SIPROTEC

Numerical Overhead Contact Line Protection Relais 7ST61 and 7ST63

Communication module

DNP 3.0

Bus mapping / Point lists

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Preface

Aim of this Manual

The manual is devided 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
SIPROTEC Numerical Overhead Contact Line Protection Relais 7ST61 and 7ST63	Function, operation, assembly and commissioning of the SIPROTEC® devices 7ST61 and 7ST63	C53000-G1176-C119-2
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 7ST61 and 7ST63 with
  - firmware version 4.0 or higher and
  - DNP communication module version 02.00.01 or higher.

For device parameterization **DIGSI®** 4 **version 4.5 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® 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.

Table of Contents

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.

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 enviroment (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. 3.1.1

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 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. 3.1.1

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® 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. 3.2.3

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.

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

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”).

DNP V3.0 Device Profile

2

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, qualifiers17 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 qfy) 17, 28 (index)		
1	2	Binary 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)
2	0	Binary Input Change - Any Variations	1 (read)	06 (no range) 07, 08 (limited qfy)		
2	2	Binary Input Change with Time	1 (read)	06 (no range) 07, 08 (limited qfy)	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 qfy) 17, 28 (index)		
10	2	Binary Output 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)
12	1	Contol Relay Output Block	3 (select) 4 (operate) 5 (direct op.) 6 (dir. op. noack)	00, 01 (start-stop) 07, 08 (limited qfy) 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 qfy) 17, 28 (index)		
20	1	32-Bit Binary Counter (with Flag)	1 (read)	00, 01 (start-stop) 06 (no range) 07, 08 (limited qfy) 17, 28 (index)		
22	0	Counter Change Event - Any Variations	1 (read)	06 (no range) 07, 08 (limited qfy)		
22	1	32-Bit Counter Change Event without Time	1 (read)	06 (no range) 07, 08 (limited qfy)		

OBJECTS			REQUEST		RESPONSE	
Object	**Vari-ation**	**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

DNP V3.0

DEVICE PROFILE DOCUMENT

Vendor Name: **SIEMENS AG**

Device Name: **7ST61 and 7ST63**

Highest DNP Level Supported:	Device Function:
For Requests DNP-L2 For Responses DNP-L2	☐ Master ☒ 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):	Maximum Application Fragment Size (octets):
Transmitted____292_____ Received_____292_____	Transmitted _Configurable up to 2048 Received_____2048_____
Maximum Data Link Re-tries:	**Maximum Application Layer Re-tries:**
☒ None ☐ Fixed at ☐ Configurable, range _0_to _255_	☒ None ☐ Configurable, range ____ to _____ (Fixed is not permitted)

Requires Data Link Layer Confirmation:

- ☐ Never
- ☐ Always
- ☐ Sometimes If 'Sometimes', when? _____
- ☒ 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	☐	None	☐	Fixed at _____	☐	Variable	☒	Configurable
Complete Appl. Fragment	☒	None	☐	Fixed at _____	☐	Variable	☐	Configurable
Application Confirm	☐	None	☐	Fixed at _____	☐	Variable	☒	Configurable
Complete Appl. Response	☒	None	☐	Fixed at _____	☐	Variable	☐	Configurable

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

Sends/Executes Control Operations:

WRITE Binary Outputs	☒	Never	☐	Always	☐	Sometimes	☐	Configurable
SELECT/OPERATE	☐	Never	☒	Always	☐	Sometimes	☐	Configurable
DIRECT OPERATE	☐	Never	☒	Always	☐	Sometimes	☐	Configurable
DIRECT OPERATE - NO ACK	☐	Never	☒	Always	☐	Sometimes	☐	Configurable
Count > 1	☒	Never	☐	Always	☐	Sometimes	☐	Configurable
Pulse On	☐	Never	☒	Always	☐	Sometimes	☐	Configurable
Pulse Off	☒	Never	☐	Always	☐	Sometimes	☐	Configurable
Latch On	☐	Never	☒	Always	☐	Sometimes	☐	Configurable
Latch Off	☐	Never	☒	Always	☐	Sometimes	☐	Configurable
Queue	☒	Never	☐	Always	☐	Sometimes	☐	Configurable
Clear Queue	☒	Never	☐	Always	☐	Sometimes	☐	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

Reports Binary Input Change Events when no specific variation requested: ☐ Never ☒ Only time-tagged ☐ Only non-time-tagged ☐ Configurable to send both, one or the other (attach explanation)	Reports time-tagged Binary Input Change Events when no specific variation requested: ☐ Never ☒ Binary Input Change With Time ☐ Binary Input Change With Relative Time ☐ Configurable (attach explanation)
Sends Unsolicited Responses: ☐ Never ☒ Configurable (Unsolicited data response mode are switched on/off via the configuration tool) ☐ Only certain objects ☐ Sometimes (attach explanation) ☒ ENABLE/DISABLE UNSOLICITED Function codes supported	Sends Static Data in Unsolicited Responses: ☒ Never ☐ When Device Restarts ☐ When Status Flags Change No other options are permitted.
Default Counter Object/Variation: ☐ No Counters Reported ☐ Configurable (attach explanation) ☒ Default Object ___20_____ Default Variation ___01_____ ☐ Point-by-point list attached Sends 32-Bit counters.	Counters Roll Over at: ☐ No Counters Reported ☐ Configurable (attach explanation) ☐ 16 Bits ☒ 32 Bits ☐ Other Value _____ ☐ Point-by-point list attached
Sends Multi-Fragment Responses: ☒ Yes ☐ No	

Point lists

3

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 Diagnosis / General alarms		
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	3
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	Definitive TRIP	Relay Definitive TRIP; ON=1, OFF=0	1
6	Relay PICKUP	Relay PICKUP; ON=1, OFF=0	1
7	Relay TRIP	Relay GENERAL TRIP command; ON=1, OFF=0	1
	3.1.2 Internal mode status		
8	DataStop	Stop data transmission; ON=1, OFF=0 (ref. to chap. 1.1.3)	3
9	Test mode	Test mode; ON=1, OFF=0	3
10	Control auth	Control authority; 0=Remote; 1=Local *(Activated for devices 7ST63/4 only)*	1
11	Control auth	Control authority; 0=Remote; 1=Local *(Activated for devices 7ST61/2 only)*	1
12	ModeLOCAL	Mode Local; 0=lokal operation with interlocking; 1=lokal operation without interlocking; *(Activated for devices 7ST63/4 only)*	1
13	ModeLOCAL	Mode Local; 0=lokal operation with interlocking; 1=lokal operation without interlocking; *(Activated for devices 7ST61/2 only)*	1
14	ModeREMOTE	Mode remote; 0=remote operation with interlocking; 1=remote operation without interlocking	1
	3.1.3 Distance protection		
15	21 PICKUP	21 PICKED UP; ON=1, OFF=0	3
16	21 TRPI	21 Distance General TRIP command; ON=1, OFF=0	3
17	21 Dis.Trip Z1	21 Trip in Zone Z1; ON=1, OFF=0	3
18	21 TRIP Z1B	21 TRIP in Zone Z1B; ON=1, OFF=0	3
19	21 TRIP Z1L	21 TRIP in Zone Z1L; ON=1, OFF=0	3
20	21 Trip Z2K	21 Trip in zone Z2 (short circuit); ON=1, OFF=0	3
21	21 Trip Z2L	21 Trip in zone Z2 (overload); ON=1, OFF=0	3
22	21 TRIP Z3K	21 TRIP in Zone Z3K; ON=1, OFF=0	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
23	21 TRIP Z3L	21 TRIP in Zone Z3L; ON=1, OFF=0	3
	3.1.4 High Speed O/C protection		
24	50HS PICKUP	50HS PICKED UP; ON=1, OFF=0	3
25	50HS Gen. TRIP	50HS General TRIP; ON=1, OFF=0	3
	3.1.5 Overcurrent protection		
26	Emer.Gen.Flt	Emerg. O/C prot.: General fault detect.; ON=1, OFF=0	3
27	Emer.Gen.Trip	Emerg. O/C protection: General Trip; ON=1, OFF=0	3
28	5X-B PICKUP	50(N)/51(N) Backup O/C PICKED UP; ON=1, OFF=0	2
29	5X-B TRIP	50(N)/51(N)-B General TRIP command; ON=1, OFF=0	2
30	50-STUB TRIP	50-STUB TRIP; ON=1, OFF=0	2
31	50(N)-B1 TRIP	50(N)-B1 TRIP; ON=1, OFF=0	3
32	50(N)-B2 TRIP	50(N)-B2 TRIP; ON=1, OFF=0	2
33	51 TRIP	51 TRIP; ON=1, OFF=0	3
	3.1.6 Thermal overload protection		
34	49 Th O/L TRIP	49 Thermal Overload TRIP; ON=1, OFF=0	2
35	49 O/L Θ Alarm	49 Thermal Overload Alarm; ON=1, OFF=0	2
	3.1.7 Defrosting protection		
36	Defrost PICKUP	Defrosting protection PICKED UP; ON=1, OFF=0	2
37	Defrost TRIP	Defrosting protection TRIP; ON=1, OFF=0	2
38	87 TRIP	87 Differential protection TRIP; ON=1, OFF=0	2
39	50-B1 IX TRIP	50-B1 defrosting current IX TRIP command; ON=1, OFF=0	3
40	50-B2 IX TRIP	50-B2 defrosting current IX TRIP command; ON=1, OFF=0	2
	3.1.8 Voltage protection		
41	27/59 PICKED UP	27/59 Over/Undervoltage prot. picked up; ON=1, OFF=0	3
42	U27/59 TRIP	27/59 Over/Undervoltage prot. TRIP comm.; ON=1, OFF=0	2
43	U>> Trip	Overvoltage trip : Stage U>>; ON=1, OFF=0	3
44	U> Trip	Overvoltage trip : Stage U>; ON=1, OFF=0	3
45	27-2 TRIP	27-2 Undervolt. TRIP command; ON=1, OFF=0	3
46	27-1 TRIP	27-1 Undervolt. TRIP command; ON=1, OFF=0	3
	3.1.9 Circuit breaker failure protection		
47	50BF pickup	50BF picked up; ON=1, OFF=0	3
48	50BF TRIP	50BF TRIP; ON=1, OFF=0	3
	3.1.10 Trip circuit supervision		
49	FAIL: Trip cir.	74TC Failure Trip Circuit; ON=1, OFF=0	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
	3.1.11 Circuit breaker test		
50	CB-TEST TRIP M	CB-Test: TRIP command main trip element; ON=1, OFF=0	3
51	CB-TEST TRIP B	CB-Test: TRIP command backup trip elem.; ON=1, OFF=0	3
52	CB-TEST CLOSE M	CB-Test: CLOSE command main trip element; ON=1, OFF=0	3
53	CB-TEST CLOSE M	CB-Test: CLOSE command backup trip elem.; ON=1, OFF=0	3
	3.1.12 Setting group		
54	Group A	Setting Group A; ON=1, OFF=0	1
55	Group B	Setting Group B; ON=1, OFF=0	1
56	Group C	Setting Group C; ON=1, OFF=0	1
57	Group D	Setting Group D; ON=1, OFF=0	1
	3.1.13 Internal controls		
58	79 OFF	79 Auto recloser is switched OFF; ON=1, OFF=0	1
59	79 TH OFF	79 Thermal AR is switched OFF; ON=1, OFF=0	1
60	Defrost OFF	Defrosting protection is switched OFF; ON=1, OFF=0	1
61	CAT1 ON	CAT1 is switched ON; ON=1, OFF=0	1
62	CAT2 ON	CAT2 is switched ON; ON=1, OFF=0	1
63	CAT3 ON	CAT3 is switched ON; ON=1, OFF=0	1
	3.1.14 Double commands - checkback signals and status		
64	52 Breaker	Input state of circuit breaker; 0 = open, 1 = close	1
65	52 Breaker status	Circuit breaker failure status; 0 = switch breaker position is open or close, 1 = switch breaker is in an intermediate position or position state is incorrect.	1
66	Disconnect switch	Input state of disconnect switch; 0 = open, 1 = close	1
67	Disconnect switch status	Disconnect switch failure status; 0 = disconnect switch position is open or close, 1 = disconnect switch is in an intermediate position or position state is incorrect.	1
68	Gnd switch	Input state of ground switch; 0 = open, 1 = close	1
69	Gnd switch status	Ground switch failure status; 0 = ground switch position is open or close, 1 = ground switch is in an intermediate position or position state is incorrect.	1
70	<unnamed>	User defined	1
71	<unnamed>	User defined	1
72	Switch 1	Input state of switch 1; 0 = open, 1 = close	1
73	Switch 1 status	Switch 1 failure status; 0 = switch 1 position is open or close, 1 = switch 1 is in an intermediate position or position state is incorrect.	1
74	Switch 2	Input state of switch 2; 0 = open, 1 = close	1
75	Switch 2 status	Switch 2 failure status; 0 = switch 2 position is open or close, 1 = switch 2 is in an intermediate position or position state is incorrect.	1
76	Switch 3	Input state of switch 3; 0 = open, 1 = close	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
77	Switch 3 status	Switch 3 failure status; 0 = switch 3 position is open or close, 1 = switch 3 is in an intermediate position or position state is incorrect.	1
78	Switch 4	Input state of switch 4; 0 = open, 1 = close	1
79	Switch 4 status	Switch 4 failure status; 0 = switch 4 position is open or close, 1 = switch 4 is in an intermediate position or position state is incorrect.	1
	3.1.15 User-allocated single-point indications		
80	<unnamed>*	User input 1	2
81	<unnamed>	User input 2	2
82	<unnamed>	User input 3	2
83	<unnamed>	User input 4	2
84	<unnamed>	User input 5	2
85	<unnamed>	User input 6	2
86	<unnamed>	User input 7	2
87	<unnamed>	User input 8	2
88	<unnamed>	User input 9	2
89	<unnamed>	User input 10	2
90	<unnamed>	User input 11	2
91	<unnamed>	User input 12	2
92	<unnamed>	User input 13	2
93	<unnamed>	User input 14	2
94	<unnamed>	User input 15	2
95	<unnamed>	User input 16	2
96	<unnamed>	User input 17	2
97	<unnamed>	User input 18	2
98	<unnamed>	User input 19	2
99	<unnamed>	User input 20	2
100	<unnamed>	User input 21	2
101	<unnamed>	User input 22	2
102	<unnamed>	User input 23	2
103	<unnamed>	User input 24	2

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

3.2 Control Relay Output Blocks/Binary Output Status

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)**

Point Index	Name	Description	Supported Control Relay Output Block Fields
	3.2.1 Internal commands		
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 act.	Protection activation	Latch On, Latch Off
5	Mode REMOTE	Mode remote control; Latch On = UNLOCKED Latch Off = Locked (ref. to chap. 1.2.2)	Latch On, Latch Off
6	auto-recl. ac.	activation of Auto-reclosure fuction	Latch On, Latch Off
7	79 TH OFF	deactivation of thermal AR	Latch On, Latch Off
8	Defrost OFF	deactivation of defrosting protection	Latch On, Latch Off
9	CAT1 ON	activation of CAT1	Latch On, Latch Off
10	CAT2 ON	activation of CAT2	Latch On, Latch Off
11	CAT3 ON	activation of CAT3	Latch On, Latch Off
	3.2.2 External commands (Double commands)		
12	52 Breaker	Trip Breaker switch	Trip, Pulse On (On-Time Fixed*)
13	52 Breaker	Close Breaker switch	Close, Pulse On (On-Time Fixed)
14	Disconnect	Trip Disconnect switch	Trip, Pulse On (On-Time Fixed)
15	Disconnect	Close Disconnect switch	Close, Pulse On (On-Time Fixed)
16	Gnd switch	Trip Ground switch	Trip, Pulse On (On-Time Fixed)
17	Gnd switch	Close Ground switch	Close, Pulse On (On-Time Fixed)
18	<unnamed>†	Trip User output 1	Trip, Pulse On (On-Time Fixed)
19	<unnamed>	Close user output 1	Close, Pulse On (On-Time Fixed)

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)**

Point Index	Name	Description	Supported Control Relay Output Block Fields
20	Switch 1	Trip switch 1	Trip, Pulse On (On-Time Fixed)
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)
	3.2.3 User-allocated single commands Please ref. to chap. 1.2.1 for additional notes.		
24	<unnamed>	User output 2	Latch On, Latch Off, Pulse On
25	<unnamed>	User output 3	Latch On, Latch Off, Pulse On

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

3.3 Analog Inputs

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
	3.3.1 Recorded measured values			
0	I =	Operational measurement: Current	32767 A	1
1	V =	Operational measurement: Voltage	3276.7 kV	1
2	IF- =	Current IF- is	3276.7 A	1
3	VF- =	Voltage VF- is	3276.7 kV	1
4	IX =	Defrosting current IX is	3276.7 A	1
5	F =	Frequency	327.67 Hz	2
6	Tcat=	Catenary Temperature	327.67C^{0}/F^{0*}	2
7	<unnamed>	User input 1		
8	<unnamed>	User input 2		
9	<unnamed>	User input 3		
10	<unnamed>	User input 4		
11	<unnamed>	User input 5		
If Object 30 Variation 01 (32-Bit Analog Input) requesten, additional:				
	3.3.2 Fault locator and fault currents			
12	Xpri =	Flt Locator: primary REACTANCE	327.67 Ω	3
13	<unnamed>	User input 6		
14	Fault section	Flt Locator: Fault in section		3
	3.3.3 Statistic values			
15	# TRIPs=	Number of breaker TRIP commands		3
16	Last I =	Last current interrupted by CB	3276.7 kA	3

*The unit are defined in the parametrization software DIGSI® 4

Glossary

AME	**A**synchronous interface **m**odule with (**e**lectrical) isolated RS485 interface for the SIPROTEC devices from Siemens.
AMO	**A**synchronous interface **m**odule with **o**ptical interface for the SIPROTEC devices from Siemens.
AR	**A**utomatic **R**ecloser
CFC	**C**ontinuous **F**unction **C**hart
DC	**D**ouble **C**ommand
DIGSI	Parameterization system for SIPROTEC devices
DNP	**D**istributed **N**etwork **P**rotocol
DP	**D**ouble-**p**oint 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	**R**emote **T**erminal **U**nit
SC	**S**ingle **C**ommand
SP	**S**ingle-**p**oint Indication

To

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Dear reader,

printing errors can never be entirely eliminated: therefore, should you come across any when reading this manual, kindly enter them in this form together with any comments or suggestions for improvement that you may have.

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