

SIPROTEC

Overcurrent Protection 7SJ80

Motor Protection 7SK80

Voltage and Frequency Protection 7RW80

Communication Modules

Modbus
Bus mapping

Preface

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Disclaimer of Liability

We have checked the contents of this manual against the hardware and software described. However, since deviations cannot be ruled out entirely, we do not accept liability for complete conformity or for any errors or omissions.

The information provided in this manual is checked at regular intervals and any corrections that might become necessary are included in the next releases.

We are grateful for any improvements that you care to suggest.

We reserve the right to make technical improvements without notice.

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Preface

Purpose of this manual

This manual describes the register map organization of the Modbus slave for the SIPROTEC devices 7SJ80, 7SK80 and 7RW80.

It is divided into the following topics:

- Modbus Register Map Organization → Chapter 1

General information on the operation, assembly, commissioning and configuration of the SIPROTEC devices you find in the following manuals:

Manual	Order number
SIPROTEC 4 System Description	E50417-H1176-C151
7SJ80 Device Manual	E50417-G1140-C343
7SK80 Device Manual	E50417-G1140-C344
7RW80 Device Manual	C53000-G1140-C233

Modbus communication profile

The following manual informs you about bus-specific parameters, data type definitions, settings and hardware description of the Modbus communication modules for SIPROTEC devices:

Manual	Order number
SIPROTEC communication modules, Modbus - Communication profile	C53000-L1840-C001-03

You can order the manuals

via the internet under <http://www.siprotec.com>

or contact your local Siemens representative.

Modbus specification

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

- Modbus over Serial Line
Specification & Implementation guide
<http://www.modbus.org>
- Modbus Application Protocol Specification
<http://www.modbus.org>

Validity of this manual

This manual is valid for SIPROTEC devices:

- 7SJ80 (Firmware version V4.60 or higher)
- 7SK80 (Firmware version V4.60 or higher)
- 7RW80 (Firmware version V4.60 or higher)

with

- Modbus communication module firmware version 04.00.05 or higher.



Note:

With the 7SJ80, 7SK80 and 7RW80 SIPROTEC devices, only Modbus communication modules of hardware version 4 or higher are used (for a description of the hardware versions of the Modbus communication modules, see manual “SIPROTEC communication modules, Modbus - Communication profile”).

The following have to be used for device parameterization:

- DIGSI version 4.82 or higher,
- Modbus Standard mapping 3-1

Additional support

For questions regarding the SIPROTEC system, please contact your Siemens representative.

Training courses

Individual course offerings may be found in our Training Catalog, or questions may be directed to our Training Center in Nuremberg.

Target audience

Protection engineers, commissioning engineers, personnel concerned with adjustment, checking, and service of selective protective equipment, automatic and control facilities, and personnel of electrical facilities and power plants.



Warning!

During operation of electrical equipment, certain parts of these devices are under high voltage. Severe personal injury or property damage can result if the device is not handled properly.

Only qualified personnel should work on this equipment or in the vicinity of this equipment. These personnel must be familiar with all warnings and service procedures described in this manual, as well as with safety regulations.

Prerequisites to proper and safe operation of this device are proper transport, proper storage, setup, installation, operation, and maintenance of the device, as well as careful operation and servicing of the device within the scope of the warnings and instructions of this manual.

In particular, the general facility and safety regulations for work with high-voltage equipment (e.g. ANSI, IEC, EN, or other national or international regulations) must be observed. Noncompliance may result in death, injury or significant equipment damage.

QUALIFIED PERSONNEL

Within the meaning of safety precautions of this manual and the instructions, qualified personnel are those persons who are qualified to set up, install, place into service, and operate this device, and who possess the following qualifications:

- Training and instruction (or other qualification) for switching, grounding, and designating devices and systems.
- Training or instruction in accordance with safety standards for care and use of certain safety equipment.
- First aid training.

Typographic and graphical conventions

The following text formats are used to identify concepts giving device information described by the text flow:

Parameter names, or identifiers for configuration or function parameters that appear in the device display or on the screen of a PC (with DIGSI®) are shown in mono-script (same point size) bold text. This also applies to header bars for selection menus.

Parameter conditions, or possible settings of parameters that appear in the device display or on the screen of a PC (with DIGSI), are additionally shown in italic style. This also applies to selection items for selection menus.

"Annunciations", or identifiers for information produced by the device or required by other devices or from the switchgear is shown in mono-script (same point size) and placed into quotation marks.

For diagrams in which the identifier type results from the representation itself, text conventions may differ from the above-mentioned.



Revision index

Listing of the changes between the editions of this manual:

Modified chapters / pages	Edition	Reasons of modification
	1	First edition, doc. no.: C53000-L2240-A320-1 15.09.2008
4, 22	2	Correction, doc. no.: C53000-L2240-A320-2 10.10.2008
Preface Chapter 1.2 new 7RW80 added	3	Correction, doc. no.: C53000-L2240-A320-3 29.09.2010



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Modbus Register Map Organization

This chapter describes the register map organization of the Modbus slave for the SIPROTEC devices 7SJ80, 7SK80 and 7RW80.

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1.1 Explanations

One standard mapping (standard mapping 3-1) is available for setting the parameters of the SIPROTEC devices 7SJ80, 7SK80 and 7RW80.

Standard mapping 3-1 contains:

- Coil Status registers:
 - 9 double commands incl. 9 double-point indications as checkback indication
 - 30 single commands incl. 30 single-point indications as checkback indication
 - 8 single-point indications / exception flags
- Input Status registers:
 - 90 single-point indications
- Input registers
 - 28 measured values
- Holding registers
 - System information
 - Time synchronization
 - 16 single-point indications / diagnostic register
 - 6 metered measurands
 - 9 statistic values
 - 24 min/max values of measured values
 - Event recorder ("Sequence of Events")

Register map

Chapters 1.3 to 1.6 define the allocation (in the following also called "mapping") of the data objects of the SIPROTEC devices 7SJ80, 7SK80 and 7RW80 to the positions in the Modbus registers.

*Note:*

The examples shown in this chapter 1.1 do not necessarily correspond to the real allocation of the objects in the bus mapping.

The SIPROTEC objects transferred are *sorted by register numbers* (starting with 1), e.g.:

Register	Designation of the SIPROTEC objects	Comment	Scaling (32767 corresponds to ...)	Internal object no.
30001	Ia =	Current in phase A	3276.7 A	601

The measured value "Ia" is assigned to register 30001 (Input register).

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
30002	50(N)/51(N) PU	1 = 50(N)/51(N) O/C PICKUP	1761

The protection annunciation (single-point indication) "50(N) / 51(N) PU" is assigned to register 10036 (Input Status register).

*Note:*

- The description of the standard mapping contains the pre-allocation of the mapping file *at delivery or at initial allocation* of a mapping in DIGSI to the SIPROTEC device.
- Changes of the allocation and the scaling of the measured values are possible in adaptation to the concrete installation environment.
- The definition of the data type (double-point indication, single-point indication, measured value, metered measurand etc.) and information on changing the allocations and the scaling of the measured values, as well as on configuring the Modbus as a system interface of a SIPROTEC device in DIGSI are contained in the "SIPROTEC communication modules, Modbus - Communication profile" manual (ref. to page 3).

1.2 Functional Scope

Depending of the functional scope, some of the following described functions, annunciations, commands, measured and metered values are not available.

7SJ80

Table 1-1 7SJ80 Functional scope

No.	Function	Ref. to Chapter
103	Setting Group Change Option	1.3.3
104	Oscillographic Fault Records	-
112	50/51 (Charac. Phase) Overcurrent Protection	1.4.3
113	50N/51N (Charac. Ground) Overcurrent Protection	1.4.3
115	67, 67-TOC Directional Overcurrent Protection	1.4.4
116	67N, 67N-TOC Directional Overcurrent Protection	1.4.4
117	Cold Load Pickup	1.3.3
122	2nd Harmonic Inrush Restraint	-
127	50 1Ph Single Phase Overcurrent Protection	-
130	(sens.) Ground fault dir. characteristic	1.4.8
131	(sensitive) Ground fault	1.4.8
140	46 Negative Sequence Protection	1.4.5
142	49 Thermal Overload Protection	-
150	27, 59 Under/Overvoltage Protection	1.4.7
154	81 Over/Underfrequency Protection	1.4.6
161	25 Function group 1 Synchronism and Voltage Check	-
170	50BF Breaker Failure Protection	-
171	79 Auto-Reclose Function	1.4.2
172	52 Breaker Wear Monitoring	-
180	Fault Locator	-
181	Line Sections for Fault Locator	-
182	74TC Trip Circuit Supervision	1.4.11
192	Capacitive voltage measurement	-
617	Port B usage	-

7SK80

Table 1-2 7SK80 Functional scope

No.	Function	Ref. to Chapter
103	Setting Group Change Option	1.3.3
104	Oscillographic Fault Records	-
112	50/51 (Charac. Phase) Overcurrent Protection	1.4.3
113	50N/51N (Charac. Ground) Overcurrent Protection	1.4.3
116	67N, 67N-TOC Directional Overcurrent Protection	1.4.4
117	Cold Load Pickup	1.4.4
122	2nd Harmonic Inrush Restraint	1.3.3
130	(sens.) Ground fault dir. characteristic	1.4.8
131	(sensitive) Ground fault	1.4.8
140	46 Negative Sequence Protection	1.4.5
141	48 Startup Supervision of Motors	1.4.10
142	49 Thermal Overload Protection	-
143	66 Startup Counter for Motors	1.4.9
144	Load Jam Protection	-
150	27, 59 Under/Overvoltage Protection	1.4.7
154	81 Over/Underfrequency Protection	1.4.6
170	50BF Breaker Failure Protection	-
172	52 Breaker Wear Monitoring	-
182	74TC Trip Circuit Supervision	1.4.11
190	External Temperature Input	-
191	Ext. Temperature Input Connection Type	-
192	Capacitive voltage measurement	-
617	Port B usage	-

7RW80

Table 1-3 7RW80 Functional scope

No.	Function	Ref. to Chapter
103	Setting Group Change Option	
104	Oscillographic Fault Records	-
143	24 Overexcitation Protection	
146	Jump of Voltage Vector	-
150	27, 59 Under/Overvoltage Protection	1.4.7
152	VT Broken wire supervision	-
154	81 Over/Underfrequency Protection	1.4.6
155	Load Restoration	-
161	25 Function group 1 Synchronism and Voltage Check	-
182	74TC Trip Circuit Supervision	1.4.11
617	Port B usage	-

1.3 Coil Status Registers (0X register)

The Coil Status register block allows the Modbus master to scan

- command outputs through the output relays of the devices (external commands),
- manipulation of taggings (internal commands) that can be changed using Modbus.

Furthermore, these registers can be used to execute switching operations and internal commands.



Note:

- The allocation of the output relays to the switching devices and to the output channels is defined during the parameterization 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.

1.3.1 Registers 00001 to 00018: Double commands

- User-defined double commands with double-point indications as checkback indication can be routed on these positions as a "Source/destination system interface" using the **DIGSI Configuration matrix**.
- Please observe the information in the chapter "Double commands/double-point indications" of the "SIPROTEC communication modules, Modbus - Communication profile" manual (ref. to page 3).

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
00001	52 Breaker ON	52 Breaker	-
00002	52 Breaker OFF		
00003	<user-defined> ON	not pre-allocated	-
00004	<user-defined> OFF		
00005	<user-defined> ON	not pre-allocated	-
00006	<user-defined> OFF		
00007	<user-defined> ON	not pre-allocated	-
00008	<user-defined> OFF		
00009	<user-defined> ON	not pre-allocated	-
00010	<user-defined> OFF		
00011	<user-defined> ON	not pre-allocated	-
00012	<user-defined> OFF		
00013	<user-defined> ON	not pre-allocated	-
00014	<user-defined> OFF		

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
00015	<user-defined> ON	not pre-allocated	-
00016	<user-defined> OFF		
00017	<user-defined> ON	not pre-allocated	-
00018	<user-defined> OFF		

1.3.2 Registers 00019 to 00043: Single commands and taggings

- User-defined single commands and taggings with the corresponding checkback indications can be routed on these positions as a "Source/destination system interface" using the **DIGSI Configuration matrix**.

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
00019	<user-defined>	not pre-allocated	-
00020	<user-defined>	not pre-allocated	-
00021	<user-defined>	not pre-allocated	-
00022	<user-defined>	not pre-allocated	-
00023	<user-defined>	not pre-allocated	-
00024	<user-defined>	not pre-allocated	-
00025	<user-defined>	not pre-allocated	-
00026	<user-defined>	not pre-allocated	-
00027	<user-defined>	not pre-allocated	-
00028	<user-defined>	not pre-allocated	-
00029	<user-defined>	not pre-allocated	-
00030	<user-defined>	not pre-allocated	-
00031	<user-defined>	not pre-allocated	-
00032	<user-defined>	not pre-allocated	-
00033	<user-defined>	not pre-allocated	-
00034	<user-defined>	not pre-allocated	-
00035	<user-defined>	not pre-allocated	-
00036	<user-defined>	not pre-allocated	-
00037	<user-defined>	not pre-allocated	-
00038	<user-defined>	not pre-allocated	-

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
00039	<user-defined>	not pre-allocated	-
00040	<user-defined>	not pre-allocated	-
00041	<user-defined>	not pre-allocated	-
00042	<user-defined>	not pre-allocated	-
00043	<user-defined>	not pre-allocated	-

1.3.3 Registers 00044 to 00048: Internal commands

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
00044	Command: ModeREMOTE	Control mode REMOTE 0 = Set to LOCKED 1 = Set to UNLOCKED	-
	Indication: ModeREMOTE	Control mode REMOTE 0 = LOCKED 1 = UNLOCKED	
00045	Command: Group A	0 = not allowed 1 = Activation of setting group A	53
	Indication: Group A	0 = Setting group A not active 1 = Setting group A is active	
00046	Command: Group B	0 = not allowed 1 = Activation of setting group B	54
	Indication: Group B	0 = Setting group B not active 1 = Setting group B is active	
00047	Command: Group C	0 = not allowed 1 = Activation of setting group C	55
	Indication: Group C	0 = Setting group C not active 1 = Setting group C is active	
00048	Command: Group D	0 = not allowed 1 = Activation of setting group D	56
	Indication: Group D	0 = Setting group D not active 1 = Setting group D is active	



Changing the setting group:

- In order to change the setting group, the value "1" = ON must be transmitted to the corresponding register of the setting group to be activated.
- Switching ON one setting group automatically switches OFF the currently active setting group.
- Transmission of the value "0" = OFF is insignificant for the change of the setting group and is refused by the SIPROTEC device.

Note:

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**.



Control mode REMOTE:

If the control authority is REMOTE, the "Control mode REMOTE" (LOCKED, UNLOCKED) provides the option of unlocked control with Modbus.

- Changing the "Control mode REMOTE" to UNLOCKED permits exactly one unlocked control operation via Modbus.
After execution of the command, the "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 by the SIPROTEC device via Modbus for a period of 5 minutes, then the "Control mode REMOTE" is automatically reset to LOCKED.
 - If the "Control mode REMOTE" was automatically reset to LOCKED by the SIPROTEC device, then this status can be recognized by the corresponding bit in the Modbus response message.
In this case, the status of "Control mode REMOTE" in output direction has to be updated by the Modbus master.
-

1.3.4 Registers 00257 to 00264: Exception flags

- Registers are write-protected.¹
- The contents of these registers are also readable using the function “Read Exception Status” (function code 7).
- Installation-specific SIPROTEC objects can be routed to these register positions as a “Destination system interface” using the DIGSI parameterization system.

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
00257	<user-defined>	not pre-allocated	-
00258	<user-defined>	not pre-allocated	-
00259	<user-defined>	not pre-allocated	-
00260	<user-defined>	not pre-allocated	-
00261	<user-defined>	not pre-allocated	-
00262	<user-defined>	not pre-allocated	-
00263	<user-defined>	not pre-allocated	-
00264	<user-defined>	not pre-allocated	-

1. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

1.4 Input Status Registers (1X register)

The Input Status register block allows the Modbus master to scan the current status of the input channels and the annunciations generated in the SIPROTEC device (protection annunciations, status annunciations etc.).



Note:

- The allocation of the input channels to the binary inputs is defined during the parameterization of the devices.
- Depending on the device composition and the existing protection packages, not all of the indicated binary outputs or protection annunciations (and corresponding Modbus registers) may be available in the SIPROTEC device.

1.4.1 Registers 10001 to 10024: User-defined annunciations

- Protection annunciations, single-point indications and taggings can be routed on these positions as a "Destination system interface" using the **DIGSI Configuration matrix**.

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10001	<user-defined>	not pre-allocated	
10002	<user-defined>	not pre-allocated	-
10003	<user-defined>	not pre-allocated	-
10004	<user-defined>	not pre-allocated	-
10005	<user-defined>	not pre-allocated	-
10006	<user-defined>	not pre-allocated	-
10007	<user-defined>	not pre-allocated	-
10008	<user-defined>	not pre-allocated	-
10009	<user-defined>	not pre-allocated	-
10010	<user-defined>	not pre-allocated	-
10011	<user-defined>	not pre-allocated	-
10012	<user-defined>	not pre-allocated	-
10013	<user-defined>	not pre-allocated	-
10014	<user-defined>	not pre-allocated	-
10015	<user-defined>	not pre-allocated	-
10016	<user-defined>	not pre-allocated	-
10017	<user-defined>	not pre-allocated	-
10018	<user-defined>	not pre-allocated	-

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10019	<user-defined>	not pre-allocated	-
10020	<user-defined>	not pre-allocated	-
10021	<user-defined>	not pre-allocated	-
10022	<user-defined>	not pre-allocated	-
10023	<user-defined>	not pre-allocated	-
10024	<user-defined>	not pre-allocated	-

1.4.2 Registers 10025 to 10033: Auto-Reclose Function

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10025	79 ON	1 = 79 Auto recloser is switched ON	2782
10026	79 is not ready	1 = 79 Auto recloser is NOT ready	2784
10027	79 DynBlock	1 = 79 Auto recloser is dynamically BLOCKED	2785
10028	79 in progress	1 = 79 Auto recloser - in progress	2801
10029	79 Close	1 = 79 Auto recloser - Close command	2851
10030	79 Successful	1 = 79 Auto recloser - Cycle successful	2862
10031	79 Lockout	1 = 79 Auto recloser - Lockout	2863
10032	79 L-N Sequence	1 = 79 A/R - single phase reclosing sequence	2878
10033	79 L-L Sequence	1 = 79 A/R - multi-phase reclosing sequence	2879

1.4.3 Registers 10034 to 10045: Overcurrent Protection

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10034	50/51 PH ACT	1 = 50/51 O/C is ACTIVE	1753
10035	50N/51N ACT	1 = 50N/51N is ACTIVE	1758
10036	50(N)/51(N) PU	1 = 50(N)/51(N) O/C PICKUP	1761
10037	50/51 Ph A PU	1 = 50/51 Phase A picked up	1762
10038	50/51 Ph B PU	1 = 50/51 Phase B picked up	1763
10039	50/51 Ph C PU	1 = 50/51 Phase C picked up	1764
10040	50N/51NPickedup	1 = 50N/51N picked up	1765
10041	50(N)/51(N)TRIP	1 = 50(N)/51(N) TRIP	1791
10042	PhA InrushBlk	1 = Phase A trip blocked by inrush detection	1840
10043	PhB InrushBlk	1 = Phase B trip blocked by inrush detection	1841

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10044	PhC InrushBlk	1 = Phase C trip blocked by inrush detection	1842
10045	INRUSH X-BLK	1 = Cross blk: PhX blocked PhY	1843

1.4.4 Registers 10046 to 10053: Directional Overcurrent Protection

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10046	67 ACTIVE	1 = 67/67-TOC is ACTIVE	2653
10047	67N ACTIVE	1 = 67N/67N-TOC is ACTIVE	2658
10048	67/67N pickedup	1 = 67/67N picked up	2691
10049	67 A picked up	1 = 67/67-TOC Phase A picked up	2692
10050	67 B picked up	1 = 67/67-TOC Phase B picked up	2692
10051	67 C picked up	1 = 67/67-TOC Phase C picked up	2693
10052	67N picked up	1 = 67N/67N-TOC picked up	2695
10053	67/67N TRIP	1 = 67/67N TRIP	2696

1.4.5 Registers 10054 to 10058: Negative Sequence Protection

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10054	46 ACTIVE	1 = 46 is ACTIVE	5153
10055	46-2 picked up	1 = 46-2 picked up	5159
10056	46-1 picked up	1 = 46-1 picked up	5165
10057	46-TOC pickedup	1 = 46-TOC picked up	5166
10058	46 TRIP	1 = 46 TRIP	5170

1.4.6 Registers 10059 to 10063: Frequency protection

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10059	81 ACTIVE	1 = 81 is ACTIVE	5213
10060	81-1 picked up	1 = 81-1 picked up	5232
10061	81-2 picked up	1 = 81-2 picked up	5233
10062	81-1 TRIP	1 = 81-1 TRIP	5236
10063	81-2 TRIP	1 = 81-2 TRIP	5237

1.4.7 Registers 10064 to 10069: Under/Overvoltage Protection

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10064	27 ACTIVE	1 = 27 Undervoltage protection is ACTIVE	6532
10065	27-1 picked up	1 = 27-1 Undervoltage picked up	6533
10066	27-1 TRIP	1 = 27-1 Undervoltage TRIP	6539
10067	59 ACTIVE	1 = 59-Overvoltage protection is ACTIVE	6567
10068	59-1 picked up	1 = 59 picked up	6568
10069	59-1 TRIP	1 = 59 TRIP	6570

1.4.8 Registers 10070 to 10081: (Sensitive) Ground Fault Protection

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10070	50Ns/67Ns ACT	1 = 50Ns/67Ns is ACTIVE	1212
10071	64 Pickup	1 = 64 displacement voltage pick up	1215
10072	64 TRIP	1 = 64 displacement voltage element TRIP	1217
10073	50Ns-2 Pickup	1 = 50Ns-2 Pickup	1221
10074	50Ns-2 TRIP	1 = 50Ns-2 TRIP	1223
10075	50Ns-1 Pickup	1 = 50Ns-1 Pickup	1224
10076	50Ns-1 TRIP	1 = 50Ns-1 TRIP	1226
10077	Sens. Gnd Ph A	1 = Sensitive ground fault picked up in phase A	1272
10078	Sens. Gnd Ph B	1 = Sensitive ground fault picked up in phase B	1273
10079	Sens. Gnd Ph C	1 = Sensitive ground fault picked up in phase C	1274
10080	SensGnd Forward	1 = Sensitive ground fault in forward direction	1276
10081	SensGnd Reverse	1 = Sensitive ground fault in reverse direction	1277

1.4.9 Registers 10082 to 10083: Startup Counter for Motors

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10082	66 ACTIVE	1 = 66 Motor start protection is ACTIVE	4826
10083	66 TRIP	1 = 66 Motor start protection TRIP	4827

1.4.10 Registers 10084 to 10086: Startup Supervision of Motors

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10084	START-SUP ACT	1 = Startup supervision is ACTIVE	6813
10085	START-SUP TRIP	1 = Startup supervision TRIP	6821
10086	START-SUP pu	1 = Startup supervision Pickup	6823

1.4.11 Registers 10087 to 10088: Trip Circuit Supervision

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10087	74TC ACTIVE	1 = 74TC Trip circuit supervision is ACTIVE	6863
10088	FAIL: Trip cir.	1 = 74TC Failure Trip Circuit	6865

1.4.12 Registers 10089 to 10090: Local/Mode

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
10089	Cntrl Auth	1 = Control authority (0 = REMOTE, 1 = LOCAL)	-
10090	ModeLOCAL	1 = Control mode LOCAL (0 = LOCKED, 1 = UNLOCKED)	-

1.5 Input Registers (3X register)

The Input register block allows the Modbus master to read measured values.



Note:

Depending on the protection functions provided (MLFB selection or configuration) and the connected analog inputs, not all of the indicated measured values (and corresponding Modbus registers) may be available.

Measured value scaling

The given default scaling values for the measured values apply to installations with the following nominal operating values:

Full Scale Voltage (parameter address 1101):

→ 1.01 ... 100.00 kV

Full Scale Current (parameter address 1102):

→ 10.01 ... 1000.00 A

Product of

- Rated Primary Voltage (parameter address 0202) and
- Matching ratio Phase-VT to Open-Delta-VT (parameter address 0206):
→ 1.01 ... 100.00 kV

Ignd-CT rated primary current (parameter address 0217)

→ 10.01 ... 1000.00 A

Power values

- Product of Full Scale Voltage and Full Scale Current multiplies by $\sqrt{3}$
→ 10.01 ... 1000.00 MW (MVAR)



Note:

Changes of the scaling of the measured values are possible in adaptation to the concrete installation environment.
You find information about this in the manual "SIPROTEC communication modules, Modbus - Communication profile" (ref. to page 3).

Register	Designation of the SIPROTEC objects	Comment	Scaling (32767 corresponds to ...)	Internal object no.
30001	Ia =	Ia	3276.7 A	601
30002	Ib =	Ib	3276.7 A	602
30003	Ic =	Ic	3276.7 A	603
30004	In =	In	3276.7 A	604
30005	Va =	Va	327.67 kV	621
30006	Vb =	Vb	327.67 kV	622
30007	Vc =	Vc	327.67 kV	623
30008	Va-b =	Va-b	327.67 kV	624
30009	Vb-c =	Vb-c	327.67 kV	625
30010	Vc-a =	Vc-a	327.67 kV	626
30011	VN =	VN	327.67 kV	627
30012	P =	P (active power)	327.67 MW	641
30013	Q =	Q (reactive power)	327.67 MVAR	642
30014	S =	S (apparent power)	327.67 MVA	645
30015	Freq =	Frequency	327.67 Hz	644
30016	PF =	Power Factor	3.2767	901
30017	<user-defined>	not pre-allocated	-	-
30018	<user-defined>	not pre-allocated	-	-
30019	<user-defined>	not pre-allocated	-	-
30020	<user-defined>	not pre-allocated	-	-
30021	<user-defined>	not pre-allocated	-	-
30022	<user-defined>	not pre-allocated	-	-
30023	<user-defined>	not pre-allocated	-	-
30024	<user-defined>	not pre-allocated	-	-
30025	<user-defined>	not pre-allocated	-	-
30026	<user-defined>	not pre-allocated	-	-
30027	<user-defined>	not pre-allocated	-	-
30028	<user-defined>	not pre-allocated	-	-

1.6 Holding Registers (4X register)

The Holding register block allows the Modbus master to read system and diagnostic information, statistic values as well as to execute time synchronization of the SIPROTEC device.

Holding registers are also used for reading the Event recorder entries ("Sequence of Events").



Note:

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

1.6.1 Registers 40001 to 40036: System information

- Registers are write-protected.¹

Register	Designation of the SIPROTEC objects	Comment
40001 - 40008	Hardware designation of the communication module (string, max. 16 characters)	"AME-GEN" for AME module, "AMO-GEN" for AMO module
40009 - 40010	Communication module software revision	<u>Example:</u> Register 40009 = 0001H, register 40010 = 0205H → Revision 1.2.5
40011 - 40026	MLFB (order number) of the SIPROTEC device (string, max. 32 characters)	<u>Example:</u> "7SJ80115EA903FA3----0D-----"
40027 - 40034	Date and time of mapping data generation (string, max. 16 characters)	<u>Example:</u> "140106095747330" corresponds to → Date: Jan. 14th, 2006, Time: 09 hours, 57 min., 47 sec. and 330 milliseconds
40035 - 40036	Number of selected standard mapping, Revision of mapping data	MSB of register 40035: → Number of selected standard mapping, LSB of register 40035 and value of register 40036: → Revision of mapping data <u>Example:</u> Register 40035 = 3102H, register 40036 = 0304H → Standard mapping 3-1, Revision 2.3.4

1. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

1.6.2 Registers 40065 to 40069: Time synchronization

- Refer to chap. "Time synchronization" in the manual "SIPROTEC Communication module, Modbus - Communication profile" (ref. to page 3).

Register	Designation of the SIPROTEC objects	Comment
40065	Milliseconds	Time/Date transfer registers
40066	Hours / Minutes	
40067	Month / Day	
40068	Time/Date status byte / Year	
40069	"Set Time and Date"	available only, if time synchronization is configured with use of the "Set Time and Date" register

1.6.3 Register 40129: Diagnostics

- Registers are write-protected.¹
- The contents of this register are also readable using function "Diagnostics" (function code 8), subfunction "Return Diagnostic Register" (function code 2).
- Ref. to chap. "Bus-specific parameters" in the manual "SIPROTEC Communication module, Modbus - Communication profile" (ref. to page 3) regarding signaling of "Data invalid" (ref. to register 40129/2¹⁵).

Register	Designation of the SIPROTEC objects	Comment	Internal object no.
40129/2 ⁰	Device OK	1 = Update of the device replica in the SIPROTEC device completed after initial start or restart	51
40129/2 ¹	Settings Calc.	1 = Setting calculation is running	70
40129/2 ²	ProtActive	1 = At Least 1 Protection Funct. is Active	52
40129/2 ³	Error Sum Alarm	1 = Error with a summary alarm ON	140
40129/2 ⁴	Alarm Sum Event	1 = Alarm summary event ON	160
40129/2 ⁵	Relay PICKUP	1 = Relay PICKUP (group signal)	501
40129/2 ⁶	Relay TRIP	1 = Relay GENERAL TRIP command	511
40129/2 ⁷	<user-defined>	not pre-allocated	-
40129/2 ⁸	Test mode	1 = Test mode is active	-
40129/2 ⁹	<user-defined>	not pre-allocated	-
40129/2 ¹⁰	<user-defined>	not pre-allocated	-
40129/2 ¹¹	<user-defined>	not pre-allocated	-
40129/2 ¹²	<user-defined>	not pre-allocated	-
40129/2 ¹³	<user-defined>	not pre-allocated	-
40129/2 ¹⁴	<user-defined>	not pre-allocated	-
40129/2 ¹⁵	Data invalid	1 = Data in the Modbus message are invalid. (This indication is created by the Modbus slave; not available in DIGSI and not relocatable.)	-

1. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

1.6.4 Registers 40201 to 40208: Metered measurands

- Registers are write-protected.¹

Scaling

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

60000 impulses per hour for $V = V_{nom}$ and $I = I_{nom}$

V_{nom} = Full Scale Voltage (parameter address 1101)

I_{nom} = Full Scale Current (parameter address 1102)

Example

In the parameter set is configured:

$I_{nom} = 100 \text{ A}$ and $V_{nom} = 12 \text{ kV}$,

60000 impulses correspond so that:

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



Note:

- The type of update (cyclic, with or without deletion) and the update interval must be programmed for the metered measurands using the parameterization software DIGSI.
- The scaling of the metered measurands at binary inputs (pulse counters) depends on the externally connected pulse generator.

Register	Designation of the SIPROTEC objects	Comment	Scaling ($2^{31}-1$ corresponds to ...)	Internal object no.
40201 - 40202	Wp(puls) =	Pulsed Energy Wp (active) (metering impulses at binary input)	$2^{31}-1$ impulses	888
40203 - 40204	Wq(puls) =	Pulsed Energy Wq (reactive) (metering impulses at binary input)	$2^{31}-1$ impulses	889
40205 - 40206	WpForward =	Wp Forward (metered measurand derived from measured values)	$2^{31}-1$ impulses	924
40207 - 40208	WqForward =	Wq Forward (metered measurand derived from measured values)	$2^{31}-1$ impulses	925
40209 - 40210	WpReverse =	Wp Reverse (metered measurand derived from measured values)	$2^{31}-1$ impulses	928
40211 - 40212	WqReverse =	Wq Reverse (metered measurand derived from measured values)	$2^{31}-1$ impulses	929

1. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

1.6.5 Registers 40301 to 40324: Statistic values

- Registers are write-protected.¹
- Statistic values can be routed on these positions as a "Destination system interface" using the **DIGSI Configuration matrix**.

Register	Designation of the SIPROTEC objects	Comment	Scaling (100000 corresponds to ...)	Internal object no.
40301 - 40302	Ia =	Primary fault current Ia	1000.00 kA	533
40303 - 40304	Ib =	Primary fault current Ib	1000.00 kA	534
40305 - 40306	Ic =	Primary fault current Ic	1000.00 kA	534
40307 - 40308	<user-defined>	not pre-allocated	-	-
40309 - 40310	<user-defined>	not pre-allocated	-	-
40311 - 40312	Sum Ia =	Accumulation of interrupted current Ph A	1000.00 kA	1021
40313 - 40314	Sum Ib =	Accumulation of interrupted current Ph B	1000.00 kA	1022
40315 - 40316	Sum Ic =	Accumulation of interrupted current Ph C	1000.00 kA	1023
40317 - 40318	Op.Hours =	Counter of operating hours	100000 hours	1020

1. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

1.6.6 Registers 40351 to 40520: Min/max values of measured values

- Registers are write-protected.¹
- Ref. to chap. 1.5 for additional notes regarding scaling of metered measurands.
- You find regarding the data type “Absolute time” in the manual “SIPROTEC communication modules, Modbus - Communication profile” (ref. to page 3).

Register	Designation of the SIPROTEC objects	Comment	Scaling (32768 corresponds to ...)	Internal object no.
40351	Ia Min=	Ia Min	3276.7 A	851
40352	Ia Min - Time/Date	Date and time of Ia Min	-	
-				
40355				
40356	Ia Max =	Ia Max	3276.7 A	852
40357	Ia Max - Time/Date	Date and time of Ia Max	-	
-				
40360				
40361	Ib Min=	Ib Min	3276.7 A	853
40362	Ib Min - Time/Date	Date and time of Ib Min	-	
-				
40365				
40366	Ib Max =	Ib Max	3276.7 A	854
40367	Ib Max - Time/Date	Date and time of Ib Max	-	
-				
40370				
40371	Ic Min=	Ic Min	3276.7 A	855
40372	Ic Min - Time/Date	Date and time of Ic Min	-	
-				
40375				
40376	Ic Max =	Ic Max	3276.7 A	856
40377	Ic Max - Time/Date	Date and time of Ic Max	-	
-				
40380				
40381	Va-nMin =	Va-nMin	327.67 kV	859
40382	Va-nMin - Time/Date	Date and time of Va-n Min	-	
-				
40385				
40386	Va-nMax =	Va-nMax	327.67 kV	860
40387	Va-nMax - Time/Date	Date and time of Va-n Max	-	
-				
40390				
40391	Vb-nMin =	Vb-nMin	327.67 kV	861
40392	Vb-nMin - Time/Date	Date and time of Vb-n Min	-	
-				
40395				

1. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

Register	Designation of the SIPROTEC objects	Comment	Scaling (32768 corresponds to ...)	Internal object no.
40396	Vb-nMax =	Vb-nMax	327.67 kV	862
40397	Vb-nMax - Time/Date	Date and time of Vb-n Max	-	
-				
40400				
40401	Vc-nMin =	Vc-nMin	327.67 kV	863
40402	Vc-nMin - Time/Date	Date and time of Vc-n Min	-	
-				
40405				
40406	Vc-nMax =	Vc-nMax	327.67 kV	864
40407	Vc-nMax - Time/Date	Date and time of Vc-n Max	-	
-				
40410				
40411	Vn Min =	V neutral Min	327.67 kV	872
40412	Vn Min - Time/Date	Date and time of Vn Min	-	
-				
40415				
40416	Vn Max =	V neutral Max	327.67 kV	873
40417	Vn Max - Time/Date	Date and time of Vn Max	-	
-				
40420				
40421	Pmin =	Active Power Minimum	327.67 MW	876
40422	Pmin - Time/Date	Date and time of Pmin	-	
-				
40425				
40426	Pmax =	Active Power Maximum	327.67 MW	877
40427	Pmax - Time/Date	Date and time of Pmax	-	
-				
40430				
40431	Qmin =	Reactive Power Minimum	327.67 MVAR	878
40432	Qmin - Time/Date	Date and time of Qmin	-	
-				
40435				
40436	Qmax =	Reactive Power Maximum	327.67 MVAR	879
40437	Qmax - Time/Date	Date and time of Qmax	-	
-				
40440				
40441	Smin =	Apparent Power Minimum	327.67 MVA	880
40442	Smin - Time/Date	Date and time of Smin	-	
-				
40445				
40446	Smax =	Apparent Power Maximum	327.67 MVA	881
40447	Smax - Time/Date	Date and time of Smax	-	
-				
40450				

Register	Designation of the SIPROTEC objects	Comment	Scaling (32768 corresponds to ...)	Internal object no.
40451	fmin =	Frequency Minimum	327.67 Hz	882
40452 - 40455	fmin - Time/Date	Date and time of fmin	-	
40456	fmax =	Frequency Maximum	327.67 Hz	
40457 - 40460	fmax - Time/Date	Date and time of fmax	-	883
40461	PF Min =	Power Factor Minimum	3.767	885
40462 - 40465	PF min - Time/Date	Date and time of PF Min	-	
40466	PF Max =	Power Factor Maximum	3.2767	
40467 - 40470	PF max - Time/Date	Date and time of PF Max	-	884

1.6.7 Registers 40601 to 40626: Event recorder ("Sequence of Events")

- Registers are write-protected (with the exception of "SOE_Control").¹
- Information regarding the handshake register, the data type "Message block" and the evaluation of Event recorder entries you find in the manual "SIPROTEC communication modules, Modbus - Communication profile" (ref. to page 3).
- Only the annunciation "Data invalid" (ref. to chap. 1.6.3) is routed by default to the Event recorder.
Further annunciations can be added to the Event recorder using DIGSI (ref. to chap. "Customization of the allocations" in the manual "SIPROTEC communication modules, Modbus - Communication profile").

Register	Designation	Comment
40601	No. of Event recorder entries	Number of Event recorder entries which still were not read
40602	"SOE_Control"	Handshake register (read/write access)
40603	Message block #1	Register type / Bit offset #1
40604		Register address #1
40605		Message cause / Indication type #1
40606		Value #1
40607 - 40610		Time stamp #1
40611		Message block #2
40612	Register address #2	
40613	Message cause / Indication type #2	
40614	Value #2	
40615 - 40618	Time stamp #2	
40619	Message block #3	
40620		Register address #3
40621		Message cause / Indication type #3
40622		Value #3
40623 - 40626		Time stamp #3



1. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

Glossary

AME	Universal asynchronous interface module with (electrical) isolated RS485 interface for the SIPROTEC devices made by Siemens
AMO	Universal asynchronous communication module with optical interface for the SIPROTEC devices made by Siemens
CFC	Continuous Function Chart
CRC	Cyclical Redundancy Check
DC	Double Command
DIGSI	Parameterization system for SIPROTEC devices
DP	Double-Point indication
SC	Single Command
SP	Single-Point information
Input data/ input direction	Data from the Modbus slave to the Modbus master
LRC	Longitudinal Redundancy Check
LSB	Least Significant Byte
Mapping	Allocation of the SIPROTEC data objects to their positions in the Modbus register map
MSB	Most Significant Byte
Output data/ output direction	Data from the Modbus master to the Modbus slave



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