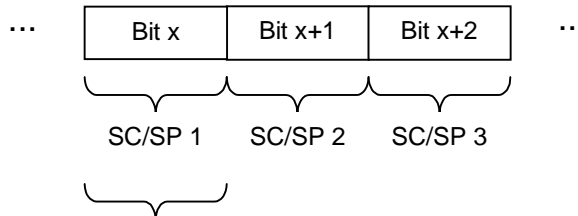
The storage of variables of more complex data types in the Modbus holding registers (i.e. variables greater than one holding register, e.g. metered measurands) is processed according to the following convention:

*The register which has the lower address contains the most significant byte (MSB) of the variable and the register with the higher address contains the least significant byte (LSB).*

## 5.1 Single command (SC) / Single-point indication (SP)

Range of values:

- 0 – OFF
- 1 – ON



Coil / input status register or one bit of a holding register

Figure 5-1 Data type single command / single-point indication

## 5.2 Double command (DC) / Double-point indication (DP)

Range of values:

- 0 (bit 1 = 0 and bit 0 = 0) - „Not applicable“ for DP, not permissible for DC
- 1 (bit 1 = 0 and bit 0 = 1) - OFF
- 2 (bit 1 = 1 and bit 0 = 0) - ON
- 3 (bit 1 = 1 and bit 0 = 1) - Error status/Intermediate position for DP, not permissible for DC

### Note



- „Not applicable“: double-point indication is not configured (not assigned to a binary input).
- The value „11“ ist transmitted for intermediate position „00“ too.

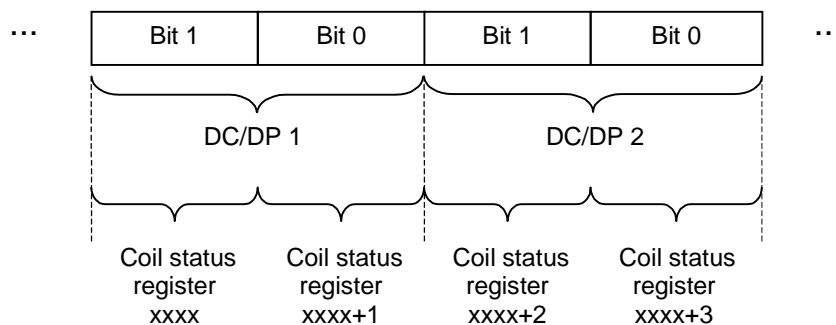


Figure 5-2 Data type double command / double-point indication



Double commands are exclusively controlled using Modbus function „Force Multiple Coils“ (ref. to chap. 2).

### 5.3 Measured value (signed integer)

Range of values:

-32768 to +32767  
(-32768 = overflow or invalid)

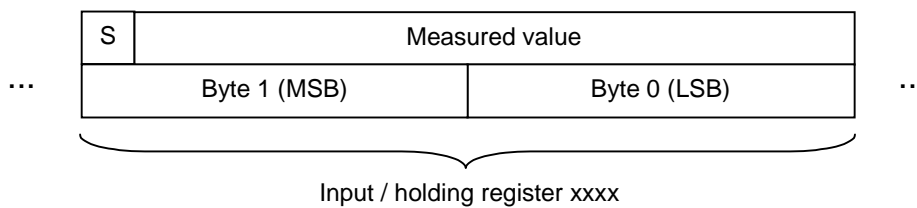


Figure 5-3 Data type measured value (signed integer)

Meaning of the status bits:

S - Sign bit, active: negative measured value (two's complement)

### 5.4 Metered measurand (unsigned long)

Range of values:

0 to +4294967295

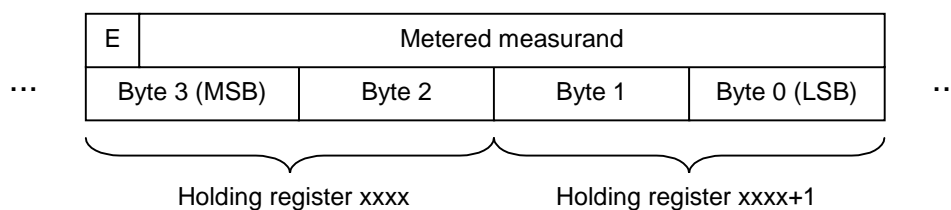


Figure 5-4 Data type metered measurand (unsigned integer)

Meaning of the status bits:

E - Error bit, active: invalid metered measurand



# 6

## Modbus register map

### 6.1 Explanation



#### Note

The examples shown in this chapter 6.1 do not necessarily correspond to the real allocation of the objects in the register mapping.

Chapters 6.3 to 6.6 define the mapping of the data objects of the SIPROTEC devices 7SJ61, 7SJ62, 7SJ63 and 6MD63 to the associated Modbus registers.

There are three standard mappings (standard mapping 1 to standard mapping 3) available, which have an identical data size and differ in the scaling of the measured values (ref. to chap. 6.5).

The listed SIPROTEC data objects are sorted by register addresses (starting with 1), e.g.:

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>    | <b>Scaling (32767 corresponds to ...)</b>  | <b>Internal object no.</b> |
|-------------------------|--|--------------------|--|----------------------------|
| 30001                   | IA   | Current in phase A | 1: 3276,7 A<br>2: 32,767 kA<br>3: 3276,7 A | 601                        |

The measured value "IA" (ref. to chap. 5.3 for measured value data type definition) is assigned to register 30001 (input register).

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b> | <b>Internal object no.</b> |
|-------------------------|--|-----------------|----------------------------|
| 00001                   | Q0 ON/OFF<br>ON                            | Circuit breaker | -                          |
| 00002                   | Q0 ON/OFF<br>OFF                           |                 |                            |

The double command "Q0 ON/OFF" and simultaneous the checkback indication of the circuit breaker Q0 as an double-point indication (ref. to chap. 5.2 for data type definitions) are assigned to the coil status registers 00001 (ON) and 00002 (OFF).

## 6.2 Notes for parametrization in DIGSI



---

Only those SIPROTEC objects can be transmitted or controlled by Modbus which are listed in the column "Designation of the SIPROTEC objects".

All these objects are already contained in the standard parameter set and they can be identified by their name or their "Internal object no." (not all SIPROTEC objects have an internal object number).

---

For transmission of installation-specific commands and annunciations user-definable objects are available.

Binary outputs and binary inputs of the SIPROTEC device can be assigned to these objects using the DIGSI parameterization software (ref. to chap. 6.3.2 and 6.4.1).

CFC-Incoming annunciations and CFC-Output indications can be used to allocate protection annunciations, which are not contained in the standard mapping to positions in Modbus registers (ref. to chap. 6.3.4 and 6.4.2).



### 6.3 Coil status registers (0X references)

The coil status register block allows the Modbus master:

- command outputs through the output relays of the SIPROTEC device (external commands),
- manipulation of taggings (internal commands), which can be changed by Modbus,
- reading the checkback indication and/or the status of output relays as well as taggings.



#### Note

The allocation of the output relays to the switching devices and to the output channels is defined during parametrization of the SIPROTEC devices.

Depending on the device composition there may be less than indicated output relays (and corresponding Modbus registers) available in the SIPROTEC device.

#### 6.3.1 Register addresses 00001 to 00018: Double commands

- Data type definition ref. to chap. 5.2.

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                                     | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 00001                   | Q0 ON/OFF<br>ON                            | Impulse output,<br>3 relays (2-pole ON, 1-pole OFF) | -                          |
| 00002                   | Q0 ON/OFF<br>OFF                           |   |                            |
| 00003                   | Q1 ON/OFF<br>ON                            | Impulse output,<br>2 relays, 1-pole                 | -                          |
| 00004                   | Q1 ON/OFF<br>OFF                           |   |                            |
| 00005                   | Q8 ON/OFF<br>ON                            | Impulse output,<br>2 relays, 1-pole                 | -                          |
| 00006                   | Q8 ON/OFF<br>OFF                           |   |                            |
| 00007                   | Q2 ON/OFF<br>ON                            | Impulse output,<br>2 relays, 1-pole                 | -                          |
| 00008                   | Q2 ON/OFF<br>OFF                           |   |                            |
| 00009                   | Q9 ON/OFF<br>ON                            | Impulse output,<br>2 relays, 1-pole                 | -                          |
| 00010                   | Q9 ON/OFF<br>OFF                           |   |                            |
| 00011                   | Switching device D1 (UsrDC1)<br>ON         | Impulse output,<br>4 relays (2-pole)                | -                          |
| 00012                   | Switching device D1 (UsrDC1)<br>OFF        |   |                            |
| 00013                   | Switching device D2 (UsrDC2)<br>ON         | Impulse output,<br>2 relays, 1-pole                 | -                          |
| 00014                   | Switching device D2 (UsrDC2)<br>OFF        |   |                            |
| 00015                   | Switching device D3 (UsrDC3)<br>ON         | Impulse output,<br>2 relays, 1-pole                 | -                          |
| 00016                   | Switching device D3 (UsrDC3)<br>OFF        |   |                            |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                     | <b>Internal object no.</b> |
|-------------------------|--|-------------------------------------|----------------------------|
| 00017                   | Switching device D4 (UsrDC4)<br>ON         | Impulse output,<br>2 relays, 1-pole | -                          |
| 00018                   | Switching device D4 (UsrDC4)<br>OFF        |                                     |                            |
| 00019<br>–<br>00032     | reserved <sup>2</sup>                      |                                     | -                          |

### 6.3.2 Register addresses 00033 to 00054: Single commands

- Data type definition ref. to chap. 5.1.

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>  | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 00033                   | Output channel E1 (UsrSC1)                 | Impulse output, single command with checkback indiation, 1 relay, 1-pole           | -                          |
| 00034                   | Output channel E2 (UsrSC2)                 | Impulse output, single command with checkback indiation, 1 relay, 1-pole           | -                          |
| 00035                   | Output channel E3 (UsrSC3)                 | Impulse output, single command with checkback indiation, 1 relay, 1-pole           | -                          |
| 00036                   | Output channel E4 (UsrSC4)                 | Impulse output, single command with checkback indiation, 1 relay, 1-pole           | -                          |
| 00037                   | Output channel E5 (UsrSC5)                 | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00038                   | Output channel E6 (UsrSC6)                 | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00039                   | Output channel E7 (UsrSC7)                 | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00040                   | Output channel E8 (UsrSC8)                 | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00041                   | Output channel E9 (UsrSC9)                 | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00042                   | Output channel E10 (UsrSC10)               | Continuous output without restauration after reset, SC without checkback indiation | -                          |
| 00043                   | Output channel E11 (UsrSC11)               | Continuous output without restauration after reset, SC without checkback indiation | -                          |
| 00044                   | Output channel E12 (UsrSC12)               | Continuous output with restauration after reset, SC without checkback indiation    | -                          |
| 00045                   | Output channel E13 (UsrSC13)               | Continuous output with restauration after reset, SC without checkback indiation    | -                          |
| 00046                   | Output channel E14 (UsrSC14)               | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00047                   | Output channel E15 (UsrSC15)               | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00048                   | Output channel E16 (UsrSC16)               | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00049                   | Output channel E17 (UsrSC17)               | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00050                   | Output channel E18 (UsrSC18)               | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00051                   | Output channel E19 (UsrSC19)               | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00052                   | Output channel E20 (UsrSC20)               | Impulse output, single command without checkback indiation, 1 relay, 1-pole        | -                          |
| 00053                   | Output channel E21 (UsrSC21)               | Continuous output without restauration after reset, SC without checkback indiation | -                          |
| 00054                   | Output channel E22 (UsrSC22)               | Continuous output without restauration after reset, SC without checkback indiation | -                          |
| 00055<br>–<br>00064     | reserved <sup>2</sup>                      |  | -                          |

<sup>2</sup> For an as "reserved" labeled coil status register the value 0 is always returned if reading. A write access is rejected in the SIPROTEC device.

**Note**

- The command output mode (pulse output, continuous output) is changeable for the single commands using parametrization software DIGSI. The command output modes indicated in above table are predefined.
- The switching direction OFF for single commands with pulse output is not permitted and is rejected in the SIPROTEC device.
- It is presupposed at single commands with pulse output and checkback indication that a switchgear with monostable time element is externally connected. This monoflop is activated by the pulse command and drops out after a predefined time. Now a repeated activation is possible. The command output is rejected in the SIPROTEC device during the time in which the checkback indication has the value ON.

**6.3.3 Register addresses 00065 to 00071: Internal commands**

- Data type definition ref. to chap. 5.1.

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>   | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 00065                   | Command: Auto recl. ON/OFF                 | 0 = Deactivation of "Autoreclosing"<br>1 = Activation of "Autoreclosing"                                | 127                        |
|                         | Annunciation: 79AR ON                      | 1 = AR is switched ON   | 2782                       |
| 00066                   | Command: Protection ON/OFF                 | 0 = Deactivation of protection functions<br>1 = Activation of protection functions                      | 126                        |
|                         | Annunciation: Prot.Active                  | 1 = At least one protection function is active  | 52                         |
| 00067                   | Command: Setting group A                   | 0 = not permissible<br>1 = Activation of setting group A  | 53                         |
|                         | Annunciation: Setting group A              | 0 = Setting group A is not active<br>1 = Setting group A is active                                      |                            |
| 00068                   | Command: Setting group B                   | 0 = not permissible<br>1 = Activation of setting group B  | 54                         |
|                         | Annunciation: Setting group B              | 0 = Setting group B is not active<br>1 = Setting group B is active                                      |                            |
| 00069                   | Command: Setting group C                   | 0 = not permissible<br>1 = Activation of setting group C  | 55                         |
|                         | Annunciation: Setting group C              | 0 = Setting group C is not active<br>1 = Setting group C is active                                      |                            |
| 00070                   | Command: Setting group D                   | 0 = not permissible<br>1 = Activation of setting group A  | 56                         |
|                         | Annunciation: Setting group D              | 0 = Setting group D is not active<br>1 = Setting group D is active                                      |                            |
| 00071                   | Command: Mode REMOTE                       | Change control mode REMOTE to<br>0 = Control mode REMOTE = LOCKED<br>1 = Control mode REMOTE = UNLOCKED | -                          |
|                         | Annunciation: SchModFern                   | Status of control mode REMOTE<br>0 = LOCKED<br>1 = UNLOCKED   |                            |
| 00072<br>–<br>00080     | reserved <sup>2</sup>                      |   | –                          |



### Control mode REMOTE

Control mode with control authority is REMOTE, option of unlocked control with Modbus.

- Changing the “Control mode REMOTE“ to UNLOCKED permits one unlocked control operation via Modbus. After execution of the command, the tagging “Control mode REMOTE“ in the SIPROTEC device will automatically be reset to LOCKED.
- A programmed test “Switch in position“ for unlocked control operations will always be executed.
- If, after changing the “Control mode REMOTE“ to UNLOCKED, no command is received via Modbus for a period of 5 minutes, then the tagging “Control mode REMOTE“ is automatically reset to LOCKED.



### Changing the setting group

In order to change the setting group, the value “1“ = ON must be transmitted to the corresponding register. Switching on one setting group automatically switches off the current active setting group. Transmission of the value “0“ = OFF is insignificant for the change of the setting group and is refused by the device.

A change of the setting group is only possible via Modbus if the parameter **CHANGE TO ANOTHER SETTING GROUP** (parameter address = 302) has the value "Protocol".

## 6.3.4 Register addresses 00081 to 0096: Application logic CFC

- Data type definitions ref. to chap. 5.1.

| Register address | Designation of the SIPROTEC objects       | Comments                              | Internal object no. |
|------------------|---|---------------------------------------|---------------------|
| 00081            | CFC-Incoming annunciation 1 (UsCfcSpl1)   | Tagging ON/OFF, released as CFC input | –                   |
| 00082            | CFC-Incoming annunciation 2 (UsCfcSpl2)   | Tagging ON/OFF, released as CFC input | –                   |
| 00083            | CFC-Incoming annunciation 3 (UsCfcSpl3)   | Tagging ON/OFF, released as CFC input | –                   |
| 00084            | CFC-Incoming annunciation 4 (UsCfcSpl4)   | Tagging ON/OFF, released as CFC input | –                   |
| 00085            | CFC-Incoming annunciation 5 (UsCfcSpl5)   | Tagging ON/OFF, released as CFC input | –                   |
| 00086            | CFC-Incoming annunciation 6 (UsCfcSpl6)   | Tagging ON/OFF, released as CFC input | –                   |
| 00087            | CFC-Incoming annunciation 7 (UsCfcSpl7)   | Tagging ON/OFF, released as CFC input | –                   |
| 00088            | CFC-Incoming annunciation 8 (UsCfcSpl8)   | Tagging ON/OFF, released as CFC input | –                   |
| 00089            | CFC-Incoming annunciation 9 (UsCfcSpl9)   | Tagging ON/OFF, released as CFC input | –                   |
| 00090            | CFC-Incoming annunciation 10 (UsCfcSpl10) | Tagging ON/OFF, released as CFC input | –                   |
| 00091            | CFC-Incoming annunciation 11 (UsCfcSpl11) | Tagging ON/OFF, released as CFC input | –                   |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                       | <b>Internal object no.</b> |
|-------------------------|--|---------------------------------------|----------------------------|
| 00092                   | CFC-Incoming annunciation 12 (UsCfcSpl12)  | Tagging ON/OFF, released as CFC input | –                          |
| 00093                   | CFC-Incoming annunciation 13 (UsCfcSpl13)  | Tagging ON/OFF, released as CFC input | –                          |
| 00094                   | CFC-Incoming annunciation 14 (UsCfcSpl14)  | Tagging ON/OFF, released as CFC input | –                          |
| 00095                   | CFC-Incoming annunciation 15 (UsCfcSpl15)  | Tagging ON/OFF, released as CFC input | –                          |
| 00096                   | CFC-Incoming annunciation 16 (UsCfcSpl16)  | Tagging ON/OFF, released as CFC input | –                          |



### Note

The CFC-Incoming annunciations allow routing of further protection annunciations on Modbus registers, which are not contained in the standard mapping (e.g. ">BLK 50/51", internal object number = 1704 or ">BLK 50N/51N", internal object number = 1714).

### Example

Control of object ">BLK 50/51" using "CFC-Incoming annunciation 1 (UsCfcSpl1)" via Modbus:

- In the DIGSI configuration matrix set the source for ">BLK 50/51" to CFC output.
- All CFC-Incoming annunciations are released as CFC input by default, therefore no further actions in the DIGSI configuration matrix are necessary.
- Open a CFC working page and insert a CONNECT module.
- Connect the input („BO X“) of the CONNECT module with the operand "UsCfcSpl1" (group „Protocol“).
- Connect the output („Y BO“) of the CONNECT module with the operand ">BLK 50/51" (Gruppe: "50/51 Overcur.“).
- Save and translate the CFC working page.

The object ">BLK 50/51" (and with that the associated protective function) can be influenced by changing the value of the "CFC-Incoming annunciation 1" via Modbus now.

### 6.3.5 Register addresses 00257 to 00264: Exception flags

- Registers are write-protected<sup>3</sup>.
- The contents of these registers are also readable using function "Read Exception Status" (function code 7).

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>     | <b>Internal object no.</b> |
|-------------------------|--|---------------------|----------------------------|
| 00257                   | reserved                                   | not used at present | –                          |
| 00258                   | reserved                                   | not used at present | –                          |
| 00259                   | reserved                                   | not used at present | –                          |
| 00260                   | reserved                                   | not used at present | –                          |
| 00261                   | reserved                                   | not used at present | –                          |
| 00262                   | reserved                                   | not used at present | –                          |
| 00263                   | reserved                                   | not used at present | –                          |
| 00264                   | reserved                                   | not used at present | –                          |

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<sup>3</sup> A write access is rejected with exception code 03 (ILLEGAL\_DATA\_VALUE).

## 6.4 Input status registers (1X references)

The input status register block allows the Modbus master to scan the current status of the input channels as well as the annunciations generated in the SIPROTEC device (e.g. protection annunciations, status annunciations).



### Note

The allocation of the input channels to the binary inputs is defined during parameterization of the devices.

Depending on the device composition and the existing protection packages not all of the indicated binary inputs or protection annunciations (and corresponding Modbus registers) may be available in the SIPROTEC device.

Ref. to chap. 5.1 for data type definition of the input status registers.

### 6.4.1 Register addresses 10001 to 10037: Input channels with allocation to the binary inputs

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                                       | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10001                   | Input channel 1 (UsrSpO/C1)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10002                   | Input channel 2 (UsrSpO/C2)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10003                   | Input channel 3 (UsrSpO/C3)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10004                   | Input channel 4 (UsrSpO/C4)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10005                   | Input channel 5 (UsrSpO/C5)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10006                   | Input channel 6 (UsrSpO/C6)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10007                   | Input channel 7 (UsrSpO/C7)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10008                   | Input channel 8 (UsrSpO/C8)                | Single-point indication OPEN/CLOSE                    | –                          |
| 10009                   | Input channel 9 (UsrSpO/C9)                | Tagging / internal single-point indication OPEN/CLOSE | –                          |
| 10010                   | Input channel 10 (UsrSpO/C10)              | Tagging / internal single-point indication OPEN/CLOSE | –                          |
| 10011                   | Input channel 11 (UsrSpO/O11)              | Single-point indication ON/OFF                        | –                          |
| 10012                   | Input channel 12 (UsrSpO/O12)              | Single-point indication ON/OFF                        | –                          |
| 10013                   | Input channel 13 (UsrSpO/O13)              | Single-point indication ON/OFF                        | –                          |
| 10014                   | Input channel 14 (UsrSpO/O14)              | Single-point indication ON/OFF                        | –                          |
| 10015                   | Input channel 15 (UsrSpO/O15)              | Single-point indication ON/OFF                        | –                          |
| 10016                   | Input channel 16 (UsrSpO/O16)              | Single-point indication ON/OFF                        | –                          |
| 10017                   | Input channel 17 (UsrSpO/O17)              | Single-point indication ON/OFF                        | –                          |
| 10018                   | Input channel 18 (UsrSpO/O18)              | Single-point indication ON/OFF                        | –                          |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                                   | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10019                   | Input channel 19 (UsrSpO/O19)              | Single-point indication ON/OFF                    | –                          |
| 10020                   | Input channel 20 (UsrSpO/O20)              | Single-point indication ON/OFF                    | –                          |
| 10021                   | Input channel 21 (UsrSpO/O21)              | Single-point indication ON/OFF                    | –                          |
| 10022                   | Input channel 22 (UsrSpO/O22)              | Single-point indication ON/OFF                    | –                          |
| 10023                   | Input channel 23 (UsrSpO/O23)              | Single-point indication ON/OFF                    | –                          |
| 10024                   | Input channel 24 (UsrSpO/O24)              | Single-point indication ON/OFF                    | –                          |
| 10025                   | Input channel 25 (UsrSpO/O25)              | Single-point indication ON/OFF                    | –                          |
| 10026                   | Input channel 26 (UsrSpO/O26)              | Single-point indication ON/OFF                    | –                          |
| 10027                   | Input channel 27 (UsrSpO/O27)              | Single-point indication ON/OFF                    | –                          |
| 10028                   | Input channel 28 (UsrSpO/O28)              | Single-point indication ON/OFF                    | –                          |
| 10029                   | Input channel 29 (UsrSpO/O29)              | Single-point indication ON/OFF                    | –                          |
| 10030                   | Input channel 30 (UsrSpO/O30)              | Single-point indication ON/OFF                    | –                          |
| 10031                   | Input channel 31 (UsrSpO/O31)              | Single-point indication ON/OFF                    | –                          |
| 10032                   | Input channel 32 (UsrSpO/O32)              | Tagging / internal single-point indication ON/OFF | –                          |
| 10033                   | Input channel 33 (UsrSpO/O33)              | Tagging / internal single-point indication ON/OFF | –                          |
| 10034                   | Input channel 34 (UsrSpO/O34)              | Tagging / internal single-point indication ON/OFF | –                          |
| 10035                   | Input channel 35 (UsrSpO/O35)              | Tagging / internal single-point indication ON/OFF | –                          |
| 10036                   | Input channel 36 (UsrSpO/O36)              | Tagging / internal single-point indication ON/OFF | –                          |
| 10037                   | Input channel 37 (UsrSpO/O37)              | Tagging / internal single-point indication ON/OFF | –                          |
| 10038<br>–<br>10048     | reserved <sup>4</sup>                      |   | –                          |

#### 6.4.2 Register addresses 10049 to 10064: Application logic CFC

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>  | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10049                   | CFC-Output indication 1 (UsCfcSpO1)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10050                   | CFC-Output indication 2 (UsCfcSpO2)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10051                   | CFC-Output indication 3 (UsCfcSpO3)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10052                   | CFC-Output indication 4 (UsCfcSpO4)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10052                   | CFC-Output indication 5 (UsCfcSpO5)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10054                   | CFC-Output indication 6 (UsCfcSpO6)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10055                   | CFC-Output indication 7 (UsCfcSpO7)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10056                   | CFC-Output indication 8 (UsCfcSpO8)        | Single-point indication ON/OFF, released as CFC output | –                          |

<sup>4</sup> For an as "reserved" labeled input status register the value 0 is always returned if reading.



| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>  | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10057                   | CFC-Output indication 9 (UsCfcSpO9)        | Single-point indication ON/OFF, released as CFC output | –                          |
| 10058                   | CFC-Output indication 10 (UsCfcSpO10)      | Single-point indication ON/OFF, released as CFC output | –                          |
| 10059                   | CFC-Output indication 11 (UsCfcSpO11)      | Single-point indication ON/OFF, released as CFC output | –                          |
| 10060                   | CFC-Output indication 12 (UsCfcSpO12)      | Single-point indication ON/OFF, released as CFC output | –                          |
| 10061                   | CFC-Output indication 13 (UsCfcSpO13)      | Single-point indication ON/OFF, released as CFC output | –                          |
| 10062                   | CFC-Output indication 14 (UsCfcSpO14)      | Single-point indication ON/OFF, released as CFC output | –                          |
| 10063                   | CFC-Output indication 15 (UsCfcSpO15)      | Single-point indication ON/OFF, released as CFC output | –                          |
| 10064                   | CFC-Output indication 16 (UsCfcSpO16)      | Single-point indication ON/OFF, released as CFC output | –                          |



#### Note

The CFC-Output indications allow configuration of further protection annunciations on Modbus registers, which are not contained in the standard mapping.

### 6.4.3 Register addresses 10065 to 10089: Automatic recloser status

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                              | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10065                   | >79 ON                                     | 1 = >79 ON                                   | 2701                       |
| 10066                   | >79 OFF                                    | 1 = >79 OFF                                  | 2702                       |
| 10067                   | >BLOCK 79                                  | 1 = >BLOCK 79                                | 2703                       |
| 10068                   | >79 T WAIT                                 | 1 = >79 T Wait (coordination control)        | 2705                       |
| 10069                   | > 79 TRIP 1p                               | 1 = >79 Ext. 1pole TRIP for internal A/R     | 2715                       |
| 10070                   | > 79 TRIP 3p                               | 1 = >79 Ext. 3pole TRIP for internal A/R     | 2716                       |
| 10071                   | >Enable ANSI#-2                            | 1 = >Enable 50/67-(N)-2 (override 79 blk)    | 2720                       |
| 10072                   | >CB Ready                                  | 1 = >Circuit breaker READY for reclosing     | 2730                       |
| 10073                   | 79AR OFF                                   | 1 = 79 Auto recloser is switched OFF         | 2781                       |
| 10074                   | reserved <sup>4</sup>                      |  | –                          |
| 10075                   | CB is NOT ready                            | 1 = Circuit breaker is NOT ready             | 2784                       |
| 10076                   | 79 DynBlock                                | 1 = 79 - Auto-reclose is dynamically BLOCKED | 2785                       |
| 10077                   | 79 in progress                             | 1 = 79 - in progress                         | 2801                       |
| 10078                   | 79 Close                                   | 1 = 79 - Close command                       | 2851                       |
| 10079                   | 79 Successful                              | 1 = 79 - cycle successful                    | 2862                       |
| 10080                   | 79 Lockout                                 | 1 = 79 - Lockout                             | 2863                       |
| 10081                   | 79 L-N Sequence                            | 1 = 79-A/R single phase reclosing sequence   | 2878                       |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                             | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10082                   | 79 L-L Sequence                            | 1 = 79-A/R multi-phase reclosing sequence   | 2879                       |
| 10083                   | >ZSC ON                                    | 1 = >Switch zone sequence coordination ON   | 2722                       |
| 10084                   | >ZSC OFF                                   | 1 = >Switch zone sequence coordination OFF  | 2723                       |
| 10085                   | TRIP Gnd Fault                             | 1 = TRIP Ground Fault                       | 2869                       |
| 10086                   | TRIP Ph Fault                              | 1 = TRIP Phase Fault                        | 2870                       |
| 10087                   | ZSC active                                 | 1 = Zone Sequencing is active               | 2883                       |
| 10088                   | ZSC ON                                     | 1 = Zone sequence coordination switched ON  | 2884                       |
| 10089                   | ZSC OFF                                    | 1 = Zone sequence coordination switched OFF | 2885                       |
| 10090<br>–<br>10096     | reserved <sup>4</sup>                      |   | –                          |

#### 6.4.4 Register addresses 10097 to 10137: Time overcurrent protection

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                        | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10097                   | >BLOCK 50-2                                | 1 = >BLOCK 50-2                        | 1721                       |
| 10098                   | >BLOCK 50-1                                | 1 = >BLOCK 50-1                        | 1722                       |
| 10099                   | >BLOCK 51                                  | 1 = >BLOCK 51                          | 1723                       |
| 10100                   | >BLOCK 50N-2                               | 1 = >BLOCK 50N-2                       | 1724                       |
| 10101                   | >BLOCK 50N-1                               | 1 = >BLOCK 50N-1                       | 1725                       |
| 10102                   | >BLOCK 51N                                 | 1 = >BLOCK 51N                         | 1726                       |
| 10103                   | >BLK CLP stpTim                            | 1 = >BLOCK Cold-Load-Pickup stop timer | 1731                       |
| 10104                   | 50/51 PH OFF                               | 1 = 50/51 O/C is switched OFF          | 1751                       |
| 10105                   | 50/51 PH BLK                               | 1 = 50/51 O/C is BLOCKED               | 1752                       |
| 10106                   | 50/51 PH ACT                               | 1 = 50/51 O/C is ACTIVE                | 1753                       |
| 10107                   | 50N/51N OFF                                | 1 = 50N/51N is switched OFF            | 1756                       |
| 10108                   | 50N/51N BLK                                | 1 = 50N/51N is BLOCKED                 | 1757                       |
| 10109                   | 50N/51N ACT                                | 1 = 50N/51N is ACTIVE                  | 1758                       |
| 10110                   | 50(N)/51(N) PU                             | 1 = 50(N)/51(N) O/C PICKUP             | 1761                       |
| 10111                   | 50/51 Ph A PU                              | 1 = 50/51 Phase A picked up            | 1762                       |
| 10112                   | 50/51 Ph B PU                              | 1 = 50/51 Phase B picked up            | 1763                       |
| 10113                   | 50/51 Ph C PU                              | 1 = 50/51 Phase C picked up            | 1764                       |
| 10114                   | 50N/51NPickedup                            | 1 = 50N/51N picked up                  | 1765                       |
| 10115                   | 50(N)/51(N)TRIP                            | 1 = 50(N)/51(N) TRIP                   | 1791                       |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                              | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10116                   | 50-2 picked up                             | 1 = 50-2 picked up                           | 1800                       |
| 10117                   | 50-2 TimeOut                               | 1 = 50-2 Time Out                            | 1804                       |
| 10118                   | 50-2 TRIP                                  | 1 = 50-2 TRIP                                | 1805                       |
| 10119                   | 50-1 picked up                             | 1 = 50-1 picked up                           | 1810                       |
| 10120                   | 50-1 TimeOut                               | 1 = 50-1 Time Out                            | 1814                       |
| 10121                   | 50-1 TRIP                                  | 1 = 50-1 TRIP                                | 1815                       |
| 10122                   | 51 picked up                               | 1 = 51 picked up                             | 1820                       |
| 10123                   | 51 TimeOut                                 | 1 = 51 Time Out                              | 1824                       |
| 10124                   | 51 TRIP                                    | 1 = 51 TRIP                                  | 1825                       |
| 10125                   | 50N-2 picked up                            | 1 = 50N-2 picked up                          | 1831                       |
| 10126                   | 50N-2 TimeOut                              | 1 = 50N-2 Time Out                           | 1832                       |
| 10127                   | 50N-2 TRIP                                 | 1 = 50N-2 TRIP                               | 1833                       |
| 10128                   | 50N-1 picked up                            | 1 = 50N-1 picked up                          | 1834                       |
| 10129                   | 50N-1 TimeOut                              | 1 = 50N-1 Time Out                           | 1835                       |
| 10130                   | 50N-1 TRIP                                 | 1 = 50N-1 TRIP                               | 1836                       |
| 10131                   | 51N picked up                              | 1 = 51N picked up                            | 1837                       |
| 10132                   | 51N TimeOut                                | 1 = 51N TimeOut                              | 1838                       |
| 10133                   | 51N TRIP                                   | 1 = 51N TRIP                                 | 1839                       |
| 10134                   | PhA InrushBlk                              | 1 = Phase A trip blocked by inrush detection | 1840                       |
| 10135                   | PhB InrushBlk                              | 1 = Phase B trip blocked by inrush detection | 1841                       |
| 10136                   | PhC InrushBlk                              | 1 = Phase C trip blocked by inrush detection | 1842                       |
| 10137                   | INRUSH X-BLK                               | 1 = Cross blk: PhX blocked PhY               | 1843                       |
| 10138<br>–<br>10144     | reserved <sup>4</sup>                      |  | –                          |

#### 6.4.5 Register addresses 10145 to 10188: Directional time overcurrent protection

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>   | <b>Internal object no.</b> |
|-------------------------|--|-------------------|----------------------------|
| 10145                   | >BLOCK 67-2                                | 1 = >BLOCK 67-2   | 2615                       |
| 10146                   | >BLOCK 67N-2                               | 1 = >BLOCK 67N-2  | 2616                       |
| 10147                   | >BLOCK 67-1                                | 1 = >BLOCK 67-1   | 2621                       |
| 10148                   | >BLOCK 67-TOC                              | 1 = >BLOCK 67-TOC | 2622                       |
| 10149                   | >BLOCK 67N-1                               | 1 = >BLOCK 67N-1  | 2623                       |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                 | <b>Internal object no.</b> |
|-------------------------|--|---------------------------------|----------------------------|
| 10150                   | >BLOCK 67N-TOC                             | 1 = >BLOCK 67N-TOC              | 2624                       |
| 10151                   | Phase A forward                            | 1 = Phase A forward             | 2628                       |
| 10152                   | Phase B forward                            | 1 = Phase B forward             | 2629                       |
| 10153                   | Phase C forward                            | 1 = Phase C forward             | 2630                       |
| 10154                   | Phase A reverse                            | 1 = Phase A reverse             | 2632                       |
| 10155                   | Phase B reverse                            | 1 = Phase B reverse             | 2633                       |
| 10156                   | Phase C reverse                            | 1 = Phase C reverse             | 2634                       |
| 10157                   | Ground forward                             | 1 = Ground forward              | 2635                       |
| 10158                   | Ground reverse                             | 1 = Ground reverse              | 2636                       |
| 10159                   | 67-2 picked up                             | 1 = 67-2 picked up              | 2642                       |
| 10160                   | 67N-2 picked up                            | 1 = 67N-2 picked up             | 2646                       |
| 10161                   | 67-2 Time Out                              | 1 = 67-2 Time Out               | 2647                       |
| 10162                   | 67N-2 Time Out                             | 1 = 67N-2 Time Out              | 2648                       |
| 10163                   | 67-2 TRIP                                  | 1 = 67-2 TRIP                   | 2649                       |
| 10164                   | 67/67-TOC OFF                              | 1 = 67/67-TOC is switched OFF   | 2651                       |
| 10165                   | 67 BLOCKED                                 | 1 = 67/67-TOC is BLOCKED        | 2652                       |
| 10166                   | 67 ACTIVE                                  | 1 = 67/67-TOC is ACTIVE         | 2653                       |
| 10167                   | 67N OFF                                    | 1 = 67N/67N-TOC is switched OFF | 2656                       |
| 10168                   | 67N BLOCKED                                | 1 = 67N/67N-TOC is BLOCKED      | 2657                       |
| 10169                   | 67N ACTIVE                                 | 1 = 67N/67N-TOC is ACTIVE       | 2658                       |
| 10170                   | 67-1 picked up                             | 1 = 67-1 picked up              | 2660                       |
| 10171                   | 67-1 Time Out                              | 1 = 67-1 Time Out               | 2664                       |
| 10172                   | 67-1 TRIP                                  | 1 = 67-1 TRIP                   | 2665                       |
| 10173                   | 67-TOC pickedup                            | 1 = 67-TOC picked up            | 2670                       |
| 10174                   | 67-TOC Time Out                            | 1 = 67-TOC Time Out             | 2674                       |
| 10175                   | 67-TOC TRIP                                | 1 = 67-TOC TRIP                 | 2675                       |
| 10176                   | 67N-2 TRIP                                 | 1 = 67N-2 TRIP                  | 2679                       |
| 10177                   | 67N-1 picked up                            | 1 = 67N-1 picked up             | 2681                       |
| 10178                   | 67N-1 Time Out                             | 1 = 67N-1 Time Out              | 2682                       |
| 10179                   | 67N-1 TRIP                                 | 1 = 67N-1 TRIP                  | 2683                       |
| 10180                   | 67N-TOCPickedup                            | 1 = 67N-TOC picked up           | 2684                       |
| 10181                   | 67N-TOC TimeOut                            | 1 = 67N-TOC Time Out            | 2685                       |
| 10182                   | 67N-TOC TRIP                               | 1 = 67N-TOC TRIP                | 2686                       |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                 | <b>Internal object no.</b> |
|-------------------------|--|---------------------------------|----------------------------|
| 10183                   | 67/67N pickedup                            | 1 = 67/67N picked up            | 2691                       |
| 10184                   | 67 A picked up                             | 1 = 67/67-TOC Phase A picked up | 2692                       |
| 10185                   | 67 B picked up                             | 1 = 67/67-TOC Phase B picked up | 2693                       |
| 10186                   | 67 C picked up                             | 1 = 67/67-TOC Phase C picked up | 2694                       |
| 10187                   | 67N picked up                              | 1 = 67N/67N-TOC picked up       | 2695                       |
| 10188                   | 67/67N TRIP                                | 1 = 67/67N TRIP                 | 2696                       |
| 10189<br>–<br>10192     | reserved <sup>4</sup>                      |                                 | –                          |

#### 6.4.6 Register addresses 10193 to 10200: Unbalanced load protection

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>        | <b>Internal object no.</b> |
|-------------------------|--|------------------------|----------------------------|
| 10193                   | >BLOCK 46                                  | 1 = >BLOCK 46          | 5143                       |
| 10194                   | 46 OFF                                     | 1 = 46 is switched OFF | 5151                       |
| 10195                   | 46 BLOCKED                                 | 1 = 46 is BLOCKED      | 5152                       |
| 10196                   | 46 ACTIVE                                  | 1 = 46 is ACTIVE       | 5153                       |
| 10197                   | 46-2 picked up                             | 1 = 46-2 picked up     | 5159                       |
| 10198                   | 46-1 picked up                             | 1 = 46-1 picked up     | 5165                       |
| 10199                   | 46-TOC pickedup                            | 1 = 46-TOC picked up   | 5166                       |
| 10200                   | 46 TRIP                                    | 1 = 46 TRIP            | 5170                       |
| 10201<br>–<br>10208     | reserved <sup>4</sup>                      |                        | –                          |

#### 6.4.7 Register addresses 10209 to 10224: Frequency protection

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>        | <b>Internal object no.</b> |
|-------------------------|--|------------------------|----------------------------|
| 10209                   | >BLOCK 81O/U                               | 1 = >BLOCK 81O/U       | 5203                       |
| 10210                   | >BLOCK 81-1                                | 1 = >BLOCK 81-1        | 5206                       |
| 10211                   | >BLOCK 81-2                                | 1 = >BLOCK 81-2        | 5207                       |
| 10212                   | >BLOCK 81-3                                | 1 = >BLOCK 81-3        | 5208                       |
| 10213                   | >BLOCK 81-4                                | 1 = >BLOCK 81-4        | 5209                       |
| 10214                   | 81 OFF                                     | 1 = 81 is switched OFF | 5211                       |
| 10215                   | 81 BLOCKED                                 | 1 = 81 is BLOCKED      | 5212                       |
| 10216                   | 81 ACTIVE                                  | 1 = 81 is ACTIVE       | 5213                       |
| 10217                   | 81-1 picked up                             | 1 = 81-1 picked up     | 5232                       |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>    | <b>Internal object no.</b> |
|-------------------------|--|--------------------|----------------------------|
| 10218                   | 81-2 picked up                             | 1 = 81-2 picked up | 5233                       |
| 10219                   | 81-3 picked up                             | 1 = 81-3 picked up | 5234                       |
| 10220                   | 81-4 picked up                             | 1 = 81-4 picked up | 5235                       |
| 10221                   | 81-1 TRIP                                  | 1 = 81-1 TRIP      | 5236                       |
| 10222                   | 81-2 TRIP                                  | 1 = 81-2 TRIP      | 5237                       |
| 10223                   | 81-3 TRIP                                  | 1 = 81-3 TRIP      | 5238                       |
| 10224                   | 81-4 TRIP                                  | 1 = 81-4 TRIP      | 5239                       |

#### 6.4.8 Register addresses 10225 to 10247: Undervoltage and overvoltage protection

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                                  | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10225                   | >BLOCK 27                                  | 1 = >BLOCK 27 undervoltage protection            | 6503                       |
| 10226                   | >27 I SUPRVSN                              | 1 = >27-Switch current supervision ON            | 6505                       |
| 10227                   | >BLOCK 27-1                                | 1 = >BLOCK 27-1 Undervoltage protection          | 6506                       |
| 10228                   | >BLOCK 27-2                                | 1 = >BLOCK 27-2 Undervoltage protection          | 6508                       |
| 10229                   | >FAIL:FEEDER VT                            | 1 = >Failure: Feeder VT                          | 6509                       |
| 10230                   | >FAIL: BUS VT                              | 1 = >Failure: Busbar VT                          | 6510                       |
| 10231                   | >BLOCK 59-1                                | 1 = >BLOCK 59-1 overvoltage protection           | 6513                       |
| 10232                   | >59 I SUPRVSN                              | 1 = >59 Switch current supervision ON            | 6515                       |
| 10233                   | 27 OFF                                     | 1 = 27 Undervoltage protection switched OFF      | 6530                       |
| 10234                   | 27 BLOCKED                                 | 1 = 27 Undervoltage protection is BLOCKED        | 6531                       |
| 10235                   | 27 ACTIVE                                  | 1 = 27 Undervoltage protection is ACTIVE         | 6532                       |
| 10236                   | 27-2 picked up                             | 1 = 27-2 Undervoltage picked up                  | 6533                       |
| 10237                   | 27-1 PU CS                                 | 1 = 27-1 Undervoltage PICKUP w/curr. supervision | 6534                       |
| 10238                   | 27-2 picked up                             | 1 = 27-2 Undervoltage picked up                  | 6537                       |
| 10239                   | 27-2 PU CS                                 | 1 = 27-2 Undervoltage PICKUP w/curr. supervision | 6538                       |
| 10240                   | 27-1 TRIP                                  | 1 = 27-1 Undervoltage TRIP                       | 6539                       |
| 10241                   | 27-2 TRIP                                  | 1 = 27-2 Undervoltage TRIP                       | 6540                       |
| 10242                   | 59 OFF                                     | 1 = 59-Overvoltage protection is switched OFF    | 6565                       |
| 10243                   | 59 BLOCKED                                 | 1 = 59-Overvoltage protection is BLOCKED         | 6566                       |
| 10244                   | 59 ACTIVE                                  | 1 = 59-Overvoltage protection is ACTIVE          | 6567                       |
| 10245                   | 59-1 picked up                             | 1 = 59 picked up                                 | 6568                       |
| 10246                   | 59-1 PU CS                                 | 1 = 59 picked up w/curr. supervision             | 6569                       |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b> | <b>Internal object no.</b> |
|-------------------------|--|-----------------|----------------------------|
| 10247                   | 59-1 TRIP                                  | 1 = 59 TRIP     | 6570                       |
| 10248<br>-<br>10256     | reserved <sup>4</sup>                      |                 | -                          |

#### 6.4.9 Register addresses 10257 to 10278: Sensitive ground fault protection

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                              | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10257                   | >BLOCK 64                                  | 1 = >BLOCK 64                                | 1201                       |
| 10258                   | >BLOCK 50Ns-2                              | 1 = >BLOCK 50Ns-2                            | 1202                       |
| 10259                   | >BLOCK 50Ns-1                              | 1 = >BLOCK 50Ns-1                            | 1203                       |
| 10260                   | >BLOCK 51Ns                                | 1 = >BLOCK 51Ns                              | 1204                       |
| 10261                   | >BLK 50Ns/67Ns                             | 1 = >BLK 50Ns/67Ns                           | 1207                       |
| 10262                   | 50Ns/67Ns OFF                              | 1 = 50Ns/67Ns is switched OFF                | 1211                       |
| 10263                   | 50Ns/67Ns ACT                              | 1 = 50Ns/67Ns is ACTIVE                      | 1212                       |
| 10264                   | 64 Pickup                                  | 1 = 64 displacement voltage pick up          | 1215                       |
| 10265                   | 64 TRIP                                    | 1 = 64 displacement voltage element TRIP     | 1217                       |
| 10266                   | 50Ns-2 Pickup                              | 1 = 50Ns-2 Pickup                            | 1221                       |
| 10267                   | 50Ns-2 TRIP                                | 1 = 50Ns-2 TRIP                              | 1223                       |
| 10268                   | 50Ns-1 Pickup                              | 1 = 50Ns-1 Pickup                            | 1224                       |
| 10269                   | 50Ns-1 TRIP                                | 1 = 50Ns-1 TRIP                              | 1226                       |
| 10270                   | 51Ns Pickup                                | 1 = 51Ns picked up                           | 1227                       |
| 10271                   | 51Ns TRIP                                  | 1 = 51Ns TRIP                                | 1229                       |
| 10272                   | Sens. Gnd block                            | 1 = Sensitive Ground fault detection BLOCKED | 1230                       |
| 10273                   | Sens.Gnd Pickup                            | 1 = Sensitive Ground fault pick up           | 1271                       |
| 10274                   | Sens. Gnd Ph A                             | 1 = Sensitive Ground fault picked up in Ph A | 1272                       |
| 10275                   | Sens. Gnd Ph B                             | 1 = Sensitive Ground fault picked up in Ph B | 1273                       |
| 10276                   | Sens. Gnd Ph C                             | 1 = Sensitive Ground fault picked up in Ph C | 1274                       |
| 10277                   | SensGnd Forward                            | 1 = Sensitive Gnd fault in forward direction | 1276                       |
| 10278                   | SensGnd Reverse                            | 1 = Sensitive Gnd fault in reverse direction | 1277                       |
| 10279                   | SensGnd undef.                             | 1 = Sensitive Gnd fault direction undefined  | 1278                       |
| 10280<br>-<br>10288     | reserved <sup>4</sup>                      |  | -                          |

**6.4.10 Register addresses 10289 to 10298: Circuit breaker failure protection**

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                | <b>Internal object no.</b> |
|-------------------------|--|--------------------------------|----------------------------|
| 10289                   | >BLOCK 50BF                                | 1 = >BLOCK 50BF                | 1403                       |
| 10290                   | >50BF ext SRC                              | 1 = >50BF initiated externally | 1431                       |
| 10291                   | 50BF OFF                                   | 1 = 50BF is switched OFF       | 1451                       |
| 10292                   | 50BF BLOCK                                 | 1 = 50BF is BLOCKED            | 1452                       |
| 10293                   | 50BF ACTIVE                                | 1 = 50BF is ACTIVE             | 1453                       |
| 10294                   | 50BF int Pickup                            | 1 = 50BF (internal) PICKUP     | 1456                       |
| 10295                   | 50BF ext Pickup                            | 1 = 50BF (external) PICKUP     | 1457                       |
| 10296                   | 50BF TRIP                                  | 1 = 50BF TRIP                  | 1471                       |
| 10297                   | 50BF int TRIP                              | 1 = 50BF (internal) TRIP       | 1480                       |
| 10298                   | 50BF ext TRIP                              | 1 = 50BF (external) TRIP       | 1481                       |
| 10299<br>-<br>103004    | reserved <sup>4</sup>                      |                                | -                          |

**6.4.11 Register addresses 10305 to 10313: Thermal overload protection**

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                            | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10305                   | BLOCK 49 O/L                               | 1 = >BLOCK 49 Overload Protection          | 1503                       |
| 10306                   | 49 EmergencyStart                          | 1 = >Emergency start of motors             | 1507                       |
| 10307                   | 49 O/L OFF                                 | 1 = 49 Overload Protection is switched OFF | 1511                       |
| 10308                   | 49 O/L BLOCK                               | 1 = 49 Overload Protection is BLOCKED      | 1512                       |
| 10309                   | 49 O/L ACTIVE                              | 1 = 49 Overload Protection is ACTIVE       | 1513                       |
| 10310                   | 49 O/L I Alarm                             | 1 = 49 Overload Current Alarm (I alarm)    | 1515                       |
| 10311                   | 49 O/L <Theta> Alarm                       | 1 = 49 Overload Alarm! Near Thermal Trip   | 1516                       |
| 10312                   | 49 Winding O/L                             | 1 = 49 Winding Overload                    | 1517                       |
| 10313                   | 49 Th O/L TRIP                             | 1 = 49 Thermal Overload TRIP               | 1521                       |
| 10314<br>-<br>10320     | reserved <sup>4</sup>                      |  | -                          |

**6.4.12 Register addresses 10321 to 10325: Motor start protection**

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                               | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10321                   | >66 emerg.start                            | 1 = >Emergency start                          | 4823                       |
| 10322                   | 66 OFF                                     | 1 = 66 Motor start protection is switched OFF | 4824                       |
| 10323                   | 66 BLOCKED                                 | 1 = 66 Motor start protection is BLOCKED      | 4825                       |



| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                         | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10324                   | 66 ACTIVE                                  | 1 = 66 Motor start protection is ACTIVE | 4826                       |
| 10325                   | 66 TRIP                                    | 1 = 66 Motor start protection TRIP      | 4827                       |
| 10326<br>-<br>10336     | reserved <sup>4</sup>                      |   | -                          |

#### 6.4.13 Register addresses 10337 to 10342: Startup supervision

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                         | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10337                   | START-SUP OFF                              | 1 = Startup supervision is switched OFF | 6811                       |
| 10338                   | START-SUP BLK                              | 1 = Startup supervision is BLOCKED      | 6812                       |
| 10339                   | START-SUP ACT                              | 1 = Startup supervision is ACTIVE       | 6813                       |
| 10340                   | START-SUP TRIP                             | 1 = Startup supervision TRIP            | 6821                       |
| 10341                   | Rotor locked                               | 1 = Rotor locked                        | 6822                       |
| 10342                   | START-SUP pu                               | 1 = Startup supervision Pickup          | 6823                       |
| 10343<br>-<br>10352     | reserved <sup>4</sup>                      |   | -                          |

#### 6.4.14 Register addresses 10353 to 10359: Trip coil monitor

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                                   | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10353                   | >74TC trip rel.                            | 1 = >74TC Trip circuit superv.: trip relay        | 6852                       |
| 10354                   | >74TC brk rel.                             | 1 = >74TC Trip circuit superv.: bkr relay         | 6853                       |
| 10355                   | 74TC OFF                                   | 1 = 74TC Trip circuit supervision is switched OFF | 6861                       |
| 10356                   | 74TC BLOCKED                               | 1 = 74TC Trip circuit supervision is BLOCKED      | 6862                       |
| 10357                   | 74TC ACTIVE                                | 1 = 74TC Trip circuit supervision is ACTIVE       | 6863                       |
| 10358                   | 74TC ProgFail                              | 1 = 74TC blocked. Binary input is not set.        | 6864                       |
| 10359                   | FAIL: Trip cir.                            | 1 = 74TC Failure Trip Circuit                     | 6865                       |
| 10360<br>-<br>10368     | reserved <sup>4</sup>                      |   | -                          |

#### 6.4.15 Register addresses 10369 to 10383: Inrush stabilization

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>            | <b>Internal object no.</b> |
|-------------------------|--|----------------------------|----------------------------|
| 10369                   | 50-1 InRushPU                              | 1 = 50-1 InRush picked up  | 7551                       |
| 10370                   | 50N-1 InRushPU                             | 1 = 50N-1 InRush picked up | 7552                       |
| 10371                   | 51 InRushPU                                | 1 = 51 InRush picked up    | 7553                       |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>              | <b>Internal object no.</b> |
|-------------------------|--|------------------------------|----------------------------|
| 10372                   | 51N InRushPU                               | 1 = 51N InRush picked up     | 7554                       |
| 10373                   | InRush OFF                                 | 1 = InRush is switched OFF   | 7556                       |
| 10374                   | InRushPhBLOCKED                            | 1 = InRush Phase is BLOCKED  | 7557                       |
| 10375                   | InRush Gnd BLK                             | 1 = InRush Ground is BLOCKED | 7558                       |
| 10376                   | 67-1 InRushPU                              | 1 = 67-1 InRush picked up    | 7559                       |
| 10377                   | 67N-1 InRushPU                             | 1 = 67N-1 InRush picked up   | 7560                       |
| 10378                   | 67-TOC InRushPU                            | 1 = 67-TOC InRush picked up  | 7561                       |
| 10379                   | 67N-TOCInRushPU                            | 1 = 67N-TOC InRush picked up | 7562                       |
| 10380                   | Gnd InRush PU                              | 1 = Ground InRush picked up  | 7564                       |
| 10381                   | Ia InRush PU                               | 1 = Phase A InRush picked up | 7565                       |
| 10382                   | Ib InRush PU                               | 1 = Phase B InRush picked up | 7566                       |
| 10383                   | Ic InRush PU                               | 1 = Phase C InRush picked up | 7567                       |
| 10384                   | reserved <sup>4</sup>                      |                              | –                          |

#### 6.4.16 Register address 10385: Fault locator

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>          | <b>Internal object no.</b> |
|-------------------------|--|--------------------------|----------------------------|
| 10385                   | >Start Flt. Loc                            | 1 = >Start Fault Locator | 1106                       |
| 10386<br>–<br>10392     | reserved <sup>4</sup>                      |                          | –                          |

#### 6.4.17 Register addresses 10393 to 10396: Cold load pickup

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                      | <b>Internal object no.</b> |
|-------------------------|--|--------------------------------------|----------------------------|
| 10393                   | CLP OFF                                    | 1 = Cold-Load-Pickup is switched OFF | 1994                       |
| 10394                   | CLP BLOCKED                                | 1 = Cold-Load-Pickup is BLOCKED      | 1995                       |
| 10395                   | CLP running                                | 1 = Cold-Load-Pickup is RUNNING      | 1996                       |
| 10396                   | Dyn set ACTIVE                             | 1 = Dynamic settings are ACTIVE      | 1997                       |
| 10397<br>–<br>10400     | reserved <sup>4</sup>                      |                                      | –                          |

#### 6.4.18 Register addresses 10401 to 10408: Measurement supervision

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                             | <b>Internal object no.</b> |
|-------------------------|--|---|----------------------------|
| 10401                   | Fail I Superv.                             | 1 = Failure: general Current Supervision    | 161                        |
| 10402                   | Failure <sum> I                            | 1 = Failure: Current Summation              | 162                        |
| 10403                   | Fail I balance                             | 1 = Failure: Current Balance                | 163                        |
| 10404                   | Fail V balance                             | 1 = Failure: Voltage Balance                | 167                        |
| 10405                   | Fail Ph. Seq.                              | 1 = Failure: Phase Sequence                 | 171                        |
| 10406                   | Fail Ph. Seq. I                            | 1 = Failure: Phase Sequence Current         | 175                        |
| 10407                   | Fail Ph. Seq. V                            | 1 = Failure: Phase Sequence Voltage         | 176                        |
| 10408                   | MeasSup OFF                                | 1 = Measurement Supervision is switched OFF | 197                        |
| 10409<br>–<br>10416     | reserved <sup>4</sup>                      |   | –                          |

#### 6.4.19 Register addresses 10417 to 10426: Set point alarms

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                        | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10417                   | SP. Op Hours>                              | 1 = Set Point Operating Hours          | 272                        |
| 10418                   | SP. I A dmd>                               | 1 = Set Point Phase A dmd>             | 273                        |
| 10418                   | SP. I B dmd>                               | 1 = Set Point Phase B dmd>             | 274                        |
| 10420                   | SP. I C dmd>                               | 1 = Set Point Phase C dmd>             | 275                        |
| 10421                   | SP. I1dmd>                                 | 1 = Set Point positive sequence I1dmd> | 276                        |
| 10422                   | SP.  Pdmd >                                | 1 = Set Point  Pdmd >                  | 277                        |
| 10423                   | SP.  Qdmd >                                | 1 = Set Point  Qdmd >                  | 278                        |
| 10424                   | SP.  Sdmd >                                | 1 = Set Point  Sdmd >                  | 279                        |
| 10425                   | SP. 37-1 alarm                             | 1 = Set Point 37-1 Undercurrent alarm  | 284                        |
| 10426                   | SP. PF(55)alarm                            | 1 = Set Point 55 Power factor alarm    | 285                        |
| 10427<br>–<br>10432     | reserved <sup>4</sup>                      |  | –                          |

#### 6.4.20 Register addresses 10433 to 10446: Status annunciations

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                 | <b>Internal object no.</b> |
|-------------------------|--|---------------------------------|----------------------------|
| 10433                   | >Trig.Wave.Cap.                            | 1 = >Trigger Waveform Capture   | 4                          |
| 10434                   | >Reset LED                                 | 1 = >Reset LED                  | 5                          |
| 10435                   | >Set Group Bit0                            | 1 = >Setting Group Select Bit 0 | 7                          |
| 10436                   | >Set Group Bit1                            | 1 = >Setting Group Select Bit 1 | 8                          |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b>   | <b>Comments</b>                                  | <b>Internal object no.</b> |
|-------------------------|--|--|----------------------------|
| 10437                   | >Manual Close                                | 1 = >Manual close signal                         | 356                        |
| 10438                   | >DataStop                                    | 1 = >Stop data transmission                      | 16                         |
| 10439                   | >Test mode                                   | 1 = >Test mode                                   | 15                         |
| 10440                   | >Door open                                   | 1 = >Cabinet door open                           | –                          |
| 10441                   | >CB wait                                     | 1 = >CB waiting for Spring charged               | –                          |
| 10442                   | >No Volt.                                    | 1 = >No Voltage (Fuse blown)                     | –                          |
| 10443                   | >SF6-Loss                                    | 1 = >SF6-Loss                                    | –                          |
| 10444                   | Cntrl Auth (device 7SJ63/6MD63) <sup>5</sup> | Control authority<br>(0 = REMOTE, 1 = LOCAL)     | –                          |
| 10445                   | ModeLOCAL (device 7SJ63/6MD63) <sup>5</sup>  | Control mode LOCAL<br>(0 = LOCKED, 1 = UNLOCKED) | –                          |
| 10446                   | Cntrl Auth (device 7SJ61/7SJ62) <sup>6</sup> | Control authority<br>(0 = REMOTE, 1 = LOCAL)     | –                          |
| 10447                   | ModeLOCAL (device 7SJ61/7SJ62) <sup>6</sup>  | Control mode LOCAL<br>(0 = LOCKED, 1 = UNLOCKED) | –                          |

---

<sup>5</sup> Not used in the 7SJ61 and 7SJ62.

<sup>6</sup> Not used in the 7SJ63 and 6MD63.

## 6.5 Input registers (3X references)

The input register block allows the Modbus master to read the values of the the analog inputs of the SIPROTEC device (recorded measured values).



### Note

Depending on the device composition not all of the indicated analog inputs (and corresponding Modbus registers) may be available in the SIPROTEC device.

Ref. to chap. 5.3 for data type definition of measured values.

### Standard mapping

By selecting the standard mappings (standard mapping 1 to standard mapping 3) the measured values can be scaled in accordance with the operational values of the primary equipment.

For each measured value the table in chap. 6.5.2 shows in the column "Scaling" the scaling values defined in standard mappings 1 to 3, e.g. (for "IA ="):

- 1: 3276.7 A - applies to standard mapping 1
- 2: 3276.7 A - applies to standard mapping 2
- 3: 32.767 kA - applies to standard mapping 3

### 6.5.1 Reference values for selecting a standard mapping in accordance with the operating values of the primary equipment



### Note

All conditions in the table below to the selected standard mapping must be fulfilled so that the measured values are transferred correctly via Modbus.

Dependent on the SIPROTEC device either parameter address 207 or parameter address 208 is adjustably.

| Standard mapping no. | Parameter address 1101                  | Parameter address 1102                  | Energy values of the primary equipment                            |
|----------------------|---|---|---|
|                      | Primary operating voltage<br>$V_{prim}$ | Primary operating current<br>$I_{prim}$ |   |
| 1                    | 1,0 kV ... 327.67 kV                    | 10 A ... 999 A                          | $I_{prim} * V_{prim} * \sqrt{3} \geq 1 \text{ MW}$                |
| 2                    | 1,0 kV ... 32.76 kV                     | 1 kA ... 32 kA                          | $1 \text{ MW} \leq I_{prim} * V_{prim} * \sqrt{3} < 1 \text{ GW}$ |
| 3                    | 1,0 kV ... 32.76 kV                     | 10 A ... 999 A                          | $I_{prim} * V_{prim} * \sqrt{3} < 1 \text{ MW}$                   |

| Standard mapping no. | Parameter address 206                               | Parameter address 207                       | Parameter address 208                       |
|----------------------|---|---|---|
|                      | Ratio factor<br>$V_{ph} / V_{delta}$                | Ratio factor<br>$I_N / I_{ph}$              | Ratio factor<br>$I_{Ns} / I_{ph}$           |
| 1                    | $V_{prim} * V_{ph} / V_{delta} < 327.67 \text{ kV}$ | $I_{prim} * I_N / I_{ph} < 1 \text{ kA}$    | $I_{prim} * I_{Ns} / I_{ph} < 1 \text{ kA}$ |
| 2                    | $V_{prim} * V_{ph} / V_{delta} < 32.76 \text{ kV}$  | $I_{prim} * I_N / I_{ph} \geq 1 \text{ kA}$ | $I_{prim} * I_{Ns} / I_{ph} < 1 \text{ kA}$ |
| 3                    | $V_{prim} * V_{ph} / V_{delta} < 32.76 \text{ kV}$  | $I_{prim} * I_N / I_{ph} < 1 \text{ kA}$    | $I_{prim} * I_{Ns} / I_{ph} < 1 \text{ kA}$ |

## 6.5.2 Recorded measured values

| Register address | Designation of the SIPROTEC objects | Comments                                  | Scaling (32767 corresponds to ...)                 | Internal object no. |
|------------------|-------------------------------------|---|--|---------------------|
| 30001            | Ia =                                | Ia  | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 601                 |
| 30002            | Ib =                                | Ib  | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 602                 |
| 30003            | Ic =                                | Ic  | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 603                 |
| 30004            | In =                                | In  | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 604                 |
| 30005            | Va =                                | Va  | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 621                 |
| 30006            | Vb =                                | Vb  | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 622                 |
| 30007            | Vc =                                | Vc  | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 623                 |
| 30008            | Va-b =                              | Va-b                                      | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 624                 |
| 30009            | Vb-c =                              | Vb-c                                      | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 625                 |
| 30010            | Vc-a =                              | Vc-a                                      | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 626                 |
| 30011            | VN =                                | VN  | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 627                 |
| 30012            | P =                                 | P (active power)                          | 1: 327.67 MW<br>2: 327.67 MW<br>3: 3276.7 kW       | 641                 |
| 30013            | Q =                                 | Q (reactive power)                        | 1: 327.67 MVAR<br>2: 327.67 MVAR<br>3: 3276.7 kVAR | 642                 |
| 30014            | S =                                 | S (apparent power)                        | 1: 327.67 MVAR<br>2: 327.67 MVAR<br>3: 3276.7 kVAR | 645                 |
| 30015            | Freq =                              | Frequency                                 | 327.67 Hz  | 644                 |
| 30016            | INs Real =                          | Resistive ground current in isol. systems | 3276.7 A   | 701                 |
| 30017            | INs Reac =                          | Reactive ground current in isol. systems  | 3276.7 A   | 702                 |
| 30018            | PF =                                | Power Factor                              | 3.2767   | 901                 |
| 30019            | I1 =                                | I1 (positive sequence)                    | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 605                 |
| 30020            | I2 =                                | I2 (negative sequence)                    | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 606                 |
| 30021            | 3I0 =                               | 3I0 (zero sequence)                       | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 831                 |
| 30022            | V1 =                                | V1 (positive sequence)                    | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV       | 629                 |

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>        | <b>Scaling (32767 corresponds to ...)</b>    | <b>Internal object no.</b> |
|-------------------------|--|------------------------|--|----------------------------|
| 30023                   | V2 =                                       | V2 (negative sequence) | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV | 630                        |
| 30024                   | 3Vo =                                      | 3Vo (zero sequence)    | 1: 327.67 kV<br>2: 32.767 kV<br>3: 32.767 kV | 832                        |
| 30025                   | <Theta> Rotor                              | Temperature of rotor   | 327.67 %                                     | 805                        |
| 30026                   | <Theta> Stator                             | Temperature of stator  | 327.67 %                                     | 806                        |
| 30027                   | Td1=                                       | Transducer 1           | 32.767 mA                                    | 996                        |
| 30028                   | Td2=                                       | Transducer 2           | 32.767 mA                                    | 997                        |

## 6.6 Holding registers (4X references)

The holding register block allows the Modbus master to read system information, measured values – mean values, metered measurands as well as fault locations.



### Note

Depending on the device composition not all of the indicated measured values/metered measurands (and corresponding Modbus registers) may be available in the SIPROTEC device.

### 6.6.1 Register addresses 40001 to 40048: System information

- Registers are write-protected<sup>7</sup>.

| Register address    | Designation   | Comments  |
|---------------------|---|---|
| 40001<br>–<br>40008 | Hardware designation of the communication module (string, max. 16 characters) | "AME-GEN" for AME module,<br>"AMO-GEN" for AMO module   |
| 40009<br>–<br>40010 | Communication module software revision  | <u>Example:</u><br>Register 40009 = 0001H, Register 40010 = 0205H<br>-> Revision 1.2.5  |
| 40011<br>–<br>40026 | MLFB (order number) of the SIPROTEC device (string, max. 32 characters)       | <u>Example:</u><br>"7SJ63254EA903HG3----0D-----"  |
| 40027<br>–<br>40034 | Date and time of mapping data generation (string, max. 16 characters)         | <u>Example:</u><br>"140100095747330" corresponds to<br>Date: 14 <sup>th</sup> Jan 2000,<br>Time: 09 hours 57 min. 47 seconds and 330 milliseconds   |
| 40035<br>–<br>40036 | Number of selected standard mapping ,<br>Revision of mapping data             | MSB of register 40035:<br>Number of selected standard mapping,<br>LSB of register 40035 and value of register 40036:<br>Revision of mapping data.<br><br><u>Example:</u><br>Register 40035 = 0102H, Register 40036 = 0304H<br>-> Standard mapping 1, Revision 2.3.4 |

### 6.6.2 Register address 40129: Diagnosis

- Registers are write-protected<sup>7</sup>,
- The contents of these registers are also readable using function "Diagnostics" (function code 7), subfunction "Return Diagnostic Register" (subfunction code 2).

| Register address       | Designation of the SIPROTEC objects | Comments   | Internal object no. |
|------------------------|-------------------------------------|--|---------------------|
| 40129 / 2 <sup>0</sup> | Device OK                           | 1 = Update of the device replica in the SIPROTEC device completed after initial start or restart | 51                  |
| 40129 / 2 <sup>1</sup> | reserved                            | = 0  | –                   |
| 40129 / 2 <sup>2</sup> | Settings Calc.                      | 1 = Setting calculation is running   | 70                  |
| 40129 / 2 <sup>3</sup> | Chatter ON                          | 1 = Chatter ON   | 125                 |
| 40129 / 2 <sup>4</sup> | Error Sum Alarm                     | 1 = Error with a summary alarm ON  | 140                 |

<sup>7</sup> A write access is rejected with exception code 03 (ILLEGAL\_DATA\_VALUE).



| Register address        | Designation of the SIPROTEC objects | Comments   | Internal object no. |
|-------------------------|-------------------------------------|--|---------------------|
| 40129 / 2 <sup>5</sup>  | Alarm Sum Event                     | 1 = Alarm Summary Event ON                             | 160                 |
| 40129 / 2 <sup>6</sup>  | Relay PICKUP                        | 1 = Relay PICKUP (protection, summary alarm)           | 501                 |
| 40129 / 2 <sup>7</sup>  | Relay TRIP                          | 1 = Relay GENERAL TRIP command (common, summary alarm) | 511                 |
| 40129 / 2 <sup>8</sup>  | DataStop                            | 1 = "Stop data transmission" is active                 | –                   |
| 40129 / 2 <sup>9</sup>  | Test mode                           | 1 = Test mode is active                                | –                   |
| 40129 / 2 <sup>10</sup> | reserved                            | = 0  | –                   |
| 40129 / 2 <sup>11</sup> | reserved                            | = 0  | –                   |
| 40129 / 2 <sup>12</sup> | reserved                            | = 0  | –                   |
| 40129 / 2 <sup>13</sup> | reserved                            | = 0  | –                   |
| 40129 / 2 <sup>14</sup> | reserved                            | = 0  | –                   |
| 40129 / 2 <sup>15</sup> | reserved                            | = 0  | –                   |



#### Error with a summary alarm

- 7SJ61 and 7SJ62:
  - The "Error with a summary alarm" corresponds to the internal alarm "I/O-Board error".
- 7SJ63 and 6MD63:
  - The "Error with a summary alarm" is ON if at least one of the following internal alarms assumes the value ON: "Error Board 1", "Error Board 2", "Error Board 3", "Error Board 4", "Error Board 5", "Error Board 6", "Error Board 7", "I/O-Board error",
  - additionally for the 7SJ631, 7SJ632, 7SJ633, 7SJ635, 7SJ636 and 6MD63 except 6MD63x0: "Error 5V", "Error 0V", "Error -5V".



#### Alarm summary event

The "Alarm summary event" is indicated, if at least one of the following internal alarms assumes the ON status:

"Failure: Current summation", "Failure: Current balance", "Failure: Voltage balance", "Failure: Phase sequence current", "Failure: Phase sequence voltage".



#### Stop data transmission

The functionality "Stop data transmission" is not supported via Modbus communication. If "Stop data transmission" is active nevertheless data via Modbus will be transmitted furthermore. The annunciation "DataStop" signals the activation of "Stop data transmission" however and can be evaluated correspondingly in the Modbus master.

### 6.6.3 Register addresses 40201 to 40215: Metered measurands

- Data type definition ref. to chap. 5.4,
- Registers are write-protected<sup>7</sup>.

**Scaling** The scaling of the metered measurands, which are derived from measured values, refers to:

**60000 impulses per hour for  $V = V_{\text{prim}}$  and  $I = I_{\text{prim}}$**

$V_{\text{prim}} =$  **PRIMARY OPERATING VOLTAGE**  
(parameter address = 1101)

$I_{\text{prim}} =$  **PRIMARY OPERATING CURRENT**  
(parameter address = 1102)

**Example** In the parameter set is configured:

$I_{\text{prim}} = 100 \text{ A}$  und  $V_{\text{prim}} = 12 \text{ kV}$ ,

60000 impulses correspond so that:

$1 \text{ h} * 100 \text{ A} * 12 \text{ kV} * \sqrt{3} = 2078.46 \text{ kWh}$



#### Note

The type of the update (cyclic, with or without deletion) and the update interval must be programmed for the metered measurands (except for the operating hours meter) with the parameterization software DIGSI.

| Register address    | Designation of the SIPROTEC objects | Comments   | Scaling<br>( $2^{31}-1$ of the unsigned long value corresponds to...) | Internal object no. |
|---------------------|-------------------------------------|--|---|---------------------|
| 40201<br>–<br>40202 | Wp(puls) =                          | Pulsed Energy Wp (active)<br>(metering impulses at binary input)   | $2^{31}-1$ impulses   | 888                 |
| 40203<br>–<br>40204 | Wq(puls) =                          | Pulsed Energy Wq (reactive)<br>(metering impulses at binary input) | $2^{31}-1$ impulses   | 889                 |
| 40205<br>–<br>40206 | WpForward=                          | Wp Forward<br>(metered measurand derived from measured value)      | $2^{31}-1$ impulses   | 924                 |
| 40207<br>–<br>40208 | WqForward=                          | Wq Forward<br>(metered measurand derived from measured value)      | $2^{31}-1$ impulses   | 925                 |
| 40209<br>–<br>40210 | WpReverse =                         | Wp Reverse<br>(metered measurand derived from measured value)      | $2^{31}-1$ impulses   | 928                 |
| 40211<br>–<br>40212 | WqReverse =                         | Wq Reverse<br>(metered measurand derived from measured value)      | $2^{31}-1$ impulses   | 929                 |
| 40213<br>–<br>40214 | Op.Hours=                           | Counter of operating hours of the primary equipment                | $2^{31}-1$ hours  | 1020                |

**Note**

- The scaling of the metered measurands at binary inputs ("Wp(puls)" and "Wq(puls)") depends on the externally connected pulse generator.
- The error status bit of the metered measurands (except of the operating hours meter) is set after a initial start or restart of the SIPROTEC device until the second update cycle of the metered measurands after the reset. This indicates the metered measurands as "invalid by reset".
- The error status bit of the metered measurand also signals the condition of the external fault input of the metered measurands at binary input (as far as this is parameterized).

#### 6.6.4 Register addresses 40251 to 40257: Measured values – mean values

- Data type definition ref. to chap. 5.3,
- Registers are write-protected<sup>7</sup>,
- Explanations for selecting a standard mapping ref. to chap. Kap. 6.5.1.

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>               | <b>Scaling (32767 corresponds to ...)</b>          | <b>Internal object no.</b> |
|-------------------------|--|-------------------------------|--|----------------------------|
| 40251                   | Ia dmd=                                    | I A demand                    | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 963                        |
| 40252                   | Ib dmd=                                    | I B demand                    | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 964                        |
| 40253                   | Ic dmd=                                    | I C demand                    | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 965                        |
| 40254                   | I1dmd =                                    | I1 (positive sequence) Demand | 1: 3276.7 A<br>2: 32.767 kA<br>3: 3276.7 A         | 833                        |
| 40255                   | Pdmd =                                     | Active Power Demand           | 1: 327.67 MW<br>2: 327.67 MW<br>3: 3276.7 kW       | 834                        |
| 40256                   | Qdmd =                                     | Reactive Power Demand         | 1: 327.67 MVAR<br>2: 327.67 MVAR<br>3: 3276.7 kVAR | 835                        |
| 40257                   | Sdmd =                                     | Apparent Power Demand         | 1: 327.67 MVAR<br>2: 327.67 MVAR<br>3: 3276.7 kVAR | 836                        |

### 6.6.5 Register addresses 40301 to 40305: Fault locator and fault currents

- Data type definitions ref. to chap. 5.3,
- Registers are write-protected<sup>7</sup>.




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**Note**

Always the latest fault location and fault currents are stored in the Modbus registers.

In the event of a fault, reading out of the fault record protocol from the SIPROTEC device is necessary for an exact diagnosis.

---

| <b>Register address</b> | <b>Designation of the SIPROTEC objects</b> | <b>Comments</b>                    | <b>Scaling (32767 corresponds to ...)</b> | <b>Internal object no.</b> |
|-------------------------|--|------------------------------------|---|----------------------------|
| 40301                   | Ia =                                       | Primary fault current Ia           | 327,67 kA                                 | 533                        |
| 40302                   | Ib =                                       | Primary fault current Ib           | 327,67 kA                                 | 534                        |
| 40303                   | Ic =                                       | Primary fault current Ic           | 327,67 kA                                 | 535                        |
| 40304                   | Xsec =                                     | Fault locator: secondary REACTANCE | 327,76 Ohm                                | 1118                       |
| 40305                   | dist =                                     | Fault Locator: Distance to fault   | 3276,7 km/miles                           | 1119                       |

# 7

## Technical data

### 7.1 Modbus slave for the SIPROTEC devices

|                          |   |
|--------------------------|---|
| <i>Modbus slave</i>      |   |
| Slave addresses          | 1 – 247   |
| Modbus modes             | RTU, ASCII  |
| Modbus functions         | <ul style="list-style-type: none"><li>• Read Coil Status</li><li>• Read Input Status</li><li>• Read Holding Register</li><li>• Read Input Register</li><li>• Force Single Coil</li><li>• Preset Single Register</li><li>• Read Exception Status</li><li>• Diagnostics<ul style="list-style-type: none"><li>Subfunktion 0 (Return Query Data)</li><li>Subfunktion 2 (Return Diagnostic Register)</li></ul></li><li>• Force Multiple Coils</li><li>• Preset Multiple Regs</li></ul> |
| <i>Data transmission</i> |   |
| Baud rates (Bit/s)       | 300, 600, 1200, 2400, 4800, 9600, 19200   |
| Parity bit               | RTU mode: NONE, EVEN, ODD<br>ASCII mode: EVEN, ODD  |

### 7.2 Hardware interface

Two communication modules are available for the connection of Modbus to the devices 7SJ61, 7SJ62, 7SJ63 and 6MD63:

**AME module** Universal asynchronous communication module with isolated RS485 interface.

**AMO module** Universal asynchronous communication module with fibre-optical interface.

## 7.2.1 Connection via the AME module

|                                   |  |
|-----------------------------------|--|
| Connections                       | 9pole D-SUB outlet (ref. to Table 7-2)   |
| Protocol                          | semi-duplex  |
| Max. line length                  | 1000 m / 3300 ft   |
| Insulation level                  | 500 V <sub>AC</sub>  |
| Bus termination                   | Integrated, connectable terminating resistors<br>221 Ohm between A and B<br>392 Ohm between B and VCC1 as well as A and GND1<br>Input resistor not terminated $\geq 10$ kOhm, then bus termination via bus plug with integrated terminating resistors.   |
| Level                             | Transmitter:<br>Low: $-5 \text{ V} \leq U_{A-B} \leq -1.5 \text{ V}$<br>High: $+5 \text{ V} \geq U_{A-B} \geq +1.5 \text{ V}$<br>Receiver:<br>Low: $U_{A-B} \leq -0.2 \text{ V}$<br>High: $U_{A-B} \geq +0.2 \text{ V}$<br>Transmitter and receiver are surge-proof for voltages between A and GND1 as well as B and GND1 in the range of $-7 \text{ V} \dots +12 \text{ V}$ . |
| Max. number of modules at the bus | 32 <sup>8</sup>  |

Table 7-1 Technical data of the connection via the AME module

| Pin | RS485 signal | Meaning   |
|-----|--------------|---|
| 1   | Shield       | Shield / operational ground   |
| 2   |              | -   |
| 3   | A            | RS485 connection pin A  |
| 4   | RTS          | Directions control RTS (TTL level)  |
| 5   | GND1         | Ground to VCC1  |
| 6   | VCC1         | Supply voltage +5V DC (max. 100 mA, supply voltage for terminating resistors) |
| 7   |              | -   |
| 8   | B            | RS485 connection pin B  |
| 9   |              | -   |

Table 7-2 Assignment of the bus connection at the device (D-SUB outlet)

## 7.2.2 Connection via the AMO module

|                        |  |
|------------------------|--|
| Connections            | fibre-optical interface, Rx and Tx, 820 nm, BFOC/2.5   |
| Protocol               | semi-duplex  |
| Max. line length       | <ul style="list-style-type: none"> <li>2000 m / 1.25 miles for glass fibre 62.5/125 <math>\mu\text{m}</math></li> <li>approx. 2 m for plastic fibre</li> </ul> |
| Optical budget         | min. 8 dB for glass fibre 62.5/125 $\mu\text{m}$   |
| Status for "no signal" | light OFF  |

Table 7-3 Technical data of the connection via the AMO module

<sup>8</sup> For exclusive utilisation of **AME** modules at the bus.  
This value could be smaller depending on the used Modbus master and further modules at the bus.  
If more than 32 devices at the bus are needed, RS485 repeaters which support bit retiming have to be used.

# Glossary

|  |  |
|--|--|
| <b>AME</b>                               | Universal <b>as</b> ynchronous communication <b>m</b> odule with ( <b>e</b> lectrical) isolated RS485 interface for the SIPROTEC devices from Siemens. |
| <b>AMO</b>                               | Universal <b>as</b> ynchronous communication <b>m</b> odule with fibre- <b>o</b> ptical interface for the SIPROTEC devices from Siemens.               |
| <b>AR</b>                                | <b>A</b> utomatic <b>R</b> ecloser   |
| <b>CFC</b>                               | <b>C</b> ontinuous <b>F</b> unction <b>C</b> hart  |
| <b>CRC</b>                               | <b>C</b> yclical <b>R</b> edundancy <b>C</b> heck  |
| <b>DC</b>                                | <b>D</b> ouble <b>C</b> ommand   |
| <b>DIGSI</b>                             | Parameterization system for SIPROTEC devices   |
| <b>DP</b>                                | <b>D</b> ouble- <b>p</b> oint Indication   |
| <b>Input data/<br/>input direction</b>   | Data from the Modbus <b>slave to the</b> Modbus <b>master</b> .  |
| <b>LRC</b>                               | <b>L</b> ongitudinal <b>R</b> edundancy <b>C</b> heck  |
| <b>LSB</b>                               | <b>L</b> east <b>S</b> ignificant <b>B</b> yte   |
| <b>Mapping</b>                           | Allocation of the SIPROTEC data objects to the positions in the Modbus register map.   |
| <b>MSB</b>                               | <b>M</b> ost <b>S</b> ignificant <b>B</b> yte  |
| <b>Output data/<br/>output direction</b> | Data from the Modbus <b>master to the</b> Modbus <b>slave</b> .  |
| <b>SC</b>                                | <b>S</b> ingle <b>C</b> ommand   |
| <b>SP</b>                                | <b>S</b> ingle- <b>p</b> oint Indication   |





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