

# SIPROTEC

## Differential Protection 7UT613 / 7UT633 / 7UT635

Communication module

DNP 3.0

Bus mapping / Point lists

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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.

1.01.00

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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
Differential Protection SIPROTEC 7UT613 / 7UT633 / 7UT635	Function, operation, assembly and commissioning of the SIPROTEC® device 7UT613 / 7UT633 / 7UT635	C53000-G1176- C160-2
DNP 3.0 Communication Database	DNP communication database of the SIPROTEC® devices	C53000-L1840-A001- 03

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 7UT613 / 7UT633 / 7UT635 with
  - firmware version 4.0 or higher and
  - DNP communication module version 02.00.01 or higher.

For device parameterization **DIGSI® 4 version 4.4 or higher** and DNP standard mappings 3-1 to 3-n (n = device type dependent number of standard mappings) have to be used.

### **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<sup>®</sup> 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<sup>®</sup> 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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*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".
- "Error Board 1", "Error Board 2", "Error Board 3", "Error Board 4", "Error Board 5", "Error Board 6"
- "Error Thermobox"
- "Error Offset"
- "Broken wire"
- Jumper settings inconsistent with parametrization of analog inputs

**Reference** ref to chap. 3.1.1

### 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 Module B", "Error Module C", "Error Module D"
- "Alarm NO calibration", "Failure Battery", "Alarm Real Time Clock",
- "Failure Phase Sequence"
- "Failure Current Balance", "Failure Voltage Balance", "Failure Current Summation".

**Reference**            ret. to chap. 3.1.1

### 1.1.3 Stop Data Transmission

The functionality "Stop data transmission" is not supported via DNP communication. If "Stop data transmission" is active nevertheless data via DNP will be transmitted furthermore.

The annunciation "DataStop" signals the activation of "Stop data transmission" however and can be evaluated correspondingly in the DNP master.

**Reference**            ref. to chap. 3.1.2

## 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<sup>®</sup> devices.

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

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### 1.2.1 Single Commands

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

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

**Reference**            ref. to chap. 3.2.2

## 1.2.2 Control mode REMOTE

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

- Changing the Control mode REMOTE“ to UNLOCKED permits one unlocked control operation via DNP. 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 DNP for a period of 5 minutes, then the “Control mode REMOTE“ is automatically reset to LOCKED.

**Reference** ref. to chap. 3.2.1

## 1.2.3 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.

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

Measurement: Full Scale Voltage (parameter address 1103):

- >100 ... 1000 kV

Measurement: Full Scale Current (parameter address 1104):

- >10 ... 1000 A

Product of:

- Transformers – Rated Primary Voltage (parameter address 0203) and
- Ratio factor  $V_{ph}/V_{delta}$  (parameter address 0211)

- >100 ... 1000 kV

Product of:

- Transformers– CT Rated primary current (parameter address 0205) and
- Ratio factor  $I_4/I_{ph}$  (parameter address 0221)

- >10 ... 1000 A

Power values:

- Product of Full Scale Voltage and Full Scale Current multiplied by  $\sqrt{3}$
- >100 ... 1000 MW (MVAR)



#### Note

Changes of the scaling of the measured values are possible in adaptation to the concrete installation environment (ref. to manual "DNP 3.0 Communication Database").

## 1.4 Metered measurands

### Scaling

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

**60000 impulses per hour for V = V<sub>prim</sub> and I = I<sub>prim</sub>**

$V_{\text{prim}} = \text{Full Scale Voltage}$   
(parameter address = 1103)

$I_{\text{prim}} = \text{FULL SCALE CURRENT}$   
parameter address = 1104)

### Example

In the parameter set is configured:

$I_{\text{prim}} = 1000 \text{ A}$  and  $V_{\text{prim}} = 400.0 \text{ kV}$ ,

60000 impulses correspond so that:

$1 \text{ h} * 1000 \text{ A} * 400 \text{ kV} * \sqrt{3} = 692.82 \text{ MWh}$



#### 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<sup>®</sup> 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: <b>SIEMENS AG</b>	
Device Name: <b>7UT613 / 7UT633 / 7UT635</b>	
Highest DNP Level Supported: For Requests    DNP-L2 For Responses   DNP-L2	Device Function: <input type="checkbox"/> Master <input checked="" type="checkbox"/> Slave
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table):  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.  16-bit Analog Change Events with Time may be requested.  The write function code for Object 50 (Time and Date), variation 1, is supported.  The features outlined within this Device Profile have successfully passed DNP Conformance Test of Subset Level 2 outlined in DNP3-2000 IED Certification Procedure.	
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

# 3

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### 3.1 Binary Input Points

<b>Binary Input Points</b>			
Static (Steady-State) Object Number: <b>1</b>			
Change Event Object Number: <b>2</b>			
Request Function Codes supported: <b>1 (read)</b>			
Static Variation reported when variation 0 requested: <b>1 (Binary Input with status)</b>			
Change Event Variation reported when variation 0 requested: <b>2 (Binary Input Change with Time)</b>			
Point Index	Name	Description	Class
<b>3.1.1 Diagnosis / General alarms</b>			
0	Device OK	Device is operational and protecting; ON=1 OFF=0	1
1	ProtActive	At least one protection funct. is active; ON=1 OFF=0	2
2	Settings Calc.	Setting calculation is running; ON=1 OFF=0	2
3	Error Sum Alarm	Error with a summary alarm; ON=1 OFF=0; (ref. to chap. 1.1.1)	2
4	Alarm Sum Event	Alarm summary event; ON=1 OFF=0 (ref. to chap. 1.1.2)	2
5	Relay PICKUP	Relay PICKUP; ON=1 OFF=0	1
6	Relay TRIP	Relay GENERAL TRIP command; ON=1 OFF=0	1
<b>3.1.2 Internal Mode Status</b>			
7	Data Stop	Data stop; ON = 1, OFF = 0; (ref. to chap. 1.1.3)	3
8	Test mode	Test mode; ON = 1, OFF = 0	3
9	Control auth	Control authority; 0=Remote; 1=Local (Activated for devices 7UT613 only)	1
10	ModeLOCAL	Mode Local; 0=lokal operation with interlocking; 1=lokal operation without interlocking; (Activated for devices 7UT613 only)	1
11	ModeREMOTE	Mode remote; 0=remote operation with interlocking; 1=remote operation without interlocking	1
12	Control auth	Control authority; 0=Remote; 1=Local (Activated for devices 7UT63x only)	1
13	ModeLOCAL	Mode Local; 0=lokal operation with interlocking; 1=lokal operation without interlocking; (Activated for devices 7UT63x only)	1
<b>3.1.3 Differential protection</b>			
14	87 picked up	87 Differential protection picked up; ON=1 OFF=0	2
15	87 TRIP	87 Differential protection TRIP; ON=1 OFF=0	2
16	87 TRIP Phase A	87 Differential protection: TRIP Phase A; ON=1 OFF=0	2
17	87 TRIP Phase B	87 Differential protection: TRIP Phase B; ON=1 OFF=0	2
18	87 TRIP Phase C	87 Differential protection: TRIP Phase C; ON=1 OFF=0	3
19	87 Diff> TRIP	87 Differential prot.: TRIP by IDIFF>; ON=1 OFF=0	3
20	87 Diff>> TRIP	87 Differential prot.: TRIP by IDIFF>>; ON=1 OFF=0	3
<b>3.1.4 Restricted ground fault protection</b>			
21	87G picked up	87G RGF picked up; ON=1 OFF=0	3
22	87G TRIP	87G RGB TRIP; ON=1 OFF=0	2
<b>3.1.5 Overcurrent protection</b>			

<b>Binary Input Points</b>			
Static (Steady-State) Object Number: <b>1</b>			
Change Event Object Number: <b>2</b>			
Request Function Codes supported: <b>1 (read)</b>			
Static Variation reported when variation 0 requested: <b>1 (Binary Input with status)</b>			
Change Event Variation reported when variation 0 requested: <b>2 (Binary Input Change with Time)</b>			
Point Index	Name	Description	Class
23	50(N)/51(N) PU	50(N)/51(N) O/C PICKUP; ON=1 OFF=0	2
24	50(N)/51(N)TRIP	50(N)/51(N) TRIP; ON=1, OFF=0	2
<b>3.1.6 Overcurrent protection Phase</b>			
25	50/51 Ph A PU	50/51 Phase A picked up; ON=1, OFF=0	3
26	50/51 Ph B PU	50/51 Phase B picked up; ON=1, OFF=0	3
27	50/51 Ph C PU	50/51 Phase C picked up; ON=1, OFF=0	3
28	50-2 TRIP	50-2 TRIP; ON=1, OFF=0	3
29	50/51 TRIP	50/51 I> TRIP; ON=1, OFF=0	3
30	51 picked up	51 picked up; ON=1, OFF=0	3
31	51 TRIP	51 TRIP; ON=1, PFF=0	3
32	Ia InRush PU	Phase A InRush picked up; ON=1 OFF=0	2
33	Ib InRush PU	Phase B InRush picked up; ON=1 OFF=0	2
34	Ic InRush PU	Phase C InRush picked up; ON=1 OFF=0	3
35	50/51 Dset.ACT	Dynamic settings 50/51 are ACTIVE; ON=1 OFF=0	3
<b>3.1.7 Overcurrent protection 3I0 (Neutral)</b>			
36	50N/51N PU	50N/51N picked up; ON=1 OFF=0	3
37	50N-2 TRIP	50N-2 TRIP; ON=1 OFF=0	3
38	50N-1 TRIP	50N-1 TRIP; ON=1 OFF=0	3
39	51N picked up	51N picked up; ON=1 OFF=0	3
40	51N TRIP	51N TRIP; ON=1 OFF=0	3
41	50/51N InRsh PU	50N/51N InRush picked up; ON=1 OFF=0	3
42	50/51N Dset.ACT	Dynamic settings 50/51N are ACTIVE; ON=1 OFF=0	3
<b>3.1.8 Overcurrent protection Ground</b>			
43	50G/51G Pickedup	50G/51G picked up; ON=1 OFF=0	3
44	50G-2 TRIP	50G-2 TRIP; ON=1 OFF=0	3
45	50G-1 TRIP	50G-1 TRIP; ON=1 OFF=0	3
46	51G picked up	51G picked up; ON=1 OFF=0	3
47	51G TRIP	51G TRIP; ON=1 OFF=0	2
48	Gnd InRush PU	Ground InRush picked up; ON=1 OFF=0	3
49	50/51G Dset.ACT	Dynamic settings 50/51G are ACTIVE; ON=1 OFF=0	3
<b>3.1.9 Thermal overload protection</b>			
50	49 O/L I Alarm	49 Overload Current Alarm (I alarm); ON=1 OFF=0	3
51	49 O/L $\Theta$ Alarm	49 Thermal Overload Alarm; ON=1 OFF=0	3
52	49 Th O/L TRIP	49 Thermal Overload TRIP; ON=1 OFF=0	3

<b>Binary Input Points</b>			
Static (Steady-State) Object Number: <b>1</b>			
Change Event Object Number: <b>2</b>			
Request Function Codes supported: <b>1 (read)</b>			
Static Variation reported when variation 0 requested: <b>1 (Binary Input with status)</b>			
Change Event Variation reported when variation 0 requested: <b>2 (Binary Input Change with Time)</b>			
Point Index	Name	Description	Class
53	49 hot spot Alarm	49 Thermal Overload hot spot Alarm; ON=1 OFF=0	3
54	49 hot spot TRIP	49 Thermal Overload hot spot TRIP; ON=1 OFF=0	3
55	49 a.rate Alarm	49 Thermal Overload aging rate Alarm; ON=1 OFF=0	3
56	49 ag.rate TRIP	49 Thermal Overload aging rate TRIP; ON=1 OFF=0	3
<b>3.1.10 Unbalanced load protection</b>			
57	46-2 picked up	46-2 picked up; ON=1 OFF=0	3
58	46-1 picked up	46-1 picked up; ON=1 OFF=0	3
59	46-TOC pickedup	46-TOC pickedup; ON=1 OFF=0	2
60	46 TRIP	46 TRIP; ON=1 OFF=0	2
<b>3.1.11 Circuit breaker failure protection</b>			
61	50BF int Pickup	50BF (internal) PICKUP; ON=1 OFF=0	2
62	50BF ext Pickup	50BF (external) PICKUP; ON=1 OFF=0	2
63	50BF-1 loc TRIP	50BF-1 TRIP (local trip); ON=1 OFF=0	2
64	50BF-2 bus TRIP	50BF-2 TRIP (busbar trip); ON=1 OFF=0	2
<b>3.1.12 Overcurrent protection 1-phase</b>			
65	50 1Ph. PU	50 O/C 1Phase picked up; ON=1 OFF=0	3
66	50-1 1Ph TRIP	50-1 O/C 1Phase TRIP; ON=1 OFF=0	3
67	50-2 1Ph TRIP	50-2 O/C 1Phase TRIP; ON=1 OFF=0	3
<b>3.1.13 Overexcitation protection</b>			
68	24 warn	24 V/f warning stage; ON=1 OFF=0	3
69	24-1 picked up	24-1 V/f picked up; ON=1 OFF=0	3
70	24-2 picked up	24-2 V/f >> picked up; ON=1 OFF=0	3
71	24-2 TRIP	24-2 TRIP of V/f>> stage; ON=1 OFF=0	3
72	24 th. TRIP	24 TRIP of th. stage; ON=1 OFF=0	3
<b>3.1.14 Message Thermobox (7XV566)</b>			
73	Fail: RTD	Fail: RTD (broken wire/short circuite); ON=1 OFF=0	3
74	RTD 1 Warning	RTD 1 Warning; ON=1 OFF=0	3
75	RTD 1 Alarm	RTD 1 Alarm; ON=1 OFF=0	3
76	RTD 2 Warning	RTD 2 Warning; ON=1 OFF=0	3
77	RTD 2 Alarm	RTD 2 Alarm; ON=1 OFF=0	3
78	RTD 3 Warning	RTD 3 Warning; ON=1 OFF=0	3
79	RTD 3 Alarm	RTD 3 Alarm; ON=1 OFF=0	3
80	RTD 4 Warning	RTD 4 Warning; ON=1 OFF=0	3
81	RTD 4 Alarm	RTD 4 Alarm; ON=1 OFF=0	3



<b>Binary Input Points</b>			
Static (Steady-State) Object Number: <b>1</b>			
Change Event Object Number: <b>2</b>			
Request Function Codes supported: <b>1 (read)</b>			
Static Variation reported when variation 0 requested: <b>1 (Binary Input with status)</b>			
Change Event Variation reported when variation 0 requested: <b>2 (Binary Input Change with Time)</b>			
Point Index	Name	Description	Class
82	RTD 5 Warning	RTD 5 Warning; ON=1 OFF=0	3
83	RTD 5 Alarm	RTD 5 Alarm; ON=1 OFF=0	3
84	RTD 6 Warning	RTD 6 Warning; ON=1 OFF=0	3
85	RTD 6 Alarm	RTD 6 Alarm; ON=1 OFF=0	3
<b>3.1.15 External TRIP</b>			
86	Ext 1 Gen.TRP	External trip 1: General TRIP; ON=1 OFF=0	3
87	Ext 2 Gen.TRP	External trip 2: General TRIP; ON=1 OFF=0	3
<b>3.1.16 Trip circuit supervision</b>			
88	FAIL: Trip cir.	74TC Failure Trip Circuit; ON=1 OFF=0	3
<b>3.1.17 Setting group</b>			
89	Group A	Setting Group A; ON=1, OFF=0	1
90	Group B	Setting Group B; ON=1, OFF=0	1
91	Group C	Setting Group C; ON=1, OFF=0	1
92	Group D	Setting Group D; ON=1, OFF=0	1
<b>3.1.18 User-allocated single-point indications</b>			
93	<unnamed> <sup>1</sup>	User input 1; 0 = open, 1 = close	2
94	<unnamed>	User input 2; 0 = open, 1 = close	2
95	<unnamed>	User input 3; 0 = open, 1 = close	2
96	<unnamed>	User input 4; 0 = open, 1 = close	2
97	<unnamed>	User input 5; 0 = open, 1 = close	2
98	<unnamed>	User input 6; 0 = open, 1 = close	2
99	<unnamed>	User input 7; 0 = open, 1 = close	2
100	<unnamed>	User input 8; 0 = open, 1 = close	2
101	<unnamed>	User input 9; 0 = open, 1 = close	2
102	<unnamed>	User input 10; 0 = open, 1 = close	2
<b>3.1.19 Double commands - checkback signals and status</b>			
103	Switch 1	Input state of switch 1; 0 = open, 1 = close	1
104	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
105	Switch 2	Input state of disconnect switch 2; 0 = open, 1 = close	1
106	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
107	Switch 3	Input state of disconnect switch 3; 0 = open, 1 = close	1

<b>Binary Input Points</b>			
Static (Steady-State) Object Number: <b>1</b>			
Change Event Object Number: <b>2</b>			
Request Function Codes supported: <b>1 (read)</b>			
Static Variation reported when variation 0 requested: <b>1 (Binary Input with status)</b>			
Change Event Variation reported when variation 0 requested: <b>2 (Binary Input Change with Time)</b>			
Point Index	Name	Description	Class
108	Switch 3	Switch 3 failure status; 0 = switch position is open or close, 1 = switch is in an intermediate position or position state is incorrect.	1
109	Switch4	Input state of disconnect switch 4; 0 = open, 1 = close	1
110	Switch 4	Switch 4 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
<b>Binary Output Status Points</b>			
Object Number: <b>10</b>			
Request Function Codes supported: <b>1 (Read)</b>			
Default Variation reported when variation 0 requested: <b>2 (Binary Output Status)</b>			
<b>Control Relay Output Blocks/Binary Output Status</b>			
Object Number: <b>12</b>			
Request Function Codes supported: <b>3 (select), 4 (operate), 5 (direct operate), 6 (direct operate, no ack)</b>			
<b>3.2.1 Internal commands</b>			
0	Group A	Select setting group A and deactivate setting group B,C,D (ref. to chap. 1.2.3)	Latch On
1	Group B	Select setting group B and deactivate setting group A,C,D	Latch On
2	Group C	Select setting group C and deactivate setting group A,B,D	Latch On
3	Group D	Select setting group D and deactivate setting group A,B,C	Latch On
4	Protection	Protection activation	Latch On, Latch off
5	ModeREMOTE	Mode remote control; Latch on = UNLOCKED Latch Off = LOCKED (ref. to chap.1.2.2)	Latch On; Latch off
<b>3.2.2 User-allocated single commands</b>			
Please ref. to chap. 1.2.1 for additional notes.			
6	<unnamed> <sup>1</sup>	User output 1	Latch On, Latch Off
7	<unnamed>	User output 2	Latch On, Latch Off
<b>3.2.3 External commands (Double commands)</b>			
8	Switch 1	Trip Switch 1	Trip, Pulse On (On-Time Fixed <sup>2</sup> )
9	Switch 1	Close Switch 1	Close, Pulse On (On-Time Fixed)
10	Switch 2	Trip Switch 2	Trip, Pulse On (On-Time Fixed)
11	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

<b>Counters</b>			
Static (Steady-State) Object Number: <b>20</b>			
Change Event Object Number: <b>22</b>			
Request Function Codes supported: <b>1 (read)</b>			
Static Variation reported when variation 0 requested: <b>1 (32-Bit Counter with Flag)</b>			
Change Event Variation reported when variation 0 requested: <b>1 (32-Bit Counter without Time)</b>			
<b>Point Index</b>	<b>Name</b>	<b>Description</b>	<b>Scaling(<math>2^{32}-1</math> of the unsigned long-value corresponds to...)</b>
0	<unnamed> <sup>1</sup>	User input 1	$2^{32}-1$ impulses
1	<unnamed>	User input 2	$2^{32}-1$ impulses
2	<unnamed>	User input 3	$2^{32}-1$ impulses
3	<unnamed>	User input 4	$2^{32}-1$ impulses

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

## 3.4 Analog Inputs

<b>Analog Inputs</b>				
Static (Steady-State) Object Number: <b>30</b>				
Change Event Object Number: <b>32</b>				
Request Function Codes supported: <b>1 (read)</b>				
Static Variation reported when variation 0 requested: <b>02 (16-Bit Analog Input)</b>				
Change Event Variation reported when variation 0 requested: <b>02 (Analog Change Event without Time)</b>				
Point Index	Name	Description	Scaling(32767 corresponds to ...)	Default Change Event assigned Class
<b>3.4.1 Recorded measured values</b>				
0	IA S1=	Primary fault current I A Side1	32767 A	1
1	IB S1=	Primary fault current I B Side1	32767 A	1
2	IC S1=	Primary fault current I C Side1	32767 A	1
3	IA S2=	Primary fault current I A Side2	327.67 A	1
4	IB S2=	Primary fault current I B Side2	327.67 A	1
5	IC S2=	Primary fault current I C Side2	327.67 A	1
6	IA S3=	Primary fault current I A Side3	32767 A	1
7	IB S3=	Primary fault current I B Side3	32767 A	1
8	IC S3=	Primary fault current I C Side3	32767 A	1
9	Freq=	Frequency	3276.7 Hz	1
10	3I0S1	3I0 (zero sequence) of Side 1 [%] is	32767 A	1
11	I1S1	I1 (positive sequence) of Side 1 [%] is	32767 A	2
12	I2S1	I2 (negative sequence) of Side 1 [%] is	32767 A	2
13	3I0S2	3I0 (zero sequence) of Side 2 [%] is	327.67 A	1
14	I1S2	I1 (positive sequence) of Side 2 [%] is	327.67 A	2
15	I2S2	I2 (negative sequence) of Side 2 [%] is	327.67 A	2
16	3I0S3	3I0 (zero sequence) of Side 3 [%] is	32767 A	1
17	I1S3	I1 (positive sequence) of Side 3 [%] is	32767 A	2
18	I2S3	I2 (negative sequence) of Side 3 [%] is	32767 A	2
<b>3.4.2 Thermal measured values</b>				
19	Θ / Θ trip =	Temperat. rise for warning and trip	327.67 %	2
20	Θ leg1=	Hot spot temperature of leg 1	3276.7 C <sup>0</sup> /F <sup>01</sup>	2
21	Θ leg2=	Hot spot temperature of leg 2	3276.7 C <sup>0</sup> /F <sup>0</sup>	2
22	Θ leg3=	Hot spot temperature of leg 3	3276.7 C <sup>0</sup> /F <sup>0</sup>	2
23	Θ leg12=	Hot spot temperature of leg 12	3276.7 C <sup>0</sup> /F <sup>0</sup>	2
24	Θ leg23=	Hot spot temperature of leg 23	3276.7 C <sup>0</sup> /F <sup>0</sup>	2
25	Θ leg31=	Hot spot temperature of leg 31	3276.7 C <sup>0</sup> /F <sup>0</sup>	2
26	Ag.Rate=	Aging Rate	327.67 %	2
27	ResWARN=	Load Reserve to warning level	327.67 %	2
28	ResALARM=	Load Reserve to alarm level	327.67 %	2

Point Index	Name	Description	Scaling(32767 corresponds to ...)	Default Change Event assigned Class
<b>Analog Inputs</b>				
Static (Steady-State) Object Number: <b>30</b>				
Change Event Object Number: <b>32</b>				
Request Function Codes supported: <b>1 (read)</b>				
Static Variation reported when variation 0 requested: <b>02 (16-Bit Analog Input)</b>				
Change Event Variation reported when variation 0 requested: <b>02 (Analog Change Event without Time)</b>				
<b>3.4.3 measured values Thermobox (7XV556)</b>				
29	⊖ RTD 1=	Temperature of RTD 1	3276.7 C°/F°	1
30	⊖ RTD 2=	Temperature of RTD 2	3276.7 C°/F°	1
31	⊖ RTD 3=	Temperature of RTD 3	3276.7 C°/F°	1
32	⊖ RTD 4=	Temperature of RTD 4	3276.7 C°/F°	2
33	⊖ RTD 5=	Temperature of RTD 5	3276.7 C°/F°	2
34	⊖ RTD 6=	Temperature of RTD 6	3276.7 C°/F°	2
<b>If Object 30 Variation 01 (32-Bit Analog Input) requesten, additional:</b>				
35	<unnamed> <sup>2</sup>	User input 1		3
36	<unnamed>	User input 2		3
37	<unnamed>	User input 3		3
38	<unnamed>	User input 4		3
39	<unnamed>	User input 5		3
40	<unnamed>	User input 6		3
41	<unnamed>	User input 7		3
42	<unnamed>	User input 8		3

1. The unit are defined in the parametrization software DIGSI® 4

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

# Glossary

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





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