

SIEMENS

SIPROTEC 4 ModbusTCP Bus Mapping 7SJ80 / 7SK80

V4.7 and higher

Manual

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**NOTE**

For your own safety, observe the warnings and safety instructions contained in this document, if available.

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Document version: C53000-L1840-C581-1.00

Edition: 07.2015

Version of the product described: V4.7 and higher

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Preface

Purpose of the Manual

This manual describes the communication profile of the SIPROTEC Communication Module with MODBUS TCP.

Target Audience

Protection system engineers, commissioning engineers, persons entrusted with the setting, testing and maintenance of automation, selective protection and control equipment, and operational crew in electrical installations and power plants.

Scope

This manual is valid for the SIPROTEC Communication Module with MODBUS TCP.

Additional Support

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, the matter should be referred to the local Siemens representative.

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Notes on Safety

This document is not a complete index of all safety measures required for operation of the equipment (module or device). However, it comprises important information that must be followed for personal safety, as

well as to avoid material damage. Information is highlighted and illustrated as follows according to the degree of danger:



DANGER

DANGER means that death or severe injury **will** result if the measures specified are not taken.

- ◇ Comply with all instructions, in order to avoid death or severe injuries.
-



WARNING

WARNING means that death or severe injury **may** result if the measures specified are not taken.

- ◇ Comply with all instructions, in order to avoid death or severe injuries.
-



CAUTION

CAUTION means that medium-severe or slight injuries **can** occur if the specified measures are not taken.

- ◇ Comply with all instructions, in order to avoid moderate or minor injuries.
-

NOTICE

NOTICE means that property damage **can** result if the measures specified are not taken.

- ◇ Comply with all instructions, in order to avoid property damage.
-



NOTE

Important information about the product, product handling or a certain section of the documentation which must be given particular attention.

Qualified Electrical Engineering Personnel

Only qualified electrical engineering personnel may commission and operate the equipment (module, device) described in this document. Qualified electrical engineering personnel in the sense of this manual are people who can demonstrate technical qualifications as electrical technicians. These persons may commission, isolate, ground and label devices, systems and circuits according to the standards of safety engineering.

Proper Use

The equipment (device, module) may be used only for such applications as set out in the catalogs and the technical description, and only in combination with third-party equipment recommended and approved by Siemens.

Problem-free and safe operation of the product depends on the following:

- Proper transport
- Proper storage, setup and installation
- Proper operation and maintenance

When electrical equipment is operated, hazardous voltages are inevitably present in certain parts. If proper action is not taken, death, severe injury or property damage can result:

- The equipment must be grounded at the grounding terminal before any connections are made.
- All circuit components connected to the power supply may be subject to dangerous voltage.
- Hazardous voltages may be present in equipment even after the supply voltage has been disconnected (capacitors can still be charged).
- Operation of equipment with exposed current-transformer circuits is prohibited. Before disconnecting the equipment, ensure that the current-transformer circuits are short-circuited.
- The limiting values stated in the document must not be exceeded. This must also be considered during testing and commissioning.

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1 General

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1.1 Explanations

One standard mapping (standard mapping 3-1) is available for setting the parameters of the SIPROTEC 4 devices 7SJ80 and 7SK80

- 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

Chapter 2 defines the allocation (in the following also called "mapping") of the data objects of the SIPROTEC 4 devices 7SJ80 and 7SK80 to the positions in the Modbus registers.



NOTE

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

The SIPROTEC 4 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 4 to the SIPROTEC 4 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 TCP as a system interface of a SIPROTEC 4 device in DIGSI 4 are contained in the manual

Modbus TCP Profile 7SJ80 / 7SK80, order number C53000-L1878-C582.

For detailed information about the data type definitions see the manual

Modbus Communication profile, order number C53000-L1840-C001-03.



NOTE

General information on the operation, assembly, commissioning and configuration of the SIPROTEC 4 devices you find in the following manuals:

- **SIPROTEC 4 System Description, order number E50417-H1176-C151**
 - **7SJ80 Device Manual order number E50417-G1140-C343**
 - **7SK80 Device Manual order number E50417-G1140-C344**
-

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	2.1.3 Registers 00044 to 00048: Internal commands
104	Oscillographic Fault Records	-
112	50/51 (Charac. Phase) Overcurrent Protection	2.2.3 Registers 10034 to 10045: Overcurrent Protection
113	50N/51N (Charac. Ground) Overcurrent Protection	2.2.3 Registers 10034 to 10045: Overcurrent Protection
115	67, 67-TOC Directional Overcurrent Protection	2.2.4 Registers 10046 to 10053: Directional Overcurrent Protection
116	67N, 67N-TOC Directional Overcurrent Protection	2.2.4 Registers 10046 to 10053: Directional Overcurrent Protection
117	Cold Load Pickup	2.1.3 Registers 00044 to 00048: Internal commands
122	2nd Harmonic Inrush Restraint	-
127	50 1Ph Single Phase Overcurrent Protection	-
130	(sens.) Ground fault dir. characteristic	2.2.8 Registers 10070 to 10081: (Sensitive) Ground Fault Protection
131	(sensitive) Ground fault	2.2.8 Registers 10070 to 10081: (Sensitive) Ground Fault Protection
140	46 Negative Sequence Protection	2.2.5 Registers 10054 to 10058: Negative Sequence Protection
142	49 Thermal Overload Protection	-
150	27, 59 Under/Overvoltage Protection	2.2.7 Registers 10064 to 10069: Under/Overvoltage Protection
154	81 Over/Underfrequency Protection	2.2.6 Registers 10059 to 10063: Frequency Protection
161	25 Function group 1 Synchronism and Voltage Check	-
170	50BF Breaker Failure Protection	-
171	79 Auto-Reclose Function	2.2.2 Registers 10025 to 10033: Auto-Reclose Function

No.	Function	Ref. to Chapter
172	52 Breaker Wear Monitoring	-
180	Fault Locator	-
181	Line Sections for Fault Locator	-
182	74TC Trip Circuit Supervision	2.2.11 Registers 10087 to 10088: Trip Circuit Supervision
617	Port B usage	-

7SK80

Table 1-2 7SK80 Functional scope

No.	Function	Ref. to Chapter
103	Setting Group Change Option	2.1.3 Registers 00044 to 00048: Internal commands
104	Oscillographic Fault Records	-
112	50/51 (Charac. Phase) Overcurrent Protection	2.2.3 Registers 10034 to 10045: Overcurrent Protection
113	50N/51N (Charac. Ground) Overcurrent Protection	2.2.3 Registers 10034 to 10045: Overcurrent Protection
116	67N, 67N-TOC Directional Overcurrent Protection	2.2.4 Registers 10046 to 10053: Directional Overcurrent Protection
117	Cold Load Pickup	2.1.3 Registers 00044 to 00048: Internal commands
122	2nd Harmonic Inrush Restraint	-
130	(sens.) Ground fault dir. characteristic	2.2.8 Registers 10070 to 10081: (Sensitive) Ground Fault Protection
131	(sensitive) Ground fault	2.2.8 Registers 10070 to 10081: (Sensitive) Ground Fault Protection
140	46 Negative Sequence Protection	2.2.5 Registers 10054 to 10058: Negative Sequence Protection
141	48 Startup Supervision of Motors	2.2.10 Registers 10084 to 10086: Startup Supervision of Motors
142	49 Thermal Overload Protection	-
143	66 Startup Counter for Motors	2.2.9 Registers 10082 to 10083: Startup Counter for Motors
144	Load Jam Protection	-
150	27, 59 Under/Overvoltage Protection	2.2.7 Registers 10064 to 10069: Under/Overvoltage Protection

No.	Function	Ref. to Chapter
154	81 Over/Underfrequency Protection	<i>2.2.6 Registers 10059 to 10063: Frequency Protection</i>
170	50BF Breaker Failure Protection	-
172	52 Breaker Wear Monitoring	-
182	74TC Trip Circuit Supervision	<i>2.2.11 Registers 10087 to 10088: Trip Circuit Supervision</i>
190	External Temperature Input	-
191	Ext. Temperature Input Connection Type	-
617	Port B usage	-

1.3 Network specific Parameters for Modbus Slave TCP

1.3.1 System and Device

All configuration options used in the system-specific parameters are marked with an **X**.

- System definition
- Controlling station definition (Master)
- Controlled station definition (Slave)

1.3.2 Network Configuration

All configuration options used in the network-specific parameters are marked with an **X**.

- point to point
- Multiple point to point
- Multipoint
- Multipoint star

1.3.3 Physical Layer

Transmission speed (control direction)

The Modbus TCP protocol is based on Ethernet. Therefore the special information about data rates in control direction are not relevant.

Transmission speed (monitor direction)

The Modbus TCP protocol is based on Ethernet. Therefore the special information about data rates in monitor direction are not relevant.

1.3.4 Link Layer

All configuration options used in the network-specific parameters are marked with an **X**.

TCP/IP Mode

	Procedure	Description
<input checked="" type="checkbox"/>	Modbus TCP / IP client-server default port-number: 502,504	Flexible configured. Range:100 to 65535
<input checked="" type="checkbox"/>	Modbus application protocol frame header (MBAP) - 7 bytes Transaction identifier – 2 bytes Protocol identifier – 2 bytes (00 00) Length – 2 bytes Unit identifier (Address) – 1 bytes	
<input checked="" type="checkbox"/>	Address field – 1 byte	Range: 1 to 247
<input checked="" type="checkbox"/>	Function code – 1 byte	
<input checked="" type="checkbox"/>	Response byte count – 1 byte	Range: 1 to 125
<input checked="" type="checkbox"/>	Maximum frame length: 249 bytes (including MBAP, maximum data)	

1.3.5 Application Layer

All configuration options used in the network-specific parameters are marked with an **X**.

Monitor direction

	Function code	Description
<input checked="" type="checkbox"/>	01.Read Coil Status (0X references)	Reading 1 or several Coil Status registers of the Modbus slave. The Coil Status registers reflect the ON/OFF status of discrete outputs of the SIPROTEC 4 device.
<input checked="" type="checkbox"/>	02.Read Input Status (1X references)	Reading 1 or several Input Status registers of the Modbus slave. The Input Status registers reflect the ON/OFF status of discrete inputs and the status of the protection function of the SIPROTEC 4 device.
<input checked="" type="checkbox"/>	03.Read Holding Registers (4X references)	Reading 1 or several Holding registers of the Modbus slave. The Holding registers contain device status information, mean values of measured values, metered measurands and others.
<input checked="" type="checkbox"/>	04.Read Input Registers (3X references)	Reading 1 or several Input registers of the Modbus slave. The Input registers contain recorded measured values.

Control direction

	Function code	Description
<input checked="" type="checkbox"/>	05.Force Single Coil (0X references)	Writing (force to ON or OFF) 1 Coil Status register (and the assigned binary output of the SIPROTEC 4 device). Use function code 15 to force multiple Coil Status registers.
<input checked="" type="checkbox"/>	06.Preset Single Register (4X references)	Function presets a value into a single Holding register.
<input checked="" type="checkbox"/>	15. Force multiple coil	Writing (force to ON or OFF) 1 or several Coil Status registers (and the assigned binary outputs of the SIPROTEC 4 device).
<input checked="" type="checkbox"/>	16. Preset multiple register	Preseting of 1 or several Holding registers.

2 Point lists for Modbus TCP

2.1	Coil Status registers (0X register)	18
2.2	Input Status registers (1X register)	22
2.3	Input Registers (3X register)	27
2.4	Holding registers (4X register)	29

2.1 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 4 devices.
- Depending on the device composition, there may be less than indicated output relays (and corresponding Modbus registers) available in the SIPROTEC 4 device.

For further information see also the manual **Modbus TCP Profile 7SJ80 / 7SK80**, order number C53000-L1878-C582.

2.1.1 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 4 **Configuration matrix**.

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
00001	52 Breaker ON	52 Breaker	-
00002	52 Breaker OFF		
00003	Disc. Switch ON ON	Disconnecter	-
00004	Disc. Switch ON OFF		
00005	Gnd. Switch ON	Grounding switch	-
00006	Gnd. Switch 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		
00015	<user-defined> ON	not pre-allocated	-
00016	<user-defined> OFF		
00017	<user-defined> ON	not pre-allocated	-
00018	<user-defined> OFF		

2.1.2 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 4 **Configuration matrix**.

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
00019	<user-defined>	not pre-allocated	-

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
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	27 OFF	1 = 27 Undervoltage protection switched OFF	18461
00036	<user-defined>	not pre-allocated	-
00037	27 BLOCKED	1 = 27 Undervoltage protection is BLOCKED	18462
00038	27 ACTIVE	1 = 27 Undervoltage protection is ACTIVE	18463
00039	>BLOCK 27.S1	1 = >BLOCK 27.S1 Undervoltage protection is ON	18426
00040	>BLOCK 27.S2	1 = >BLOCK 27.S2 Undervoltage protection is ON	18427
00041	<user-defined>	not pre-allocated	-
00042	<user-defined>	not pre-allocated	-
00043	<user-defined>	not pre-allocated	-

2.1.3 Registers 00044 to 00048: Internal commands

Register	Designation of the SIPROTEC 4 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	

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
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	Control mode REMOTE 0 = Set to LOCKED 1 = Set to UNLOCKED	-
	Indication: Group D	Control mode REMOTE 0 = LOCKED 1 = UNLOCKED	

**NOTE****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.

A change of the setting group is only possible via Modbus TCP if the parameter **Change to Another Setting Group** (parameter address = 302) has the value **Protocol**.

**NOTE****Control mode REMOTE:**

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

- Changing the **Control mode REMOTE** to UNLOCKED permits exactly one unlocked control operation via Modbus TCP.

After execution of the command, the **Control mode REMOTE** in the SIPROTEC 4 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 4 device via Modbus TCP 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 4 device, then this status can be recognized by the corresponding bit in the Modbus TCP response message.

In this case, the status of **Control mode REMOTE** in output direction has to be updated by the Modbus TCP master.

2.1.4 Registers 00257 to 00264: Exception flags

- Registers are write-protected. A Write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).
- The contents of these registers are also readable using the function **Read Exception Status** (function code 7).
- Installation-specific SIPROTEC 4 objects can be routed to these register positions as a **Destination system interface** using the DIGSI 4 parameterization system.

Register	Designation of the SIPROTEC 4 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	-

2.2 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 TCP registers) may be available in the SIPROTEC 4 device.

2.2.1 Registers 10001 to 10024: User-defined information

Protection information, single-point indications and taggings can be routed on these positions as a **Destination system interface** using the DIGSI 4 **Configuration matrix**.

Register	Designation of the SIPROTEC 4 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	-
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	-

2.2.2 Registers 10025 to 10033: Auto-Reclose Function

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
10025	79 ON	1 = 79 Auto recloser is switched ON	2782

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
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

2.2.3 Registers 10034 to 10045: Overcurrent Protection

Register	Designation of the SIPROTEC 4 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
10044	PhC InrushBlk	1 = Phase C trip blocked by inrush detection	1842
10045	INRUSH X-BLK	1 = Cross blk: PhX blocked PhY	1843

2.2.4 Registers 10046 to 10053: Directional Overcurrent Protection

Register	Designation of the SIPROTEC 4 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

2.2.5 Registers 10054 to 10058: Negative Sequence Protection

Register	Designation of the SIPROTEC 4 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

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
10057	46-TOC pickedup	1 = 46-TOC picked up	5166
10058	46 TRIP	1 = 46 TRIP	5170

2.2.6 Registers 10059 to 10063: Frequency Protection

Register	Designation of the SIPROTEC 4 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

2.2.7 Registers 10064 to 10069: Under/Overvoltage Protection

Register	Designation of the SIPROTEC 4 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

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

Register	Designation of the SIPROTEC 4 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

2.2.9 Registers 10082 to 10083: Startup Counter for Motors

Register	Designation of the SIPROTEC 4 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

2.2.10 Registers 10084 to 10086: Startup Supervision of Motors

Register	Designation of the SIPROTEC 4 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

2.2.11 Registers 10087 to 10088: Trip Circuit Supervision

Register	Designation of the SIPROTEC 4 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

2.2.12 Registers 10089 to 10090: Local/Mode

Register	Designation of the SIPROTEC 4 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)	-

2.2.13 Registers 10091 to 10107: User-defined annunciations

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
10091	<user-defined>	not pre-allocated	
10092	<user-defined>	not pre-allocated	-
10093	<user-defined>	not pre-allocated	-
10094	<user-defined>	not pre-allocated	-
10095	<user-defined>	not pre-allocated	-
10096	<user-defined>	not pre-allocated	-
10097	<user-defined>	not pre-allocated	-
10098	<user-defined>	not pre-allocated	-

Register	Designation of the SIPROTEC 4 objects	Comment	Internal object no.
10099	<user-defined>	not pre-allocated	-
10100	<user-defined>	not pre-allocated	-
10101	<user-defined>	not pre-allocated	-
10102	<user-defined>	not pre-allocated	-
10103	<user-defined>	not pre-allocated	-
10104	<user-defined>	not pre-allocated	-
10105	<user-defined>	not pre-allocated	-
10106	<user-defined>	not pre-allocated	-
10107	<user-defined>	not pre-allocated	-

2.3 Input Registers (3X register)

The Input register block allows the Modbus TCP 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 TCP registers) may be available.

Measured value scaling	<p>The given default scaling values for the measured values apply to installations with the following nominal operating values:</p> <p>Full Scale Voltage (parameter address 1101): → 1.01 ... 100.00 kV</p> <p>Full Scale Current (parameter address 1102): → 10.01 ... 1000.00 A</p> <p>Product of</p> <ul style="list-style-type: none"> Rated Primary Voltage (parameter address 0202) and Matching ratio Phase-VT to Open-Delta-VT (parameter address 0206): → 1.01 ... 100.00 kV <p>Ignd-CT rated primary current (parameter address 0217) → 10.01 ... 1000.00 A Power values</p> <ul style="list-style-type: none"> 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.

For further information see the manual **Modbus TCP Profile 7SJ80 / 7SK80**, order number C53000-L1878-C582.

Register	Designation of the SIPROTEC 4 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	32.767	901
30017	<user-defined>	not pre-allocated	-	-

Register	Designation of the SIPROTEC 4 objects	Comment	Scaling (32767 corresponds to ...)	Internal object no.
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	-	-

2.4 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 4 device.

2.4.1 Registers 40001 to 40036: System information

Registers are write-protected. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

Register	Designation of the SIPROTEC 4 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	Example: Register 40009 = 0001H, register 40010 = 0205H → Revision 1.2.5
40011 - 40026	MLFB (order number) of the SIPROTEC 4 device (string, max. 32 characters)	Example: 7SJ80115EA903FA3----0D-----
40027 - 40034	Date and time of mapping data generation (string, max. 16 characters)	Example: 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 Example: Register 40035 = 3102H, register 40036 = 0304H → Standard mapping 3-1, Revision 2.3.4

2.4.2 Registers 40065 to 40069: Time synchronization

For further information to the **Time synchronization** see the manual **Modbus TCP Profile 7SJ80 / 7SK80**, order number C53000-L1878-C582.

Register	Designation of the SIPROTEC 4 objects	Comment
40065	Milliseconds	Time/Date transfer registers
40066	Hours / Minutes	
40067	Month / Day	
40068	Time/Date status byte / Year	

Register	Designation of the SIPROTEC 4 objects	Comment
40069	Set Time and Date	available only, if time synchronization is configured with use of the Set Time and Date register

2.4.3 Register 40129: Diagnostics

- Registers are write-protected. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).
- The contents of this register are also readable using function **Diagnostics** (function code 8), subfunction **Return Diagnostic Register** (function code 2).

Table 2-1

Register	Designation of the SIPROTEC 4 objects	Internal object no.	
40129/2 ⁰	Device OK	1 = Update of the device replica in the SIPROTEC 4 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	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 4 and not relocatable.)	-

2.4.4 Registers 40201 to 40212: Metered measurands

Registers are write-protected. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).

Scaling

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

60000 impulses per hour for V = Vnom and I = Inom
 Vnom = Full Scale Voltage (parameter address 1101)
 Inom = 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 4 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

2.4.5 Registers 40301 to 40318: Statistic values

Registers are write-protected. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE). Statistic values can be routed on these positions as a **Destination system interface** using the DIGSI 4 **Configuration matrix**.

Register	Designation of the SIPROTEC 4 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

Register	Designation of the SIPROTEC 4 objects	Comment	Scaling (100000 corresponds to ...)	Internal object no.
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

2.4.6 Registers 40351 to 40470: Min/max values of measured values

Registers are write-protected. A write access is rejected with exception code 03 (ILLEGAL_DATA_VALUE).
Ref. to chapter [2.3 Input Registers \(3X register\)](#) for additional notes regarding scaling of measured values.

Register	Designation of the SIPROTEC 4 objects	Comment	Scaling (32768 corresponds to ...)	Internal object no.
40351 40352 - 40355	Ia Min= Ia Min - Time/Date	Ia Min Date and time of Ia Min	3276.7 A -	851
40356 40357 - 40360	Ia Max = Ia Max - Time/Date	Ia Max Date and time of Ia Max	3276.7 A -	852
40361 40362 - 40365	Ib Min= Ib Min - Time/Date	Ib Min Date and time of Ib Min	3276.7 A -	853
40366 40367 - 40370	Ib Max = Ib Max - Time/Date	Ib Max Date and time of Ib Max	3276.7 A -	854
40371 40372 - 40375	Ic Min= Ic Min - Time/Date	Ic Min Date and time of Ic Min	3276.7 A -	855
40376 40377 - 40380	Ic Max = Ic Max - Time/Date	Ic Max Date and time of Ic Max	3276.7 A -	856
40381 40382 - 40385	Va-nMin = Va-nMin - Time/ Date	Va-nMin Date and time of Va-n Min	327.67 kV -	859
40386 40387 - 40390	Va-nMax = Va-nMax - Time/ Date	Va-nMax Date and time of Va-n Max	327.67 kV -	860
40391 40392 - 40395	Vb-nMin = Vb-nMin - Time/ Date	Vb-nMin Date and time of Vb-n Min	327.67 kV -	861
40396 40397 - 40400	Vb-nMax = Vb-nMax - Time/ Date	Vb-nMax Date and time of Vb-n Max	327.67 kV -	862

Register	Designation of the SIPROTEC 4 objects	Comment	Scaling (32768 corresponds to ...)	Internal object no.
40401 40402 - 40405	Vc-nMin = Vc-nMin - Time/Date	Vc-nMin Date and time of Vc-n Min	327.67 kV -	863
40406 40407 - 40410	Vc-nMax = Vc-nMax - Time/ Date	Vc-nMax Date and time of Vc-n Max	327.67 kV -	864
40411 40412 - 40415	Vn Min = Vn Min - Time/Date	V neutral Min Date and time of Vn Min	327.67 kV	872
40416 40417 - 40420	Vn Max = Vn Max - Time/Date	V neutral Max Date and time of Vn Max	327.67 kV -	873
40421 40422 - 40425	Pmin = Pmin - Time/Date	Active Power Minimum Date and time of Pmin	327.67 MW -	876
40426 40427 - 40430	Pmax = Pmax - Time/Date	Active Power Maximum Date and time of Pmax	327.67 MW -	877
40431 40432 - 40435	Qmin = Qmin - Time/Date	Reactive Power Minimum Date and time of Qmin	327.67 MVAR -	878
40436 40437 - 40440	Qmax = Qmax - Time/Date	Reactive Power Maximum Date and time of Qmax	327.67 MVAR -	879
40441 40442 - 40445	Smin = Smin - Time/Date	Apparent Power Minimum Date and time of Smin	327.67 MVA -	880
40446 40447 - 40450	Smax = Smax - Time/Date	Apparent Power Maximum Date and time of Smax	327.67 MVA -	881
40451 40452 - 40455	fmin = fmin - Time/Date	Frequency Minimum Date and time of fmin	327.67 Hz -	882
40456 40457 - 40460	fmax = fmax - Time/Date	Frequency Maximum Date and time of fmax	327.67 Hz -	883
40461 40462 - 40465	PF Min = PF min - Time/Date	Power Factor Minimum Date and time of PF Min	3.767 -	885
40466 40467 - 40470	PF Max = PF max - Time/Date	Power Factor Maximum Date and time of PF Max	32.767 -	884

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