

SEMENS

Customer:

Intercomplex Ltd.

Project:

6.2

NXAIR 20kV_SST Boyana

Panel Arrangement Diagram

Reference:

19306

Offer for medium-voltage switchgear NXAIR 24kV

NXAIR_M-13689

6. <u>Documentation</u>

6.1 Single-Line Diagram

Annex 1

Annex 2

6.3 Constructional Data

Annex 3

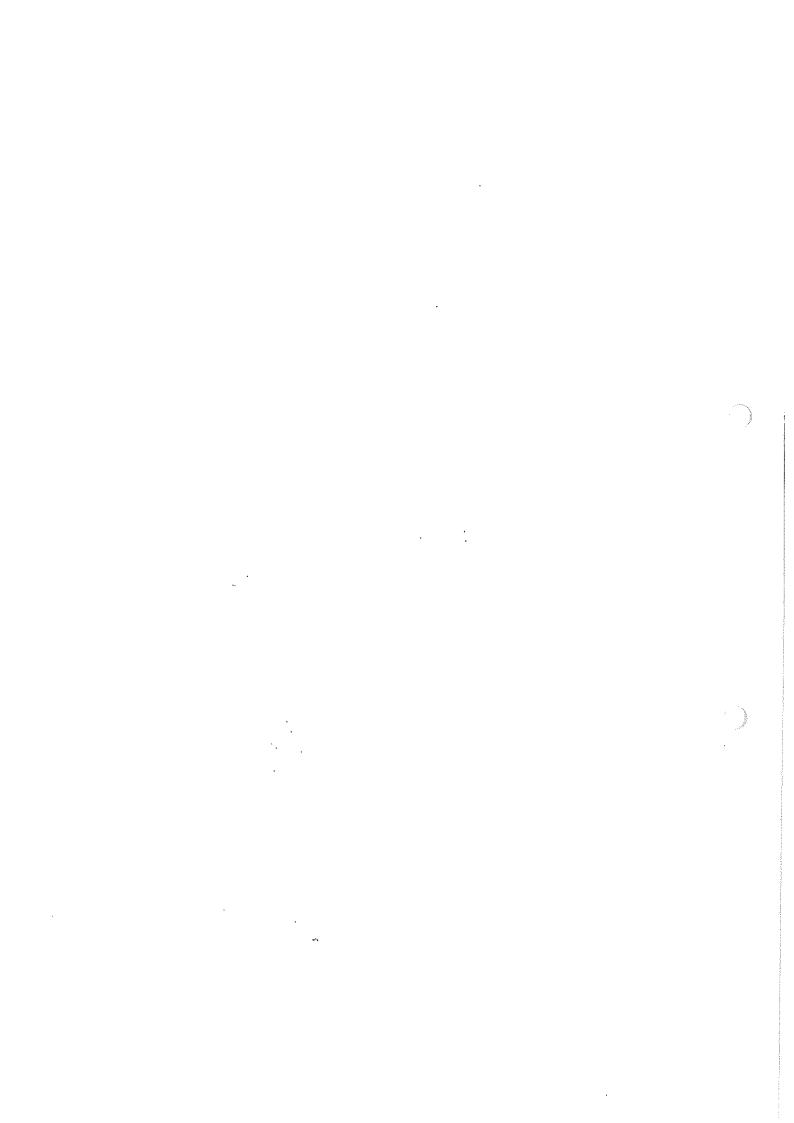
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Issue:: 28.03.2019 Revision:

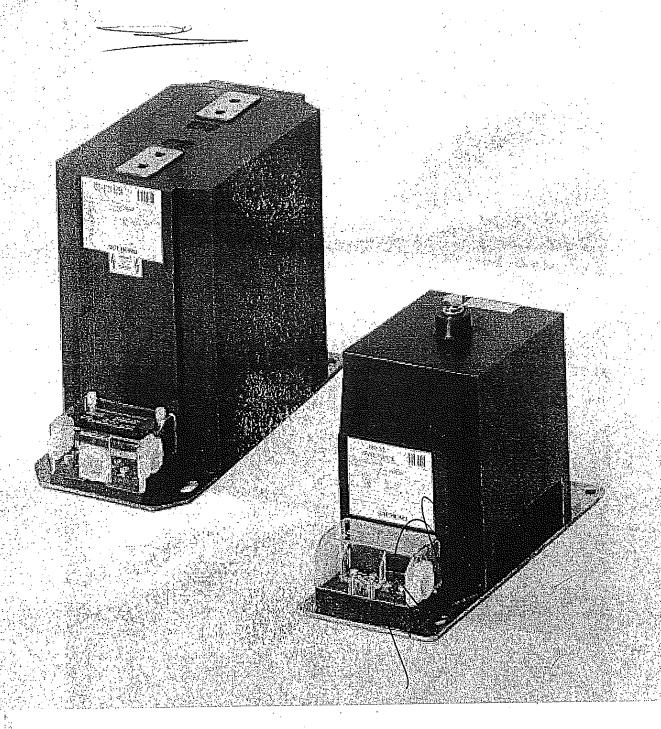
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4M Protective and Measuring Transformers

Medium-Voltage Equipment Selection and Ordering Data

Catalog HG 24 · 2009

Answers for energy.

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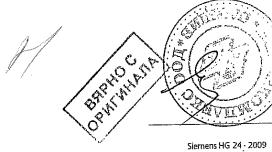


4M Protective and Measuring Transformers

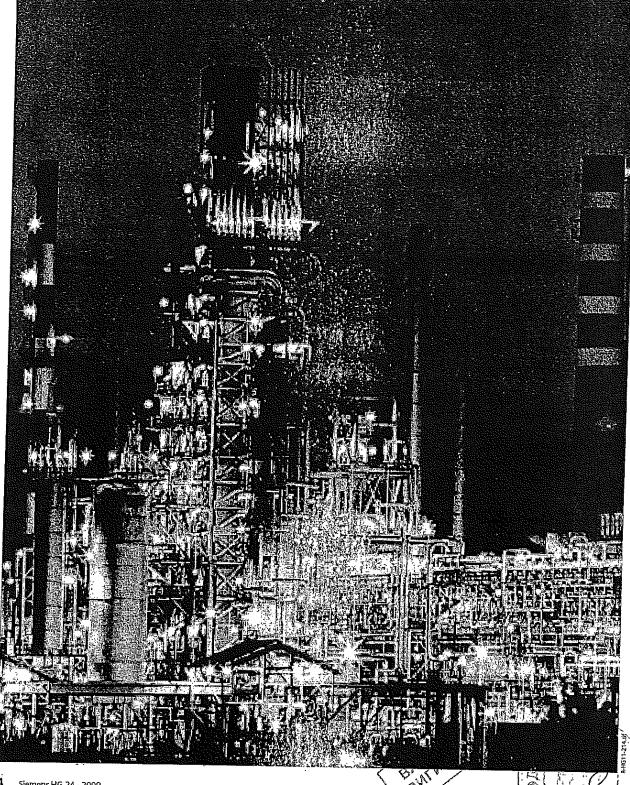
Medium-Voltage Equipment Catalog HG 24 · 2009

Invalid: Catalog HG 24 · 1994

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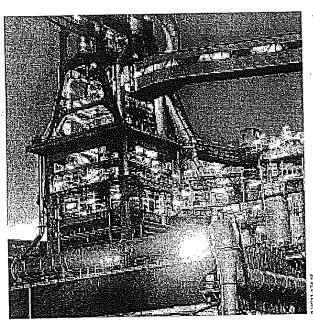


Siemens HG 24 · 2009









Industrial application: Refinery

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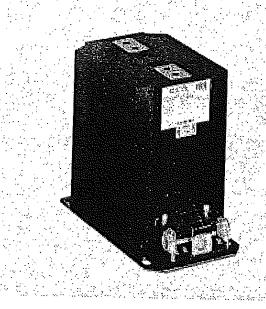
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Protective and Measuring Transformers - The Adaptable

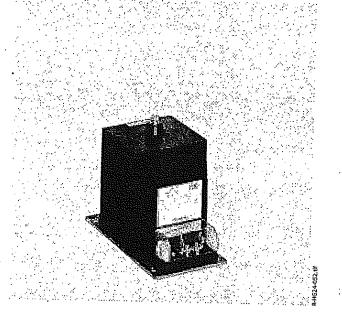
The task of instrument transformers is to transform high currents and voltages proportionally and in-phase into small current or voltage values for measuring or protection purposes. So they are used either to measure and record the transmitted power or to feed protection devices

with evaluable signals, which enable the protection device to e.g. trip a switching device depending on the situation. Furthermore, they isolate the connected measuring or protection equipment electrically from live parts of the switchgear.

Current transformer



Voltage transformer

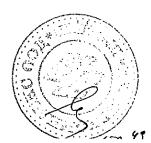


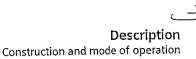
Current transformers can be regarded as transformers working in short-circuit, with the full normal current flowing through their primary side. Devices connected on the secondary side are series-connected. Current transformers can have several secondary windings with magnetically separated cores of the same or different characteristics. They can, for example, be equipped with two measuring cores of different accuracy class, or with measuring and protection cores with different accuracy limit factors.

Due to the risk of overvoltages, current transformers must not be operated with open secondary terminals, but only in short circuit or with the burden of the measuring equipment. Voltage transformers contain only one magnet core and are normally designed with one single secondary winding. If necessary, earthed (single-phase) voltage transformers are provided with an additional residual voltage winding (earth-fault winding) beside the secondary winding (measuring winding).

In contrast to current transformers, voltage transformers must nover be short-circuited on the secondary side. The earth-side terminal of the primary winding is effectively earthed in the terminal box, and must not be removed in operation.









Types of construction

Protective and measuring transformers are designed in different types of construction for the multiple installation requirements and operating conditions they are subjected to. They are electrical devices which convert primary electrical values – currents or voltages – into proportional and in-phase values that are adequate for the connected devices such as measuring instruments, meters, protection relays and similar. A distinction is made here between current and voltage transformers.

The following transformer types are available for selection in this catalog:

Current transformers

- Indoor support-type current transformer in block-type design
- Indoor support-type current transformer in single-turn design (e.g. bar-primary transformer)
- Indoor bushing-type current transformer in single-turn design
- Indoor bar-primary bushing-type current transformer
- Outdoor support-type current transformer

Voltage transformers

- Earthed (single-phase) or unearthed (double-phase) indoor transformers in different sizes
- Earthed (single-phase) or unearthed (double-phase) outdoor transformers in different sizes

The transformers offered in the selection are only a part of the possible variations. If the transformer required is not shown, please clarify the feasibility with the responsible sales partner or the order processing department in the Switchgear Factory Berlin. The same applies to transformers according to the ANSI standard.

Approvals/Certifications

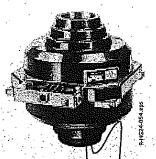
In Germany, instrument transformers may only be used for commercial purposes, such as billing metering of electricity, if they have been approved once (type approval) by the Physikalisch-Technische Bundesanstalt (PTB) (Federal Physical-Technical Institute), and if every transformer is calibrated by an officially recognised inspecting authority.

Calibration is done by a calibration office, or by the transformer manufacturer on behalf of a calibration office. The test is documented by means of a test mark as well as a calibration certificate.

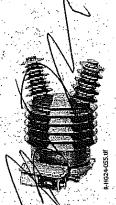
The calibration costs are charged in accordance with the official scale of fees.



Example for transformer in block-type design



Example for bushing-type transformer



Example for outdoor transformer

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[5] 2000年上,1950年2012年2012年2013年20日,1960年12日,1960年12日,1960年12日,1960年12日,1960年12日,1960年12日,1960年12日,1960年12日,196 Current transformers

Current transformers can be regarded as transformers operating in short circuit, which carry the full rated current on the primary side. The devices on the secondary side are series-connected. They can have several secondary windings with mechanically separated cores of the same or different characteristics. Thus, current transformers can be designed e.g. with two measuring cores of different accuracy class, or with measuring or protection cores with different accuracy limit factors.

Due to the risk of overvoltages, current transformers must not be operated with open secondary terminals, but only in short circuit or with the burden of the measuring equipment.

Glossary of terms

Rated current IN (r.m.s. value in A)

The rated primary (I_{PN}) and secondary (I_{SN}) current is the current that characterises the transformer, or the current it is designed for. Both values are given on the transformer rating plate. The rated primary current (l_{PN}) depends on the power system and is defined by the system operator.

Usual values for primary currents (in A):

10; 12.5; 15; 20; 25; 30; 40; 50; 60; 75

and their decimal multiples (preferred values are underlined).

Usual values for secondary currents: 1 and 5 A.

For technical reasons, but above all for economical reasons, 1 A is recommended as secondary current, especially if there are long measuring leads.

Rated continuous thermal current I_D (thermal strength)

The value of the current which can be permitted to flow continuously in the primary winding, the secondary winding being connected to the rated burden, without the temperature rise exceeding the values specified.

 l_{D} is often equal to l_{N} , but it can also be defined as a multiple thereof.

Rated short-time thermal current Ith

The r.m.s. value of the primary current, flowing in case of short circuit, which a current transformer will withstand for 1 or 3 seconds without suffering harmful effects, the secondary winding being short-circuited.

Rated dynamic current l_{dyn}

The peak value of the primary current which a transformer will withstand, without being damaged electrically or mechanically by the resulting electromagnetic forces, the secondary winding being short-circuited.

Rated transformation ratio K_N

The ratio of the rated primary current to the rated secondary current. It is expressed as an unreduced fraction, e.g. 500 A/1 A.

Rated output S_N

The value of the apparent power (in VA at a specified power factor), for which the current transformer has to keep the accuracy class at the rated secondary current and with rated burden. Thus, the rated output describes the capacity of a current transformer to "drive" the secondary current within the error limits by means of a burden.

Current transformers can feature the following preferred rated outputs: 2.5 VA; 5 VA; 10 VA; 15 VA; 30 VA.

Rated burden Z_N

The burden is the apparent resistance of the devices connected on the secondary side (including all connection leads), for which the current transformer has to keep the stipulated class limits. The burden is normally expressed as apparent power in VA.

Current error F

The current error of a current transformer is (in %):

$$F_{\rm I} = 100 \cdot \frac{K_{\rm N} \cdot I_{\rm sec} - I_{\rm prim}}{I_{\rm prim}}$$

Rated transformation ratio Actual primary current Actual secondary current

Phase displacement d

The difference in phase between the primary and secondary current vectors, the direction of the vectors being so chosen that the angle is zero for a perfect transformer.

The phase displacement is said to be positive when the secondary current vector leads the primary current vector. It is usually expressed in minutes.







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Limits of current error and phase displacement according to IEC 60044-1

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Accupey class ± current error in percent	± pliase displacement in minutes.
at rated current J _i , 1	at rated current I _I is
120% 100% 20% 5%	120 % 100 % 20% - 5%
Measuring current transformers	10 15 30
0.5 0.5 0.5 0.75 1.5	30 30 45 80 60 60 90 100
1.5 3. Protective current transformers	80 , , , , , , , , , , , , , , , , , , ,
5P. 1	
10P - 3	
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Measuring current transformers

Current trầnsformers provided for the connection of measuring instruments, meters and similar devices (e.g. 10 VA Cl. 0.5 FS5).

Rated instrument limit primary current

The value of the primary current at rated burden and a composite error of 10 %.

Instrument security factor n

The ratio of rated instrument limit primary current to the rated primary current

Note:

In the event of short-circuit currents flowing through the primary winding of a current transformer, the thermal stress to the measuring instruments supplied by the current transformer is smallest when the value of the rated instrument security factor is small.

Accuracy class

The limit of the percentage current error at rated current $I_{\rm N}$ (see table).

Generally, current transformers are used for a measuring range of 5 % to 120 % of the rated primary current.

Special designs

Extended current ratings

Current transformers with ext. 200 % can be continuously operated at 2 x $I_{\rm N}$, and keep the error limits of their class in the range up to 200 % of the rated primary current.

Protective current transformers

Current transformers intended to supply protection relays (e.g. 15 VA Cl. 10 P 10).

Accuracy class (identification P)

The limit of the percentage current error for the rated accuracy limit primary current.

Rated accuracy limit primary current

The value of primary current up to which the transformer will comply with the requirements for composite error.

Accuracy limit factor

The ratio of the rated accuracy limit primary current to the rated primary current.

Multi-ratio current transformers

If the ratio of current transformers has to be variable, e.g. for planned switchgear extensions, it is possible to use multiratio current transformers.

Primary multi-ratio

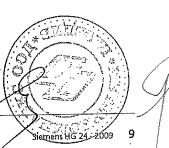
Only possible for wound-primary transformers (transformers with several primary turns) with a ratio of 1:2 (e.g. 2 x 600 A/1 A). Reconnection is made by re-arrangement of copper lugs in the primary conflection area. Ratings, instrument security factors as well as the secondary internal resistance remain constant during reconnection.

Secondary multi-ratio

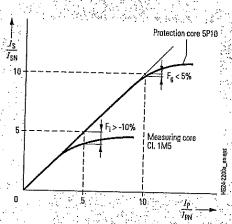
In single-turn and would-primary transformers, this can be implemented by taps of the secondary windings (e.g. 2000–1000 A/1 A).

Ratings or instrument security factors change almost linearly with the ratio. If not stated otherwise, the specified rated data is always referred to the lower current value.



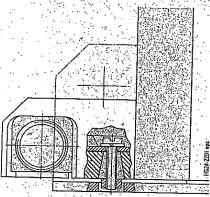


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Overcurrent performance of current transformers when loaded with rated burden

- F Current error
- F_q Composite error



Earthing of the secondary winding, for example, in a 4MA7 current transformer

Performance in the event of overcurrent

In the event of an overcurrent, the rated secondary current increases proportionally with the rated primary current up to the rated instrument limit primary current.

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The ratio of the rated instrument limit primary current to the rated primary current provides the instrument security factor assigned to the core. In accordance with this factor, the rated instrument limit primary current is subjected to specific error limits.

The measuring and protection cores place different demands on these error limits.

For measuring cores, the current error F_1 is > -10 % in order to protect the supplied measuring devices, meters, etc. safely in case of overcurrent.

in protection cores, the composite error F_q is max. 5 % (5P) or 10 % (10P) in order to ensure the desired protection tripping.

The specified limits are only fulfilled at the rated burden of the transformer. If the operating burden differs from the rated burden of the transformer, the instrument security factor changes as follows:

$$n' = n \cdot \frac{Z_N + S_E}{S + S_E}$$

- Actual instrument security factor
- Rated instrument security factor
- Rated burden in VA
- Internal power consumption of the transformer in VA (approx. 5 % to 20 % of $Z_{\rm N})$ Actually connected burden in VA

Operation and earthing

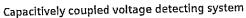
The secondary circuits of current transformers must never be open during operation, as dangerously high voltages can occur, especially at high currents and cores with high ratings.

All metal parts of a transformer that are not live, but accessible, must be earthed. Therefore, the transformers have earth connection points identified with the earthing symbol. Also, one terminal of the secondary winding (for current transformers, normally k or 1s, etc.) must be earthed.

For earthing the secondary windings, a thread is provided under each secondary terminal. The earth connection required is made by fitting a special screw.







The guidelines for every medium-voltage switchgear of the new generation state that doors and covers can only be opened when there is no risk of electric shock. The movable single-pole voltage testers used up to now are not suitable for this. Therefore, every medium-voltage switchgear is offered with a system including a fixed-mounted capacitive voltage divider.

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The capacitive voltage detecting system consists of a capacitive divider which divides the voltage U between the phase L and earth into the partial voltages U_1 and U_2 , and of an indicator applied to U_2 . The indicator contains a glow lamp that flashes when voltage is applied.

Indication range:

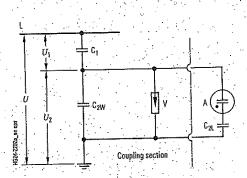
At 0.01 x U_N no indication, as of 0.40 x U_N , secure indication.

On request, support-type current transformers type 4MA7 can be delivered with capacitive layers for the voltage detecting system — then they contain a coupling electrode. This electrode is cast in a firm and protected way, and lead out at the secondary terminals with the designation CK. These current transformers are routine-tested additionally for compliance with the requested capacitance values $(C_1$ and $C_{2w})$. These values are documented on an additional label.

To ensure protection against electric shock even in the most improbable case that the current transformer punctures with the high-voltage capacitor (while an operator is touching the test sockets), a surge arrester is connected in parallel to this arrangement inside the transformer. If the high voltage is exceeded, it responds within nanoseconds, limiting the voltage at the test socket to harmless values.

Important for the ordering selection

When ordering transformers with capacitive layers it is necessary to state the actual operating voltage U_N (rated voltage), e.g. $U_m = 24$ kV, $U_N = 15$ kV.



Voltage detecting system

A indicator

C. High-voltage capacitance (transformer)

C_{2W} Low-voltage capacitance (transformer)

Czl. Low-voltage capacitance (lead)

. High-voltage phase :

J Voltage between phase and earth

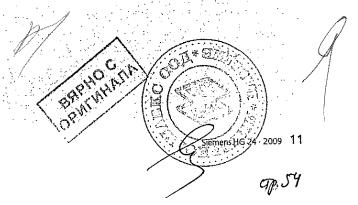
U1 Partial voltage at C1

U2 Partial voltage at C2 and A

V Surge arrester







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Voltage transformers have only one magnet core, and are normally designed with one single secondary winding. If necessary, earthed (single-phase) voltage transformers are equipped with an additional residual voltage winding (earth-fault winding) beside the secondary winding (measuring winding).

In contrast to current transformers, voltage transformers must never be short-circuited on the secondary side. The earth-side terminal of the primary winding is effectively earthed in the terminal box, and must not be removed during operation.

Glossary of terms

Highest voltage for equipment Um

The highest r.m.s. phase-to-phase voltage (in kV) for which a transformer is designed in respect of its insulation.

Rated voltage U_N

The voltage values (primary $U_{\rm PN}$ or secondary $U_{\rm SN}$) stated on the rating plate of a transformer. If the voltage transformers are connected between phase and earth in three-phase systems, this phase-to-neutral voltage is considered the rated voltage. Except for the residual voltage winding, it is expressed as $UI\sqrt{3}$, with U being the phase-to-phase voltage.

kv	Rated primary voltage RV	Rated Secondary yollage V
up to 52	3.3 3.6 4.8 5 6 6.6	100 110 120
	7.2_10_11_13.8_15	
	17.5 20 22 30 33 35 40 45	
	or the values divided	or the values divided
Callandar and the second second	by √3	bv √3

Rated transformation ratio K_N

The ratio of the rated primary voltage to the rated secondary voltage. It is expressed as unreduced fraction, e.g.

100001√3 V / 1001√3 V (single-phase) 10000 V/100 V (double-phase).

Voltage error Fu

The voltage error expressed in percent is defined by the

$$\mathsf{F}_{\mathsf{U}} = 100 \cdot \frac{\mathsf{K}_{\mathsf{N}} \cdot U_{\mathsf{sec}} - U_{\mathsf{prim}}}{U_{\mathsf{prim}}}$$

U_{prim} Actual primary voltage U_{sec} Actual secondary voltage Actual secondary voltage under measuring conditions when U_{prim} is applied

Phase displacement

The difference in phase between the primary voltage and the secondary voltage vectors, the direction of the vectors being so chosen that the angle is zero for a perfect transformer. The phase displacement is said to be positive when the secondary voltage vector leads the primary voltage vector. It is usually expressed in minutes.

Limits for voltage error and phase displacement according to IEC 60044-1

The voltage error and phase displacement at rated frequency shall not exceed the values given in the table at any voltage between 80 % and 120 % of rated voltage and with burdens of between 25 % and 100 % of rated burden at a power factor of 0.8 lagging.

	Markov de la company de la	Timen and the second second
Accuracy class	± voltage error	phase displacement :
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0.5	0.2	10
0.3%	. , 0.5 7	(1) (1) (20) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4
1	1	40

Rated output S_N

The value of the apparent power (in VA at a specified power factor) which the transformer is intended to supply to the secondary circuit at the rated secondary voltage and with rated burden connected to it.

Preferred values:

Accuracy.			Ra	ted out	out: a re-		
0.2 0.5	化金线 10	15	30	VA 50	2187.9		
0.5	10	15	30-1-3	ີ້50∵.		100	
		Maga	30 Valani	50 美元初	75 Frankli	100	200 (500 (500)

Thermal limiting output Sth

The value of the apparent power referred to rated voltage which can be taken from a secondary winding, at rated primary voltage applied, without exceeding the limits of temperature rise.

Thermal limiting output of the residual voltage winding

As the residual voltage winding is connected in broken delta, it is only stressed in case of fault. Therefore, the thermal limiting output of the residual voltage winding is referred to a stress duration of e.g. 8 h, and is expressed in VA.

Rated voltage factor

The multiplying factor to be applied to the rated primary voltage to determine the maximum voltage at which a transformer must comply with the relevant thermal requirements for a specified time and with the relevant accuracy requirements.

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Description
Voltage transformers



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Multi-ratio

Voltage transformers for different rated primary voltages can only be reconnected on the secondary side for reasons of insulation.

Operation and earthing

In contrast to current transformers, voltage transformers must never be short-circuited on the secondary side. The earth-side primary terminal of earthed voltage transformers is insulated for a test voltage of 2 kV. It is connected to the earthed base plate in the terminal box.

<u>Attention</u>

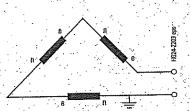
This connection must not be opened during operation. Residual voltage windings connected in broken delta may

Residual voltage windings connected in broken delta may only be earthed together at one point.

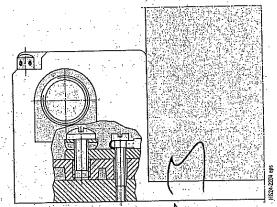
For earthing the secondary windings, a thread is provided under each secondary terminal. The earth connection required is established by fitting a special screw.

Relaxation oscillations

When single-phase voltage transformers are used in isolated systems, damping of the e-n windings connected in broken delta is recommended in order to avoid the possible destruction of the voltage transformers by relaxation oscillations.



Connection and earthing of the e-n or da-dn winding

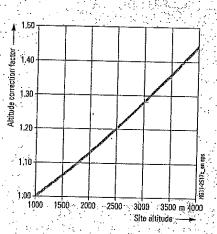


Earthing of the secondary winding, for example, in a 4MR voltage transformer





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Highest voltage /	Rated short-duration	Rated lightning
tor equipment	power-frequency withstand voltage	simulica witherand of
		Vollage A
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12	28	75
17,5	38	95
- 24	50 🧓 .	125
_36	70	170
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Ambient conditions

The transformers are designed for the normal operating conditions defined in the standards.

The conditions shown opposite apply to indoor transformers. All indoor transformers are suitable for use with high air humidity and occasional condensation (e.g. in tropical areas).

As for outdoor transformers, the following conditions apply:

Minimum temperature

Relative air humidity

Outdoor transformers up to 100 %

Dielectric strength

The dielectric strength of air insulation decreases with increasing altitude due to low air density. According to IEC 62271-1, the values of the rated lightning impulse withstand voltage and the rated short-duration power-frequency withstand voltage specified, among others, in the chapter "Technical Data" apply to a site altitude of 1000 m above sea level. For an altitude above 1000 m, the insulation level must be corrected according to the opposite diagram.

The characteristic shown applies to both rated withstand voltages.

To select the devices, the following applies:

 $U \ge U_0 \times K_a$

 $\begin{array}{ll} \textbf{\textit{U}} & \text{Rated with stand voltage under reference atmosphere} \\ \textbf{\textit{U}}_0 & \text{Rated with stand voltage requested for the place of installation} \\ \textbf{\textit{K}}_a & \text{Altitude correction factor according to the opposite diagram} \end{array}$

Example

For a requested rated lightning impulse withstand voltage of 75 kV at an altitude of 2500 m, an insulation level of 90 kV under reference atmosphere is required as a minimum:

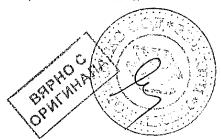
90 kV ≥ 75 kV x 1.2

Test voltages and insulation level for instrument transformers

Proper operation of the transformers is proved by the following tests:

- Impulse test (type test)
- Separate source withstand voltage test (routine test)
- Induced voltage withstand test (routine test)
- Partial discharge measurement (routine test)

All transformers correspond to insulation class E, i.e. the maximum temperature rise is 120 $^{\circ}$ C.





Partial discharge measurement

Apart from the tests mentioned on page 14, partial discharge measurements are required for current and voltage transformers to test the insulation. A partial discharge is to be understood as any small, brief electrical discharge appearing on or in a test object when voltage is applied. The discharges appear as soon as the partial discharge inception voltage of the insulating medium is exceeded at any point.

GEALINGERS TO RESTORE OF THE SECOND LAMBETTERS FOR MEDICAL PRODUCTION OF THE CONTRACT HE DESCRIPTION OF A LAMB AND Relatively high field strengths appear at sharp edges and peaks of metal parts, or also on bubbles and gas inclusions in solid or liquid insulating materials.

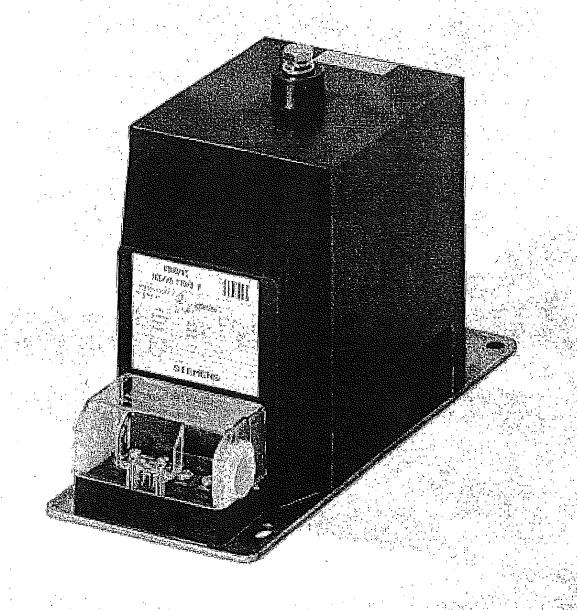
> Partial discharges act like HF emitters, producing a mixture of the most different frequencies. The partial discharge measurement enables an assessment about the homogeneity of the insulating material. Partial discharge measurements are performed as a routine test on inductive transformers with solid insulation as of $U_{\rm m} = 3.6$ kV.

Type of earthing	Type of transformer	Pre-stressing voltage	Measuring voltages	Permissible partial Vdiscflarge level
Systems with isolated or impedance earthed neutral	Current transformers and earthed voltage transformers	≥103 1.3 U _m		Apparent load 250 pC 50 pC
	Unearthed voltage - transformers	1.3 U _m .	1.1.U _m	50 pC
Systems with solidly earthed neutral	Current transformers and earthed voltage transformers	0.8 x 1.3 U _m	$1.1 \frac{U_{\rm m}}{\sqrt{3}}$	50 pC
	Unearthed voltage transformers	1.3 U _m	1.1 U _m	50 pC

Standards

Protective and measuring transformers conform to the following standards:

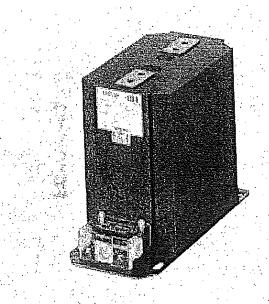
- VDE 0414 "Stipulations for instrument transformers"
- VDE 0111 "Insulation co-ordination for equipment in three-phase systems above 1 kV"
- IEC 60044-1
- IEC 60044-2
- ANSI 1675 (IEEE)
- DIN 42600



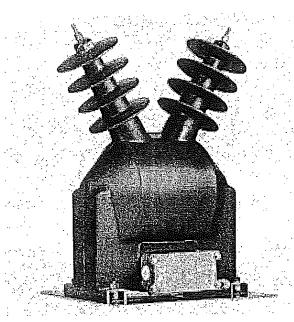
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4MA74 current transformer



4MS6-outdoor voltage transformer

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Ordering data and configuration example	18
Product overview of current transformers	19
4MA7 indoor support-type current transformer, block-type design	20
4MB1 indoor support-type current transformer, single-turn design	41
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Product overview of voltage transformers	62
4MR1 indoor voltage transformer; block-type design, single-phase, small	63
4MR2 indoor voltage transformer, block-type design, double-phase; small	63
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4MR6 Indoor voltage transformer, block-type design, double-phase, large	63
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4MS4 outdoor voltage transformer, double-phase, small	63
4MS5 outdoor voltage (ransformer, single-phase, large	. 63
4MS6 outdoor voltage transformer, double phase, large	63
M	
M	



Order number structure

Protective and measuring transformers are described by a 12 or 16-digit order number. The first five characters describe the type, design and application of the transformer (primary part), and the positions 6 to 12 or 6 to 16 identify the core data of the transformer.

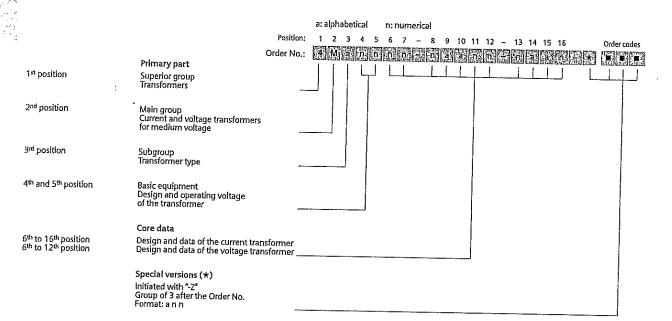
The transformers offered in the selection are only a part of the possible variations. If the transformer required is not shown, please clarify the feasibility with the responsible sales partner or the order processing department at the Switchgear Factory Berlin. The same applies to transformers according to the ANSI standard.

Order codes

Individual equipment versions, marked with 9 or Z in the 9^{th} to 16^{th} position, are explained more in detail by a 3-digit order code. Several order codes can be added to the order number in succession and in any sequence.

Built-on components and special versions (*)

For built-on components and special versions, "-Z" is added to the order number and a descriptive order code follows. If several built-on components and special versions are required, the suffix "-Z" is listed only once. If a requested special version is not in the catalog and can therefore not be ordered via order code, it has to be identified with Y 9 9 after consultation. The agreement hereto is made directly between your responsible sales partner and the order processing department in the Switchgear Factory Berlin.



Configuration example

At the end of each of the following pages with selection data you will find a configuration example to make the order number structure more clear.

Starting from the last selection of the basic type, this example is continued, so that at the end of the equipment selection a completely configured and orderable transformer results for every product group.

On the foldout page we offer a configuring aid. Here you can fill in the order number you have determined for your transformer.

Example for Order No.: Order codes:





1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Position: Current transformer, MARKET IN THE STREET STREET type of construction according to IEC 1) Illustration Type of design



Indoor support-type current transformer, block-type design, small type according to DIN 42600, cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV

4 M A 7 Selection from page 20ff



Indoor support-type current transformer, single-turn design, cast resin insulated, operating voltage up to 12 kV or 24 kV

4 M B 1 Selection from page 41ff



Indoor bushing-type current transformer, single-turn design, cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV

4 M C 2 Selection from page 44ff



Indoor bar-primary bushing-type current transformer, (6.16) indoor par-primary busining-type current detailuring, cast-resin insulated, cast-resin insulated, cast-resin insulated, coperating voltage up to 12 kV, 24 kV or 36 kV

4 M C 3 Selection from page 47ff



Outdoor support-type current transformer, cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV

4 M E 2 Selection from page 53ff



Outdoor support-type current transformer, top-assembly type; operating voltage up to 12 kV, 24 kV, 36 kV and 52 kV 4 M E: 3 Selection from page 58ff

1) Transformers according to ANSI standard on request

OPNIM Example for Order No.: 4 M A 7 B B B Order codes

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Equipment Selection

4MA7 indoor support-type current transformer, block-type design



	4MA7 indoor support-type curren transformer, block-type design	t				<u>alte mattet tille villa ja De</u>	<u> </u>
	per position	Position: 1	2 3 4 5 6	7 - 8 9 1	0 11 12 - 13 14	l 15 1s	Ordered
	Operating voltage (maximum value)	Order No.:	MAZEL				Order codes
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						**	
Cc	onfiguration example						
In: Ma	door support-type current transformer, block-type design aximum operating voltage $U_m = 12 \text{ kV}$	/4 M					

Rated lightning impulse withstand voltage $U_p = 75 \text{ kV}$

Rated short-duration power-frequency with stand voltage $U_{\rm d}$ = 28 kV

Rated short-time thermal current $J_{\rm th}$ = 16 kA

Example for Order No.: 43 M A 7 2 4 4 Order codes:

Equipment Selection-4MA7 indoor support-type current transformer, block-type design





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8th/9th position	Position: Order No.:	1 2 3 4 5 4 M A 7		8 9 10	11 12 -	13 14	15 16		Order codes	
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plinary primary current to thermal cu current with primary to the current to multi-ratio				역시되는 무료장점	See page 22 to		See page 40 See page 40	See page 40	,	
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2x 150 種間運動 2x 200 南路南陸 1				3 Ø	1					
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request)	Page 32 Page 34 Page 34 Page 36	n 94 54			1					
			1							
			1							0
Configuration example		[4] M A 17	/	拉拉		_	 	-		
Indoor support-type current transformer, block-type design $(U_m = 12 \text{ kV}, U_p = 75 \text{ kV}, U_d = 28 \text{ kV}, I_{th} = 16 \text{ kA})$		FIREMENT	2 4 4		^	1		,	/	
Rated primary current $I_{eN} = 100 \text{ A}$	to design Outstand					/: (c) /: [劉宣]				:
Examp	le for Order No.: Order codes:	property beams as property party	把把握			团和			ST	
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8 kA

8 KA		
10 th to 14 th position Core versions	Position: 1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Order codes	<u> </u>
At rated primary current I _{PM}	Order No.: AMANA BERNALD STATE OF STATE	3
	Strengthiss 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
100 A 125 A 150 A 200 A 250 A 300 A 400 A 500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A		
60 A 75 A	100 x / _{PN} 0	
40 A 50 A	200 x I _{PN} 2	
20 A 25 A	300 x I _{PN} 400 x I _{PN} 4	
1 st core 2 rd core 5 Thermal strer		
Class M. raing		
Class Class Co. VA T- Part Class Co. VA T- Part Co.		
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0.5 FSS 10	C 3 - C A	
	E BIOLOTA	
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15 15 30 45 30	E 3 - 3 L	
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15 15	E 2 (1 - 2 Q)	
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15 30 	H 3 - 4 L H 44 - 4 L	
1 FS5 5 10P 10 5 厘 編 10 2 2 3 10P 10 5 厘 編	H 1 - 1 Q	
10 15	H 2 - 3 Q	
15 30	H 3 - 3 0 H 3 - 4 0	
30 30 30 30 30 30 30 30 30 30 30 30 30 3	THE PROPERTY OF THE PARTY OF TH	
Configuration example		
Indoor support-type current transformer, block-type design $(U_{\rm m}=12~{\rm kV}, J_{\rm th}=8~{\rm kA}, J_{\rm pN}=100~{\rm A})$		
Thermal strength 100 x I _{PN}		
1st core class 5P; instrument security factor 10; rating 30 VA 2nd core without		$\int_{\mathbb{R}^{n}}$
Example for Orc	er No.: 2 M A P P P P P P P P P P P P P P P P P P	
	codes:	澍
22 Siemens HG 24 · 2009		<i>3.</i>]





3 kA with primary multi-ratio	Position:	12345	567-	8 9 10	11 12	13 14 15	16	Order codes	
Core versions	Order No.:	4 M A 7				Total treat	s.p.40		
At rated primary current / N	Thermal strength			17.2		4. 4.	s. p. 40 s. p. 40		
2x 100 A 2x 125 A 2x 150 A 2x 200 A 2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I _{PN}			40.00	O NAMES OF THE OWNERS	pps://www.			
2x 60 A 2x 75 A	.150 x I _{PN} 200 x I _{PN}			F.	2				
#	- 300 x / _{PÑ} .			E	(A) (A) (B) (B) (A) (B) (B) (B) (B) (B) (B) (B) (B) (B) (B				
2x 20 A 2x 25 A	400 x I _{PN}		•	#7 57 					
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Configuration example		4 M A Z	y	-					$ \swarrow$
Indoor support-type current transformer, block-type design $(U_m = 12 \text{ kV}, I_{th} = 8 \text{ kA}, I_{PN} = 2 \times 100 \text{ A})$		CINTERNATION	2 3 3	- 3 M			(2 ts)	150	\times 1
Thermal strength 100 × I _{PN} 1st core class 1; instrument security factor FSS; rating 15 VA								All and the second	$\sim M$
2 nd core class 10P; accuracy limit factor 10; rating 30 VA		ENVERT TENTE CONTRACTOR	and the second field of the second second	popu previ teka	HI3		Eg/ /	(j. 500). Syrighal	
Example	e for Order No.: Order codes:	17 THE R. P. LEWIS CO., LANSING, MICH.	2 3 3					(2018)	7到
	Other codes:	一种一种 医水道	i www.teffi.ff	and the second	✓ ✓ ✓ ✓	a least .	1.43. 6	/	" Tay

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10th to 14th position	Position:	1	, ,			_	_								
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400 A 500 A 600 A 750 A 1000 A															
1200 A 1250 A 1500 A 2000 A 2500 A	100 x I _{PN}											n			
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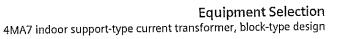
■ Feasible (other combinations on request)

Configuration example Indoor support-type current transformer, block-type design $(U_{\rm m} = 12~{\rm kV}, I_{\rm th} = 12.5~{\rm kA}, I_{\rm PN} = 100~{\rm A})$ Thermal strength 150 $\times I_{PN}$ 1st core class 10P; instrument security factor 10; rating 5 VA 2nd core without

4 MIA Z



Example for Order No.: A MA 7.2 A D = O M Q T Order codes:







.5 kA – with primary multi-ratio to 14th position	Position: Order No.:	1 2 3 4 5 6 7 - 8 5 4 M A 7 1 4 0 - 8	9 10 11 12 - 13	14 15 16	Order codes
C & C(3) O(1)	Thermal :	<u> 1744 Martin Calendaria de Persua</u>			6.4 5
2x 125 A 2x 150 A 2x 200 A 2x 500 A	100 x I _{PN}		0		54
2x 100 A	150 x I _{PN} =		2	E 20	
2x75 A 2x50 A 2x60 Å	300 x I _{PN}		FINAL TO	(F)	
2x 40 A 2x 25 A 2x 30 A	400 x I _{PN} 500 x I _{PN}		F F 5 F 6 F 7	1 ,7 ,	
2x 20 A	800 x I _{P(i}		7 F2V8346	ega Gui Sai	
Internal Stre	ngth			194 198	
Factor 7 Class Class Factor NA rating NA rating 1000 x /nx 600 x /nx 500 x /nx			以下		
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Feasible (other combinations on request)					
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door support-type current transformer, block-type design $I_{m} = 12 \text{ kV}$, $I_{th} = 12.5 \text{ kA}$, $I_{PN} = 2 \times 100 \text{ A}$)		Z40E3			
ermal strength 150 x I _{PN} core class 0.5; instrument security factor FS5; rating 15 VA				T OF	
d core class 10P; accuracy limit factor 10; rating 15 VA	or Order No.:	72 MIA 73 22 4 FO Z 3		91 3 4 /~	ma. Sugar en en reder

vian.



16 kA	

10 th to 14 th position	Position:
Core versions	Order No.:
At rated primary current John	Thermal
	strength.
200 A 250 A 300 A 400 A 500 A 600 A 750 A 800 A	-040 E.TeBO 401-
1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I _{PN}
125 A 150 A	150 x J _{PN}
100 A	200 x Inc
-60 A 75 A -	300 x I _{PN}
40 A 50 A	400 v t
30 A. F. W. A. C. C. C. C. C. C. S. S. S. S. S. C. C. S.	600 x I _{PN} ;
25 A	800 x I _{PN}
1 · 20A () [[] [] [] [] [] [] [] [] []	1000 x J _{PN}

(C. March 1987) Andrews and the Company of the Comp

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		15			30	,			4 - 5 - 4 - 7		100

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

 $(U_m = 12 \text{ kV}, I_{th} = 16 \text{ kA}, I_{PN} = 100 \text{ A})$

.30

Thermal strength 200 x IPN

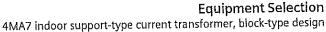
1st core class 0.5; instrument security factor FS5; rating 10 VA

2nd core class 5P; accuracy limit factor 10; rating 10 VA

Example for Order No.: Order codes:

MMMZ 2 4 4 E OW

MMAGEA AFOM 因到基礎图尼至







oryming og pre<mark>r ar former i selekter er e</mark>n inter galer og inter liggered for i selekter etter etter en bede en b 16 kA - with primary multi-ratio 10 11 12 Position: 1 2 3 4 5 6 7 10th to 14th position 4 M A 7 **B** 4 4 **E B** Order No.: Core versions Thermal At rated primary current IPN 2x 200 A 2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A 100 x I_{PN} 150 x J_{PN} 2x 125 Å 2x 150 Å 200 x I_{PN} 2x 100 A $300 \times I_{PN}$ 2x 60 A 2x 75 A 400 x I_{PN} 2x 40 A 2x 50 A $600 \times I_{PN}$ 2x 30 A. 💥 800 x I_{PN} 2x 25 A 1000 x I_{PN} 2x 20 Å F\$10 10 15 FS5 10 : 15 FS5 10 10 10 -10 30 0 10P 10 S 0 10 0 15 30 0.5 5P 15 15 30 10P 10 5 0.5 F\$5 .10 10: E 15 15 Ě 30 5 5 10 5P [Н. 10 10 15 Ή .15 / : i 15 15 30 30 10P 10 5 ES5 įΉ 10% 10 -H 10 15 H 3 15 15 Н 3 30 15 **美國 30 医复数 5.8 第0**语 英國 68 第 Feasible (other combinations on request) Configuration example 4 M A 7 Indoor support-type current transformer, block-type design 2 4 4 - 3 M $(U_{\rm m} = 12 \text{ kV}, I_{\rm th} = 16 \text{ kA}, I_{\rm PN} = 2 \times 100 \text{ A})$ Thermal strength 200 x $I_{\rm PN}$ 1st core class 0.5; instrument security factor FS5; rating 10 VA 2nd core without 4 M A Example for Order No.: Order codes: Siernens HG/24 · 2009 27 em.p. 70



10th to 14th position

20 kA

Core versions	Order No.:	1 2 3 4 5 6 [4] MI ARZ (114)	7 - 8	9 10 11 12 - 13 1	4 15 16	Order codes
At rated primary current Jou	Thermal 5	的認識的政策學			The state of the s	
	strength				4 4 4	
200 A 250 A 300 A 400 A 500 A 600 A 750 A		A version 5 al			હીં ખં. ખં. ∵ ખં∷	i.
1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I _{PN}			0		
100 A 125 A	150 x I _{PN}	'		多法的复数医		
75 75 A 84	200 x J _{PN} 300 x J _{PN}			2 - ₹55 - Notenia Personal Property (Notes No. 1991)	3	
50 A 60 A	400 x J _{PN}			TANK TOWNER	Ž.	•
40 A.	500 x I _{PN}			F. 175 (2.19)	f.	
30 A 	800 x I _{PN}			7		
25 A 6. 1	1000 x I _{PN}			8 -63	-	
14 core 2 di core 1 Thermal stre	hath value			NATES N		
	2 2 2			国际影响的		
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				L 3 - 0 A		* *
15 80. 10P 10 5				L 3 - 0 A		٠.
10P 10 5 開展 周囲 日 			•	Q 1 - 0 A	* * * * * * * * * * * * * * * * * * * *	
				Q-2 - 0 A		
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■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

30

 $(U_{\rm m} = 12 \text{ kV}, I_{\rm th} = 20 \text{ kA}, I_{\rm PN} = 100 \text{ A})$

10 15

30

Thermal strength 200 $\times I_{PN}$

1st core class 1; instrument security factor FS5; rating 10 VA

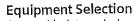
 2^{nd} core class 5P; accuracy limit factor 10; rating 15 VA

Example for Order No.: Order codes:

4 M A 7

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20 kA – with primary multi-ratio		Childrendon
10th to 14th position	Position:	1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Ordercodes
Core versions	Order No.: 🔡 • Thermal	This figure state and a second state of the se
At rated primary current /m	_strength	
2x 200 A 2x 250 A 2x 300 A 2x 400 A	100 v I	0
2x 500 A 2x 600 A 2x 150 A	100 x I _{PN} 150 x I _{PN}	
2x 100 A 2x 125 A	200 x I _{PN}	
2x75 A	300 x I _{PN}	<u> </u>
2x 50 A 2x 60 A 2x 40 A	400 x I _{PN} 500 x I _{PN}	1990 - 1995 - 19
7v 30 A	800 x I _{PN}	7 1755 7766 (2015 2017 175)
2x 25 Å	1000 x I _{PN}	
1st core 2 2nd core Thermal str	ength	
1st core 2st Zel Core : Thermal str は	Z Z Z	
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10P 10 5		Q 1 - 0 A
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10 15 15		H 2 - L
- 1 : 14 (15 1) 15 (15 1) 15 (15 1) 15 (17 1) 17		H 3 - 4 L
15 30 30 30 30 30 30 30 30 30 30 30 30 30	展題	
30 30 30 30 30 30 30 30 30 30 30 30 30 3		1 1 Q 2 1 2 Q
15 30 30 30 1 FS5 5 10P 10 5 5 5 2 10		H 1 - 1 Q H 2 - 2 Q - 3 Q
- 10 15 - 15 (15 (15 (15 (15 (15 (15 (15 (15 (15		
- 15 19 19 19 19 19 19 19 19 19 19 19 19 19	#5 .527745 ■ ■	H 3 - 4 Q H 4 - 4 Q
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H Consible (other combinations on reguest)		- *** *** *** *** *** *** *** *** *** *

■ Feasible (other combinations on request)

Configuration example

indoor support-type current transformer, block-type design

($U_{\rm m}=12$ kV, $I_{\rm th}=20$ kA, $I_{\rm PN}=2\times 100$ A) Thermal strength $200\times I_{\rm PN}$

1st core class 1; instrument security factor FS5; rating 5 VA

2nd core class 10P; accuracy limit factor 10; rating 5 VA

Example for Order No.: Order codes:

4 M A 7

MMA72ABC3MHJZ

2 4 8 E 3 M



10 th to 14 th position Core versions	Pasition; Order No.:	1 2 4 M		5 6 高度	7 - 1620120	8 1029	9 10 11	12 ~ 13 1	4 15 16	a francia esta con	Order code
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0.5 FS5 10						•	C 2	A 0 - A 0 - 1			
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30							1 3 1 4 5 3	- 4 Q		N.	
easible (other combinations on request)						13. 13.					
figuration example or support-type current transformer, block-type design	[4]					[7]					

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2nd core without

 $(U_{\rm m}=12~{\rm kV},I_{\rm th}=25~{\rm kA},I_{\rm PN}=100~{\rm A})$ Thermal strength $300\times I_{\rm PN}$

1st core class 10P; instrument security factor 10; rating 15 VA

emp. ≠3

9 10 11 12 - 13 14 15 16



25 kA - with primary multi-ratio

10th to 14th position	Position: 1
Core versions	Order No.: 4
At rated primary current $I_{\rm PN}$	Thermal strength
2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x J _{PN}
2x 200 A	150 x I _{PN}
2x 125 A 2x 150 A	200 x I _{PN} 300 x I _{PN}
2∨75 A	400 x I _{PN}
2x50 A 2x 60 A	500 x I _{PN}
2x 40 A	800 x I _{PN}
	,

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Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

 $(U_{\rm m} = 12 \text{ kV}, I_{\rm th} = 25 \text{ kA}, I_{\rm PN} = 2 \times 100 \text{ A})$

Thermal strength 300 $\times I_{\rm PN}$

1st core class 10P; instrument security factor 10; rating 15 VA

2nd core without

Example for Order No.: Order codes:

MARTINE SERVICE

2 5 4 - 3 M

4 M A 7

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mp. 74

7



31.5 kA

10th to 14th position Core versions	Position; Order No.:	: 3	4 5	6	7 15711	- 8	9	10 11	12 -	- 13 ·	4 15	16	er.	Order codes
At rated primary current in	Thermal strength	 	I ELECTION CO.		insigna	121 (24)	ويحجوا ال				s. p. 409	s.p.4 6 四述	s.p. 40	
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125 A 150 A	200 x I _{PN} 300 x I _{PN} 400 x I _{PN}			:		•			2	EBE				
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■ Feasible-(other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

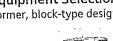
 $(U_{\rm m} \approx 12 \text{ kV}, I_{\rm th} \approx 31.5 \text{ kA}, I_{\rm PN} = 100 \text{ A})$ Thermal strength 400 x $I_{\rm PN}$

1st core class 0.2; instrument security factor FS10; rating 15 VA

2nd core without

Example for Order No.: Order codes:

AMA 7 2 5 7 E 6 M





21'2 KV - Midis himman mana							_	_				43 44		1.0	Order codes
10th to 14th position	Position:	1 2	3	4	5 6	7 - 1000000	- 8 #107553		,,,	1 12 5405			15 15		
Core versions	Order No.:		1 A	[2]	1 5	IZ E					15		9		
At rated primary current I _{PB}	Thermal :: strength ::			•		*		1			14. d 18. d		od s	s.p.	<u>.</u> ;
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200 A	$200 \times I_{PN}$:		24 T	. 41	m mişir N			
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60 A .☆	$600 \times I_{PN}$									6	altera				
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Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

 $(U_{\rm m}=12$ kV, $I_{\rm th}=31.5$ kA, $I_{\rm PN}=2$ x 100 A)

Thermal strength 400 x $I_{\rm PN}$

1st core class 0.5; instrument security factor FSS; rating 5 VA

2nd core class 10P; accuracy limit factor 10; rating 5 VA

AMAZ 2 5 7 - 3 M

Example for Order No.: Order codes:

Siemens HG 24 · 2009 33



40 kA

40 KA																		
10 th to 14 th position	Position:	1 2	2	A	_	۷ -		•				_						
Core versions	Order No.:	148 M	ega.	Fil				8 	9 320	10 1	1 12	2 기타고	13 1 වෙතුල	4 15	16	कहा सरका		er codes
At rated primary current /pu s	Thermal Strength	TEN KIN	T1-5-15		13.15		. This							- 40 - 40	4 1	5.		
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150 A 125 A	200 01		,								2 3 4	124		<u> </u>		٠,		
100 A 125 A 75 A 60 A	600 x I _{PN} 800 x I _{PN}				•				ļ	2 A	6 ₂			i				
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Feasible (other combinations on request)

Configuration example-

Indoor support-type current transformer, block-type design

 $(U_{\rm m} = 12~{\rm kV}, I_{\rm th} = 40~{\rm kA}, I_{\rm PN} = 100~{\rm A})$

Thermal strength 400 $\times I_{PN}$

1st core class 1; instrument security factor FS5; rating 5 VA

2nd core class 5P; accuracy limit factor 10; rating 5 VA

Example for Order No.: 4 M A 3 2 6 2 3 0 M E 7 3 Order codes:

AMINE



Order codes

40 kA – with primary multi-ratio

10th to 14th position	Position:	1	2	3	4	5 (5 7	_	8	9	10	11	12	- 1	3 14	4 15
Core versions	Order No.:	4	М	A	7		113									
At rated primary current I _{PN}	Thermal strength	5-3-850 F-850] []	্য
2x 400 A 2x 500 2x 600 A	100 x I _{PN}										ŧ	(E9 3)	0	7.09	E. 27	া
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2x 150 A	300 x I _{PN}										₽.		٠. م		. 1	
2x 100 A 2x 125 A 2x 75 A 2x 60 A	400 x I _{PN} 600 x I _{PN} 800 x I _{PN}										f) L		6 7	K.E		<u>.</u> i
2x50A (***)	1000 x I _{PN}										10000000		8		清洁 经有效	
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Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

[30] [] 30[]

 $(U_m = 12 \text{ kV}, I_{th} = 40 \text{ kA}, I_{PN} = 2 \times 100 \text{ A})$

Thermal strength 400 x I_{PN}

1st core class 0.2; instrument security factor F510; rating 10 VA

2nd core without

4 M A Z 216 3 4 5 M

Example for Order No.: 4 Mi A 7 7 6 3 - 3 M C 2

Order codes:

C. A. P. W. A. Siem

Siemens IG 21: 2009 3

cma,78



50 kA		
10 th to 14 th position Core versions	Position;	1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Order code
At rated pilmary current $p_{\rm pl}$	Order No.: Thermal	
	strength 🛝	8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I _{PN}	0
400 A 100 A 250 A 300 A	150 x I _{PN} 200 x I _{PN}	A CONTRACTOR OF PARTY OF THE PA
1 · 200 A · 2 · 2 · 2 · 2 · 3 · 4 · 2 · 2 · 3 · 3 · 2 · 3 · 3 · 3 · 3 · 3	300 x 7 _{PN}	2
125 A 150 A	400 x I _{PN} 500 x I _{PN}	4
75 A	800 x I _{PN}	7
	1000 x I _{PN}	8
18 core 200 core Thermal stren	din series	
7.00	555	
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easible (other combinations on request)		
figuration example or support-type current transformer, block-type design	[4]	
= 12 kV, I_{th} = 50 kA, I_{PN} = 100 A) mal strength 500 x I_{PN}	النعة	216 Z C D M
ore class 0.5; instrument security factor FS5; rating 5 VA		
ore class 5P; accuracy limit factor 10; rating 5 VA		THE COMMENT

4MA7 indoor support-type current transformer, block-type design

10 11 12

6 7



. .

50 kA – with primary multi-ratio

10th to 14th position	Postion:
Core versions	Order No.:
At rated primary current I _{PN}	Thermal :: strength ::
2x 500 A 2x 600 Å 2x 400 Å	100 x I _{PN} 150 x I _{PN}
2x 250 Å 2x 300 Å 2x 200 Å	200 x I _{PN} 300 x I _{PN}
2x 125 A 2x 150 A 2x 100 A	400 x I _{PN} 500 x I _{PN}
2x75 A 2x 60 A 2x 60 A	800 x I _{PN} 1000 x I _{PN}

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■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

 $(U_{\rm m} = 12 \text{ kV}, I_{\rm th} = 50 \text{ kA}, I_{\rm PN} = 2 \times 100 \text{ A})$

Thermal strength 500 x-I_{PN}

1st core class 0.5; instrument security factor F55; rating 5 VA

2nd core class 5P; accuracy limit factor 10; rating 5 VA

Example for Order No.: 4 M A 7 C

MANISA ŽIKI

2 6 7 - 3 M

4 M A 7

Semens HG 24/2009 37

cmp. 8t



63 kA

10 th to 14 th position	Position:	1
Core versions	Order No.:	7
At ated primary current J _{PN}	Thermal (3)	J
750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I _{PN}	
500 A 600 A	150 x I _{PN}	
400 A	$200 \times I_{PN}$	
250 A 300 A 4 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1	300 x / _{PN}	
200 A	400 v t	
125 A 150 A	500 x Jus	
100 A	800 x I _{PN}	
- 75 A [1] () () () () () () () () () (1000 x /m/	

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10P	10	5			2 .	· *·					. :. ·		3, 37		
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		15	d formu.		na Paris		· - · · · ·	i 1.1.	_ '-		i i, a		. 2 <i>6</i> .	注.	

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

 $(U_{\rm m} = 12 \text{ kV}, I_{\rm th} = 63 \text{ kA}, I_{\rm PN} = 100 \text{ A})$

10

Thermal strength 800 x $I_{\rm PN}$

1st core class 0.5; instrument security factor FS5; rating 15 VA

2nd core without

0.5

Example for Order No.: Order codes: AMBE

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Equipment Selection 4MA7 indoor support-type current transformer, block-type design





	ni 921745.	riching de la parteun a mai ade esperantes especiales.
63 kA – with primary multi-ratio		2 2 4 5 6 7 _ 8 9 10 11 12 - 13 14 15 16 Ordercodes
10 th to 14 th position Core versions	Position: Order No.:	1 2 3 4 3 6 7 - 6 3 10 11 12 13 13 13 13 13 13 13 13 13 13 13 13 13
At rated primary current I _{PN}	"Thermal ! strength :-	AMAZEZX FEEREN PER POR CONTROL OF
2x 500 A 2x 600 A	150 x I _{PN}	ି ୀ କୁନ୍ଦ୍ର ଅନ୍ୟୁଷ୍ଟ ଅନ୍ୟ ଅନ୍ୟୁଷ୍ଟ ଅନ୍ୟ ଅନ୍ୟୁଷ୍ଟ ଅନ୍ୟ
2x 400 A 2x 250 A 2x 300 A	$200 \times I_{PN}$ $300 \times I_{PN}$	3
2x 200 A 2x 125 A 2x 150 A	400 x I _{PN} 500 x I _{PN}	5
2x100 A	800 x I _{PN} 1000 x I _{PN}	8 FM 84 FM 84 FM
2x75 A	- COO X IPN	
1º core Z nd core Thermal str	ength	
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15 15 15 15 15 15 15 15 15 15 15 15 15 1		
0.5 FS5 5 10P 10 5 B B B		E 1 - 1 Q E 2 2 2 Q
15 15		
30 30 30 1 FSS 5 5P 10 5 2 8 8		H 1 - 1 L H 2 (1 - 2 L)
- 10 15 10 15 15 15 15 15 日 日 日 日 日 日 日 日 日 日 日 日		\ \ H 2 - 3 L
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10 15 15 15 15 15 15 15 15 15 15 15 15 15		H 2 - 3 Q H 3 - 1 - 3 Q
15 30 30 30		H 3 - 4 Q H 4 - 4 Q
Feasible (other combinations on request)	for 2x 125 A	
Configuration example Indoor support-type current transformer, block-type design		ETMENT2
$(U_{\rm m} = 12 \text{ kV}, I_{\rm th} = 63 \text{ kA}, I_{\rm PN} = 2 \times 100 \text{ A})$		2(7)312 [3]M
Thermal strength 800 × I _{PN}		

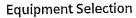
2nd core class 10P; accuracy limit factor 10; rating 5 VA

1st core class 0.5; instrument security factor FS5; rating 5 VA

15th position 10 11 12 Rated secondary current Order No.: Rated current for 1st core Without 2nd core -5 A - Without 2nd core ő 1 A - 5 A 1 A 5 A 16th position Additional features 50 Hz, VDE marking 50 Hz, IEC marking. 50 Hz, VDE marking with approval 1) 60 Hz, IEC marking Further not listed special versions (only after consultation with the order processing department in the Switchgear Factory Berlin). Information additionally in clear text. 1) Only for class 0.2 and 0.5 Special versions With routine test certificate in German/English With capacitive layer for voltage detecting system. 10 kV 15 kV ... Differential earth-fault balance in protection core Other special versions on request Configuration example Indoor support-type current transformer, block-type design 4 M A 7 Maximum operating voltage $U_m = 12 \text{ kV}$ Rated lightning impulse withstand voltage $U_{\rm p}$ = 75 kV Rated short-duration power-frequency with stand voltage U_d = 28 kV Rated short-time thermal current Ith = 63 kA Rated primary current I_{PN} = 2x 100 Å 3 M Thermal strength 800 $\times I_{PN}$ 1st core class 0.5; instrument security factor FS5; rating 5 VA 2nd core class 10P; accuracy limit factor 10; rating 5 VA End Rated secondary current 1st core 1A; 2nd core 5A Power frequency 50 Hz; marking according to IEC With routine test certificate in German/English With capacitive layer for voltage detecting system 10 kV

> Example for Order No.: Order codes:

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4MB1 indoor support-type current transformer, single-turn design



4MB1 indoor support-type current transformer, single-turn design

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transformer, single-turn design	n											
5th position	Position:	1 2	3 4	5 6	7 - 9236998	B 9	10 11 일본 기술	12 -	13 14	15 16	GPU:	Order codes
Operating voltage (maximum value)	Order No.:	4 M	8 1 1							iles, ilestii	25 DEFT 1	KEN LEN ER
impulse withstand control voltage v	ted short-duration ower-frequency with stand voltage U ₆						See page 42 See page 42	See page 42	See page 42 See page 42	See page 43	See page 43	
W + 1 KV S P	kV					أستاري						
12 75 17,5 95 24 128	28 38 50	4 M 4 M	. B. 1	2 31/3 4								
6 th /7 th position												
Rated short-time thermal current			集团。			215						
Rated short-time thermal current (b) KA				7	8							
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250	-	52.		8	4							
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8th/9th position Rated primary current	Au de l'institution						· (1				
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To athle (ask as appeling light on request)					$\sim \chi$		\ '1					•

Feasible (other combinations on request)

Configuration example indoor support-type current transformer, single-turn design Maximum operating voltage $U_{\rm m}$ = 24 kV Rated lightning impulse withstand voltage $U_{\rm p}$ = 125 kV Rated short-duration power-frequency withstand voltage $U_{\rm d}$ = 50 kV Rated short-time thermal current $I_{\rm th}$ = 300 kA Rated primary current $I_{\rm PN}$ = 3000 A

Example for Order No.: 4 M B 1 4 8 5 F

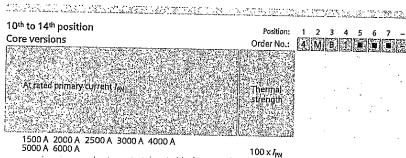
4 M B 1

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cmp 84





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.,		30			30				
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Feasible (other combinations on request)

Configuration example Indoor support-type current transformer, single-turn design $(U_{\rm m} = 24$ kV, $I_{\rm th} = 300$ kA, $I_{\rm PN} = 3000$ A) Thermal strength 100 $\times I_{PN}$ 1st core class 0.5; instrument security factor F510; rating 30 VA 2nd core class 5P; accuracy limit factor 10; rating 30 VA

> Example for Order No.: Order codes:

A B S S ME COMPAGNICAL

Equipment Selection

4MB1 indoor support-type current transformer, single-turn design





4:54:77:50 (\$45:4.25.4.10.4. \$2.2.25.4.1.1. \$4.4.10.4.	Position;	1 2 3 4 5 6 7	- 8 9 10 11 12 - 13	14 15 16
Rated secondary current	Order No.:	4 M B 1 M B		
Rated current for 1st core Rated cu	ment for 2 nd core		,	
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5A Without	2 nd core		0	A B L
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1A 5A ** 5A **				D
5.4				(E)(() (')()
5A 🐑 W. 7				

16th position

Additional features

50 Hz, VDE marking

50 Hz, IEC marking

50 Hz, VDE marking with approval 1)

60 Hz, IEC marking

Further not listed special versions (only after consultation with the order processing department in the Switchgear Factory Berlin). Information additionally in clear text.

1) Only for class 0.2 and 0.5

Special versions

Options

With routine test certificate in German/English Other special versions on request

Configuration example

Indoor support-type current transformer, single-turn design

Maximum operating voltage U_m = 24 kV

Rated lightning impulse with stand voltage $U_p = 125 \text{ kV}$

Rated short-duration power-frequency with stand voltage $U_{\rm d}$ = 50 kV

Rated short-time thermal current I_{th} = 300 kA

Rated primary current I_{PN} = 3000 A

Thermal strength 100 x $I_{\rm PN}$

1st core class 0.5; instrument security factor FS10; rating 30 VA

2nd core class 5P; accuracy limit factor 10; rating 30 VA

Rated secondary current 1st core 5 A; 2nd core 5 A

Power frequency 60 Hz; marking according to IEC

Example for Order No.:

Order codes:

4 M B 1 8 5 -TILL

0

4 M B 1 4 B 5 - 1

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cmp. 86



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4MC2 indoor bushing-type current transformer, single-turn design

and of the state design														
5 th position Operating voltage (maximum value)	Position: Order No.:	1 2	3 4 C 2	5 6	7 - 3(2)	8 9	10 1	1 12	- 13	14 1	5 16 2000	31 <u>77</u> 8		codes
Operating voltage: Rated lightning Rated shor Impulse with stand power-for							enilia. En v		V # 8 70	ball.		363		
VOltage Withstand	i voltage						page 4.	page 4	page 4	page 45	page 46	page 46	٠	•
U _T U _T V							See	See	See	See	Se	See		
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36 170 70)	4 14	r 2	6							••			

6th to 9th position Rated short-time thermal current/

Rated primary current

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30	300	
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50	500	6 7 - 0 11
60	600	
80	800	7 3 - 0 Y
1004	1000	
120	1200	7 6 - 1 B
150	-1500	为一种的人。一种是一种一种,是一种一种 对于一种一种
200 250	2000	8 2 - 1 F
	2500	
300	3000	8 5 - 1 H
	r in Dire	

Configuration example

Indoor bushing-type current transformer, single-turn design Maximum operating voltage U_m = 36 kV Rated lightning impulse withstand voltage U_p = 170 kV Rated short-duration power-frequency withstand voltage U_d = 70 kV

Rated short-time thermal current $I_{\rm th}$ = 50 kA Rated primary current $I_{\rm PN}$ = 500 A

Example for Order No.:

4 M 6 2

Order codes:

ema 87

4MC2 indoor bushing-type current transformer, single-turn design

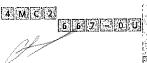


RAALAA JA MERENTIN MARARANI JARUSTI KANASA SASAHA ATAHAN BAJAHAN ATAHAN MARAHA JAJATAR BAJAHAN SASAHA 10th to 14th position 10 4 M C 2 B B B + B B Core versions Order No.: See page 46 See page 4 At rated primary current IPN 150 A 200 A 300 A 400 A 500 A 600 A 800 A 1000 A 1200 A 1500 A 2000 A 2500 A 3000 A 100 x I_{PN} 7 Rateri 0.2 :: 15: FS5 15

Feasible (other combinations on request)

Configuration example Indoor bushing-type current transformer, single-turn design ($U_{\rm m}=36~{\rm kV}$, $I_{\rm th}=50~{\rm kA}$, $I_{\rm PN}=500~{\rm A}$) Thermal strength 100 x $I_{\rm PN}$ 1st core class 1; instrument security factor FSS; rating 30 VA 2nd core class 10P; accuracy limit factor 10; rating 30 VA

Example for Order No.: Order codes:



AMC2657E0UHAGGN

[0]

omp. 80

cmp. 83



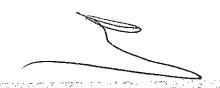
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15th position Rated secondary current	Position: Order No.:	1 2 3 4 4 M C 2		- 8 9 1	0 11 12 -	13 14 15 16 Order code
Rated current for 18 core Rated current for 2nd				ander extens		
	coresi 11 7#		•		· · · · ·	
1 A Without 2nd core 5 A Without 2nd core						O A A
1A 1A 5A 6 75 6 75 6 77 77 5A 78 6 78 77 77	Tillige College					C DATESTA WATER
1A 5A	- 5 <u>12 p</u>				÷	E FERRISP LAND
16 th position Additional features						
	· 有效素 图	·				
Options						
50 Hz, VDE marking 50 Hz, IEC marking		•	•		· ·	
50 Hz, VDE marking with approval 1) 60 Hz, IEC marking	il Forensia Profit of Political					
Further not listed special versions (only after consultation with order processing department in the Switchgear Factory Berlin, Information additionally in clear text.	n the).					
1) Only for class 0.2 and 0.5	sielaid.					9
17 Sing 101 Gess 0.2 and 0.5						
Special versions						
± / Options			. ,	.,		
With routine test certificate in German/English Other special versions on request					. '	- Z A 1 0
						Free garden transcription of the state of th
Configuration example						
Indoor bushing-type current transformer, single-turn design Maximum operating voltage $U_{\rm m} = 36 \rm kV$		EM G 2				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Rated lightning impulse withstand voltage $U_p = 170 \text{ kV}$ Rated short-duration power-frequency withstand voltage $U_d = 70 \text{ kV}$						
Rated short-time thermal current I _{th} = 50 kA Rated primary current I _{Ph} = 500 A Thermal strength 100 y I			6 7 4	o v	Arrivo, Jan	A STATE OF THE STA
Thermal strength 100 x I _{PN} 1st core class 1; instrument security factor FS5; rating 30 VA 2nd core class 10P: accuracy limit factor 10: rating 30 VA				t vente	OJ	

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2nd core class 10P; accuracy limit factor 10; rating 30 VA Rated secondary current 1st core 5 A; 2nd core 1 A
Power frequency 50 Hz; marking according to VDE.

> Example for Order No.: Order codes:







4MC3 indoor bar-primary bushing-type current transformer

5th position		Position:	1 Z	3 4	5 6 meqe	. 7	_ Revers	B 9	10 0=380	11 12 -31 -5	- 1		4 15	16		Order codes
Operating voltage (ma	ximum value)	Order No.:	A M	C 3					Lanie		i sala	,892,	Alba M		21231	Endente :
Operating Voltages	impulse withstand pow	short-duration er-frequency stand voltage U _d		The second secon					See page 48	See page 48		or affect and	See page 49		See page 49	
12	75	28 - 50	4 M	C 3	2 2				:							
- 作: 24 (4) (2 (第三人) (1) - 36	* * * * *				6	ante. Serte	gi susiti arresta	a aktro ormer	1							
	170 				生になっている。				; ;							

6th to 9th position

Rated short-time thermal current/

Rated primary current

Rated And Andrews Short-time Andrews A	Rated primary curr	ent 🔠 📜	d Sienerale Georgesti House Volumen		
In the second	/PN				
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250 300 300 400	3000 4000			1	8 5 + 8 7
500 600	5000 6000	4.30.44.4.12	gan fin grad		7 0 7 2
800	10000				7. 3

Configuration example

Indoor bar-primary bushing-type current transformer Maximum operating voltage $U_{\rm m}$ = 12 kV Rated lightning impulse withstand voltage $U_p = 75 \text{ kV}$ Rated short-duration power-frequency withstand voltage $U_d = 28 \text{ kV}$ Rated short-time thermal current $I_{th} = 400 \text{ kA}$ Rated primary current IPN = 4000 A

> Example for Order No.: Order codes:



10 th to 14 th position Core versions	Position: Order No.:	Property Colored Property	4 11/3/15	5 6	7 -	8 9	10 11 12 10 55 18 12	! - 13 1 TETELENIO	4 15 16	e transite e e e e e e e e e e e e e e e e e e	Order code
	Order No.:								0.0		
At rated primary current I _{PN}	Thermal strength					K			See page 49 See page 49	page 49	
									See p	See	
2000 A 2500 A 3000 A 4000 A 5000 A 6000 A 8000 A 10000 A	100 x <i>I</i> _{PN}			•		£3	# E3541.16		3	•	•
	100 X 1PN					B		FAST (ij.		
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						Q o	4 6	- 0 A			
OP 20 60 - 기계: 400 (- 10년 : 기계: 10년 : 기계: 10년 : 10년						. (P¥; S ₽2**	6	- 0 A		,	
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₽. 10 60						. Q.	6 6∏	- 8 S - 8 S			
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2 FS10 30 1 FS10 60 10P 40 60 10P 20 100				: .	. 4		o o%/184	1 C			
5 FS10 30 60 60 100 FS10 30 60 60 60 100	W = *					Υ	0 -	467 非性) 1 E			- '.'.
easible (other combinations on request)	W/. T . B	٠.			•	Y.,	0 % 5-		. *.		
							구 기원				
						19-3 18-3					
figuration example or bar-primary bushing-type current transformer		MICIS	7								
= 12 kV, I_{th} = 400 kA, I_{PN} = 4000 A) mal strength 100 x I_{PN}	hos:										
ore class 0.5; instrument security factor FS10; ration 15 VA-							Eo.				
ore class 0.2; instrument security factor FS10; rating 30 VA ore class 10P; accuracy limit factor 10; rating 30 VA						-13			Δ	1.0	, T. # : -
Example for Orc	der No : 19795	Mericr	irane:	giran w	gwerer	<u> </u>	g M	0 D	<u> </u>	/. いて よこと	7
	r codes:	MICIG	2.18	1120		Y 0		0, D		M/A	と 登庫 か

Equipment Selection4MC3 indoor bar-primary bushing-type current transformer





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15 th position Position:	1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Ordercodes 4 M C 3 同
Rated secondary current Order No.:	[4] M C 3 回
Rated current Rated current Rated current Rated current	
for 1% core for 2nd core for 3nd core for 4th core	
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1 A 1 A Without Without	
5A 5A Without Without 1 A 5A Without Without	·
1A 5A Without Without Without	
1 A 1 A Without	
5A 5A Without	J. C.
1A 1A 1A 1A 5A 5A	
30	
16th position	
Additional features	
Options	
COLLY VDE marking	
50 Hz, VDE marking 50 Hz, IEC marking	
50 Hz, VDE marking with approval 1)	CHI ST WASH.
- 60 Hz, IEC marking	
Further not listed special versions (only after consultation with the order processing department in the Switchgear Factory Berlin). Information additionally in clear text.	9
1) Only for class 0.2 and 0.5	
Special versions	
Options:	
With routine test certificate in German/English	- Z A 1 0
Size (for specification see the following pages)	
12	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
21 22	- Z A 2 2
· 사용 등 하는 하는 화장 등 유명 하는 얼굴이 가득 것이 되는 <mark>34</mark> 4일	AREA TO THE REAL PROPERTY AND THE REAL PROPE
32 	- Z A 3 2
- 1 (A) (195gg 2.3) 2.1 (A) (1 (A)	- Z A 4 2
	A FILE A SIL
52	
61 62	- Z A 6 2
72 or 73 or 73 or 74 or 75 or	Z A 7 2 A 7 3
Other special versions on request	
Configuration example	
Indoor bar-primary bushing-type current transformer	
Maximum operating voltage $U_{\rm m} = 12 \text{ kV}$	
Rated lightning impulse withstand voltage $U_p = 75 \text{ kV}$ Rated short-duration power-frequency withstand voltage $U_d = 28 \text{ kV}$	
Rated short-time thermal current $I_{th} = 400 \text{ kA}$	
Rated primary current I _{PN} = 4000 A	
Thermal strength 100 \times I_{PN} 1st core class 0.5; instrument security factor FS10; rating 15 VA	
1st core class 0.5; instrument security factor PS 10; rating 15 VA 2nd core class 0.2; instrument security factor PS10; rating 30 VA	enterprise and the state of the
3rd core class 10P; accuracy limit factor 10; rating 30 VA	YO FOD
Rated secondary current 1st core 1 A; 2nd core 1 A; 3nd core 1 A	

mens HG/27 2009 49

Power frequency 50 Hz; marking according to IEC Size 42

Example for Order No.: 4 M S 3 2 8 7 M

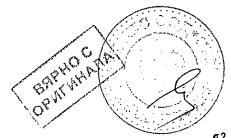
Equipment Selection

4MC3 indoor bar-primary bushing-type current transformer



Size specificatio	n for 4MC32	transformer:	5 1)			and a management of the same o	والمستريد والمسترية والمستريد والمستريد	
10 th to 14th position of Order No	82-1E	84-16	85-14	6 th to 19 th posit	ion of Order No.	90.10	ў 11 11 11 11 11 11 11 11 11 11 11 11 11	93.16
C30-0A C40-DA F30-0A F40-0A J40-0A J60-0A Q40-0A Q60-0A S60-0A S80-0A	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52, 61, 62	31, 32, 41, 42, 51, 52, 61, 62, 72, 73	41, 42, 51, 52, 61, 62, 72, 73
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F30-4Q	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52, 62, 72, 73	32, 42, 51, 52, 62, 72, 73	51, 52, 62, 72, 73
F30-6S	21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52,	12, 21, 22, 31, 32, 41, 42, 51, 52, 12, 21	22, 31, 32, 41, 42, 51, 52, 62, 72, 73	32, 42, 51, 52, 62, 72	42,51, 52,62, 72,73
F40-6S J60-8S	21, 22, 31, 32 12, 21, 22, 31,	21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52 12, 21, 22, 31,	12, 21, 22, 31, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 61, 62	42, 51, 52, 62, 72, 73	42, 51, 52, 62, 72, 73
Q60-8s	12, 21, 22, 31, 32	22, 31, 32 12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41,	32,41, 42,51; 52 12,21, 22,31, 32,41,	31, 32, 41, 42, 51, 52 21, 22, 31, 32, 41, 42,	21, 22, 31, 32, 41, 42, 51, 52, 61, 62, 21, 22, 32, 41, 42, 51, 52, 61,	31, 32, 41, 42, 51, 52, 61, 62, 72, 73 32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 73, 73 42, 52, 62, 72, 73
S60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	42 21,22, 31,32, 41,42	42, 51, 52 12, 21, 54, 22, 31, 54, 32, 41, 51,	51, 52 21, 22 31, 32 41, 42, 51, 52	52, 61, 62 21,22, 32,41, 42,52, 61,62	72, 73, 72, 73, 32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
580-8S	21, 22, 32	12, 21, 22, 32	21, 22, 31, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 51,	22, 32, 41, 42, 51, 52, 62	41, 42, 51, 52, 62, 72, 73	42,52, 62,72, 73
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Y00-1A Y00-1B Y00-1C Y00-1D Y00-1E	12, 22, 32 22, 32	22, 32	22, 32, 42 22, 32,	252 22, 32, 42, 52 41, 52	42, 52	52, 62	73	73
Y00-1E Y00-1F 1) Selection for transforme	ers with rated seco				52 23 23 23 1	52, 62	73	the second of the second

¹⁾ Selection for transformers with rated secondary current 1 A. Sizes for 5 A on request



Equipment Selection 4MC3 indoor bar-primary bushing-type current transformer



		 	gar garani raga

	Size specification fo	or 4MC34 trai	nsformers 1)	TERRE AND				ucenerio	
Pole					i th to 9 th position	of Order No.		440	
CADONA \$1, \$22 \$1, \$52 \$2, \$41, \$41, \$42, \$42, \$41, \$42, \$42, \$42, \$42, \$42, \$42, \$42, \$42				2000年700万元代,持20	SALE TO A PARTY OF THE	STEEL SHELL SHELL	的复数电影 医克里特氏	31 32	it in the Herica
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F30-4Q					51, 52		73' '		51, 52,
F30-6Q	F30-4Q	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	21, 22, 31, 32,	21, 22, 31, 32,	31, 32, 41, 42,	32, 41, 42, 51,	51, 52, 62, 72,	62, 72,
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160-85	140.03	31, 32	31,32	31, 32,	32, 41, 42, 51,	41, 42,	51, 52, 61, 62	72,73	_
Q60-8S 12, 21, 12, 21, 12, 21, 12, 21, 12, 21, 12, 21, 12, 21, 12, 21, 22, 31, 31, 32, 41, 42, 51, 52, 62, 73, 73, 12, 21, 22, 31, 32,	J60-8S	12, 21, 22, 31,	12, 21, 22, 31,	22, 31,	32.41	31, 32, 41, 42,	31, 32, 41, 42,	41, 42, 51, 52,	62, 72,
Q60-8S				42	42, 51, 52	51, 52	61, 62	72, 73	: 42. 52.
Section Sect	28-03Q	12, 21, 22, 31, 32	22, 31,	22, 31, 32, 41,	22, 31, 32, 41,	31, 32, 41, 42,	41 42, 51, 52,	42, 51, 52, 62,	62, 72, 73
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\$80-85	35U-83	31, 32	31, 32	31,32	31, 32, 41, 42, 51, 52	31, 32, 41, 42, 51, 52	52,61,	72, 73	73
Y00-0A 11, 12, 11, 12, 11, 12, 11, 12, 11, 12, 11, 12, 12	\$325134 6505 1512 6434 654 \$80-8\$	21, 22, 32		31, 32,	21, 22, 32, 41,	21, 22,	\ \41, 42,	51, 52, 62, 72,	42, 52, 62, 72, 73
31, 32	Y000-0A	ີ່ ,11,,12, ຖະສື	111,12,5	11.12.	52 11, 12,	21,22	22, 32,	22.32.	42, 52, 62, 72
Y00-0B 22, 32 21, 22, 22, 32, 41, 42 42, 51, 42, 52 52, 62, 62, 72, 72, 73 Y00-0C 11, 12, 11, 12, 11, 12, 12, 12, 12, 12,		21, 22, 31, 32	21, 22, 31, 32	31, 32	31; 32, 41; 42;	^ / 41, 42. · · \	52, 61;	52, 61, 62, 72, 73. —	. 73
Y00-0C 11, 12, 11, 12, 11, 12, 12, 12, 12, 12,	YOO-OB	22, 32	21, 22, 32	22, 32, 41, 42	22, 32, 42, 51,	22, 32, 42, 52	22, 42, 52, 62	42, 52, 62, 72,	52, 62, 72, 73
Y00-1A 12, 22, 22, 32 22, 32, 22, 32, 42, 52 Y00-1B 32 42 42, 52 Y00-1D 22, 32 22, 32 22, 32, 41, 52 52 52, 62 73 73 Y00-1E 42 Y00-1F	VOD DD	11, 12, 21, 22		11, 12, 21, 22,	· 22.31. /		22,32, 42,51,	52, 62,	
Y00-1A 12, 22, 22, 32 22, 32, 42, 52 52, 62 73 73 Y00-1B 32 42 42, 52 Y00-1C Y00-1D 22, 32 22, 32, 41, 52 52 52, 62 73 73 Y00-1C Y00-1F 42 Y00-1F		31,32	31,32	31, 32, 41, 42	32, 41,	151/52	. 52		
Y00-1D 22, 32 22, 32, 41, 52 52, 62 /3 Y00-1E 42 Y00-1F	Y00-1A Y00-1B	12, 22, 32	22, 32	22, 32, 42	22, 32,	43,53	52, 62	73	73
	Y00-1D			22, 32, 42	41; 52	52	52, 62	73	73
The Continue of the Continue o				7.55.451		$\Sigma_{\mathbb{R}^2}$			

¹⁾ Selection for transformers with rated secondary current 1 A. Sizes for 5 A-on request

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Equipment Selection

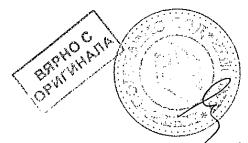
4MC3 indoor bar-primary bushing-type current transformer



Size specification for 4MC36 transformers ¹⁾

Size specification	on for 4MC3	6 transformer	s 1)	le gan d'Estre est d'Aranne de co es es				
10h to 14h position of s Order No.	82-1F %	84-1G	85 [H ₄ /s	87-11	ion of Order No.	90-1E	92-1N	93.1P
C30-0A C40-0A F30-0A F40-0A J40-0A J60-0A Q40-0A	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	11, 12, 21, 22, 31, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52, 61, 62	31, 32, 41, 42, 51, 52, 61, 62, 72, 73	41, 42, 51, 52, 61, 62, 72, 73
Q60-0A S60-0A	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	11, 12, 21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52,	31, 32, 41, 42, 51, 52, 61, 62, 72, 73	41, 42, 51, 52, 61, 62, 72, 73
S80-0A	12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	41, 42, 51, 52, 61, 62 22, 31, 32, 41, 42, 51, 52, 61,	41, 42, 51, 52, 62, 72, 73	41, 42, 51, 52, 62, 72, 73
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F30-65	22, 31, 32	12, 21, 22, 31, 32 12, 21, 22, 31,	12, 21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52, 62	42, 52, 62, 72, 73	52, 62, 72, 73
F40-6S	12, 21, 22, 31, 32, 31, 12, 21, 22, 31, 32	22, 31, 32, 21, 12, 21, 22, 31, 32	22, 31, 32, 41, 42- 21, 22, 31, 32,	21, 22, 31, 32, 41, 42, 51, 52 21, 22, 31, 32,	21, 22, 31, 32, 41, 42, 51, 52 21, 22, 31, 32,	42, 51, 52, 61, 62	42, 52, 62, 72, 73 41, 42,	52, 62, 72, 73 42, 52,
1 J60-85	32 12, 21; 22, 31;	32 12, 21, 22, 31, 32	41, 42 21, 22, 31, 32,	41, 42, 51, 52	41, 42, 51, 52	32, 41, 42, 51, 52, 61, 62 21, 22,	51, 52, 62, 72, 73 41, 42, 51, 52,	62, 72, 73 42, 52,
Q60-85	32 21, 22, 31, 32	12, 21,	41, 42 = 1 ; 21, 22,	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	31,32, 41,42, 51,52, 61,62 22,32,	51,52, 61,62, 72,73 42,51,	62, 72, 73 42, 52,
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580-8S	21, 22, 32	31, 32, 42	21, 22, 32, 41, 42	42, 51, 52 21, 22, 32, 41, 42, 51,	51,52- 22,32, 41,42, 51,52	52, 61, 62 22, 32, 41, 42, 51, 52,	42, 52, 62, 72, 73	52, 62, 72, 73
Yoo-oA	11, 12, - 21, 22, - 31, 32	11,12, 21,22, 31,32	21, 22, 31, 32, 41, 42	52 21, 22, 18 32, 41, 18 42, 51, 19 52	22, 32, 41, 42, 51, 52	62 22, 42, 52, 61, 62		52, 62, E 72, 73
Y00-0B Y00-0C Y00-0D	22, 32 11, 12, 21, 22, 31, 32	22,32 11,12, 21,22, 31,32	22, 32 21, 22, 31, 32,	22, 42, 52	42, 52 22, 32, 41, 42	42, 52, 62 22, 52, 62	52	53 73 (1)
Y00-1A Y00-1B Y00-1C	31, 32 22, 32	22, 32	41, 42 22, 32	42, 51, 34, 55, 55, 55, 55, 55, 55, 55, 55, 55, 5	22, 32, 41, 42; 51, 52		73 73	73
Y00:1D Y00:1E Y00:1F	22	-22. by	22, 42	52			73	73
1) Calardan for the control of			nest with a series	and well-the sealing		企业是国际区	CANADAS PRINC	。这就是经历上海

¹⁾ Selection for transformers with rated secondary current 1 A. Sizes for 5 A on request









HME2 outdoor support-type cu ith position Operating voltage (maximum value)	Position: Order No.:	1 2 3 4 5 6 7 - 4 M E 2 5 6 7 -		11 12 -	13 14 15	6 1 - A	Order codes
				(1,4,1,144 p.1,144 a.r. 1,2)	1634 4:- 11/201		
voltage impulse withstand power	short-duration er-frequency		e 22	e 55	See page 55 See page 55 See page 56	See page 56 See page 56	
voltage	stand voltage		See page 55	See page 55 See page 55	p pag	e pag	
$ u_{\mathbf{n}}$, $ u_{\mathbf{p}}$, $ u_{\mathbf{p}}$, $ u_{\mathbf{p}}$	D_{θ}		Š	S S	N N N	% %	
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36 170	70	4 M E 2 6	271.7 E 197				
· [편집] 첫 💆 10 - 10 전 - 12 시간 10 - 12 인	4		44 - 381 140 154				
th to 9 th position							
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							•
Rated Rated Rate short-time primary current primary c							
thermal current with pri	imary		37.0				
	建筑市的区域 企		光光速度 存款推行				
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MASSES ASSESSED ASSES	<u>Proproductions</u>		98 1945 - 3 A				
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1.5	25 ≝	■ \$2.5 CENTER THANKS 1.6	- 3 F				
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5 2x	25 🔳	2 5	- 3 F				
7.5 2x	50 a 5	■ 行法主義と対象地対抗之間を対 ■ 3 2	二/学派人(- 3 L				•
7.5 2x 2x	50	- 17 (L. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	PERMIT	\\ '	\ \		
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25 4 4 5 7 3 22 10 11 4 12 13 14 14 2 2x 15 30 2x	. 250	■ 表示技术人的推制的PAI等。 5 6/	~ 3/6, A				
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60 2x 2x 2x 2x 3x	300 #	TO THE PERSON OF					
	100 <u>0</u> 5 T. (1)		各計畫				
6th to 9th position continued on page 54							M.
-Configuration example						/	
Outdoor support-type current transformer		4 M E 2				ŕ	
Maximum operating voltage $U_{\rm m} = 24 \text{ kV}$			45 (12.4) 5 (13.4)				
Rated lightning impulse withstand voltage $U_{\rm p}$ = 125 kV Rated short-duration power-frequency withstand voltage	se U _d = 50 kV				1		
Rated short-time thermal current Ith = 15 kA	=				1.0	and the second	

Rated short-time thermal current I_{th} = 15 kA Rated primary current I_{PN} = 2x 75 A

Example for Order No.: 4/M E 2 4/4 3 3 1 5 1 5 1

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th to 9 th position (continued) ated short-time thermal current/ ated primary current	Position: Order No.:	1 2 3 4 M E	4 5 6	7 -	8 9	10	11 12	- 13	14	15 16		Order coo
Rated Rated 9	ited Thermal								:		•	1 .
short-time plimary current orimary thermal current with r	ited Thermal /current) strength Primary ratio					Je 55	Je 55 Je 55	53.	e 55	le 56.	page 56	
ra e multi Distriction de la completación de l	i rétio			(1) (1)	格敦	See page 55	See page 55 See page 55	See page 55	See page 55	See page 56 See page 56	See pag	•
in Fin 12 A	M X X X X X X X X X X X X X X X X X X X			1915. Wates		Ů,		. v	Ņ	ν. ν.	 .v	
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6 60 - 7.5 75			2 13	6 ~	0 К 0 L							
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rent in the second of the seco							:					

Configuration example Outdoor support-type current transformer $(U_{\rm m}=24~{\rm kV},\,U_{\rm p}=125~{\rm kV},\,U_{\rm d}=50~{\rm kV})$ Rated short-time thermal current $I_{\rm th}=100~{\rm kA}$ Rated primary current $I_{PN} = 1000 \text{ A}$

Example for Order No.: 4 MEZAZZZZZZZZZ Order codes:

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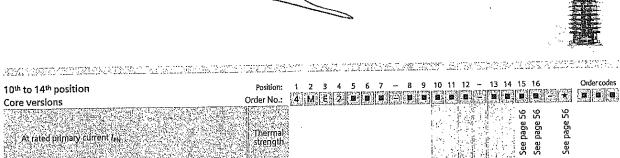
10th to 14th position

At rated primary current I_{PN}

Core versions







Thermal

strength.

0.5 0.6 1.5 2 2.5 3 4 5 6 7.5 10 15 20 25 30 40	100 /
50 60 80 100 120 1 2 3 4 5 6 8 10 12 15 20 30 40 50 60 80 100	100 x I _{PN}
120	200 x I _{PN}
0,5 0.6 1.5 2 2.5 3 4 5 6 7.5 10 15 20 25 30 40	200 v I
50 60 80 100 120	300 x J _{PN}
1st core 2nd core 3rd core	Rated
	primary
	current:
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0.2 FS10 5	
15 - 43 - 155 130 5 111 5 2 5 5 5 5 7 7 7 7 7 8 2 7	
0.5 FS5 10	
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30 30	
0.2 FS10 15 0.5 FS5 15 5P 10 15	
0.2 FS10 15 0.3 F33 13 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	
0.5 FS5 15 5P 10 15 5P 10 15	四 磁 耳

Feasible (other combinations on request)

Configuration example... Outdoor support-type current transformer $(U_{\rm m} = 24~{\rm kV},\, I_{\rm th} = 100~{\rm kA},\, I_{\rm PN} = 1000~{\rm A})$ Thermal strength 300 x IPN 1st core class 10P; instrument security factor 10; rating 60 VA 2nd core without 3rd core without

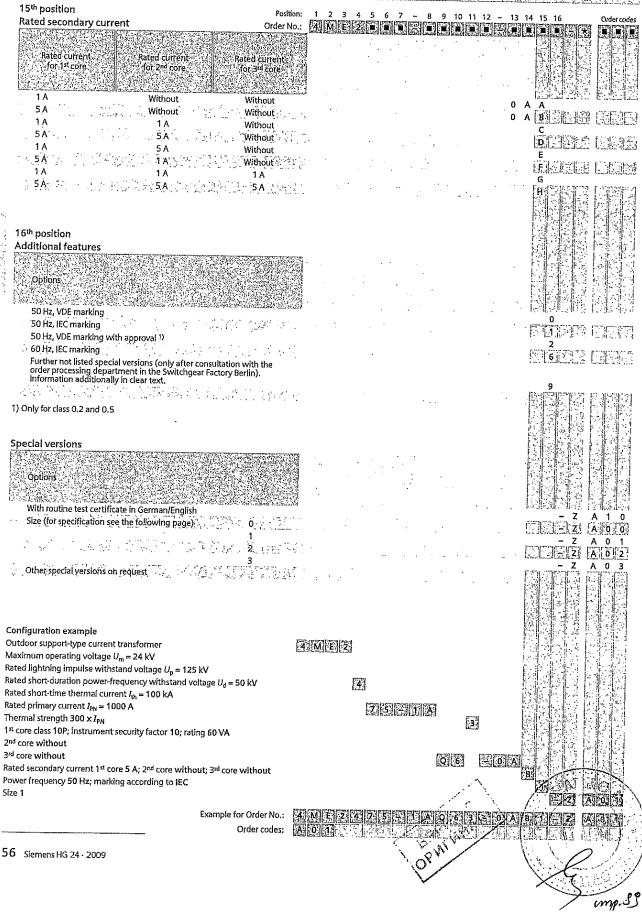
> Example for Order No.: Order codes:

4 M E 2 4 7 5 - 1 A

0 6 4 M E 2 4 7 5 - 1 A 0 6 3

Q

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e specification for 4		ptó 12 KV		At 24 kV		At 36 kV	:
Order No.		with	rated short-time therm	al current			
	100 x I _{fN}	200 x / _{PN} ∰	00 x / _{PN} 10 10	0 x I _{PN} 3 c.	200 x J _{PN}	100 x J _{PN}	
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C20A	. 1	1	1.	1	1	1 -	
СЗ0А	1	1	1	1	1 : 1,1 = -	1	
C4.0A	1	i iv ja sa 🦥 .	$,\underline{1}, \dots, \underline{1}, \dots =$			1.1	
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Q4-0A			2			1.	
Q60A	2	2 - 47 - 27 - 18 - 18 - 18 - 18 - 18 - 18 - 18 - 1	2 Laintean ta	1	2	2 .	
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E3.4L				2	. <u></u>	1	
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Siemens 16 24-2009 57

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4ME3 outdoor support-type current transformer 5th position 8 9 10 11 12 - 13 14 15 16 Order codes Operating voltage (maximum value) Order No.; Operating Rated lightning Rated short-duration power-frequency impulse withstand voltage voltage See page 60 See page 60 See page 60 See page 60 See page 61 See page 61 See page 60 See page 61 withstand voltage 12 75 28 M E 3 24 125 50 4 M E 3 36 170 70 E 52 250 .95 M E 3 6th to 9th position Rated short-time thermal current/ Rated primary current Rated primary current primary current with primary střenáth thermal current 0.5 0 0 2x V MOLTS B 10 2x 0 3 15 2.5 25 6 15 但指指的 5 25 2 5 .5 2x 50 3 2 - 3 L 3 6 (- 3 J) 7.5 2x 75 10 2x.: 50 10 100 3 6 -3 15 75 2x-15 150 4 3 20 100 2x 4 8 = 3 M 20 2x 200 4 8 25 250 2x 5 4 - 3 R 30 2x 150 5 6 3 5 6 14 3 6 6 3 - 3 Q 30 2x 300 40 2x 200 40 Zx: 400 6 3 (3 T 50 2x 250 6 3 R 50 6 7 - 3 0 2x 500 60 2x 300 0 3 60 . 2x') 600 6th to 9th position continued on page 59 Configuration example Outdoor support-type current transformer AMME 5 Maximum operating voltage $U_{\rm m} = 52 \text{ kV}$ RARHOC. Rated lightning impulse withstand voltage $U_p = 250 \text{ kV}$ William Control Rated short-duration power-frequency withstand voltage $U_d = 95 \text{ kV}$

Rated short-time thermal current $I_{th} = 25 \text{ kA}$ Rated primary current $I_{PN} = 2x 250 A$

Example for Order No.:

Order codes:







6th to 9th position (continued)	Position:	1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Order codes	
Rated short-time thermal current/	Order No.:		
Rated primary current	Thermal		
Rated Rated Short-time primary current primary current with primary current with primary current with primary	t strength	See page 60 See page 60 See page 60 See page 60 See page 61 See page 61 See page 61	
thermal current Substitution with primary multiration	会对的数据的 的	See page 60 See page 60 See page 60 See page 60 See page 61 See page 61 See page 61	
J _B J _{PN} J _{PN} A A A A	00×64 40×00 7×00		
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人名英格兰 医克里克氏			1
Configuration example			
Outdoor support-type current transformer $(U_m = 52 \text{ kV}, U_p = 250 \text{ kV}, U_d = 95 \text{ kV})$			
Rated short-time thermal current $I_{th} = 100 \text{ kA}$ Rated primary current $I_{PN} = 1000 \text{ A}$			$\langle \cdot , \cdot \rangle$
	ole for Order No Order code		1

10 th to 14 th position Core versions	Position: Order No.:	1 2 3 4 M E	4 5 6	7 -	8 9 117271118	10 11	12 - 13	14 15	ottom from on tonor	Order codes
	Sider No.:									
At rated primary current / _{PN}	Thermal strength	1	1					See page 61	See page 61 See page 61	
								See	See	
0.5 0.6 1.5 2 2.5 3 4 5 6 7.5 10 15 20 25 30 40 50 60 80 100 120 150 200 250 300	100 x I _{PN}	•				rain script	0.000	lada	••	
1 2 3 4 5 6 8 10 12 15 20 30 40 50 60 80 100 120	200 x 7 _{PN}		٠.	*	7.				*	
0.5 0.6 1.5 2 2.5 3 4 5 6 7.5 10 15 20 25 30 40 50 60 80 100 120	300 × I _{PN}	White				t, lassilā silavīstēs	734441.0450 3			
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easible (other combinations on request)	,									
					50 155 150 140					
figuration example										
door support-type current transformer	ā	MED.								
= 52 kV, $I_{\rm th}$ = 100 kA, $I_{\rm PN}$ = 1000 A) mal strength 300 $\times I_{\rm PN}$			8 2 5		IA .				1	1 To 1
ore class 10P; instrument security factor 10; rating 60 VA core without					声 说			1	د کی دوج بر وم مستسمد داد ومو	
ore without					15.0	534 5		-L'	-: <i>(</i>	/ · • • •





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15th position Position:	The state of the s	4 15 16 Order codes
Rated secondary current Order No.:		
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16 th position		
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50 Hz, IEC marking 50 Hz, VDE marking with approval ¹⁾	•	2
60 Hz, IEC marking		6 1 1
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	\sim	
1) Only for class 0.2 and 0.5	\wedge	月野、野、猪、
	/ '	

Special versions

Optionen

With routine test certificate in German/English
Other special versions on request

Configuration example

Outdoor support-type current transformer

Maximum operating voltage $U_{\rm m}$ = 52 kV

Rated lightning impulse withstand voltage $U_p = 250 \text{ kV}$

Rated short-duration power-frequency with stand voltage U_d = 95 kV

Rated short-time thermal current $I_{\rm th}$ = 100 kA

Rated primary current I_{PN} = 1000 A

Thermal strength 300 x $I_{\rm PN}$

1st core class 10P; instrument security-factor 10; rating 60 VA

2nd core without

3rd core without

Rated secondary current 1st core 5 A; 2nd core without; 3rd core without

Power frequency 50 Hz; marking according to IEC

Example for Order No.:

Order codes:

8

3

Q 6 F O A

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cmp. 10

Voltage transformers, type of construction according to IEC 1)

Position: 1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Order codes type of construction according to IEC 1)

Type of design



Indoor voltage transformer, block-type design, small type of construction according to DIN 42600, single-phase cast-resin insulated, operating voltage up to 12 kV or 24 kV

4 M R 1 Selection from page 63ff



Indoor voltage transformer, block-type design, small type of construction according to DIN 42600, double-phase cast-resin insulated, operating voltage up to 12 kV or 24 kV

4 M R 2 Selection from page 63ff



Indoor voltage transformer, block-type design, large type of construction according to DIN 42600, single-phase cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV

4 M R 5 Selection from page 63ff



Indoor voltage transformer, block-type design, large type of construction according to DIN 42600, double-phase cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV

4 M R 3 6. Selection from page 63ff



Outdoor voltage transformer, small type of construction, single-phase cast-resin insulated, operating voltage up to 12 kV, 24 kV, 36 kV or 52 kV

4 M S 3 Selection from page 63ff



Outdoor voltage transformer, small type of construction, double-phase cast-resin insulated, operating voltage up to 12 kV, 24 kV, 36 kV or 52 kV

1 M S 4. Selection from page 63ff



Outdoor voltage transformer, large type of construction, single-phase cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV

4 M S 5 Selection from page 63ff

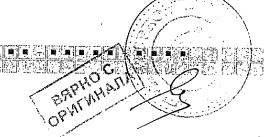


Outdoor voltage transformer, large type of construction, double-phase cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV

4 M S 6 Selection from page 63ff

1) Transformers according to ANSI standard on request

Example for Order No.: Order codes:



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aximum operatin 2 kV	1110 کی ۲۰۰۰ کی	Position:	1 2 3 4 5 6 7 -		10 11 1	THE PROPERTY OF THE PROPERTY O
60 Hz		Order No.:				Capaners Contract at the Contract of the Contr
* 1	a O					
Maximum coperating voltage Rated lightning impul withstand voltage Rated short duration power frequency withstand voltage	Rated primary voltage R1 – single phase R2 – double phase R6 – single phase	Npe 4MK6 – double-prisse Type 4MS3 – single-prisse Type 4MS5 – double-prisse Type 4MS5 – double-prisse Type 4MS6 – double-prisse		N IN	9 10 1	
Maximium operating solitige Rated lightning in writistand solitige Rated short-durall power-freguency writistand solitige	ed primary vol single-phase double-phase single-phase	double-phas single-phase double-phase single-phase		See page 65 See page 65	See page 66 See page 66	See page 67 See page 67
at the standard stand				ec as	8 ed 94	89 C. C. C
Maximum Deperating voltage Rated lightning in Withstand voltage Fated short dural power frequency withstand voltage	Rate ART	lype 4MN6—double-phase lype 4MS3—single-phase type 4MS5—single-phase lype 4MS6—double-phase		Ϋ́	ййι	দে প
U _{max} U _p 3 U _d	答	Type 4MK6 Type 4MS3 Type 4MS4 Type 4MS5 Type 4MS5				
kV. □ kV: □ kV	SOURCE STATE OF Y				,	
12 75 28	3.3/√3 ■ ■	.	2 0 8			
	3.3 □ 3.6/√3 □ □		2 7 0			
	3.6 📜	3	2 7 0.			
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	5 √3 ■ ■		2 1 3			
	∂.[5] <u></u>	M 1 M	2 1 3			
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e v	6,6/√3 ⊠ ■		2 1 7			
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e <u>s</u> e en e	11 N3 F E		2 3 0		1	
	. 11 ■ 6–10 /√3 ■	w T	2 6 1		(.

Configuration example Voltage transformer Outdoor design, single-phase Rated primary voltage $U_{\rm prim}=6.6 \ensuremath{N_3}$ kV

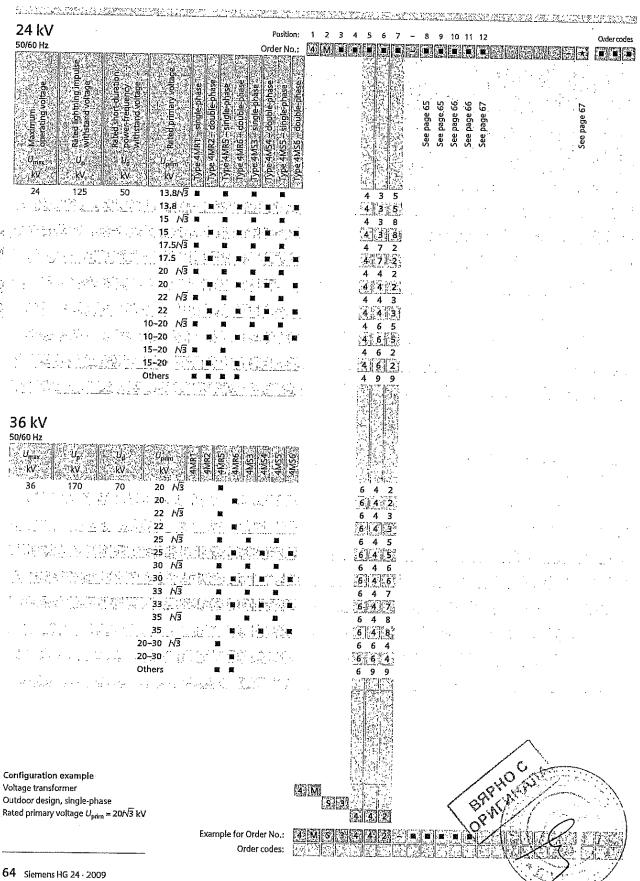
4 M \$ 3 2 1 7

Example for Order No.: Order codes:

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complete













SET LIEFE, INC. INC. DEEL SEEVEL TO DETECT OF THE TEXTS. THE SEE		
52 kV Position		
50/60 Hz Order No		Al
E Maximum contrating voltage. E Rated lightning-impulse with search of the search of		
A Maximum S E Rated flatining imple Rated flatining imple Rated short-duration Power-frequency Whits and challes phase Type 44/R1 = single-phase Type 44/R3 = single-phase Type 44/R3 = double-phase Type 44/R3 = double-phase	ee page 67	
Maximum operating vo coperating vo coperating vo with send in the send of the send vow has a single-MRI — single-MRS— single-MRS— single-MRS— single-MRS— single-MRS— single-MRS— single-MRS— single-MRS— single-MRS— single-	See page 67	
Waxim opperation with the MRZ is a MRZ in MR	No. 1	
N	Type 4MS6	
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0th 44 - m		
8 th position Auxiliary residual voltage winding		
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9 th position Rated secondary voltage		
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100年 - 1	B	
120√5 展 版 图 版 120 □	C	
•		
•		
Configuration example Voltage transformer		
Outdoor design, single-phase		

Outdoor design, single-phase Rated primary voltage with multi-ratio $U_{prim} = 35\sqrt{3} \text{ kV}$ Without auxiliary residual voltage winding Rated secondary voltage $U_{sec} = 110 \text{ V}$

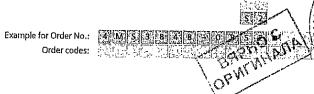
Example for Order No.: 4 M S 3 B 4 B 0 B F F

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10th/11th position		Position;	1 2	3 4 5	6 7	- 8	9 10 11	12				Order coo
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ge level	single-phase double-phase angle-phase double-phase	single phas dbuble pha single phas double pha						6				
	– single phase - double phase - aingle phase - double phase	Single phase double phase single-phase double-phase			•		(1)250 (4)250 (4)250 (4)300 (4	See page 67			See page 67	:
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							134					
nfiguration example							1. 18			بسبسي		-

Configuration exam Voltage transformer Outdoor design, single-phase Rated output of measuring winding 180 VA Accuracy class 0.5









BOUND ON A SAME AND A NUMBER OF SAME AND SAME AND SAME OF SAME AND 8 9 10 11 12 12th position Additional features Options 50 Hz, VDE marking 50 Hz, IEC marking 50 Hz, VDE marking with approval ¹⁾ 60 Hz, IEC marking Other features on request 场的 计二级存储器 1) Only for class 0.2 and 0.5 Additional equipment

With routine test certificate in German/English

Configuration example Voltage transformer

Outdoor design, single-phase, cast-resin insulated Rated primary voltage with multi-ratio $U_{prim} = 35/\sqrt{3} \text{ kV}$ Without auxiliary residual voltage winding

Rated secondary voltage $U_{sec} = 110 \text{ V}$ Rated output of measuring winding 180 VA

Accuracy class 0.5 Additional features 50 Hz, IEC marking

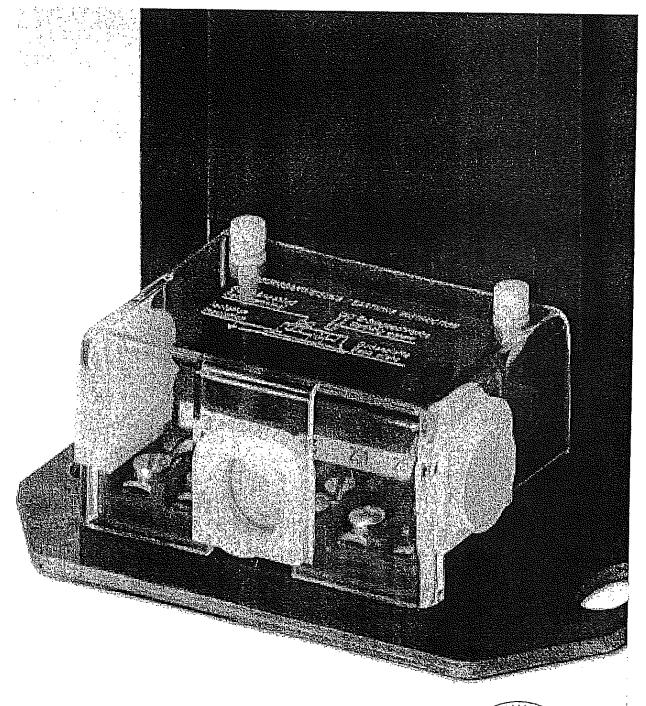
With routine test certificate in German/English

Example for Order No.:

Order codes:

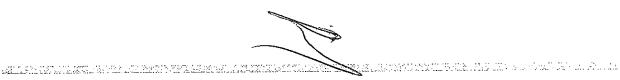
848

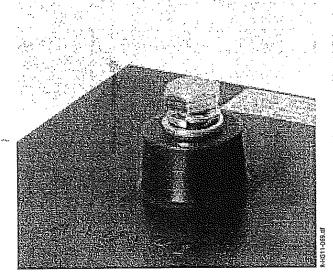
4MSSI4BECRESKI



OF WINHAUM







Primary connection terminal of 4MR12 voltage transformer

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Voltage transformers:	
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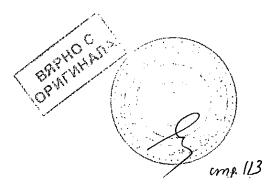
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4MA74	24	50	125	50/60	20 to 2500	2 x 20 to 2 x 60	0 1/5	1,2	80 .atenatics (111)	120		5000	25	2
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4MB12	12	28 ·	75	50/60	1500 to 4000	only possible or secondary side		1.2	100 x J _{PN}	practically unlimited	3	3000	19 or 26	4
4MB13	12.	28	7 5	50 <i>l</i> 60	1500 to	only possible or secondary side		1.2	100 x J _{PN}	practically '	3	1.3000.	34	4;
4MB14	241)	501)	1251)	50/60	1500 to 4000	only possible or secondary side		1.2	100 x I _{PN}	practically unlimited	3	3000	26	4
4MC22	12	,-28 ²	75	50/60	150 to 3000	only possible or secondary side		1.2	100 x <i>I</i> _N , '	practically unlimited	· 3.	5000	12 to 48	5
4MC24	24	50	125	50/60	150 to 3000	only possible or secondary side	로, 발립당 ¹ 1/5	1.2	100 x I _{PN}	practically	분.기. 전 3	5000	28 to 48	
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					10000	secondary side	1/5	1.2	#100 x J _{PN}	unlimited :	47 3	5000	32 to 150	1 -7
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4ME22	12	28	75	50/60	5 to 1200	2 x 5 to 2 x 600	1/5	1,2	80	2.5 x 7 _{th}	i - 5	2400,	22	9/10
4ME24	24	50	125	50/60	5 to 1200	2 x 5 to 2 x 600	1/5	1.2	80	$2.5 \times I_{\mathrm{th}}$	3	2400	22	9/10
4ME26	36	70 .	170	50/60	5 to 1200	2 x 5 to 2 x 600	^1 <i>15</i>	1.2	80	2.5 x 7 _{th}	34.	2000	. 22	11/12
4ME32	12	28	75	50/60	5 to 3000	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x I _{th}	3	5000	65	13
4ME34	24	50	125	50/60	5 to 3000	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x / _{th}	3.	5000	65	13
4ME36	36	70	170	50/60	5 to 3000	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x I _{th}	3	5000	65	14
4ME38	52	95	250	50/60	5 to 3000'	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x I _{th}	3 - 3	5000	65 57	15
			重进第								i irrin Susidhe		MAIN.	

¹⁾ Also possible on request: $U_{\rm m}=17.5$, $U_{\rm d}=38$ kV and $U_{\rm p}=75$ kV



Technical DataElectrical data, dimensions and weights of current transformers



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Size specification for 4MC	2 transformers		to 9th positio	n of Order t	lo.		144			
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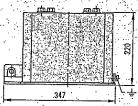
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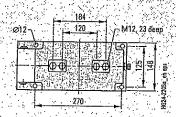
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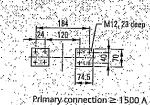
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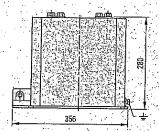
Dimension drawings for current transformers



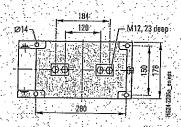
Dimension drawing 1

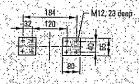


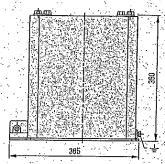




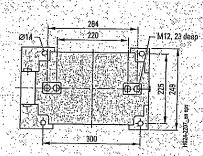
Dimension drawing 2

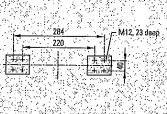






Dimension drawing 3



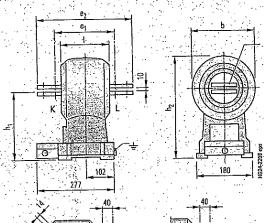


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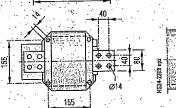
Electrical data, dimensions and weights of current transformers







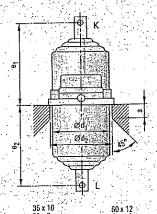
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	4MB12; size 2	260	230	350	295	425	196
	4MB13	273	_	-	288	425	300
	4MR14	260	230	350	295	425	196
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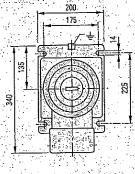


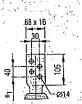
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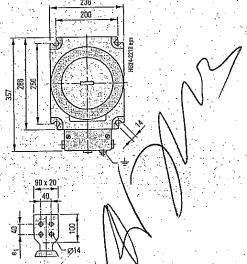
^{TE} Current ratings	Bars
Up to 1500 A	2 x 50 x 10
1500 A to 2500 A	2 x 80 x 10
. 2500 A to 3000 A	2 x 80 x 10 or 3 x 80 x 10
3000 A to 4000 A	3 x 80 x 10 or 3 x 100 x 10
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Dimension drawing 4





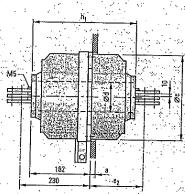


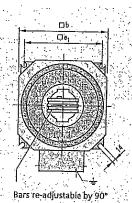


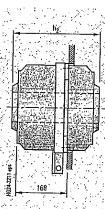
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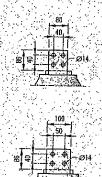
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	4MC26	1	60	180	185	315 11-25-21 (1-11-1	320	340 515	330 : "Sod (".".	1300	325	40 to 48
		01 ∺	50	230	253	· . : -280	. 285	313,	LOUIS CONTRACTOR CONTRACTOR	and Charles	un acter asser	and the state of t

1) Design for rated primary current 3000 A only available in size 21, 11 or 01







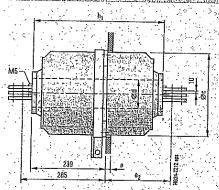


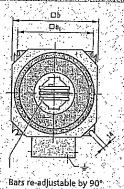
Dimension drawing 6

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11	10	295	278	115	255	175	313	285
12	60	295	. 278 -	115	255	∴-250	288	360
21	10	370	356	115	325	175	313	285
22.	60	370	356	115	325	250	288	360
	10	370	356	155	325		_	285
321.	60	370	356 : T	155	325	, A. J.		360
41	10	440	440	205	490	, <u>-</u>	-	285
42	60	440	440 "	205 · c	490		- <u>-</u>	360
51	10	530	530	297	490	-	- "	285
. 52	60	530	530	297	490			360
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, 62	60	530	530	310	490		4 6	
72	10	650	650	380	600		_	-
	60.60	650	650	380	600	344 I N E	ar Çiyle)
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Conductor bars

Normal designs
2000 A: 2 bars, 80 x 10 mm
2500 A: 2 bars, 100 x 10 mm
3000 A: 3 bars, 80 x 10 mm
4000 A: 3 bars, 100 x 10 mm





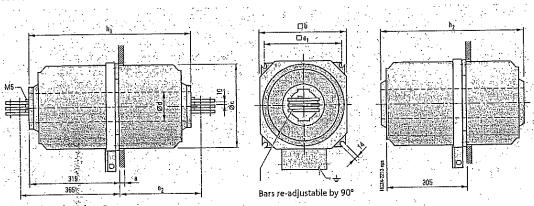
Dimension drawing 7 ...

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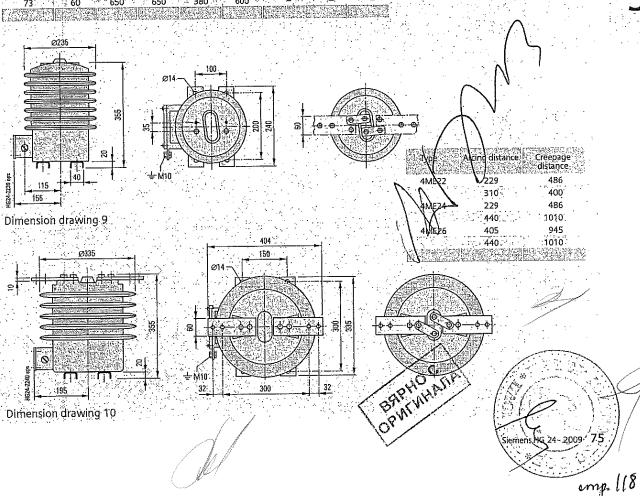


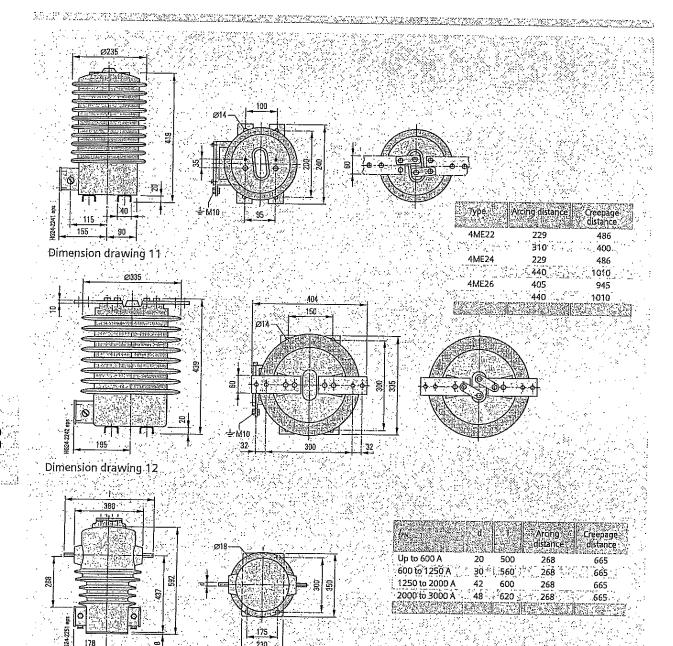


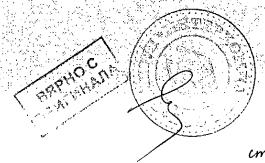


Dimension drawing 8

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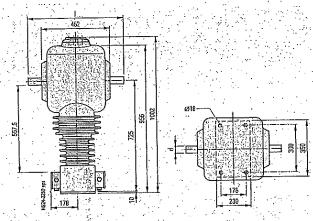




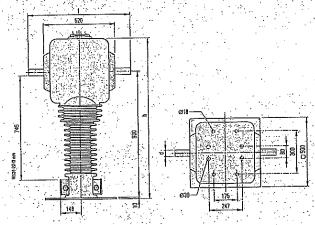
Dimension drawing 13

Electrical data, dimensions and weights of current transformers





Dimension drawing 14



				Arcing	Creepage
		KALE BARAS	eri er er er Karrestoaren	distance	distance
500 A	30	700	1125	745	1823
Up to 1250 A	30,	700	1188	745	. 1823
1250 to 2000 A	42	740	1188	745	1823
2000 to 3000 A	.45	760	1188	745	1823
2x 600 A	30	700	1217	745	1823
可加州沙地 斯	建图分类 标	解音樂	是對個的	开点定样	

Dimension drawing 15 Terminal designations of current transformers Designation of connection terminals 1 primary winding 100/1 A 1 secondary winding 2 equivalent primary windings 1 secondary winding with primary multi-ratio 1 primary winding , 1000–800 ... 200/1A 111 1 secondary winding with tappings with secondary multi-ratio, highest rated current at 11 or 54 1 orimary winding 2 or more secondary windings on separate cores

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4MR12	12	28	75	50/60	11.5 <i>N</i> 3	100/√3; 110/√3; 120/√3	350	1,9	230/4	2016-000-000-000-000-000-000-000-000-000-	18	16
4MR14 ¹¹	24	50	125	50/60	22/√3	100√3; 110√3; 120√3	500	.1.9	230/4		. 28	16
4MR22	12	28	75	50/60	11.5	100; 110; 120	400	∵ સક્કેમ ⊶		1991 THE TAN -	18	∷ ,
4MR24	24	50	125	50/60	22-	100; 110; 120	. 400				30	17
4MR52	12	28	75	50/60	11.5/√3	100√3; 110√3; 120√3	600	1.9	350/6	unid er milyling ut 	25	18
4MR54	. 24	50	125	50/60	22/\3	100/\3;110/\3;	600	19	350/6		inter-	e. galayar
4MR56	36	70	170	50/60	35√3	120√3 100√3; 11 <u>0</u> √3;	800	왕(년) 1일 - 1.0			(# 35 (************************************	18
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4MR64	. ::T::::r 24	50	125	50/60	22	100, 110, 120	600	ي روند د د ته	2 14 21 445 2 2 4 21 445	eren in	25	19
4MR66	36	70	:: ::170	50/60	35	100; 110; 120	600			는 교기회(1) 왕(4	35 \$1.55.5	19
4MS32	່າວນີ. ⊄ລ່ 12	28	1./175 75	50/60	12 <i>N</i> 3	. 100; 110; 120 100√3; 110√3;	, 800 **:			ra a kiri Ziji ya mi A Tumudanen di	:70÷	19
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4M534	24	50	.125	50/60	22]√3-	100/√3; 110/√3; 120/√3	400	.1.9 T	230/4	1000	75	20
4MS36	12	28	75	50/60	35√3	100√3; 110√3; 120√3	400	1.9	230/4	1000	79	20
4MS38	52	70	250	50/60	50√3	100/√3; 110/√3; 120√3	800.	1.9	500/9 ÷.	1000	~ 79	20
4MS42	12	28	75	50/60	12	100; 110; 120	500			1000	73	′ ∴ 21
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4MS46	12	28	75	50/60	35	100; 110; 120	900	ent entre ent	- 3 m ()	1000	82	1 日本本 21
4MS52	12	28	75	50/60	12√3	100√3; 110√3; 120√3	400	1.9	230/4	1000	35,5	22
4MS54	24	50	125	50/60	22√3	100√3; 11 <u>0√3;</u>	#1015.45472 400	<u>A A Y A</u> 1,9	230/4	<u>1000</u> 1000	35.5	22 22
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4MS64	24	50	125	50/60	. 22	100; 110; 120	500			1000	14.5	24
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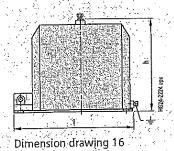


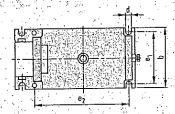




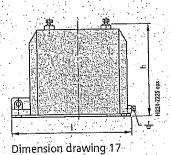


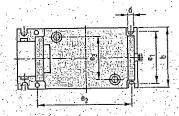
Dimension drawings for voltage transformers



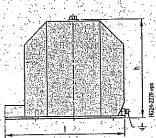


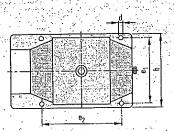
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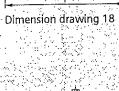


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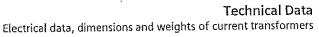
Dimension drawing 19

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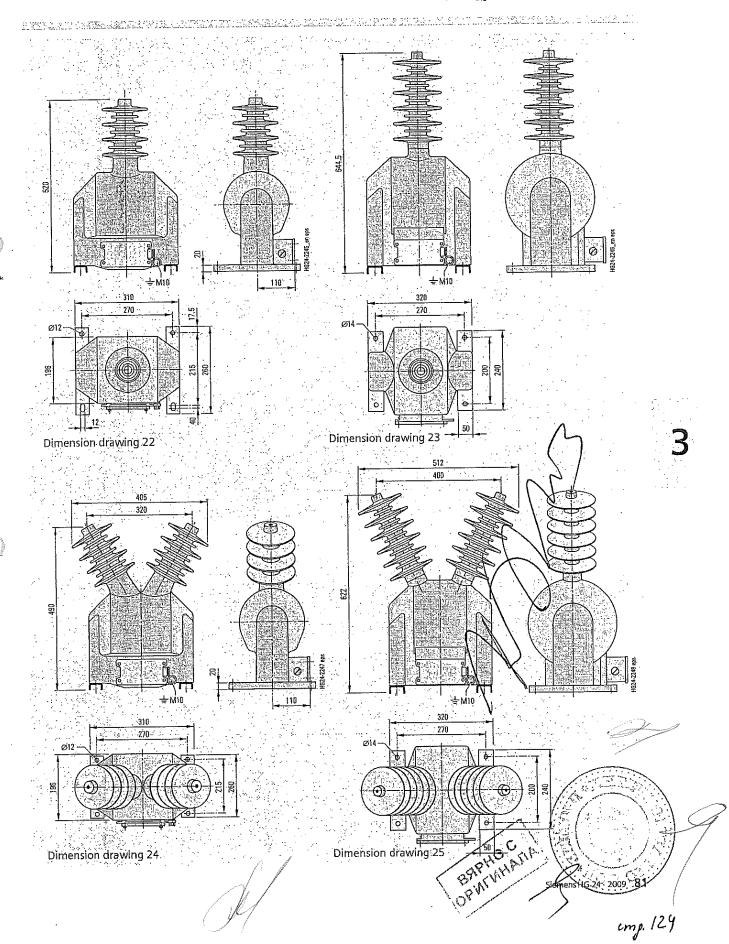
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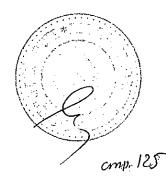






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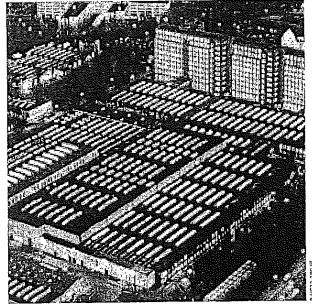




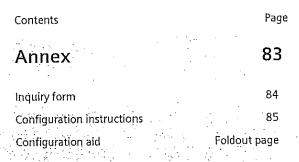




Brandenburg Gate, Berlin, Germany



Switchgear Factory Berlin, Germany







Dept.

Name

Street

Phone

Dept.

Name

Street

Fax

Postal code/city

Siemens AG

cma 127

Please copy, fill in and return to your Siemens partner.

Inquiry concerning	Technical data of c	urrent transfe	ormer		Other values
☐ 4MA7 current transformer☐ 4MB1 current transformer	Operating voltage	□ 12 kV □ 36 kV	□ 17.5 kV □ 52 kV	□ 24 kV	□kv
☐ 4MC2 current transformer☐ 4MC3 current transformer☐	Rated lightning impulse withstand voltage	□ 75 kV □ 170 kV	□ 95 kV □ 250 kV	□ 125 kV	□kv
☐ 4ME2 current transformer	Rated short-duration power- frequency withstand voltage	□ 28 kV □ 70 kV	□ 38 kV □ 95 kV	□ 50 kV	□kv
☐ 4ME3 current transformer	Rated primary current	□A	□ 2xA		
☐ 4MR voltage transformer☐ 4MS voltage transformer☐	Secondary current	□ 1 A	□ 5 A		
Management	Thermal strength	□ 100 x I _{PN} □ 300 x I _{PN}	□ 150 x I _{PN} □ 400 x I _{PN}	□ 200 x I _{PN} □ 500 x I _{PN}	
Please		□ 600 x I _{PN}	□ 800 x I _{PN}	□ 1000 x I _{PN}	□x I _{PN}
☐ Submit an offer	1st core	☐ Protection core ☐ Measuring core	□Class	☐Factor	VA
□ Call us □ Visit us	2 nd core	☐ Protection core☐ Measuring core	□Class	☐Factor	VA
Your address	3 rd core	☐ Protection core☐ Measuring core	☐Class	□Factor	DVA
Company	Technical data of vo	oltage transfo	rmer		Other values
Dept.	Maximum operating voltage	□ 12 kV □ 36 kV	□ 24 kV □ 52 kV		□kv
Name .	Rated lightning impulse withstand voltage	□ 75 kV □ 170 kV	☐ 95 kV ☐ 250 kV	□ 125 kV	□k∨
Street	Rated short-duration power- frequency withstand voltage	□ 28 kV □ 70 kV	□ 38 kV □ 95 kV	□ 50 kV	kv
Postal code/city	Rated primary voltage	□kv	□/√3		
Phone	Rated secondary voltage		□ 110 V □ 110/√3 V	□ 120 V □ 120√3 V	v <i>N</i> 3∨
Fax	Auxiliary residual voltage winding	☐ Without	□ 100/3 V	□ 110/3 V	□ 120/3 V
E-mail	Rated output of the measuring winding		□ Class 0,5 □ 50 VA	□ Class 1 □ 100 VA	□VA
Siemens AG	Application and other	requirements			
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Blocktype transformer, bushing-type transformer, outdoor transformer, etc.

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For configuration of your 4M protective and measuring transformers

You prefer to configure your instrument tra ______ner on your own? Please follow the steps for configuration and enter the ower number in the configuration aid.

Instruction for configuration of the 4M protective and measuring transformers

1step: Definition of the current transforme

Possible options:

Transformer design $(L_{\rm c})$ and $(L_{\rm c})$ and $(L_{\rm c})$ and $(L_{\rm c})$ are the state of
Core data

Coardio, hy 2000 /n

Quantity, byz. class, factor and rating of cores

Charles, byz. class, factor and rating of cores

These natures define the positions 3 to 15 of the order number of the current transformer.

2㎡ step: Definition of the voltage transformer

The Possible options Please specify the following includes:

Single-phase or double-phase 1.12.W to 52.W Un. 12.W to 52.W U. Un. 175.W to 250.W Rated Eghtning impulse with stand voltage (Up) Operating voltage (U_n) Number of priase

I JA 28 W10 95 W

Bated secondary vollage (U_{III})

Bated secondary vollage (U_{II})

Bated secondary vollage (U_{II})

Bated secondary vollage (U_{III})

Bated secondary vollage (U_{III})

Bated secondary vollage (U_{III})

Bated secondary vollage (U_{II})

Bated secondary vollage (

These rating define the positions 3 to 71 of the order number of the values transformer.

316 step: Do you have any further requirements concerning the equipment?

Should you still need more options than the possible equipment like terminal designations according to VDE or IEC, selection of sizes, routine test ceptificate, etc

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C, please contact your responsible sales partner.

Slemens HG 24 · 2009 85

Simmers AG.
Everyy Sector.
Power Ostribution Distribution
Wedum: Voltage
Wornerdampallee 104
13523 Beilin Germany.

Formore information, pease contact on Curromer Support Center.
Phone: 449, 1867.54.70 to Fast: 49, 186.52.47.71 Curryes, depending on provident Email: support externy@sterprost.com

Order No. Esboark (524-A)D1443-7500. Finted in Gerfrany. Dispo 31601; 449: 7460. KG 05, 05 24: 08: 18.

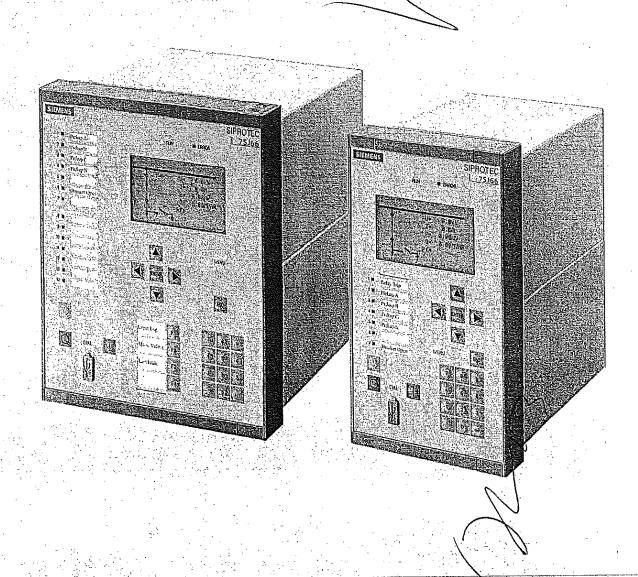
Freyeslebenstrasse 1 91058 Erlangen, Gen

Responsible for <u>Technical contents:</u> Siemens AG, E D MV C I LM Berlin

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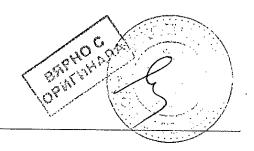
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Function overview, Hardware	3
Applications	4
Construction	6 .
Protection functions	6
Functions	12.
Communication	13
Selection table	14
Typical connections	15
Typical applications	17
Selection and ordering data	19
Connection diagram	24
Dimensions	28

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



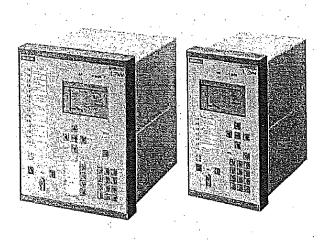


Fig. 1 SIPROTEC 4 7SJ66 multifunction protection relay

Description

The SIPROTEC 7SJ66 unit is a numerical protection, control and monitoring device, designed to use in Medium Voltage and Industry applications.

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

Protection functions (continued)

- · Inrush restraint
- · Motor protection
- Overload protection
- · Temperature monitoring
- · Under-lovervoltage protection
- · Under-loverfrequency 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 f, 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 (build in interfaces)

- System interface IEC 60870-5-103 / IEC 61850 / Modbus RTU / DNP3
- Service interface for DIGSI 4/ RTD-Box
- Electrical and optical interface
- RSTP, PRP (Redundancy Protocol (p) Ethernet)
- Front USB interface for DIGSI
- Time synchronization via IRIG BYDCF7X

Hardware

- Screw-type current terminals
- Spring or Screw-type Voltage and Binary I/O terminals
- · 4 current and 4 voltage transformers
- 16/22/36 binary inputs
- 7/10/23 output relaŷs
- Graphical or 8 line text display

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Application

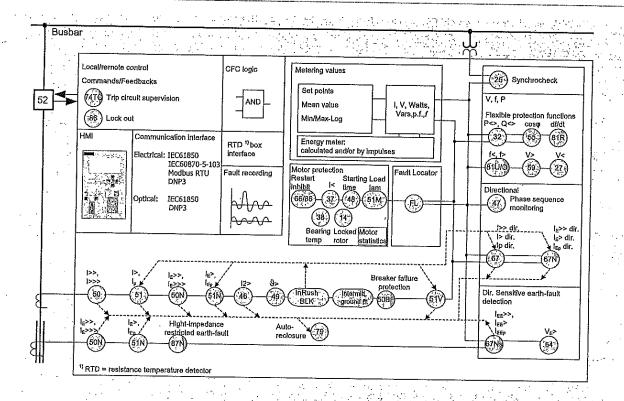


Fig. 2 Function diagram

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 currents. 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

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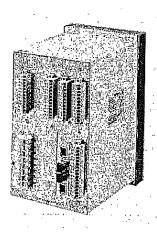


Application

ANSI 👉 💯 🤼	LEC STORES CONTROL VILLE	Protection functions
50, 50N		Definite-time overcurrent protection (phase/neutral)
(50,-51V, 51N)	I _p , I _{Ep}	Inverse overcurrent protection (phase/neutral), phase function with voltage-dependent option
67, 67N)	I _{dir} >, I _{dir} >>, I _{p dir} I _{Edir} >, I _{Edir} >>, I _{Ep dir}	Directional overcurrent protection (definite/inverse, phase/neutral), Directional comparison protection
(67Ns/50Ns)	J _{EE} >, J _{EE} >>, I _{EEp}	Directional/non-directional sensitive ground-fault detection
	-	Cold load pick-up (dynamic setting change)
59N/64	V _E , V ₀ >	Displacement voltage, zero-sequence voltage
M-	I _{IE} > .	Intermittent ground fault
(67Ns)	J _{IE} dir>	Directional intermittent ground fault protection
(87N)	Taran Taran	High-impedance restricted ground-fault protection
(50BF)	• .	Breaker failure protection
79		Auto-reclosure
25		Synchro-check ·
46	I ₂ >	Phase-balance current protection (negative-sequence protection)
<u>(47)</u>	V ₂ >, phase-sequence	Unbalance-voltage protection and for phase-sequence monitoring
49	Ֆ	Thermal overload protection
48	•	Starting time supervision
(51M)		Load jam protection
(14)		Locked rotor protection
(66/86)		Restart inhibit
37	I<	Undercurrent monitoring
38		Temperature monitoring via external device (RTD-box), e.g. bearing temperature monitoring
27, 59	V<, V>	Undervoltage / overvoltage protection
(59R)	dV/dt	Rate-of-voltage-change protection
32	P⇔, 0⇔	Reverse-power, forward-power protection
(27/Q)	Q>/V<	Undervoltage-controlled reactive power protection
(55)	. cos l	Power factor protection
(810/U)	f>, f<	Overfrequency / underfrequency protection
81R)	dfidt	Rate-of-frequency-change protection
21FL		Fault locator

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Construction, protection functions



50-1 50-2 nom

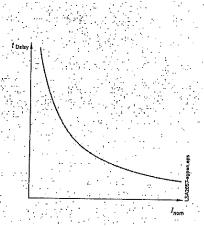


Fig. 3 SIPROTEC 7SJ66 rear view with optical Ethernet system interfaces

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 lugs.

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Protection functions

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.

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.

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.

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Protection functions

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 negativesequence system quantities (selectable). Using negativesequence 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)

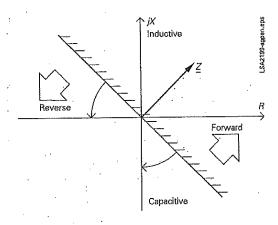
For isolated-neutral and compensated networks, the direction of power flow in the zero sequence is calculated from the zerosequence current I_0 and zero-sequence voltage V_0 .

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 lowresistance 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".

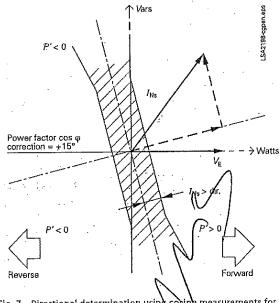
It has the following functions:

- TRIP via the displacement voltage V_E.
- · Two instantaneous elements or one instantaneous plus one user-defined characteristic.
- Each element can be set in forward, reverse, or nondirectional.
- The function can also be operated in the insensitive mode as an additional short-circuit protection.



Directional characteristic of the directional overcurrent protection





cosine measurements for Fig. 7 Directional determination using 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.



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Protection functions

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 summating the duration of the individual pulses and by triggering when a (settable) summed time is reached. The response threshold $I_{\rm IE}$ 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 halfperiod 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 specifically 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 Dy 5). This provides backup protection for highresistance 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.

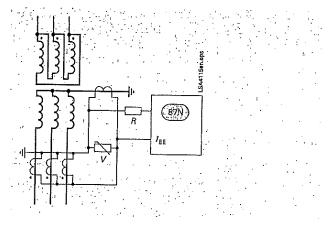


Fig. 8 High-impedance restricted ground-fault protection

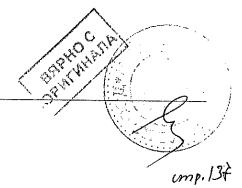
High-impedance restricted ground-fault protection (ANSI 87N)

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 7SJ6 units, the voltage is measured by detecting the current through the (external) resistor R at the sensitive current measurement input $I_{\rm EE}$. 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 stand- ard 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 _E >	•	50,50N
V<, V>, V _E >, dV/dt		27, 59, 59R, 64
3 <i>I</i> ₀ >, <i>I</i> ₁ >, <i>I</i> ₂ >, <i>I</i> ₂ / <i>I</i> ₁ , 3 <i>V</i> ₀ >, <i>V</i> ₁ ><, <i>V</i> ₂ ><		50N, 46, 59N, 47
P><, Q><		32
cos 8 (p.f.)><		55 ·
f><		810, B1U
dfldt><		81R

For example, the following can be implemented:

- Reverse power protection (ANSI 32R)
- · Rate-of-frequency-change protection (ANSI 81R)

Undervoltage-controlled reactive power protection (ANSI 27/Q)

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
- · Separate settings for phase and ground faults
- Multiple ARC, one rapid auto-reclosure (RAR) and up to nine delayed auto-reclosures (DAR)

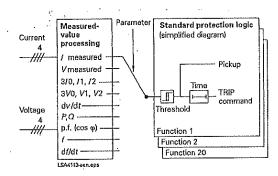


Fig. 9 Flexible protection functions

- 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 autoreclosure 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 scalculated using a thermal homogeneous-body model (according to !EC 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 ratios can be detected correctly while the motor is rotating and when it is stopped. The ambient temperature of 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.

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Protection functions

■ Motor protection

Restart inhibit (ANSI 66/86)

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 monitored for limit value violation. The temperatures are being 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 5/115).

Starting time supervision (ANSI 48/14)

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:

for $I > I_{MOTOR START}$

$$t = \left(\frac{I_{A}}{I}\right)^{2} \cdot T_{A}$$

= Actual current flowing

IMOTOR START = Pickup current to detect a motor start

= Tripping time

 I_{A} - Rated motor starting current

= Tripping time at rated motor starting current T_A

(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.

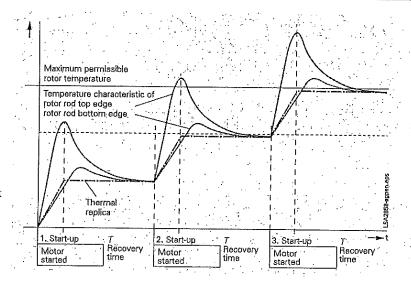


Fig. 10

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 I phase-balance current protection detects a phase failure or load unbalance 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 functions agrive over a





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 810/U)

Frequency protection can be used for over- frequency and underfrequency 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 (select-able 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:

- · ΣΙ
- ΣI^{x} , with x = 1... 3
- Σ i²t

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

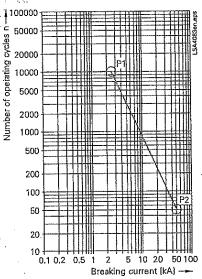
Two-point method

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 angle detection, and zero-sequence voltage detection.



0.5 1 2 5 10 20 50 100

Breaking current (kA) —

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 wideranging 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 fundtions

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

oned via.

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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.

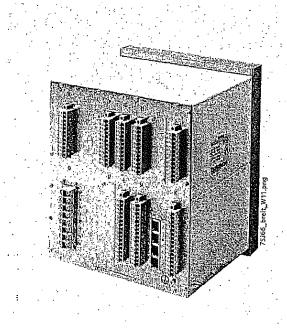


Fig. 12 SIPROTEC 7SJ663 rear view with communication ports

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.

Meaşured 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_E, I_{EE} (67Ns)
- * Yoltages V_{L1} , V_{L2} , V_{L3} , V_{L1L2} , V_{L2L3} , V_{L3L1}
- Symmetrical components I_1 , I_2 , $3I_0$; V_1 , V_2 , V_0
- Power Watts, Vars, VAIP, Q, S (P, Q: total and phase selective)
- Power factor (cos φ), (total and phase selective)
- Frequency
- Energy ± kWh, ± kVarh, 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.

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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 IRIG-B 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 masterless 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.

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

Modbus RTU protocol

This 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 time-stamped event list is available.

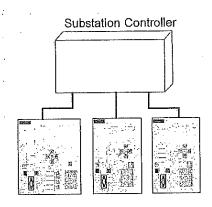


Fig. 13 IEC 60870-S-103: Radial electrical connection

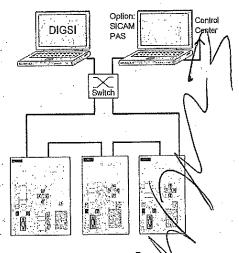


Fig. 14 Bus structure for station bus with Ethernet and IEC 61850, electrical and optical ring

DNP3

DNP (Distributed Network Protocol, version 3) is a messagingbased communication protocol. SIPROTEC 7SJ66 is fully Level 1 and Level 2-compliant with DNP3, which is supported by a number of protection units manufactures.

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Selection table

Selection table for multifu		Kirana a a a a a a a a a a a a a a a a a a	garanak latina n	o Jeologia Perselliere	e na everana evera	Parae s Province	Company of the control of the contro
Device.	が使っている。 ***: 11:12:11:11:11:11:11:11:11:11:11:11:11:1	rent protection c	- F1-	7SJ63			erasida yazar Akra da vina
Multifunctional protection functions	<u> </u>	√.	√3302	· / / / / / / / / / / / / / / / / / / /	75)64 1 1 V	75J82 -	75166"
CTs	4 .	4	4	4	:		Residence Estate
VTs	0/3	0	3/4	3	4	0/4	图式64省级
Binary Inputs incl. Life contact	3-11	3 - 11	8 - 11	11 - 37	7 - 48	11 - 23	16-36
Binary outputs	5-9	4-9	6-9	8 - 19	5 - 26	8-16	協が込む もっか
Spring-type terminals						B 7 10	<u>第 7 - 24 ま</u>
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	DC 110 - 250 V
UL listing	·		· / -	·	• •		F 44 (T 11)
Surface mounting case	•	· • ·					
Detached operator panel	·			•			[1] [1] [1] [1] [1] [1] [1] [1] [1] [1]
Languages	gelenles/fr/it/ ru/ch	ge/en/es/fr/it/ru	gelenles/fr/it/ru	ge/en/es/fr	gelenleslfrlitlru	gelen/pt/es/ru	en/es/ru
Front USB						· /	
Interfaces exchangeable			✓ ·		✓		
IEC 61850	•	. 6	. 6	. 6.			
IEC 60870-5-103	•	•	<u> </u>			<u></u>	
Modbus RTU							• (elec.)
Profibus FMS		111 3 12				· • • • • • • • • • • • • • • • • • • •	• (elec.)
Profibus DP					•		
PROFINET I/O		<u> </u>	•	<u> </u>	<u> </u>		
		• • • •	• •		•		
DNP3 serial/TCP	·•	•	•	<u> </u>	•	•	
RSTP		<u> </u>	· ·		(Y		
PRP	· · · · · · · · · · · · · · · · · · ·	<u> </u>	11. 1	· /			
HSR	20 8 4 6 7 6 6		*		- V		

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.

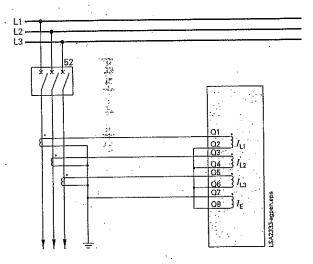


Fig. 15 Residual current circuit without directional element

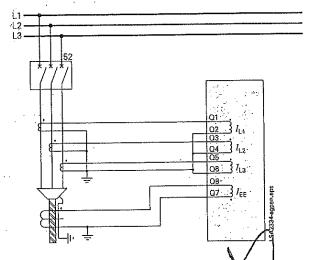


Fig. 16 Sensitive ground-current detection without directional element

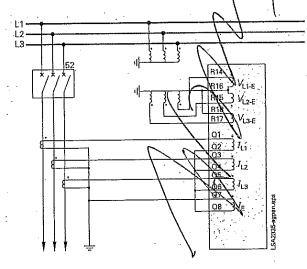


Fig. 17 Residual current circuit with directional element

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Typical connections

Connection for compensated networks

The figure shows the connection of two phase-to-ground voltages and the $V_{\rm E}$ 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.

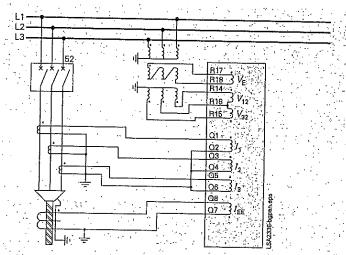


Fig. 18 Sensitive directional ground-fault detection with directional element for phases



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.

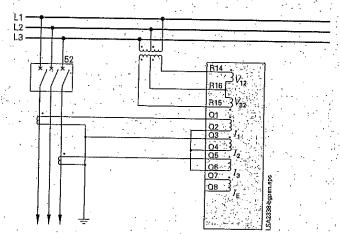


Fig. 19 Isolated-neutral or compensated networks

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.

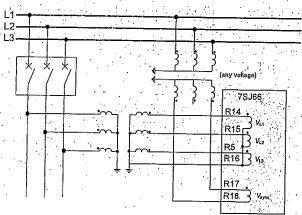


Fig. 20 Measuring of the busbar voltage and the outgoing feeder voltage for the synchro-check



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Type of network	3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	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 possible	Phase-to-ground connection or phase-to-phase connection
Isolated or compensated networks	Overcurrent protection phases directional	Residual circuit, with 3 or 2 phase- current transformers possible	Phase-to-ground connection or phase-to-phase connection
(Low-resistance) grounded networks	Overcurrent protection ground directional	Residual circuit, with 3 phase-current transformers required, phase-balance neutral current transformers possible	Phase-to-ground connection required
Isolated networks	Sensitive ground-fault protection	Residual circuit, if ground current > 0.05 I _N on secondary side, otherwise phase-balance neutral current transformers required	3 times phase-to-ground connection or phase-to-ground connection with open delta winding
Compensated networks	Sensitive ground-fault protection	Phase-balance neutral current transformers required	Phase-to-ground connection with open delta winding required

Undervoltage releases

Typical applications

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

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 opening of the live status contact upon failure of the protection unit or by shortcircuiting the trip coil in event of network fault.

in 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.

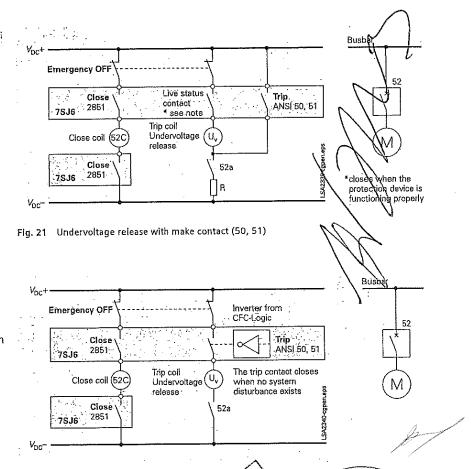


Fig. 22 Undervoltage trip with locking contact (trip signal 50 is inverted)

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Typical applications

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 75J66.

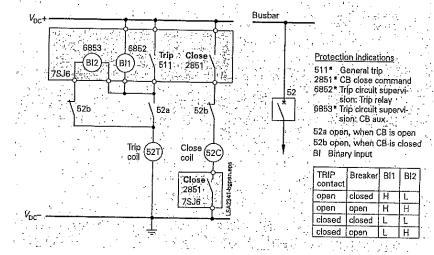


Fig. 23 Trip circuit supervision with 2 binary inputs

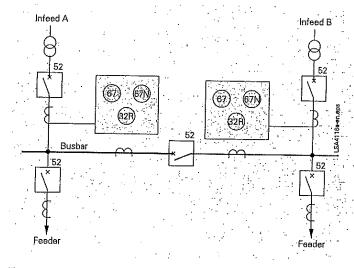
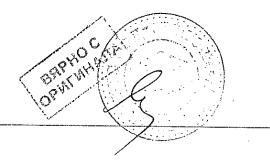


Fig. 24 Reverse-power protection for dual supply







Selection and ordering data

Description Order No.	
	3141516° 171819
SIPROTEC 75 J66 multifunction protection relay and bay controller 75 J66 LI-LILLI-L	
Housing, inputs, outputs	
Housing 1/3 19", 4 x U, 4 x I, 16 Bl, 7 BO, 1 life contact 1	
Housing 1/3 19", 4 x U, 4 x I, 22 BI, 10 BO, 1 life contact 2	
Housing 1/2 19", 4 x U, 4 x I, 36 Bl, 23 BO, 1 life contact, 4 function keys	
Measuring inputs	
$I_{ph} = 1 \text{ A}, I_{N} = 1 \text{ A (min.} = 0.05 \text{ A)}$	
Position 15 only with A, C, E, G	
I _{ph} = 1 A, I _N = sensitive (min. = 0.001 A) Position 15 only with B _i D, F, H	
I _{bb} = 5 A, I _N = 5 A (min; = 0.25 A)	
Position 15 only with A, C, E, G	
I _{ph} = 5 A, I _N = sensitive (min. = 0.001 A) Position 15 only with B, D, F, H	
Position 15 day with b, D, 1, 11	
Rated auxiliary voltage (power supply, indication voltage)	
DC 110 to 250 V, AC 115 to 230 V, threshold binary input DC 69 V 5	
DC 110 to 250 V, AC 115 to 230 V, threshold binary input DC 138V	
Construction	
Flush-mounting case, screw-type terminals, 8-line text display	
Flush-mounting case, spring-type terminals (direct connection), screw-type terminals for CT connection (direct connection) (direct connection) (direct connection) (direct connection) (direct connection) (direct connection)	
tion (direct connection/ring-type cable lugs), 8-line text display Flush-mounting case, screw-type terminals, graphical display	
Flush-mounting case, screw-type terminals, graphical display	
screw-type terminals for CT connection (direct connection/ring-type cable lugs), graphical display	
activity special management of the special spe	
Region-specific default settings/function versions and language settings	
Region World, 50/60 Hz, IEC/ANSI, language: English (language can be changed)	
Region World, 50/60 Hz, IEC/ANSI, language: English (language can be changed) E	
Region RU, 50/60 Hz, IEC/ANSI, language: Russian (language can be changed).	
System interface (Port B)	
No system interface IEC 60870-5-103, electrical RS485, RJ45-connector 1) 2	
Modbus RTU, electrical RS485, RJ45-connector 1)	1/1/20
DNP3, RS485 1) 9	The Big
IEC 61850, 100 Mbit Ethernet, electrical, double, RI45-connector 2)	LOR
IEC 61850, 100 Mbit Ethernet, optical, double, LC-connector 2)	1,0 5
DNP3 + IEC 61850, 100 Mbit Ethernet, electrical, double, RJ45-connector ²⁾	LER
DNP3 + IEC 61850, 1'00 Mbit Ethernet, optical, double, LC-connector 2)	L 2 S
Service interface (Port C) 0	
No interface	
DIGS! 4/Modem/RTD-box, electrical RS485, RJ45-connector 6	
Ethernet port (DIGSI port, RTD box connection, not IEC 61850), RJ45-connector	
Functionality	ed on next page

. 1) only available with position 12 = 0 or 2

· See next page

2) only available with position 12 = 0 or 6

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Selection and ordering data

Dir 67/67N Direction determination for overcurrent, phases ground Basic + Basic version (see above) Dir V,P,f: 67/67N Direction determination for overcurrent, phases ground 27/59 Under-lovervoltage 810/U Under-loverfrequency 27Q Undervoltage-controlled reactive power protection 27/47/59(N) Flexible protection (index quantities derived from 32/55/81R current and voltages): Voltage; power, p.f., rate-of-frequency-change protection Basic version (see above) 67/67N Direction determination for overcurrent, phases a ground 27/59 Under-loverfrequency 27Q Under-loverfrequency		Order c
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51 V Voltage-dependent inverse-time overcurrent provertion (with 2 time constants). 46 Phase balance current protection (negative-sequence protection) 37 Undercurrent monitoring. 47 Phase sequence 59N/64 Displacement voltage 508F Breaker failure protection 74TC Trip circuit supervision, 4 setting groups, cold-le larush blocking B6 Lockout Basic+ Basic version (see above) V,P,f 27/59 Under-lover/lage 10/10 Under-lover/lage-controlled reactive power protection 74TC Trip circuit supervision, 4 setting groups, cold-le larush blocking B6 Lockout Basic version (see above) Under-lover/lage-controlled reactive power protection 32/55/81R current and voltages): Voltage, power, p.f., rate-of-frequency-change protection Basic version (see above) Under-lover/lage-controlled reactive power protection Basic version (see above) Under-lover/lage-controlled reactive power protection Basic version (see above) Under-lover/lage-controlled reactive power, p.f., rate-of-frequency-change protection Basic version (see above) Direction determination for overcurrent, phases ground Under-lover/lage above) Under-lover/requency Under-lover/requency Under-lover/requency Under-lover/requency Under-lover/requency Under-lover/requency Under-lover/requency Under-lover/requency Under-lover/requency Under-lover-protection (index quantities derived fron 32/55/81R current and voltages): Voltage, power, p.f., rate-of-frequency-change protection Basic + Basic version (see above) Under-lover-protection (index quantities derived fron 32/55/81R current and voltages): Voltage, power, p.f., rate-of-frequency-change protection Basic + Basic version (see above) Under-lover-protection (index quantities derived fron 32/55/81R current and voltages): Voltage, power, p.f., rate-of-frequency-change protection Basic + Basic version (see above) Under-lover-protection (index quantities derived fron 32/55/81R current and voltages): Voltage, power, p.f., rate-of-frequency-change protection Basic + Basic version (see above) Under-lover-protection (index quantit	rent	
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$P_{\rm r}$ f = Voltage, power, frequency protection 1) only with position 7 = 1 or 5 (non-sensitive gro	ound current input)	STATE OF THE STATE

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asic + ens.earth-f-det.		Basic version (see page before)	r	, טויי
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II KEF		phases and ground		ı İ
		Directional sensitive ground-fault detection		1
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asic + Sens.earth-f-det.		Basic version (see page before)	•	[]
oir IEF REF	67167N	Direction determination for overcurrent,		
1.28		phases and ground		
9 .7		Directional sensitive ground-fault detection		
		Directional intermittent ground fault protection		
1.	87N	High-impedance restricted ground fault		
<u>, </u>		Intermittent earth-fault		
Basic + Sens.earth-f-det.		Basic version (see page before)	F	F2)
V.P.f REF	67Ns	Directional sensitive ground-fault detection	•	a a
3.1	67Ns	Directional intermittent ground fault protection		[]
· 100	87N	High-impedance restricted ground fault		1 1
	27/59	Under-/overvoltage		11
	81O/U	Under-Joverfrequency		
	27Q	Undervoltage-controlled reactive power protection-		
	27/47/59(N)	Flexible protection (index quantities derived from		
* .	32/55/81R	current and voltages): Voltage, power, p.f.,		
	32,33,0 FR	rate-of-frequency-change protection		
				H (
Basic + Sens.earth-f-det.		Basic version (see page before)	F	B ²⁾
REF	67Ns	Directional sensitive ground-fault detection	4	
2	67Ns	Directional intermittent ground fault protection		
	. 87N	High-impedance restricted ground fault		
5		Basic version (see page before)	- ' H	FR \
Basic + Sens.earth-f-det.	67Ns	Directional sensitive ground-fault detection		
Motor V,P,f REF	67Ns	Directional intermittent ground fault protection		
		High-impedance restricted ground fault		$\mathbb{N} / \mathbb{N} > \mathbb{N}$
	87N	Starting ime supervision, locked rotor	`	
	48/14		\	
	66/86	Restart inhibit		<u> </u>
•	51M	Motor load jam protection		// //
	27.50	Motor statistics		
	27/59	Under-lovervoltage		$\prod X$
•	81 O/U.	Under-loverfrequency Undervoltage-controlled reactive power protection		NM
	27Q			111 1
) Flexible protection (index quantities derived from		1/2/1
•	32/55/81R	current and voltages): Voltage, power, p.f., rate-of-frequency-change protection		11/11
Pacie + Cons carth f dat		Basic version (see page before)		1 / / /
Basic + Sens.earth-f-det.	67/67N	Direction determination for overcurrent,	` Н	H ²⁾ \ '
Motor Dir V,P,f REF	0770719	phases and ground	•	11 \
	6"7h1c	Directional sensitive ground-fault detection		*
	67Ns	Directional intermittent ground fault protection		
	67Ns .	High-impedance restricted ground fault protection		
	87N			
	48/14	Starting ime supervision, locked rotor		
	66/86	Restart inhibit		
	51M	Motor load jam protection Motor statistics	•	
	27/50	Under-lovervoltage		
•	27/59]] ,
	810/0	Under-loverfrequency		
	27Q	Undervoltage-controlled reactive power protection	,	
	27/47/59(N) Flexible protection (index quantities derived from		11 11
	32/55/81R	current and voltages): Voltage, power, p.f., rate-of-frequency-change protection		

 $V_{i}P_{i}f$ = Voltage, power, frequency protection

= Directional overcurrent protection

= Intermittent ground fault REF = Restricted earth fault

2) For isolated/compensated networks, only with postition 7=2,6 (sensitive earth current input)

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next page

SIPROTEC 75J66

Selection and ordering data

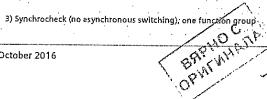
Description # 1	Order code
SIPROTEC 75J66 multifun	ction protection relay and bay controller: 12345 6 7 8 9 101112 13141516.171819
<u></u>	ANSI No. Description
Basic + Sens.earth-f-det, Motor Dir IEF V.P.f REF	Basic version (see page 20) 67/67N Direction determination for overcurrent,
	phases and ground 67Ns Directional sensitive ground-fault detection 67Ns Directional intermittent ground fault protection
	87N High-impedance restricted ground fault 48/14 Starting ime supervision, locked rotor 66/86 Restart inhibit
	51M Motor load jarn protection Motor statistics
	810/U :Under-/overfrequency 27Q Under-voltage-controlled reactive power protection
	27/47/59(N) Flexible protection (index quantities derived from 32/55/81R current and voltages): Voltage, power, p.f., rate-of-frequency-change protection
Basic + Motor Dir V,P,f	Basic version (see page 20) 67/67N: Direction determination for overcurrent,
	phases and ground 48/1.4 Starting ime supervision, locked rotor 66/86 Restart inhibit
	51M - Motor load jam protection Motor statistics 27/59 Under-lovervoltage
	810/U Under-loverfrequency 270 Undervoltage-controlled reactive power protection 27/47/59(N) Flexible protection (index quantities derived from 32/55/81R current and voltages): Voltage, power, p.f.,
•	rate-of-frequency-change protection
Basic + Motor	Basic version (see page 20) 48/14 Starting ime supervision, locked rotor 66/86 Restart inhibit 51M Motor load jam protection Motor statistics
	Measuring/fault recording With fault recording With fault recording With fault recording, average values, min/max values 3
	Auto reclosing, fault locator, synchro-check Without
	79 With 79 ≥ 21FL With fault locator 79,21FL With 79 and fault locator
5	25: With synchronization 4 3): 15, 79, 21FL With synchronization 79 and fault locator

 $V_i P_i f$ = Voltage, power, frequency protection

- Directional overcurrent protection

= Intermittent ground fault







Description

DIGSI 4

Software for engineering and operation of all Siemens protection devices up to SIPROTEC 4 and SIPROTEC Compact. Supports MS Windows 7 Professional/Ultimate/Enterprise and MS Windows Server 2008 R2.

Basic

Full version with license for 10 computers, on CD-ROM (authorization by serial number)

7X55400-0AA00

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)

7X55402-0AA00

Professional + IEC 61850

Complete version:

DIGSI 4 Basic and additionally SIGRA (fault record analysis), CFC Editor (logic editor), Display Editor (editor for control displays),

DIGSI 4 Remote (remote operation) + IEC 61850 system configurator

7X55403-0AA00

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 Basis or Professional License for 10 PCs. Authorization by serial number. On CD-ROM 7XS5460-0AA00

Software for engineering and operation of all Siemens protection devices up to SIPROTEC 4 and SIPROTEC Compact. Supports MS Windows 7 Professional/Ultimate/Enterprise and MS Windows Server 2008 R2.

7XS5410-0AA00

Temperature monitoring box

RTD-box TR1200 (RS 485)

7XV5662-6AD10

RTD-box TR1200 IP (Ethernet)

7XV5662-8AD10

Varistor/Voltage Arrester

Voltage arrester for high-impedance REF protection

125 Vrms; 600 A; 1S/S 256

C53207-A401 D76-1

240 Vrms; 600 A; 1S/S 1088

C53207-A401-Q77-1

Manual for 75J66

English

C53000-B/114

please Inquire for latest edition (exact Order No.)

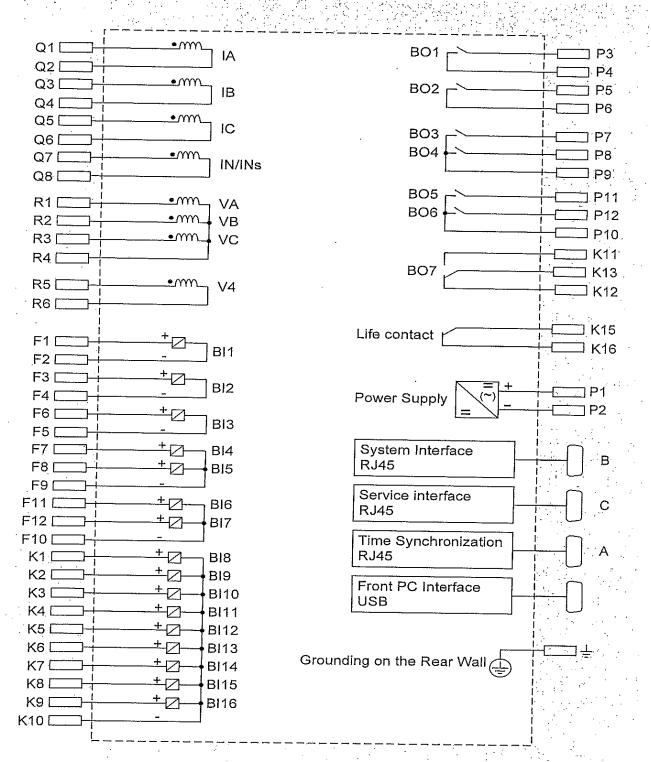
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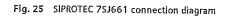


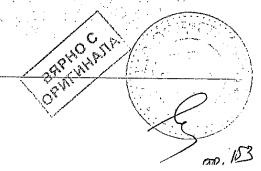
SIPROTEC 7SJ66

Connection diagram



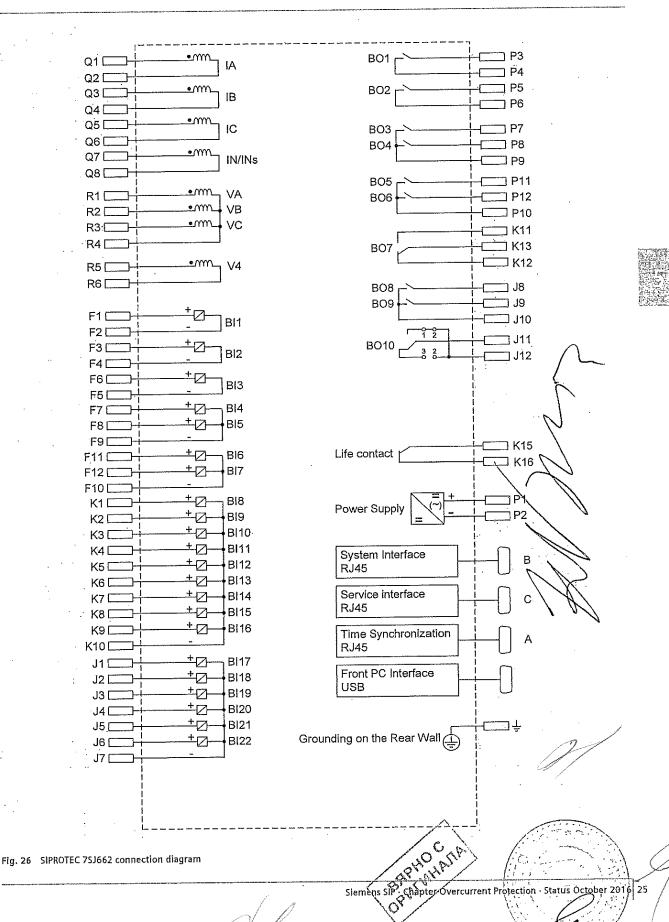






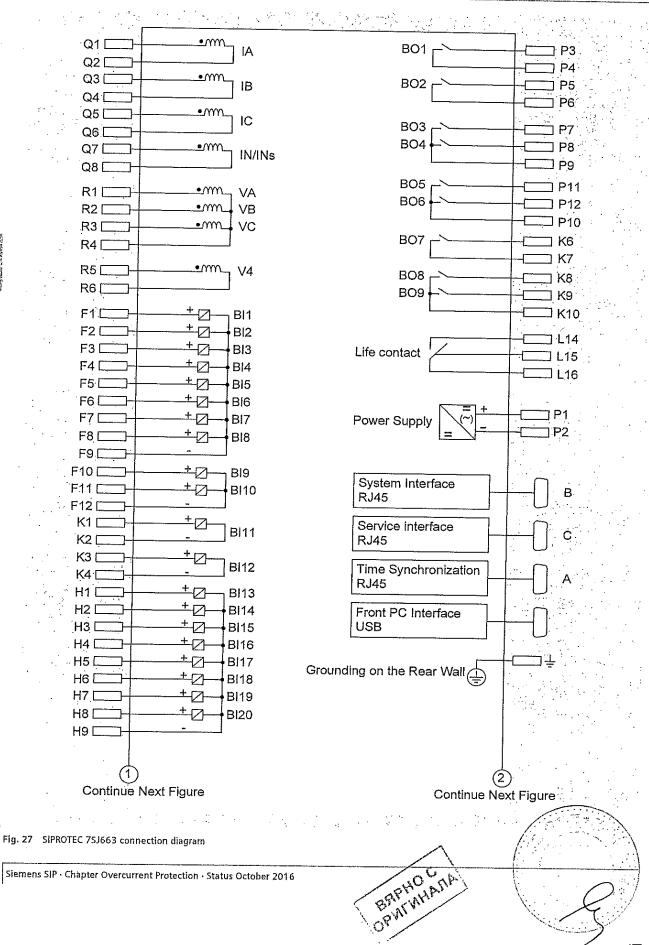


Connection diagram



SIPROTEG 7SJ66

Connection diagram



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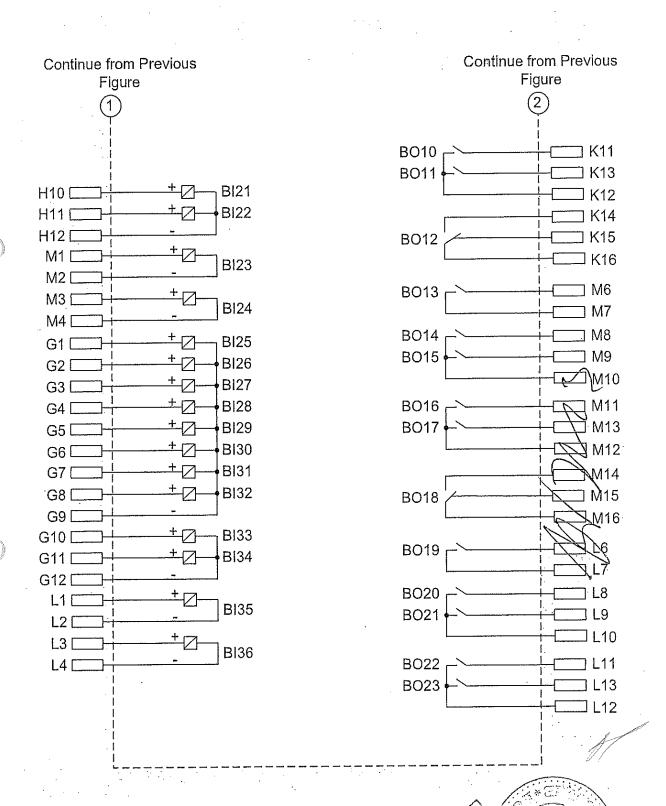


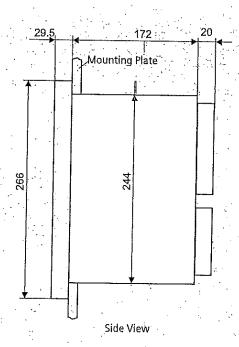
Fig. 28 SIPROTEC 7SJ663 connection diagram

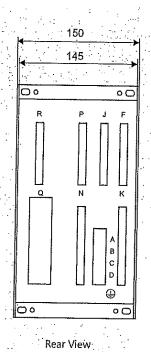
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SIPROTEC 7SJ66

Dimensions





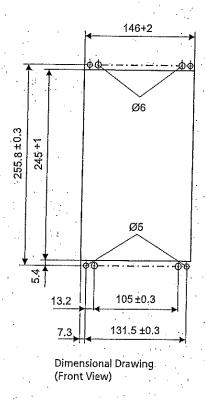


Fig. 29 Dimensional drawing for SIPROTEC 7SJ66 (housing size 1/3)

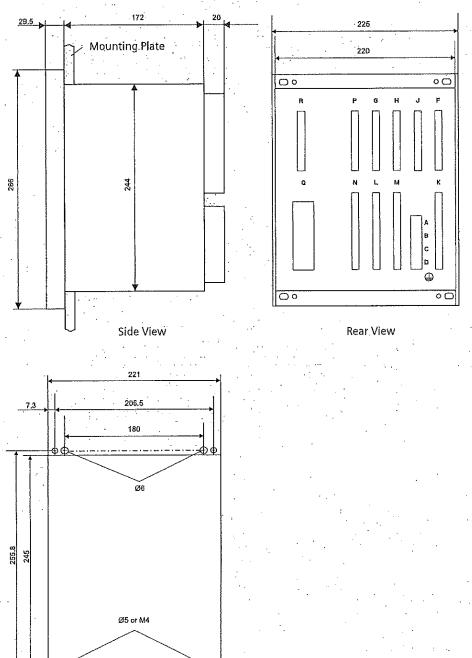
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Dimensions



Dimensions in mm

Fig. 30 Dimensional drawing of a SIPROTEC 7SJ66 (housing size 1/2)

Dimensional Drawing (Front View)

Siemens SIP · Chapter Overcurrent Protection Status-October 2016 29

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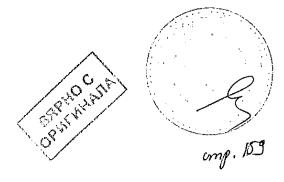
FBY all products using security features of OpenSSI the following small apply:
This product includes software developed by the OpenSSI Project for use in
the OpenSSI Toolkir, (http://www.cpenSsi.org/)
This product includes dryptographic software written by Eric Young (Eay@accopytion)

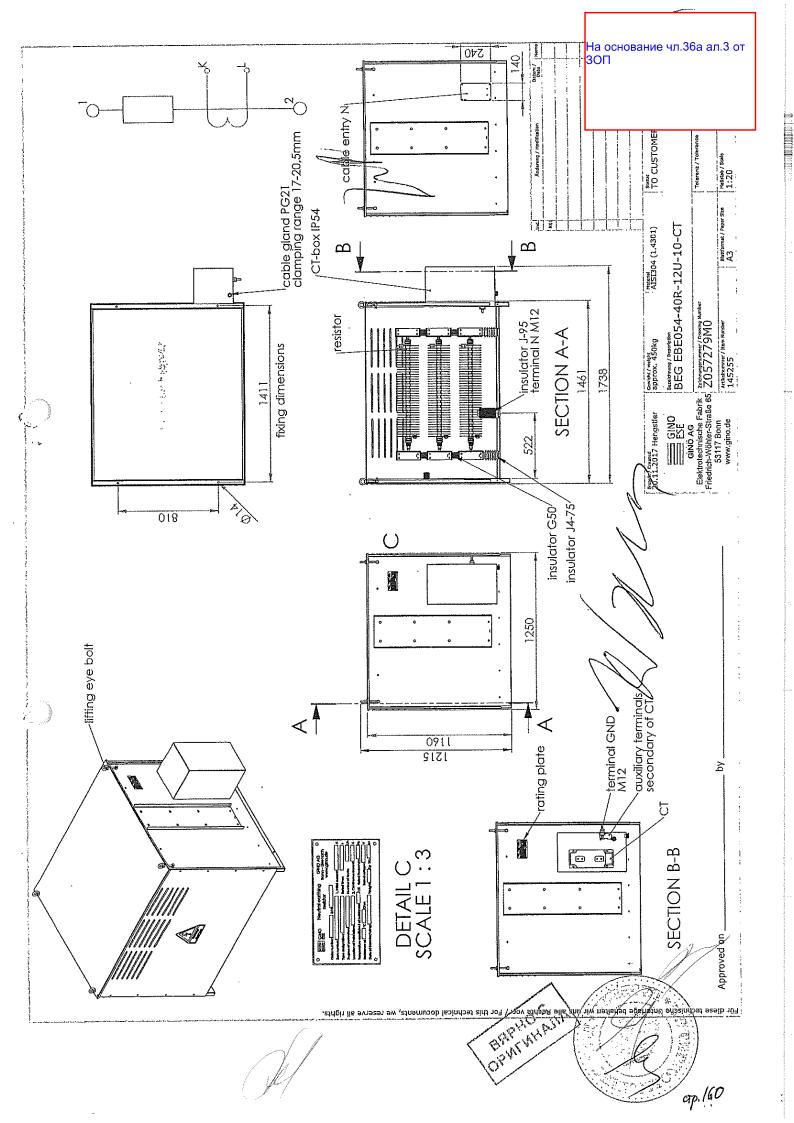
For more information, please contact our

Customer Support Center.

Phone: +49 180 524 70 00 Fax: +49 180 524 24 71

(Charges depending on provider)
E-Mail: support.ic@siemens.com
www.siemens.com/siprotec





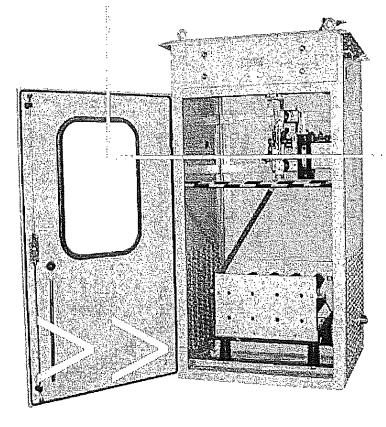
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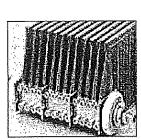


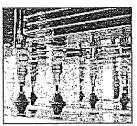


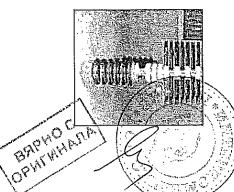
Neutral Earthing Resistors

For permanent or temporary neutral earthing in HV systems



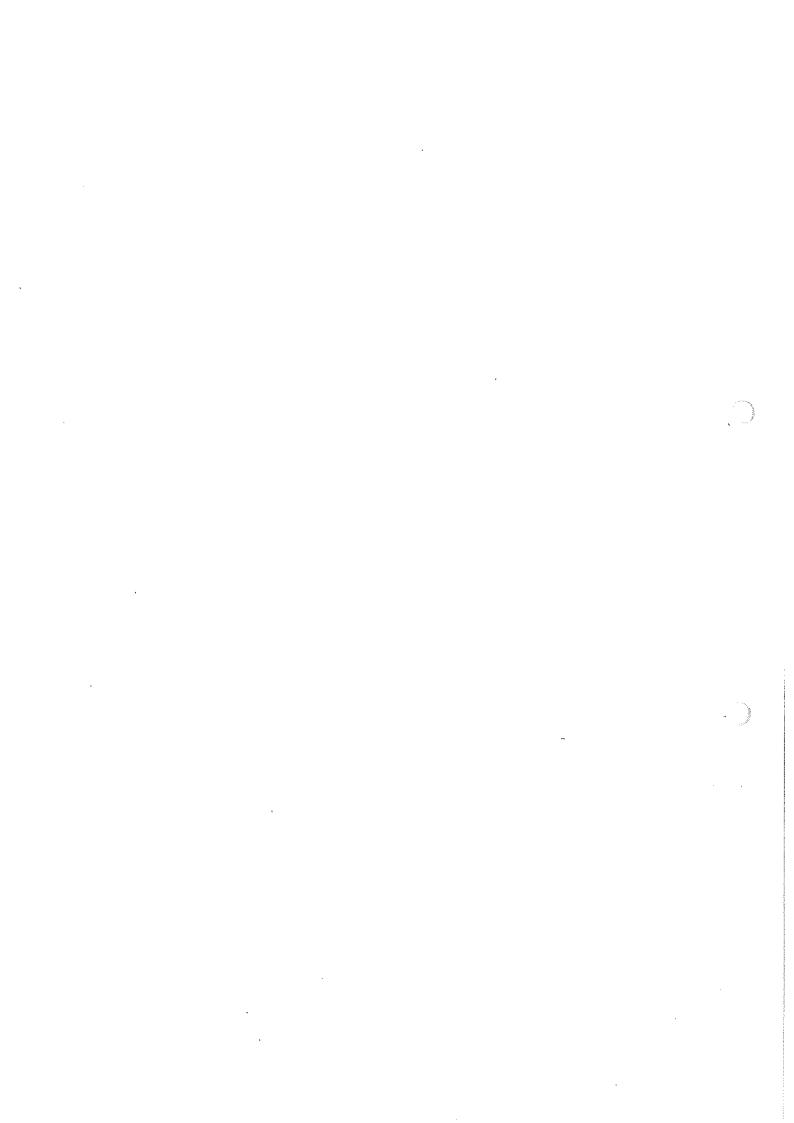














For continuous or temporary low-resistance neutral grounding in medium voltage systems

Neutral point connection



The method of neutral point connection in three-phase systems determines the power frequency voltage increase on non-defective phases in case of

The ratio of the root-mean-square value of the highest power frequency line-to-ground voltage (U_{LF}) of a phase, not affected by the ground fault to the root-mean-square value of the line-to-ground voltage U_L that would be available at the location under analysis under no-fault conditions, is named ground fault factor \mathcal{E} . This ground fault factor constitutes the decisive factor for the selection of the insulation level as per DIN 57111/VDE 0111.

National point connection.	£ =Uır/Uı
Direct, Z0/Z1 = 0	1.0
Low-resistance Z0/Z1 - 15	1,11,4
High- resistance ZO/Z1 - 20100.	1,75.,.1,8
Compensated > infinite	1,751,85
Isulated Z0/Z1 ~ 100200	1,751,85
ZO = neutral point impedance [1]	
Z1 = symmetrical supply impedance	

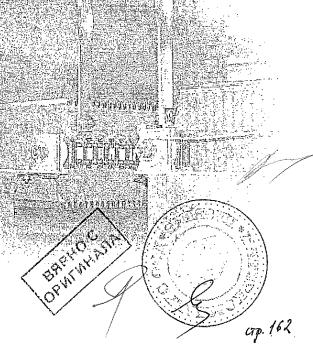
Direct neutral point grounding exhibits the following disadvantage: a single phase ground fault is also single phases short-circuit that allows short-circuit current flow that is only restricted by the impedance at the default location. There is no power frequency voltage increase in the healthy phases. In grids with an insulated neutral point, a ground fault bridges the earth capacitance of the affected phase. The ground fault current released corresponds to the sum of the capacitive currents of the other two phases with the voltage between each of the healthy phases and the ground rising to the line-to-line voltage.

Where the neutral point is grounded with a choke, the inductive impedance of which is equal to the capacitive impedance to ground, this is called a compensated system. Compensation of the line-to-earth capacity generates a voltage vector on the ground-fault-neutralizer that is directed against the voltage of the faulty phase and thus suppresses the fault arc. However, automatic suppression is only possible when compensation is almost complete and thus only suitable for systems with limited volumetric expansion. A continuous ground fault is hard to find due to the complex voltage conditions.

Low-resistance neutral point grounding is selected for extended systems. The neutral point is grounded with a resistor which restricts the ground fault current to a defined value up to the time when the system is switched off. The intensity of the default current depends on the resistance value and on the impedance at the ground fault location. The maximum ground fault current only occurs in case of a ground fault near a transformer. In this case, the voltage of the neutral point will rise to about that of the line-to-ground voltage. All other power frequency line voltages are not affected.

In order to detect a continuously occurring ground fault in compensated systems, a brief low-resistance neutral point grounding is used where a transformer neutral point is briefly grounded via a resistor actuated by a switchgear. Unlike continuous low-resistance neutral point grounding, only one resistor is required in this case for several transformers or generators.





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General

For systems with total current tripping, a relatively small maximum ground fault current may be selected, i.e. the ground resistor is sized such that the ground fault current is restricted to a value that is smaller than the nominal current. For systems with over-current tripping, the ground fault current must be larger than the nominal current so that it is safely recognized as an over-current. The value is normally specified as being 1.5 times to several times the nominal current. It should be selected such that on the one hand a ground fault at the peripherals of the network is still detected but that the ground fault current occurring in the immediate vicinity of the generator or transformer-can still be managed without difficulties, on the other. This is influenced by the structure and protection of the individual system in question so that there are no general rules available. Where the system includes several generators or transformers, all grounding resistors should have the same value corresponding to the settings of the installed protection.

Although the protection facilities often react within seconds of a ground fault, a larger admissible ON time is selected for the resistor to enable for several connection attempts. Since the majority of ground faults result from flashovers on outdoor insulators whose arc is quenched by tripping, brief connection is required to reduce the operation downtime. A permanent ground fault will then result in a new load on the resistor.

The usual values for the admissible load period for a ground resistor are 5...10...15...20...30 seconds with 10 s being most frequently used. The demand for 30 s originates from the time when liquid resistors were used whose load period was defined by the amount of electrolytes, among others. For air-cooled metal resistors, 30 s load periods are economically not viable because, unlike the liquid resistors, they cool down relatively fast and the load period has a strong impact on the resistor price. Oil-cooled metal resistors are only suited where high protection and/or high load periods are required because the relatively low admissible oil temperature only enables for an incomplete utilization of the resistor material.

Resistors for indoor applications are manufactured in IPOO and IP2O.

Resistor outdoor applications, at least IP23 is required.

Higher protection is problematic with a view to the restricted ventilation caused by the thermal load of the elements, insulators and housings.

Insulation is designed for the system voltages 12, 24, 36, 52 kV with larger clearance and/or creepage distances being required in some cases as a function of the place of installation, climatic conditions, soiling or the installation altitude.

Applicable codes and standards:	
DIN 40050	Protections
DIN 57101/VDE 0101	Insulation coordination for utilities in three-phase circuits >1 kV
DIN 57111/VDE 0111	Installation of electrical power installations > 1 kV
DIN 57141/VDE 0141	Grounding in alternating current systems > 1 kV
IEC 273	Characteristics of indoor and outdoor post insulators
IEEESid 32-1972-	Requirements, Terminology and Test Procedures for Neutral Grounding Devices

GINO Grounding Resistors

GINO grounding resistors consist of the resistor packages with resistor elements made from siliconized cast iron with or without surface protection (e.g., zinc dust primer) or steel sheet grid elements made from various resistor materials. Several resistor packages can be combined to a withdrawable module, insulated from the housing and up to three modules can be arranged in one housing. One or several modules can also be combined for installation in existing switchgears on a base frame to form an IPOO resistor.

The housing design is influenced by the selected place of installation; among others, GINO/ESE grounding resistors type IP23 are only suited for installation in electrical operating areas. When installed outside of electrical operating areas, the enclosure must be such that a straight wire cannot touch any hazardous elements. If installation is planned in public locations, the wire may be of very small diameters. Protective measures in addition to those specified in DIN 40050 have to be taken.

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Grounding resistor design

Indoor resistors are provided with a primer after sandblasting of the frame surface followed by a high-quality synthetic resin coat. Housings for outdoor applications are provided with a weather-proof two-component PUR paint coat comprising a 2-component primer and a 2-component top coat. The standard color is RAL 7032.

For installation, the customer shall provide a plane foundation with the requisite cable duct. The bottom of the housing is provided with wire mesh and removable bottom plates at suitable locations for cable connection.

As a rule, all terminals are provided with copper bars on the inside of the housing. The cables are inserted through the bottom of the housing or the side. Upon request and at extra cost, the resistors can also be provided with indoor or outdoor bushings or angle connectors for connection of the neutral conductor.

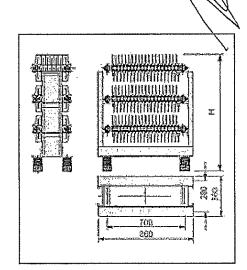
The insulation of the connection for operational earth depends on the conditions of the grounding system. Where a ground fault voltage UE at the connecting point as per VDE00141 exceeds prerequisite 4 (V4) 3000 V, it has proven to be advantageous to also insulate the grounding connection for the system voltage or $1/\sqrt{3}$ times the system voltage. In all other cases it is possible to insulate for lower voltages and also to use LV transformers instead of the more expensive MV transformers, where applicable. Such preconditions are mostly found in applications where the admissible fault current is of only a few hundred amperes. A transformer to be installed in the ground resistor will take up the function of a (lower) resistor package and this has to be considered for the selection of the enclosure.

According to the VDE 0141 regulations, all conductive housing and frame parts that do not belong to the active circuit have to be conductively interconnected, Doors and removable cover sheets are provided with a separate ground connection.

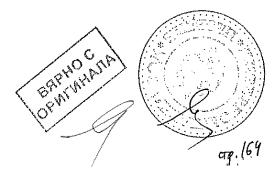
For the connection of the protective ground the frames are provided with at least one grounding bolt M10 or with several M8 bolts.

Resistor modules, protection class IPOO, installation

Size: No, of banks 1) Dimension H W	eight ca. kg
System voltage 12 kV, maximum 4 kV per bank	
1202 850	145
1203 3 1040	210
1204 1310	275
1205	340
1206	400
System voltage 24 kV; maximum 12 kV per module, maximum 4	kV per bank
2402 940	150
2403 3 1130	215
2404 4 1400	280
2405	345
2406 6 1840	405
System voltage 3G kV, maximum 12 kV per module; maximum 4	MV per bank 🚁
3602 2 1050	155
3603 1240	220
3604 4 1510	285
3605	350
3606	410



M





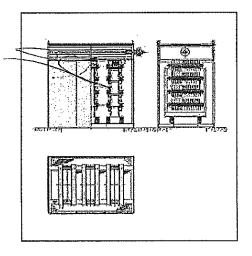


Size M	odules	Max. no. of banks	- 13- 5	Dime	nsions	Politica Politica	Weight ca. kg
			W	D.	H	H1	
System vol	anoalz	IW, maximum 4.18Vq	io dani				
12102		2		, 1	1500	1250	390
12103		3			1700	1450	470
12104	1	4	800		1950	1750	550
12105	1.	5			2150	1900	_630
12106		6			2400	2150	710
12208	F. ver	, 8.		1200	1950	1750	1000
12210	Ż	10	1400		2150	1900	1150
12212	. paster =	12			2400	2150	1300
12312		12			1950	1750	1350
12315	3	15	1800		2150	1950	1570
12318		18			2400	2150	1780
Systemivo	tage 24	kV, maximum 12 kV	peramo	düle _i m	ахітит	4 kV pc	rbank
24104		P4-404 - 201			2100	1825	710
24105	1	5	900		2300	2025	800
24106		6			2550	2275	890
24208		. 8			2100	1825	1090
24210	2	10	1500	1400	2300	2025	1250
24212		12			2550	2275	1400
24312	e ber speri	12			2100	1825	1450
24315	3	15 A	2000		:2300	2025	1680
24318		1/2,217,-(,18, //2,)			2500	2275	1900
System vol	iage 3 (i kV, maximum 12 kV	per mo	dule; m	aximum	4 kV pe	r bank
36104		4		· · · · · · · ·	2300	1900	840
36105	1	5	1200		2500	2100	930
36106	. 1, 7,	6			2750	2350	1020
36208	er i egin	8			2300	1900	1230_
36210	2	10	1800	1700	2500	2100	1400
36212		12			275,0	2350	1550
36312		12			2300	1900	1610
36315	3.	15	2300		2500	2100	1830
36318		18 18 E E			2750	2350	2060

Special designs and accessories available

Galvanized housing, hot-dip galvanized frame, hot-dip galvanized sheet cladding, 2K PUR painting

- Steel grid elements made from chromium nickel steel instead of cast iron
- · Higher protection class IP3x, IP4x, IP5x
- Indoor / outdoor bushing HV side
- Currency converter
- Higher clearances and creepage distances with insulators
- Disconnecting switch, 1-pole, different drives
 Low voltage recess or terminal strip



Notes

Information required:

- System voltage
- Ohm value R
- Rated earth fault current [l_f] =
- Operating time s
 - Cont. Current, where applicable [15]

Protection class 1Pxx

Connection (cable, bushing)

Dimensioning:

Calculate current-time integral \(\text{i} \) t \(\) = Select element type GWE.. on page \(\) 1.19

- Calculate the number of elements

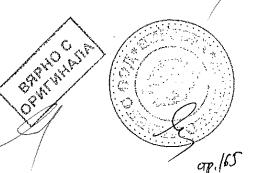
 $n_{Elements} = R / R_{Elements}$

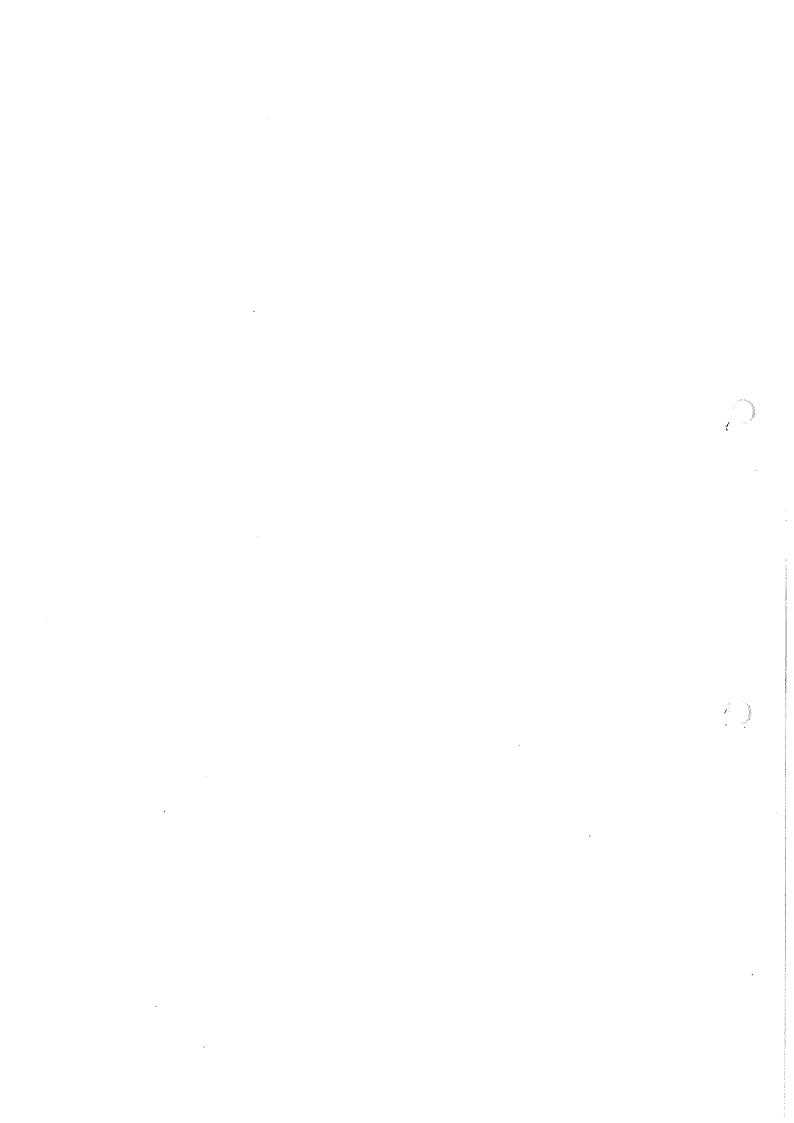
Calculate the number of banks

 $n_{Banks} = n_{Elements}$ / 48 round up to full no. of banks, select even number of elements per bank, direct-axis voltage If $\cdot R_{Bank}$ per bank maximum 4 kV, increase number of banks, where required Select module or housing size, observe criteria for system voltage If $\cdot R_{Module} \lesssim 4$ kV Additional remarks in special brochure

"Neutral point grounding resistors"









Routine tests

- Every resistor will be subjected to individual testing where in addition to the visual checking of the manufacture and verification of the part dimensions and paint coat thickness, the tests below will be conducted and recorded
- Checking the resistor package as per IEEE Std 32-1972 by applying 2.25 times the longitudinal voltage + 2kV, 1 minute
- Measuring of the d.c. resistance at ambient temperature
- The dielectric strength is considered as evidenced given the use of tested insulators and observation of the minimum clearance distances as per VDE 0101 and VDE 0111

Special designs and additional equipment items

- Galvanized housing, hot-dip galvanized frame, galvanized cladding, with 2-component PUR paint coat
- Resistors with punched sheet elements made from corrosion and acid-proof chromium nickel steel 18 9, material number 1.4301/AlSl304
- Higher protection IP3x, IP4x, IP5x
- Transformers, support-type current transformers or low voltage transformers on the ground connection side (see above remark)
- Special design with higher clearance and creepage distances by using C- supports as per IEC 273
- Disconnector, single-pole, ring-type drive
- Disconnector, single-pole, track-control drive
- Disconnector, single-pole, with motor drive
- Separate low-voltage compartment or terminal box

GINO GmbH Elektrotechnische Fabrik Friedrich-Wöhler-Str. 65 D-53117 Bonn

Phone: +49 228 98 98 6-0 Fax: +49 228 98 98 6-34



GINO GmbH Elektrotechnische Fabrik Heinrichstraße 47 D-9981,7 Eisenach

Phone: +49 36 91 77 7- 0 Fax: +49 36 91 77 7- 307



E-Mail: Info@gino.de / Internet: www.gino.de





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