SIPROTEC

Numerical Overhead Contact line Protection for AC Traction Power Supply 7ST61, 7ST63

Communication module

Modbus
Bus mapping

Revision 1.0

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Preface

Purpose of this manual

The manual describes the register map organization of the Modbus slave of the SIPROTEC devices 7ST61, 7ST63 and is devided into the following topics:

- Modbus register map → Chapter 1.

General details about the function, operation, assembly and commissioning of the SIPROTEC devices you find in the

- SIPROTEC4 System Manual, order no. E50417–H1176–C151.

Modbus communication profile documentation

The following additional manual informs you about the data types, bus specific parameters and hardware inteface of the Modbus slave modul of the SIPROTEC devices:

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

Modbus specification

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.

Validity

This manual is valid for the SIPROTEC devices:

- 7ST61, 7ST63 (firmware version 4.0 or higher),

with

- Modbus communication module version 03.01.01 or higher,

For device parameterization have to be used:

- DIGSI 4.5 or higher,
- Modbus standard mappings 3-n
  (n = device type dependent number of standard mappings).

Additional Support

For questions regarding SIPROTEC4 devices, please contact your Siemens representative.

Training courses

Individual course offerings may be found in our Training Catalog and questions can be directed to our Training Centre. Please contact your Siemens representative.

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 significant equipment damage could result from improper behaviour.

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 product are proper transport, proper storage, setup, installation, operation, and maintenance of the product, 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
	1.0	First edition, Doc.-No.: C53000-L1840-C016-03 Mar 11th, 2004

Table of contents

Modbus register map

1

This chapter describes the register map organization of the Modbus slave of the SIPROTEC devices 7ST61, 7ST63.

1.1 Explanations

Note:

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

Chapters 1.2 to 1.5 define the mapping of the data objects of the SIPROTEC devices 7ST61, 7ST63 to the associated Modbus registers.

The columns "Designation of the SIPROTEC objects" contain the texts of the SIPROTEC objects for `"US English"` device language.

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

Register	Designation of the SIPROTEC objects	Comments	Scaling (32767corresponds to...)	Internal object no.
30001	I =	Operational measurement: I =	32767 A	668

The measured value `"I ="` is assigned to register 30001 (Input register).

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10053	5X-B TRIP	1 = 50(N)/51(N) General TRIP command	7211

The single-point indication `“5X-B TRIP”` is assigned to the Input Status register 10053.

Note:

- The description of the standard mapping contains the pre-allocation of the mapping files *at delivery or at first assignment* 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 enviroment.
  You find information about this in the manual "SIPROTEC Communication module, Modbus - Communication profile" (ref. to page i).
- The definition of the data types (single-point indication, measured value etc.) are contained in the manual "SIPROTEC Communication module, Modbus - Communication profile" (ref. to page i).

1.2 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),
- 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 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.

1.2.1 Registers 00001 to 00012: Double commands (with checkback indication)

- User-defined double commands with double-point indication as checkback indication can be routed on these position as “Source/Destination system interface” using the **`DIGSI Configuration matrix`**.
- Please ref. to chap. “Double command / Double-point indication” in the manual “SIPROTEC Communication module, Modbus - Communication profile” for additional notes.

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
00001	52Breaker ON	52Breaker	-
00002	52Breaker OFF		
00003	Disc.Swit. ON	Disconnect Switch	-
00004	Disc.Swit. OFF		
00005	GndSwit. ON	Ground Switch	-
00006	GndSwit. OFF		
00007	<user-defined> ON	not pre-allocated	-
00008	<user-defined> OFF		
00009	<user-defined> ON	not pre-allocated	-
00010	<user-defined> OFF		

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
00011	<user-defined> ON	not pre-allocated	-
00012	<user-defined> OFF		

1.2.2 Registers 00013 to 00016: Single commands (with checkback indication)

- User-defined single commands with checkback indication or taggings can be routed on these position as “Source/Destination system interface” using the **DIGSI Configuration matrix**.

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
00013	<user-defined>	not pre-allocated	-
00014	<user-defined>	not pre-allocated	-
00015	<user-defined>	not pre-allocated	-
00016	<user-defined>	not pre-allocated	-

1.2.3 Registers 00017 to 00032: Internal commands

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
00017	Command: Setting Group A	0 = not permitted 1 = Activation of setting group A	-
	Indication: Setting Group A	0 = Setting group A is not active 1 = Setting group A is active	
00018	Command: Setting Group B	0 = not permitted 1 = Activation of setting group B	-
	Indication: Setting Group B	0 = Setting group B is not active 1 = Setting group B is active	
00019	Command: Setting Group C	0 = not permitted 1 = Activation of setting group C	-
	Indication: Setting Group C	0 = Setting group C is not active 1 = Setting group C is active	
00020	Command: Setting Group D	0 = not permitted 1 = Activation of setting group D	-
	Indication: Setting Group D	0 = Setting group D is not active 1 = Setting group D is active	
00021	Command: ProtActive	0 = Deactivation of protection functions 1 = Activation of potection functions	52
	Indication: ProtActive	0 = No protection function is active. 1 = At least one protection function is active.	

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
00022	Command: 79 ON	0 = Deactivation of Auto-Reclose function 1 = Activation of Auto-Reclose function	2782
	Indication: 79 ON	1 = Auto-Reclose function is active	
00023	Command: ModeREMOTE	Control mode REMOTE 0 = Set to LOCKED 1 = Set to UNLOCKED	-
	Indication: ModeREMOTE	Control mode REMOTE 0 = LOCKED 1 = UNLOCKED	
00024	Command: 79 TH ON	0 = Deactivation of thermal Auto-Reclose function 1 = Activation of thermal Auto-Reclose function	2795
	Indication: 79 TH ON	1 = thermal Auto-Reclose function is active	
00025	Command: Defrost ON	0 = Deactivation of Defrosting Protection 1 = Activation of Defrosting Protection	13963
	Indication: Defrost ON	1 = Defrosting Protection is active	
00026	<user-defined> ON	not pre-allocated	-
	<user-defined> OFF		
00027	Command: Z1str act	0 = 21 Distance Zone Z1Stroke OFF 1 = 21 Distance Zone Z1Stroke ON	3916
	Indication: Z1str act	1 = 21 Distance Zone Z1Stroke is active	
00028	Command: Z2str act	0 = 21 Distance Zone Z2Stroke OFF 1 = 21 Distance Zone Z2Stroke ON	3918
	Indication: Z2str act	1 = 21 Distance Zone Z2Stroke is active	
00029	Command: Z3str act	0 = 21 Distance Zone Z3Stroke OFF 1 = 21 Distance Zone Z3Stroke ON	3992
	Indication: Z3str act	1 = 21 Distance Zone Z3Stroke is active	
00030	Command: Cat.1 active	0 = 49 Catenary 1 OFF 1 = 49 Catenary 1 ON	6616
	Indication: Cat.1 active	1 = 49 Catenary 1 is active	
00031	Command: Cat.2 active	0 = 49 Catenary 2 OFF 1 = 49 Catenary 2 ON	6617
	Indication: Cat.2 active	1 = 49 Catenary 2 is active	
00032	Command: Cat.3 active	0 = 49 Catenary 3 OFF 1 = 49 Catenary 3 ON	6618
	Indication: Cat.3 active	1 = 49 Catenary 3 is active	

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.

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:

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 "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 "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 input message.
  In this case the status of "Control mode REMOTE" in output direction has to be updated by the Modbus master.

1.2.4 Registers Registers 00257 to 00264: Exception Flags

- Registers are write-protected.[1]
- The contents of these registers is also readable using function "Read Exception Status" (function code 7).
- Installation-specific SIPROTEC objects can be routed on these register positions using parameterization system DIGSI.

Register	Designation of the SIPROTEC objects	Comments	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).

1.3 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.

1.3.1 Registers 10001 to 10008: Double-point indications

- Double-point indications can be routed on these register positions as “Destination system interface” using the **`DIGSI Configuration matrix`**.

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10001	<user-defined> ON	not pre-allocated	-
10002	<user-defined> OFF		
10003	<user-defined> ON	not pre-allocated	-
10004	<user-defined> OFF		
10005	<user-defined> ON	not pre-allocated	-
10006	<user-defined> OFF		
10007	<user-defined> ON	not pre-allocated	-
10008	<user-defined> OFF		

1.3.2 Registers 10009 to 10032: Single-point indications, taggings

- Further protection annunciations, single-point indications and taggings (internal single-point indications) can be routed on these register positions as “Destination system interface” using the **`DIGSI Configuration matrix`**.

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
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	-

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
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	-
10025	<user-defined>	not pre-allocated	-
10026	<user-defined>	not pre-allocated	-
10027	<user-defined>	not pre-allocated	-
10028	<user-defined>	not pre-allocated	-
10029	<user-defined>	not pre-allocated	-
10030	<user-defined>	not pre-allocated	-
10031	<user-defined>	not pre-allocated	-
10032	<user-defined>	not pre-allocated	-

1.3.3 Registers 10033 to 10047: Distance protection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10033	21 PICKUP	1 = 21 PICKED UP	3671
10034	21 TRIP	1 = 21 Distance General TRIP command	3801
10035	21 Z1 act	1 = 21 Zone Z1 is active	3915
10036	<user-defined>	not pre-allocated	-
10037	21 Z2 act	1 = 21 Zone Z2 is active	3917
10038	<user-defined>	not pre-allocated	-
10039	21 Z3 act	1 = 21 Zone Z3 is active	3991
10040	<user-defined>	not pre-allocated	-
10041	21 Dis.Trip Z1	1 = 21 Trip in Zone Z1	3810
10042	21 TRIP Z1B	1 = 21 TRIP in Zone Z1B	13900
10043	21 TRIP Z1L	1 = 21 TRIP in Zone Z1L	13901
10044	21 Trip Z2K	1 = 21 Trip in zone Z2 (short circuit)	3930
10045	21 Trip Z2L	1 = 21 Trip in zone Z2 (overload)	3931
10046	21 TRIP Z3K	1 = 21 TRIP in Zone Z3K	13903
10047	21 TRIP Z3L	1 = 21 TRIP in Zone Z3L	13904

1.3.4 Registers 10048 to 10049: High-Speed O/Cprotection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10048	50HS PICKUP	1 = 50HS PICKED UP	4281
10049	50HS Gen. TRIP	1 = 50HS General TRIP	4293

1.3.5 Registers 10050 to 10051: Emergency O/C protection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10050	50(N,G) PU	1 = 50(N,G)/51(N,G) O/C PICKUP	1761
10051	50/51(N,G) TRIP	1 = 50(N,G)/51(N,G) TRIP	1791

1.3.6 Registers 10051 to 10057: Overcurrent protection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10052	5X-B PICKUP	1 = 50(N)/51(N) Overcurrent PICKED UP	7161
10053	5X-B TRIP	1 = 50(N)/51(N) General TRIP command	7211
10054	50-STUB TRIP	1 = 50-STUB TRIP	7235
10055	50(N)-B1 TRIP	1 = 50(N)-B1 TRIP	7221
10056	50(N)-B2 TRIP	1 = 50(N)-B2 TRIP	7222
10057	51 TRIP	1 = 51 TRIP	1825

1.3.7 Registers 10058 to 10059: Thermal overload protection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10058	49 O/L ΘAlarm	1 = 49 Thermal Overload Alarm	1516
10059	49 Th O/L TRIP	1 = 49 Thermal Overload TRIP	1521

1.3.8 Registers 10060 to 10064: Defrosting protection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10060	Defrost PICKUP	1 = Defrosting Protection PICKED UP	13966
10061	Defrost TRIP	1 = Defrosting Protection TRIP	13967
10062	87 TRIP	1 = 87 Differential Protection TRIP	13975
10063	50-B1 IX TRIP	1 = 50-B1 Defrosting current IX TRIP command	13972
10064	50-B2 IX TRIP	1 = 50-B2 Defrosting current IX TRIP command	13973

1.3.9 Registers 10065 to 10070: Undervoltage / Overvoltage protection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10065	27/59 PICKED UP	1 = 27/59 Over/Undervoltage prot. picked up	13834
10066	27/59 TRIP	1 = 27/59 Over/Undervoltage prot. TRIP comm.	13839
10067	59-2 TRIP	1 = 59-2 Overvoltage TRIP command	4336
10068	59-1 TRIP	1 = 59-2 Overvoltage TRIP command	4335
10069	27-2 TRIP	1 = 27-2 Undervolt. TRIP command	13838
10070	27-1 TRIP	1 = 27-1 Undervolt. TRIP command	13837

1.3.10 Registers 10071 to 10072: Circuit breaker failure protection

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10071	50BF pickup	1 = 50BF picked up	1455
10072	50BF TRIP	1 = 50BF TRIP	1471

1.3.11 Register 10073: Trip coil monitor

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10073	74TC Trip cir.	1 = 74TC Failure Trip Circuit	6865

1.3.12 Registers 10074 to 10077: Circuit breaker test

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10074	CB-TEST TRIP M	1 = CB-Test: TRIP command main trip element	13862
10075	CB-TEST TRIP B	1 = CB-Test: TRIP command backup trip elem.	13863
10076	CB-TEST CLOSE M	1 = CB-Test: CLOSE command main trip element	13864
10077	CB-TEST CLOSE M	1 = CB-Test: CLOSE command backup trip elem.	13865

1.3.13 Registers 10078 to 10083: Status annunciations

Register	Designation of the SIPROTEC objects	Comments	Internal object no.
10078	DataStop	1 = Stop data transmission is active	-
10079	Test mode	1 = Test modeis active	-
10080	Cntrl Auth (device 7ST63)[1]	Control authority (0 = REMOTE, 1 = LOCAL)	-
10081	ModeLOCAL (device 7ST63)[1]	Control mode LOCAL (0 = LOCKED, 1 = UNLOCKED)	-
10082	Cntrl Auth (device 7ST61)[2]	Control authority (0 = REMOTE, 1 = LOCAL)	-
10083	ModeLOCAL (device 7ST61)[2]	Control mode LOCAL (0 = LOCKED, 1 = UNLOCKED)	-

1 Not used in the 7ST61.
2 Not used in the 7ST63.

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.

1.4 Input registers (3X references)

The Input register block allows the Modbus master to read 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.

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

Full Scale Voltage (parameter address 204):

→ 1.0 ... 150.0 kV

Full Scale Current (parameter address 202):

→ 10 ... 5000 A

Note:

Changes of the scaling of the measured values are possible in adaption to the concrete installation environment.
You find information about this in the manual “SIPROTEC Communication module, Modbus - Communication profile” (ref. to page i).

Register	Designation of the SIPROTEC objects	Comments	Scaling (32767 corresponds to ...)	Internal object no.
30001	I =	Operational measurement: I =	32767 A	668
30002	V =	Operational measurement: V=	3276.7 kV	678
30003	IF- =	Current IF- is	32767 A	13921
30004	VF- =	Voltage VF- is	3276.7 kV	13920
30005	IX =	Defrosting current IX is	32767 A	13923
30006	Freq =	Frequency	327.67 Hz	644
30007	Tcat =	Catenary Temperature	3276.7 °C/°F	950
30008	<user-defined>	not pre-allocated	-	-
30009	<user-defined>	not pre-allocated	-	-
30010	<user-defined>	not pre-allocated	-	-
30011	<user-defined>	not pre-allocated	-	-
30012	<user-defined>	not pre-allocated	-	-

1.5 Holding registers (4X references)

The Holding register block allows the Modbus master:

- query of system and diagnostic information as well as statistic values,
- time synchronization of the SIPROTEC device and
- reading the Event recorder (Sequence of Events).

1.5.1 Registers 40001 to 40036: System information

- Registers are write-protected.[1]

Register	Designation of the SIPROTEC objects	Comments
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 device (string, max. 32 characters)	Example: "7ST61215EC931CA0----0D----------"
40027 - 40034	Date and time of mapping data generation (string, max. 16 characters)	Example: "170203095747330" corresponds to → Date: Feb. 17th, 2003 → 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

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

1.5.2 Registers 40065 to 40069: Time synchronization

- Ref. to chap. “Time synchronization” in the manual “SIPROTEC Communication module, Modbus - Communication profile” for additional notes regarding methods of time synchronization and Time/Date data type.

Register	Designation of the SIPROTEC objects	Comments
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

1.5.3 Register 40129: Diagnosis

- Registers are write-protected.[1]
- The contents of this register is also readable using function "Diagnostics" (function code 7), subfunction "Return Diagnostic Register" (subfunction code 2).
- Ref. to chap. “Bus specific parameters” in the manual “SIPROTEC Communication module, Modbus - Communication profile” regarding signalization of “Data invalid” (register 40129/2^{15}).

Register	Designation of the SIPROTEC objects	Comments	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	<user-defined>	not pre-allocated	-
40129/2^2	Settings Calc.	1 = Setting calculation is running	70
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	<user-defined>	not pre-allocated	-
40129/2^6	Relay TRIP	1 = Relay GENERAL TRIP command	511
40129/2^7	Protection PU	1 = General protective PICKUP of device	13991
40129/2^8	Protection TRIP	1 = General protective TRIP of device	13992
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).

1.5.4 Registers 40301 to 40316: Statistic values and fault locator

- Registers are write-protected.[1]
- Installation-specific statistic and fault locator values can be routed on these register positions as “Destination system interface” using the **DIGSI Configuration matrix**.

Register	Designation of the SIPROTEC objects	Comments	Scaling (100000 corresponds to ...)	Internal object no.
40301 - 40302	Xpri =	Fault Locator: primary REACTANCE	1000.00 Ohm	1115
40303 - 40304	<user-defined>	not pre-allocated		-
40305 - 40306	Fault section	Fault Locator: Fault in section	100000 (dimensionless)	1121
40307 - 40308	# TRIPs =	Number of breaker TRIP commands	100000 (dimensionless)	1000
40309 - 40310	Last I =	Last current interrupted by circuit breaker	10000.0 kA	13926
40311 - 40312	<user-defined>	not pre-allocated		-
40313 - 40314	<user-defined>	not pre-allocated		-
40315 - 40316	<user-defined>	not pre-allocated		-
40317 - 40318	<user-defined>	not pre-allocated		-
40319 - 40320	<user-defined>	not pre-allocated		-

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

The statistic and fault locator values of the SIPROTEC devices 7ST61, 7ST63 which are not preallocated have the following scaling:

Designation of the SIPROTEC objects	Comments	Scaling (100000 corresponds to ...)	Internal object no.
Rpri =	Fault Locator: primary RESISTANCE	1000.00 Ohm	1114
Rsec =	Fault Locator: secondary RESISTANCE	1000.00 Ohm	1117
Xsec =	Fault Locator: secondary REACTANCE	1000.00 Ohm	1118
Zsec =	Secondary fault impedance	1000.00 Ohm	3941
dist =	Fault Locator: Distance to fault	10000.0 km	1119
d[%] =	Fault Locator: Distance [%] to fault	10000.0 %	1120
dist =	Fault Locator: Distance to fault	10000.0 miles	1122
79 1st cycle =	79 Number reclosure attempts 1st cycle	100000 (dimensionless)	13870
79 >1st cycle =	79 Number reclosure attempts >1st cycle	100000 (dimensionless)	13871
Last It =	Last It value measured	1000.00 As	13853
Σ It =	Summation of measured It values	1000.00 As	13851
Last I2t =	Last I2t value measured	100000 (dimensionless)	13854
Σ I2t =	Summation of measured I2t values	100000 (dimensionless)	13852
MAX I =	Max. fault current	10000.0 kA	13925
Σ I =	Summation of fault currents	10000.0 kA	13927
$\Sigma (I / In)^2$ =	Summation of fault currents $(I / In)^2$	100000 (dimensionless)	1008

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

- Registers are write-protected (with the exception of “SOE_Control”).[1]
- Information regarding the individual information in the handshake register, the data type “Message block” and the evaluation of Event recorder entries you find in the manual “SIPROTEC Communication module, Modbus - Communication profile” (ref. to page i).
- Only the annunciation “Data invalid” (ref. to chap. 1.5.3) is routed per 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 module, Modbus - Communication profile”).

Register	Designation	Comments
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	Register type / Bit offset #2
40612		Register address #2
40613		Message cause / Indication type #2
40614		Value #2
40615 - 40618		Time stamp #2
40619	Message block #3	Register type / Bit offset #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 communication module with (electrical) isolated RS485 interface for the SIPROTEC devices from Siemens.
AMO	Universal asynchronous communication module with fibre-optical interface for the SIPROTEC devices from Siemens.
CFC	Continuous Function Chart
CRC	Cyclical Redundancy Check
DC	Double Command
DIGSI	Parameterization system / parameterization software for SIPROTEC devices
DP	Double-point indication
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 the positions in the Modbus register map.
MSB	Most Significant Byte
Output data / Output direction	Data from the Modbus master to the Modbus slave.
SC	Single command
SP	Single-point indication

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