

ПРЕДЛОЖЕНИЕ ЗА ИЗПЪЛНЕНИЕ НА ПОРЪЧКАТА - ПЛИК №2
за участие в процедура за възлагане на обществена поръчка с предмет:

“Проектиране и изграждане на два броя местими полустационарни подстанции 20/6,3 кV – 10 MVA за ел захранване на северния неработен борд в рудник “Трояново-север”- реф. № 24/2015г. ЗОП.

ДО:

“МИНИ МАРИЦА ИЗТОК”ЕАД – ГР.РАДНЕВО
ул. “Георги Димитров” - №13

ОТ:

«ЕЛ КОНТРОЛ» ЕООД – гр. Стара Загора

УВАЖАЕМИ ДАМИ И ГОСПОДА,

С настоящото представяме нашето техническо предложение за изпълнение на обществената поръчка за изпълнение на проектиране и изграждане на два броя местими полустационарни подстанции 20/6,3 кV – 10 MVA за ел захранване на северния неработен борд в рудник “Трояново-север”. – реф. № 024/2015г. – ЗОП.

Предлагаме да изпълним пълният предмет на поръчката, изискван от възложителя.

Предложението за изпълнение на поръчката съдържа един вариант за изпълнение, съгласно изискванията на Документацията за участие.

Предложените от нас условия са както следва:

Срокът за изпълнение на поръчката по етапи е както следва

- Срокът за изпълнение на I^{ва} етап (проучване и изготвяне на РП) е 30 календарни дни след подписване на договор.
- Времетраенето на строителството (II^{ва} етап) е 300 календарни дни. Датата, от която ще започне да се отчита времетраенето е датата на подписване на Протокол №2 за откриване на строителната площадка и определяне на линия и заверка на заповедната книга на строежа по чл.158, ал.2 във връзка с чл.170, ал. 3 от ЗУТ. Датата, на която изтича времетраенето се счита датата на съставяне на Констативен акт обр.15.

Наясно сме, че:

- Изпълнителят има право да поиска удължаване на срока за изпълнение на работите, при лоши климатични условия, нареждане за спиране, възлагане на допълнителни СМР, в рамките на непредвидените разходи или други обстоятелства, които могат да настъпят и които не се дължат на пропуск или на нарушаване на договора от страна на Изпълнителя или които не могат да се вменят като негова отговорност. Размерът на удължаването ще се определи след консултации между възложителя и изпълнителя. Договореното удължаване на срока се

удостоверява с подписан протокол между упълномощени представители на изпълнителя и възложителя.

Конкретните срокове сме посочили в Строителна програма с график за изпълнение на работите и плащанията – Приложение №2 към техническата оферта, по образец на възложителя.

Предлагам следният гаранционен срок за изпълнените строителни и монтажни работи и съоръжения на строителния обект, а именно:

- на изпълнените видове работи – 10 (десет) години, в съответствие с минималния гаранционен срок определен в чл. 20, ал. 4, т.1 от Наредба №2 към ЗУТ за въвеждане в експлоатация на строежите към ЗУТ.

- на доставените материали – гаранционния срок предлаган от Производителя. За по важните материали гаранционния срок е посочен в Приложение №8 към договора.

В Приложение №6 към настоящето предложение за изпълнение на поръчката Ви представяме разработената от нас Концепция за изпълнение на поръчката, съдържаща идейно решение за изпълнение на поръчката (ведно с всички изискуеми приложения), ведно с приложен линеен график (Диаграма на Гант) с приложения в съответствие с предложените организация и подход на изпълнение на поръчката.

Представяме техническата оферта и приложенията към нея на хартиен и на електронен носител

При така предложените условия от нас, в нашата ценова оферта сме включили всички разходи, свързани с качествено изпълнение на поръчката в описания вид и обхват.

Ако се доказва еквивалентност се прилагат и документите по чл.33, ал.3 от ЗОП.

Гарантираме, че сме в състояние да изпълним качествено поръчката в пълно съответствие с гореописаната оферта.

Приложения към техническата оферта:

Приложение №1 – Техническо описание на по – важните материали, които ще бъдат доставени и типични и гранични експлоатационни условия, при които ще се уважат настъпилите гаранционни събития *(по образец на възложителя)*

Приложение №2 – Строителна програма с график за изпълнение на работите и плащанията *(по образец на възложителя)*

Приложение № 3 – Документи, удостоверяващи съответствието на изделията с изискванията на документацията, под формата на брошури, чертежи, схеми, данни и др.

Приложение № 4 – Данни за завода - производител на предлаганите МиС и копия от протоколи от типовите изпитания на предлаганите съоръжения, проведени в акредитирани независими лаборатории.

Приложение № 5 - Технически изисквания към параметрите и качеството на КРУ, релейни защиты и други съоръжения. (Приложението да се попълни от Участника с точните характеристики и параметри на предлаганите МиС, включително и брой комутации на съоръженията.) */по приложен в документацията образец/*

Приложение №6 - Концепция за изпълнение на поръчката, съдържаща идейно решение за изпълнение на поръчката (ведно с всички изискуеми приложения), ведно с приложен линеен график (Диаграма на Гант) с приложения в съответствие с предложените организация и подход на изпълнение на поръчката *(разработено от участника във свободен формат при спазване изискванията на техническата спецификация и изискванията на документацията)*

ПОДПИС и ПЕЧАТ:

Нягол Христов (име и фамилия)

Управител (длъжност на представляващия участника)

Дата: 13.05.2015г.



“ЕЛ КОНТРОЛ“ ЕООД
[наименование на участника]

Техническо описание
на по-важните материали, които ще бъдат доставени, предоставени или
използвани и типични и гранични експлоатационни условия, при които ще се
уважат настъпилите гаранционни събития

№	Описание на доставките	Мярка	Кол.	Стандарт	Производител	Страна на произход	Гаранционен срок на материала, даден от производителя
1	Комплектна разпределителна уредба NXAir 7.2кV, 1250A, 25kA	бр.	6	IEC	Siemens AG	Турция	12 месеца
2	Комплектна разпределителна уредба NXAir 24кV, 1250A, 25kA	бр.	1	IEC	Siemens AG	Турция	12 месеца
3	Трифазен силов маслен трансформатор СН 20/0,4кV, 25кVA	бр.	1	IEC 60076	Елпром Трафо	България	12 месеца
4	Индустриална акумулаторна батерия с гел електролит 220V/100Ah – серия DRYFIT A412/100A	бр.	18	IEC	Sonnenschein GmbH	Германия	36 месеца
5	Тиристорни токочправители Benning 220V/25A-тип D400 G216/25 Bwrgug-TDG3	бр.	1	IEC	BENNING GmbH	Германия	36 месеца
6	Трифазен електромер за активна и реактивна енергия, индиректен, Кл. 0.5 за активна и кл.2 за реактивна, напр.обхват 3х 58/100V, токов обхват базов(максимален) 5(10)A.	бр.	1	IEC	Landis+ Gyr	Швейцария	12 месеца

my

PK

dfy

Гаранционния срок за изпълнените работи е 10 години и е в съответствие с минималния гаранционен срок определен в чл. 20, ал. 4, т.1 от Наредба №2 към ЗУТ за въвеждане в експлоатация на строежите към ЗУТ.

Оферираните от нас гаранционни срокове за оборудването, материалите и изпълнените работи и всички останали гаранционни условия са валидни за специфичните експлоатационни условия на възложителя, с които сме се запознали при извършения оглед на обекта.

1. Типични (експлоатационни) условия, при които ще важи представената гаранция:

/описват се/

Експлоатация при температури на околната среда от - 5°C до + 40°C

Надморска височина: до 1000 метра.

2. Гранични (екстремни) условия, при които гаранцията няма да важи и претенциите на възложителя няма да бъдат уважени.

/описват се – напр умишлени повреди, повреди, причинени от форс-мажорни обстоятелства, повреди, следствие от неправилно обслужване, пренатоварване и др./

- умишлени повреди
- наводнения на терена
- ураганни ветрове
- земетресения
- изкопни работи в близост до съоръженията
- неправилна експлоатация – къси съединения, претоварване и др. условия извън описаните типични условия

ПОДПИС и ПЕЧАТ:

Нягол Христов (име и фамилия)

Управител (длъжност на представляващия участника)



Дата: 13.05.2015г.

A handwritten signature in blue ink, located at the bottom right of the page.

A handwritten signature in blue ink, located at the bottom right of the page.

A handwritten signature in blue ink, located at the bottom right of the page.

Строителна програма с график за изпълнение на работите /в т.ч. график за доставка на материалите, доставка на Изпълнителя/

Строителна програма с график за изпълнение на работите /в т.ч. график за доставка на материалите, доставка на Изпълнителя/												
месец	1	2	3	4	5	6	7	8	9	10	11	
дни	1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20	21-31	1-10	11-20	21-31
Сключване на договор и подписване на акт обр.2	1											
Изготвяне на работните проекти и съгласуване	30											
Прочувателни работи	5											
Изготвяне на проект за Местима п/ст 1	25											
Изготвяне на проект за Местима п/ст 2	10											
Доставка на основни съоръжения	150											
Доставка на КРУ 20кV и 6кV	150											
Доставка на Трансформатор СН	90											
Доставка на батерия и изправител	90											
Доставка на Трансформатор ИЗЦ и активно съпротивление	75											
Доставка на електромер	75											
Строителни дейности по Местима п/ст 1	60											
Мобилизация	5											
Оформяне на терена и подготовка на легло на чакълиран път	15											
Насипване и трамбоване на чакъл	10											
Изкопни работи за изграждане на фундамент, заземителен контур и монтаж на цистерна	5											
Транспортиране на налична цистерна на Възложителя до обекта и монтаж	1											
Котражни и армировъчни работи	10											
Полагане на бетон за фундаменти	1											
Изграждане на заземителен контур	5											
Монтаж на тръби за връзка с цистерна и отводняване на терена	10											
Подготвяне на фундаменти на стълбчета за осветление и ограда	5											
Декофриране на фундамента на ел.къщата и силовия трансформатор и монтаж на тава с чакъл	5											
Строителни дейности по Местима п/ст 2	60											
Мобилизация	5											
Оформяне на терена и подготовка на легло на чакълиран път	15											
Насипване и трамбоване на чакъл	10											
Изкопни работи за изграждане на фундамент, заземителен контур и монтаж на цистерна	5											
Транспортиране на налична цистерна на Възложителя до обекта и монтаж	1											
Котражни и армировъчни работи	10											
Полагане на бетон за фундаменти	1											
Изграждане на заземителен контур	5											
Монтаж на тръби за връзка с цистерна и отводняване на терена	10											

СН

СН

СН

СН

[illegible]

dy

Пусково-наладъчни работи в Местима п/ст 1		30	
Изпитване на първични съоръжения и кабели		15	
Проверка на цифрови защити		10	
Настройка на сигнали за SCADA		20	
Настройка на радиовръзка		5	
Поставяне на съоръженията под напрежение и провеждане на 72 часови проби		3	
Дейности по монтаж на първично оборудване в ел.къща за Местима п/ст 2		30	
Монтаж на първични съоръжения в ел.къща		25	
Изграждане на вътрешни връзки, ограждения и блокировки		5	
Транспортиране и монтаж на ел.къщата на новоизградения фундамент		1	
Натоварване, транспорт и монтаж на силов трансформатор 20/6 kV на новоизградения фундамент		1	
Дейности по изграждане на външни кабелни трасета и окабелявана съоръжения в Местима п/ст 2		30	
Монтаж на кабелни трасета		5	
Заземяване на съоръженията		5	
Полагане на силови и контролни кабели		5	
Направа на кабелни глави и подсъединяване на кабели		5	
Изграждане на мъниезащитна инсталация		5	
Изграждане на външно осветление		5	
Външно присъединяване на подстанцията		10	
Изграждане на външна ограда		5	
Оформяне на бетонови пътеки		5	
Пусково-наладъчни работи в Местима п/ст 2		30	
Изпитване на първични съоръжения и кабели		15	
Проверка на цифрови защити		10	
Настройка на сигнали за SCADA		20	
Настройка на радиовръзка		5	
Поставяне на съоръженията под напрежение и провеждане на 72 часови проби		3	
Довършителни работи		5	
Довършителни работи и почистване на работните площи		5	

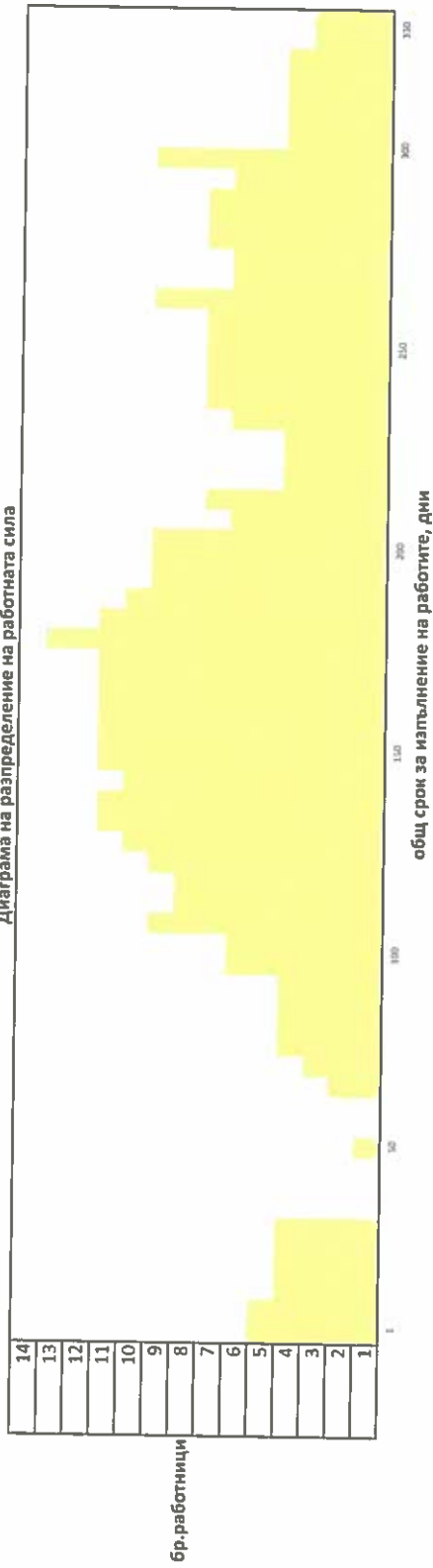
См

Р

Р

✓

Диаграма на разпределение на работната сила



✓

✓

✓

ПОРАДИ ГОЛЕМИЯ ФИЗИЧЕСКИ ОБЕМ НА ФАЙЛОВЕТЕ „ЕЛ КОНТРОЛ“ ЕООД
ПРЕДСТАВЯ ПЪЛНИЯ ОБЕМ НА СЛЕДНИТЕ ДОКУМЕНТИ НА CD:

- Ръководство за експлоатация на мултифункционални релейни защиты SIPROTEC 7SJ62/64;
- Ръководство за експлоатация на мултифункционални релейни защиты SIPROTEC 7SJ62/63/64;
- Типови изпитания на мултифункционални релейни защиты SIPROTEC 7SJ66;
- Типови изпитания на диференциални релейни защиты SIPROTEC 7UT613/63x/683;

Дата: 13.05.2015г.

Подпис и печат:
Нягол Христов – управител



SIEMENS

SIPROTEC

Многофункциональное
Устройство Защиты и
Местного Управления
7SJ62/64

V4.9

Руководство по эксплуатации

Предисловие

Содержание

Введение

Функции

Монтаж и ввод в эксплуатацию

Технические данные

Приложения

Список литературы

Алфавитный указатель

Словарь терминов

1

2

3

4

A

C53000-G1156-C207-2

ВЕРНО С
ОРИГИНАЛА



SIPROTEC

Multi-Functional Protective Relay with Local Control 7SJ62/63/64

V4.6

Manual

Preface

Introduction

Functions

Mounting and Commissioning

Technical Data

Appendix

Literature

Glossary

Index

1

2

3

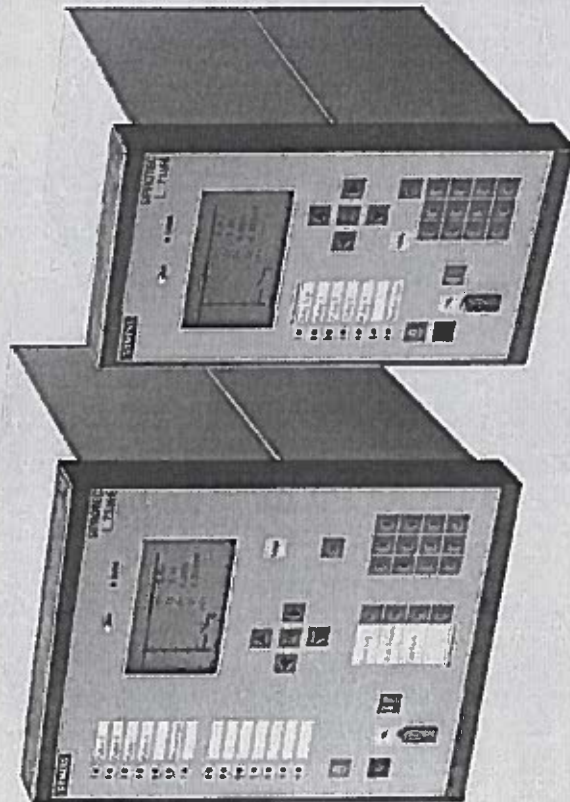
4

A

C53000-G1140-C147-9



SIEMENS



Protection Systems

SIPROTEC 7SJ66

Overcurrent Protection

Chapter for the Catalog SIP - Edition No. 8

ОРИГИНАЛ



Answers for infrastructure and cities.

SIPROTEC 7SJ66

	Page
Description	3
Function overview, Hardware	3
Applications	4
Construction	6
Protection functions	6
Functions	12
Communication	13
Selection table	14
Typical connections	15
Typical applications	17
Selection and ordering data	19
Connection diagram	24
Dimensions	28

You will find a detailed overview of the technical data under www.siemens.com/siprotec

Protection functions (continued)

- Inrush restraint
- Motor protection
- Overload protection
- Temperature monitoring
- Under-voltage protection
- Under-frequency protection
- Rate-of-frequency-change protection
- Power protection (e.g. reverse, factor)
- Undervoltage controlled reactive power protection
- Breaker failure protection
- Negative-sequence protection
- Phase-sequence monitoring
- Synchro-check
- Fault locator
- Lockout
- Auto-reclosure

Control functions/programmable logic

- Commands I ctrl of CB and of isolators
- Position of switching elements is shown on the graphic display
- Control via keyboard, binary inputs, DIGSI 4 or SCADA system
- User-defined logic with CFC (e.g. interlocking)

Monitoring functions

- Operational measured values V, I, f
- Energy metering values W_p, W_q
- Circuit-breaker wear monitoring
- Slave pointer
- Trip circuit supervision
- Fuse failure monitor
- 8 oscillographic fault records
- Motor statistics

Communication (built in interfaces)

- System interface IEC 60870-5-103/IEC 61850 / Modbus RTU
- Service interface for DIGSI 4/RTD-Box
- Front USB interface for DIGSI 4
- Time synchronization via IRIG B/DCF77

Hardware

- 4 current transformers
- 4 voltage transformers
- 16/22/36 binary inputs
- 71/10/23 output relays
- Spring-type terminals
- Graphical or 8 line text display

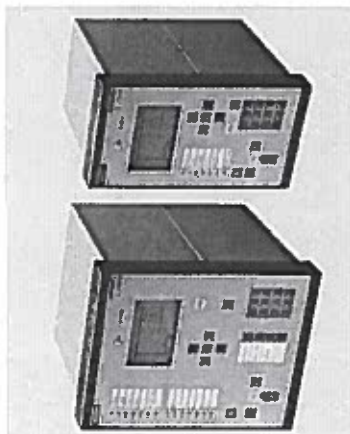


Fig. 1 SIPROTEC 4 7SJ66 multfunction protection relay

Description

The SIPROTEC 7SJ66 unit is a numerical protection, control and monitoring device.

SIPROTEC 7SJ66 is featuring the "flexible protection functions". Up to 20 protection functions can be added according to individual requirements. Thus, for example, a rate-of-frequency-change protection or reverse power protection can be implemented.

The relay provides control of the circuit breaker, further switching devices and automation functions. The integrated graphical logic editor (CFC) allows the user to implement its own functions, e.g. for the automation of switchgear (interlocking).

The communication interfaces support the easy integration into modern communication networks.

Function overview

Protection functions

- Overcurrent protection
- Directional overcurrent protection
- Sensitive directional ground-fault detection
- Displacement voltage
- Intermittent ground-fault protection
- Directional intermittent ground fault protection
- High-impedance restricted ground fault

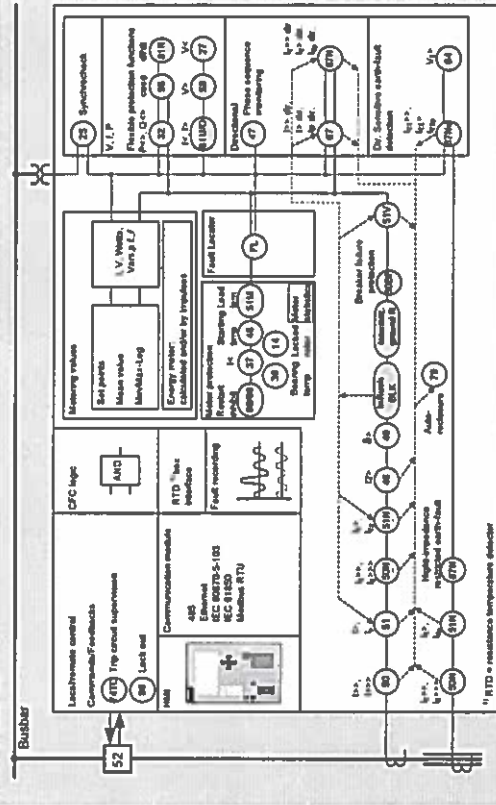


Fig. 2 Function diagram

Application

The SIPROTEC 7SJ66 unit is a numerical protection relay that also performs control and monitoring functions and therefore supports the user in cost-effective power system management. The relay ensures reliable supply of electric power to the customers. Local operation has been designed according to ergonomic criteria. A large, easy-to-read display was a major design aim.

Control

The integrated control function permits control of disconnect devices, grounding switches or circuit-breakers via the integrated operator panel, binary inputs, DIGSI 4 or the control and protection system (e.g. SICAM). The present status (or position) of the primary equipment can be displayed, in case of devices with graphic display. A full range of command processing functions is provided.

Programmable logic

The integrated logic characteristics (CFC) allow the user to implement their own functions for automation of switchgear (interlocking) or a substation via a graphic user interface. The user can also generate user-defined messages.

Line protection

The SIPROTEC 7SJ66 units can be used for line protection of high and medium-voltage networks with earthed (grounded), low-resistance grounded, isolated or compensated neutral point.

Synchro-check

In order to connect two components of a power system, the relay provides a synchro-check function which verifies that switching ON does not endanger the stability of the power system.

Motor protection

When protecting motors, the SIPROTEC 7SJ66 relay is suitable for asynchronous machines of all sizes.

Transformer protection

The relay performs all functions of backup protection supplementary to transformer differential protection. The inrush suppression effectively prevents tripping by inrush current. The high-impedance restricted ground-fault protection detects short-circuits and insulation faults on the transformer.

Backup protection

The SIPROTEC 7SJ66 can be used universally for backup protection.

Flexible protection functions

By configuring a connection between a standard protection logic and any measured or derived quantity, the functional scope of the relays can be easily expanded by up to 20 protection stages or protection functions.

Metering values

Extensive measured values, limit values and metered values permit improved system management.

ANSI	IEC	Protection functions
50, 50N	$I > I_{set}$, $I > I_{set}$, $I > I_{set}$	Definite-time overcurrent protection (phases/neutral)
50, 51V, 51N	$I > I_{set}$	Inverse overcurrent protection (phases/neutral), phase function with voltage-dependent option
67, 67N	$I > I_{set}$, $I > I_{set}$, $I > I_{set}$	Directional overcurrent protection (definite/inverse, phase/neutral), Directional comparison protection
67N250M	$I > I_{set}$, $I > I_{set}$	Directional/non-directional sensitive ground-fault detection
59N164	V_L , V_0	Cold load pick-up (dynamic setting change)
-	I_{set}	Displacement voltage, zero-sequence voltage
67H1	I_{set}	Intermittent ground fault
67H1	I_{set}	Directional intermittent ground fault protection
87H1	I_{set}	High-impedance restricted ground-fault protection
80R1	I_{set}	Breaker failure protection
79	I_{set}	Auto-reclosure
25	I_{set}	Syncho-check
46	I_{set}	Phase-balance current protection (negative-sequence protection)
47	V_{set} , phase-sequence	Unbalance-voltage protection and/or phase-sequence monitoring
49	ϕ	Thermal overload protection
48	I_{set}	Starting time supervision
51M	I_{set}	Load jam protection
14	I_{set}	Locked rotor protection
6406	I_{set}	Restart inhibit
37	I_{set}	Undercurrent monitoring
38	I_{set}	Temperature monitoring via external device (RTD box), e.g. bearing temperature monitoring
27, 59	V_L , V_0	Undervoltage/overvoltage protection
59R	dV/dt	Rate-of-voltage-change protection
32	P_{set} , Q_{set}	Reverse-power, forward power protection
27RQ	Q_{set}	Undervoltage-controlled reactive power protection
35	$\cos \phi$	Power factor protection
810RQ	f_{set} , f_c	Overfrequency/underfrequency protection
81R	dff/dt	Rate-of-frequency-change protection
81R	f_{set}	Fault locator

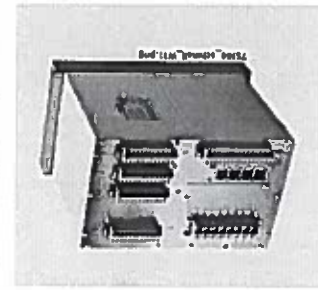


Fig. 3 SIPROTEC 7SJ66 rear view

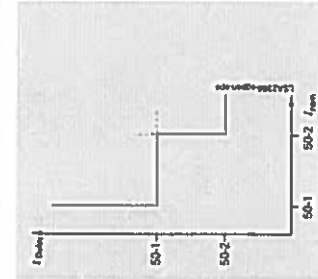


Fig. 4 Definite-time overcurrent protection

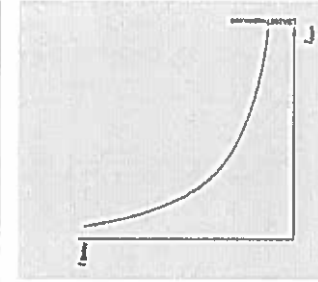


Fig. 5 Inverse-time overcurrent protection

Construction

Connection techniques and housing with many advantages
1/3-rack size and 1/2-rack size are the available housing widths of the SIPROTEC 7SJ66 relays, referred to a 19" module frame system. This means that previous models can always be replaced. The height is a uniform 244 mm for flush-mounting housing. All CT-cables can be connected with or without ring lug.

Available inverse-time characteristics

Characteristic ref. to	ANSI/IEEE	IEC 60255-3
Inverse	•	•
Short inverse	•	•
Long inverse	•	•
Moderately inverse	•	•
Very inverse	•	•
Extremely inverse	•	•

Reset characteristics

For easier time coordination with electromechanical relays, reset characteristics according to ANSI C37.112 and IEC 60255-3 / BS 142 standards are applied.

Overcurrent protection (ANSI 50, 50N, 51, 51V, 51N)
This function is based on the phase-selective measurement of the three phase currents and the ground current (four transformers). Three definite-time overcurrent protection elements (DMT) exist both for the phases and for the ground. The current threshold and the delay time can be set within a wide range. In addition, inverse-time overcurrent protection characteristics (IDMTL) can be activated.

The inverse-time function provides – as an option – voltage-restraint or voltage-controlled operating modes.

Protection functions

When using the reset characteristic (disk emulation), a reset process is initiated after the fault current has disappeared. This reset process corresponds to the reverse movement of the Ferraris disk of an electromechanical relay (thus: disk emulation).

User-definable characteristics

Instead of the predefined time characteristics according to ANSI, tripping characteristics can be defined by the user for phase and ground units separately. Up to 20 current-time value pairs may be programmed. They are set as pairs of numbers or graphically in DIGSI 4.

Inrush restraint

The relay features second harmonic restraint. If the second harmonic is detected during transformer energization, pickup of non-directional and directional normal elements are blocked.

Cold load pickup/dynamic setting change

For directional and non-directional overcurrent protection functions the initiation thresholds and tripping times can be switched via binary inputs or by time control.

Directional overcurrent protection (ANSI 67, 67N)

Directional phase and ground protection are separate functions. They operate in parallel to the non-directional overcurrent elements. Their pickup values and delay times can be set separately. Definite-time and inverse-time characteristics are offered. The tripping characteristic can be rotated about ± 180 degrees.

By means of voltage memory, directionality can be determined reliably even for close-in (local) faults. If the switching device closes onto a fault and the voltage is too low to determine direction, directionality (directional decision) is made with voltage from the voltage memory. If no voltage exists in the memory, tripping occurs according to the coordination schedule.

For ground protection, users can choose whether the direction is to be determined via zero-sequence system or negative-sequence system quantities (selectable). Using negative-sequence variables can be advantageous in cases where the zero voltage tends to be very low due to unfavorable zero-sequence impedances.

Directional comparison protection (cross-coupling)

It is used for selective protection of sections fed from two sources with instantaneous tripping, i.e. without the disadvantage of time coordination. The directional comparison protection is suitable if the distances between the protection stations are not significant and pilot wires are available for signal transmission. In addition to the directional comparison protection, the directional coordinated overcurrent protection is used for complete selective backup protection. If operated in a closed-circuit connection, an interruption of the transmission line is detected.

(Sensitive) directional ground-fault detection (ANSI 64, 67Ns, 67N)

For isolated-neutral and compensated networks, the direction of power flow in the zero sequence is calculated from the zero-sequence current I_0 and zero-sequence voltage V_0 .

For networks with an isolated neutral, the reactive current component is evaluated; for compensated networks, the active current component or residual resistive current is evaluated. For special network conditions, e.g. high-resistance grounded networks with ohmic-capacitive ground-fault current or low-resistance grounded networks with ohmic-inductive current, the tripping characteristics can be rotated approximately ± 45 degrees.

Two modes of ground-fault direction detection can be implemented: tripping or "signalling only mode".

has the following functions:

TRIP via the displacement voltage V_c .
Two instantaneous elements or one instantaneous plus one user-defined characteristic.

Each element can be set in forward, reverse, or non-directional.

The function can also be operated in the insensitive mode as an additional short-circuit protection.

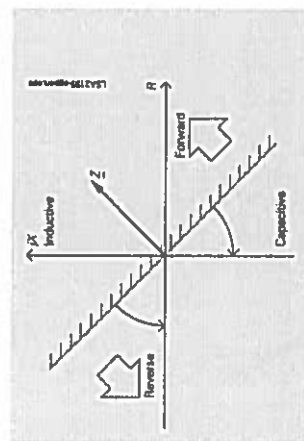


Fig. 6 Directional characteristic of the directional overcurrent protection

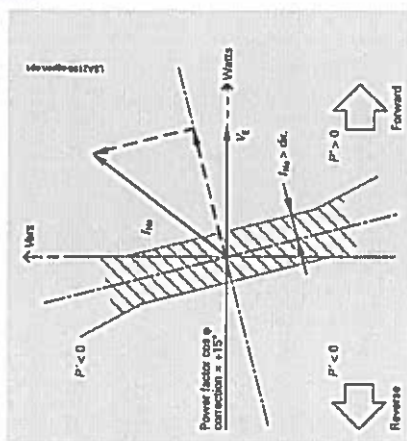


Fig. 7 Directional determination using cosine measurements for compensated networks

(Sensitive) ground-fault detection (ANSI 50Ns, 51Ns / 50N, 51N)

For high-resistance grounded networks, a sensitive input transformer is connected to a phase-balance neutral current transformer (also called core-balance CT).

The function can also be operated in the insensitive mode as an additional short-circuit protection.

Intermittent ground-fault protection

Intermittent (re-striking) faults occur due to insulation weaknesses in cables or as a result of water penetrating cable joints. Such faults either simply cease at some stage or develop into lasting short-circuits. During intermittent activity, however, star-point resistors in networks that are impedance-grounded may undergo thermal overloading. The normal ground-fault protection cannot reliably detect and interrupt the current pulses, some of which can be very brief.

The selectivity required with intermittent ground faults is achieved by summing the duration of the individual pulses and by tripping when a (settable) summed time is reached. The response threshold $I_{t\Sigma}$ evaluates the r.m.s. value, referred to one systems period.

Directional intermittent ground fault protection (ANSI 67Ns)

The directional intermittent ground fault protection has to detect intermittent ground faults in resonant grounded cable systems selectively. Intermittent ground faults in resonant grounded cable systems are usually characterized by the following properties:

- A very short high-current ground current pulse (up to several hundred amperes) with a duration of under 1 ms
- They are self-extinguishing and re-ignite within one half-period up to several periods, depending on the power system conditions and the fault characteristic.
- Over longer periods (many seconds to minutes), they can develop into static faults.

Such intermittent ground faults are frequently caused by weak insulation, e.g. due to decreased water resistance of old cables. Ground fault functions based on fundamental component measured values are primarily designed to detect static ground faults and do not always behave correctly in case of intermittent ground faults. The function described here evaluates specific call the ground current pulses and puts them into relation with the zero-sequence voltage to determine the direction.

Phase-balance current protection (ANSI 46) (Negative-sequence protection)

In line protection, the two-element phase-balance current negative-sequence protection permits detection on the high side of high-resistance phase-to-phase faults and phase-to-ground faults that are on the low side of a transformer (e.g. with the switch group Dy5). This provides backup protection for high-resistance faults beyond the transformer.

Breaker failure protection (ANSI 50BF)

If a faulted portion of the electrical circuit is not disconnected upon issuance of a trip command, another command can be initiated using the breaker failure protection which operates the circuit-breaker, e.g. of an upstream (higher-level) protection relay. Breaker failure is detected if, after a trip command, current is still flowing in the faulted circuit. As an option, it is possible to make use of the circuit-breaker position indication.

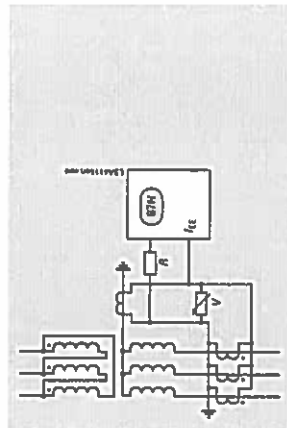


Fig. 8 High-impedance restricted ground-fault protection

High-impedance restricted ground-fault protection (ANSI 87H)
The high-impedance measurement principle is an uncomplicated and sensitive method for detecting ground faults, especially on transformers. It can also be applied to motors, generators and reactors when these are operated on an grounded network.

When the high-impedance measurement principle is applied, all current transformers in the protected area are connected in parallel and operated on one common resistor of relatively high R whose voltage is measured (see Fig. 8). In the case of 7SJ66 units, the voltage is measured by detecting the current through the (external) resistor R at the sensitive current measurement input $I_{t\Sigma}$. The varistor V serves to limit the voltage in the event of an internal fault. It cuts off the high momentary voltage spikes occurring at transformer saturation. At the same time, this results in smoothing of the voltage without any noteworthy reduction of the average value.

If no faults have occurred and in the event of external faults, the system is at equilibrium, and the voltage through the resistor is approximately zero. In the event of internal faults, an imbalance occurs which leads to a voltage and a current flow through the resistor R .

The current transformers must be of the same type and must at least offer a separate core for the high-impedance restricted ground-fault protection. They must in particular have the same transformation ratio and an approximately identical knee-point voltage. They should also demonstrate only minimal measuring errors.

Flexible protection functions

The SIPROTEC 7SJ66 units enable the user to easily add on up to 20 protective functions. To this end, parameter definitions are used to link a standard protection logic with any chosen characteristic quantity (measured or derived quantity). The standard logic consists of the usual protection elements such as the pickup message, the parameter-definable delay time, the TRIP command, a blocking possibility, etc. The mode of operation for current, voltage, power and power factor quantities can be three-phase or single-phase. Almost all quantities can be operated as greater than or less than stages. All stages operate with protection priority.

Protection stages/functions attainable on the basis of the available characteristic quantities:

Function	ANSI No.
$I > I_N$	50, 50N
$I < I_N$, $I > I_{set}$, $V > V_{set}$, dI/dt	27, 59, 59R, 64
$3I_{ph} > I_{ph}$, $I_{ph} > I_{ph}$, $3V_{ph} > V_{ph}$, $V_{ph} > V_{ph}$	50M, 46, 59M, 47
$P > P_{set}$, $Q > Q_{set}$	32
$\cos(\phi) > \cos(\phi)_{set}$	55
$I < I_{set}$	B10, B1U
$dI/dt < dI/dt_{set}$	B1R

For example, the following can be implemented:

- Reverse power protection (ANSI 32R)
- Rate-of-frequency-change protection (ANSI B1R)

Undervoltage-controlled reactive power protection (ANSI 27Q)

The undervoltage-controlled reactive power protection protects the system for mains decoupling purposes. To prevent a voltage collapse in energy systems, the generating side, e.g. a generator, must be equipped with voltage and frequency protection devices. An undervoltage-controlled reactive power protection is required at the supply system connection point. It detects critical power system situations and ensures that the power generation facility is disconnected from the mains. Furthermore, it ensures that reconnection only takes place under stable power system conditions. The associated criteria can be parameterized.

Synchro-check (ANSI 25)

In case of switching ON the circuit-breaker, the units can check whether the two subnetworks are synchronized. Voltage-, frequency- and phase-angle-differences are being checked to determine whether synchronous conditions are existent.

Auto-reclosure (ANSI 79)

Multiple reclosures can be defined by the user and lockout will occur if a fault is present after the last reclosure. The following functions are possible:

- 3-pole ARC for all types of faults
- Parameter settings for phase and ground faults
- One rapid auto-reclosure (RAR) and up to nine delay auto-reclosures (DAR)

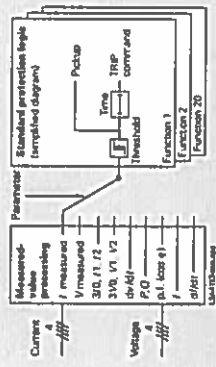


Fig. 9 Flexible protection functions

- Starting of the ARC depends on the trip command selection (e.g. 46, 50, 51, 67)
- Blocking option of the ARC via binary inputs
- ARC can be initiated externally or via CFC
- The directional and non-directional elements can either be blocked or operated non-delayed depending on the auto-reclosure cycle
- Dynamic setting change of the directional and non-directional elements can be activated depending on the ready AR

Thermal overload protection (ANSI 49)

For protecting cables and transformers, an overload protection with an integrated pre-warning element for temperature and current can be applied. The temperature is calculated using a thermal homogeneous-body model (according to IEC 60255-8), which takes account both of the energy entering the equipment and the energy losses. The calculated temperature is constantly adjusted accordingly. Thus, account is taken of the previous load and the load fluctuations.

For thermal protection of motors (especially the stator) a further time constant can be set so that the thermal (rotor) can be detected correctly while the motor is rotating and when it is stopped. The ambient temperature or the temperature of the coolant can be detected serially via an external temperature monitoring box (resistance-temperature detector box, also called RTD-box). The thermal replica of the overload function is automatically adapted to the ambient conditions. If there is no RTD-box it is assumed that the ambient temperatures are constant.

Settable dropout delay times

If the devices are used in parallel with electromechanical relays in networks with intermittent faults, the long dropout times of the electromechanical devices (several hundred milliseconds) can lead to problems in terms of time grading. Clean time grading is only possible if the dropout time is approximately the same. This is why the parameter of dropout times can be defined for certain functions such as time-over-current protection, ground short-circuit and phase-balance current protection.

Motor protection

Restart inhibit (ANSI 66RB6)

If a motor is started up too many times in succession, the rotor can be subject to thermal overload, especially the upper edges of the bars. The rotor temperature is calculated from the stator current. The reclosing lockout only permits start-up of the motor if the rotor has sufficient thermal reserves for a complete start-up (see Fig. 10).

Emergency start-up

This function disables the reclosing lockout via a binary input by storing the state of the thermal replica as long as the binary input is active. It is also possible to reset the thermal replica to zero.

Temperature monitoring (ANSI 38)

One temperature monitoring box with a total of 12 measuring sensors can be used for temperature monitoring and detection by the protection relay. The thermal status of motors, generators and transformers can be monitored with this device. Additionally, the temperature of the bearings of rotating machines are being monitored for limit value violation. The temperatures are measured with the help of temperature detectors at various locations of the device to be protected. This data is transmitted to the protection relay via one or two temperature monitoring boxes (see "Accessories", page 511/51).

Starting time supervision (ANSI 48T14)

Starting time supervision protects the motor against long unwanted start-ups that might occur in the event of excessive load torque or excessive voltage drops within the motor, or if the rotor is locked. Rotor temperature is calculated from measured stator current. The tripping time is calculated according to the following equation:

$$t = \left(\frac{I_A}{I_N} \right)^2 \cdot T_A$$

for $I > I_{MOTOR START}$

I = Actual current flowing

$I_{MOTOR START}$ = Pickup current to detect a motor start

t = Tripping time

I_A = Rated motor starting current

T_A = Tripping time at rated motor starting current (2 times, for warm and cold motor)

The characteristic (equation) can be adapted optimally to the state of the motor by applying different tripping times T_A in dependence of either cold or warm motor state. For differentiation of the motor state the thermal model of the rotor is applied.

If the trip time is rated according to the above formula, even a prolonged start-up and reduced voltage (and reduced start-up current) will be evaluated correctly. The tripping time is inverse (current dependent).

A binary signal is set by a speed sensor to detect a blocked rotor. An instantaneous tripping is effected.

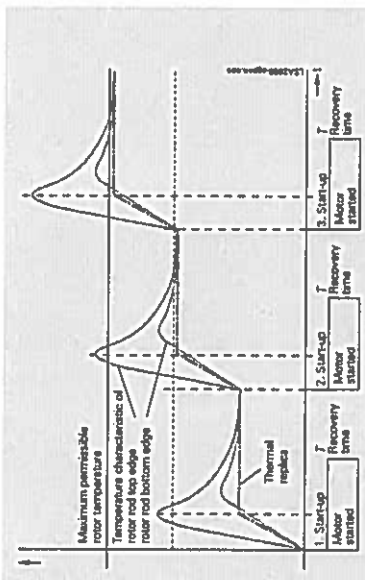


Fig. 10

Load jam protection (ANSI 51M)

Sudden high loads can cause slowing down and blocking of the motor and mechanical damages. The rise of current due to a load jam is being monitored by this function (alarm and tripping).

The overload protection function is too slow and therefore not suitable under these circumstances.

Phase-balance current protection (ANSI 46)

(Negative-sequence protection)

The negative-sequence / phase-balance current protection detects a phase failure or load imbalance due to network asymmetry and protects the rotor from impermissible temperature rise.

Undercurrent monitoring (ANSI 37)

With this function, a sudden drop in current, which can occur due to a reduced motor load, is detected. This may be due to shaft breakage, no-load operation of pumps or fan failure.

Motor statistics

Essential information on start-up of the motor (duration, current, voltage) and general information on number of starts, total operating time, total down time, etc. are saved as statistics in the device.

Voltage protection

Overvoltage protection (ANSI 59)

The two-element overvoltage protection detects unwanted network and machine overvoltage conditions. The function can operate either with phase-to-phase, phase-to-ground, positive phase-sequence or negative phase-sequence system voltage. Three-phase and single-phase connections are possible.

Undervoltage protection (ANSI 27)

The two-element undervoltage protection provides protection against dangerous voltage drops (especially for electric machines). Applications include the isolation of generators or motors from the network to avoid undesired operating states and a possible loss of stability. Proper operating conditions of electrical machines are best evaluated with the positive-sequence quantities. The protection function is active over a

SIPROTEC 7SJ66

Protection functions

wide frequency range (25 to 70 Hz). Even when falling below this frequency range the function continues to work, however, with a greater tolerance band.

The function can operate either with phase-to-phase, phase-to-ground or positive phase-sequence voltage and can be monitored with a current criterion. Three-phase and single-phase connections are possible.

Frequency protection (ANSI 81TJ1)

Frequency protection can be used for over-frequency and under-frequency protection. Electric machines and parts of the system are protected from unwanted speed deviations. Unwanted frequency changes in the network can be detected and the load can be removed at a specified frequency setting.

There are four elements (selectable as overfrequency or underfrequency) and each element can be delayed separately. Blocking of the frequency protection can be performed if using a binary input or by using an undervoltage element.

Fault locator (ANSI 21FL)

The integrated fault locator calculates the fault impedance and the distance-to-fault. The results are displayed in Ω , kilometers (miles) and in percent of the line length.

Circuit-breaker wear monitoring

Methods for determining circuit-breaker contact wear or the remaining service life of a circuit-breaker (CB) allow CB maintenance intervals to be aligned to their actual degree of wear. The benefit lies in reduced maintenance costs.

There is no mathematically exact method of calculating the wear or the remaining service life of circuit-breakers that takes into account the arc-chamber's physical conditions when the CB opens. This is why various methods of determining CB wear have evolved which reflect the different operator philosophies. To do justice to these, the devices offer several methods:

- ΣI
- ΣI^2 , with $x = 1, \dots, 3$
- ΣP

The devices additionally offer a new method for determining the remaining service life:

- Two-point method

The CB manufacturers double-logarithmic switching cycle diagram (see Fig. 11) and the breaking current at the time of contact opening serve as the basis for this method. After CB opening, the two-point method calculates the number of still possible switching cycles. To this end, the two points P1 and P2 only have to be set on the device. These are specified in the CB's technical data.

All of these methods are phase-selective and a limit value can be set in order to obtain an alarm if the actual value falls below or exceeds the limit value during determination of the remaining service life.

Customized functions (ANSI 32, 51V, 55, etc.)

Additional functions, which are not time critical, can be implemented via the CFC using measured values. Typical functions include reverse power, voltage controlled overcurrent, phase sequence protection, and zero-sequence voltage detection.

Protection functions

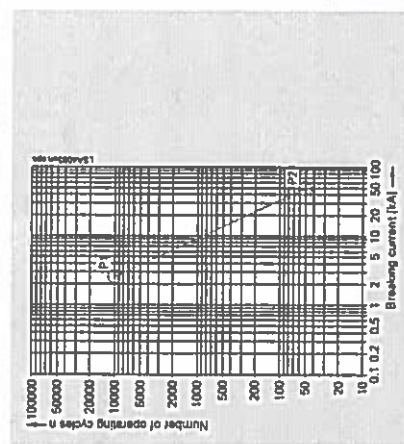


Fig. 11 CB switching cycle diagram

Commissioning

Commissioning could hardly be easier and is fully supported by DIGSI 4. The status of the binary inputs can be read individually and the state of the binary outputs can be set individually. The operation of switching elements (circuit-breakers, disconnect devices) can be checked using the switching functions of the bay controller. The analog measured values are represented as wide-ranging operational measured values. To prevent transmission of information to the control center during maintenance, the bay controller communications can be disabled to prevent unnecessary data from being transmitted. During commissioning, all indications with test marking for test purposes can be connected to a control and protection system.

Test operation

During commissioning, all indications can be passed to an automatic control system for test purposes.

Control and automatic functions

Control

In addition to the protection functions, the SIPROTEC 4 units also support all control and monitoring functions that are required for operating medium-voltage or high-voltage substations. The main application is reliable control of switching and other processes.

The status of primary equipment or auxiliary devices can be obtained from auxiliary contacts and communicated to the SIPROTEC 7SJ66 via binary inputs. Therefore it is possible to detect and indicate both the OPEN and CLOSED position or a fault or intermediate circuit-breaker or auxiliary contact position.

The switchgear or circuit-breaker can be controlled via:

- integrated operator panel
- binary inputs
- substation control and protection system
- DIGSI 4

SIPROTEC 7SJ66

Functions

Automation/user-defined logic

With integrated logic, the user can set, via a graphic interface (CFC), specific functions for the automation of switchgear or substation. Functions are activated via function keys, binary input or via communication interface.

Switching authority

Switching authority is determined according to parameters and communication. If a source is set to "LOCAL", only local switching operations are possible. The following sequence of switching authority is laid down: "LOCAL"; DIGSI PC program; "REMOTE".

Command processing

All the functionality of command processing is offered. This includes the processing of single and double commands with or without feedback, sophisticated monitoring of the control hardware and software, checking of the external process, control actions using functions such as runtime monitoring and automatic command termination after output. Here are some typical applications:

- Single and double commands using 1, 1 plus 1 common or 2 trip contacts
- User-definable bay interlocks
- Operating sequences combining several switching operations such as control of circuit-breakers, disconnectors and grounding switches
- Triggering of switching operations, indications or alarm by combination with existing information

Assignment of feedback to command

The positions of the circuit-breaker or switching devices and transformer taps are acquired by feedback. These indication inputs are logically assigned to the corresponding command outputs. The unit can therefore distinguish whether the indication change is a consequence of switching operation or whether it is a spontaneous change of state.

Chatter disable

Chatter disable feature evaluates whether, in a configured period of time, the number of status changes of indication input exceeds a specified figure. If exceeded, the indication input is blocked for a certain period, so that the event list will not record excessive operations.

Indication filtering and delay

Binary indications can be filtered or delayed. Filtering serves to suppress brief changes in potential at the indication input. The indication is passed on only if the indication voltage is still present after a set period of time. In the event of indication delay, there is a wait for a preset time. The information is passed on only if the indication voltage is still present after this time.

Indication derivation

A further indication (or a command) can be derived from an existing indication. Group indications can also be formed. The volume of information to the system interface can thus be reduced and restricted to the most important signals.

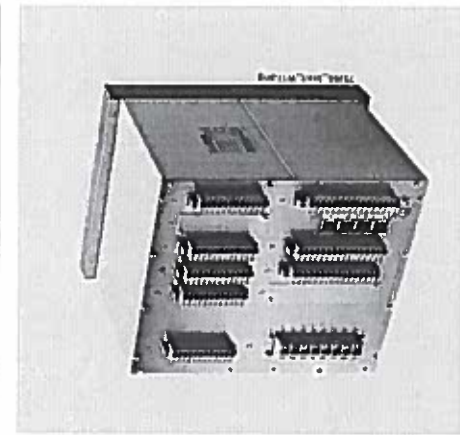


Fig. 12 SIPROTEC 7SJ663 rear view with communication ports

Switchgear cubicles for high/medium voltage

All units are designed specifically to meet the requirements of high/medium-voltage applications.

In general, no separate measuring instruments (e.g., for current, voltage, frequency, ...) or additional control components are necessary.

Measured values

The r.m.s. values are calculated from the acquired current and voltage along with the power factor, frequency, active and reactive power. The following functions are available for measured value processing:

- Currents I_{L1} , I_{L2} , I_{L3} , I_{L4} , I_{L5} (67Ns)
 - Voltages V_{L1} , V_{L2} , V_{L3} , V_{L4} , V_{L5} , V_{LX1} , V_{LX2} , V_{LX3}
 - Symmetrical components I_1 , I_2 , I_0 ; V_1 , V_2 , V_0
 - Power Watts, Vars, VAMP, Q, S (P, Q: total and phase selective)
 - Power factor (cos ϕ) (total and phase selective)
 - Frequency
 - Energy = kWh, \pm kWh, forward and reverse power flow
 - Mean as well as minimum and maximum current and voltage values
 - Operating hours counter
 - Mean operating temperature of overload function
 - Limit value monitoring
- Limit values are monitored using programmable logic in the CFC. Commands can be derived from this limit value indication.
- Zero suppression
- In a certain range of very low measured values, the value is set to zero to suppress interference.

Communication

In terms of communication, the units offer substantial flexibility in the context of connection to industrial and power automation standards.

USB interface

There is a USB interface on the front of the relay. All the relay functions can be parameterized on PC by using DIGSI. Commissioning tools and fault analysis are built into the DIGSI program and are used through this interface.

Rear interfaces

- Time synchronization interface
All units feature a permanently integrated electrical time synchronization interface. It can be used to feed timing telegrams in IEC 61850 or DCF77 format into the units via time synchronization receivers.
- System interface
Communication with a central control system takes place through this interface. The units can exchange data through this interface via Ethernet and IEC 61850 protocol and can also be operated by DIGSI.
- Service interface
The service interface was conceived for remote access to a number of protection units via DIGSI. It also allows communication via modem. For special applications, a temperature monitoring box (RTD box) can be connected to this interface.

System interface protocols

IEC 61850 protocol

The Ethernet-based IEC 61850 protocol is the worldwide standard for protection and control systems used by power supply corporations. Siemens was the first manufacturer to support this standard. By means of this protocol, information can also be exchanged directly between bay units so as to set up simple master-slave systems for bay and system interlocking. Access to the units via the Ethernet bus is also possible with DIGSI.

IEC 60870-5-103 protocol

The IEC 60870-5-103 protocol is an international standard for the transmission of protective data and fault recordings. All messages from the unit and also control commands can be transferred by means of published, Siemens-specific extensions to the protocol.

Abundant solutions are also possible. Optionally it is possible to send out and alter individual parameters (only possible with the redundant module).

Modbus RTU protocol

This uncomplicated, serial protocol is mainly used in industry and by power supply corporations, and is supported by a number of unit manufacturers. SIPROTEC units function as Modbus slaves, making their information available to a master or receiving information from it. A line-stamped event list is available.

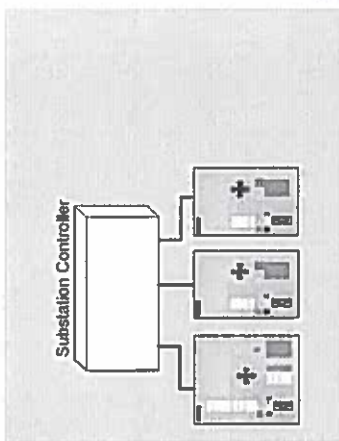


Fig. 13 IEC 60870-5-103: Radial electrical connection

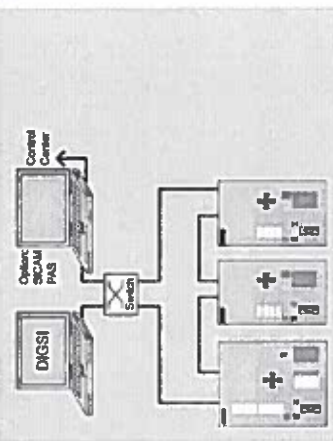


Fig. 14 Bus structure for station bus with Ethernet and IEC 61850 electrical ring

Selection table for multifunctional overcurrent protection devices											
Device	7SJ66	7SJ67	7SJ62	7SJ63	7SJ64	7SJ62	7SJ63	7SJ64	7SJ62	7SJ63	7SJ66
Multifunctional protection functions	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CTs	4	4	4	4	4	4	4	4	4	4	4
VBs	0/3	0	3/4	3	4	3/4	3	4	3/4	3	4
Binary inputs incl. life contact	3-11	3-11	8-11	11-37	7-48	11-37	11-37	7-48	11-37	11-37	16-34
Binary outputs	5-9	4-9	6-9	8-19	5-26	8-19	8-19	5-26	8-19	8-19	7-24
Spring-type terminals											
Auxiliary voltage	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 24-250 V AC 115-230 V	DC 110-250 V AC 115-230 V
UL listing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Surface mounting case	•	•	•	•	•	•	•	•	•	•	•
Detached operator panel											
Languages	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	gelemlésírás rúch	enkes
Front USB	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interfaces exchangeable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IEC 61850	•	•	•	•	•	•	•	•	•	•	• (elec.)
IEC 60870-5-103	•	•	•	•	•	•	•	•	•	•	• (elec.)
Modbus RTU	•	•	•	•	•	•	•	•	•	•	• (elec.)
Profibus FMS	•	•	•	•	•	•	•	•	•	•	•
Profibus DP	•	•	•	•	•	•	•	•	•	•	•
PROFINET IO	•	•	•	•	•	•	•	•	•	•	•
DNP 3 serial/UDP	•	•	•	•	•	•	•	•	•	•	•

✓ basic

• not available

• optional

Typical connections

- Connection of current and voltage transformers

Standard connection

For grounded networks, the ground current is obtained from the phase currents by the residual current circuit.

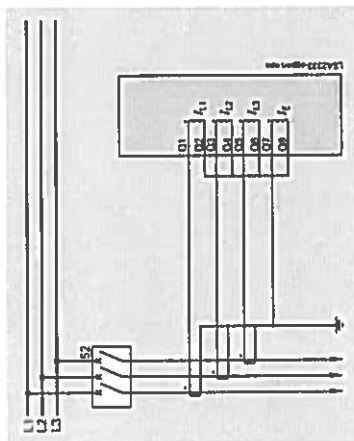


Fig. 15 Residual current circuit without directional element

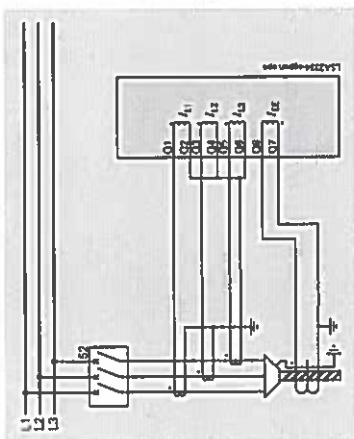


Fig. 16 Sensitive ground-current detection without directional element

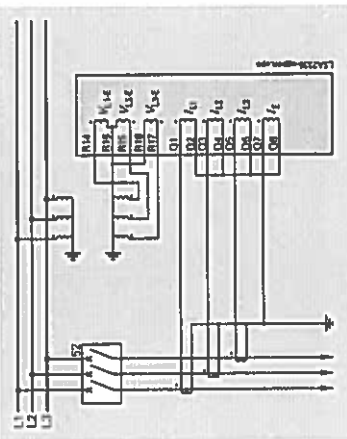


Fig. 17 Residual current circuit with directional element

Connection for compensated networks

The figure shows the connection of two phase-to-ground voltages and the V_t voltage of the open delta winding and a phase-balance neutral current transformer for the ground current. This connection maintains maximum precision for directional ground-fault detection and must be used in compensated networks. Fig. 19 shows sensitive directional ground-fault detection.

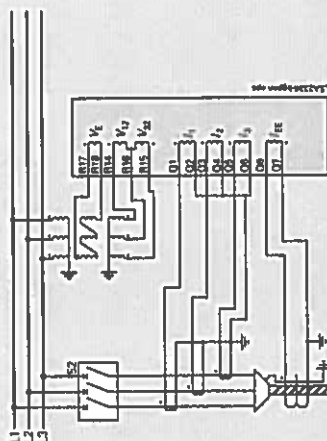


Fig. 18 Sensitive directional ground-fault detection with directional element for phases

Connection for isolated-neutral or compensated networks only

If directional ground-fault protection is not used, the connection can be made with only two phase current transformers. Directional phase short-circuit protection can be achieved by using only two primary transformers.

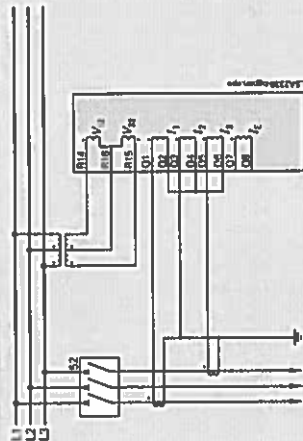


Fig. 19 Isolated neutral or compensated networks

Connection for the synchro-check function

The 3-phase system is connected as reference voltage, i.e. the outgoing voltages as well as a single-phase voltage, in this case a busbar voltage, that has to be checked for synchronism.

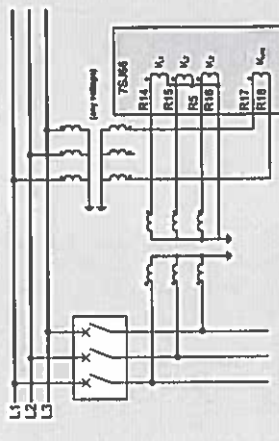


Fig. 20 Measuring of the busbar voltage and the outgoing feeder voltage for the synchro-check



Overview of connection types		
Type of network	Function	Current connection
(Low-resistance) grounded network	Overcurrent protection phase/ground non-directional	Residual circuit, with 3 phase-current transformers required, phase-balance neutral current transformer possible
(Low-resistance) grounded networks	Sensitive ground fault protection	Phase-balance neutral current transformers required
Isolated or compensated networks	Overcurrent protection phases non-directional	Residual circuit, with 3 or 2 phase current transformers possible
(Low-resistance) grounded networks	Overcurrent protection phases directional	Residual circuit, with 3 phase-current transformers required
Isolated or compensated networks	Overcurrent protection phases directional	Residual circuit, with 3 or 2 phase-current transformers possible
(Low-resistance) grounded networks	Overcurrent protection ground directional	Residual circuit, with 3 phase-current transformers required
Isolated networks	Sensitive ground fault protection	Residual circuit, if ground current > 0.05 In on secondary side, otherwise phase-balance neutral current transformers required
Compensated networks	Sensitive ground fault protection	Phase-balance neutral current transformers required

Typical applications

■ Connection of circuit-breaker

Undervoltage releases

Undervoltage releases are used for automatic tripping of high-voltage motors.

Example:
DC supply voltage of control system fails and manual electric tripping is no longer possible.

Automatic tripping takes place when voltage across the coil drops below the trip limit. In Fig. 21, tripping occurs due to failure of DC supply voltage, by automatic tripping of the live status contact upon opening of the protection unit or by short-circuiting the trip coil in event of network fault.

Fig. 22 tripping is by failure of auxiliary voltage and by interruption of tripping circuit in the event of network failure. Upon failure of the protection unit, the tripping circuit is also interrupted, since contact held by internal logic drops back into open position.

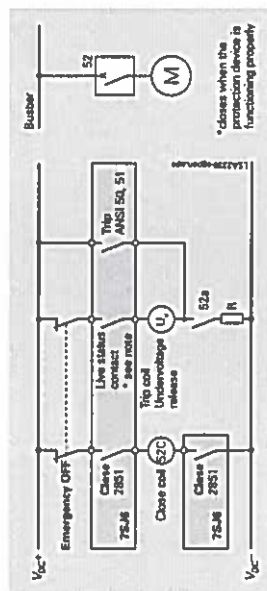


Fig. 21 Undervoltage release with make contact (S0, S1)

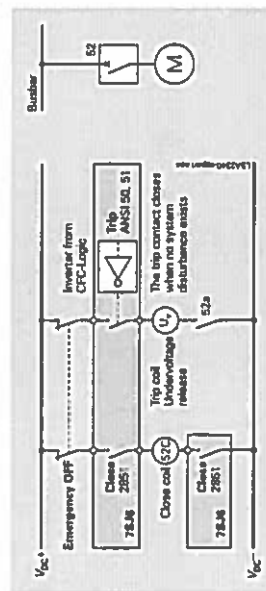


Fig. 22 Undervoltage trip with locking contact (trip signal S0 is inverted)

Trip circuit supervision (ANSI 74TC)

One or two binary inputs can be used for monitoring the circuit-breaker trip coil including its incoming cables. An alarm signal occurs whenever the circuit is interrupted.

Lockout (ANSI 86)

All binary outputs can be stored like LEDs and reset using the LED reset key. The lockout state is also stored in the event of supply voltage failure. Reclosure can only occur after the lockout state is reset.

Reverse-power protection for dual supply (ANSI 32R)

If power is fed to a busbar through two parallel infeeds, then in the event of any fault on one of the infeeds it should be selectively interrupted. This ensures a continued supply to the busbar through the remaining infeed. For this purpose, directional devices are needed which detect a short-circuit current or a power flow from the busbar in the direction of the infeed. The directional overcurrent protection is usually set via the load current. It cannot be used to deactivate low-current faults. Reverse-power protection can be set far below the rated power. This ensures that it also detects power feedback into the line in the event of low-current faults with levels far below the load current. Reverse-power protection is performed via the "flexible protection functions" of the SIPROTEC 7SJ66.

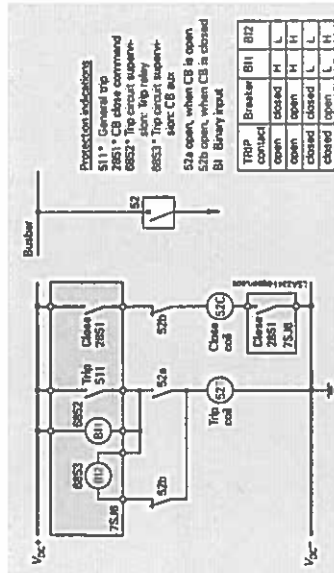


Fig. 23 Trip circuit supervision with 2 binary inputs

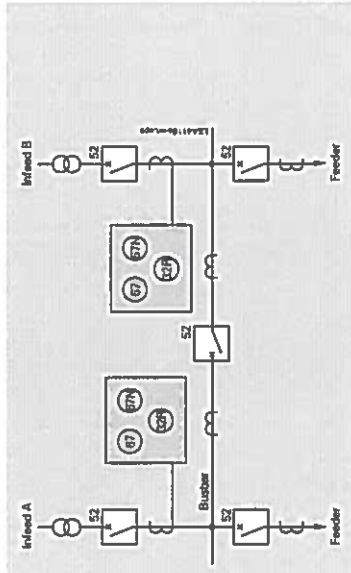


Fig. 24 Reverse power protection for dual supply

SIPROTEC 7SJ66

Selection and ordering data

Order No.	7506	H15
SIPROTEC 7SJ186 multifunction protection relay and bay controller		
Basic version	ANSI No.	Description
Control	501S1	Overcurrent protection $I_{>}$, $I_{>>}$, $I_{>>>}$, I_p
50K51N	50K51N	Ground fault protection $I_{>}$, $I_{>>}$, $I_{>>>}$, I_{fg}
50M51N	50M51N	In sensitive ground fault protection via IEE function: $I_{g>}$, $I_{g>>}$, $I_{g>>>}$ (Fig. 1)
50F50N	50F50N	Flexible protection functions (index quantities derived from current); Additional time-overcurrent protection stage $I_{>}$, $I_{>>}$, $I_{>>>}$, $I_{>>>>}$
51 V	51 V	Voltage-dependent inverse-time overcurrent protection
49	49	Overload protection (with 2 time constants)
46	46	Phase balance current protection
37	37	(negative-sequence monitoring)
47	47	Undercurrent monitoring
59M64	59M64	Phase sequence
50BF	50BF	Displacement voltage
74TC	74TC	Breaker failure protection
86	86	Trip circuit supervision, 4 setting groups, cold-load pickup inrush blocking
Basic + V.P.f		Lactout
Basic version (see above)		
FE		
27I59	27I59	Under-voltage
81OU	81OU	Under-frequency
27Q	27Q	Undervoltage-controlled reactive power protection
27I47IS9(N)	27I47IS9(N)	Flasible protection (index quantities derived from current and voltage); Voltage, power, p.f., rate-of-frequency-change protection
32J5S81R	32J5S81R	rate-of-frequency-change protection
Basic version (see above)		
P E		
27I59	27I59	Under-voltage
81OU	81OU	Under-frequency
27Q	27Q	Undervoltage-controlled reactive power protection
27I47IS9(N)	27I47IS9(N)	Flasible protection (index quantities derived from current and voltage); Voltage, power, p.f., rate-of-frequency-change protection
32J5S81R	32J5S81R	rate-of-frequency-change protection
Basic version (see above)		
F C		
67I67N	67I67N	Direction determination for overcurrent, phases and ground
Basic version (see above)		
F G		
67I67N	67I67N	Direction determination for overcurrent, phases and ground
27I59	27I59	Under-voltage
81OU	81OU	Under-frequency
27Q	27Q	Undervoltage-controlled reactive power protection
27I47IS9(N)	27I47IS9(N)	Flasible protection (index quantities derived from current and voltage); Voltage, power, p.f., rate-of-frequency-change protection
32J5S81R	32J5S81R	rate-of-frequency-change protection
Basic version (see above)		
P G		
67I67N	67I67N	Direction determination for overcurrent, phases and ground
27I59	27I59	Under-voltage
81OU	81OU	Under-frequency
27Q	27Q	Undervoltage-controlled reactive power protection
27I47IS9(N)	27I47IS9(N)	Flasible protection (index quantities derived from current and voltage); Voltage, power, p.f., rate-of-frequency-change protection
32J5S81R	32J5S81R	rate-of-frequency-change protection
Basic version (see above)		
P C		
67I67N	67I67N	Direction determination for overcurrent, phases and ground
Basic version (see above)		

Continued on next page

V, P, f = Voltage, power, frequency protection 1) only with position 7 = 1 or 5 (non-sensitive ground current input)
 Dir = Directional overcurrent protection
 IEF = Intermittent ground fault

1) only with position 7 = 1 or 2 (non-arc-time ground current input)

SIPROTEC 7SJ66

Selection and ordering data

Description	Order No.	Order code
SIPROTEC 7SJ66 multifunction protection relay and bay controller	7SJ66	12345 6 7 8 9 101112 131415
Basic + Sens. earth-f-det. Dir REF	67167N 67Ns 67Ns	FD
Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault protection		
Basic + Sens. earth-f-det. Dir IEF REF	67167N 67Ns 67Ns 67Ns	FD
Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault protection Intermittent earth-fault		
Basic + Sens. earth-f-det. V.P.I. REF	67167N 67Ns 67Ns 67Ns 2759 8100U 27Q 27Q 27Q 325581R	FD
Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault protection Under-boost voltage Under-boost frequency Under-voltage-controlled reactive power protection Flexible protection (index quantities derived from current and voltages); Voltage, power, p.L., rate-of-frequency-change protection		
Basic + Sens. earth-f-det. REF	67167N 67Ns 67Ns	FD
Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault protection		
Basic + Sens. earth-f-det. Motor V.P.I. REF	67167N 67Ns 67Ns 67Ns 4814 6086 51M 2759 8100U 27Q 27Q 27Q 325581R	HD
Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault protection Starting line supervision, locked rotor Restart inhibit Motor load jam protection Motor statistics Under-boost voltage Under-boost frequency Under-voltage-controlled reactive power protection Flexible protection (index quantities derived from current and voltages); Voltage, power, p.L., rate-of-frequency-change protection		
Basic + Sens. earth-f-det. Motor Dir V.P.I. REF	4814 6086 51M	HA
Basic version (see page 20) Starting line supervision, locked rotor Restart inhibit Motor load jam protection Motor statistics		
Measuring/fault recording With fault recording With fault recording, average values, maximum values		
Auto reclosing, fault locator, synchro-check Without With 79 21FL 79, 21FL 25 25, 79, 21FL		
With 79 and fault locator With synchronization With synchronization, 79 and fault locator		

SIPROTEC 7SJ66

Selection and ordering data

Description	Order No.	Order code
SIPROTEC 7SJ66 multifunction protection relay and bay controller	7SJ66	12345 6 7 8 9 101112 131415
Basic + Sens. earth-f-det. Motor Dir IEF V.P.I. REF	67167N 67Ns 67Ns 67Ns 4814 6086 51M 2759 8100U 27Q 27Q 27Q 325581R	HD
Basic version (see page 20) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault protection Starting line supervision, locked rotor Restart inhibit Motor load jam protection Motor statistics Under-boost voltage Under-boost frequency Under-voltage-controlled reactive power protection Flexible protection (index quantities derived from current and voltages); Voltage, power, p.L., rate-of-frequency-change protection		
Basic + Sens. earth-f-det. Motor Dir V.P.I.	4814 6086 51M	HA
Basic version (see page 20) Starting line supervision, locked rotor Restart inhibit Motor load jam protection Motor statistics		
Measuring/fault recording With fault recording With fault recording, average values, maximum values		
Auto reclosing, fault locator, synchro-check Without With 79 21FL 79, 21FL 25 25, 79, 21FL		
With 79 and fault locator With synchronization With synchronization, 79 and fault locator		

V.P.I. = Voltage, power, frequency protection
Dir = Directional overcurrent protection
IEF = Intermittent ground fault
REF = Restricted earth fault

2) For isolated-compensated networks, only with position 7-2,4 (sensitive earth current input)

Continued on next page



SIPROTEC 7SJ66

Selection and ordering data

Accessories	Description	Order No.
	DIGSI 4 Software for configuration and operation of Siemens protection units running under MS Windows Server 2008 / XP Professional Edition / Windows 7 Ultimate / Enterprise Full version with license for 10 computers, on CD-ROM (authorization by serial number) Basic 7XS5400-0AA00	7XS5400-0AA00
	Professional DIGSI 4 Basic and additionally SIGRA (fault record analysis), CFC Editor (logic editor), Display Editor (editor for default and control displays) and DIGSI 4 Remote (remote operation) Professional + IEC 61850 Complete version: DIGSI 4 Basic and additionally SIGRA (fault record analysis), CFC Editor (logic editor), Display Editor (editor for default and control displays) DIGSI 4 Remote (remote operation) IEC 61850 system configurator 7XS5403-0AA00	7XS5403-0AA00
	IEC 61850 System configurator Software for configuration of stations with IEC 61850 communication under DIGSI, running under MS Windows Server 2008 / XP Professional Edition / Windows 7 Ultimate / Enterprise Optional package for DIGSI 4 Basic or Professional License for 10 PCs. Authorization by serial number. On CD-ROM 7XS5460-0AA00	7XS5460-0AA00
	SIGRA 4 Software for graphic visualization, analysis and evaluation of fault records. Can also be used for fault records of devices of other manufacturers (Comtrade format). Running under MS Windows Server 2008 / XP Professional Edition / Windows 7 Ultimate / Enterprise (generally contained in DIGSI Professional, but can be ordered additionally) Authorization by serial number. On CD-ROM. 7XS5410-0AA00	7XS5410-0AA00
	Temperature monitoring box RTD-box TR1200 (IS 485) RTD-box TR1200 IP (Ethernet) 7XS5662-6AD10 7XS5662-8AD10	7XS5662-6AD10 7XS5662-8AD10
	Voltage/Voltage arrester Voltage arrester for high-impedance REF protection 125 Vrms; 600 A; 15S 256 240 Vrms; 600 A; 15S 1088 C53207-A401-D76-1 C53207-A401-D77-1	C53207-A401-D76-1 C53207-A401-D77-1
	Manual for 7SJ66 English C53000-81140-C3B3-x 1)	C53000-81140-C3B3-x 1)

1) x = Please inquire for latest edition (exact Order No.)

SIPROTEC 7SJ66

Connection diagram

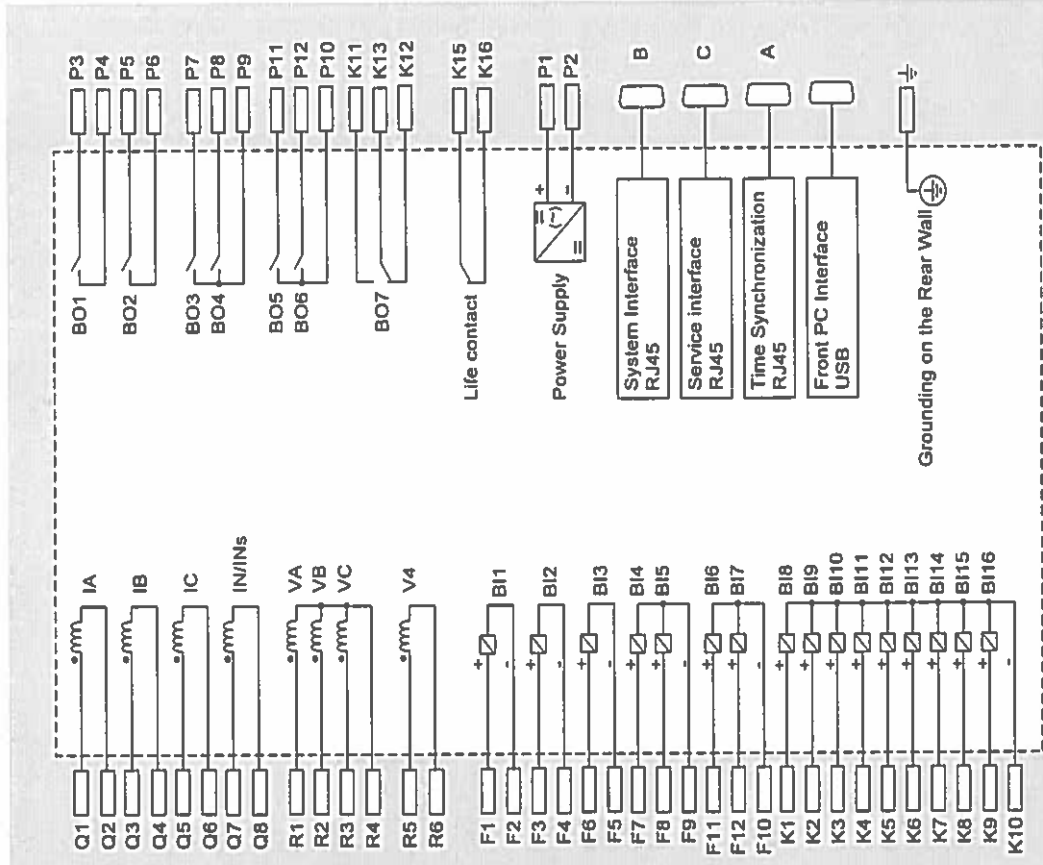


Fig. 25 SIPROTEC 7SJ66 connection diagram

SIPROTEC 7SJ66

Connection diagram

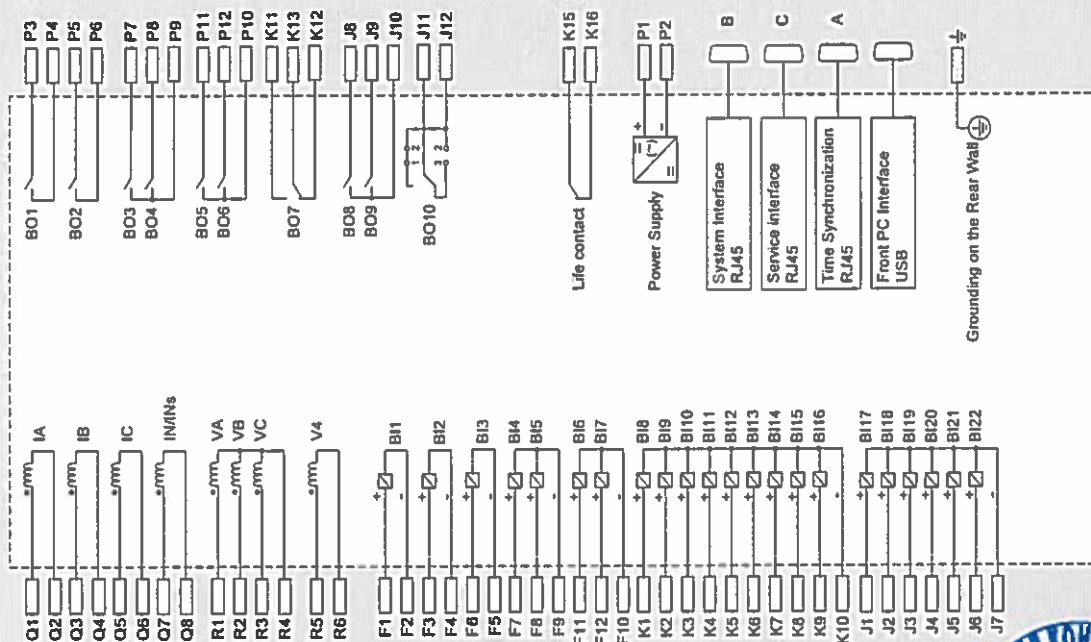


Fig. 27 SIPROTEC 7SJ662 connection diagram

SIPROTEC 7SJ66

Connection diagram

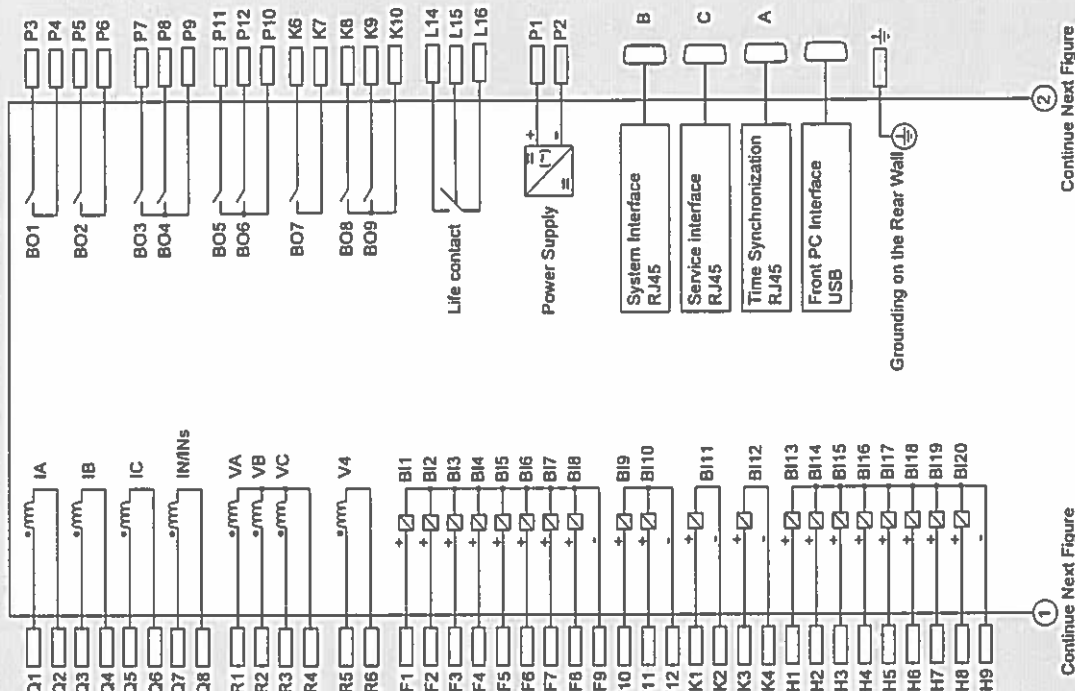
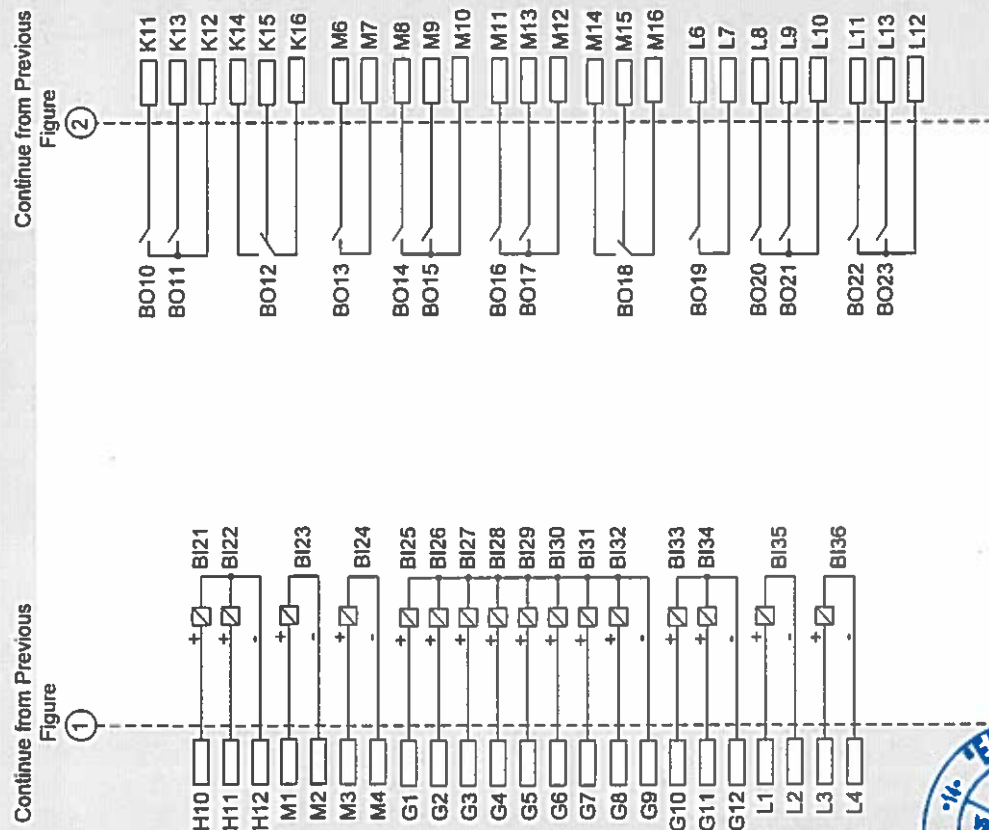


Fig. 27 SIPROTEC 7SJ663 connection diagram

SIPROTEC 7SJ66

Connection diagram



SIPROTEC 7SJ66

Dimensions

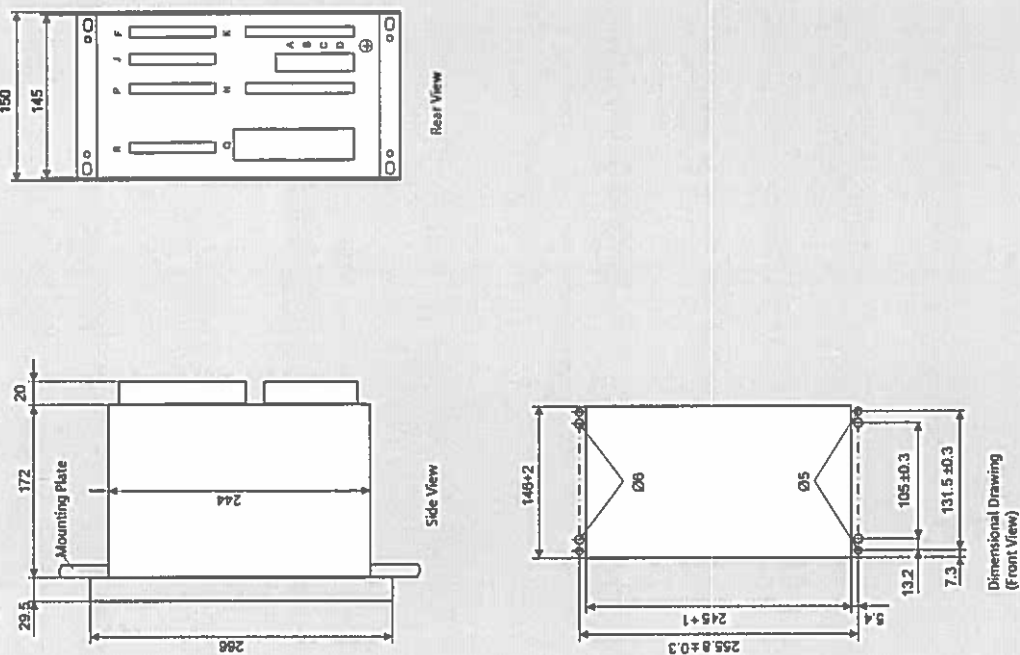
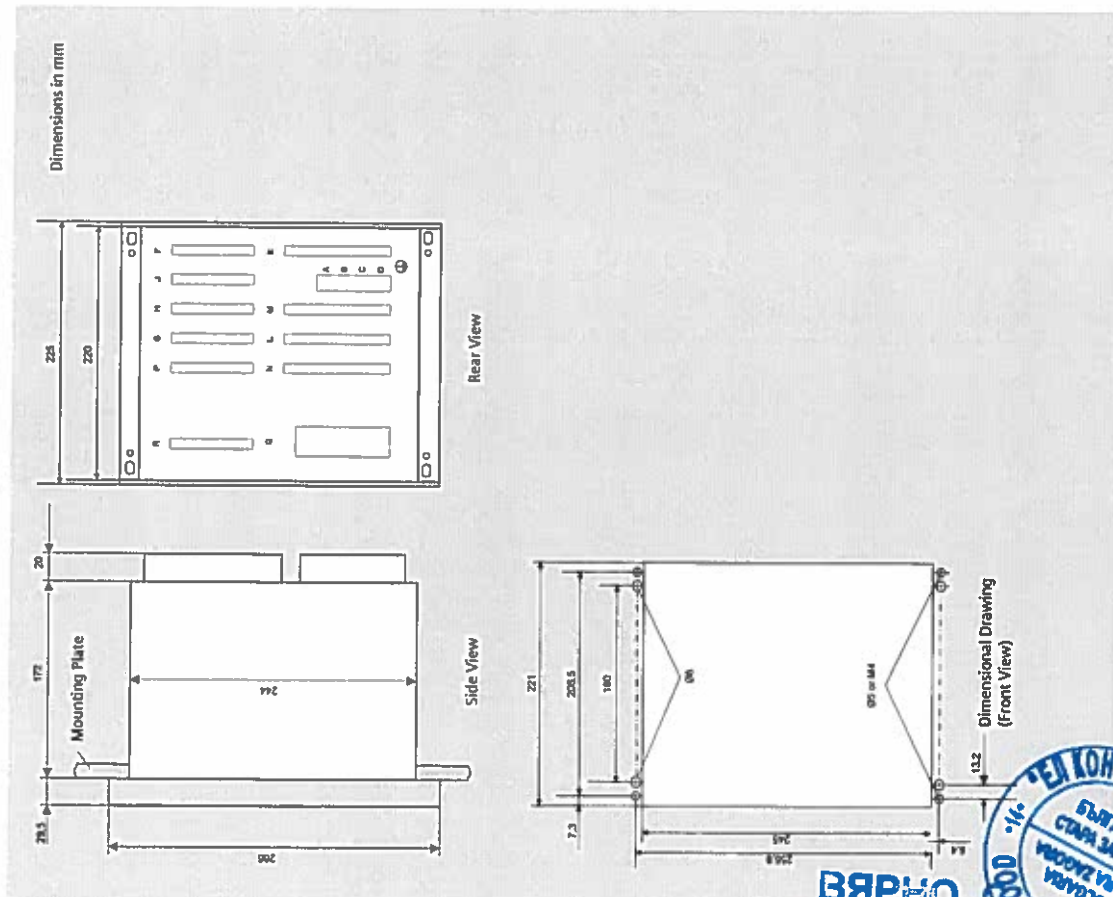


Fig. 29 Dimensional drawing for SIPROTEC 7SJ66 (housing size 113)

SIPROTEC 7SJ66

Dimensions



Technical drawing of a SIPROTEC 7SJ66 (housing size 122)

Published by and Copyright © 2014:

Siemens AG
Infrastructure & Cities Sector
Smart Grid Division
Energy Automation
Humboldtstr. 59
90459 Nuremberg, Germany

All rights reserved.
It is not stated otherwise on the individual pages of this catalog, we reserve the right to make modifications, especially regarding the stated values, dimensions and weights.

Drawings are not binding.
All product designations used are trademarks or product names of Siemens AG or other suppliers.
If not stated otherwise, all dimensions in this catalog are given in mm.

Subject to change without prior notice.
The information in this document contains general descriptions of the technical options available, which may not apply in all cases. The required technical options should therefore be specified in the contract.

For all products using security features of OpenSSL, the following shall apply:
This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>).
This product includes cryptographic software written by Eric Young (eray@cryptosoft.com).

For more information, please contact our
Customer Support Center.
Phone: +49 180 524 84 37
Fax: +49 180 524 24 71
(Charges depending on provider)
E-Mail: support.ic@siemens.com
www.siemens.com/siprotec

Transformer Differential Protection / 7UT6

SIPROTEC 4 7UT6 differential protection relay for transformers, generators, motors and busbars

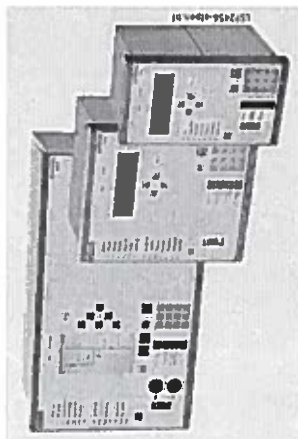


Fig. 81 SIPROTEC 4 7UT6 differential protection relay for transformers, generators, motors and busbar

Description

The SIPROTEC 7UT6 differential protection relays are used for fast and selective fault clearing of short-circuits in transformers of all voltage levels and also in rotating electric machines like motors and generators, for short lines and busbars.

The protection relay can be parameterized for use with three-phase and single-phase transformers.

The specific application can be chosen by parameterization. In this way an optimal adaptation of the relay to the protected object can be achieved.

In addition to the differential function, a backup overcurrent protection for 1 winding/star point is integrated in the relay. Optionally, a low or high impedance restricted ground-fault protection, a negative-sequence protection and a breaker failure protection can be used. 7UT613 and 7UT633 feature 4 voltage inputs. With this option an overvoltage and undervoltage protection is available as well as frequency protection, reverse / forward power protection, fuse failure monitor and overexcitation protection. With external temperature monitoring boxes (thermo-boxes) temperatures can be measured and monitored in the relay. Therefore, complete thermal monitoring of a transformer is possible, e.g. hot-spot calculation of the oil temperature.

7UT613 and 7UT633 only feature full coverage of applications without external relays by the option of multiple protection functions e.g. overcurrent protection is available for each winding measurement location of a transformer. Other functions are available twice: ground-fault differential protection, breaker protection and overload protection. Furthermore, up to 12 user-defined (flexible) protection functions may be activated by the customer with the choice of measured voltages, currents, power and frequency as input variables.

The relays provide easy-to-use local control and automation functions. The integrated programmable logic (CFC) allows the users to implement their own functions, e.g. for the automation of switchgear (interlocking). User-defined messages can be generated as well. The flexible communication interfaces are open for modern communication architectures with control system.

Function overview

- Differential protection for 2- up to 5-winding transformers (3-/1-phase)
- Differential protection for motors and generators
- Differential protection for short 2 up to 5 terminal lines (phase-segregated or with summation CT)
- Protection functions
 - Differential protection with phase-segregated measurement
 - Sensitive measuring for low-fault currents
 - Fast tripping for high-fault currents
 - Restraint against inrush of transformer
 - Phase / ground overcurrent protection
 - Overload protection with or without temperature measurement
 - Negative-sequence protection
 - Breaker failure protection
 - Low/high-impedance restricted ground fault (REF)
 - Voltage protection functions (7UT613/633)
- Control functions
 - Commands for control of circuit-breakers and isolators
 - 7UT633: Graphic display shows position of switching elements, local remote switching by key-operated switch
 - Control via keyboard, binary inputs, DIGSI 4 or SCAADA system
 - User-defined logic with CFC
- Monitoring functions
 - Self-supervision of the relay
 - Trip circuit supervision
 - Oscillographic fault recording
 - Permanent differential and restraint current measurement, extensive scope of operational values
- Communication interfaces
 - PC front port for setting with DIGSI 4
 - System interface
 - IEC 61850 Ethernet
 - IEC 60870-5-103 protocol,
 - PROFIBUS-FMS/DP,
 - MODBUS or DNP 3.0
 - Service interface for DIGSI 4 (modem) temperature monitoring (thermo-box)
 - Time synchronization via IRIG-B/DCF 77

Transformer Differential Protection / 7UT6

Application

Application

The numerical protection relays 7UT6 are primarily applied as differential protection on

- transformers
 - 7UT612: 2 windings
 - 7UT613/633: 2 up to 3 windings
 - 7UT635: 2 up to 5 windings,
- generators
- motors
- short line sections
- small busbars
- parallel and series reactors.

The user selects the type of object that it is to be protected by setting during configuration of the relay. Subsequently, only those parameters that are relevant for this particular protected object need to be set. This concept, whereby only those parameters relevant to a particular protected object need to be set, substantially contributed to a simplification of the setting procedure. Only a few parameters must be set. Therefore the new 7UT6 relays also make use of and extend this concept. Apart from the protected plant objects defined in the 7UT6, a further differential protection function allows the protection of

- single busbars with up to 12 feeders.
- The well-proven differential measuring algorithm of the 7UT51 relay is also used in the new relays, so that a similar response with regard to short-circuit detection, tripping time saturation detection and inrush restraint is achieved.

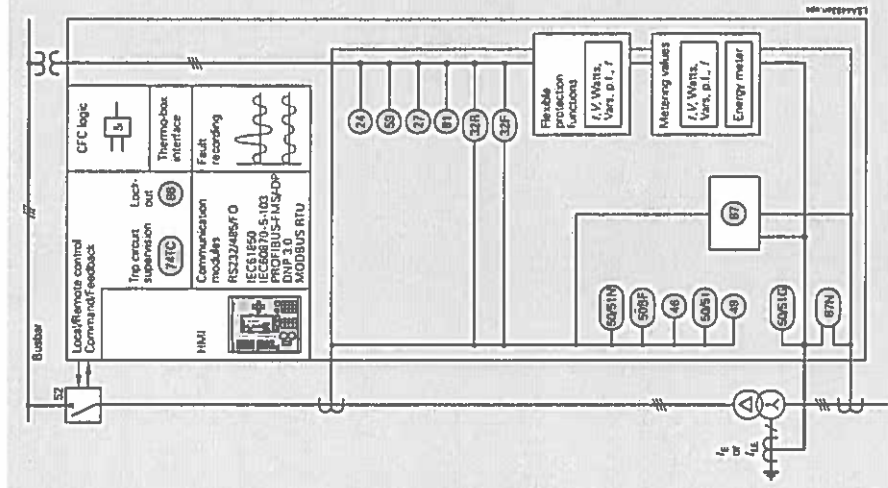


Fig. 82 Function diagram

Transformer Differential Protection /7UT6

Application, construction

Application	ANSI No.	7UT612	7UT613/23	7UT635	Three-phase transformer	Single-phase transformer	Auto-transformer	Generator/Motor	Busbar, 3-phase	Busbar, 1-phase
Differential protection	87T/C/N/A	1	1	1	■	■	■	■	■	■
Ground fault differential protection	87 N	1	2	2	■	■	■	■	■	■
Overcurrent protection, phases	50S1	1	3	3	■	■	■	■	■	■
Overcurrent protection 3φ	50S1N	1	3	3	■	■	■	■	■	■
Overcurrent-time protection, ground	50S1G	1	2	2	■	■	■	■	■	■
Overcurrent-time protection, single-phase		1	1	1	■	■	■	■	■	■
Negative-sequence protection	46	1	1	1	■	■	■	■	■	■
Overload protection IEC 60255-8	49	1	2	2	■	■	■	■	■	■
Overload protection IEC 60354	49	1	2	2	■	■	■	■	■	■
Overvoltage protection *) V _{Ph}	24	1	1	1	■	■	■	■	■	■
Overvoltage protection *) V _Σ	59	1	1	1	■	■	■	■	■	■
Undervoltage protection *) V _Σ	27	1	1	1	■	■	■	■	■	■
Frequency protection *) f _Σ , f _c	81	1	1	1	■	■	■	■	■	■
Reverse power protection *) P	32R	1	1	1	■	■	■	■	■	■
Forward power protection *) P _Σ , P _c	32F	1	1	1	■	■	■	■	■	■
Fuse failure protection	60FL	1	1	1	■	■	■	■	■	■
Breaker failure protection	50 BF	1	2	2	■	■	■	■	■	■
External temperature monitoring (thermo-box)	38	■	■	■	■	■	■	■	■	■
Lockout	86	■	■	■	■	■	■	■	■	■
Measured-value supervision		■	■	■	■	■	■	■	■	■
Trip circuit supervision	74 TC	■	■	■	■	■	■	■	■	■
Direct coupling 1		■	■	■	■	■	■	■	■	■
Direct coupling 2		■	■	■	■	■	■	■	■	■
Operational measured values		■	■	■	■	■	■	■	■	■
Flexible protection functions	27, 32, 47, 50, 55, 59, 81	12	12	12	■	■	■	■	■	■

■ Function applicable
 - Function not applicable in this application
 *) Only 7UT613/635a

Construction

The 7UT6 is available in three housing widths referred to a 19" module frame system. The height is 243 mm.
 (7UT612),
 (7UT613),
 (7UT633/635) of 19"

All cables can be connected with or without cable ring lugs. Plug-in terminals are available as an option, it is thus possible to employ prefabricated cable harnesses. In the case of surface mounting on a panel, the connection terminals are located above and below in the form of screw-type terminals. The communication interfaces are located on the same sides of the housing. For dimensions please refer to the dimension drawings

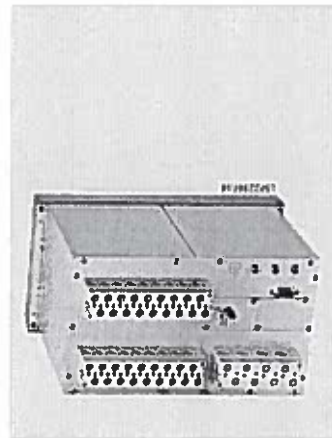


Fig. B/3 Rear view flush-mounting housing

Transformer Differential Protection /7UT6

Protection functions

Protection functions

Differential protection for transformers (ANSI 87T)

When the 7UT6 is employed as fast and selective short-circuit protection for transformers the following properties apply:

- Tripping characteristic according to Fig. B/4 with normal sensitive $I_{\text{dip}} >$ and high-set trip stage $I_{\text{dip}} >$
- Vector group and ratio adaptation
- Depending on the treatment of the transformer neutral point, zero-sequence current conditioning can be set with or without consideration of the neutral current. With the 7UT6, the star-point current at the star-point CT can be measured and considered in the vector group treatment, which increases sensitivity by one third for single-phase faults.
- Fast clearance of heavy internal transformer faults with high-set differential element $I_{\text{dip}} >$.
- Restrain of inrush current with 2nd harmonic. Cross-block function that can be limited in time or switched off.
- Restrain against overfluxing with a choice of 3rd or 5th harmonic stabilization is only active up to a settable value for the fundamental component of the differential current.
- Additional restraint for an external fault with current transformer saturation (patented CT-saturation detector from 7UT51).
- Insensitivity to DC current and current transformer errors due to the freely programmable tripping characteristic and fundamental filtering.
- The differential protection function can be blocked externally by means of a binary input.

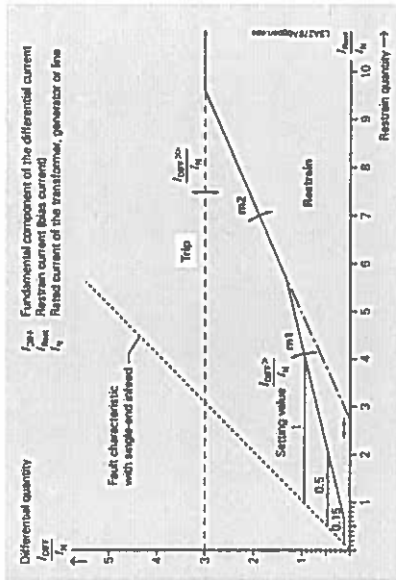


Fig. B/4 Tripping characteristic with preset transformer parameters for three-phase faults

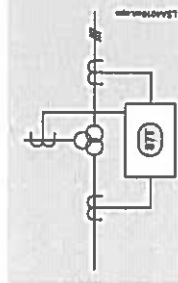


Fig. B/5 3-winding transformer (1 or 3-phase)

Transformer Differential Protection / 7UT6

Protection functions

Reverse-power protection (ANSI 32R) (7UT613/633 only)

The reverse-power protection monitors the direction of active power flow and picks up when the mechanical energy fails. This function can be used for operational shutdown (sequential tripping) of the generator but also prevents damage to the steam turbines. The reverse power is calculated from the positive-sequence systems of current and voltage. Asymmetrical power system faults therefore do not cause reduced measuring accuracy. The position of the emergency trip valve is injected as binary information and is used to switch between two trip command delays. When applied for motor protection, the sign (+) of the active power can be reversed via parameters.

Forward-power protection (ANSI 32F) (7UT613/633 only)

Monitoring of the active power produced by a generator can be useful for starting up and shutting down generators. One stage monitors exceeding of a limit value, while another stage monitors falling below another limit value. The power is calculated using the positive-sequence component of current and voltage. The function can be used to shut down idling motors.

Flexible protection functions (7UT613/633 only)

For customer-specific solutions up to 12 flexible protection functions are available and can be parameterized. Voltages, currents, power and frequency from all measurement locations can be chosen as inputs. Each protection function has a settable threshold, delay time, blocking input and can be configured as a 1 phase or 3-phase unit.

Monitoring functions

The relay comprises high-performance monitoring for the hardware and software.

The measuring circuits, analog-digital conversion, power supply voltages, battery, memories and software sequence (watch-dog) are all monitored.

The fuse failure function detects failure of the measuring voltage due to short-circuit or open circuit of the wiring or VT and avoids overvoltage of the undervoltage elements in the protection functions. (7UT613/633 only)

Thermal monitoring of transformers

The importance of reducing the costs of transmitting and distributing energy by optimizing the system load has resulted in the increased importance of monitoring the thermal condition of transformers. This monitoring is one of the tasks of the monitoring systems, designed for medium and large transformers. The thermal protection function based on a simple thermal model, and using differential protection systems for a number of years.

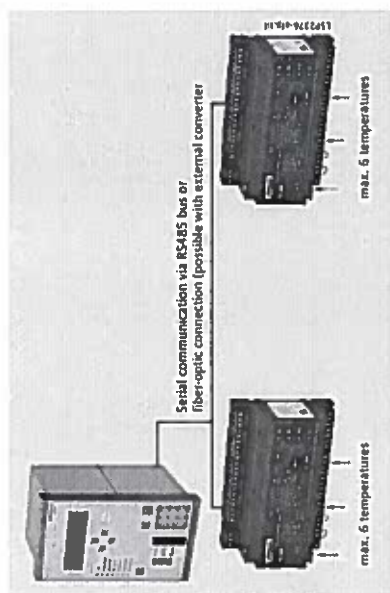


Fig. 8/9 Temperature measurement and monitoring with external thermo-boxes

The ability of the 7UT6 to monitor the thermal condition can be improved by serial connection of a temperature monitoring box (also called thermo-box or RTD-box) (Fig. 8/9). The temperature of up to 12 measuring points (connection of 2 boxes) can be registered. The type of sensor (Pt100, Ni100, Ni120) can be selected individually for each measuring point. Two alarm stages are derived for each measuring point when the corresponding set threshold is exceeded.

Alternatively to the conventional overload protection, the relay can also provide a hot-spot calculation according to IEC 60345. The hot-spot calculation is carried out separately for each leg of the transformer and takes the different cooling modes of the transformer into consideration.

The oil temperature must be registered via the thermo-box for the implementation of this function. An alarm warning stage and final alarm stage is issued when the maximum hot-spot temperature of the three legs exceeds the threshold value.

For each transformer leg a relative rate of ageing, based on the ageing at 98 °C is indicated as a measured value. This value can be used to determine the thermal condition and the current thermal reserve of each transformer leg. Based on this rate of ageing, a remaining thermal reserve is indicated in % for the hottest spot before the alarm warning and final alarm stage is reached.

Transformer Differential Protection / 7UT6

Protection functions

Measured values

The operational measured values and statistic value registering in the 7UT6, apart from the registration of phase currents and voltages (7UT613/633 only) as primary and secondary values, comprises the following:

- Currents 3-phase $I_1, I_2, I_3, I_1, I_2, I_3$
- Currents 1-phase I_1 to I_3 for each feeder and further inputs I_1 to I_4
- Voltages 3-phase $V_{11}, V_{12}, V_{13}, V_{12}, V_{13}, V_{21}, V_{22}, V_{23}, V_{31}, V_{32}, V_{33}$ and 1-phase V_1, V_2, V_3
- Phase angles of all 3-phase/1-phase currents and voltages
- Power Watts, Vars, VAIP, Q, S (P, Q, total and phase selective)
- Power factor ($\cos \phi$).
- Frequency
- Energy + kWh, + kVarh, forward and reverse power flow
- Min./max. and mean values of V_{M-PH} , $V_{M-V}, V_1, V_2, I_{M-V}, I_1, I_2, I_3, I_{M-PH}$, $I_{M-V}, S, P, Q, \cos \phi, f$

- Registration of the interrupted currents and counter for protection trip commands
- Mean operating temperature of overload function
- Measured temperatures of external thermo-boxes
- Differential and restraint currents of differential protection and REF

- Metered values

For internal metering, the unit can calculate an energy metered value from the measured current and voltage values. The 7UT6 relays may be integrated into monitoring systems by means of the diverse communication options available in the relays. An example for this is the connection to the SIPRAM transformer monitoring system with PROFIBUS-DP interface.

Metered values

For internal metering, the unit can calculate an energy metered value from the measured current and voltage values.

The 7UT6 relays may be integrated into monitoring systems by means of the diverse communication options available in the relays. An example for this is the connection to the SIPRAM transformer monitoring system with PROFIBUS-DP interface.

Commissioning and operating aids

Commissioning could hardly be easier and is fully supported by DIGSI 4. The status of the binary inputs can be read individually and the state of the binary outputs can be set individually. The operation of switching elements (circuit-breakers, disconnect devices) can be checked using the switching functions of the bay controller. The analog measured values are represented as wide-ranging operational measured values. To prevent transmission of information to the control center during maintenance, the bay controller communications can be disabled to prevent unnecessary data from being transmitted. During commissioning, all indications with test marking for test purposes can be connected to a control and protection system.

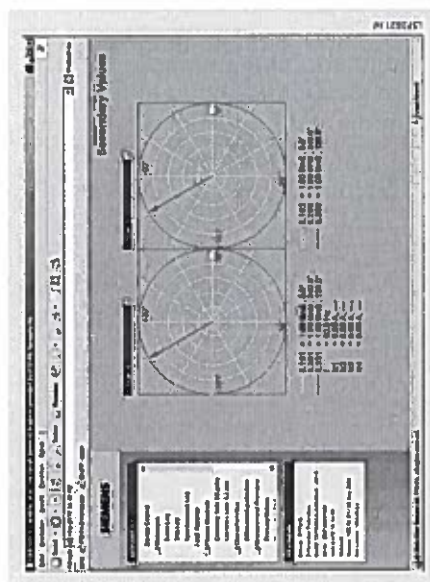


Fig. 8/10 Commissioning via a standard Web browser: Phasor diagram

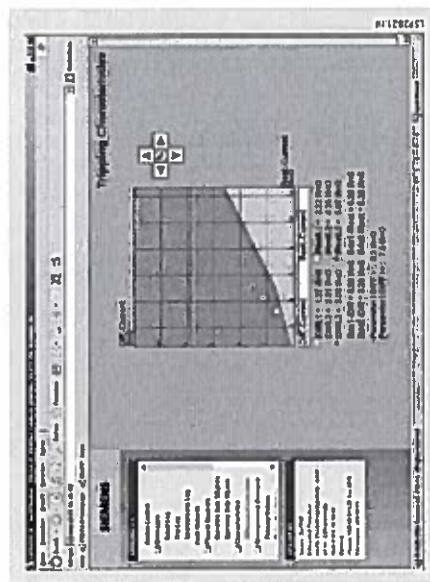


Fig. 8/11 Commissioning via a standard Web browser: Operating characteristic

All measured currents and voltages (7UT613/633 only) of the transformer can be indicated as primary or secondary values. The differential protection bases its pickup thresholds on the rated currents of the transformer. The referred differential and stabilising (restraint) currents are available as measured values per phase.

If a thermo-box is connected, registered temperature values may also be displayed. To check the connection of the relay to the primary current and voltage transformers, a commissioning measurement is provided.

This measurement function works with only 5 to 10 % of the transformer rated current and indicates the current and the angle between the currents and voltages (if voltages applied). Termination errors between the primary current transformers and input transformers of the relay are easily detected in this manner.

The operating state of the protection may therefore be checked online at any time. The fault records of the relay contain the phase and ground currents as well as the calculated differential and restraint currents. The fault records of the 7UT613633 relays also contain voltages.

Brower-based commissioning aid

The 7UT6 provides a commissioning and test program which runs under a standard internet browser and is therefore independent of the configuration software provided by the manufacturer.

For example, the correct vector group of the transformer may be checked. These values may be displayed graphically as vector diagrams.

The stability check in the operating characteristic is available as well as event log and trip log messages. Remote control can be used if the local front panel cannot be accessed.

Control and automation functions

Control

In addition to the protection functions, the SIPROTEC 4 units also support all control and monitoring functions that are required for operating medium-voltage or high-voltage substations.

The main application is reliable control of switching and other processes.

The status of primary equipment or auxiliary devices can be obtained from auxiliary contacts and communicated via binary inputs. Therefore it is possible to detect and indicate both the OPEN and CLOSED position or a fault or intermediate circuit-breaker or auxiliary contact position.

The switchgear or circuit-breaker can be controlled via:

- integrated operator panel
- binary inputs
- substation control and protection system
- DIGSI 4

Command processing

All the functionality of command processing is offered. This includes the processing of single and double commands with or without feedback, sophisticated monitoring of the control hardware and software, checking of the external process, control actions using functions such as runtime monitoring and automatic command termination after output. Here are some typical applications:

- Single and double commands using 1, 1 plus 1 common or 2 contacts
- Operating requirements combining several switching operations
- Operating requirements combining several switching operations
- Operating requirements combining several switching operations

During commissioning, all indications can be passed to an automatic control system for test purposes.

Automation/user-defined logic

With integrated logic, the user can set, via a graphic interface (CFC), specific functions for the automation of switchgear or substation. Functions are activated via function keys, binary input or via communication interface.

Switching authority

Switching authority is determined according to parameters, communication or by key-operated switch (when available).

If a source is set to "LOCAL", only local switching operations are possible. The following sequence of switching authority is laid down: "LOCAL", DIGSI PC program, "REMOTE"

Every switching operation and change of breaker position is kept in the status indication memory. The switch command source, switching device, cause (i.e. spontaneous change or command) and result of a switching operation are retained.

Assignment of feedback to command

The positions of the circuit-breaker or switching devices and transformer taps are acquired by feedback. These indication inputs are logically assigned to the corresponding command outputs. The unit can therefore distinguish whether the indication change is a consequence of switching operation or whether it is a spontaneous change of state (intermediate position).

Chatter disable

The chatter disable feature evaluates whether, in a configured period of time, the number of status changes of indication input exceeds a specified figure. If exceeded, the indication input is blocked for a certain period, so that the event list will not record excessive operations.

Filter time

All binary indications can be subjected to a filter time (indication suppression).

Indication filtering and delay

Indications can be filtered or delayed.

Filtering serves to suppress brief changes in potential at the indication input. The indication is passed on only if the indication voltage is still present after a set period of time. In the event of indication delay, there is a wait for a preset time. The information is passed on only if the indication voltage is still present after this time.

Indication derivation

A further indication (or a command) can be derived from an existing indication. Group indications can also be formed. The volume of information to the system interface can thus be reduced and restricted to the most important signals.

Transmission lockout

A data transmission lockout can be activated, so as to prevent transfer of information to the control center during work on a circuit bay.

Test operation

During commissioning, all indications can be passed to an automatic control system for test purposes.

Communication

With respect to communication, particular emphasis has been placed on high levels of flexibility, data integrity and utilization of standards common in energy automation. The design of the communication modules permits interchangeability on the one hand, and on the other hand provides openness for future standards (for example, Industrial Ethernet).

Local PC interface

The PC interface accessible from the front of the unit permits quick access to all parameters and fault event data. Of particular advantage is the use of the DIGSI 4 operating program during commissioning.

Rear-mounted interfaces

Two communication modules located on the rear of the unit incorporate optional equipment complements and readily permit retrofitting. They assure the ability to comply with the requirements of different communication interfaces.

The interfaces make provision for the following applications:

- Service interface (Port C/Port D)
In the RS485 version, several protection units can be centrally operated with DIGSI 4. On connection of a modem, remote control is possible. Via this interface communication with thermo-boxes is executed.
- System interface (Port B)
This interface is used to carry out communication with a control or protection and control system and supports a variety of communication protocols and interface designs, depending on the module connected.

Commissioning aid via a standard Web browser

In the case of the 7UT6, a PC with a standard browser can be connected to the local PC interface or to the service interface (refer to "Commissioning program"). The relays include a small Web server and send their HTML-pages to the browser via an established dial-up network connection.

Retrofitting: Modules for every type of communication

Communication modules for retrofitting are available for the entire SIPROTEC 4 unit range. These ensure that, where different communication interfaces (electrical or optical) and protocols (IEC 61850 Ethernet, IEC 60870-5-103, PROFIBUS-FMS/DP, MODBUS RTU, DNP 3.0, DIGSI, etc.) are required, such demands can be met.

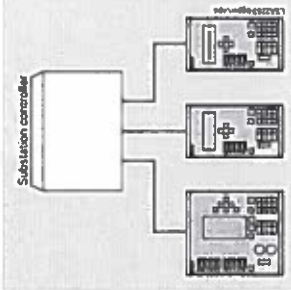


Fig. B12 IEC 60870-5-103 star-type RS232 copper conductor connection or fiber-optic connection

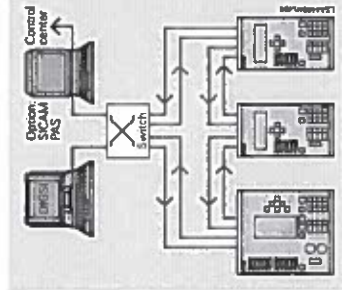


Fig. B13 Bus structure for station bus with Ethernet and IEC 61850, fiber-optic ring

Safe bus architecture

- RS485 bus
With this data transmission via copper conductors electromagnetic influences are largely eliminated by the use of twisted-pair conductor. Upon failure of a unit, the remaining system continues to operate without any disturbances.
- Fiber-optic double ring circuit
The fiber-optic double ring circuit is immune to electromagnetic interference. Upon failure of a section between two units, the communication system continues to operate without disturbance.

It is generally impossible to communicate with a unit that has failed. If a unit were to fail, there is no effect on the communication with the rest of the system.



Transformer Differential Protection/7UT6

Communication

IEC 61850 Ethernet

The Ethernet-based IEC 61850 protocol is the worldwide standard for protection and control systems used by power supply corporations. Siemens was the first manufacturer to support this standard. By means of this protocol, information can also be exchanged directly between bay units so as to set up simple masterless systems for bay and system interlocking. Access to the units via the Ethernet bus is also possible with DICS1.

IEC 60870-5-103

IEC 60870-5-103 is an internationally standardized protocol for the efficient communication in the protected area. IEC 60870-5-103 is supported by a number of protection device manufacturers and is used worldwide.

PROFIBUS-DP

PROFIBUS-DP is an industry-recognized standard for communications and is supported by a number of PLC and protection device manufacturers.

MODBUS RTU

MODBUS RTU is an industry-recognized standard for communications and is supported by a number of PLC and protection device manufacturers.

DNP 3.0

DNP 3.0 (Distributed Network Protocol Version 3) is a messaging-based communication protocol. The SIPROTEC 4 units are fully Level 1 and Level 2 compliant with DNP 3.0. DNP 3.0 is supported by a number of protection device manufacturers.



Fig. 8/14 RS232/RS485 electrical communication module



Fig. 8/15 820 nm fiber optic communication module



Fig. 8/16 PROFIBUS communication module, optical double-ring

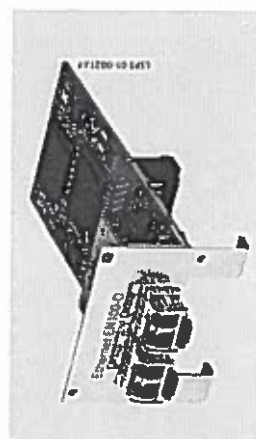


Fig. 8/17 Optical Ethernet communication module for IEC 61850 with integrated Ethernet switch

Transformer Differential Protection/7UT6

Communication

System solutions for protection and station control

Together with the SICAM power automation system, SIPROTEC 4 can be used with PROFIBUS-FMS. Over the low-cost electrical RS485 bus, or interference-free via the optical double ring, the units exchange information with the control system.

Units featuring IEC 60870-5-103 interfaces can be connected to SICAM in parallel via the RS485 bus or radially by fiber-optic link. Through this interface, the system is open for the connection of units of other manufacturers (see Fig. 8/12).

Because of the standardized interfaces, SIPROTEC units can also be integrated into systems of other manufacturers or in SIMATIC. Electrical RS485 or optical interfaces are available. The optimum physical data transfer medium can be chosen thanks to opto-electrical converters. Thus, the RS485 bus allows low-cost wiring in the cubicles and an interference-free optical connection to the master can be established.

For IEC 61850, an interoperable system solution is offered with SICAM PAS. Via the 100 Mbit/s Ethernet bus, the units are linked with PAS electrically or optically to the station PC. The interface is standardized, thus also enabling direct connection of units of other manufacturers to the Ethernet bus. With IEC 61850, however, the units can also be used in other manufacturers' systems (see Fig. 8/13).

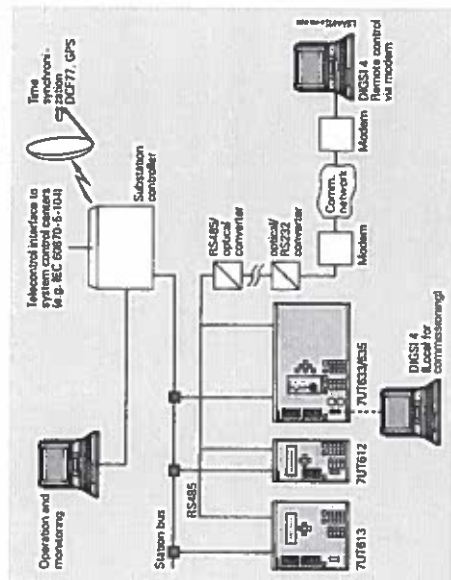


Fig. 8/10 System solution: Communications

Transformer Differential Protection /7UT6

Typical connections

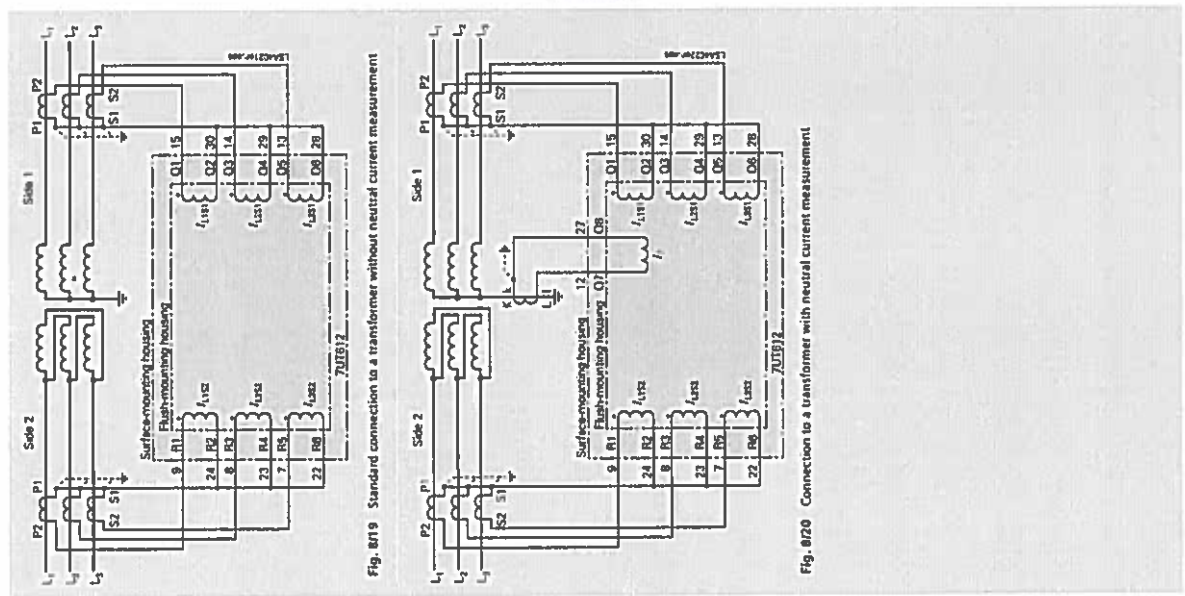


Fig. 8/19 Standard connection to a transformer without neutral current measurement

Fig. 8/20 Connection to a transformer with neutral current measurement

Transformer Differential Protection /7UT6

Typical connections

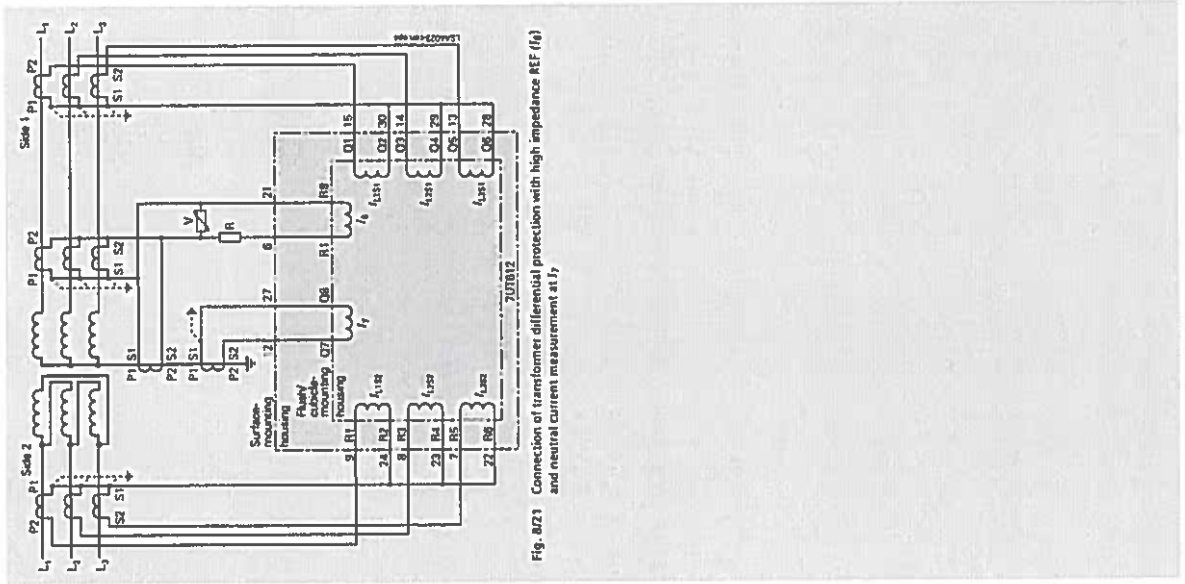


Fig. 8/21 Connection of transformer differential protection with high impedance REF (I0) and neutral current measurement at I0

8

8



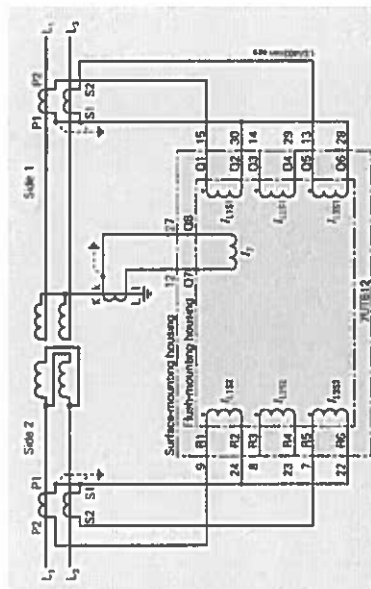


Fig. 8.722 Connection example to a single-phase power transformer with current transformer between starpoint and grounding point

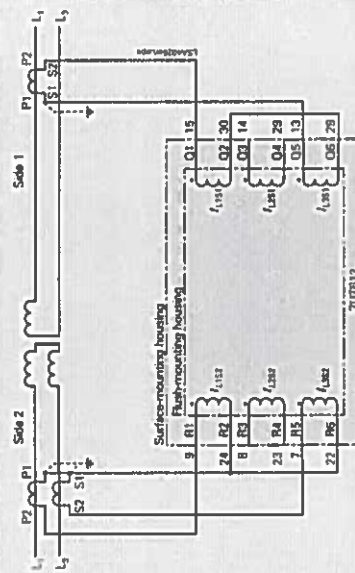


Fig. 8.723 Connection example to a single-phase power transformer with only one current transformer (right side)

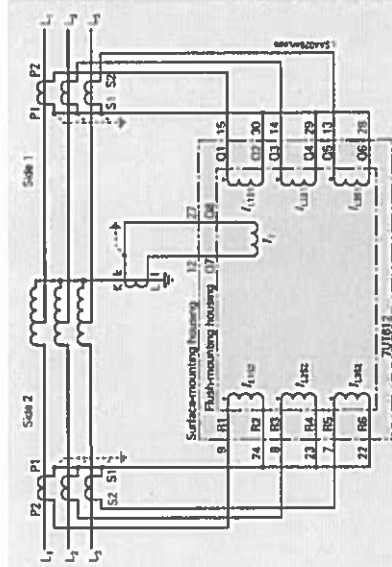


Fig. 8.724 Connection to a three-phase auto transformer with current transformer between starpoint and grounding point

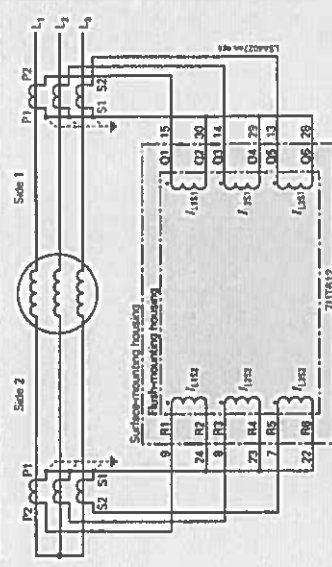


Fig. 8.725 Generator or motor protection

Transformer Differential Protection/7UT6
Typical connections

Transformer Differential Protection/7UT6

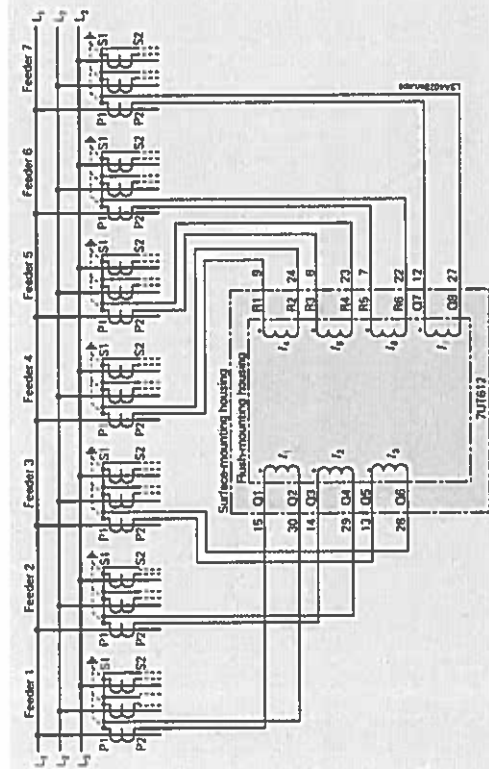


Fig. B2.6 Connection 7U1612 as single-phase busbar protection for 7 feeders, illustrated for phase L1

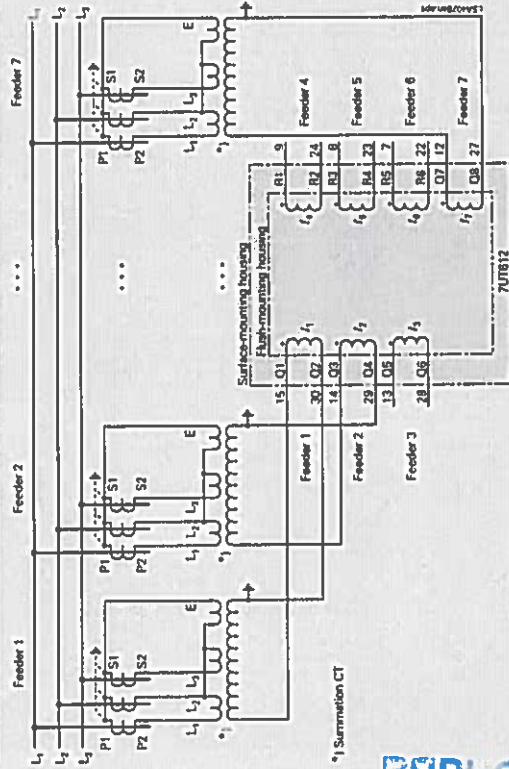


Fig. B.27 Connection 7UT612 as busbar protection for feeders, connected via external summation current transformers (SCT) - partial illustration for feeders 1, 2 and 7

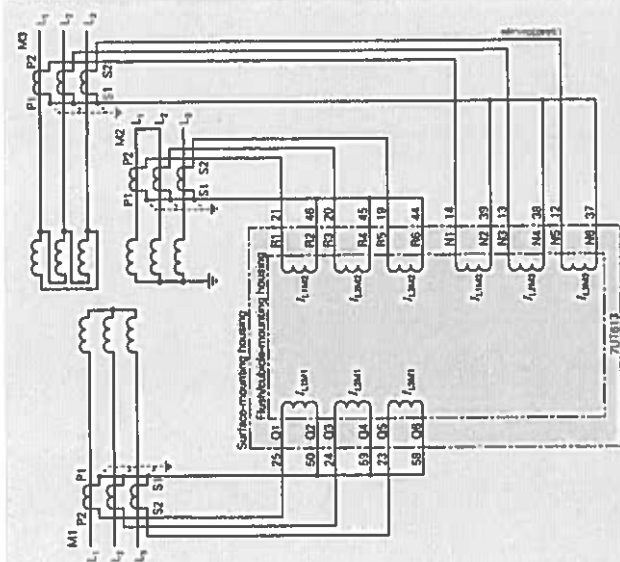


Fig. 8/28 Connection example 7U1613 for a three-winding power transformer

Transformer Differential Protection/7UT6

Typical connections

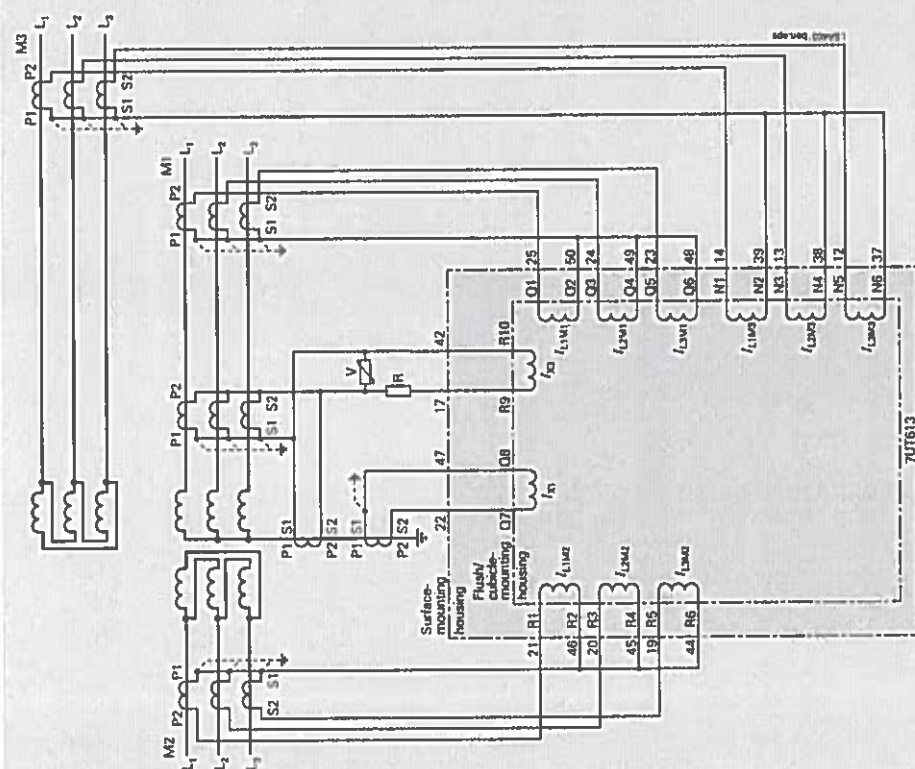


Fig. 8/29 Connection example 7U1613 for a three-winding power transformer with current transformers between starpoint and grounding point, additional connection for high-impedance protection; I_{23} connected as high-sensitivity input

Siemens SIP · Edition No. 7 B21

Transformer Differential Protection/7UT6

Typical connections

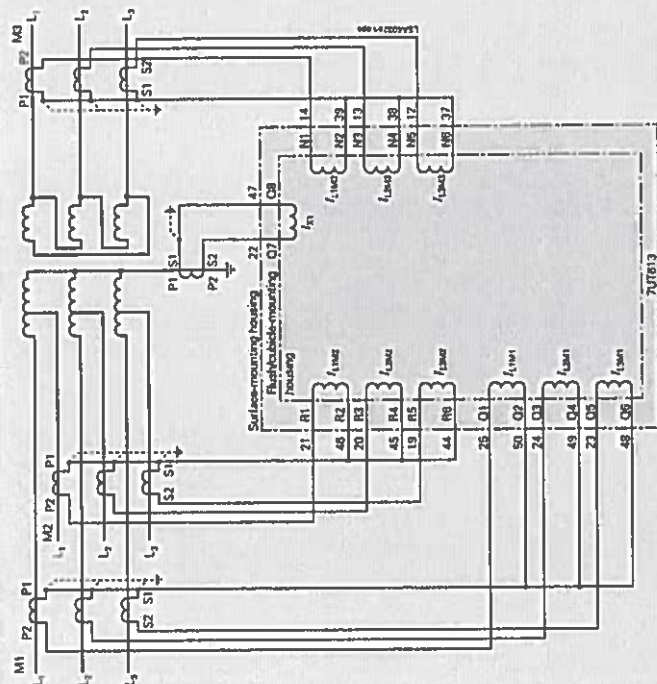


Fig. 8/30 Connection example 7UT613 for a three-phase auto-transformer with three-winding and current transformer between starpoint and grounding point

8122 Siemens SIP - Edition No. 7

Transformer Differential Protection / 7UT6

Typical connections

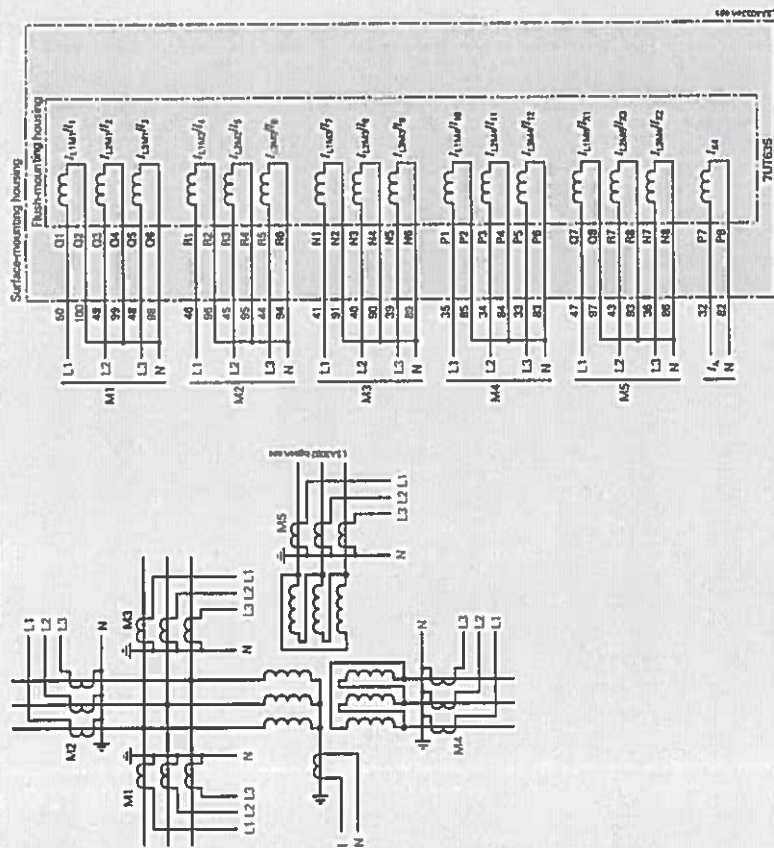


Fig. 831 Connection example 7UT635 for a three-winding power transformer with 5 measurement locations (3 phase) and neutral current measurement

Transformer Differential Protection / 7UT6

Typical connections

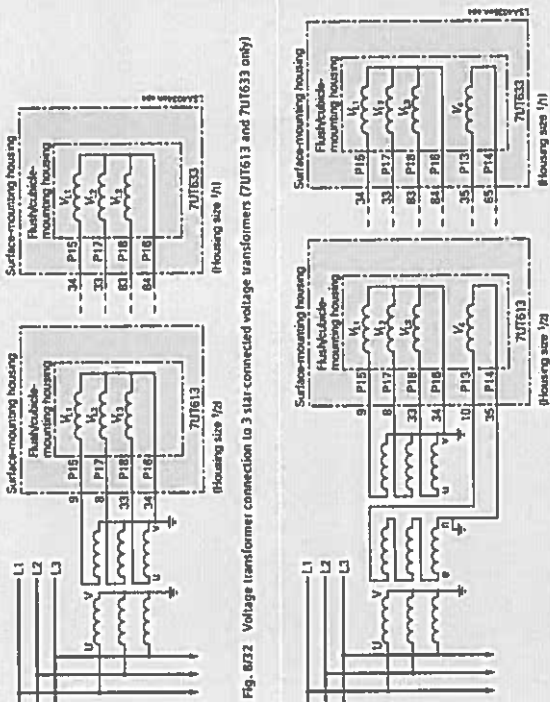


Fig. 832 Voltage transformer connection to 3 star-connected voltage transformer (7UT613 and 7UT633 only)

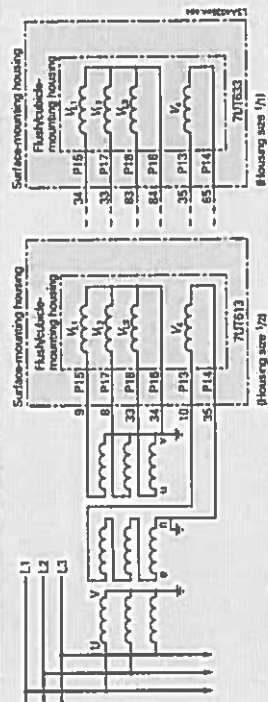


Fig. 833 Voltage transformer connection to 3 star-connected voltage transformer with additional delta winding (e-n-winding) (7UT613 and 7UT633 only)

Transformer Differential Protection/7UT6

Technical data

General unit data		Switching capacity	
Analog inputs		Make	
Rated frequency		1000 W / VA	
Rated current		30 VA	
Power consumption		40 W	
In CT circuits		25 W	
with $I_N = 1$ A; in VA approx.		250 V	
with $I_N = 5$ A; in VA approx.		30 A for 0.5 seconds	
with $I_N = 8$ A; in VA approx.		5 A continuous	
sensitive input in VA approx.		8 ms	
Overload capacity		5 ms	
in CT circuits		< 1 ms	
Thermal (r.m.s.)		LEDs	
Dynamic (peak value)		Quantity	
In CT circuits for highly sensitive input (I_{TH} Thermal)		RUN (green)	
Dynamic		ERROR (red)	
Rated voltage (7UT61 3/633 only)		LED (red), function can be assigned	
Power consumption per phase at 100 V		Unit design	
Overload capacity Thermal (r.m.s.)		Housing 7X20	
Auxiliary voltage		For dimensions, please refer to dimension drawings part 14	
Rated voltage		Degree of protection	
Permissible tolerance		For the device	
Superimposed AC voltage (peak to peak)		In flush-mounting housing	
Power consumption (DC/AC)		In flush-mounting housing front	
Quiescent; in W approx. Engaged; in W approx. depending on design		For personal safety	
Bridging time during failure of the auxiliary voltage $V_{aux} \geq 110$ V		Housing	
Binary inputs		Size, referred to 19" frame	
Functions are freely assignable		Weight, in kg	
Quantity marshallable		Flush-mounting housing	
Rated voltage range		Surface-mounting housing	
Minimum pickup threshold		Serial interface	
Ranges are settable by means of jumpers for each binary input		Operating interface 1 for DCS3.4 or browser	
Maximum permissible voltage		Connection	
Current consumption, energized		Front side, non-isolated, RS232, 9-pin subminiature connector (SUB D)	
Command / indication / alarm relay		Transmission rate in kbaud	
Duration		Setting as supplied:	
1 RU product		38.4 kbaud, parity BEI	
Dimensions (mm)		Distance, max.	
Alarm contact with NO or NC contact (not available)		Time synchronization DCF77 / HPG-B signal / IRIG-0000	
Dimensions (mm)		Connection	
Dimensions (mm)		Voltage levels	
Dimensions (mm)		Service interface (operating interface 2) for DCS3.4 / modern / service isolated RS232/RS-485/FO	
Dimensions (mm)		9-pin subminiature connector (SUB-D)	
Dimensions (mm)		500 V 50 Hz	
Dimensions (mm)		Max. 15 m / 49.2 ft	
Dimensions (mm)		Max. 1000 m / 3300 ft	
Dimensions (mm)		1.5 km (1 mile)	

*1 With high-speed contacts, all operation times are reduced by a factor of 5.

* With high-speed contacts all operating times are reduced by 4.5 ms.

Transformer Differential Protection/7UT6

Technical data

System interface		Electrical tests	
IEC 61850	ETHERNET, electrical (EN 100) for IEC 61850 and DIGSI	Standards	IEC 60255 (Product standards) ANSI/IEEE C37.90.0.1/1.2 UL 508
Connection for flush-mounting case	<p>Rear panel, mounting location "B", two RJ45 connectors, 100 Mbit acc. to IEEE802.3</p> <p>At bottom part of the housing</p> <p>500 V; 50 Hz</p> <p>100 Mbit/s</p> <p>20 m16 ft</p>	Insulation tests	EC 60255-5 and 60870-2-1
for surface-mounting case		Standards	2.5 kV (r.m.s.), 50 Hz / 60 Hz
Test voltage			DC 3.5 kV
Transmission Speed			500 V (r.m.s.), 50 Hz / 60 Hz
Distance			
ETHERNET optical (EN 100) for IEC 61850 and DIGSI			
Connection for flush-mounting case	<p>Rear panel, mounting location "B", LC connector receiver/transmitter</p> <p>Not available</p> <p>$\lambda = 1350$ nm</p> <p>100 Mbit/s</p> <p>glass fiber 50/125 µm or glass fiber 62/125 µm</p> <p>Max. 5 m for glass fiber</p> <p>62.5/125 µm</p> <p>Max. 800 m/0.5 mile</p>	Insulation tests	5 kV (peak); 1.2/50 ms, 0.5 J
for surface-mounting case		Standards	3 positive and 3 negative impulses at intervals of 5 s
Optical wavelength			
Layer Class 1 acc. to EN 60825-1/2			
Permissible path attenuation			
Distance			
IEC 60870-5-103			
Isolated RS232/RS485/FO	<p>9-pin subminiature connector (SUB-D)</p> <p>4800 to 19200 baud</p> <p>500 V/50 Hz</p> <p>Max. 15 m</p> <p>Max. 1000 m</p> <p>ST connector</p> <p>$\lambda = 820$ nm</p> <p>Max. 8 dB for glass fiber</p> <p>62.5/125 µm</p> <p>Max. 1.5 km</p>	EMC tests for interference immunity	IEC 60255-6, 60255-22 (product standards) EN 61000-6-2 (generic standard) DIN 57435 / Part 303
Baud rate			2.5 V (peak); 1 MHz; $\tau = 15$ ms; 400 samples per test duration 2 s; $R_p = 200 \Omega$
Dielectric test			8 kV contact discharge; 15 kV air discharge; both polarities; 150 pF; $R_p = 330 \Omega$
Distance for RS232			10 Vm; 80 to 1000 MHz; 80 % AM; 1 kHz
Distance for RS485			10 Vm; 80, 150, 450, 900 MHz; 80 % AM; duration > 10 s
Permissible attenuation			10 Vm; 900 MHz; repetition frequency 200 Hz; duty cycle 50 % PM
Distance			4 kV; 5/50 ms, 5 Hz; burst length = 15 ms; repetition rate 300 ms; both polarities; $A_1 = 30 \text{ Q}$; test duration 1 min; Impulse: 1, 2/50 ms
PROFIBUS fiber optic (FM5-DP)	<p>Only for flush-mounting housing</p> <p>For surface-mounting housing</p> <p>Baud rate</p> <p>Dielectric test</p> <p>Distance</p> <p>Permissible attenuation</p> <p>Distance</p>		Common (longitudinal) mode: 2kV; 12 Q, 9 µF Differential (transversal) mode: 1kV; 2 Q, 18 µF Common (longitudinal) mode: 2kV; 42 Q, 0.5 µF Differential (transversal) mode: 1kV; 42 Q, 0.5 µF 10 V, 150 Vm; to 80 MHz; 80 % AM; 1 MHz
PROFIBUS RS485 (FM5-DP)	<p>Connector type</p> <p>Baud rate</p> <p>Dielectric test</p> <p>Distance</p> <p>Permissible attenuation</p> <p>Distance</p>		
DNP 3.0 RS485 / MODBUS RS485	<p>Connector type</p> <p>Baud rate</p> <p>Dielectric test</p> <p>Distance</p> <p>Permissible attenuation</p> <p>Distance</p>		
Conversion with external OLM	<p>For fiber-optic interface please complete Order No. at 11th position with 4 (FM5 RS485) or 9 (DP RS485) and Order code LMA and additionally order: SIEMENS OLM 66K1502-3AB10</p> <p>For double ring: SIEMENS OLM 66K1502-4AB10</p>		

Transformer Differential Protection/7UT6

Technical data

Electrical tests (cont'd)	
EMC tests for interference immunity (cont'd)	
Magnetic field with power frequency	30 A/m continuous; 300 A/m for 3 s; 50 Hz, 0.5 mT; 50 Hz
IEC 61000-4-8, IEC 60255-6 class IV	2.5 kV (peak), 1 MHz, 1-15 µs; Damped wave; 400 surges per second; duration 2 s; R = 200 Ω
Oscillatory surge withstand capability, ANSI/IEEE C37.90.1	4 kV; 500 ms; 5 Hz; burst 15 ms; repetition rate 300 ms; both polarities; duration 1 min.; R = 80 Ω
Fast transient surge withstand capability, ANSI/IEEE C37.90.1	2.5 kV (peak value), polarity alternating 100 Hz, 1 MHz, 10 MHz and 50 MHz, R = 200 Ω
Da mped oscillations IEC 60894, IEC 61000-4-12	
EMC tests for interference emission (type test)	
Standard	EN 50081-1 (generic standard)
Conducted interference, only auxiliary supply IEC-CISPR 22	150 kHz to 30 MHz Limit class B
Radio interference field strength IEC-CISPR 22	30 to 1000 MHz Limit class B
Mechanical stress tests	
Vibration, shock stress and seismic vibration	
During operation	
Standards	IEC 60255-21 and IEC 60068
Vibration IEC 60255-21-1, class 2 IEC 60068-2-6	Sinusoidal 10 to 60 Hz: ± 0.075 mm amplitude, 60 to 150 Hz: 1 g acceleration frequency sweep 1 octave/min. 20 cycles in 3 orthogonal axes
Shock IEC 60255-21-2, class 1 IEC 60068-2-27	Half-sinusoidal acceleration 5 g, duration 11 ms, 3 shocks each in both directions of the 3 axes
Seismic vibration IEC 60255-21-2, class 1 IEC 60068-3-3	Sinusoidal 1 to 8 Hz: ± 3.5 mm amplitude (horizontal axis) 1 to 8 Hz: ± 1.5 mm amplitude (vertical axis) 8 to 35 Hz: 1 g acceleration (horizontal axis) 8 to 35 Hz: 0.5 g acceleration (vertical axis) frequency sweep 1 octave/min 1 cycle in 3 orthogonal axes
During transport	
Standards	IEC 60255-21 and IEC 60068
Vibration IEC 60255-21-1, class 2 IEC 60255-2-6	Sinusoidal 5 to 8 Hz: ± 7.5 mm amplitude; 8 to 150 Hz: 2 g acceleration frequency sweep 1 octave/min 20 cycles in 3 orthogonal axes
Shock IEC 60255-21-2, class 1 IEC 60068-2-27	Half-sinusoidal acceleration 15 g, duration 11 ms, 3 shocks each in both directions of the 3 axes
Shock IEC 60255-2-2, class 1	Half-sinusoidal acceleration 10 g, duration 16 ms, 1000 shocks on each of the 3 axes in both directions

Transformer Differential Protection/7UT6

Technical data

Functions	
Generators, motors, reactors	
Differential protection	
General	
Pickup value	Pickup time (in ms) at frequency 50 Hz 60 Hz
Differential current $I_{diff} > I_{set}$	7UT 612 $I_{set} > \min. 38 35$
High-current stage $I_{diff} > I_{high}$	$I_{set} > \min. 19 17$
Pickup on switch-on (factor of four >)	Dropout time (in ms), approx. 35 30
Add-on stabilization on external fault (set value) $I_{add-on} > I_{set}$	7UT 613/623 $I_{set} > \min. 30 27$
Tolerances (at preset parameters) $I_{set} > \text{stage and characteristic}$	Dropout time (in ms), approx. 11 11
5 % of set value	Dropout ratio, approx. 54 46
5 % of set value	
Time delay	
Delay of $I_{set} > \text{stage}$ $T_{1set} >$	Differential current monitor
Delay of $I_{diff} > \text{stage}$ $T_{1diff} >$	Steady-state differential current monitoring $I_{diff} > I_{set}$ (steps 0.01)
Time tolerance	Delay of blocking with differential current monitoring $T_{diff} >$ (steps 1 s)
The set times are pure delay times	Feeder current guard
Transformers	
Harmonic stabilization	Tripp release $I_{diff} > I_{set}$ by 0.20 to 2.00 (steps 0.01)
Inrush restraint ratio $I_{diff} > I_{set}$	Operating times
Stabilization ratio further (in-th) harmonic (optional 3rd or 5th) $I_{diff} > I_{set}$	Pickup time (in ms) at frequency 50 Hz 60 Hz
Crossblock function max. action time for crossblock	7UT 612 $I_{set} > \min. 25 25$
Can be activated (deactivated) 2 to 1000 AC cycles (steps 1 cycle) or 0 (crossblock deactivated) or deactivated (active unit dropout)	Dropout time (in ms), approx. 30 30
Operating times	7UT 613/623 $I_{set} > \min. 11 11$
Pickup time (in ms) at frequency 50 Hz 60 Hz	Dropout time (in ms), approx. 54 46
7UT 612 $I_{set} > \min. 38 35$	Dropout ratio, approx. 0.7
$I_{set} > \min. 19 17$	
Dropout time (in ms), approx. 35 30	
7UT 613/623 $I_{set} > \min. 30 27$	
$I_{set} > \min. 11 11$	
Dropout time (in ms), approx. 54 46	
Dropout ratio, approx. 0.7	
Current matching for transformers	
Vector group adaptation	0 to 11 (x 30°) (steps 1)
Star-point conditioning	Grounded or non-grounded (for each winding)

Transformer Differential Protection / 7UT6

Technical data

Current stages (cont'd)			
Tolerances	Currents	3 % of set value or 1 % of rated current	1 % of set value or 10 ms
Definite time	Times	Pickup	at 1.05 ≤ I _{lim} ≤ 1.15; or 1.05 ≤ I _{lim} ≤ 1.15;
Inverse time	Times	5 % ± 15 ms at f ₀ = 50/60 Hz for 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1; or 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1	5 % ± 15 ms at f ₀ = 50/60 Hz for 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1; or 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1
Acc. to IEC	Times	5 % ± 15 ms at f ₀ = 50/60 Hz for 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1; or 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1	5 % ± 15 ms at f ₀ = 50/60 Hz for 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1; or 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1
Acc. to ANSI	Times	5 % ± 15 ms at f ₀ = 50/60 Hz for 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1; or 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1	5 % ± 15 ms at f ₀ = 50/60 Hz for 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1; or 2 ≤ I _{lim} ≤ 20 and I _{lim} ≥ 1
The set definite times are pure delay times.			
Operating times of the definite time stages			
Pickup time (in ms) at frequency	50 Hz	60 Hz	
ZUT6.12			
Without inrush restraint, min.	20	18	
With inrush restraint, min.	40	35	
Dropout time (in ms), approx.	30	30	
ZUT6.13/63a			
Without inrush restraint, min.	11	11	
With inrush restraint, min.	33	29	
Dropout time (in ms), approx.	35	35	
Pickup time (in ms) at frequency	50 Hz	60 Hz	
ZUT6.12			
Without inrush restraint, min.	40	35	
With inrush restraint, min.	40	35	
Dropout time (in ms), approx.	30	30	
ZUT6.13/63a			
Without inrush restraint, min.	21	19	
With inrush restraint, min.	31	29	
Dropout time (in ms), approx.	45	41	
Dropout ratio			
Current stages			Approx. 0.95 for I _{lim} ≤ 0.5
Inrush blocking			10 to 45 % (steps 1 %)
(2 nd harmonic) I _{lim} /I ₀			I > 0.2 A ⁽¹⁾
Lower operation limit			0.30 to 25.00 A ⁽¹⁾ (steps 0.01 A)
Max. current for blocking			Can be activated/deactivated
Crossblock function between phases			0.00 to 180 s (steps 0.01 A)
max. action time for crossblock			

Restricted ground-fault protection			
Multiple availability			
Settings			
Differential current I _{dIF} > I _{lim}	0.05 to 2.00 (steps 0.01)	110° (fixed)	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)
Limit angle Φ _{lim}			
Time delay T _{del}			
Operating times			
Pickup time (in ms) at frequency	0 Hz	60 Hz	
ZUT6.12			
AI 1.5: setting value I _{dIF} > approx.	37	38	
AI 2.5: setting value I _{dIF} > approx.	30	32	
Dropout time (in ms), approx.	40	40	
ZUT6.13/63a			
AI 1.5: setting value I _{dIF} > approx.	35	30	
AI 2.5: setting value I _{dIF} > approx.	33	29	
Dropout time (in ms), approx.	26	23	
Dropout ratio, approx.	0.7		
Overcurrent-time protection for phase and residual currents			
Multiple availability			
3 times (option)			
Characteristics			
Definite-time stages (DT)	I _m >> 3I ₀ >> I _m > 3I ₀		
Inverse-time stages (IT)	I _m , 3I ₀		
Acc. to IEC	Inverse, very inverse, extremely inverse, long-time inverse		
Acc. to ANSI	Inverse, moderately inverse, very inverse, extremely inverse, definite inverse, short inverse, long inverse		
Reset characteristics (RT)	Alternatively, user-specified trip and reset characteristics		
Acc. to ANSI with disk emulation	Acc. to ANSI with disk emulation		
Current stages			
High-current stages I _m >>	0.10 to 35.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (stage ineffective)		
T _{ph} >>	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)		
3I ₀ >>	0.05 to 35.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (stage ineffective)		
T ₁₀ >>	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)		
Definite-time stages I _m >	0.10 to 35.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (stage ineffective)		
T _{ph}	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)		
3I ₀ >	0.05 to 35.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (stage ineffective)		
T ₁₀ >	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)		
Inverse-time stages I _p	0.10 to 4.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (no trip)		
T _{ph}	0.05 to 3.20 s (steps 0.01 s) or deactivated (no trip)		
3I ₀	0.05 to 4.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (no trip)		
T ₁₀	0.05 to 3.20 s (steps 0.01 s) or deactivated (no trip)		
Inverse-time stages I _p	0.10 to 4.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (no trip)		
D _{ph}	0.50 to 15.00 s (steps 0.01 s) or deactivated (no trip)		
3I ₀	0.05 to 4.00 A ⁽¹⁾ (steps 0.01 A) or deactivated (no trip)		
D ₁₀	0.50 to 15.00 s (steps 0.01 s) or deactivated (no trip)		

1) Secondary values based on I_m = 1 A; for I_m = 5 A they must be multiplied by 5.

Transformer Differential Protection / 7UT6

Technical data

Overcurrent-time protection for ground current			
Multiple availability			
3 times (option)			
Characteristics			
Definite-time stages (DT)	$I_g >> I_g >$		
Inverse-time stages (IT)	I_g		
Acc. to IEC	Inverse, very inverse, extremely inverse, long-time inverse		
Acc. to ANSI	Inverse, moderately inverse, very inverse, extremely inverse, definite inverse, short inverse, long inverse		
Reset characteristics (RT)	Alternatively, user-specified trip and reset characteristics		
Acc. to ANSI with disk emulation	Acc. to ANSI with disk emulation		
Current stages			
High-current stage	$I_H >>$	0.05 to 35.00 A ¹⁾ (steps 0.01 A) or deactivated (stage ineffective)	
Definite-time stage	$I_D >$	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)	
Inverse-time stage	$I_I >$	0.05 to 35.00 A ¹⁾ (steps 0.01 A) or deactivated (stage ineffective)	
Acc. to IEC	T_{IP}	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)	
Acc. to ANSI	T_{IP}	0.05 to 35.00 A ¹⁾ (steps 0.01 A) or deactivated (stage ineffective)	
Dynamic parameters	T_{IP}	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)	
Acc. to ANSI	T_{IP}	0.05 to 35.00 A ¹⁾ (steps 0.01 A) or deactivated (stage ineffective)	
Tolerances	Currents	3 % of set value or 1 % of rated current at $I_H = 1 A$ or 5 A; 5 % of set value or 3 % of rated current at $I_H = 0.1 A$	
Definite time	Times	1 % of set value or 10 ms	

Dynamic cold-hot pickup for overcurrent-time protection					
Time control					
Start criterion	Binary input from circuit breaker auxiliary contact or current criterion (of the assigned side)				
CB open time	T_{CO}	0 to 21600 s (= 6 h) (steps 1 s)			
Active time	T_{ACT}	1 to 21600 s (= 6 h) (steps 1 s)			
Accelerated dropout time	T_{ADP}	1 to 600 s (= 10 min) (steps 1 s) or deactivated (no accelerated dropout)			
Setting ranges and changeover values					
Dynamic parameters of current pickup and delay times or time multipliers					
Single-stage overcurrent-time protection					
Current stages					
High-current stage	$I_H >>$	0.05 to 35.00 A ¹⁾ (steps 0.01 A) or deactivated (stage ineffective)			
Definite-time stage	$I_D >$	0.00 to 60.00 s (steps 0.01 s) or deactivated (no trip)			
Inverse-time stage	$I_I >$	0.05 to 35.00 A ¹⁾ (steps 0.01 A) or deactivated (stage ineffective)			
Tolerances	Currents	3 % of set value or 1 % of rated current at $I_H = 1 A$ or 5 A; 5 % of set value or 3 % of rated current at $I_H = 0.1 A$			
Definite time	Times	1 % of set value or 10 ms			

Operating times			
Pickup time (in ms) at frequency	50 Hz	60 Hz	
ZUT6.12			
Minimum	20	18	
Dropout time (in ms), approx.	30	27	
ZUT6.13/63a			
Minimum	14	13	
Dropout time (in ms), approx.	25	22	
Dropout ratios	Approx. 0.95 for $I_H \geq 0.5$		
Current stages			

Operating times of the definite-time stage			
Pickup time (in ms) at frequency	50 Hz	60 Hz	
ZUT6.12			
Without inrush restraint, min.	20	18	
With inrush restraint, min.	40	35	
Dropout time (in ms), approx.	30	30	
ZUT6.13/63a			
Without inrush restraint, min.	11	11	
With inrush restraint, min.	23	29	
Dropout time (in ms), approx.	35	35	
Dropout ratios	Approx. 0.95 for $I_H \geq 0.5$		
Current stages			
Inrush blocking	10 to 45 % (steps 1 %)		
Lower operation limit	$I > 0.2 A^{1)}$		
Max. current for blocking	0.30 to 25.00 A ¹⁾ (steps 0.01 A)		

1) Secondary values based on $I_m = 1 A$; for $I_m = 5 A$ they must be multiplied by 5.

2) Secondary values for high-sensitivity current input I_H independent of rated current.

Transformer Differential Protection/7UT6

Technical data

Unbalanced load protection (Negative-sequence protection)	
Characteristics	
Definite time stages (DT)	$I_2 >> I_2^p$
Inverse time stages (IT)	I_2^p
Acc. to IEC	Inverse, very inverse, extremely inverse
Acc. to ANSI	Inverse, moderately inverse, very inverse, extremely inverse
Reset characteristics (RT)	Acc. to ANSI with disk emulation
Operating range	0.1 to 4 A ¹⁾
Current stages	
High-current stage	$I_2 >> I_{20}$
Definite-time stage	$I_2 > I_{20}$
Inverse-time stages	I_2^p
Acc. to IEC	T_{IT}^p
Inverse-time stages	I_2^p
Acc. to ANSI	D_{IT}^p
Tolerances	
Definite-time	Currents
Inverse time	Times
Acc. to IEC	Times
Acc. to ANSI	Times
The set definite times are pure delay times.	
Operating times of the definite time stages	
Pickup time/dropout time	
Pickup time (in ms) at frequency	50 Hz 60 Hz
7U1612	
Minimum	50 45
Dropout time (in ms), approx.	30 30
7U1613/1623	
Minimum	41 34
Dropout time (in ms), approx.	25 20
Dropout rates	
Current stages	Approx. 0.95 for $I_{d1}/I_{d2} \geq 0.5$
Thermal overload protection	
Overload protection using a thermal replica	
Multiple availability	
2 times (option)	
Setting ranges	
Setting range	0.10 to 4.00 (steps 0.01)
Time constant	1.0 to 999.9 min (steps 0.1 min)
Starting down factor at motor	± 0 to 10.0 (steps 0.1)
Up and stall (for motors) K _f -factor	50 to 100% referred to trip temperature time (steps 1%)
Thermal alarm stage	0.10 to 4.00 A ¹⁾ (steps 0.01 A)
Current-based alarm stage	0.60 to 10.00 A ¹⁾ (steps 0.01 A)
Start-up recognition	or deactivated
(for motors)	(no start-up recognition)
Emergency stop action time	10 to 15000 s (steps 1 s)

$$\frac{1}{\left(1 - \frac{1}{k}\right)^2}$$

Secondary values based on $I_N = 1$ A, for $I_N = 5$ A they must be multiplied by 5.

emens SIP - Edition No. 7 B/31

Transformer Differential Protection/7UT6

Technical data

Thermo-buses for overload protection		1 or 2
Thermo-buses (connectable)		
Number of temperature sensors per thermo-bus	Max. 6	
Measuring type	PT 100 D or HI 100 Q or HI 120 Q	
Construction thresholds		
for each measuring point:		
Warning temperature (stage 1)	-50 to 250 °C (steps 1 °C) -50 to 482 °F (steps 1 °F) or deactivated (no warning)	
Alarm temperature (stage 2)	-50 to 250 °C (steps 1 °C) -50 to 482 °F (steps 1 °F) or deactivated (no alarm)	
Breaker failure protection		
Number of duplicate availability	2 times (option)	
Setting ranges		
Current flow monitoring	0.04 to 1.00 A ¹⁾ (steps 0.01 A) for the respective side Approx. 0.9 for I ≥ 0.25 A ¹⁾ 5 % of set value or 0.01 A ¹⁾	
Dropoff to pickup ratio		
Pickup tolerance		
Breaker status monitoring	Binary input for CB auxiliary contact	
Starting conditions		
For breaker failure protection		
Internal trip		
External trip (via binary input)		
Time		
Pickup time	Approx. 2 ms (7UT613/633) and approx. 3 ms (7UT612) with measured quantities present; Approx. 20 ms after switch-on of measured quantities, $t_{\text{set}} = 50/60 \text{ Hz}$	
Reset time	50 Hz 60 Hz	
(incl. output relay), approx.	30 ms 30 ms	
7UT612	25 ms 25 ms	
7UT613/633		
Delay times for all stages	0.00 to 60.00 s; deactivated (steps 0.01 s)	
Time tolerance	1 % of setting value or 10 ms	
Overvoltage protection (NEN HE122) (7UT613 / 633 only)		
Setting ranges		
Pickup threshold alarm stage	1 to 1.2 (steps 0.01)	
Pickup threshold V ₁₅₅ -stage	1 to 1.4 (steps 0.01)	
Time delays T	0 to 60 s (steps 0.01 s) or deactivated	
Characteristic values of V ₁₅₅ and assigned times (T ₁₅₅)	1.05/1.1/1.15/1.2/1.25/1.3/1.35/1.4	
Cooling down time T _{cooling}	0 to 20000 s (steps 1 s)	
Time (in ms)	0 to 20000 s (steps 1 s)	
(alarm and V ₁₅₅ -stage)		
Pickup times at 1.1 of set value, approx.	50 Hz 60 Hz	
Drop-off times, approx.	36 31	
Drop-off ratio (alarm, trip)	28 23	
Drop-off ratio (alarm, trip)	0.95	
Tolerances		
V ₁₅₅ Pickup	3 % of set value	
Time delays T	1 % or 10 ms	
Thermal characteristic (time)	5 % rated to V ₁₅₅ or 600 ms	

Under-voltage protection (default-time and inverse-time function) (ANSI 27)		10 to 125 V (steps 0.1 V)
Setting range	Under-voltage pickup V ₁ < V ₂	
V ₁ < (positive sequence) phase-to-phase voltage		
Time delays T	0 to 60 s (steps 0.01 s) or indefinite 0.1 to 5 s (steps 0.01 s)	
Time multiplier T _u		
Times		
Pickup time V ₁ < V ₂	Approx. 50 ms	
Drop-off time V ₁ < V ₂	Approx. 50 ms	
Drop-off ratio V ₁ < V ₂ , V ₁ < V ₂	1.01 or 0.5 V	
Tolerances		
Voltage limit values	1 % of set value or 0.5 V	
Time delays T	1 % or 10 ms	
Inverse-time characteristic	1 % of measured value of voltage	
Over-voltage protection (ANSI 59)		
Setting ranges		
Over-voltage pickup V ₃ > V ₄ (maximum phase-to-phase voltage or phase-to-ground-voltage)	30 to 170 V (steps 0.1 V)	
Time delays T		
Pickup times V ₃ > V ₄	0 to 60 s (steps 0.01 s) or indefinite	
Drop-off times V ₃ > V ₄	Approx. 50 ms	
Drop-off ratio V ₃ > V ₄	Approx. 50 ms	
Tolerances	0.9 to 0.99 (steps 0.01)	
Voltage limit value	1 % of set value 0.5 V	
Time delays T	1 % or 10 ms	
Frequency protection (ANSI 81)		
Setting ranges		
Supr. selectable f ₁ / c	4	
Pickup values f ₁ / c	40 to 65 Hz (steps 0.01 Hz)	
Time delays T	3 stages 0 to 100 s, 1 stage up to 600 s	
Under-voltage blocking V ₁ < (steps 0.01 s)	10 to 125 V (steps 0.1 V)	
Times		
Pickup times f ₁ / c	Approx. 100 ms	
Drop-off times f ₁ / c	Approx. 100 ms	
Drop-off difference Δ ₁	Approx. 20 mHz	
Drop-off ratio V ₁ < c	Approx. 1.05	
Tolerances		
Frequency	10 mHz (at V ₁ > 0.5 V)	
Under-voltage blocking	1 % of set value or 0.5 V	
Time delays T	1 % or 10 ms	
Reverse-power protection (ANSI 320)		
Setting ranges		
Reverse power P _{rev} > 15 _W	0.5 to 30 % (steps 0.01 %)	
Time delays T	0 to 60 s (steps 0.01 s) or indefinite	
Times		
Pickup time	Approx. 360 ms (50 Hz); Approx. 300 ms (60 Hz); Approx. 360 ms (50 Hz); Approx. 300 ms (60 Hz)	
Drop-off time	Approx. 0.6	
Drop-off ratio P _{rev} >		
Tolerances		
Reverse power P _{rev} >	0.25 % S _N ± 3 % set value	
Time delays T	1 % or 10 ms	

1) Secondary values based on I_N = 1 A.
for I_N = 5 A they must be multiplied by 5.

32 Siemens SIP - Edition No. 7

Transformer Differential Protection/7UT6

Technical data

[illegible]

Transformer Differential Protection/7UT6

Technical data

Operational measured values (Cont'd)		Reset, automatic	Time of day adjustable (in minutes, 0 to 1439 min)
– Phase angles of currents.	$\varphi(I_1)$ to $\varphi(I_3)$ $\varphi(I_1)$ to $\varphi(I_4)$, $\varphi(I_1)$ to $\varphi(I_{12})$ $\varphi(I_1)$ to $\varphi(I_5)$, $\varphi(I_1)$ to $\varphi(I_{14})$ $\varphi(I_1)$ to $\varphi(I_{12})$, $\varphi(I_1)$ to $\varphi(I_{14})$	Reset, manual Using binary input, using keypad, via communication	Time frame and starting time adjustable (in days, 1 to 365 days, and ω) Using binary input, using keypad, via communication
– Tolerance	in $^\circ$, referred to $\varphi(I_1)$ 1 $^\circ$ at rated current	Min./Max./mean values for current	I_{11} , I_{12} , I_{14} I_1 (positive-sequence component) I_2 (negative-sequence component), 3% I_{11} , I_{12} , I_{14} (12, 14, 11, 12, 11, 12, 14, 11, 12, 1

Transformer Differential Protection/7UT6

Selection and ordering data

Description	Order No.
7UT612 differential protection relay for transformers, generators, motors and busbars DIGSI 4 I/browser/modem interface (Port C) on rear temperature monitoring box connector	7UT612□-□□□□□□□□ A 0
No DIGSI 4 port	0
DIGSI 4 I/browser, electrical RS232	1
DIGSI 4 I/browser or temperature monitoring box ¹⁾ , electrical RS485	2
DIGSI 4 I/browser or temperature monitoring box ¹⁾ , B20 nm fiber optic, ST connector	3
Functions	
Measured values/monitoring functions	
Basic measured values	1
Basic measured values Measurement to thermo-barostat acc. to IEC, overload factor	4
Differential protection + basic functions	
Differential protection for transformer, generator, motor, busbar (B7) Overload protection for one winding (d9), Lockout (R6) Overcurrent-time protection (S0N15T); Is, Is>, Is (finnish stabilization) Overcurrent-time protection (S0N15IM); 3Iop> 3Iop (deutsch stabilization) Overcurrent-time protection ground (S0G51G); Ik>, Ik>>, Ig (finnish stabilization)	A
Differential protection + basic functions + additional functions	
Restricted ground fault protection, low impedance (B7M) Restricted ground fault protection, high impedance (B7M without resistor and verifier), OKC 1 phase Trip circuit supervision (74TC), breaker failure protection (S0BF), unbalanced load protection (46)	B

1) Sensitivity selectable normal/high.

- ii) External temperature monitoring box required.

Transformer Differential Protection/7UT6

Selection and ordering data

Description	Order No.	Order code
7UT613 differential protection relay for transformers, generators, motors and busbars Housing 5, 8 BI, 8 BO, 1 live status contact, 11 L, 1 ₁ ¹⁾	7UT613	
Rated current		
$I_n = 1\text{ A}$	1	
$I_n = 5\text{ A}$	5	
Rated auxiliary voltage (power supply, binary inputs)		
DC 24 to 48 V, binary input threshold 19 V ²⁾	2	
DC 60 to 125 V ³⁾ , binary input threshold 19 V ²⁾	4	
DC 110 to 250 V ¹⁾ , AC 115/230 V, binary input threshold 88 V ²⁾	5	
DC 110 to 250 V ¹⁾ , AC 115/230 V, binary input threshold 176 V ²⁾	6	
Unit design		
Surface-mounting housing with two-ier terminals	B	
Flush-mounting housing with plug-in terminals	D	
Flush-mounting housing with screw-type terminals	E	
Region-specific default settings/language settings		
Region DE, 50/60 Hz, IEC/ANSI, language German; selectable	A	
Region World, 50/60 Hz, IEC/ANSI, language English (GB); selectable	B	
Region US, 60/50 Hz, ANSI/IEEE, language English (US); selectable	C	
Region World, 50/60 Hz, IEC/ANSI, language French; selectable	D	
Region World, 50/60 Hz, IEC/ANSI, language Spanish; selectable	E	
System interface (Port B) on rear		
No system interface	D	
IEC 60870-5-103 protocol, electrical RS232	1	
IEC 60870-5-103 protocol, electrical RS485	2	
IEC 60870-5-103 protocol, optical 820 nm, ST connector	3	
PROFIBUS-FMS Slave, electrical RS485	4	
PROFIBUS-FMS Slave, optical, single ring, ST connector ⁴⁾	5	
PROFIBUS-FMS Slave, optical, double ring, ST connector ⁴⁾	6	
PROFIBUS-DP Slave, electrical RS485	9	
PROFIBUS-DP Slave, optical 820 nm, double ring, ST connector ⁴⁾	9	
MODBUS, electrical RS485	9	
MODBUS, optical 820 nm, ST connector ⁴⁾	9	
DNP 3.0, electrical RS485	9	
DNP 3.0, optical 820 nm, ST connector ⁴⁾	9	
IEC 61850, 100 Mbit Ethernet, electrical, double, RJ45 connector (EN 100)	9	
IEC 61850, 100 Mbit Ethernet, optical, double, LC connector (EN 100) 5)	9	

4) With surface mounting housing, only RS485 interface available.
5) If position 9 - "B" (surface-mounting housing), please order relay with electrical Ethernet interface and use a separate PO switch.

Transformer Differential Protection/7UT6

Selection and ordering data

Description	Order No.	Order code
7UT613 differential protection relay for transformers, generators, motors and busbars	7UT613	
Port C and Port D		
Port C: DIGSI 4/modem, electrical RS232, Port D: empty	1	
Port C: DIGSI 4/modem/thermo bus, electrical RS485, Port D: empty	2	
Port C and Port D installed	9	
Port C (service interface)		
DIGSI 4/modem, electrical RS232	1	
DIGSI 4/modem/thermo bus, electrical RS485	2	
Port D (additional interface)		
Thermo bus, optical 820 nm, ST connector	1	
Thermo bus, electrical RS485	2	
Measured values monitoring functions		
Basic measured values	1	
Extended measured values, min./max. values, mean values	2	
Extended measured values, min./max., mean values, transformer monitoring functions (connection to thermo bus/both spots, overload factor)	4	
Differential protection + basic functions		
Differential protection for transformer, generator, motor, busbar (87)		
Overload protection according to IEC for one side (49)		
Lock out (86)		
Overcurrent time protection phases (50S1): $I_{>}$, $I_{>>}$, $I_{>>>}$, $I_{>}$ (rush stabilization)		
Overcurrent time protection $3I_0$ (50MS1M): $3I_{0>}$, $3I_{0>>}$, $3I_{0>>>}$ (rush stabilization)		
Overcurrent time protection ground (50GSI1G): $I_{G>}$, $I_{G>>}$, $I_{G>>>}$ (rush stabilization)		
Differential protection + basic functions + additional current functions		
Restricted ground-fault protection, low impedance (87N)		
Restricted ground-fault protection, high impedance (87N without resistor and voltage), OIC 1 phase		
Trip circuit supervision (74TC)		
Unbalanced load protection (46)		
Breaker failure protection (50BF)		
High-sensitivity overcurrent time protection/tank leakage protection (64), OIC 1-phase		
Additional voltage functions		
Without voltage functions	A	
With overexcitation protection and voltage/powertime measurement	B	
With overexcitation protection and voltage/powertime measurement		
+ Over/undervoltage protection (59/27)		
+ Frequency protection (81)		
+ Directional power protection (32R/7)		
+ Fuse failure monitor (60FL)		
Additional functions (general)		
Without	D	
Multiple protection functions (50, 51, 50NMG, 87N, 50BF, 49) ¹⁾	1	
Flexible protection functions	2	
Multiple + flexible protection functions	3	

1) Available if selected on position 14.

Transformer Differential Protection / 7UT6

Selection and ordering data

Description	Order No.	Order code
7UT63 differential protection relay for transformers, generators, motors and busbars, graphic display	7UT63	
Housing, inputs and outputs		
Housing: 1/2 19", 21 BL, 24 BO, 1 live status contact, 12 current inputs (11 L, 1 _{RT}); 4 voltage inputs (1 x 3-phase + 1 x 1-phase)		3
Housing: 1/2 19", 29 BL, 24 BO, 1 live status contact, 16 current inputs (14 L, 2 I _{RT})		5
Rated current		
I _N = 1 A		1
I _N = 5 A		5
Rated auxiliary voltage (power supply, binary inputs)		
DC 24 to 48 V, binary input threshold 19 V _D		2
DC 60 to 125 V, binary input threshold 19 V _D		4
DC 110 to 250 V, AC 115/230 V, binary input threshold 88 V _D		5
DC 110 to 250 V, AC 115/230 V, binary input threshold 176 V _D		6
Unit design		
Surface mounting with two-tier terminals		B
Flush-mounting with plug-in terminals		D
Flush-mounting with screw-type terminals		E
Surface-mounting with two-tier terminals, with 5 high-speed trip contacts		H
Flush-mounting with plug-in terminals, with 5 high-speed trip contacts		P
Flush-mounting with screw-type terminals, with 5 high-speed trip contacts		Q
Region-specific default settings/language settings		
Region DE: 50/60 Hz, IEC/ANSI language German; selectable		A
Region US: 50/60 Hz, IEC/ANSI language English (GB); selectable		B
Region US: 60/50 Hz, ANSI/IEEE language English (US); selectable		C
Region World: 50/60 Hz, IEC/ANSI language French; selectable		D
Region World: 50/60 Hz, IEC/ANSI language Spanish; selectable		E
System interface (Port B) on rear		
No system interface		0
IEC 60870-5-103 protocol, electrical RS232		1
IEC 60870-5-103 protocol, electrical RS485		2
IEC 60870-5-103 protocol, optical 820 nm, ST connector		3
PROFIBUS-FMS Slave, electrical RS485		4
PROFIBUS-FMS Slave, optical, single ring, ST connector ¹⁾		5
PROFIBUS-FMS Slave, optical, double ring, ST connector ¹⁾		6
PROFIBUS-DP Slave, electrical RS485		9
PROFIBUS-DP Slave, optical 820 nm, double ring, ST connector ¹⁾		9
MODBUS, electrical RS485		L0A
MODBUS, optical 820 nm, ST connector ¹⁾		L0B
DNP 3.0, electrical RS485		L0C
DNP 3.0, optical 820 nm, ST connector ¹⁾		L0D
IEC 61850, 100 Mbit Ethernet, electrical, double, RJ45 connector (EN 100)		L0E
IEC 61850, 100 Mbit Ethernet, optical, double, LC connector (EN 100 ¹⁾)		L0F

- 1) Sensitivity selectable normal/high.
 4) With surface-mounting housing: only RS485 interface available.
 5) If position 9 = "B" (surface-mounting housing), please order relay with electrical Ethernet interface and use a separate FO switch.

Transformer Differential Protection / 7UT6

Selection and ordering data

Description	Order No.	Order code
7UT63 differential protection relay for transformers, generators, motors and busbars, graphic display	7UT63	
Port C and Port D		
Port C: DIGSI 4/modem, electrical RS232; Port D: empty		1
Port C: DIGSI 4/modem/thermo box, electrical RS485; Port D: empty		2
Port C and Port D installed		9
Port C (service interface)		
DIGSI 4/modem, electrical RS232		1
DIGSI 4/modem/thermo box, electrical RS485		2
Port D (additional interface)		
Thermo box, optical 820 nm, ST connector		3
Thermo box, electrical RS485		4
Measured values/monitoring functions		
Basic measured values		1
Extended measured values, min./max. values, mean values		2
Transformer monitoring functions (connection to thermo busbar spot, overload factor)		4
Differential protection + basic functions		
Differential protection for transformer, generator, motor, busbar (87)		A
Overload protection according to IEC for one side (49)		B
Lock out (88)		C
Overcurrent zone protection phases (50S1); I _{ph} , I _{ph} > I _{ph} (inrush stabilization)		D
Overcurrent zone protection 3φ (50S1N); I _{ph} , I _{ph} > I _{ph} (inrush stabilization)		E
Overcurrent zone protection ground (50G1); I _{ph} , I _{ph} > I _{ph} (inrush stabilization)		F
Differential protection + basic functions + additional current functions		
Restricted ground-fault protection, low impedance (87N)		A
Restricted ground-fault protection, high impedance (87M) without resistor and vector, OC 1-phase		B
Unbalanced load protection (74TC)		C
Breaker failure protection (58B7)		D
High-sensitivity overcurrent line protection/leakage protection (64), OC 1-phase		E
Additional voltage functions (only with 7UT633)		
Without voltage functions		A
With overvoltage protection and voltage/power/energy measurement		B
+ Overvoltage protection and voltage/power/energy measurement		C
+ Frequency protection (81)		D
+ Directional power protection (32B7)		E
+ Fuse failure monitor (85L)		F
Additional functions (general)		
Without		0
Multiple protection functions (50, 51, 50NG, 87N, 50BF, 49)1)		1
Flexible protection functions		2
Multiple + flexible protection functions		3

1) Available if selected on position 14.

Transformer Differential Protection / 7UT6

Selection and ordering data

Accessories	Description	Order No.
	DIGSI 4 Software for configuration and operation of Siemens protection relays running under MS Windows (Windows 2000/XP Professional Edition), device templates, Comtrade Viewer, electronic manual included as well as "Getting started" manual on paper, connecting cables (copper)	
	Basic Full version with license for 10 computers, on CD-ROM (authorization by serial number)	7XS5400-0AA00
	Professional DIGSI 4 Basic and additionally SIGRA (fault record analysis), CFC Editor (logic editor), Display Editor (editor for default and control displays) and DIGSI 4 Remote (remote operation)	7XS5402-0AA00
	Professional + IEC 61850 DIGSI 4 Basic and additionally SIGRA (fault record analysis), CFC Editor (logic editor) and DIGSI 4 Remote (remote operation) + IEC 61850 system configurator	7XS5403-0AA00
	IEC 61850 System configurator Software for configuration of stations with IEC 61850 communication under DIGSI, running under MS Windows 2000 or XP Professional Edition Optional package for DIGSI 4 Basic or Professional License for 10 PCs. Authorization by serial number. On CD-ROM	7XS5460-0AA00
	SIGRA 4 (generally contained in DIGSI Professional, but can be ordered additionally) Software for graphic visualization, analysis and evaluation of fault records. Can also be used for fault records of devices of other manufacturers (Comtrade format) running under MS Windows 2000/XP Professional Edition. Incl. templates, electronic manual with license for 10 PCs. Authorization by serial number. On CD-ROM.	7XS5410-0AA00
	Connecting cable Cable between PC/Notebook (9-pin connector) and protection relay (9-pin connector) (contained in DIGSI 4, but can be ordered additionally) Cable between thermo box and relay - length 5 m/16.4 ft - length 25 m/82 ft - length 50 m/164 ft	7XV5100-4 7XV5103-7AA05 7XV5103-7AA25 7XV5103-7AA50
	Voltage transformer miniature circuit-breaker Rated current 1.6 A; thermal overload release 1.6 A; overcurrent trip 6 A	3RV1611-1AG14
	Temperature monitoring box with 6 thermal inputs For SIPROTEC units With 6 temperature sensors and RS485 interface ACDC 24 to 60 V ACDC 90 to 240 V	7XV5662-2AD10 7XV5662-5AD10
	Manual for 7UT6x English V4.6 German V4.6 Turkish V4.6	C53000-G1176-C210-2 C53000-G1100-C230-3 C53000-G115A-C230-1
	Manual for 7UT6 English V4.0	C53000-G1176-C160-1 C53000-G1176-C160-2

Transformer Differential Protection / 7UT6

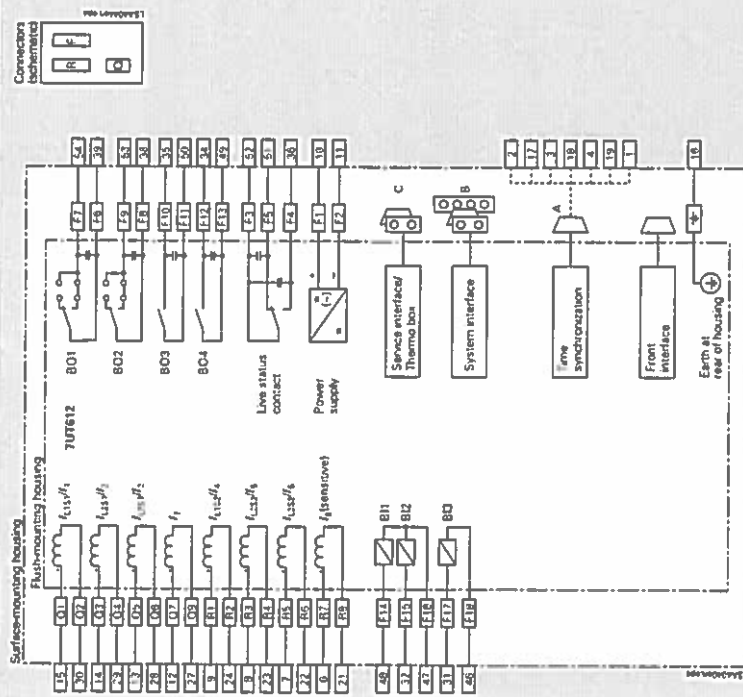
Selection and ordering data

Accessories	Description	Order No.	Size of package	Supplier	Fig.
	Connector 2-pin 3-pin	C73334-A1-C35-1 C73334-A1-C36-1	1	Siemens	8/35 8/36
	Crimp connector C12 0.5 to 1 mm ² C12 0.5 to 2.5 mm ² Type III+ 0.75 to 1.5 mm ² For type III+ and matching female For C12 and matching female	0-827039-1 0-827040-1 0-827397-1 0-163083-7 0-163084-2 0-539635-1 0-539648-2 0-734372-1 1-734387-1	4000 1 4000 4000 1 1 1 1	AMP II AMP II AMP II AMP II AMP II AMP II AMP II AMP II	
	Crimping tool 19" mounting rail	C73165-A63-0200-1	1	Siemens	8/34
	Short-circuit links For current terminals For other terminals	C73334-A1-C33-1 C73334-A1-C34-1	1 1	Siemens	8/37 8/38
	Safety cover for terminals large small	C73334-A1-C31-1 C73334-A1-C32-1	1 1	Siemens	

1) Your local Siemens representative can inform you on local suppliers.

Transformer Differential Protection/7UT6

Connection diagram



ВЯРНО
ОРИГИНАЛ

Siemens SIP · Edition No. 7 BJ43

Transformer Differential Protection/7UT6

Connection diagram

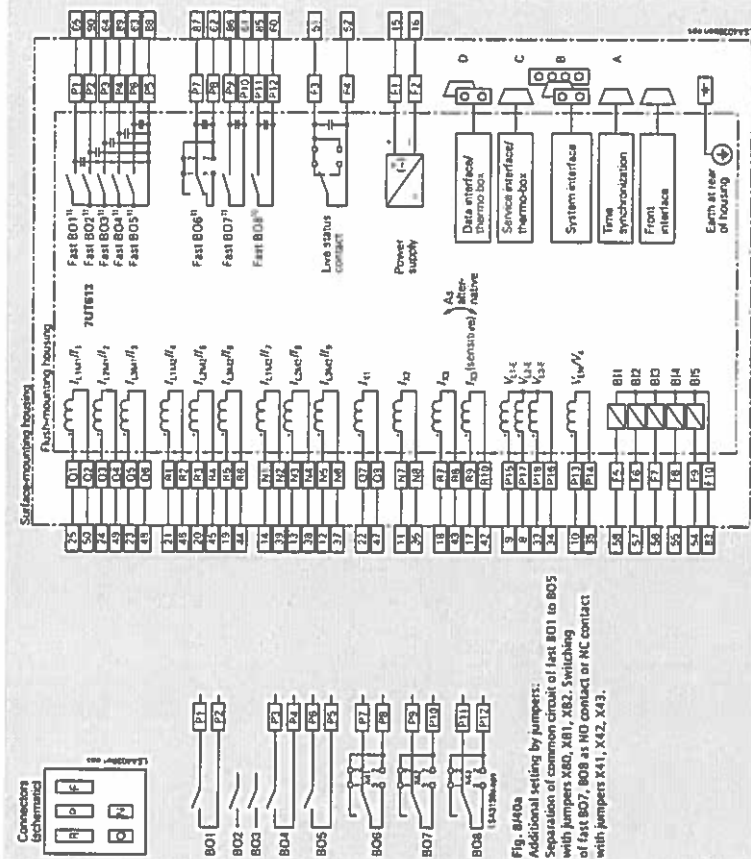


Fig. 8/40a
Additional setting by jumpers:
Separation of common circuit of fast B01 to B05
with jumpers X80, X81, X82. Switching
of fast B07, B08 as NO contact or NC contact
with jumpers X41, X42, X43.

1) Configuration of binary outputs up to hardware-version ..ACC
For advanced flexibility see Fig. B140a.

Fig. 840 Connection diagram 7UT613

Siemens SIP - Edition No. 7

Transformer Differential Protection / 7UT6

Connection diagram

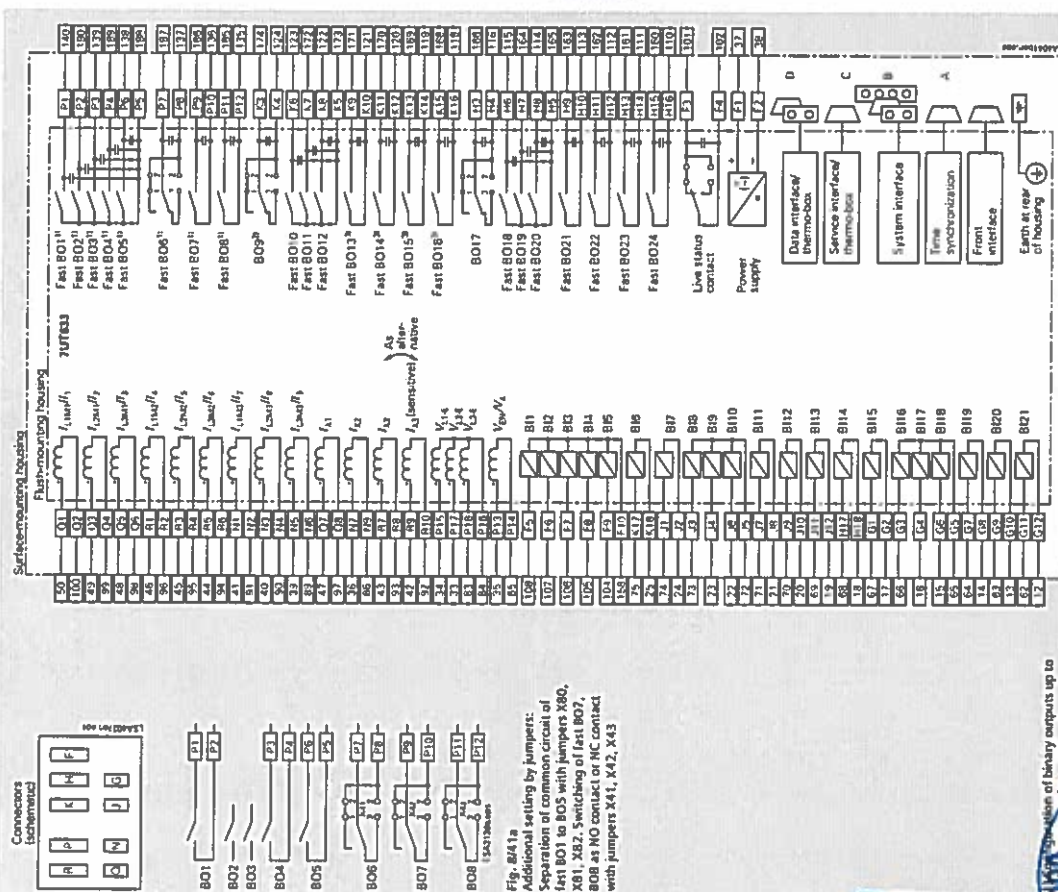


Fig. 841a
Additional setting by jumpers:
Separation of common circuit of
fast B01 to B05 with jumpers X80,
X81, X82. Switching of fast B07,
B08 as NO contact or NC contact
with jumpers X41, X42, X43

Transformer Differential Protection / 7UT6

Connection diagram

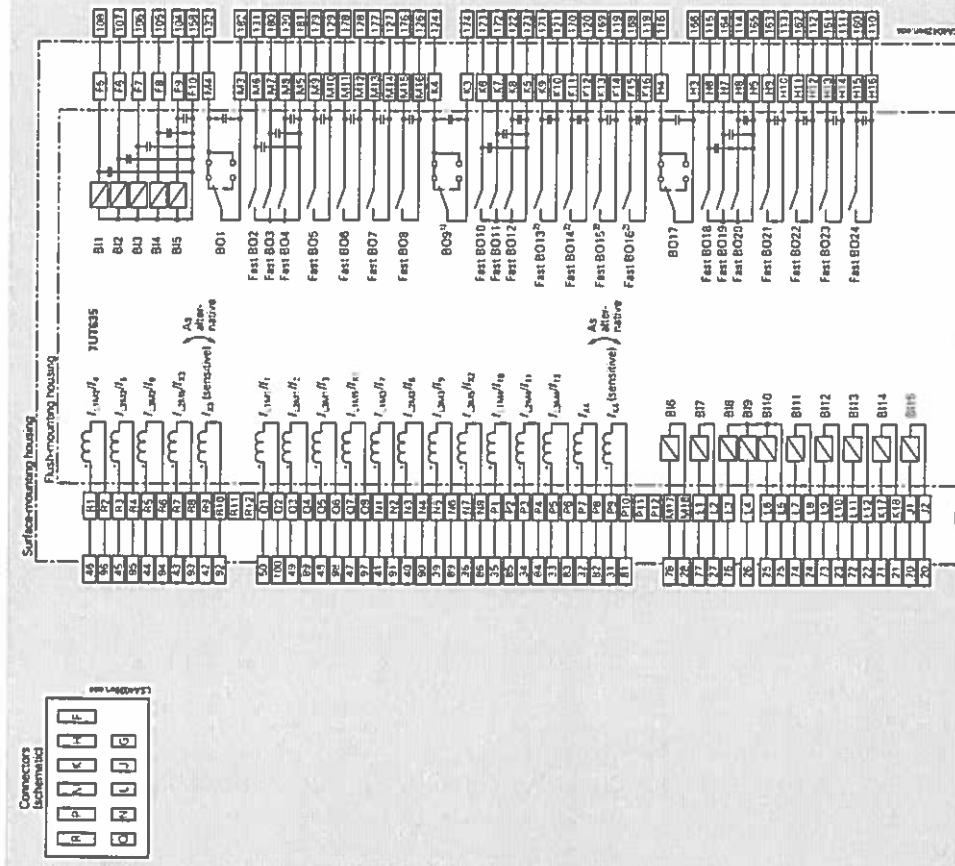


Fig. 842 Connection diagram 7UT635 part 1; continued on following page

Fig. 842 Connection diagram 7UT635 part 1; continued on following page

Siemens SIP Edition No. 7 8/45

Siemens SIP Edition No. 7 8/45

Transformer Differential Protection /7UT6

Connection diagram

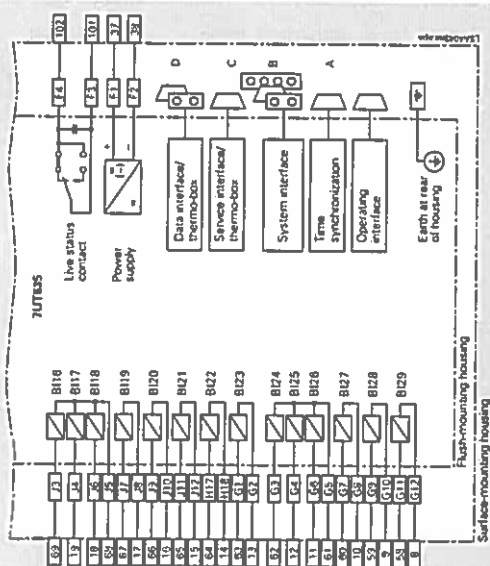


Fig. 8/43 Connection diagram 7UT6S part 2



IEC 61850 Certificate Level A¹

Page 1/2

No. 74105246-MOC/INC 13-4265

For the server product:
SIPROTEC V4
7SJ66 Multifunction Protection
Firmware V04.00

Issued to:
Siemens A.G., IC SG EA
Protection and Substation Control Systems
Wermerwerdamm 5
D-13623 Berlin
Germany



Issued by:

The server product has not shown to be non-conforming to:

IEC 61850 First Edition Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1

Communication networks and systems in substations

The conformance test has been performed according to IEC 61850-10, the UCA International Users Group Device Test Procedures version 2.3 with TPCL² version 1.7, the product's protocol, model and technical issue implementation conformance statements: "SIEMENS SIPROTEC 7SJ66 IEC 61850 PMT, PCS, TICS, C53000-G1140-C383-1", "Model Implementation Conformance Statement (MICS), version 1 Revision 8" and the extra information for testing: "SIEMENS SIPROTEC 7SJ66 IEC 61850 PMT, PCS, TICS, C53000-G1140-C383-1".

The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases):

1: Basic Exchange (20/24)	9a: GOOSE Publish (10/13)
2: Data Set Definition (23/23)	9b: GOOSE Subscribe (11/11)
4: Setting Group Selection (2/3)	12a: Direct Control (4/12)
4: Setting Group Definition (1/1)	12c: Enhanced Direct Control (4/13)
5: Unbuffered Reporting (17/19)	12d: Enhanced SBO Control (12/16)
6: Buffered Reporting (19/21)	13: Time Synchronization (3/3)
6: Enhanced buffered reporting (12/12)	14: File Transfer (4/7)

This certificate includes a summary of the test results as carried out at SIEMENS in Germany with UniCA 61850 Client simulator 4.27.04 with test suite 3.27.02 and UniCA 61850 Analyzer 5.27.06. This document has been issued for information purposes only, and the original paper copy of the KEMA report No. 74105246-MOC/INC 13-4264 will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to KEMA by SIEMENS. The manufacturer's production process has not been assessed. This attestation does not imply that KEMA has approved any product other than the specimen tested.

Anheim, December 12, 2013

M. Kijenssen
Director Intelligent Networks & Communication

P. Schimmel
Certification Manager

¹ Level A - Independent test lab with certified ISO 9001 Quality System

² TPCL - Test procedures change list

Siemens Nederland B.V., Anheim, the Netherlands. All rights reserved. Please note that any electronic version of this KEMA attestation is provided to the customer for information purposes only. It is prohibited to update or change it in any manner whatsoever, including but not limited to dividing it into parts without the written consent of KEMA. The original paper version and the original version of the electronic version shall prevail.

Siemens Nederland B.V.
Unifunctional 310, 6812 AR Anheim, P.O. Box 9035, 6800 ET Anheim, The Netherlands
T +31 20 358 20 25 F +31 20 351 36 53 sales@kema.com www.kema.com



Page 2/2

Applicable Test Procedures from the UCA International Users Group Device Test Procedures version 2.3 with TPCL version 1.7

Conformance Block	Mandatory	Conditional
1: Basic Exchange	Ass1, Ass2, Ass3, AssN2, AssN3, AssN4, AssN5 Srv1, Srv2, Srv3, Srv4, Srv5, SrvN1abod, SrvN4	Srv6, Srv7, Srv8, SrvN1e, SrvN1f, SrvN3
2: Data Sets	Dset1, Dset10a, DsetN1ae	
2+: Data Set Definition	Dset2, Dset3, Dset4, Dset5, Dset6, Dset7, Dset8, Dset9 DsetN1od, DsetN2, DsetN3, DsetN4, DsetN5, DsetN6, DsetN7, DsetN8, DsetN9, DsetN10, DsetN11, DsetN12, DsetN13, DsetN14, DsetN15	
4: Setting Group Selection	Sg1, SgN1a, Sg3	
4+: Setting Group Definition	Sg2, Sg4, SgN1b, SgN2, SgN3, SgN4, SgN5	
5: Unbuffered Reporting	Rp1, Rp2, Rp3, Rp4, Rp7, Rp10, Rp12 RpN1, RpN2, RpN3, RpN4	Rp5, Rp6, Rp8, Rp9, Rp11, RpN5
6: Buffered Reporting	Br1, Br2, Br3, Br4, Br7, Br8, Br9, Br12, Br14 BrN1, BrN2, BrN3, BrN4, BrN5	Br5, Br6, Br10, Br11, Br13
6+: Enhanced buffered reporting	BrE1, BrE2, BrE3, BrE6, BrE7, BrE8, BrE9, BrE10, BrE11	BrE4, BrE5, BrE12
9a: GOOSE publish	Gosp2, Gosp3, Gosp4, Gosp7, Gosp9, Gosp10a	Gosp1, Gosp6, Gosp10b, GospN1
9b: GOOSE subscribe	GosN1a, GosN2, GosN3, GosN4, GosN5, GosN6	GosN1b, GosN4
12a: Direct control	CIN3, CIN8 DOsN1	DOsN3
12c: Enhanced Direct Control	CIN3, CIN8 DOsN2, DOsN5	
12d: Enhanced SBO control	CIN1, CIN2, CIN3, CIN4, CIN9 SBOsN1, SBOsN2, SBOsN3	CIN2, CIN7, CIN11
13: Time sync	Tm1, Tm2, TmN1	
14: File transfer	FT1, FT2ab, FT4, FTN1ab	

Prüfbericht Test Report

Prüfbericht-Nr. / Test Report No. : TS0314-04

Ausgabedatum / Date of issue : 2014-03-31

Thema / Subject :

Typprüfung Multifunktionsschutz SIPROTEC 7SJ66 V4.0 / Ausgabe 01

Type test Multi_Protection_Relay SIPROTEC 7SJ66 V4.0 / Edition 01

Die Prüfungen wurden durchgeführt von (Prüflaboratorium):

The tests were performed by (testing laboratory):

SIEMENS AG
Development
IC SG EA PRO D 6 2
Wernerwerkdamm 5
D - 13629 Berlin

Die Prüfungen wurden durchgeführt für (Auftraggeber):

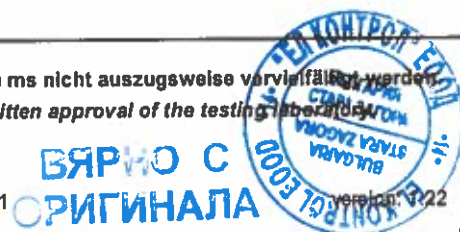
The tests were performed for (client):

SPA RD NKG
SPA RD
88, Chengxin Avenue
211100 China

Dieser Prüfbericht besteht aus 89 Seiten.
This Test Report consists of 89 pages.

Dieser Bericht darf ohne schriftliche Genehmigung des Prüflaboratoriums nicht auszugsweise vervielfältigt werden.
This report must not be reproduced except in full without the written approval of the testing laboratory.

© SIEMENS AG 2014



EG-Konformitätserklärung EC Declaration of Conformity

No. 001/14

Hersteller: Siemens AG
Manufacturer: Infrastructure & Cities Sector
Smart Grid Division
Energy Automation

Anschrift: Humboldtstraße 59
Address: 90459 Nürnberg
Bundesrepublik Deutschland

**Produkt-
bezeichnung:** Multifunktionsschutz / Multifunction Protective Relay
**Product
description:** 7SJ662 and 7SJ663

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EG Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit

Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

2006/95/EG Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen

Directive of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits

CE-Kennzeichnung / CE marking : 14

Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen:
Conformity to the Directives is assured through the application of the following standards:

Referenznummer <i>Reference number</i>	Ausgabedatum <i>Edition</i>	Referenznummer <i>Reference number</i>	Ausgabedatum <i>Edition</i>
EN 60255-26	2013-09	EN 60255-5	2001-04
EN 61000-6-2	2005-08	EN 60255-27	2005-12
EN 61000-6-4	2007-01 + A1/2011-02		

Nürnberg, den / the 2014-03-21

Siemens Aktiengesellschaft

Mr. Erkens
General Manager
IC SG EA PRO D

Name, Funktion
Name, function

Unterschrift
signature

Mr. Trescher
Vice President Global Development
IC SG EA PRO D

Name, Funktion
Name, function

Unterschrift
signature

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie. Die Sicherheitsanweisungen der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.



EG-Konformitätserklärung EC Declaration of Conformity

No. 001/12

Hersteller: Siemens AG
Manufacturer: Infrastructure & Cities Sector
Smart Grid Division
Energy Automation

Anschrift: Humboldtstraße 59
Address: 90459 Nürnberg
Bundesrepublik Deutschland

**Produkt-
bezeichnung:** Produktfamilie SIPROTEC 4
Product Family SIPROTEC 4
**Product
description** 6MD61, 6MD63, 6MD662/3/4, 7SA522, 7SA6, 7SD5, 7SD610, 7SJ61, 7SJ62,
7SJ63, 7SJ64, 7SS52, 7ST61, 7ST63, 7UM61, 7UM62, 7UT612, 7UT613,
7UT63, 7VE6, 7VK61

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EG Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit

Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

2006/95/EG Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen

Directive of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits

CE-Kennzeichnung / CE marking: 2012

Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen:
Conformity to the Directives is assured through the application of the following standards:

Referenznummer <i>Reference number</i>	Ausgabedatum <i>Edition</i>	Referenznummer <i>Reference number</i>	Ausgabedatum <i>Edition</i>
EN 50263	1999-11	EN 60255-5	2001-04
EN 60255-26	2009-10		

Nürnberg, den / the 2012-02-14

Siemens Aktiengesellschaft

Mr. Erkens
General Manager
IC SG EA PRO

Name, Funktion
Name, function

Unterschrift
signature

Mr. Trescher
Vice President Global Development
IC SG EA PRO D

Name, Funktion
Name, function

Unterschrift
signature

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

Siemens Aktiengesellschaft: Chairman of the Supervisory Board: Gerhard Cromme; Managing Board: Peter Loescher, Chairman, President and Chief Executive Officer; Roland Busch, Brigitte Ederer, Klaus Helmrich, Joe Kaeser, Barbara Kux, Hermann Requardt, Siegfried Russwurm, Peter Y. Sokmann, Michael Sues; Registered office:



Prüfbericht Test Report

Prüfbericht-Nr. / Test Report No. : TS 06-01

Ausgabedatum / Date of issue : 2014-02-14

Thema / Subject :

Typprüfung Differentialschutz SIPROTEC 7UT613/63x/683 - V4.6 / Ausgabe 5

Type test Differential Protection SIPROTEC 7UT613/63x/683 - V4.6 / Edition 5

Die Prüfungen wurden durchgeführt von (Prüflaboratorium):

The tests were performed by (testing laboratory):

interne Tests / internal tests

SIEMENS AG,
IC SG EA PRO D62
Wernerwerkdamm 5
D - 13629 Berlin

externe Tests / external tests
s. Unteraufträge / see
subcontracting

Die Prüfungen wurden durchgeführt für (Auftraggeber):

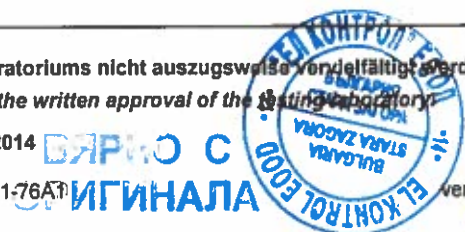
The tests were performed for (client):

SIEMENS AG,
IC SG EA PRO D
Wernerwerkdamm 5
D - 13629 Berlin

Dieser Prüfbericht besteht aus 72 Seiten.
This Test Report consists of 72 pages.

Dieser Bericht darf ohne schriftliche Genehmigung des Prüflaboratoriums nicht auszugsweise veröffentlicht werden.
This report must not be reproduced except in full without the written approval of the testing laboratory.

© SIEMENS AG 2014





KEMAK

The product has not shown to be non-conforming to:

IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1

Communication networks and systems in substations

Direct Sales Dept. 310.6812 AR Amherst P.O. Box 9035, 6800 ET Amherst The Netherlands
+31-20-5666142 F +31 26 351 54 56 sales@kema.com www.kema.com

Applicable Test Procedures from the UCA International Users Group Device Test Procedures
version 2.2

Conformance Block	Mandatory	Conditional
1: Basic Exchange	Ass1, Ass2, Ass3, AssH2, AssN3, AssN4, AssN5 Srv1, Srv2, Srv3, Srv4, Srv5, SrvN1abcd, SrvN4	Srv6, Srv7, Srv8, SrvN1e, SrvN3
2: Data Sets	Dset1, Dset10a, DsetN1ae	
24: Data Set Definition	Dset2, Dset3, Dset4, Dset5, Dset6, Dset7, Dset8, DsetN1cd, DsetN2, DsetN3, DsetN4, DsetN5, DsetN6, DsetN7, DsetN8, DsetN9, DsetN10, DsetN11, DsetN12, DsetN13, DsetN14, DsetN15	
4: Setting Group Selection	Sg1, SgN1a	
5: Unbuffered Reporting	Rp1, Rp2, Rp3, Rp4, Rp7, Rp10 RpN1, RpN2, RpN3, RpN4	Rp5, Rp6, RpN5, Rp8, Rp9, Rp11
6: Buffered Reporting'	Br1, Br2, Br3, Br4, Br7, Br8, Br9 Br12, BrN1, BrN2, BrN3, BrN4, BrN5	Br5, Br10, Br11, Br13
9a: GOOSE publish	Gop2, Gop3, Gop4, Gop7, Gop10	Gop1, GopN1
9b: GOOSE subscribe	Gos1a, Gos2, Gos3, GosN1, GosN2, GosN3, GosN4, GosN5, GosN6	
12a Direct control	CHN3, CHN8 DONs1, DONs3 CHN3, CHN8	CH2
12c: Enhanced Direct Control	DOes2, DOes5 CHN3, CHN8	
12d: Enhanced SBO Control	CHN3, CHN1, CHN2, CHN3, CHN4, CHN9 SBOes1, SBOes2, SBOes3	CH2, CH7, CHN11
13: Time Sync	Tm1, Tm2, TmN1	
F1: File Transfer	F11, F12ab, F14, FIN1ah	

Buffered reporting tissue #453 has successfully been tested, compare test report for details

EG-Konformitätserklärung EC Declaration of Conformity

No. SICAM TM_01/13

Hersteller: Siemens AG
 Manufacturer: Infrastructure & Cities Sector
 Smart Grid Division
 Energy Automation

Anschrift: Humboldtstraße 59
 Address: 90459 Nürnberg
 Bundesrepublik Deutschland

Produkt-
 bezeichnung: SICAM TM,
 die Folgeseiten sind Bestandteil dieser Erklärung
 Product-
 description: SICAM TM,
 next pages are integral part of this declaration

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:
 The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EG	Richtlinie 2004/108/EG des europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit <i>Directive 2004/108/EG of the European Parliament and of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility</i>
2006/95/EG	Richtlinie 2006/95/EG des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen <i>Directive 2006/95/EG of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.</i>
CE-Kennzeichnung / CE marking : 2012	

Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen:
 Conformity to the Directives is assured through the application of the following standards:

Referenznummer Reference number	Ausgabedatum Edition	Referenznummer Reference number	Ausgabedatum Edition
EN 60870-2-1	1996	EN 60950-1	2006

Nürnberg, den / the 2013-06-25

Siemens Aktiengesellschaft

Mr. Erkens
 General Manager
 IC SG EA PRO

Name, Funktion
 Name, function

Unterschrift
 signature

Mr. Trescher
 Vice President Global Development
 IC SG EA PRO D

Name, Funktion
 Name, function

Unterschrift
 signature

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie und ist keine Zusicherung von Eigenschaften im Sinne des Produkthaftungsgesetzes. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten. Das Produkt ist ausschließlich für den Einsatz in industrieller Umgebung vorgesehen.
 This declaration certifies the conformity to the specified directives but contains no assurance of properties and is no guarantee of the properties under the Product Liability Act. The safety documentation accompanying the product shall be considered in detail. The product is only for use in industrial environment.

Siemens Aktiengesellschaft: Chairman of the Supervisory Board: Gerhard Cromme; Managing Board: Peter Loescher, Chairman, President and Chief Executive Officer; Roland Busch, Brigitte Ederer, Klaus Helmrich, Joe Kaeser, Barbara Kux, Hermann Requardt, Siegfried Russwurm, Peter Y. Solmasen, Michael Suess; Registered offices: Berlin and Munich, Germany; Commercial registries: Berlin Charlottenburg, HRB 12300, Munich, HRB 6684, WEEE-Reg.-No. DE 23691339



EG-Konformitätserklärung EC Declaration of Conformity

No. SICAM TM_01/13

Produktbezeichnung:
Product designation:

Grundgeräte / Basic devices

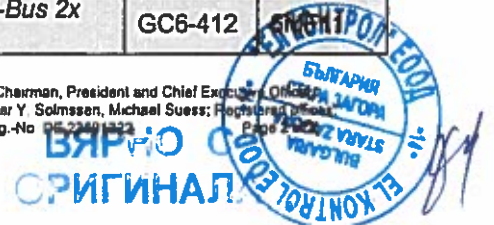
CP-6014	Steuerkopfm modul	Master Control Module	GC6-014	6MF11
---------	-------------------	-----------------------	---------	-------

Kommunikationsbaugruppen / Communication Boards

SM-0551	Serial Interface Processor 1 SI	Serial Interface Processor 1 SI	BC0-551	6MF10
SM-2545	Profi-Bus Interface	Profi-Bus Interface	BA2-545	6MF10
SM-2551	Serial Interface Processor 2 SI	Serial Interface Processor 2 SI	BC2-551	6MF10
SM-2556	Network-Interf.Ethernet 10/100TX	Network-Interf.Ethernet 10/100TX	BC2-556	6MF10
SM-2557	Network-Interf.Ethernet 2x100TX	Network-Interf.Ethernet 2x100TX	BC2-557	6MF10
SM-2558	Ethernet-Interf. 1x100TX,(+1SS)	Ethernet-Interf. 1x100TX,(+1SI)	BC2-558	6MF10

Peripheriebaugruppen / Peripheral Boards

DI-6100	Binäre Eing. 2x8,24-60VDC	Binary Input 2x8,24-60VDC	GC6-100	6MF11
DI-6101	Binäre Eing. 2x8,110/220VDC	Binary Input 2x8,110/220VDC	GC6-101	6MF11
DI-6102	Binäre Eing. 2x8,24-60VDC,1ms	Binary Input 2x8,24-60VDC,1ms	GC6-102	6MF11
DI-6103	Binäre Eing. 2x8,110/220VDC,1ms	Binary Input 2x8,110/220VDC,1ms	GC6-103	6MF11
DI-6104	Binäre Eing. 2x8,220VDC	Binary Input 2x8,220VDC	GC6-104	6MF11
DO-6200	Bin. Ausg.Trans. 2x8, 24-60VDC	Bin. Outp.Trans. 2x8, 24-60VDC	GC6-200	6MF11
DO-6212	Bin Ausg Rel 8x 24-220VDC/230VAC	Bin Outp Rel 8x 24-220VDC/230VAC	GC6-212	6MF11
DO-6220	Befehlsausg. Basismodul	Command Out Basic Module	GC6-220	6MF11
DO-6221	Befehlsausg. Basismodul Messung	Command Out Basic Module Measure	GC6-221	6MF11
DO-6230	Befehlsausgabe Relaismodul	Command Output Relay Module	GC6-230	6MF11
AI-6300	Analoge Eingabe 2x2 ±20mA/±10V	Analog Input 2x2 ±20mA/±10V	GC6-300	6MF11
AI-6303	Ana. Eing.(Wandler,4xU,3xI) EMC+	Analog Inp.(Transf,4xV,3xC) EMC+	GC6-303	6MF11
AI-6304	Ana. Eing. (4xU, 3xI, 2xFO) EMC+	Analog Inp.(4xV, 3xC, 2xFO) EMC+	GC6-304	6MF11
AI-6307	Analoge Eingabe 2x2 ±5mA/±10V	Analog Input 2x2 ±5mA/±10V	GC6-307	6MF11
AI-6308	Analoge Eingabe 2x2 ±2mA/±10V	Analog Input 2x2 ±2mA/±10V	GC6-308	6MF11
AI-6310	Analoge Eingabe 2x2 Pt100/Ni100	Analog Input 2x2 Pt100/Ni100	GC6-310	6MF11
AO-6380	Ana. Ausgabe 4x ±20mA/±10mA/±10V	Ana. Output 4x ±20mA/±10mA/±10V	GC6-380	6MF11
PE-6410	Peripheriekoppl. Ax-Bus elektr.	Periph. Controller Ax-Bus elect.	GC6-410	6MF11
PE-6411	Peripheriekoppl. Ax-Bus 1x opt.	Periph. Controller Ax-Bus 1x FO	GC6-411	6MF11
PE-6412	Peripheriekoppl. Ax-Bus 2x opt.	Periph. Controller Ax-Bus 2x FO	GC6-412	6MF11



EG-Konformitätserklärung EC Declaration of Conformity

No. SICAM TM 01/13

TE-6420	Drehzahlerf. 2x2 5/24VDC/NAMUR	Speed Measurem. 2x2 5/24V/NAMUR	GC6-420	6MF11
TE-6430	Zählereingang 2x24-60VDC	Counting Pulse Inp. 2x24-60VDC	GC6-430	6MF11
TE-6450	Positionserfassung 2x2 SSI/RS422	Position Acquisit. 2x2 SSI/RS422	GC6-450	6MF11

Zubehör / Accessory

CC6-095	Flash Card	Flash Card	CC6-095	6MF12
CM-2860	Patch Plug Standard V28,ET,TR	Patch Plug standard V28,ET,TR	CA2-860	6MF12
CM-2869	Patch Plug Profibus	Patch Plug Profibus	CA2-869	6MF12
CM-0819	RS232/RS485 Conv. galv. getrennt	RS232/RS485 Converter isolated	GA0-819	6MF11
CM-0821	Feldbusint. Ring (3xLWL, 1xel.)	Fieldbus-Int. Ring (3xFO, 1xel.)	GA0-821	6MF11
CM-0822	Feldbusinterface Stern (4xLWL)	Fieldbus-Interface Star (4xFO)	GA0-822	6MF11
CM-0823	Feldbusint.Ring (3xLWL, 1xRS485)	Fieldbus-Int. Ring (3xFO, 1xRS485)	GA0-823	6MF11
CM-0829	RS232/RS422; RS485 Converter	RS232/RS422; RS485 Converter	GA0-829	6MF11
CM-6810	TM I/O-Module Absetzkabel	TM I/O-Modules Extension Cable	GC6-810	6MF11
CM-2845	Anschlußbox für SM-2545 in AK	Connectionbox for SM-2545 in AK	GA2-845	6MF11
PS-4620	Zusatzstromversorgung 24-60VDC	Additional Power Supply 24-60VDC	GA4-620	6MF11
DCF77	DCF77 Empfänger für Hutschiene	DCF77 Receiver for DIN rail	GA0-806	6MF11
CM-1820	TB Anschlusskabel 5m	TB Cable 5m	BA1-820	6MF10
CM-0820	ADAP Toolbox Adapter	ADAP Toolbox Adapter	GA0-820	6MF11
CM-0827	Fiberoptik-Interface (el.-LWL)	Fibre-Optic Interface (el.-FO)	GA0-827	6MF11
PS-6630	Stromversorgung 24-60VDC EMC+	Power Supply 24-60VDC EMC+	GC6-630	6MF11
PS-6632	Stromversorgung 110-220VDC EMC+	Power Supply 110-220VDC EMC+	GC6-632	6MF11
CM-0842	Ax 1703-Businterface 4-fach LWL	Ax 1703-Businterface 4x fiber op	GA0-842	6MF11
CM-0843	Ax 1703-Businterface elektrisch	Ax 1703-Businterface electrical	GA0-843	6MF11



Page 3 of 3



DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

Certificate No.: 111195-2012-AHSO-GER-TGA

This is to certify that

Siemens AG
Infrastructure & Cities Sector
Smart Grid Division (SG)
Energy Automation (EA)

Humboldtstr. 59
90459 Nürnberg - Germany
and the sites in the appendix

has been found to conform to the Management System Standard

ISO 9001:2008
ISO 14001:2004
BS OHSAS 18001:2007

This certificate is valid for the following product or service ranges:

Development, Production, Engineering, Sales and Service of Protection, Substation Automation, Telecontrol, Power Quality, Smart Grid Solutions and Energy Management Systems

Initial Certification date:

26.07.2010

This certificate is valid until:

04.06.2015

The audit has been performed under the supervision of

Volker Rändler

Lead Auditor

Place and date:

Essen, 05.06.2012

for the Accredited Unit:

DNV ZERTIFIZIERUNG UND UMWELTBEREICHEN GMBH



TGA-ZNI-04-92-00
TGA-ZNI-04-92-60
TGA-ZNI-04-92-64

Nikolaus Kim
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

DNV ZERTIFIZIERUNG UND UMWELTBEREICHEN GMBH, Schellinghof 14, 43129 Essen, Tel: +49 201 7296 222 Fax: +49 201 7296 333 - www.dnv.de



DNV BUSINESS ASSURANCE

APPENDIX TO CERTIFICATE

This appendix refers to certificate no.: 111195-2012-AHSO-GER-TGA

Siemens AG
Infrastructure & Cities Sector
Smart Grid Division (SG)
Energy Automation (EA)

locations included in the certification are as follows:

Site

Siemens AG
Infrastructure & Cities Sector
Smart Grid Division
Energy Automation (IC SG EA)
Humboldtstraße 59
D-90459 Nürnberg

Scope

Development, Engineering, Sales and Service of Protection, Substation Automation, Telecontrol, Power Quality, Smart Grid Solutions and Energy Management Systems

Siemens AG

Infrastructure & Cities Sector
Smart Grid Division
Energy Automation (IC SG EA)
Wernerwerkdam 5
D-13629 Berlin

Development, Production, Engineering, Sales and Service of Protection, Substation Automation, Telecontrol, Power Quality, Smart Grid Solutions and Energy Management Systems

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

DNV ZERTIFIZIERUNG UND UMWELTBEREICHEN GMBH, Schellinghof 14, 43129 Essen, Tel: +49 201 7296 222 Fax: +49 201 7296 333 - www.dnv.de



APPENDIX TO CERTIFICATE

This appendix refers to certificate no.: 11195-2012-AHSO-GER-TGA

Siemens AG
Infrastructure & Cities Sector
Smart Grid Division (SG)
Energy Automation (EA)

locations included in the certification are as follows:

Scope
Development, Engineering, Sales and Service of Protection, Substation Automation, Telecontrol, Power Quality, Smart Grid Solutions, Energy Management Systems and Energy Market Management Solutions

Site
Siemens Industry, Inc.
Infrastructure & Cities Sector
Smart Grid Division
Energy Automation (IC SG EA)
10900 Wayzata Boulevard, Suite 400
USA-Minnetonka, MN 55305

Scope
Engineering, Sales and Service of Protection, Substation Automation, Telecontrol, Power Quality and Smart Grid Solutions

Site
Siemens Industry, Inc.
Infrastructure & Cities Sector
Smart Grid Division
Energy Automation (IC SG EA)
7000 Siemens Rd
USA-Wendell, NC 27591

Scope
Development, Engineering, Sales and Service of Telecontrol, Smart Grid and Energy Management Systems

Site
Siemens Industry, Inc.
Infrastructure & Cities Sector
Smart Grid Division
Energy Automation (IC SG EA)
600 East Middlefield Road
USA-Mountain View, CA 94043

Not a fulfillment of conditions as set out in the Certification Agreement may render this Certificate invalid.
 000110WELTSTADT ACHTER (Wohl) Schmeinsdorf (14.45129) Essen, Tel: +49 201 7296 222 Fax: +49 201 7296 333 - www.acht.de

РИГИНАЛА

CERTIFICATE

No. Z10 14 02 83147 003



Product Service

Holder of Certificate: Siemens AG
 Infrastructure & Cities Sector
 Smart Grid Division
 Energy Automation (IC SG EA)
 Humboldtstraße 59
 90459 Nürnberg
 GERMANY

Certification Mark:



Product:

Automation Equipment, Safety Related

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way, in addition the certification holder must not transfer the certificate to third parties. See also notes overleaf.

Test report no.:

SW84681T

Valid until:

2019-03-26



Date: 2014-04-09

Page 1 of 3

(Matthias Ramold)

CERTIFICATE

No. Z10 14 02 83147 003



Product Service

Model(s):

Safety PLC of SICAM AK and SICAM TM
 Product group: SICAM RTUs
 For nomenclature see attachment

Parameters:

SICAM AK:
 Temperature Range: -5 ... 55 °C
 SICAM TM:
 Temperature Range: -25 ... 70 °C
 SICAM TM I/O Modules:
 Rated voltage: 18,0 ... 31,2 VDC
 Temperature Range: -25 ... 70 °C
 Max. rating output: 24 VDC – 3 A

The user documentation in the current valid revision is mandatory part of this certificate. The product complies with the following safety requirements only if the specifications documented in the currently valid revision are met.

Tested according to:

2006/42/EG
 EN 61131-2:2003
 IEC 61508-1:2010 (SIL 2)
 IEC 61508-2:2010 (SIL 2)
 IEC 61508-3:2010 (SIL 2)
 IEC 61508-4:2010 (SIL 2)
 EN ISO 13849-1:2008 (PL d, Cat. 3)
 EN IEC 62061:2005 (SIL CL 2)
 EN 50126-1:2006 (SIL 2)
 EN 50129:2003 (SIL 2)
 EN 50128:2011 (SIL 2)

Factory(ies):

82268

ATTACHMENT

to certificate

No. Z10 14 02 83147 003



Product Service

Nomenclature of Safety PLC of SICAM AK and SICAM TM

SICAM AK

CP-2017 / SPLC01

Safety PLC

SICAM TM

CP-6014 / SPLC01

Safety PLC

SICAM TM I/O Modules

DI-6170

DO-6270

AI-6370

Digital Input

Digital Output

Analog Input

2*4 24V

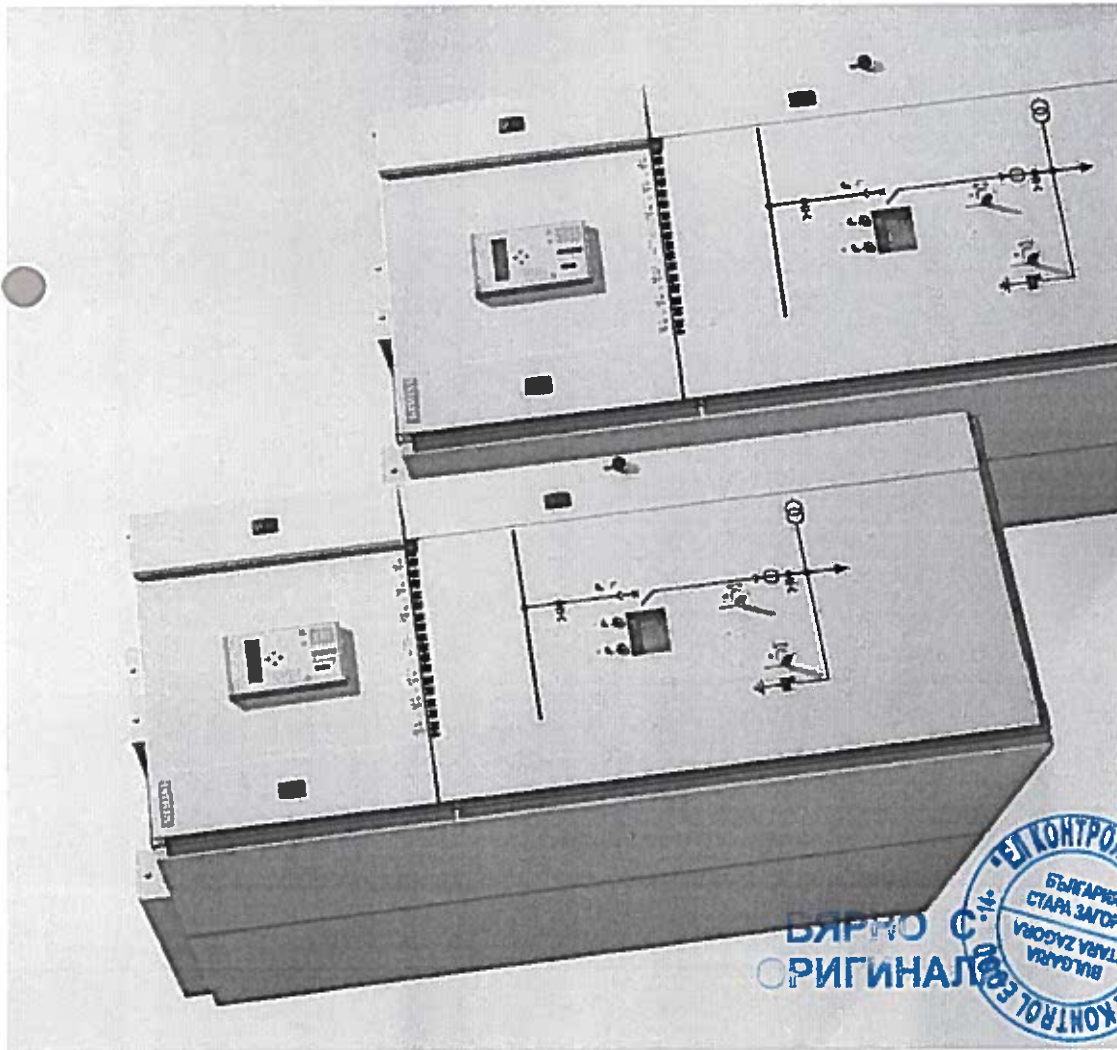
4* Solid State 24 VDC

4* 4...20 mA

Date:

2014-04-09

Page 3 of 3



Распределительные устройства среднего напряжения NXAIR, NXAIR M и NXAIR P с воздушной изоляцией и вакуумным силовым выключателем на наибольшее рабочее напряжение до 24 кВ

Распределительные устройства среднего напряжения

Каталог на 25.71 - 2006

SIEMENS

Распределительные устройства с вакуумным силовым выключателем NXAIR, NXAIR M и NXAIR P на номинальное рабочее напряжение до 24 кВ (с воздушной изоляцией)

Содержание

Страницы

Типы

Область применения	
Типы	2
Примеры применения	3 и 4
Классификация	4
Требования	
Преимущества для пользования и оптимизационные особенности	5
Технические характеристики	
Электрические характеристики	6-8
Габаритные размеры	9
Климатическая схема	
Программа поставки	
NXAIR	10 и 11
NXAIR M	12 и 13
NXAIR P	14 и 15
Конструкция	
Базовая конструкция и комплектация	16-19
Обслуживание, изолированные отсеки	
Комплектация	
Вакуумные выключатели	20
Другие коммутационные устройства	21
Трансформаторы при токах	22
оперные комплектующие	23
Оборудование низкого напряжения	
Применяемые нормы	24 и 25
Нормы, прописанные директивы	
Данный каталог заменяет Каталог IAS 25.71/2005	



Область применения

Распределительные устройства среднего напряжения NXAIR, NXAIR M, NXAIR P представляют распределительные устройства с силовым выключателем с воздушной изоляцией в металлическом корпусе, переоснащенные типовыми исполнениями и предназначенными для установки в помещениях с относительной влажностью не более 60% (в соответствии с IEC 60288 / VDE 0670, часть 6), ГОСТ 14693-90 и IEC 60271-2000 / VDE 0671-200 (Бывший IEC 60288 / VDE 0670, часть 6), ГОСТ 14693-90

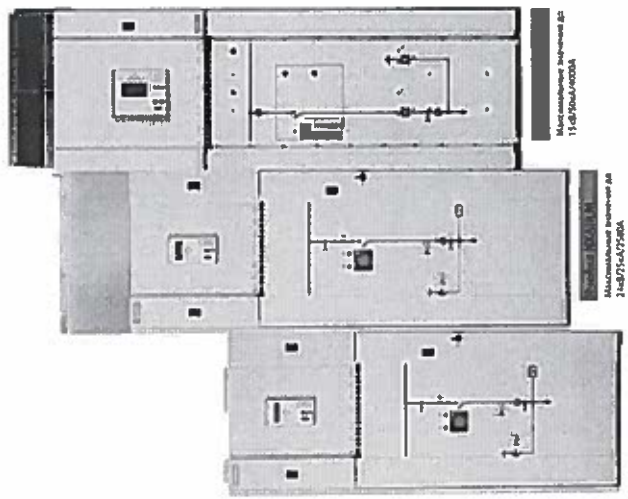
Категория эксплуатации: IEC 23 (полностью секционированное РУ)

Готовность: RM (металлический)

Класс секционирования: IAS A FLR, IEC 50 кВ

Классификация на стойкость к внутреннему дуге: I с

(см. также Раздел «Классификация» на стр. 4)



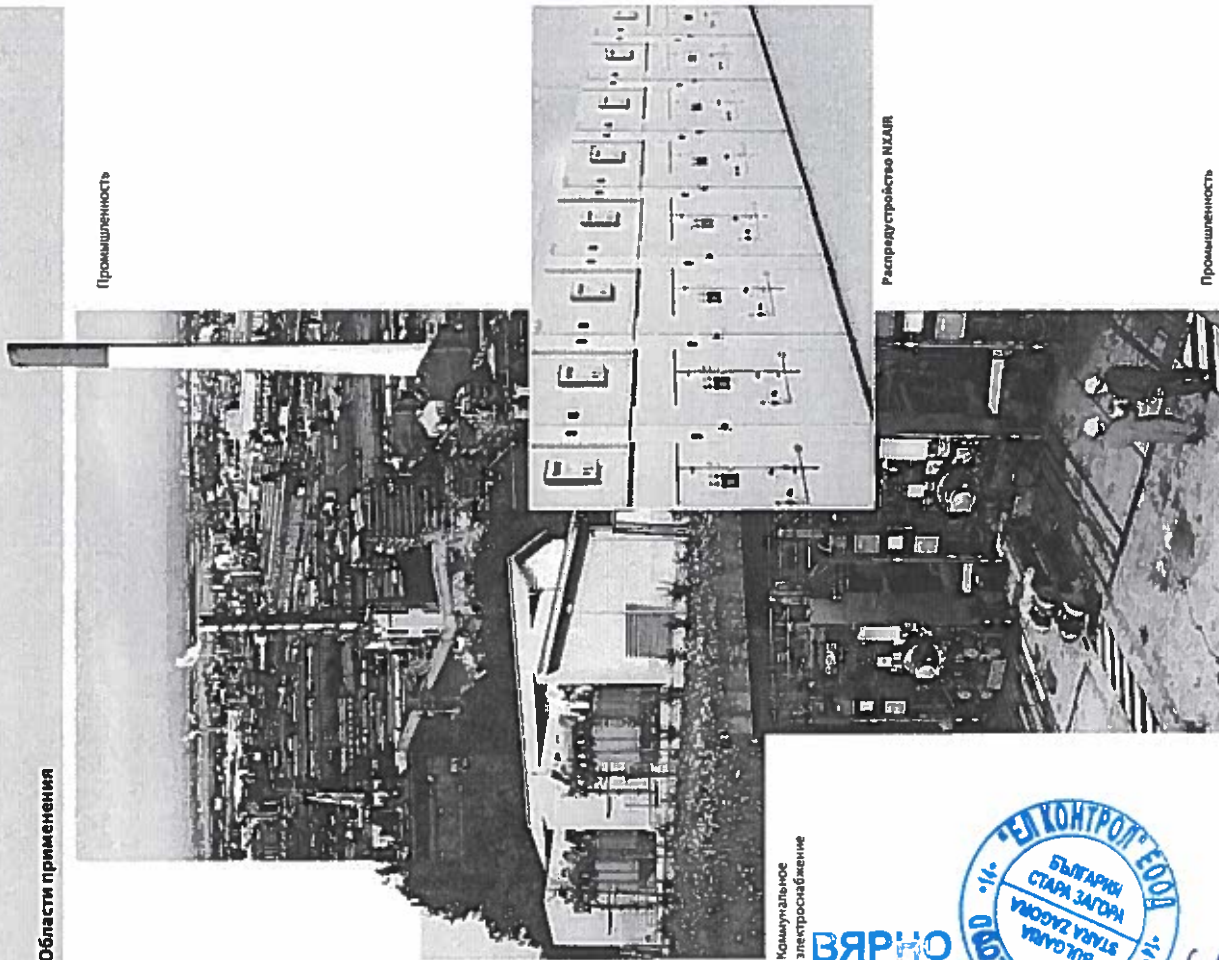
Примеры применения

Примеры применения см. Страница 4

Расторопительные устройства с вращающимся корпусом выпускаются НИКАР, НИКАР АТ
НИКАР Р на номинальное давление выдерживание до 24 кг/к. (подписано и рассмотрено)

Область применения

Области применения



Промышленность

Sümmen HA 25.71.2006

59

Расследование началось сразу же после получения сообщения о происшествии. В течение 24 часов были проведены все необходимые мероприятия по установлению личности погибшего и выяснению обстоятельств происшествия. В результате расследования установлено, что погибший являлся гражданином Российской Федерации, проживающим в г. Москве. Погибший находился в г. Москве в командировке по работе. Причиной происшествия признана ошибка водителя при маневрировании на дороге. Водитель не соблюдал правила дорожного движения, что привело к столкновению с автомобилем, в котором находился погибший. Водитель был привлечен к административной ответственности. По результатам расследования выданы рекомендации по повышению безопасности дорожного движения.

Область применения

Традиционные области применения

распределительные устройства с системой
включениями NXAIR, NXAIR M и NXAIR P
предназначены для применения в трансформаторных и распределительных подстанциях, главным образом, на пассивном уровне распределения

Область применения:

Городское электроснабжение

- ВЫЯДЫДАДУ АНТЮРАЖНОУДАНЭ

ПРОМЫШЛЕННОСТЬ

- Электростанция
- Центральная промышленность
- Автомобильная промышленность
- Металлургическое предприятие
- Полупроводниковые материалы
- Горнодобывающая промышленность
- Текстильная, бумажная и пищевая промышленность
- Химическая промышленность
- Нефтегазовая промышленность
- Трубопроводные транспортные системы
- Морские нефтедобывающие платформы
- Электроническая промышленность
- Нефтегазовая промышленность
- Судостроение
- Дизель-генераторные электростанции
- Системы резервного электроснабжения
- Разработка бурного угля открытым способом
- Агрегаты для газового электроснабжения

Классификация

и соответствующие устройства с полным включением ИХАИР ИХАИР М
и ИХАИР Р соответствуют следующим классификациям по ИЕС 62 271-200
и ИЕС 6671-200. ГОСТ 14693-90

Категория эксплуатационной готовности и класс срабатывания

[illegible]

Классификация на стойкость к внутренней дуге

The information provided on this page is for informational purposes only. It is not intended to be used as a substitute for professional advice. Please consult your physician or other healthcare provider for more information.

MC	КАБЛ I, 6	<ul style="list-style-type: none"> « Классификация на стойкость к воздействию
A		<ul style="list-style-type: none"> « Расстояние между порода
F		<ul style="list-style-type: none"> « для испытания 300 мм (вместо 150 мм)
L		<ul style="list-style-type: none"> « в закрытом пространстве (или поперечном)
R		<ul style="list-style-type: none"> « Расстояние между порода
IC		<ul style="list-style-type: none"> « с стороны фасада
		<ul style="list-style-type: none"> « Расположение между порода
		<ul style="list-style-type: none"> « с стороны боковой поверхности
		<ul style="list-style-type: none"> « Расстояние между порода
		<ul style="list-style-type: none"> « с одной стороны для испытания
		<ul style="list-style-type: none"> « Изначальный ток для
		<ul style="list-style-type: none"> IKAMB до 40 kA
		<ul style="list-style-type: none"> « Изначальный ток для
		<ul style="list-style-type: none"> IKAMB M25 25 kA
		<ul style="list-style-type: none"> « Изначальный ток для
		<ul style="list-style-type: none"> IKAMB P до 50 kA
		<ul style="list-style-type: none"> « Длительность I c

[illegible]

Siemens HA 75.71-2006

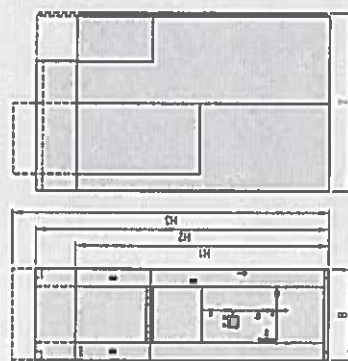
Siemens HA 75.71.2006

Технические характеристики

Электрические характеристики, габаритные размеры

1) На работу §§ 43

1) На работу §§ 43



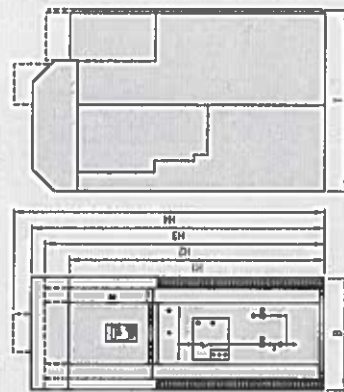
Siemens HA 2S.71-2006

Технические характеристики

Электрические характеристики, габаритные размеры

1) 3. 12. 1981 г. 10:00

Габаритные размеры		Размеры мм
Шарнир А	Ребра шарнира выгнуты > 2000 А	400 1000
	Ребра шарнира < 400 А и ребра с различным > 2000 А	400 1000
	Ребра шарнира выгнуты объемный > 2000 А	2 x 800 2 x 1000
	Ребра с изогнутой поверхностью, изогнуты	800
Высота Н1	Стандартная высота шарнира высота < 3150 А	2250 2450
	Н1 - высота шарнира шарнира шарнира	2550
Глубина Н2	Стандартная глубина шарнира < 1000 А	210
	Глубина Н2 - высота шарнира шарнира шарнира	1635
Глубина Н3	Глубина шарнира шарнира шарнира	1600
	Глубина шарнира шарнира шарнира	1320



© 1995 by John Wiley & Sons, Inc.

Siemens HA 25.71.2006

ВЯРНО
ОРИГИНАЛ

Технические характеристики

Компоновочная схема

NXAIR

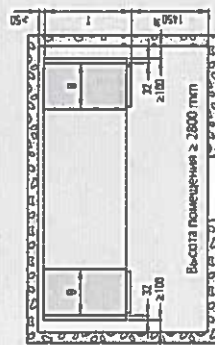
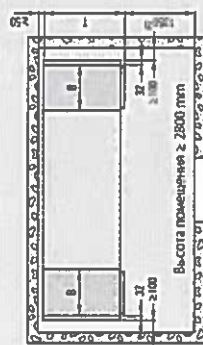
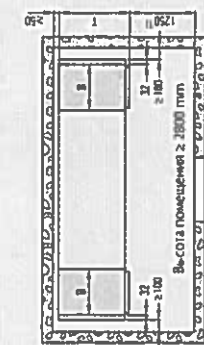
Установка шифров в один ряд (вид сверху) для РУ с односторонним сборным шинным Габаритные размеры В (ширина) и Т (глубина), см, таблицу на стр. 6.
Для обслуживания ячеек требуется коридор шириной ≥ 1410 мм.
Для схем расположения «стена к стене» и «фасад к фасад» действуют соответствующие компоновочные габаритные размеры как для установок шифров в один ряд.
Для схемы расположения «стена к стене» требуется коридор для обслуживания шириной 1200 мм слева или справа от распределительного

NXAIR M

Установка шифров в один ряд (вид сверху) для РУ с односторонним сборным шинным Габаритные размеры В (ширина) и Т (глубина), см, таблицу на стр. 7.
Для обслуживания ячеек требуется коридор шириной ≥ 1700 мм.
Для схем расположения «стена к стене» и «фасад к фасад» действуют соответствующие компоновочные габаритные размеры как для установок шифров в один ряд.
Для схемы расположения «стена к стене» требуется коридор для обслуживания шириной 1200 мм слева или справа от распределительного

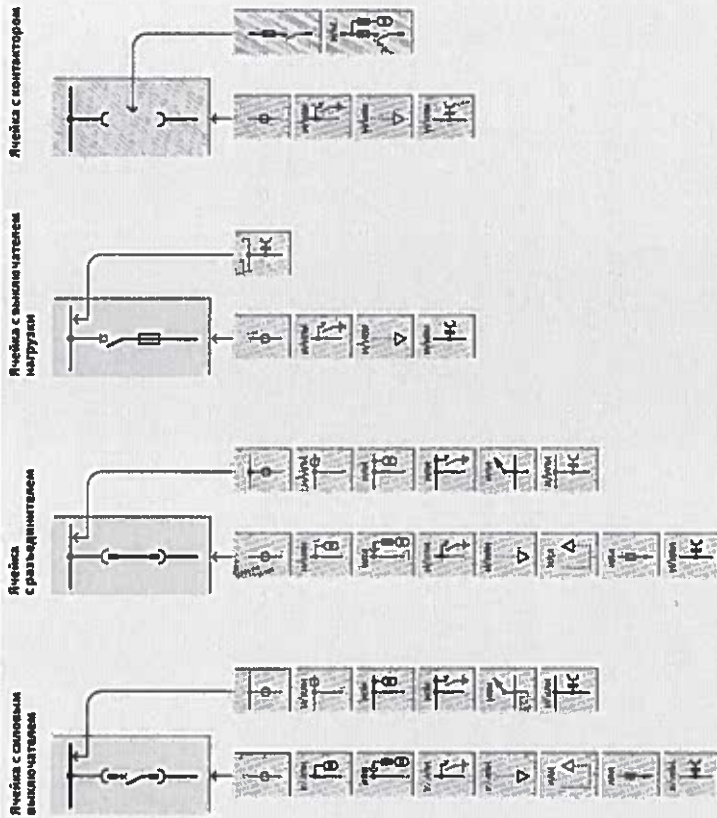
NXAIR P

Установка шифров в один ряд (вид сверху) для РУ с односторонним сборным шинным Габаритные размеры В (ширина) и Т (глубина), см, таблицу на стр. 8.
Для обслуживания ячеек требуется коридор шириной ≥ 1800 мм.
Для схем расположения «стена к стене» и «фасад к фасад» действуют соответствующие компоновочные габаритные размеры как для установок шифров в один ряд.
Для схемы расположения «стена к стене» требуется коридор для обслуживания шириной 1200 мм слева или справа от распределительного



Технические характеристики

Обзор типов ячеек NXAIR



Встраиваемые устройства

Ф	Трансформатор тока
ФТ	Трансформатор тока на обесточенный шина
П	Трансформатор напряжения
ПЗ	Трансформатор напряжения с защитой от перегрузки
ПЗД	Двухконтурный трансформатор с защитой от перегрузки
ПЗДЗ	Выход сдвоенный для параллельного включения

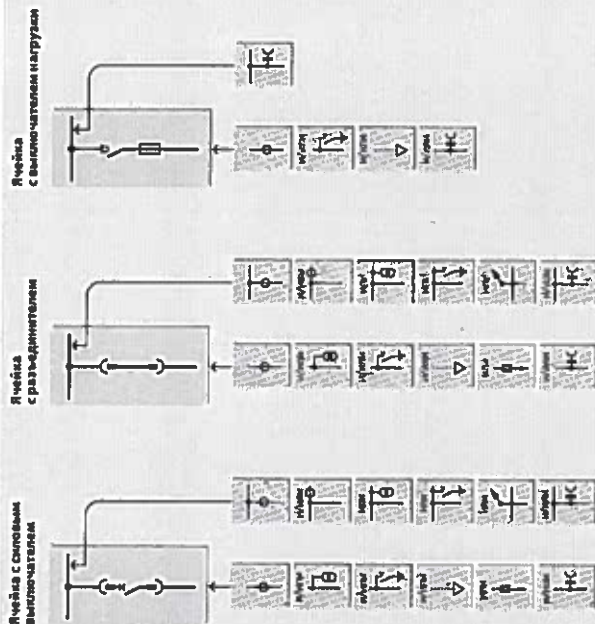
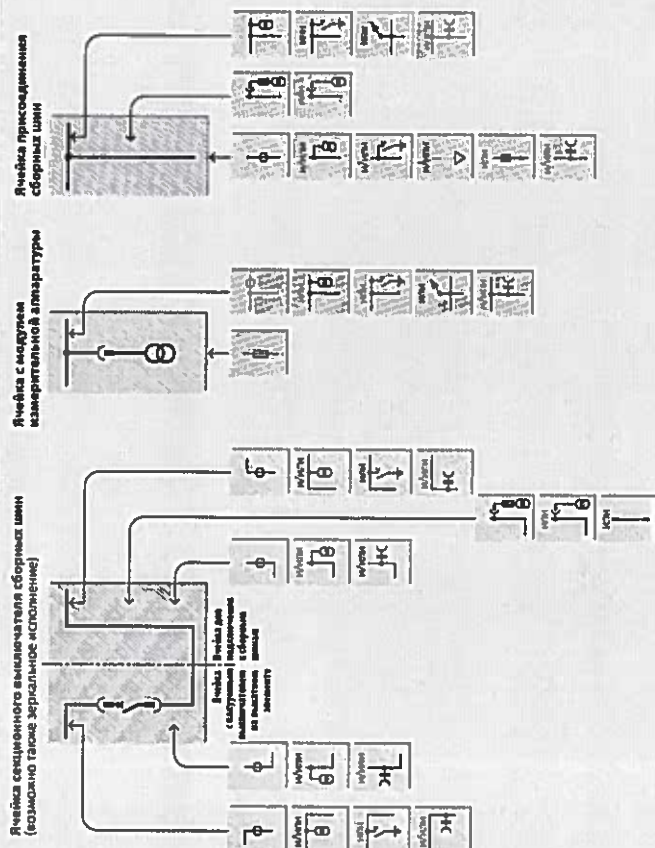
ФК	Функция защиты от перегрузки
ФКЗ	Функция защиты от перегрузки с задержкой
ФКЗД	Функция защиты от перегрузки с задержкой и сдвоенным выходом
ФКЗДЗ	Функция защиты от перегрузки с задержкой и сдвоенным выходом с защитой от перегрузки

С	Способы измерения на выходящих элементах
СЗ	Способы измерения на выходящих элементах с задержкой
СЗД	Способы измерения на выходящих элементах с задержкой и сдвоенным выходом
СЗДЗ	Способы измерения на выходящих элементах с задержкой и сдвоенным выходом с защитой от перегрузки

Другие встраиваемые устройства для сборки в ячейку NXAIR: см. на стр. 19.
1. Схемы измерения на выходящих элементах с задержкой и сдвоенным выходом.

Технические характеристики

Обзор типов ячеек NXAIR M



Встраиваемые устройства

φ	Трансформатор тока
⊕	Трансформатор тока на сборном шине
⊖	Трансформатор напряжения
⚡	Защитный разрядник на сборном шине
⚡	Выход сборной шины для подключения шинной системы
⚡	Термопары на выключателе

Другие встраиваемые устройства для сборных шин и отсеков присоединений см. на стр. 19

1 См. подробные данные для сборки в таблице на стр. 19

РУ с двойной системой сборных шин

РУ с двойной системой сборных шин состоит из элементов РУ с двойной системой сборных шин.

Оно может иметь следующие модификации:

- Установка фазы к фазу*
- Установка шины к шине

(см. описание на стр. 13 или 15)

Встраиваемые устройства

φ	Трансформатор тока
⊕	Трансформатор тока на сборном шине
⊖	Трансформатор напряжения
⚡	Защитный разрядник на сборном шине
⚡	Выход сборной шины для подключения шинной системы
⚡	Термопары на выключателе

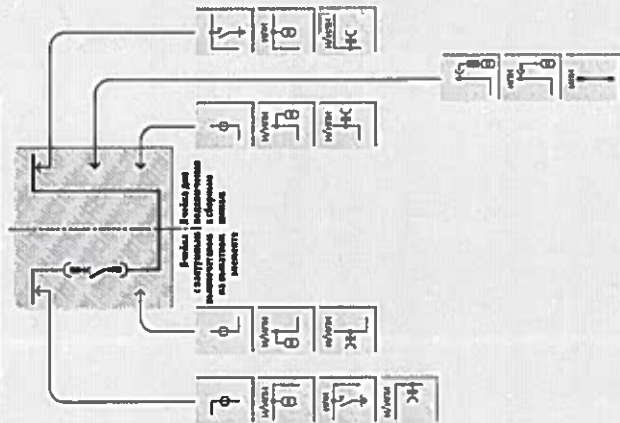
Другие встраиваемые устройства для сборных шин и отсеков присоединений см. на стр. 19

1 См. подробные данные для сборки в таблице на стр. 19

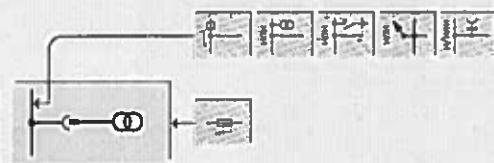
Технические характеристики

Обзор типов ячеек

Ячейка секционного выключателя сборных шин (возможно также дублирование)



Ячейка с модулем аппаратуры



РУ с двойной системой сборных шин

РУ с двойной системой сборных шин состоит из элементов РУ с одной системой сборных шин. Оно может иметь следующие конфигурации:

- расположение «ступень»
- расположение «фасад к фасад»

Распределение фаз по фасадам

- ячейки из элементов РУ с одной системой сборных шин (ячейки с основной выключателем, ячейки с разрядником, ячейки с выключателем, ячейки с измерительной аппаратурой)

- Два ряда распределительных устройств соединены кабелем или шинками под ячейками

- Шинный соединитель состоит из:
 - ячейки с основной выключателем
 - ячейки с разрядником

Распределение фаз по фасадам

- Ячейки из элементов РУ с одной системой сборных шин (ячейки с основной выключателем, ячейки с разрядником, ячейки с выключателем, ячейки с измерительной аппаратурой)

- Два ряда распределительных устройств соединены шинками внутри ячеек

- Шинный соединитель состоит из:
 - ячейки с основной выключателем
 - ячейки с разрядником

- Ячейки с основной выключателем
- Ячейки с разрядником

Встраиваемые устройства

φ	Трансформатор тока	φ	Трансформатор тока
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах

Другие встраиваемые устройства для сборки шин и отсеков присоединений см. на стр. 19

φ	Трансформатор тока	φ	Трансформатор тока
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах
Δ	Трансформатор тока на сборных шинах	Δ	Трансформатор тока на сборных шинах

Другие встраиваемые устройства для сборки шин и отсеков присоединений см. на стр. 19

1) Со стороны и стороны от шинной системы

2) Со стороны и стороны от шинной системы

3) Со стороны и стороны от шинной системы

4) Со стороны и стороны от шинной системы

5) Со стороны и стороны от шинной системы

6) Со стороны и стороны от шинной системы

7) Со стороны и стороны от шинной системы

8) Со стороны и стороны от шинной системы

9) Со стороны и стороны от шинной системы

10) Со стороны и стороны от шинной системы

11) Со стороны и стороны от шинной системы

12) Со стороны и стороны от шинной системы

13) Со стороны и стороны от шинной системы

14) Со стороны и стороны от шинной системы

15) Со стороны и стороны от шинной системы

16) Со стороны и стороны от шинной системы

17) Со стороны и стороны от шинной системы

18) Со стороны и стороны от шинной системы

19) Со стороны и стороны от шинной системы

20) Со стороны и стороны от шинной системы

21) Со стороны и стороны от шинной системы

22) Со стороны и стороны от шинной системы

23) Со стороны и стороны от шинной системы

24) Со стороны и стороны от шинной системы

25) Со стороны и стороны от шинной системы

26) Со стороны и стороны от шинной системы

27) Со стороны и стороны от шинной системы

28) Со стороны и стороны от шинной системы

29) Со стороны и стороны от шинной системы

30) Со стороны и стороны от шинной системы



Растрачиваемые устройства с воздушным выключателем (ВАУ) и (ВАУ) на номинальное рабочее напряжение до 24 кВ (с воздушной изоляцией)

КОНСТРУКЦИЯ

Конструкция ячеек, эксплуатация

Эксплуатация ячеек

Характеристики

- Встроенная автоматическая система
- Наглядное соответствие положения силового выключателя «ОТКЛЮЧ.» положению разрядника «ОТКЛЮЧ.» на встраиваемой мини-встраиваемой системе
- Оригинальная система управления с элементами управления с соответствующими индикаторами положения выключателя
- Все коммутационные операции возможны только при закрытой двери отсека высокого напряжения
- Эргономическая удобная высота всех элементов управления и индикации
- Отдельный контроль напряжения на фазе или обмотки шинах — посредством емкости 2 системы указателя напряжения при закрытой передней двери ячейки

Безопасность
Выполняются условия безопасности, предписанные стандартами IEC 62 271, IEC 606 067 200, ГОСТ 14693-90

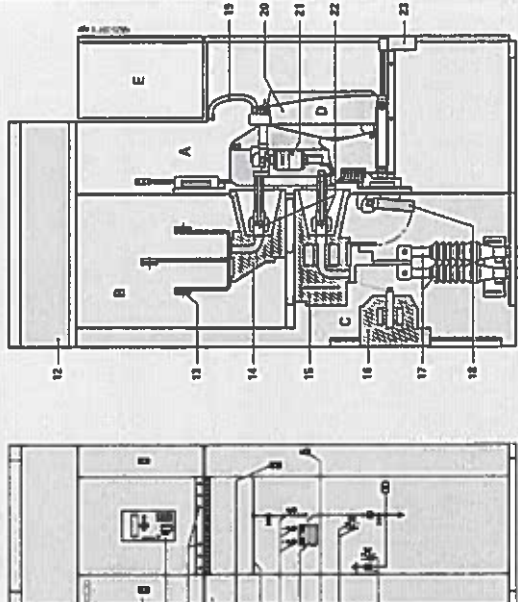
- Персональное заземление
- Фидерная система только при голой цепи коммутационного аппарата «разрядник»
- Перемещение модуля коммутационного аппарата во время работы при выключенном состоянии выключателя (в положении «ОТКЛ.» и заземлитель в положении «ОТКЛ.»)
- Работа коммутационного аппарата возможна только, когда модуль находится в одном из крайних положений «разрядник» или «заземлитель»

Помощь оператору, контроль

- Механическое подключение предотвращает установку коммутационных устройств (аппаратов) на не предназначенных для них местах, но рассчитанных на меньшее значение номинального рабочего тока в ячейках с более высокими значениями номинального рабочего тока
- Блокировка двери отсека ВН, зависит от положения выключателя
- Механическое подключение предотвращает установку коммутационных устройств (аппаратов) на не предназначенных для них местах, но рассчитанных на меньшее значение номинального рабочего тока в ячейках с более высокими значениями номинального рабочего тока
- Блокировка двери отсека ВН, зависит от положения выключателя
- Механическое подключение предотвращает установку коммутационных устройств (аппаратов) на не предназначенных для них местах, но рассчитанных на меньшее значение номинального рабочего тока в ячейках с более высокими значениями номинального рабочего тока

- Отсек коммутационного аппарата
- Отсек сборки шин
- Отсек сборки присоединений
- Собранная выключательная часть
- Отсек низкого напряжения

Пример стандартной конструкции ячейки



- 1 Дверца отсека низкого и среднего напряжения
- 2 Заземляющий кабель
- 3 Контактная система
- 4 Дверца отсека высокого напряжения
- 5 Заземляющий кабель
- 6 Контактная система
- 7 Дверца отсека высокого напряжения
- 8 Заземляющий кабель
- 9 Контактная система
- 10 Дверца отсека высокого напряжения
- 11 Заземляющий кабель
- 12 Контактная система
- 13 Дверца отсека высокого напряжения
- 14 Заземляющий кабель
- 15 Контактная система
- 16 Дверца отсека высокого напряжения
- 17 Заземляющий кабель
- 18 Контактная система
- 19 Дверца отсека высокого напряжения
- 20 Заземляющий кабель
- 21 Контактная система
- 22 Дверца отсека высокого напряжения
- 23 Заземляющий кабель

- 1 Дверца отсека низкого и среднего напряжения
- 2 Заземляющий кабель
- 3 Контактная система
- 4 Дверца отсека высокого напряжения
- 5 Заземляющий кабель
- 6 Контактная система
- 7 Дверца отсека высокого напряжения
- 8 Заземляющий кабель
- 9 Контактная система
- 10 Дверца отсека высокого напряжения
- 11 Заземляющий кабель
- 12 Контактная система
- 13 Дверца отсека высокого напряжения
- 14 Заземляющий кабель
- 15 Контактная система
- 16 Дверца отсека высокого напряжения
- 17 Заземляющий кабель
- 18 Контактная система
- 19 Дверца отсека высокого напряжения
- 20 Заземляющий кабель
- 21 Контактная система
- 22 Дверца отсека высокого напряжения
- 23 Заземляющий кабель

- Отсек коммутационного аппарата
- Отсек сборки шин
- Отсек сборки присоединений
- Собранная выключательная часть
- Отсек низкого напряжения

Растрачиваемые устройства с воздушным выключателем (ВАУ) и (ВАУ) на номинальное рабочее напряжение до 24 кВ (с воздушной изоляцией)

КОНСТРУКЦИЯ

Конструкция ячеек, эксплуатация

Эксплуатация ячеек

Характеристики

- Встроенная автоматическая система
- Наглядное соответствие положения силового выключателя «ОТКЛЮЧ.» положению разрядника «ОТКЛЮЧ.» на встраиваемой мини-встраиваемой системе
- Оригинальная система управления с элементами управления с соответствующими индикаторами положения выключателя
- Все коммутационные операции возможны только при закрытой двери отсека высокого напряжения
- Эргономическая удобная высота всех элементов управления и индикации
- Отдельный контроль напряжения на фазе или обмотки шинах — посредством емкости 2 системы указателя напряжения при закрытой передней двери ячейки

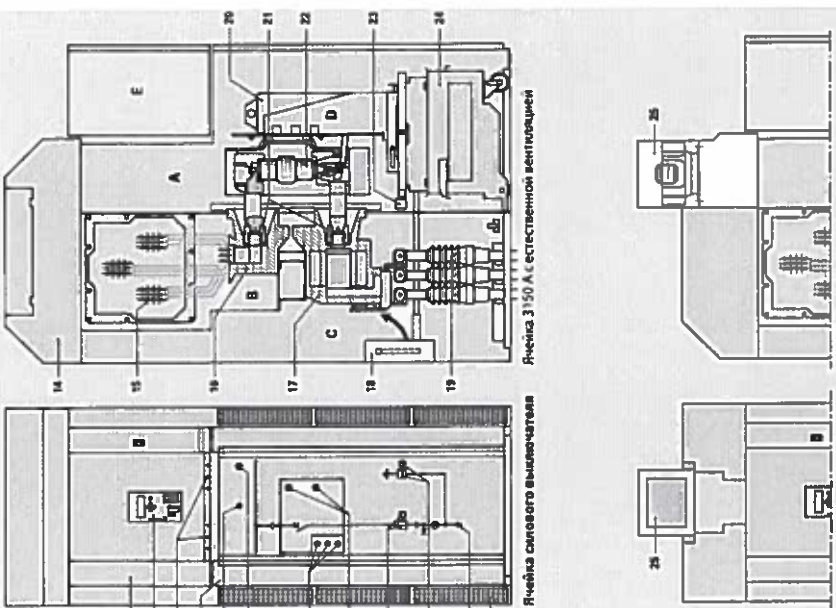
Безопасность
Выполняются условия безопасности, предписанные стандартами IEC 62 271, IEC 606 067 200, ГОСТ 14693-90

- Персональное заземление
- Фидерная система только при голой цепи коммутационного аппарата «разрядник»
- Перемещение модуля коммутационного аппарата во время работы при выключенном состоянии выключателя (в положении «ОТКЛ.» и заземлитель в положении «ОТКЛ.»)
- Работа коммутационного аппарата возможна только, когда модуль находится в одном из крайних положений «разрядник» или «заземлитель»

Помощь оператору, контроль

- Механическое подключение предотвращает установку коммутационных устройств (аппаратов) на не предназначенных для них местах, но рассчитанных на меньшее значение номинального рабочего тока в ячейках с более высокими значениями номинального рабочего тока
- Блокировка двери отсека ВН, зависит от положения выключателя
- Механическое подключение предотвращает установку коммутационных устройств (аппаратов) на не предназначенных для них местах, но рассчитанных на меньшее значение номинального рабочего тока в ячейках с более высокими значениями номинального рабочего тока
- Блокировка двери отсека ВН, зависит от положения выключателя
- Механическое подключение предотвращает установку коммутационных устройств (аппаратов) на не предназначенных для них местах, но рассчитанных на меньшее значение номинального рабочего тока в ячейках с более высокими значениями номинального рабочего тока

- Отсек коммутационного аппарата
- Отсек сборки шин
- Отсек сборки присоединений
- Собранная выключательная часть
- Отсек низкого напряжения



Ячейка 4000 А с принудительной вентиляцией

Ячейка 3150 А с естественной вентиляцией

Компоненты

Другие коммутационные аппараты

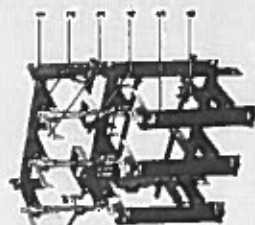
Вакуумный контактор

POSTGRADUATE

- [illegible]

выключатель нагрузки

- Концентрация стартовых клеток 205-1, 62, 205-1, 105, 205, 0670, 301, 0671, 105, 105.
- Присутствие колоний трансформированных клеток в культуре материнских клеток и/или в культуре клеток после трансплантации.
- Задача и цель исследования.
- Типовые результаты.
- Категория исследования.
- Место для хранения.
- Выходные материалы.
- Базисная информация.
- Базисная информация.



Стационарный симметричный алгоритм

Наименование работы/направления	Уровень	Итого ч/г
Изучение и подбор материалов	до 12 ч/г	24 ч/г
Изучение тех. терминологии	до 16 ч/г	до 16 ч/г
Изучение тех. терминологии	до 40 ч/г	до 40 ч/г
Изучение тех. терминологии	до 40 ч/г	до 40 ч/г
Изучение тех. терминологии	до 40 ч/г	до 40 ч/г
Изучение тех. терминологии	до 40 ч/г	до 40 ч/г

- [illegible]

Компоненты

Трансформаторы тока и проходные изоляторы

Прямые трансформаторы тока

THE MYSTER

- [illegible]



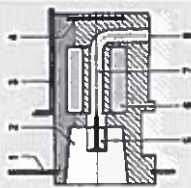
Y 6511



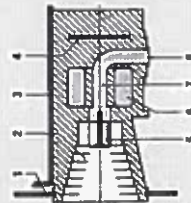
Президиум Трансформатор ТУШ
№ 250 А



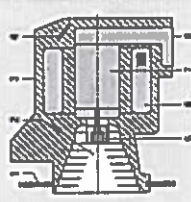
Иркутский государственный университет
№ 4250 А



Copyright © 2004 by John Wiley & Sons, Inc.



06-01-2007



Cenozoic

Проходный экзамен

SAFARI

1. Различительная связь между отсылками к конкретным источникам информации и абстрактным высказываниям присуща дискурсу
2. Число пропозиций индекса
3. Монотонная логика
4. Контекст эмпирически устанавливаем
5. Непредельность индекса
6. Ссылка на эмпирическую область
7. Конкретный предикат
8. Предикат не является логически результатом



Test NOXA 7146



Infrared

[illegible]

Издано на основе каталога
ES0001-K1425-A811-A6-7600

Siemens AG
Power Transmission and Distribution
Medium Voltage Division Postfach 32 40

91050 Erlangen Germany
www.siemens.com/med-um-voltage-mvchgear

Если только на отдельных страницах
настоящего каталога не указано иное,
сохранено право на внесение изменений
в особенности прикладных рабочих параметров,
габаритных и установочных размеров, весовых
характеристик.

Рисунки обязательной силы не имеют.

Все используемые обозначения и детали
являются зарегистрированными фирменными
товарными знаками компании Siemens AG
или других предприятий-поставщиков.

Если не указано иначе, все габаритные размеры
в настоящем каталоге указаны в мм.

Информация в настоящем документе содержит
общее описание технических возможностей,
которые не обязательно обесцениваются в каждом
отдельно взятом случае. Поэтому желательные
функциональные и эксплуатационные
характеристики должны устанавливаться
в каждом отдельном случае на этапе заключения
контракта.

Если у вас возникнут вопросы
относительно данного типа оборудования,
пожалуйста, свяжитесь с нами:

ООО «Сименс»
Департамент Передачи
и Распределения Энергии
115114, г. Москва,
ул. Ленинская, д. 11/10, стр. 3
тел. +7 495 737 18 14
факс +7 495 737 24 43
моб. +7 495 737 23 85

ВЕРНО
ОРИГИНАЛА



[Handwritten signature]

Summary of type tests

Document No.: NX/SU/164e

Rev. 02

Content: 3 sheets

Object: Metal-enclosed, air-insulated, medium voltage switchgear NXAIR 24kV

Version: Circuit-breaker panel with vacuum circuit-breaker module SION 3AE

Rated operation voltage: 24/50/125 kV
Rated normal current: 1265 A (50 Hz) / 1235 A (60 Hz)
Rated short-time withstand current: 25 kA
Rated duration of short-circuit: 3 s
Rated frequency: 50 Hz / 60 Hz
Degree of protection: IP3XD/ IP4X
Loss of service continuity category, partition class: LSC 2B-PM
Internal arc classification: IAC AFLR 1s

Main Standards: IEC 62271-200 Edition 2.0 AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
IEC 62271-100 Edition 2.1 Alternating-current circuit-breakers
IEC 62271-102 Edition 1.0 Alternating current disconnectors and earthing switches

Table of Type Tests:

	chap.	kind of type test		kind of document	number of document
a)	6.2	Dielectric tests	main circuit	Test report	U4472/096
			low voltage circuits	Evidence from Test report	NX/CO/023 U4463/039
b)	6.5	Temperature-rise tests		Test report	U4445/434 (50 Hz) U4445/435 (60 Hz)
	6.4	Measurement of the resistance of circuits		Test report	U4445/434 (50 Hz) U4445/435 (60 Hz)
c)	6.6	Short-time withstand current and peak withstand current tests	main circuit	Test report	10065Fr
			earthing circuit	Test report	10065Fr
			make-proof earthing switch	Test report	10065Fr

	chap.	kind of type test		kind of document	number of document
d)	6.101	Verification of making and breaking capacities	circuit-breaker	Test report	1174.2101123.0598
			make-proof earthing switch	Test report	1174.2101123.0598
e)	6.102	Mechanical operation tests	circuit-breaker	Test report	05-043-MM/E
			disconnecter	Test report	U4445/442
			make-proof earthing switch	Test report	U4445/440
			withdrawable part	Test report	U4445/437
			interlocks	Test report	U4445/437
f)	6.7	Verification of the protection (IP coding)		Test report	U4462/048 (IP3XD) U4469/064 (IP4X)
g)	6.104	Tests on non-metallic partitions and shutters		—	n.a.
h)	6.103	Pressure withstand test of gas-filled compartments		—	n.a.
i)	6.8	Tightness tests		—	n.a.
j)	6.106	Internal arcing tests (classification IAC)		Test report	11022FR-1 (with gas duct) 10069FR-1, -2, -3 (with absorber)
k)	6.9	Electromagnetic compatibility tests (EMC)		Test report	10-E004202-BM-A01

The above mentioned switchgear complies with the standards that are quoted in the particular test documents.

This summary may contain test documents that refer to switchgear with different technical ratings. These test documents are also valid for the above mentioned object.

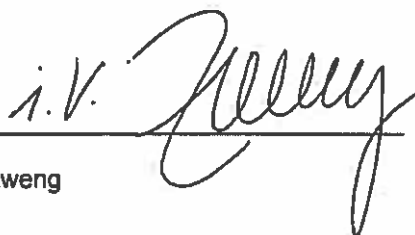
This summary represents the current status of the NXAIR 24kV type test documentation.

Frankfurt am Main, 18 December 2013

Siemens Aktiengesellschaft



Thomas Lange



Dieter Zweng

Siemens AG
Infrastructure & Cities Sector; Management: Roland Busch
Low and Medium Voltage Division; Management: Ralf Christian
Medium Voltage & Systems; Management: Stephan May

Carl-Benz-Str. 22
60388 Frankfurt am Main
Germany

Tel.: +49 (69) 4008 0
Fax: +49 (69) 4008 2411
www.siemens.com/infrastructure-cities

Siemens Aktiengesellschaft: Chairman of the Supervisory Board: Gerhard Cromme;
Managing Board: Joe Kaeser, Chairman, President and Chief Executive Officer; Roland Busch, Klaus Helmrich,
Hermann Requardt, Siegfried Russwurm, Peter Y. Solmsen, Michael Suess, Ralf P. Thomas
Registered offices: Berlin and Munich, Germany; Commercial registries: Berlin Charlottenburg, HRB 12300, Munich, HRB 6684
WEEE-Reg.-No. DE 23691322

ВЯНО С
ОРИГИНАЛА



SIEMENS



Management
System
ISO 9001:2008
CERTIFIED
www.tuv.com
0 90007133



Management
System
ISO 9001:2008
CERTIFIED
www.tuv.com
0 90007133

Декларация за съответствие

С настоящето потвърждаваме, че комплектна разпределителна уредба за средно напрежение тип NXAIR, е производство на SIEMENS AG.

Оборудването е проектирано, произведено и изпитано съгласно актуалните IEC и VDE/ISO стандарти.

Данни за продукта:

Наименование: Комплектна разпределителна уредба за средно напрежение (КРУ):

- Тип NXAIR
- Производство по СК ISO 9001
ISO 14001
 - Рег. No. на сертификат 125409-2012-AHSO-GER-TGA
 - Валидност 20.12.2015
- Съответствие с IEC и EN стандарти: 60 298; 62 271-200;

Заклучение: Оборудването е типово изпитано и подлежи на рутинни изпитания преди експедиция от завода производител и отговаря на световните стандарти.

ИЗДАВА

Отдел: Средно Напрежение – “СИМЕНС” ЕООД

Таньо Караиванов



/Ръководител Направление Енергиен Мениджмънт/



ВЯРНО
СТИГИНАЛА

Summary of type tests

Document No.: NX/SU/051e

Rev. 03

Content: 3 sheets

Object: Metal-enclosed, air-insulated, medium voltage switchgear NXAIR

Version: Circuit-breaker panel with vacuum circuit-breaker module SION 3AE

Rated operation voltage: 12/28/75 kV
Rated normal current: 1250 A (50Hz) / 1210A (60Hz)
Rated short-time withstand current: 25 kA / 31,5 kA
Rated duration of short-circuit: 3 s
Rated frequency: 50 Hz / 60 Hz
Degree of protection: IP3XD / IP4X
Loss of service continuity category, partition class: LSC 2B-PM
Internal arc classification: IAC AFLR 25kA 1s, IAC AFLR 31,5kA 1s

Main Standards: IEC 62271-200 2003-11 AC metal-enclosed switchgear and controlgear
 IEC 62271-100 Edition 1.2 High-voltage alternating current circuit-breakers
 IEC 62271-102 2003-08 High-voltage alternating current disconnectors and earthing switches

Table of Type Tests:

	chap.	kind of type test		kind of document	number of document
a)	6.2	Dielectric tests	main circuit	Test report	U4472/005 (25kA); 1174.2090958.0653 (31,5kA)
			low voltage circuits	Evidence from Test report	NX/CO/023 U4463/039
b)	6.5	Temperature-rise tests		Test report	U4445/404 (50Hz) U4445/408 (60Hz)
	6.4	Measurement of the resistance of circuits		Test report	U4445/404 (50Hz) U4445/408 (60Hz)
c)	6.6	Short-time withstand current and peak withstand current tests	main circuit	Test report	U4463/102 (25kA); 1174.2090959.0667 (31,5kA)
			earthing circuit	Test report	0962Fr (25kA); 1174.2090959.0667 (31,5kA)
			earthing switch with short-circuit making capability	Test report	U4463/103 (25kA); U4463/106 (31,5kA)

	chap.	kind of type test		kind of document	number of document
d)	6.101	Verification of making and breaking capacities	circuit-breaker	Test report	1174.2090959.0669
			earthing switch with short-circuit making capability	Test report	1174.2090157.0193 (25kA); 1174.2090959.0671 (31,5kA)
e)	6.102	Mechanical operation tests	circuit-breaker	Test report	08-007-MM/E (25kA); 05-042-MM/E (31,5kA)
			disconnecter	Test report	U4471/008 (25kA); U4469/053 (31,5kA)
			earthing switch with short-circuit making capability	Test report	1174.2090959.0672
			withdrawable part	Test report	U4471/015
			interlocks	Test report	U4471/015
f)	6.7	Verification of the protection (IP coding)		Test report	1482.2110298.0144 (IP3XD); 1174.2090707.0643 (IP4X)
g)	6.104	Tests on non-metallic partitions and shutters		—	n.a.
h)	6.103	Pressure withstand test of gas-filled compartments		—	n.a.
i)	6.8	Tightness tests		—	n.a.
j)	6.106	Internal arcing tests (classification IAC)		Test report	L09052 (25kA with absorber); 10013Fr (31,5kA with absorber); 1174.2090959.0674 (with gas duct)
k)	6.9	Electromagnetic compatibility tests (EMC)		Test report	10-E004202-BM-A01

The above mentioned switchgear complies with the standards that are quoted in the particular test documents.

This summary may contain test documents that refer to switchgear with different technical ratings. These test documents are also valid for the above mentioned object.

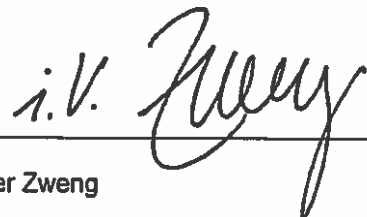
This summary represents the current status of the NXAIR type test documentation.

Frankfurt am Main, 29 April 2011

Siemens Aktiengesellschaft



Thomas Lange



Dieter Zweng

Siemens AG
Energy Sector; Management: Michael Suess
Power Distribution Division; Management: Ralf Christian
Medium Voltage; Management: Wolfgang Heuring

Carl-Benz-Str. 22
60386 Frankfurt am Main
Germany

Tel.: +49 (69) 4008 0
Fax: +49 (69) 4008 2411

Siemens Aktiengesellschaft: Chairman of the Supervisory Board: Gerhard Cromme;
Managing Board: Peter Loescher, Chairman, President and Chief Executive Officer; Roland Busch, Brigitte Ederer, Klaus Helmrich,
Joe Kaeser, Barbara Kux, Hermann Raquardt, Siegfried Russwurm, Peter Y. Solmssen, Michael Suess
Registered offices: Berlin and Munich, Germany; Commercial registries: Berlin Charlottenburg, HRB 12300, Munich, HRB 6684
WEEE-Reg.-No. DE 23891322



Summary of type tests

Document No: NX/SU/172e

Rev. 00

Content: 3 sheets

Object: Metal-enclosed, air-insulated, medium voltage switchgear NXAIR

Version: Withdrawable type contactor panel with vacuum contactor fuse combination 3TL62/3

Rated operation voltage: 7.2/20/60 kV¹

Rated normal current: 310 A,²

with busbar current 3150 A / 4000 A

Rated short-time withstand current: 25 kA / 31.5 kA²

Rated duration of short-circuit: 3 s

Rated frequency: 50 Hz / 60 Hz

Degree of protection: IP3XD

Loss of service continuity category, partition class: LSC 2B, PM

Internal arc classification: IAC A FLR 25kA 1s, IAC A FLR 31.5kA 1s

1) Rated lightning impulse withstand voltage across the contact gap 40 kV.

2) Limited by the used HV -HRC- fuses.

Main Standards:

IEC 62271-200	2003-11	AC metal-enclosed switchgear and controlgear
IEC 60470	2000-05	High-voltage alternating current contactors and contactor based motor starters
IEC 62271-102	2003-08	High-voltage alternating current disconnectors and earthing switches

Table of Type Tests:

	chap.	kind of type test		kind of document	number of document
a)	6.2	Dielectric tests	main circuit	Test report	U4469/011, TR11F1-002
			low voltage circuits	Evidence from Test report	NX/CO/023, U4463/039
b)	6.5	Temperature-rise tests		Test report	U4445/364, U4445/369, U4445/370
	6.4	Measurement of the resistance of circuits		Test report	U4445/364, U4445/369, U4445/370
c)	6.6	Short-time withstand current and peak withstand current tests	main circuit	Test report	1174.2080772.749
			earthing circuit	Test report	1174.2080772.749
			make-proof earthing switch	Test report	1174.2080772.749