

SIPROTEC

Multifunction Generator, Motor and Transformer Protection Relay 7UM62

Communication module

DNP 3.0

Bus mapping / Point lists

Preface

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Liability statement

We have checked the contents of this manual against the described hardware and software. Nevertheless, deviations may occur so that we cannot guarantee the entire harmony with the product.

The contents of this manual will be checked in periodical intervals, corrections will be made in the following editions. We look forward to your suggestions for improvement.

We reserve the right to make technical improvements without notice.

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Preface

Aim of This Manual The manual is divided into the following topics:

- Notes to SIPROTEC objects
- DNP V3.0 Device Profile
- Point lists

General information about design, configuration, and operation of SIPROTEC devices are laid down in the *SIPROTEC 4* system manual, order no. E50417-H1176-C151.

Target Audience Protection engineers, commissioning engineers, persons who are involved in setting, testing and service of protection, automation, and control devices, as well as operation personnel in electrical plants and power stations.

Additional literature This manual describes the DNP 3.0 Device Profile of the SIPROTEC devices. The following additional manuals inform you about the DNP point lists and the function, operation, assembly and commissioning of the SIPROTEC devices:

Manual	Contents	Order number
Multifunction Generator, Motor and Transformer Protection Relay SIPROTEC 7UM62	Function, operation, assembly and commissioning of the SIPROTEC device 7UM62	C53000-G1176-C149
DNP 3.0 Communication Database	DNP communication database of the SIPROTEC devices	C53000-L1840-A00

The DNP V3.0 specification and the structure of the DNP messages are defined in:

- > DNP V3.00 Subset Definitions
Edition 2.00, November 1995
DNP Users Group,
Document Nr.: P009-OIG.SUB
- > DNP V3.00 Data Object Library
Edition 0.02, July 1997
DNP Users Group
Document Nr.: P009-OBL
- > DNP V3.00 Data Link Layer
Edition 0.02, May 1997
DNP Users Group
Document Nr.: P009-OPD.DL
- > DNP V3.00 Application Layer
Edition 0.03, May 1997
DNP Users Group
Document Nr.: P009-OPD.APP
- > DNP V3.00 Transport Functions
Edition 0.01, May 1997
DNP Users Group
Document Nr.: P009-OPD.TF

Applicability of this Manual

This manual is valid for

- SIPROTEC devices 7UM62 with
 - firmware version 4.1 or higher and
 - DNP communication module version 02.00.01 or higher.

For device parameterization **DIGSI 4 version 4.3 or higher** and DNP standard mappings 3-1 to 3-n (n = device type dependent number of standard mappings) have to be used.

With this Document (C53000-L1840-A009-04) in chapter 3.4 a second mapping (standardmapping 2) for more measured values is available.

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.

Training Courses

Individual course offerings may be found in our Training Catalogue, or questions may be directed to our training center. Please contact your Siemens representative.

Instructions and Warnings

The warnings and notes contained in this manual serve for your own safety and for an appropriate lifetime of the device. Please observe them!

The following terms are used:

DANGER

indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken. This particularly applies to damage on or in the device itself and consequential damage thereof.

Note

indicates information about the device or respective part of the instruction manual which is essential to highlight.

**Warning!**

Hazardous voltages are present in this electrical equipment during operation. Non-observance of the safety rules can result in severe personal injury or property damage.

Only qualified personnel shall work on and around this equipment after becoming thoroughly familiar with all warnings and safety notices of this manual as well as with the applicable safety regulations.

The successful and safe operation of this device is dependent on proper handling, installation, operation, and maintenance by qualified personnel under observance of all warnings and hints contained in this manual.

In particular the general erection and safety regulations (e.g. IEC, DIN, VDE, EN or other national and international standards) regarding the correct use of hoisting gear must be observed. Non-observance can result in death, personal injury or substantial property damage.

QUALIFIED PERSONNEL

For the purpose of this instruction manual and product labels, a qualified person is one who is familiar with the installation, construction and operation of the equipment and the hazards involved. In addition, he has the following qualifications:

- Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- Is trained in the proper care and use of protective equipment in accordance with established safety practices.
- Is trained in rendering first aid.

Typographic and Symbol Conventions

The following text formats are used when literal information from the device or to the device appear in the text flow:

Parameter names, i.e. designators of configuration or function parameters which may appear word-for-word in the display of the device or on the screen of a personal computer (with operation software DIGSI 4), are marked in bold letters of a monospace type style.

Parameter options, i.e. possible settings of text parameters, which may appear word-for-word in the display of the device or on the screen of a personal computer (with operation software DIGSI 4), are written in italic style, additionally.

“Annunciations”, i.e. designators for information, which may be output by the relay or required from other devices or from the switch gear, are marked in a monospace type style in quotation marks.

Deviations may be permitted in drawings when the type of designator can be obviously derived from the illustration.

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Notes to SIPROTEC objects

1

This chapter contains notes for the use and evaluation of certain SIPROTEC objects which are available via DNP3.0 communication.

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1.2	Binary Outputs / Commands	1-3
1.3	Analog Inputs / Measured values	1-3
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Note

The description of the standard mappings / point lists (ref. to chap. 3) contains the pre-allocation of the mapping files at delivery or first assignment of a mapping in DIGSI 4 to the SIPROTEC device.

Changes of the allocation and the scaling of the measured values are possible in adaptation to the concrete installation environment (ref. to page i).

1.1 Binary Inputs / Annunciations



Note

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

1.1.1 Error with a summary alarm

The "Error with a summary alarm" is ON if at least one of the following internal alarms assumes the value ON:

- "Error 5V", "Error neutral CT", "Error 1A/5A wrong", "Error A/D converter".

Reference ref to chap. 3.1.33

1.1.2 Alarm Summary Event

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

- "Error Board 1", "Error Board 2", "Error Board 3", "Error Board 4", "Error Board 5", "Error Board 6", "Error Board 7",
- "Alarm NO calibration", "Failure Battery", "Alarm Real Time Clock",
- "Failure Phase Sequence", "VT Fuse Failure", "Failure Voltage Balance", "Failure Voltage Summation Phase – Ground", "Failure General Voltage Supervision",
- "Failure Current Balance", "Failure Current Summation", "Failure General Current Supervision".

Reference ret. to chap. 3.1.33

1.2 Binary Outputs / Commands



Note

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

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

1.2.1 Single Commands

The command output mode (*pulse output, continuous output*) is changeable for the single commands using parametrization software DIGSI 4.

The switching direction OFF for single commands with *pulse output* is not permitted and is rejected in the SIPROTEC device.

Reference ref. to chap. 3.2.2

1.2.2 Changing the setting group

Switching on one setting group automatically switches off the current active setting group. Transmission of the value OFF is insignificant for the change of the setting group and is refused by the device.

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

Reference ref. to chap. 3.2.1

1.3 Analog Inputs / Measured values



Note

- Depending on the device composition not all of the indicated analog inputs (and corresponding DNP message points) may be available in the SIPROTEC device.
 - The transferred percentage values are with reference to the nominal values of the primary equipment.
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 module, DNP 3.0 Communication Database " (ref. to page i).
-

1.4 Metered measurands

Scaling

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

60000 impulses per hour for $S = S_{nom}$

S_{nom} = Rated Apparent Power of the Generator (parameter address = 0252)

Example

In the parameter set is configured:

$S_{nom} = 5.27$ MVA

60000 impulses correspond so that:

$1 \text{ h} * 5.27 \text{ MVA} = 5.27 \text{ MVAh}$



Note

- The type of the update (cyclic, with or without deletion) and the update interval must be programmed for the metered measurands with the parametrization software DIGSI 4.
 - The scaling of the metered measurands at binary inputs ("Wp(puls)" and "Wq(puls)") depends on the externally connected pulse generator.
-

DNP V3.0 Device Profile

2

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2.1 Implementation Table

The following table gives a list of all objects recognized and returned by the SIPROTEC device.

For static objects, requests sent with qualifiers 00, 01, 06, 07 or 08 will be responded with qualifiers 00 or 01.

Requests sent with qualifiers 17 or 28 will be responded with qualifiers 17 or 28.

For change-event objects, qualifiers 17 or 28 are always responded.

In the table below text shaded 00, 01 (start stop) indicates Subset Level 3 functionality (beyond Subset Level 2), text shaded as 07, 08 (limited qty) indicates functionality beyond Subset Level 3.

OBJECTS			REQUEST		RESPONSE	
Object	Variation	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
1	0	Binary Input - Any Variations	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qty) 17, 28 (index)		
1	2	Binary Input with Status	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
2	0	Binary Input Change - Any Variations	1 (read)	06 (no range) 07, 08 (limited qty)		
2	2	Binary Input Change with Time	1 (read)	06 (no range) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
10	0	Binary Output - Any Variations	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qty) 17, 28 (index)		
10	2	Binary Output with Status	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
12	1	Contol Relay Output Block	3 (select) 4 (operate) 5 (direct op.) 6 (dir. op. noack)	00, 01 (start-stop) 07, 08 (limited qty) 17, 28 (index)	129 (response)	echo of response
20	0	Binary Counter - Any Variations	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qty) 17, 28 (index)		
20	1	32-Bit Binary Counter (with Flag)	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qty) 17, 28 (index)		
22	0	Counter Change Event - Any Variations	1 (read)	06 (no range) 07, 08 (limited qty)		
22	1	32-Bit Counter Change Event without Time	1 (read)	06 (no range) 07, 08 (limited qty)		

OBJECTS			REQUEST		RESPONSE	
Object	Variation	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
30	0	16-Bit Analog Input - Any Variations	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qfy) 17, 28 (index)		
30	1	32-Bit Analog Input with Status	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qfy) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
30	2	16-Bit Analog Input with Status	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qfy) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
32	0	Analog Change Event - Any Variations	1 (read)	06 (no range) 07, 08 (limited qfy)		
32	1	32-Bit Analog Change Event without Time	1 (read)	06 (no range) 07, 08 (limited qfy)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	2	16-Bit Analog Change Event without Time	1 (read)	06 (no range) 07, 08 (limited qfy)	129 (response) 130 (unsol. resp)	17, 28 (index)
50	1	Time and Date	2 (write)	07 (limited qfy = 1)		
60	1	Class 0 Data	1 (read)	06 (no range)		
60	2	Class 1 Data	1 (read)	06 (no range) 07, 08 (limited qfy)		
60	3	Class 2 Data	1 (read)	06 (no range) 07, 08 (limited qfy)		
60	4	Class 3 Data	1 (read)	06 (no range) 07, 08 (limited qfy)		
80	1	Internal Indications	2 (write)	00 (start-stop) (index must = 7)		

2.2 Device Profile Document

<h1 style="margin: 0;">DNP V3.0</h1> <h2 style="margin: 0;">DEVICE PROFILE DOCUMENT</h2>	
Vendor Name: SIEMENS AG	
Device Name: 7UM62	
Highest DNP Level Supported: For Requests DNP-L2 For Responses DNP-L2	Device Function: <input type="checkbox"/> Master <input checked="" type="checkbox"/> Slave
<p>Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table):</p> <p>For static (non-change-event) object requests, request qualifier codes 00 and 01 (start-stop), 07 and 08 (limited quantity), and 17 and 28 (index) are supported in addition to request qualifier code 06 (no range). Static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. Static object requests sent with qualifiers 17 or 28 will be responded with qualifiers 17 or 28. For change-event object requests, qualifiers 17 or 28 are always responded.</p> <p>16-bit Analog Change Events with Time may be requested.</p> <p>The write function code for Object 50 (Time and Date), variation 1, is supported.</p> <p>The features outlined within this Device Profile have successfully passed DNP Conformance Test of Subset Level 2 outlined in DNP3-2000 IED Certification Procedure.</p>	
Maximum Data Link Frame Size (octets): Transmitted <u> 292 </u> Received <u> 292 </u>	Maximum Application Fragment Size (octets): Transmitted <u> Configurable up to 2048 </u> Received <u> 2048 </u>
Maximum Data Link Re-tries: <input checked="" type="checkbox"/> None <input type="checkbox"/> Fixed at <input type="checkbox"/> Configurable, range <u> 0 </u> to <u> 255 </u>	Maximum Application Layer Re-tries: <input checked="" type="checkbox"/> None <input type="checkbox"/> Configurable, range <u> </u> to <u> </u> (Fixed is not permitted)
Requires Data Link Layer Confirmation: <input type="checkbox"/> Never <input type="checkbox"/> Always <input type="checkbox"/> Sometimes If 'Sometimes', when? _____ <input checked="" type="checkbox"/> Configurable If 'Configurable', how? by the protection data processing program DIGSI® 4	

Requires Application Layer Confirmation:

- Never
- Always (not recommended)
- When reporting Event Data (Slave devices only)
- When sending multi-fragment responses (Slave devices only)
- Sometimes If 'Sometimes', when? _____
- Configurable If 'Configurable', how? by the protection data processing program DIGSI® 4

Timeouts while waiting for:

- | | | | | |
|-------------------------|--|---|-----------------------------------|--|
| Data Link Confirm | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable |
| Complete Appl. Fragment | <input checked="" type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input type="checkbox"/> Configurable |
| Application Confirm | <input type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input checked="" type="checkbox"/> Configurable |
| Complete Appl. Response | <input checked="" type="checkbox"/> None | <input type="checkbox"/> Fixed at _____ | <input type="checkbox"/> Variable | <input type="checkbox"/> Configurable |

Others: Default value are configurable by the protection data processing program DIGSI® 4

Sends/Executes Control Operations:

- | | | | | |
|-------------------------|---|--|------------------------------------|---------------------------------------|
| WRITE Binary Outputs | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| SELECT/OPERATE | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| DIRECT OPERATE | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| DIRECT OPERATE - NO ACK | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Count > 1 | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Pulse On | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Pulse Off | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Latch On | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Latch Off | <input type="checkbox"/> Never | <input checked="" type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Queue | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |
| Clear Queue | <input checked="" type="checkbox"/> Never | <input type="checkbox"/> Always | <input type="checkbox"/> Sometimes | <input type="checkbox"/> Configurable |

Note:

CONTROL RELAY OUTPUT BLOCK parameters (count, on-time, off-time) are ignored.

TimeSync Information:

a.) TimeSync Period

- Never
- Fixed at _____seconds
- Configurable, range ___1___ to ___86400___seconds

b.) Maximum time base drift over 10 minute interval: _____30___ms

c.) Maximum Internal Time Reference Error when set via DNP: _____1___ms

d.) Maximum Delay Measurement error: _____20___ms

e.) Maximum response time: _____100___ms

c.) Event data time-tag error – if different than (c):

- Binary Input Change Events _____ms
- Counter Change Events _____ms
- Frozen Counter Change Events _____ms
- Analog Change Events _____ms
- Frozen Analog Change Events _____ms

<p>Reports Binary Input Change Events when no specific variation requested:</p> <p><input type="checkbox"/> Never</p> <p><input checked="" type="checkbox"/> Only time-tagged</p> <p><input type="checkbox"/> Only non-time-tagged</p> <p><input type="checkbox"/> Configurable to send both, one or the other (attach explanation)</p>	<p>Reports time-tagged Binary Input Change Events when no specific variation requested:</p> <p><input type="checkbox"/> Never</p> <p><input checked="" type="checkbox"/> Binary Input Change With Time</p> <p><input type="checkbox"/> Binary Input Change With Relative Time</p> <p><input type="checkbox"/> Configurable (attach explanation)</p>
<p>Sends Unsolicited Responses:</p> <p><input type="checkbox"/> Never</p> <p><input checked="" type="checkbox"/> Configurable (Unsolicited data response mode are switched on/off via the configuration tool)</p> <p><input type="checkbox"/> Only certain objects</p> <p><input type="checkbox"/> Sometimes (attach explanation)</p> <p><input checked="" type="checkbox"/> ENABLE/DISABLE UNSOLICITED Function codes supported</p>	<p>Sends Static Data in Unsolicited Responses:</p> <p><input checked="" type="checkbox"/> Never</p> <p><input type="checkbox"/> When Device Restarts</p> <p><input type="checkbox"/> When Status Flags Change</p> <p>No other options are permitted.</p>
<p>Default Counter Object/Variation:</p> <p><input type="checkbox"/> No Counters Reported</p> <p><input type="checkbox"/> Configurable (attach explanation)</p> <p><input checked="" type="checkbox"/> Default Object <u> 20 </u></p> <p>Default Variation <u> 01 </u></p> <p><input type="checkbox"/> Point-by-point list attached</p> <p>Sends 32-Bit counters.</p>	<p>Counters Roll Over at:</p> <p><input type="checkbox"/> No Counters Reported</p> <p><input type="checkbox"/> Configurable (attach explanation)</p> <p><input type="checkbox"/> 16 Bits</p> <p><input checked="" type="checkbox"/> 32 Bits</p> <p><input type="checkbox"/> Other Value _____</p> <p><input type="checkbox"/> Point-by-point list attached</p>
<p>Sends Multi-Fragment Responses: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	

Point lists

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3.1 Binary Input Points

Binary Input Points			
Static (Steady-State) Object Number: 1			
Change Event Object Number: 2			
Request Function Codes supported: 1 (read)			
Static Variation reported when variation 0 requested: 1 (Binary Input with status)			
Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time)			
Point Index	Name	Description	Class
3.1.1 Overcurrent Time Protection I>			
0	50/51-1 Ph A PU	1 = 50/51-1 Phase A picked up	2
1	50/51-1 Ph B PU	1 = 50/51-1 Phase B picked up	2
2	50/51-1 Ph C PU	1 = 50/51-1 Phase C picked up	2
3	V< seal in	1 = 50/51-1 undervoltage seal-in	3
4	50/51 TRIP	1 = 50/51 I> TRIP	1
3.1.2 Overcurrent Time Protection I>>			
5	67 forward	1 = 67 I>> direction forward	3
6	67 backward	1 = 67 I>> direction backward	3
7	50/51-2 Ph A PU	1 = 50/51-2 Phase A picked up	2
8	50/51-2 Ph B PU	1 = 50/51-2 Phase B picked up	2
9	50/51-2 Ph C PU	1 = 50/51-2 Phase C picked up	2
10	51/67 TRIP	1 = 50/51/67 I>> TRIP	1
3.1.3 Inverse Time Overcurrent Protection			
11	51V Ph A PU	1 = 51V Phase A picked up	2
12	51V Ph B PU	1 = 51V Phase B picked up	2
13	51V Ph C PU	1 = 51V Phase C picked up	2
14	51V TRIP	1 = 51V TRIP	1
3.1.4 Thermal Overload Protection			
15	49 O/L I Alarm	1 = 49 Overload Current Alarm (I alarm)	3
16	49 O/L Θ Alarm	1 = 49 Thermal Overload Alarm	3
17	49 Th O/L TRIP	1 = 49 Thermal Overload TRIP	1
3.1.5 Unbalanced Load Protection			
18	46-1 Warn	1 = 46-1 Current warning stage	3
19	46-1 picked up	1 = 46-1 picked up	2
20	46-2 picked up	1 = 46-2 picked up	2
21	46-2 TRIP	1 = 46-2 TRIP of current stage	1
22	46- Θ TRIP	1 = 46 TRIP of thermal stage	1
3.1.6 Sensitive Ground Fault Protection			
23	Failure 64R	1 = Failure 64R: measuring circuit	3
24	50Ns-1 Pickup	1 = 50Ns-1 Pickup	2
25	50Ns-1 TRIP	1 = 50Ns-1 TRIP	1

Binary Input Points			
Static (Steady-State) Object Number: 1			
Change Event Object Number: 2			
Request Function Codes supported: 1 (read)			
Static Variation reported when variation 0 requested: 1 (Binary Input with status)			
Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time)			
Point Index	Name	Description	Class
26	50Ns-2 Pickup	1 = 50Ns-2 Pickup	2
27	50Ns-2 TRIP	1 = 50Ns-2 TRIP	1
3.1.7 Stator Ground Fault Protection			
28	59/67 V0 PU	1 = 59N/67GN V0 picked up	2
29	59/67 I0 PU	1 = 59N/67GN I0 picked up	2
30	59/67 V0 TRIP	1 = 59N/67GN V0 stage TRIP	1
31	59N/67GN TRIP	1 = 59N/67GN TRIP	1
3.1.8 Stator Ground Fault Protection with 3rd harmonic			
32	27TN/59TN PU	1 = 27TN/59TN with 3 rd harmonic picked up	2
33	27TN/59TN TRP	1 = 27TN/59TN with 3 rd harmonic TRIP	1
3.1.9 Overvoltage Protection			
34	59-1 picked up	1 = 59-1 Overvoltage V> picked up	2
35	59-2 picked up	1 = 59-2 Overvoltage V>> picked up	2
36	59-1 TRIP	1 = 59-1 Overvoltage V> TRIP	1
37	59-2 TRIP	1 = 59-2 Overvoltage V>> TRIP	1
3.1.10 Undervoltage Protection			
38	27-1 picked up	1 = 27-1 Undervoltage V< picked up	2
39	27-2 picked up	1 = 27-2 Undervoltage V<< picked up	2
40	27-1 TRIP	1 = 27-1 Undervoltage V< TRIP	1
41	27-2 TRIP	1 = 27-2 Undervoltage V<< TRIP	1
3.1.11 Frequency Protection			
42	81-1 picked up	1 = 81-1 picked up	2
43	81-2 picked up	1 = 81-2 picked up	2
44	81-3 picked up	1 = 81-3 picked up	2
45	81-4 picked up	1 = 81-4 picked up	2
46	81-1 TRIP	1 = 81-1 TRIP	1
47	81-2 TRIP	1 = 81-2 TRIP	1
48	81-3 TRIP	1 = 81-3 TRIP	1
49	81-4 TRIP	1 = 81-4 TRIP	1
3.1.12 Overexcitation Protection			
50	24 warn	1 = 24 V/f warning stage	3
51	24-1 picked up	1 = 24-1 V/f> picked up	2
52	24-2 picked up	1 = 24-2 V/f>> picked up	2
53	24 th.TRIP	1 = 24 TRIP of thermal stage	1

Binary Input Points			
Static (Steady-State) Object Number: 1			
Change Event Object Number: 2			
Request Function Codes supported: 1 (read)			
Static Variation reported when variation 0 requested: 1 (Binary Input with status)			
Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time)			
Point Index	Name	Description	Class
54	24-2 TRIP	1 = 24-2 TRIP of V/f>> stage	1
3.1.13 Reverse Power Protection			
55	32R picked up	1 = 32R picked up	2
56	32R TRIP	1 = 32R TRIP	1
57	32R+SV TRIP	1 = 32R TRIP with stop valve	1
3.1.14 Forward Power Supervision			
58	32F< picked up	1 = 32F P< stage picked up	2
59	32F> picked up	1 = 32F P> stage picked up	2
60	32F P< TRIP	1 = 32F P< stage TRIP	1
61	32F P> TRIP	1 = 32F P> stage TRIP	1
3.1.15 Fuse Failure Monitor			
62	VT Fuse Failure	1 = Voltage Transformer Fuse Failure	3
3.1.16 Underexcitation Protection			
63	40 Vexc failure	1 = 40 Exc. voltage failure recognized	3
64	40 picked up	1 = 40 picked up	2
65	40-1 TRIP	1 = 40 characteristic 1 TRIP	1
66	40-2 TRIP	1 = 40 characteristic 2 TRIP	1
67	40&V<TRIP	1 = 40 characteristic&Vexc< TRIP	1
68	40-3 TRIP	1 = 40 characteristic 3 TRIP	1
3.1.17 Circuit Breaker Failure Protection			
69	50BF pickup	1 = 50BF picked up	2
70	50BF TRIP	1 = 50BF TRIP	1
3.1.18 Impedance Protection			
71	21 Fault Ph A	1 = 21 Fault detection , Phase A	2
72	21 Fault Ph B	1 = 21 Fault detection , Phase B	2
73	21 Fault Ph C	1 = 21 Fault detection , Phase C	2
74	21 I> & U<	1 = 21 O/C with undervoltage seal in	3
75	21 Z1< TRIP	1 = 21 Z1< TRIP	1
76	21 Z1B< TRIP	1 = 21 Z1B< TRIP	1
77	21 Z2< TRIP	1 = 21 Z2< TRIP	1
78	21 T3> TRIP	1 = 21 T3> TRIP	1
3.1.19 External Trip Coupling			
79	Ext 1 Gen.TRP	1 = External trip 1: General TRIP	1
80	Ext 2 Gen.TRP	1 = External trip 2: General TRIP	1

Binary Input Points			
Static (Steady-State) Object Number: 1			
Change Event Object Number: 2			
Request Function Codes supported: 1 (read)			
Static Variation reported when variation 0 requested: 1 (Binary Input with status)			
Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time)			
Point Index	Name	Description	Class
81	Ext 3 Gen.TRIP	1 = External trip 3: General TRIP	1
82	Ext 4 Gen.TRIP	1 = External trip 4: General TRIP	1
3.1.20 Inadvertent Energisation Protection			
83	50/27 picked up	1 = 50/27 picked up	2
84	50/27 TRIP	1 = 50/27 TRIP	1
3.1.21 Trip Coil Monitor			
85	FAIL: Trip cir.	1 = 74TC Failure Trip Circuit	3
3.1.22 Inverse Undervoltage Protection Up<			
86	Vp< picked up	1 = Inverse Undervoltage Vp< picked up	2
87	Vp< TRIP	1 = Inverse Undervoltage Vp< TRIP	1
3.1.23 Startup Supervision of Motors			
88	48 Rot. locked	1 = 48 Rotor LOCKED after Lock. Rotor Time	3
89	48 picked up	1 = 48 Starting time supervision picked up	2
90	48 TRIP	1 = 48 Starting time supervision TRIP	1
3.1.24 Startup Counter for Motors			
91	66 TRIP	1 = 66 Restart inhibit motor TRIP	1
3.1.25 Rotor Ground Fault Protection			
92	64R-1 picked up	1 = 64R-1 picked up	2
93	64R-2 TRIP	1 = 64R-2 TRIP	1
3.1.26 DC Voltage/Current Protection			
94	DC Prot.pick.up	1 = DC protection picked up	2
95	DC Prot. TRIP	1 = DC protection TRIP	1
3.1.27 State of the Out-Of-Step Protection			
96	78 det. char. 1	1 = 78 characteristic 1 picked up	2
97	78 det. char. 2	1 = 78 characteristic 2 picked up	2
98	78 TRIP char. 1	1 = 78 TRIP characteristic 1	1
99	78 TRIP char. 2	1 = 78 TRIP characteristic 2	1
3.1.28 Differential Protection			
100	87 picked up	1 = 87 Differential protection picked up	2
101	87 TRIP	1 = 87 Differential protection TRIP	1
102	87 TRIP Phase A	1 = 87 Differential protection: TRIP Phase A	1
103	87 TRIP Phase B	1 = 87 Differential protection: TRIP Phase B	1
104	87 TRIP Phase C	1 = 87 Differential protection: TRIP Phase C	1
105	87 Diff> TRIP	1 = 87 Differential prot.: TRIP by IDIFF>	1

Binary Input Points			
Static (Steady-State) Object Number: 1			
Change Event Object Number: 2			
Request Function Codes supported: 1 (read)			
Static Variation reported when variation 0 requested: 1 (Binary Input with status)			
Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time)			
Point Index	Name	Description	Class
106	87 Diff>> TRIP	1 = 87 Diff>> TRIP	1
3.1.29 100% Stator Ground Fault Protection			
107	SGF 100 ALARM	1 = Stator ground fct. prot. 100% Alarm stage	2
108	SGF100 TRIP	1 = Stator ground fct. prot. 100% TRIP	1
3.1.30 64R Protection 1- 3 Hz			
109	64R-1_3Hz pickup	1 = 64R-1 (1-3Hz) picked up (Alarm)	2
110	64R-2_3Hz TRIP	1 = 64 R-2 (1-3 Hz) TRIP	1
3.1.31 Restricted Ground Fault Protection			
111	87N picked up	1 = 87N picked up	2
112	87N TRIP	1 = 87N TRIP	1
3.1.32 Failure Messages of the Protection Functions			
113	Failure SGF	1 = Failure stator ground fct. prot. 100%	3
114	Failure 64R	1 = Failure 64R: measuring circuit	3
115	Fail 64R 1-3 Hz	1 = Failure 64R protection (1-3 Hz)	3
3.1.33 Diagnosis			
116	Device OK	1 = Update of the device replica in the SIPROTEC device completed after iinitia-start or restart	3
117	ProtActive	1 = At least one protection function is active	3
118	Error Sum Alarm	1 = Error with a summary alarm ON	3
119	Alarm Sum Event	1 = Alarm summary event ON	3
120	Relay PICKUP	1 = Relay PICKUP (group signal)	2
121	Relay TRIP	1 = Relay GENERAL TRIP command	1
122	Operat. Cond.	1 = Suitable measured quantities are present at the device inputs ($V > 0.05 * V_{nom}$, $I > 0.05 * I_{nom}$ and $10 \text{ Hz} < \text{Freq.} < 70 \text{ Hz}$)	3
3.1.34 User-defined annunciations			
123	<user-defined>	not pre-allocated	3
124	<user-defined>	not pre-allocated	3
125	<user-defined>	not pre-allocated	3
126	<user-defined>	not pre-allocated	3
127	<user-defined>	not pre-allocated	3
128	<user-defined>	not pre-allocated	3
129	<user-defined>	not pre-allocated	3
130	<user-defined>	not pre-allocated	3
131	<user-defined>	not pre-allocated	3
132	<user-defined>	not pre-allocated	3

Binary Input Points			
Static (Steady-State) Object Number: 1			
Change Event Object Number: 2			
Request Function Codes supported: 1 (read)			
Static Variation reported when variation 0 requested: 1 (Binary Input with status)			
Change Event Variation reported when variation 0 requested: 2 (Binary Input Change with Time)			
Point Index	Name	Description	Class
133	<user-defined>	not pre-allocated	3
134	<user-defined>	not pre-allocated	3
3.1.35 Setting group			
135	Group A	Setting Group A; ON=1, OFF=0	1
136	Group B	Setting Group B; ON=1, OFF=0	1
137	<unnamed>	ON=1, OFF=0	1
138	<unnamed>	ON=1, OFF=0	1
3.1.36 User-allocated single-point indications			
139	<unnamed> ¹	User input 1; 0 = open, 1 = close	2
140	<unnamed>	User input 2; 0 = open, 1 = close	2
141	<unnamed>	User input 2; 0 = open, 1 = close	2
142	<unnamed>	User input 2; 0 = open, 1 = close	2
143	<unnamed>	User input 2; 0 = open, 1 = close	2
144	<unnamed>	User input 2; 0 = open, 1 = close	2
145	<unnamed>	User input 2; 0 = open, 1 = close	2
146	<unnamed>	User input 2; 0 = open, 1 = close	2
147	<unnamed>	User input 2; 0 = open, 1 = close	2
148	<unnamed>	User input 2; 0 = open, 1 = close	2
149	<unnamed>	User input 2; 0 = open, 1 = close	2
150	<unnamed>	User input 2; 0 = open, 1 = close	2
151	<unnamed>	User input 2; 0 = open, 1 = close	2
152	<unnamed>	User input 2; 0 = open, 1 = close	2
153	<unnamed>	User input 2; 0 = open, 1 = close	2
154	<unnamed>	User input 2; 0 = open, 1 = close	2
3.1.37 Double commands - checkback signals and status			
155	Switch 1	Input state of switch 1; 0 = open, 1 = close	1
156	Switch 1	Switch 1 failure status; 0 = switch position is open or close, 1 = switch is in an intermediate position or position state is incorrect.	1
157	Switch 2	Input state of disconnect switch 2; 0 = open, 1 = close	1
158	Switch 2	Switch 2 failure status; 0 = switch position is open or close, 1 = switch is in an intermediate position or position state is incorrect.	1

1. The names are defined during indication allocation using parametrization software DIGSI 4

3.2 Control Relay Output Blocks/Binary Output Status

Point Index	Name	Description	Supported Control Relay Output Block Fields
Binary Output Status Points Object Number: 10 Request Function Codes supported: 1 (Read) Default Variation reported when variation 0 requested: 2 (Binary Output Status)			
Control Relay Output Blocks/Binary Output Status Object Number: 12 Request Function Codes supported: 3 (select), 4 (operate), 5 (direct operate), 6 (direct operate, no ack)			
3.2.1 Internal commands			
0	Group A	Select setting group A and deactivate setting group B,C,D (ref. to chap.1.2.2)	Latch On
1	Group B	Select setting group B and deactivate setting group A,C,D	Latch On
2	reserved		Latch On
3	reserved		Latch On
3.2.2 User-allocated single commands			
Please ref. to chap.1.2.1 for additional notes.			
4	<unnamed> ¹	User output 1	Latch On, Latch Off
5	<unnamed>	User output 2	Latch On, Latch Off
6	<unnamed>	User output 3	Latch On, Latch Off
7	<unnamed>	User output 4	Latch On, Latch Off
8	<unnamed>	User output 5	Latch On, Latch Off
9	<unnamed>	User output 6	Latch On, Latch Off
10	<unnamed>	User output 7	Latch On, Latch Off
11	<unnamed>	User output 8	Latch On, Latch Off
12	<unnamed>	User output 9	Latch On, Latch Off
13	<unnamed>	User output 10	Latch On, Latch Off
14	<unnamed>	User output 11	Latch On, Latch Off
15	<unnamed>	User output 12	Latch On, Latch Off
16	<unnamed>	User output 13	Latch On, Latch Off
17	<unnamed>	User output 14	Latch On, Latch Off
18	<unnamed>	User output 15	Latch On, Latch Off
19	<unnamed>	User output 16	Latch On, Latch Off
3.2.3 External commands (Double commands)			
20	Switch 1	Trip Switch 1	Trip, Pulse On (On-Time Fixed ²)

Binary Output Status PointsObject Number: **10**Request Function Codes supported: **1 (Read)**Default Variation reported when variation 0 requested: **2 (Binary Output Status)****Control Relay Output Blocks/Binary Output Status**Object Number: **12**Request Function Codes supported: **3 (select), 4 (operate), 5 (direct operate),
6 (direct operate, no ack)**

Point Index	Name	Description	Supported Control Relay Output Block Fields
21	Switch 1	Close Switch 1	Close, Pulse On (On-Time Fixed)
22	Switch 2	Trip Switch 2	Trip, Pulse On (On-Time Fixed)
23	Switch 2	Close Switch 2	Close, Pulse On (On-Time Fixed)

- 1.The names are defined during indication allocation using parametrization software DIGSI 4
- 2.The On-Time is fixed within the SIPROTEC parameter package for each common object.
The Control Relay Output Block information on-time will be ignored.

3.3 Counters

Counters			
Static (Steady-State) Object Number: 20			
Change Event Object Number: 22			
Request Function Codes supported: 1 (read)			
Static Variation reported when variation 0 requested: 1 (32-Bit Counter with Flag)			
Change Event Variation reported when variation 0 requested: 1 (32-Bit Counter without Time)			
Point Index	Name	Description	Scaling($2^{32}-1$ of the unsigned long-value corresponds to...)
0	Wp+	Wp Forward (Metered measurand derived from measured values)	$2^{31}-1$ impulses
1	Wq+	Wq Forward (Metered measurand derived from measured values)	$2^{31}-1$ impulses
2	Wp-	Wp Reverse (Metered measurand derived from measured values)	$2^{31}-1$ impulses
3	Wq-	Wq Reverse (Metered measurand derived from measured values)	$2^{31}-1$ impulses

3.4 Analog Inputs

3.4.1 Standardmapping 1

Analog Inputs				
Static (Steady-State) Object Number: 30				
Change Event Object Number: 32				
Request Function Codes supported: 1 (read)				
Static Variation reported when variation 0 requested: 02 (16-Bit Analog Input)				
Change Event Variation reported when variation 0 requested: 02 (Analog Change Event without Time)				
Point Index	Name	Description	Scaling(32767 corresponds to ...)	Default Change Event assigned Class
3.4.1.1 Recorded measured values				
0	IA S1=	Operat. meas. current A side 1	327.67 %	3
1	IB S1=	Operat. meas. current B side 1	327.67 %	3
2	IC S1=	Operat. meas. current C side 1	327.67 %	3
3	IA S2=	Operat. meas. current A side 2	327.67 %	3
4	IB S2=	Operat. meas. current B side 2	327.67 %	3
5	IC S2=	Operat. meas. current C side 2	327.67 %	3
6	Va-b=	Va-b	327.67 %	3
7	Vb-c=	Vb-c	327.67 %	3
8	Vc-a=	Vc-a	327.67 %	3
9	P =	P (active power)	327.67 %	3
10	Q =	Q (reactive power)	327.67 %	3
11	f =	Frequency	327.67 Hz	3
12	I2 =	I2 (negative sequence)	327.67 %	3
3.4.1.2 Thermal measured values				
13	Θ / Θ trip =	Temperat. rise for warning and trip	327.67 %	3
14	<user-defined> ¹	not pre-allocated		3
3.4.1.3 Min/Max values				
15	<user-defined>	not pre-allocated		3
16	<user-defined>	not pre-allocated		3
17	<user-defined>	not pre-allocated		3
18	<user-defined>	not pre-allocated		3
19	<user-defined>	not pre-allocated		3
20	<user-defined>	not pre-allocated		3
21	<user-defined>	not pre-allocated		3
22	<user-defined>	not pre-allocated		3
23	<user-defined>	not pre-allocated		3
24	<user-defined>	not pre-allocated		3
25	<user-defined>	not pre-allocated		3

Analog Inputs				
Static (Steady-State) Object Number: 30				
Change Event Object Number: 32				
Request Function Codes supported: 1 (read)				
Static Variation reported when variation 0 requested: 02 (16-Bit Analog Input)				
Change Event Variation reported when variation 0 requested: 02 (Analog Change Event without Time)				
Point Index	Name	Description	Scaling(32767 corresponds to ...)	Default Change Event assigned Class
26	<user-defined>	not pre-allocated		3
If Object 30 Variation 01 (32-Bit Analog Input) requesten, additional:				
3.4.1.4 Statistic values				
27	<user-defined>	not pre-allocated		3
28	<user-defined>	not pre-allocated		3
29	<user-defined>	not pre-allocated		3
30	<user-defined>	not pre-allocated		3
31	<user-defined>	not pre-allocated		3
32	<user-defined>	not pre-allocated		3
33	<user-defined>	not pre-allocated		3
34	<user-defined>	not pre-allocated		3
35	<user-defined>	not pre-allocated		3
36	<user-defined>	not pre-allocated		3
37	<user-defined>	not pre-allocated		3
38	<user-defined>	not pre-allocated		3

1.The names are defined during indication allocation using parametrization software DIGSI 4. On this position <user-defined> all available measured values can be routed here.

3.4.2 Standardmapping 2

Analog Inputs				
Static (Steady-State) Object Number: 30				
Change Event Object Number: 32				
Request Function Codes supported: 1 (read)				
Static Variation reported when variation 0 requested: 02 (16-Bit Analog Input)				
Change Event Variation reported when variation 0 requested: 02 (Analog Change Event without Time)				
Point Index	Name	Description	Scaling(32767 corresponds to ...)	Default Change Event assigned Class
3.4.2.1 Recorded measured values				
0	IA S1=	Operat. meas. current A side 1	327.67 %	3
1	IB S1=	Operat. meas. current B side 1	327.67 %	3
2	IC S1=	Operat. meas. current C side 1	327.67 %	3
3	IA S2=	Operat. meas. current A side 2	327.67 %	3
4	IB S2=	Operat. meas. current B side 2	327.67 %	3
5	IC S2=	Operat. meas. current C side 2	327.67 %	3
6	Va-b=	Va-b	327.67 %	3
7	Vb-c=	Vb-c	327.67 %	3
8	Vc-a=	Vc-a	327.67 %	3
9	P =	P (active power)	327.67 %	3
10	Q =	Q (reactive power)	327.67 %	3
11	f =	Frequency	327.67 Hz	3
12	I2 =	I2 (negative sequence)	327.67 %	3
3.4.2.2 Thermal measured values				
13	Θ / Θ trip =	Temperat. rise for warning and trip	327.67 %	3
14	<user-defined> ¹	not pre-allocated		3
15	<user-defined> ¹	not pre-allocated		3
16	<user-defined> ¹	not pre-allocated		3
17	<user-defined> ¹	not pre-allocated		3
18	<user-defined> ¹	not pre-allocated		3
19	<user-defined> ¹	not pre-allocated		3
20	<user-defined> ¹	not pre-allocated		3
21	<user-defined> ¹	not pre-allocated		3
22	<user-defined> ¹	not pre-allocated		3
23	<user-defined> ¹	not pre-allocated		3
24	<user-defined> ¹	not pre-allocated		3
3.4.2.3 Min/Max values				
25	<user-defined>	not pre-allocated		3
26	<user-defined>	not pre-allocated		3
27	<user-defined>	not pre-allocated		3
28	<user-defined>	not pre-allocated		3

Analog Inputs				
Static (Steady-State) Object Number: 30				
Change Event Object Number: 32				
Request Function Codes supported: 1 (read)				
Static Variation reported when variation 0 requested: 02 (16-Bit Analog Input)				
Change Event Variation reported when variation 0 requested: 02 (Analog Change Event without Time)				
Point Index	Name	Description	Scaling(32767 corresponds to ...)	Default Change Event assigned Class
29	<user-defined>	not pre-allocated		3
30	<user-defined>	not pre-allocated		3
31	<user-defined>	not pre-allocated		3
32	<user-defined>	not pre-allocated		3
33	<user-defined>	not pre-allocated		3
34	<user-defined>	not pre-allocated		3
35	<user-defined>	not pre-allocated		3
36	<user-defined>	not pre-allocated		3
If Object 30 Variation 01 (32-Bit Analog Input) requesten, additional:				
3.4.2.4 Statistic values				
37	<user-defined>	not pre-allocated		3
38	<user-defined>	not pre-allocated		3
39	<user-defined>	not pre-allocated		3
40	<user-defined>	not pre-allocated		3
41	<user-defined>	not pre-allocated		3
42	<user-defined>	not pre-allocated		3
43	<user-defined>	not pre-allocated		3
44	<user-defined>	not pre-allocated		3
45	<user-defined>	not pre-allocated		3
46	<user-defined>	not pre-allocated		3
47	<user-defined>	not pre-allocated		3
48	<user-defined>	not pre-allocated		3

1.The names are defined during indication allocation using parametrization software DIGSI 4. On this position <user-defined> all available measured values can be routed here.

Glossary

AME	Asynchronous interface module with (electrical) isolated RS485 interface for the SIPROTEC devices from Siemens.
AMO	Asynchronous interface module with optical interface for the SIPROTEC devices from Siemens.
AR	Automatic Recloser
CFC	Continuous Function Chart
DC	Double Command
DIGSI	Parameterization system for SIPROTEC devices
DNP	Distributed Network Protocol
DP	Double-point Indication
Input data/ input direction	Data from the DNP slave to the DNP master.
Mapping	Allocation of the SIPROTEC data objects to the DNP point index.
Output data/ output direction	Data from the DNP master to the DNP slave.
RTU	Remote Terminal Unit
SC	Single Command
SP	Single-point Indication



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