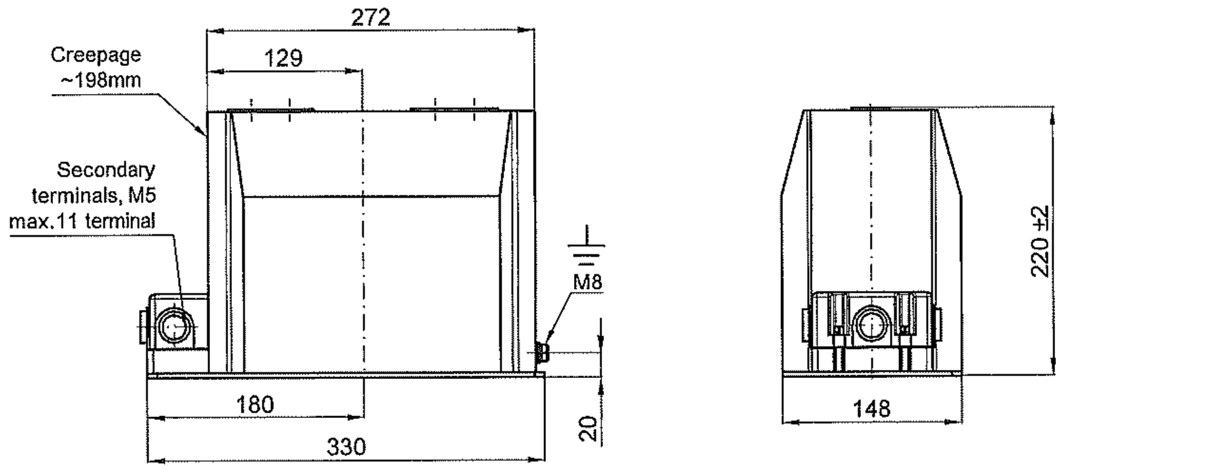
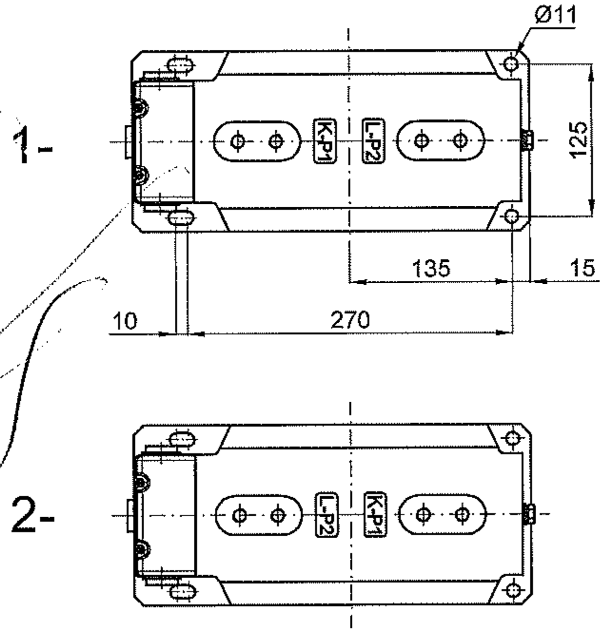
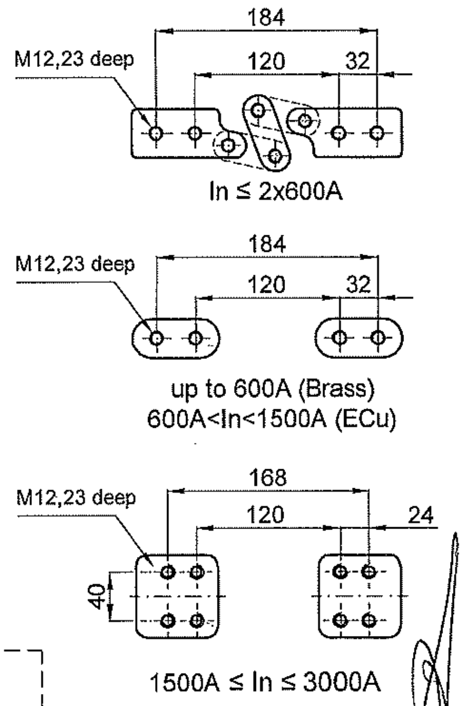
SIEMENS Technical Specification No :2-A359-303

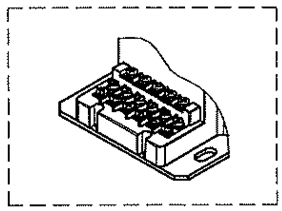




PRIMARY CONNECTION TERMINALS



SCREW	Tightening Torque Nm
M5	4
M8	16-20
M12	60-70



Secondary terminal's detail

DEĞİŞİKLİK
TEKNİK BÜRO
Tarih 04/ 11 / 2015

QTY	DESCRIPTION	POS	DIMENSIONS	WEIGHT	PART OR DIN NO.	MATERIAL

NO	DATE	NAME	MODIFICATION
G	06-10-10	NİL	Secondary plate code canceled
H	09-11-10	AYŞE	Produce no changed
I	20-07-11	ARZU	Holding holes removed
J	09-12-14	AYŞE	Primary terminal changed
K	28-10-15	ARZU	Design changed.

25-12-14

PLATE CODE	3011438
BOX CODE	3003014
	415
REV.	K

TOLERANS DIN ISO 2768-1 (c)

SCALE -/-

4MA72
CURRENT TRANSFORMER
SIEMENS

REPLACES THE DRAWING NO.

DR'N	
CH'D	
APP'D	
C.C	MT

ALCE TRANSFORMING SUPPORTING

OG Ölçü Trafo

0'52

ОБОСОБЕНА ПОЗИЦИЯ № 1

Модернизация (ретрофит /проектиране, реконструкция, доставка и монтаж на машини и съоръжения, подготовка и въвеждане в експлоатация/) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика в регион „София“ и регион „София Област“

Д) ПРИЛОЖЕНИЕ 1.5

№	Наименование	Мярка	Количество	Ед. цена лв. без ДДС	Обща цена лв. без ДДС
1.	Включвателна бобина за вакуумен прекъсвач 20 kV	бр.	5	89,00	445,00 лв.
2.	Включвателна бобина за вакуумен прекъсвач 10 kV	бр.	5	89,00	445,00 лв.
3.	Изключвателна бобина за вакуумен прекъсвач 20 kV	бр.	5	89,00	445,00 лв.
4.	Изключвателна бобина за вакуумен прекъсвач 10 kV	бр.	5	89,00	445,00 лв.
5.	Мотор за зареждане на вакуумен прекъсвач 20 kV	бр.	5	150,00	750,00 лв.
6.	Мотор за зареждане на вакуумен прекъсвач 10 kV	бр.	5	150,00	750,00 лв.
				ОБЩА ЦЕНА ЗА РЕЗЕРВНИ ЧАСТИ ВСИЧКО: ∑ (1÷6)	3280,00

ОБОСОБЕНА ПОЗИЦИЯ № 2

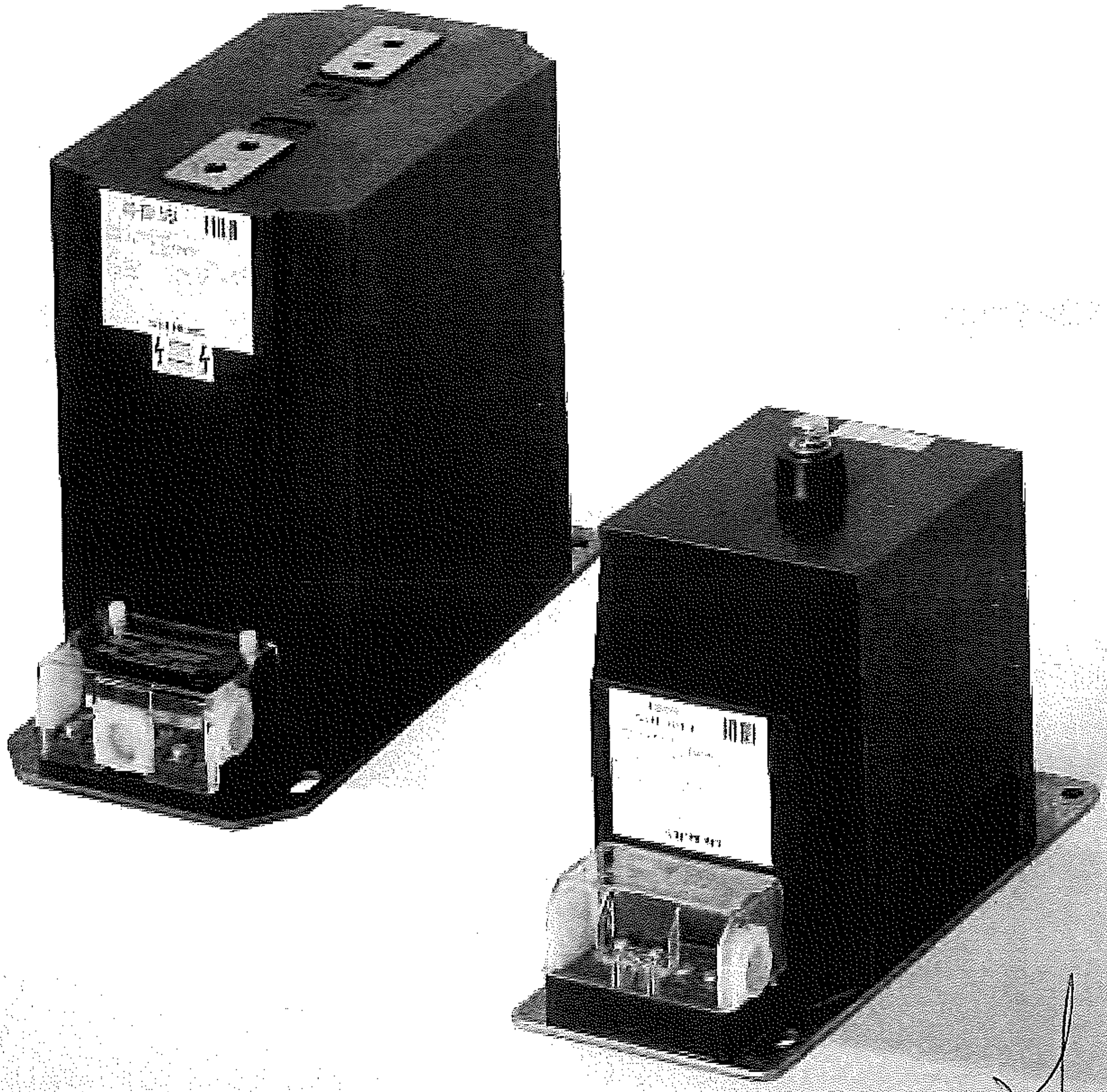
Модернизация (ретрофит /проектиране, реконструкция, доставка и монтаж на машини и съоръжения, подготовка и въвеждане в експлоатация/) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика в регион регион „Перник - Кюстендил“ и регион „Благоевград“

№	Наименование	Мярка	Количество	Ед. цена лв. без ДДС	Обща цена лв. без ДДС
1.	Включвателна бобина за вакуумен прекъсвач 20 kV	бр.	5	Да се посочи	Да се посочи
2.	Изключвателна бобина за вакуумен прекъсвач 20 kV	бр.	5	Да се посочи	Да се посочи
3.	Мотор за зареждане на вакуумен прекъсвач 20 kV	бр.	5	Да се посочи	Да се посочи
				ОБЩА ЦЕНА ЗА РЕЗЕРВНИ ЧАСТИ ВСИЧКО: ∑ (1÷3)	Да се посочи

ОБОСОБЕНА ПОЗИЦИЯ № 3

Модернизация (ретрофит /проектиране, реконструкция, доставка и монтаж на машини и съоръжения, подготовка и въвеждане в експлоатация/) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика в регион регион „Ловеч - Враца“, регион „Монтана – Видин“ и регион „Плевен“

№	Наименование	Мярка	Количество	Ед. цена лв. без ДДС	Обща цена лв. без ДДС
1.	Включвателна бобина за вакуумен прекъсвач 20 kV	бр.	5	Да се посочи	Да се посочи
2.	Включвателна бобина за вакуумен прекъсвач 10 kV	бр.	5	Да се посочи	Да се посочи
3.	Изключвателна бобина за вакуумен прекъсвач 20 kV	бр.	5	Да се посочи	Да се посочи
4.	Изключвателна бобина за вакуумен прекъсвач 10 kV	бр.	5	Да се посочи	Да се посочи
5.	Мотор за зареждане на вакуумен прекъсвач 20 kV	бр.	5	Да се посочи	Да се посочи
6.	Мотор за зареждане на вакуумен прекъсвач 10 kV	бр.	5	Да се посочи	Да се посочи
				ОБЩА ЦЕНА ЗА РЕЗЕРВНИ ЧАСТИ ВСИЧКО: ∑ (1÷6)	Да се посочи



4M Protective and Measuring Transformers

Medium-Voltage Equipment
Selection and Ordering Data

Catalog HG 24 · 2009

Answers for energy.

SIEMENS

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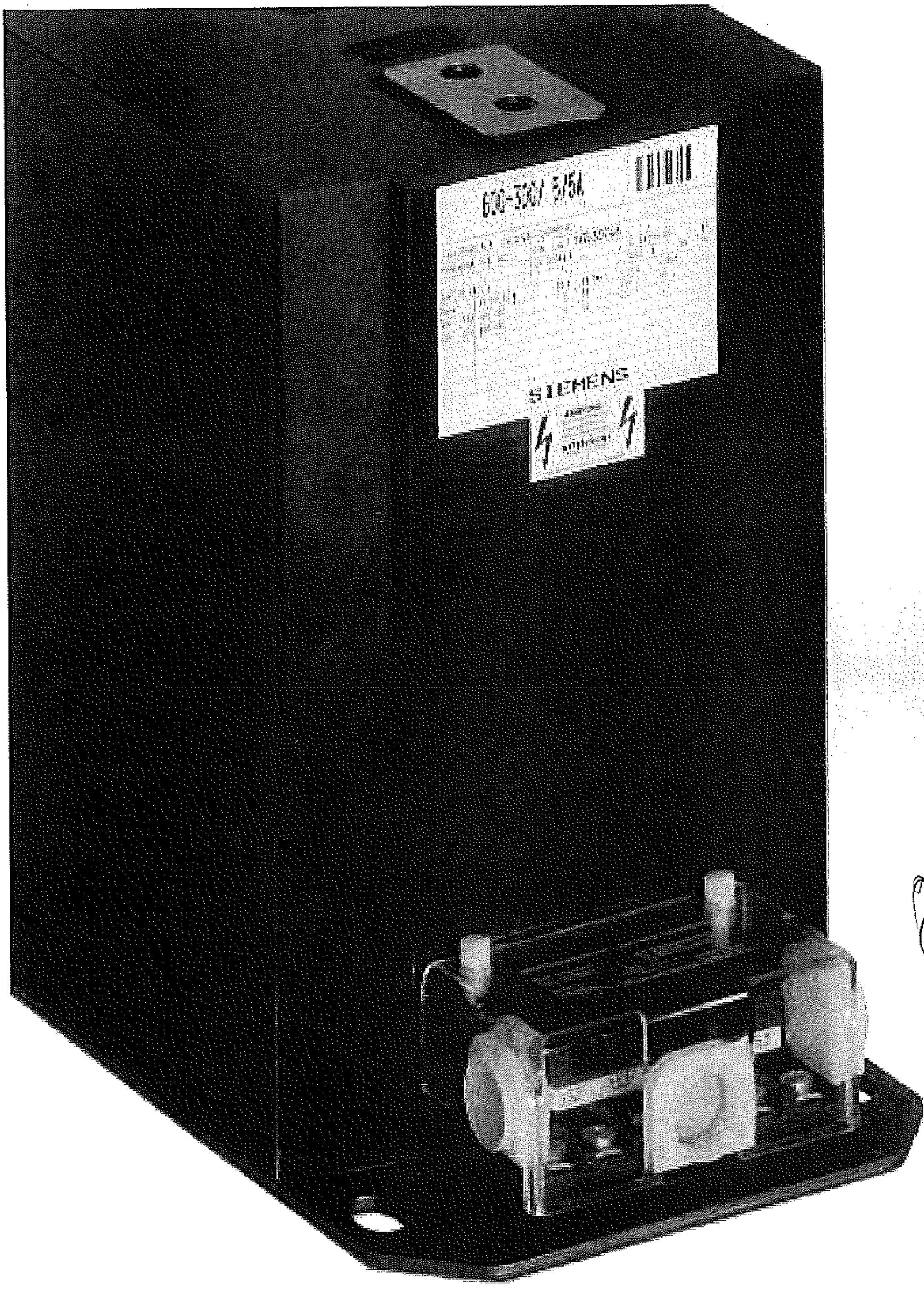

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4M Protective and Measuring Transformers

Medium-Voltage Equipment
Catalog HG 24 · 2009

Invalid: Catalog HG 24 · 1994

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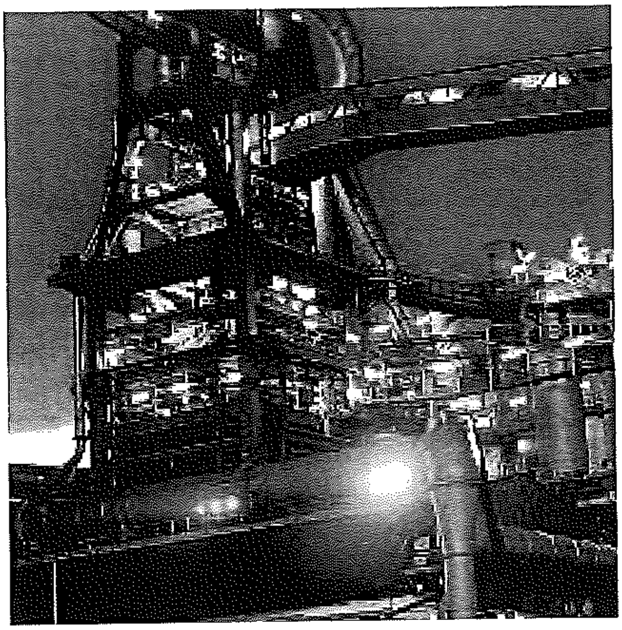

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Industrial application: Refinery

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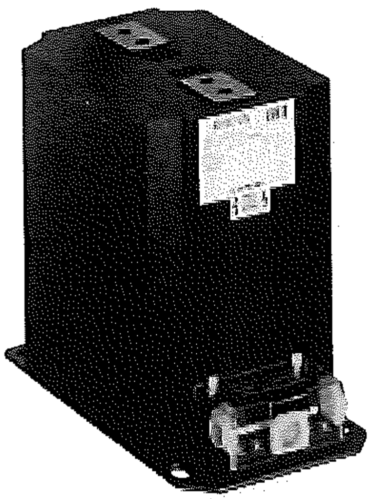
Protective and Measuring Transformers – The Adaptable

1

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



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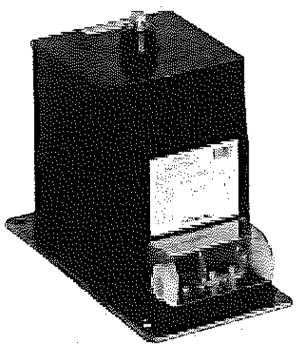
Voltage transformer



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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 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 in operation.

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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:

<u>Current transformers</u>

- 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

<u>Voltage transformers</u>

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

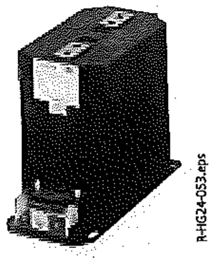
The transformers offered in the selection are only a part of the possible variations. If the transformer required is not shown, please clarify the feasibility with the responsible sales partner or the order processing department in the Switchgear Factory Berlin. The same applies to transformers according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

Approvals/Certifications

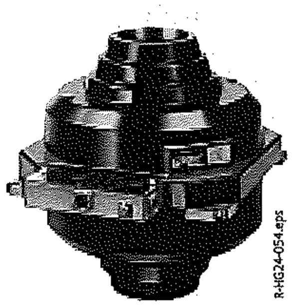
In Germany, instrument transformers may only be used for commercial purposes, such as billing metering of electricity, if they have been approved once (type approval) by the Physikalisch-Technische Bundesanstalt (PTB) (Federal Physical-Technical Institute), and if every transformer is calibrated by an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

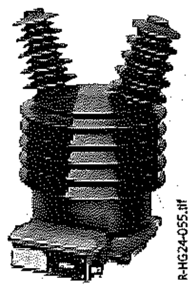
The calibration costs are charged in accordance with the official scale of fees.



Example for transformer in block-type design



Example for bushing-type transformer



Example for outdoor transformer

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1

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 I_N (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 (I_{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.

I_D is often equal to I_N, but it can also be defined as a multiple thereof.

Rated short-time thermal current I_{th}

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 I_{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_i

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

$$F_i = 100 \cdot \frac{K_N \cdot I_{sec} - I_{prim}}{I_{prim}}$$

K_N Rated transformation ratio
I_{prim} Actual primary current
I_{sec} Actual secondary current

Phase displacement d_i

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

Accuracy class	± current error in percent at rated current I_n				± phase displacement in minutes at rated current I_n			
	120 %	100 %	20 %	5 %	120 %	100 %	20 %	5 %
Measuring current transformers								
0.2	0.2	0.2	0.35	0.75	10	10	15	30
0.5	0.5	0.5	0.75	1.5	30	30	45	80
1	1	1	1.5	3	60	60	90	100
Protective current transformers								
5P	–	1	–	–	–	60	–	–
10P	–	3	–	–	–	–	–	–

Measuring current transformers

Current transformers 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_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_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 multi-ratio 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 connection area. Ratings, instrument security factors as well as the secondary internal resistance remain constant during reconnection.

Secondary multi-ratio

In single-turn and wound-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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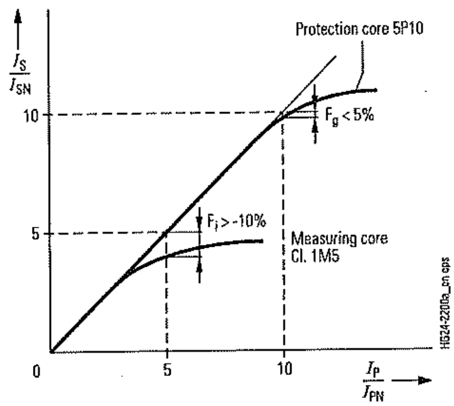
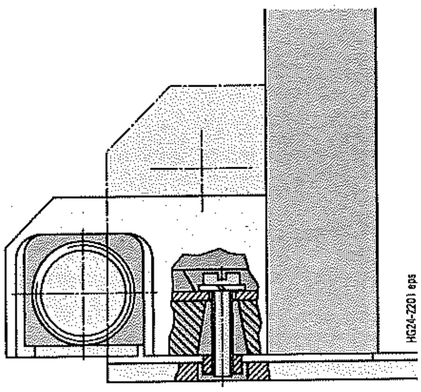


Overcurrent performance of current transformers when loaded with rated burden

F_i Current error
F_g 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.

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_i is > −10 % in order to protect the supplied measuring devices, meters, etc. safely in case of overcurrent.

In protection cores, the composite error F_g 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:

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

n' Actual instrument security factor
n Rated instrument security factor
Z_N Rated burden in VA
S_E Internal power consumption of the transformer in VA (approx. 5 % to 20 % of Z_N)
S 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.

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Capacitively coupled voltage detecting system

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.

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.

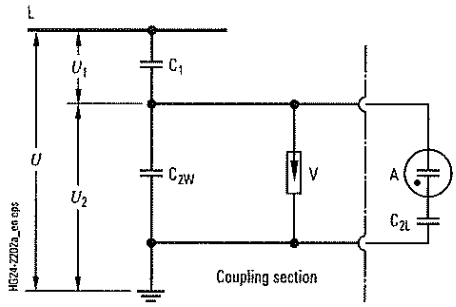
Indication range:
At 0.01 x U_N, no indication,
as of 0.40 x U_N, secure indication.

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_1 High-voltage capacitance (transformer)
C_{2W} Low-voltage capacitance (transformer)
C_{2L} Low-voltage capacitance (lead)
L High-voltage phase
U Voltage between phase and earth
U_1 Partial voltage at C_1
U_2 Partial voltage at C_2 and A
V Surge arrester

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1

Voltage transformers

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 U_m

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_{PN} or secondary U_{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 $U/\sqrt{3}$, with U being the phase-to-phase voltage.

U_m kV	Rated primary voltage kV	Rated secondary voltage V
up to 52	3.3 3.6 4.8 5 6 6.6 7.2 10 11 13.8 15 17.5 20 22 30 33 35 40 45	100 110 120
	or the values divided by $\sqrt{3}$	or the values divided by $\sqrt{3}$

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.

$10000/\sqrt{3}$ V / $100/\sqrt{3}$ V (single-phase)
10000 V/100 V (double-phase).

Voltage error F_U

The voltage error expressed in percent is defined by the formula:

$$F_U = 100 \cdot \frac{K_N \cdot U_{sec} - U_{prim}}{U_{prim}}$$

U_{prim} Actual primary voltage
U_{sec} 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.

Accuracy class	± voltage error %	± phase displacement Minutes
0.2	0.2	10
0.5	0.5	20
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 class	Rated output VA						
0.2	10	15	30	50	–	–	–
0.5	10	15	30	50	75	100	–
1	–	–	30	50	75	100	200

Thermal limiting output S_{th}

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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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.

Attention

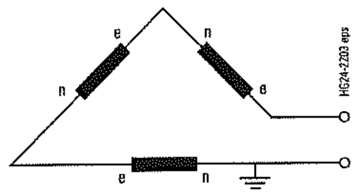
This connection must not be opened during operation.

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

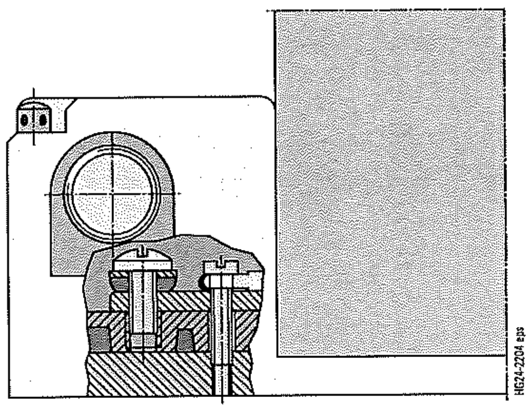
For earthing the secondary windings, a thread is provided under each secondary terminal. The earth connection required is established by fitting a special screw.

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

1

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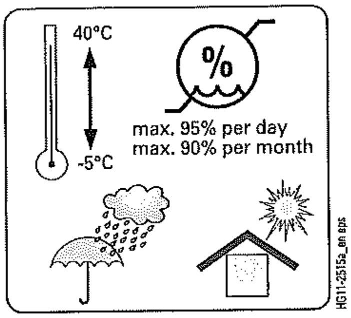
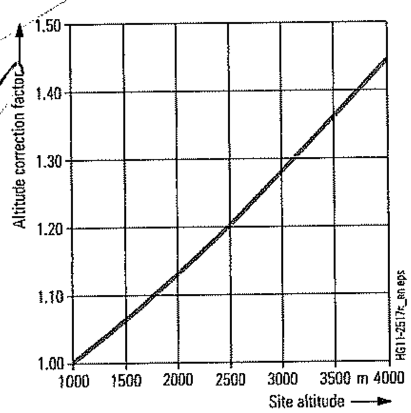
Description
Ambient conditions and dielectric strength

1





Highest voltage for equipment U_m	Rated short-duration power-frequency withstand voltage	Rated lightning impulse withstand voltage
kV	kV	V
7.2	20	60
12	28	75
17.5	38	95
24	50	125
36	70	170
52	95	250

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

Outdoor transformers class 25	−25 °C
Outdoor transformers class 40	−40 °C

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:

$U \geq U_0 \times K_a$

U Rated withstand voltage under reference atmosphere
U_0 Rated withstand voltage requested for the place of installation
K_a Altitude correction factor according to the opposite diagram

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 °C.

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1

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.

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 $U_m = 3.6$ kV.

Type of earthing	Type of transformer	Pre-stressing voltage ≥ 10 s	Measuring voltage ≥ 1 min	Permissible partial discharge level Apparent load
Systems with isolated or impedance earthed neutral	Current transformers and earthed voltage transformers	$1.3\,U_m$	$1.1\,U_m$	250 pC
			$1.1\frac{U_m}{\sqrt{3}}$	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	$0.8 \times 1.3\,U_m$	$1.1\frac{U_m}{\sqrt{3}}$	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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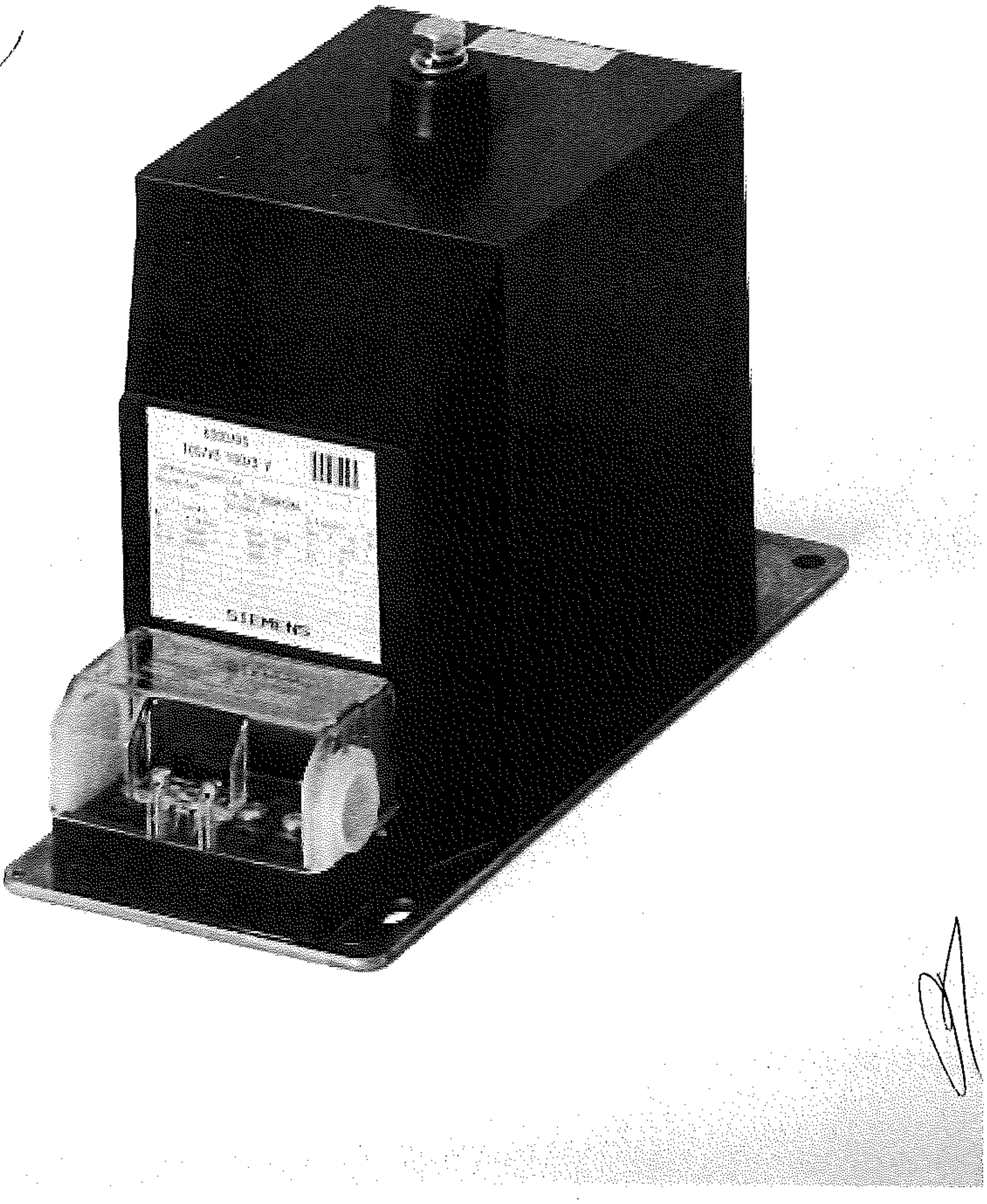
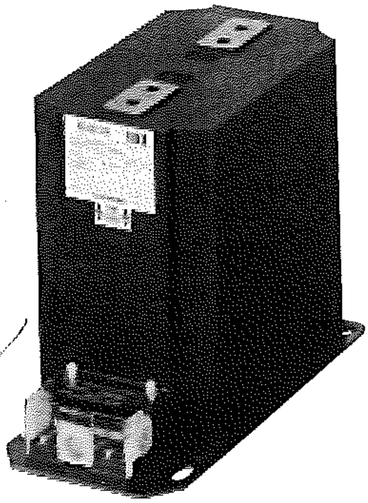


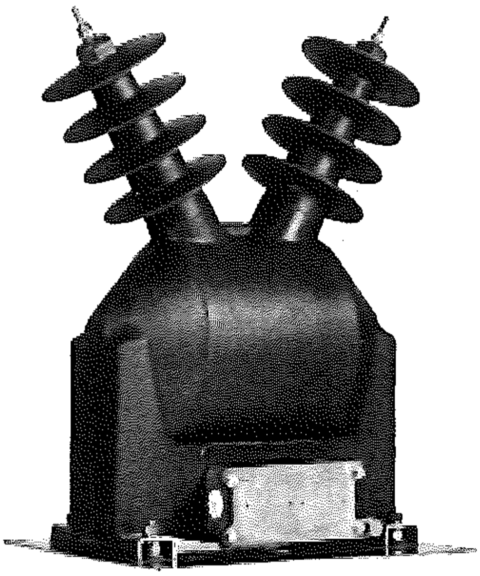
R-HG24-057.tif

649



R-HG24-053.eps

4MA74 current transformer



R-HG24-058.eps

4MS6 outdoor voltage transformer

Contents Page

Equipment Selection 17

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Equipment Selection

Ordering data and configuration example

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.

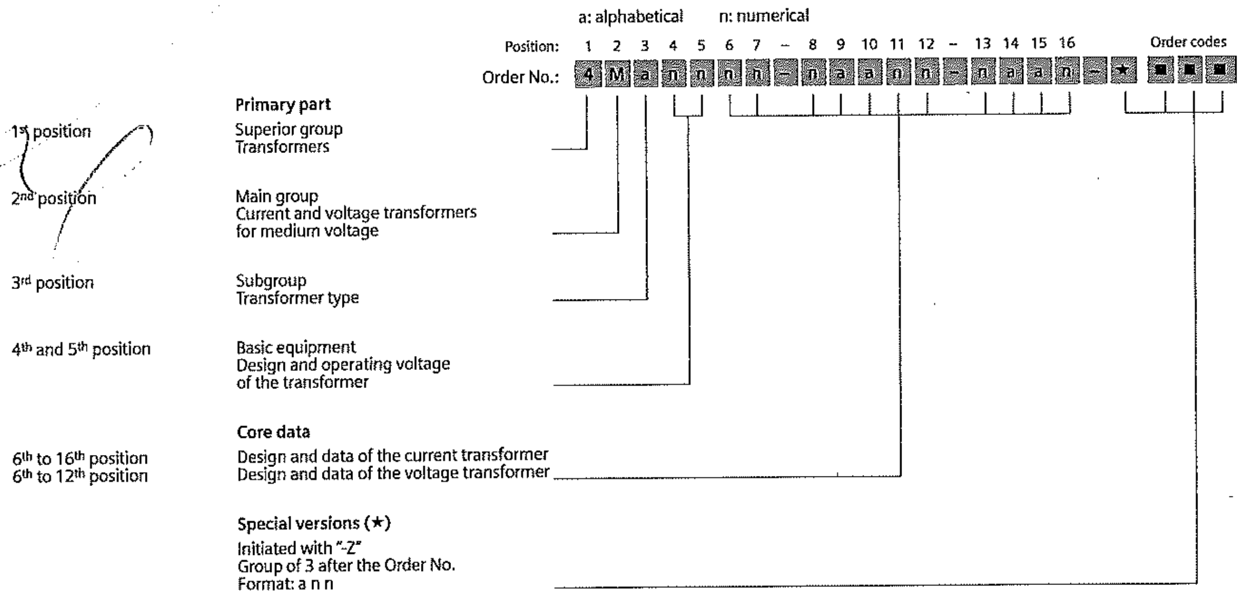
Order codes

Individual equipment versions, marked with **9** or **Z** in the 9th to 16th 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.

2



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.: 4 M A 7 2 4 4 – ■ ■ ■ ■ ■ – ■ ■ ■ ■

Order codes:

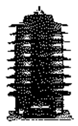
651

Equipment Selection
Product overview of current transformers

Current transformer,
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

Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Illustration	Type of design	Order No.	
 R-HG24-056.eps	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**
 R-HG24-060.eps	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**
 R-HG24-061.eps	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**
 R-HG24-054.eps	Indoor bar-primary bushing-type current transformer, cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV	4 M C 3	Selection from page **47ff**
 R-HG24-062.eps	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**
 R-HG24-071.eps	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

2

Example for Order No.: 4 M A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■

Order codes:

652

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

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

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	A	7	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■

Position 8: See page 21; Position 9: See page 21; Positions 10 to 14: See page 22 to page 39; Position 15: See page 40; Position 16: See page 40; ★: See page 40

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.	Order codes
12	75	28	4 M A 7 2	
17.5	95	38	4 M A 7 2	– Z F 1 8
24	125	50	4 M A 7 4	
36	170	70	4 M A 7 6	

2

6th/7th position
Rated short-time thermal current

Rated short-time thermal current I_{th} kA	Remark	Positions 6/7
8		3 3
12.5		4 0
16		4 4
20		4 8
25		5 4
31.5		5 7
40		6 3
50	Not for U_m = 36 kV	6 7
63	Not for U_m = 24 kV and U_m = 36 kV	7 1

Configuration example

Indoor support-type current transformer, block-type design — 4 M A 7
Maximum operating voltage U_m = 12 kV
Rated lightning impulse withstand voltage U_p = 75 kV
Rated short-duration power-frequency withstand voltage U_d = 28 kV — 2
Rated short-time thermal current I_{th} = 16 kA — 4 4

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

653

Equipment Selection

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

8th/9th position
Rated primary current

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

10–14: See page 22 to page 39
15: See page 40
16: See page 40
★: See page 40

Rated primary current I_{PN} A	Rated primary current, with primary multi-ratio I_{PN} A	Rated short-time thermal current I_{th} 8 kA	12.5 kA	16 kA	20 kA	25 kA	31.5 kA	40 kA	50 kA	63 kA	8	9
20		■	■	■							0	E
25		■	■	■	■						0	F
30		■	■	■	■						0	G
40		■	■	■	■	■	■				0	H
50		■	■	■	■	■	■	■			0	J
60		■	■	■	■	■	■	■	■		0	K
75		■	■	■	■	■	■	■	■	■	0	L
100		■	■	■	■	■	■	■	■	■	0	M
125		■	■	■	■	■	■	■	■	■	0	N
150		■	■	■	■	■	■	■	■	■	0	P
200		■	■	■	■	■	■	■	■	■	0	Q
250		■	■	■	■	■	■	■	■	■	0	R
300		■	■	■	■	■	■	■	■	■	0	S
400		■	■	■	■	■	■	■	■	■	0	T
500		■	■	■	■	■	■	■	■	■	0	U
600		■	■	■	■	■	■	■	■	■	0	V
750		■	■	■	■	■	■	■	■	■	0	W
800				■							0	X
1000		■	■	■	■	■	■	■	■	■	1	A
1200		■	■	■	■	■	■	■	■	■	1	B
1250		■	■	■	■	■	■	■	■	■	1	C
1500		■	■	■	■	■	■	■	■	■	1	D
2000		■	■	■	■	■	■	■	■	■	1	F
2500		■	■	■	■	■	■	■	■	■	1	G
	2x 20	■	■	■							3	E
	2x 25	■	■	■	■						3	F
	2x 30	■	■	■	■						3	G
	2x 40	■	■	■	■	■	■				3	H
	2x 50	■	■	■	■	■	■	■	■		3	J
	2x 60	■	■	■	■	■	■	■	■		3	K
	2x 75	■	■	■	■	■	■	■	■	■	3	L
	2x 100	■	■	■	■	■	■	■	■	■	3	M
	2x 125	■	■	■	■	■	■	■	■	■	3	N
	2x 150	■	■	■	■	■	■	■	■	■	3	P
	2x 200	■	■	■	■	■	■	■	■	■	3	Q
	2x 250	■	■	■	■	■	■	■	■	■	3	R
	2x 300	■	■	■	■	■	■	■	■	■	3	S
	2x 400	■	■	■	■	■	■	■	■	■	3	T
	2x 500	■	■	■	■	■	■	■	■	■	3	U
	2x 600	■	■	■	■	■	■	■	■	■	3	V
		Page 22	Page 24	Page 26	Page 28	Page 30	Page 32	Page 34	Page 36	Page 38		

■ Feasible (other combinations on request)

2

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, U_p = 75 kV, U_d = 28 kV, I_{th} = 16 kA)
Rated primary current I_{PN} = 100 A

4 M A 7
2 4 4 –
0 M

Example for Order No.: 4 M A 7 2 4 4 – 0 M ■ ■ ■ – ■ ■ ■ ■
Order codes:

654

Equipment Selection

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

8 kA

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes		
Order No.:	4	M	A	7	■	3	3	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
																	s. p. 40	s. p. 40		s. p. 40			

At rated primary current I_{PN}	Thermal strength	Position 12
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	100 x I_{PN}	0
60 A 75 A	150 x I_{PN}	1
40 A 50 A	200 x I_{PN}	2
30 A	300 x I_{PN}	3
20 A 25 A	400 x I_{PN}	4

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	Thermal strength 1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Pos. 10	Pos. 11	Pos. 12	–	Pos. 13	Pos. 14
0.2	FS10	10								■	■	■	■	■	C	2		–	0	A
		15								■	■	■	■	■	C	3		–	0	A
0.5	FS5	10								■	■	■	■	■	E	2		–	0	A
		15								■	■	■	■	■	E	3		–	0	A
		30								■	■	■	■	■	E	4		–	0	A
1	FS5	10								■	■	■	■	■	H	2		–	0	A
		15								■	■	■	■	■	H	3		–	0	A
		30								■	■	■	■	■	H	4		–	0	A
5P	10	5								■	■	■	■	■	L	1		–	0	A
		10								■	■	■	■	■	L	2		–	0	A
		15								■	■	■	■	■	L	3		–	0	A
		30										■	■	■	L	4		–	0	A
10P	10	5								■	■	■	■	■	Q	1		–	0	A
		10								■	■	■	■	■	Q	2		–	0	A
		15								■	■	■	■	■	Q	3		–	0	A
		30									■	■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5					■	■	■	■	■	E	1		–	1	L
		10			10					■	■	■	■	■	E	2		–	2	L
		15			15								■	■	E	3		–	3	L
		30			30								■	■	E	4		–	4	L
0.5	FS5	5	10P	10	5					■	■	■	■	■	E	1		–	1	Q
		10			10					■	■	■	■	■	E	2		–	2	Q
		15			15								■	■	E	3		–	3	Q
		30			30								■	■	E	4		–	4	Q
1	FS5	5	5P	10	5					■	■	■	■	■	H	1		–	1	L
		10			10					■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15							■	■	■	H	3		–	3	L
		15			30								■	■	H	3		–	4	L
		30			30								■	■	H	4		–	4	L
1	FS5	5	10P	10	5					■	■	■	■	■	H	1		–	1	Q
		10			10					■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15							■	■	■	H	3		–	3	Q
		15			30							■	■	■	H	3		–	4	Q
		30			30								■	■	H	4		–	4	Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 8 kA, I_{PN} = 100 A)
Thermal strength 100 x I_{PN}
1st core class 5P; instrument security factor 10; rating 30 VA
2nd core without

4 M A 7
2 3 3 – 0 M
0
L 4 – 0 A

Example for Order No.: 4 M A 7 2 3 3 – 0 M L 4 0 – 0 A ■ ■
Order codes:

655

8 kA – with primary multi-ratio

10th to 14th position

Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M A 7 ■ 3 3 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	12th position
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}	0
2x 60 A 2x 75 A	150 x I_{PN}	1
2x 40 A 2x 50 A	200 x I_{PN}	2
2x 30 A	300 x I_{PN}	3
2x 20 A 2x 25 A	400 x I_{PN}	4

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10	11	12	–	13	14
0.2	FS10	10								■	■	■	■	■	C	2		–	0	A
		15								■	■	■	■	■	C	3		–	0	A
0.5	FS5	10								■	■	■	■	■	E	2		–	0	A
		15								■	■	■	■	■	E	3		–	0	A
		30								■	■	■	■	■	E	4		–	0	A
1	FS5	10								■	■	■	■	■	H	2		–	0	A
		15								■	■	■	■	■	H	3		–	0	A
		30								■	■	■	■	■	H	4		–	0	A
5P	10	5								■	■	■	■	■	L	1		–	0	A
		10								■	■	■	■	■	L	2		–	0	A
		15								■	■	■	■	■	L	3		–	0	A
		30										■	■	■	L	4		–	0	A
10P	10	5								■	■	■	■	■	Q	1		–	0	A
		10								■	■	■	■	■	Q	2		–	0	A
		15								■	■	■	■	■	Q	3		–	0	A
		30									■	■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5					■	■	■	■	■	E	1		–	1	L
		10			10							■	■	■	E	2		–	2	L
		15			15							□	■	■	E	3		–	3	L
		30			30								■	■	E	4		–	4	L
0.5	FS5	5	10P	10	5					■	■	■	■	■	E	1		–	1	Q
		10			10							■	■	■	E	2		–	2	Q
		15			15								■	■	E	3		–	3	Q
		30			30								■	■	E	4		–	4	Q
1	FS5	5	5P	10	5					■	■	■	■	■	H	1		–	1	L
		10			10					■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15							■	■	■	H	3		–	3	L
		15			30							□	■	■	H	3		–	4	L
		30			30								■	■	H	4		–	4	L
1	FS5	5	10P	10	5					■	■	■	■	■	H	1		–	1	Q
		10			10					■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15							■	■	■	H	3		–	3	Q
		15			30							□	■	■	H	3		–	4	Q
		30			30								■	■	H	4		–	4	Q

■ Feasible (other combinations on request) □ Not for 2x 40 A

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 8 kA, I_{PN} = 2x 100 A) — 4 M A 7 2 3 3 – 3 M
Thermal strength 100 x I_{PN} — 0
1st core class 1; instrument security factor FS5; rating 15 VA
2nd core class 10P; accuracy limit factor 10; rating 30 VA — H 3 – 4 Q

Example for Order No.: 4 M A 7 2 3 3 – 3 M H 3 0 – 4 Q ■ ■

Order codes:

2

656

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

12.5 kA

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	4	0	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s. p. 40	s. p. 40		s. p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
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	100 x I_{PN}	0
100 A	150 x I_{PN}	1
75 A	200 x I_{PN}	2
50 A 60 A	300 x I_{PN}	3
40 A	400 x I_{PN}	4
25 A 30 A	500 x I_{PN}	5
20 A	800 x I_{PN}	7

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10–14
0,2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15							■	■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15					■		■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10				■	■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10				■	■	■	■	■	■	E 2 – 2 Q
		15			15						■	■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10				■	■	■	■	■	■	H 2 – 2 L
		10			15					■	■	■	■	■	H 2 – 3 L
		15			15					■	■	■	■	■	H 3 – 3 L
		15			30							■	■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15					■	■	■	■	■	H 2 – 3 Q
		15			15					■	■	■	■	■	H 3 – 3 Q
		15			30						■	■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design — 4 M A 7
(U_m = 12 kV, I_{th} = 12.5 kA, I_{PN} = 100 A) — 2 4 0 – 0 M
Thermal strength 150 x I_{PN} — 1
1st core class 10P; instrument security factor 10; rating 5 VA — Q 1 – 0 A
2nd core without

Example for Order No.: 4 M A 7 2 4 0 – 0 M Q 1 1 – 0 A ■ ■

Order codes:

657

12.5 kA – with primary multi-ratio

10th to 14th position

Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M A 7 ■ 4 0 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Order No. pos. 12
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}	0
2x 100 A	150 x I_{PN}	1
2x 75 A	200 x I_{PN}	2
2x 50 A 2x 60 A	300 x I_{PN}	3
2x 40 A	400 x I_{PN}	4
2x 25 A 2x 30 A	500 x I_{PN}	5
2x 20 A	800 x I_{PN}	7

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Order No. pos. 10–14
0.2	FS10	10								■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15							■	■	■	■	■	■	E 3 – 0 A
		30								■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30										■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10						■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10						■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10				■	■	■	■	■	■	H 2 – 2 L
		10			15					■	■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30							■	■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15					■	■	■	■	■	H 2 – 3 Q
		15			15					■	■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 12.5 kA, I_{PN} = 2x 100 A)
Thermal strength 150 x I_{PN}
1st core class 0.5; instrument security factor FS5; rating 15 VA
2nd core class 10P; accuracy limit factor 10; rating 15 VA

4 M A 7
2 4 0 – 3 M
1
E 3 – 3 Q

Example for Order No.: 4 M A 7 2 4 0 – 3 M E 3 1 – 3 Q ■ ■

Order codes:

2

65B

Equipment Selection

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

16 kA

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M A 7 ■ 4 4 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
200 A 250 A 300 A 400 A 500 A 600 A 750 A 800 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
125 A 150 A	150 x I_{PN}	1
100 A	200 x I_{PN}	2
60 A 75 A	300 x I_{PN}	3
40 A 50 A	400 x I_{PN}	4
30 A	600 x I_{PN}	6
25 A	800 x I_{PN}	7
20 A	1000 x I_{PN}	8

2

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	
0.2	FS10	10								■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■	■		■	■	■	■	■	E 2 – 0 A
		15					■	■		■	■	■	■	■	E 3 – 0 A
		30								■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■	■		■	■	■	■	■	H 2 – 0 A
		15				■	■	■		■	■	■	■	■	H 3 – 0 A
		30						■		■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■	■		■	■	■	■	■	L 1 – 0 A
		10						■		■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■	■		■	■	■	■	■	Q 1 – 0 A
		10				■	■	■		■	■	■	■	■	Q 2 – 0 A
		15						■		■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■	■		■	■	■	■	■	E 1 – 1 L
		10			10			■		■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■	■		■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15						■	■	■	■	E 3 – 3 Q
		30			30							■	■	■	E 4 – 4 Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30							■	■	■	H 3 – 4 L
		30			30							■	■	■	H 4 – 4 L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 Q
		10			10					■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30							■	■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 16 kA, I_{PN} = 100 A)
Thermal strength 200 x I_{PN}
1st core class 0.5; instrument security factor FS5; rating 10 VA
2nd core class 5P; accuracy limit factor 10; rating 10 VA

4 M A 7 | 2 4 4 – 0 M | 2 | E 2 | – 2 L

Example for Order No.: 4 M A 7 2 4 4 – 0 M E 2 2 – 2 L ■ ■

Order codes:

659

16 kA – with primary multi-ratio

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	4	4	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s.p. 40	s.p. 40		s.p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
2x 200 A 2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}	0
2x 125 A 2x 150 A	150 x I_{PN}	1
2x 100 A	200 x I_{PN}	2
2x 60 A 2x 75 A	300 x I_{PN}	3
2x 40 A 2x 50 A	400 x I_{PN}	4
2x 30 A	600 x I_{PN}	6
2x 25 A	800 x I_{PN}	7
2x 20 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	12	–	13	14
0.2	FS10	10								■	■	■	■	■	C	2		–	0	A
		15								■	■	■	■	■	C	3		–	0	A
0.5	FS5	10				■	■	■		■	■	■	■	■	E	2		–	0	A
		15						■		■	■	■	■	■	E	3		–	0	A
		30								■	■	■	■	■	E	4		–	0	A
1	FS5	10				■	■	■		■	■	■	■	■	H	2		–	0	A
		15				■	■	■		■	■	■	■	■	H	3		–	0	A
		30								■	■	■	■	■	H	4		–	0	A
5P	10	5				■	■	■		■	■	■	■	■	L	1		–	0	A
		10						■		■	■	■	■	■	L	2		–	0	A
		15								■	■	■	■	■	L	3		–	0	A
		30										■	■	■	L	4		–	0	A
10P	10	5				■	■	■		■	■	■	■	■	Q	1		–	0	A
		10				■	■	■		■	■	■	■	■	Q	2		–	0	A
		15						■		■	■	■	■	■	Q	3		–	0	A
		30										■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5			■		■	■	■	■	■	E	1		–	1	L
		10			10						■	■	■	■	E	2		–	2	L
		15			15							■	■	■	E	3		–	3	L
		30			30								■	■	E	4		–	4	L
0.5	FS5	5	10P	10	5			■		■	■	■	■	■	E	1		–	1	Q
		10			10						■	■	■	■	E	2		–	2	Q
		15			15							■	■	■	E	3		–	3	Q
		30			30								■	■	E	4		–	4	Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H	1		–	1	L
		10			10					■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15						■	■	■	■	H	3		–	3	L
		15			30							■	■	■	H	3		–	4	L
		30			30								■	■	H	4		–	4	L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H	1		–	1	Q
		10			10					■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15						■	■	■	■	H	3		–	3	Q
		15			30							■	■	■	H	3		–	4	Q
		30			30								■	■	H	4		–	4	Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 16 kA, I_{PN} = 2x 100 A)
Thermal strength 200 x I_{PN}
1st core class 0.5; instrument security factor FS5; rating 10 VA
2nd core without

4 M A 7
2 4 4 – 3 M
2
E 2 – 0 A

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

2

660

Equipment Selection

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

20 kA

10th to 14th position

Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		Order codes
Order No.:	4	M	A	7	■	4	8	–	■	■	■	■	■	–	■	■	■	■	– ★	■ ■ ■
																	s. p. 40	s. p. 40	s. p. 40	

At rated primary current I_{PN}	Thermal strength	Pos. 12
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	100 x I_{PN}	0
150 A	150 x I_{PN}	1
100 A 125 A	200 x I_{PN}	2
75 A	300 x I_{PN}	3
50 A 60 A	400 x I_{PN}	4
40 A	500 x I_{PN}	5
30 A	800 x I_{PN}	7
25 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Pos. 10	Pos. 11	Pos. 12	–	Pos. 13	Pos. 14
0.2	FS10	10					■		■	■	■	■	■	■	C	2		–	0	A
		15								■	■	■	■	■	C	3		–	0	A
0.5	FS5	10				■	■		■	■	■	■	■	■	E	2		–	0	A
		15					■		■	■	■	■	■	■	E	3		–	0	A
		30							■	■	■	■	■	■	E	4		–	0	A
1	FS5	10				■	■		■	■	■	■	■	■	H	2		–	0	A
		15				■	■		■	■	■	■	■	■	H	3		–	0	A
		30							■	■	■	■	■	■	H	4		–	0	A
5P	10	5				■	■		■	■	■	■	■	■	L	1		–	0	A
		10							■	■	■	■	■	■	L	2		–	0	A
		15								■	■	■	■	■	L	3		–	0	A
		30										■	■	■	L	4		–	0	A
10P	10	5				■	■		■	■	■	■	■	■	Q	1		–	0	A
		10				■	■		■	■	■	■	■	■	Q	2		–	0	A
		15							■	■	■	■	■	■	Q	3		–	0	A
		30									■	■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E	1		–	1	L
		10			10					■	■	■	■	■	E	2		–	2	L
		15			15							■	■	■	E	3		–	3	L
		30			30									■	E	4		–	4	L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E	1		–	1	Q
		10			10					■	■	■	■	■	E	2		–	2	Q
		15			15							■	■	■	E	3		–	3	Q
		30			30									■	E	4		–	4	Q
1	FS5	5	5P	10	5	■	■		■	■	■	■	■	■	H	1		–	1	L
		10			10					■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15						■	■	■	■	H	3		–	3	L
		15			30								■	■	H	3		–	4	L
		30			30									■	H	4		–	4	L
1	FS5	5	10P	10	5	■	■		■	■	■	■	■	■	H	1		–	1	Q
		10			10				■	■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15						■	■	■	■	H	3		–	3	Q
		15			30							■	■	■	H	3		–	4	Q
		30			30								■	■	H	4		–	4	Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 20 kA, I_{PN} = 100 A)
Thermal strength 200 x I_{PN}
1st core class 1; instrument security factor FS5; rating 10 VA
2nd core class 5P; accuracy limit factor 10; rating 15 VA

4 M A 7
2 4 8 – 0 M
2
H 2 – 3 L

Example for Order No.: 4 M A 7 2 4 8 – 0 M H 2 2 – 3 L ■ ■
Order codes:

661

20 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M A 7 ■ 4 8 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■
s.p. 40 (position 15), s.p. 40 (position 16), s.p. 40 (★)

At rated primary current I_{PN}	Thermal strength	Position 12
2x 200 A 2x 250 A 2x 300 A 2x 400 A		0
2x 500 A 2x 600 A	100 x I_{PN}	1
2x 150 A	150 x I_{PN}	2
2x 100 A 2x 125 A	200 x I_{PN}	3
2x 75 A	300 x I_{PN}	4
2x 50 A 2x 60 A	400 x I_{PN}	5
2x 40 A	500 x I_{PN}	7
2x 30 A	800 x I_{PN}	8
2x 25 A	1000 x I_{PN}	

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Pos. 10	Pos. 11	–	Pos. 13	Pos. 14
0.2	FS10	10								■	■	■	■	■	C	2	–	0	A
		15								■	■	■	■	■	C	3	–	0	A
0.5	FS5	10				■	■		■	■	■	■	■	■	E	2	–	0	A
		15							■	■	■	■	■	■	E	3	–	0	A
		30								■	■	■	■	■	E	4	–	0	A
1	FS5	10				■	■		■	■	■	■	■	■	H	2	–	0	A
		15				■	■		■	■	■	■	■	■	H	3	–	0	A
		30							■	■	■	■	■	■	H	4	–	0	A
5P	10	5				■	■		■	■	■	■	■	■	L	1	–	0	A
		10							■	■	■	■	■	■	L	2	–	0	A
		15								■	■	■	■	■	L	3	–	0	A
		30										■	■	■	L	4	–	0	A
10P	10	5				■	■		■	■	■	■	■	■	Q	1	–	0	A
		10					■		■	■	■	■	■	■	Q	2	–	0	A
		15							■	■	■	■	■	■	Q	3	–	0	A
		30										■	■	■	Q	4	–	0	A
0.5	FS5	5	5P	10	5				■	■	■	■	■	■	E	1	–	1	L
		10			10						■	■	■	■	E	2	–	2	L
		15			15							■	■	■	E	3	–	3	L
		30			30								■	■	E	4	–	4	L
0.5	FS5	5	10P	10	5				■	■	■	■	■	■	E	1	–	1	Q
		10			10				■		■	■	■	■	E	2	–	2	Q
		15			15							■	■	■	E	3	–	3	Q
		30			30								■	■	E	4	–	4	Q
1	FS5	5	5P	10	5	■	■		■	■	■	■	■	■	H	1	–	1	L
		10			10					■	■	■	■	■	H	2	–	2	L
		10			15						■	■	■	■	H	2	–	3	L
		15			15						■	■	■	■	H	3	–	3	L
		15			30								■	■	H	3	–	4	L
		30			30								■	■	H	4	–	4	L
1	FS5	5	10P	10	5	■	■		■	■	■	■	■	■	H	1	–	1	Q
		10			10					■	■	■	■	■	H	2	–	2	Q
		10			15						■	■	■	■	H	2	–	3	Q
		15			15						■	■	■	■	H	3	–	3	Q
		15			30								■	■	H	3	–	4	Q
		30			30								■	■	H	4	–	4	Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 20 kA, I_{PN} = 2x 100 A)
Thermal strength 200 x I_{PN}
1st core class 1; instrument security factor FS5; rating 5 VA
2nd core class 10P; accuracy limit factor 10; rating 5 VA

4 M A 7
2 4 8 – 3 M
2
H 1 – 1 Q

Example for Order No.: 4 M A 7 2 4 8 – 3 M H 1 2 – 1 Q ■ ■
Order codes:

2

662

Equipment Selection

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

25 kA

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		Order codes
Order No.:	4	M	A	7	■	5	4	–	■	■	■	■	■	–	■	■	■	■	– ★	■ ■ ■
																	s. p. 40	s. p. 40	s. p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
250 A 300 A 400 A 500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
200 A	150 x I_{PN}	1
125 A 150 A	200 x I_{PN}	2
100 A	300 x I_{PN}	3
75 A	400 x I_{PN}	4
50 A 60 A	500 x I_{PN}	5
40 A	800 x I_{PN}	7

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15							■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 25 kA, I_{PN} = 100 A)
Thermal strength 300 x I_{PN}
1st core class 10P; instrument security factor 10; rating 15 VA
2nd core without

4MA7
254-0M
3
Q3 -0A

Example for Order No.: 4MA7254-0MQ33-0A ■ ■
Order codes:

663

2

25 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ 5 4 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s.p. 40 (position 15), s.p. 40 (position 16), s.p. 40 (★)

At rated primary current I_{PN}	Thermal strength	Position 12
2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}	0
2x 200 A	150 x I_{PN}	1
2x 125 A 2x 150 A	200 x I_{PN}	2
2x 100 A	300 x I_{PN}	3
2x 75 A	400 x I_{PN}	4
2x 50 A 2x 60 A	500 x I_{PN}	5
2x 40 A	800 x I_{PN}	7

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Positions 10 11 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15							■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10							■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30										■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5				■	■	■	■	■	■	E 1 – 1 L
		10			10						■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30								■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 25 kA, I_{PN} = 2x 100 A)
Thermal strength 300 x I_{PN}
1st core class 10P; instrument security factor 10; rating 15 VA
2nd core without

4 M A 7
2 5 4 – 3 M
3
Q 3 – 0 A

Example for Order No.: 4 M A 7 2 5 4 – 3 M Q 3 3 – 0 A ■ ■
Order codes:

664

Equipment Selection

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

2

31.5 kA

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M A 7 ■ 5 7 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
400 A 500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
250 A 300 A	150 x I_{PN}	1
200 A	200 x I_{PN}	2
125 A 150 A	300 x I_{PN}	3
100 A	400 x I_{PN}	4
75 A	500 x I_{PN}	5
60 A	600 x I_{PN}	6
50 A	800 x I_{PN}	7
40 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Positions 10 11 12 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■	■	■	■	■	■	■	■	E 2 – 0 A
		15					■	■	■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■	■	■	■	■	■	■	■	H 2 – 0 A
		15					■	■	■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■	■	■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■	■	■	■	■	■	■	■	Q 1 – 0 A
		10				■	■	■	■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■	■	■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■	■	■	■	■	■	■	■	E 1 – 1 Q
		10			10				■	■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5	■	■	■	■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5	■	■	■	■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 31.5 kA, I_{PN} = 100 A)
Thermal strength 400 x I_{PN}
1st core class 0.2; instrument security factor FS10; rating 15 VA
2nd core without

4 M A 7
2 5 7 – 0 M
4
C 3 – 0 A

Example for Order No.: 4 M A 7 2 5 7 – 0 M C 3 4 – 0 A ■ ■

Order codes:

665

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

31.5 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ 5 7 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■
s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}	0
250 A 300 A	150 x I_{PN}	1
200 A	200 x I_{PN}	2
125 A 150 A	300 x I_{PN}	3
100 A	400 x I_{PN}	4
75 A	500 x I_{PN}	5
60 A	600 x I_{PN}	6
50 A	800 x I_{PN}	7
40 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	12	–	13	14
0.2	FS10	10						■	■	■	■	■	■	■	C	2		–	0	A
		15							■	■	■	■	■	■	C	3		–	0	A
0.5	FS5	10				■	■	■	■	■	■	■	■	■	E	2		–	0	A
		15					■	■	■	■	■	■	■	■	E	3		–	0	A
		30						■	■	■	■	■	■	■	E	4		–	0	A
1	FS5	10				■	■	■	■	■	■	■	■	■	H	2		–	0	A
		15				■	■	■	■	■	■	■	■	■	H	3		–	0	A
		30						■	■	■	■	■	■	■	H	4		–	0	A
5P	10	5				■	■	■	■	■	■	■	■	■	L	1		–	0	A
		10						■	■	■	■	■	■	■	L	2		–	0	A
		15							■	■	■	■	■	■	L	3		–	0	A
		30									■	■	■	■	L	4		–	0	A
10P	10	5				■	■	■	■	■	■	■	■	■	Q	1		–	0	A
		10					■	■	■	■	■	■	■	■	Q	2		–	0	A
		15						■	■	■	■	■	■	■	Q	3		–	0	A
		30									■	■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5		■	■	■	■	■	■	■	■	E	1		–	1	L
		10			10					■	■	■	■	■	E	2		–	2	L
		15			15							■	■	■	E	3		–	3	L
		30			30							■	■	■	E	4		–	4	L
0.5	FS5	5	10P	10	5		■	■	■	■	■	■	■	■	E	1		–	1	Q
		10			10					■	■	■	■	■	E	2		–	2	Q
		15			15							■	■	■	E	3		–	3	Q
		30			30								■	■	E	4		–	4	Q
1	FS5	5	5P	10	5	■	■	■	■	■	■	■	■	■	H	1		–	1	L
		10			10				■	■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15						■	■	■	■	H	3		–	3	L
		15			30								■	■	H	3		–	4	L
		30			30								■	■	H	4		–	4	L
1	FS5	5	10P	10	5	■	■	■	■	■	■	■	■	■	H	1		–	1	Q
		10			10				■	■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15						■	■	■	■	H	3		–	3	Q
		15			30							■	■	■	H	3		–	4	Q
		30			30								■	■	H	4		–	4	Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design — 4 M A 7
(U_m = 12 kV, I_{th} = 31.5 kA, I_{PN} = 2x 100 A) — 2 5 7 – 3 M
Thermal strength 400 x I_{PN} — 4
1st core class 0.5; instrument security factor FS5; rating 5 VA
2nd core class 10P; accuracy limit factor 10; rating 5 VA — E 1 – 1 Q

Example for Order No.: 4 M A 7 2 5 7 – 3 M E 1 4 – 1 Q ■ ■
Order codes:

2

666

Equipment Selection

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

40 kA

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 | Order codes

Order No.: 4 M A 7 ■ 6 3 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ | ■ ■ ■

Positions 15, 16 and ★: s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
400 A 500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
300 A	150 x I_{PN}	1
200 A 250 A	200 x I_{PN}	2
150 A	300 x I_{PN}	3
100 A 125 A	400 x I_{PN}	4
75 A	600 x I_{PN}	6
60 A	800 x I_{PN}	7
50 A	1000 x I_{PN}	8

2

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Positions 10 11 12 – 13 14
0.2	FS10	10						■		■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■	■		■	■	■	■	■	E 2 – 0 A
		15				■	■	■		■	■	■	■	■	E 3 – 0 A
		30								■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■	■		■	■	■	■	■	H 2 – 0 A
		15				■	■	■		■	■	■	■	■	H 3 – 0 A
		30								■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■	■		■	■	■	■	■	L 1 – 0 A
		10								■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■	■		■	■	■	■	■	Q 1 – 0 A
		10					■	■		■	■	■	■	■	Q 2 – 0 A
		15						■		■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 Q
		10			10					■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design | 4 M A 7
(U_m = 12 kV, I_{th} = 40 kA, I_{PN} = 100 A) | 2 6 3 – 0 M
Thermal strength 400 x I_{PN} | 4
1st core class 1; instrument security factor FS5; rating 5 VA | E 1 – 1 L
2nd core class 5P; accuracy limit factor 10; rating 5 VA

Example for Order No.: 4 M A 7 2 6 3 – 0 M E 1 4 – 1 L ■ ■

Order codes:

667

40 kA – with primary multi-ratio

10th to 14th position

Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 — Order codes

Order No.: 4 M A 7 ■ 6 3 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s.p. 40 s.p. 40 s.p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
2x 400 A 2x 500 2x 600 A	100 x I_{PN}	0
2x 300 A	150 x I_{PN}	1
2x 200 A 2x 250 A	200 x I_{PN}	2
2x 150 A	300 x I_{PN}	3
2x 100 A 2x 125 A	400 x I_{PN}	4
2x 75 A	600 x I_{PN}	6
2x 60 A	800 x I_{PN}	7
2x 50 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Order code (10–14)
0.2	FS10	10						■		■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■	■		■	■	■	■	■	E 2 – 0 A
		15					■	■		■	■	■	■	■	E 3 – 0 A
		30						■		■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■	■		■	■	■	■	■	H 2 – 0 A
		15				■	■	■		■	■	■	■	■	H 3 – 0 A
		30						■		■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■	■		■	■	■	■	■	L 1 – 0 A
		10						■		■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■	■		■	■	■	■	■	Q 1 – 0 A
		10					■	■		■	■	■	■	■	Q 2 – 0 A
		15						■		■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■	■		■	■	■	■	■	E 1 – 1 L
		10			10						■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■	■		■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 Q
		10			10					■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30								■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design

(U_m = 12 kV, I_{th} = 40 kA, I_{PN} = 2x 100 A)

Thermal strength 400 x I_{PN}

1st core class 0.2; instrument security factor FS10; rating 10 VA

2nd core without

4 M A 7

2 6 3 – 3 M

4

C 2 – 0 A

Example for Order No.: 4 M A 7 2 6 3 – 3 M C 2 4 – 0 A ■ ■

Order codes:

2

668

Equipment Selection

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

50 kA

10th to 14th position

Core versions

	Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
	Order No.:	4	M	A	7	■	6	7	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																		s. p. 40	s. p. 40		s. p. 40	

At rated primary current I_{PN}	Thermal strength	10	11	12	–	13	14
500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	$100 \times I_{PN}$			0			
400 A	$150 \times I_{PN}$			1			
250 A 300 A	$200 \times I_{PN}$			2			
200 A	$300 \times I_{PN}$			3			
125 A 150 A	$400 \times I_{PN}$			4			
100 A	$500 \times I_{PN}$			5			
75 A	$800 \times I_{PN}$			7			
60 A	$1000 \times I_{PN}$			8			

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	$1000 \times I_{PN}$	$800 \times I_{PN}$	$600 \times I_{PN}$	$500 \times I_{PN}$	$400 \times I_{PN}$	$300 \times I_{PN}$	$200 \times I_{PN}$	$150 \times I_{PN}$	$100 \times I_{PN}$	10	11	12	–	13	14
0.2	FS10	10							■	■	■	■	■	■	C	2		–	0	A
		15								■	■	■	■	■	C	3		–	0	A
0.5	FS5	10				■	■		■	■	■	■	■	■	E	2		–	0	A
		15					■		■	■	■	■	■	■	E	3		–	0	A
		30							■	■	■	■	■	■	E	4		–	0	A
1	FS5	10				■	■		■	■	■	■	■	■	H	2		–	0	A
		15				■	■		■	■	■	■	■	■	H	3		–	0	A
		30							■	■	■	■	■	■	H	4		–	0	A
5P	10	5				■	■		■	■	■	■	■	■	L	1		–	0	A
		10							■	■	■	■	■	■	L	2		–	0	A
		15								■	■	■	■	■	L	3		–	0	A
		30										■	■	■	L	4		–	0	A
10P	10	5				■	■		■	■	■	■	■	■	Q	1		–	0	A
		10					■		■	■	■	■	■	■	Q	2		–	0	A
		15							■	■	■	■	■	■	Q	3		–	0	A
		30									■	■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E	1		–	1	L
		10			10					■	■	■	■	■	E	2		–	2	L
		15			15							■	■	■	E	3		–	3	L
		30			30									■	E	4		–	4	L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E	1		–	1	Q
		10			10					■	■	■	■	■	E	2		–	2	Q
		15			15						■	■	■	■	E	3		–	3	Q
		30			30									■	E	4		–	4	Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H	1		–	1	L
		10			10					■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15						■	■	■	■	H	3		–	3	L
		15			30								■	■	H	3		–	4	L
		30			30									■	H	4		–	4	L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H	1		–	1	Q
		10			10				■	■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15						■	■	■	■	H	3		–	3	Q
		15			30							■	■	■	H	3		–	4	Q
		30			30								■	■	H	4		–	4	Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design ($U_m = 12$ kV, $I_{th} = 50$ kA, $I_{PN} = 100$ A) — 4 M A 7 2 6 7 – 0 M

Thermal strength **500** x I_{PN} — 5

1st core class **0.5**; instrument security factor **FS5**; rating **5 VA**
2nd core class **5P**; accuracy limit factor **10**; rating **5 VA** — E 1 – 1 L

Example for Order No.: 4 M A 7 2 6 7 – 0 M E 1 5 – 1 L ■ ■

Order codes:

669

50 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M A 7 ■ 6 7 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s.p. 40 s.p. 40 s.p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
2x 500 A 2x 600 A	100 x I_{PN}	0
2x 400 A	150 x I_{PN}	1
2x 250 A 2x 300 A	200 x I_{PN}	2
2x 200 A	300 x I_{PN}	3
2x 125 A 2x 150 A	400 x I_{PN}	4
2x 100 A	500 x I_{PN}	5
2x 75 A	800 x I_{PN}	7
2x 50 A 2x 60 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	12	13	14
0.2	FS10	10							■	■	■	■	■	■	C	2	–	0	A
		15								■	■	■	■	■	C	3	–	0	A
0.5	FS5	10				■	■		■	■	■	■	■	■	E	2	–	0	A
		15					■		■	■	■	■	■	■	E	3	–	0	A
		30							■	■	■	■	■	■	E	4	–	0	A
1	FS5	10				■	■		■	■	■	■	■	■	H	2	–	0	A
		15				■	■		■	■	■	■	■	■	H	3	–	0	A
		30							■	■	■	■	■	■	H	4	–	0	A
5P	10	5				■	■		■	■	■	■	■	■	L	1	–	0	A
		10							■	■	■	■	■	■	L	2	–	0	A
		15								■	■	■	■	■	L	3	–	0	A
		30										■	■	■	L	4	–	0	A
10P	10	5				■	■		■	■	■	■	■	■	Q	1	–	0	A
		10							■	■	■	■	■	■	Q	2	–	0	A
		15								■	■	■	■	■	Q	3	–	0	A
		30										■	■	■	Q	4	–	0	A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E	1	–	1	L
		10			10					■	■	■	■	■	E	2	–	2	L
		15			15								■	■	E	3	–	3	L
		30			30								■	■	E	4	–	4	L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E	1	–	1	Q
		10			10					■	■	■	■	■	E	2	–	2	Q
		15			15							■	■	■	E	3	–	3	Q
		30			30								■	■	E	4	–	4	Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H	1	–	1	L
		10			10					■	■	■	■	■	H	2	–	2	L
		10			15							■	■	■	H	2	–	3	L
		15			15							■	■	■	H	3	–	3	L
		15			30								■	■	H	3	–	4	L
		30			30								■	■	H	4	–	4	L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H	1	–	1	Q
		10			10				■	■	■	■	■	■	H	2	–	2	Q
		10			15						■	■	■	■	H	2	–	3	Q
		15			15						■	■	■	■	H	3	–	3	Q
		15			30							■	■	■	H	3	–	4	Q
		30			30								■	■	H	4	–	4	Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 50 kA, I_{PN} = 2x 100 A)
Thermal strength 500 x I_{PN}
1st core class 0.5; instrument security factor FS5; rating 5 VA
2nd core class 5P; accuracy limit factor 10; rating 5 VA

4 M A 7
2 6 7 – 3 M
5
E 1 – 1 L

Example for Order No.: 4 M A 7 2 6 7 – 3 M E 1 5 – 1 L ■ ■
Order codes:

2

670

Equipment Selection

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

63 kA

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	7	1	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s. p. 40	s. p. 40		s. p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
500 A 600 A	150 x I_{PN}	1
400 A	200 x I_{PN}	2
250 A 300 A	300 x I_{PN}	3
200 A	400 x I_{PN}	4
125 A 150 A	500 x I_{PN}	5
100 A	800 x I_{PN}	7
75 A	1000 x I_{PN}	8

2

1st core			2nd core			Thermal strength									Positions 10, 11, 12 – 13, 14
Class	Factor	VA rating	Class	Factor	VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■		■	■	■	■	■	■	E 2 – 0 A
		15					■		■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■		■	■	■	■	■	■	H 2 – 0 A
		15				■	■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15					■	■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15					■	■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 63 kA, I_{PN} = 100 A) — 4 M A 7
Thermal strength 800 x I_{PN} — 2 7 1 – 0 M … 7
1st core class 0.5; instrument security factor FS5; rating 15 VA — E 3 – 0 A
2nd core without

Example for Order No.: 4 M A 7 2 7 1 – 0 M E 3 7 – 0 A ■ ■
Order codes:

671

63 kA – with primary multi-ratio

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	A	7	■	7	1	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s. p. 40	s. p. 40		s. p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
2x 500 A 2x 600 A	150 x I_{PN}	1
2x 400 A	200 x I_{PN}	2
2x 250 A 2x 300 A	300 x I_{PN}	3
2x 200 A	400 x I_{PN}	4
2x 125 A 2x 150 A	500 x I_{PN}	5
2x 100 A	800 x I_{PN}	7
2x 75 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■		C 2 – 0 A
		15								■	■	■	■		C 3 – 0 A
0.5	FS5	10				■	■		■	■	■	■	■		E 2 – 0 A
		15					■		■	■	■	■	■		E 3 – 0 A
		30							■	■	■	■	■		E 4 – 0 A
1	FS5	10				■	■		■	■	■	■	■		H 2 – 0 A
		15				■	■		■	■	■	■	■		H 3 – 0 A
		30								■	■	■	■		H 4 – 0 A
5P	10	5				■	■		■	■	■	■	■		L 1 – 0 A
		10							■	■	■	■	■		L 2 – 0 A
		15							□	■	■	■	■		L 3 – 0 A
		30										■	■		L 4 – 0 A
10P	10	5				■	■		■	■	■	■	■		Q 1 – 0 A
		10					■		■	■	■	■	■		Q 2 – 0 A
		15							■	■	■	■	■		Q 3 – 0 A
		30									■	■	■		Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■		E 1 – 1 L
		10			10					■	■	■	■		E 2 – 2 L
		15			15							■	■		E 3 – 3 L
		30			30								■		E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■		E 1 – 1 Q
		10			10					■	■	■	■		E 2 – 2 Q
		15			15							■	■		E 3 – 3 Q
		30			30								■		E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■		H 1 – 1 L
		10			10					■	■	■	■		H 2 – 2 L
		10			15					■	■	■	■		H 2 – 3 L
		15			15						■	■	■		H 3 – 3 L
		15			30								■		H 3 – 4 L
		30			30								■		H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■		H 1 – 1 Q
		10			10				■	■	■	■	■		H 2 – 2 Q
		10			15					■	■	■	■		H 2 – 3 Q
		15			15						■	■	■		H 3 – 3 Q
		15			30							■	■		H 3 – 4 Q
		30			30								■		H 4 – 4 Q

■ Feasible (other combinations on request) □ Not for 2x 125 A

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 63 kA, I_{PN} = 2x 100 A)
Thermal strength 800 x 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

4 M A 7
2 7 1 – 3 M
7
E 1 – 1 Q

Example for Order No.: 4 M A 7 2 7 1 – 3 M E 1 7 – 1 Q ■ ■
Order codes:

2

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Equipment Selection

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

Position:	1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16	Order codes
Order No.:	4 M A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★	■ ■ ■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	
1 A	Without 2nd core	0 A A
5 A	Without 2nd core	0 A B
1 A	1 A	C
5 A	5 A	D
1 A	5 A	E
5 A	1 A	F

16th position
Additional features

Options	
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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		Order No.	Order codes
With routine test certificate in German/English		– Z	A 1 0
With capacitive layer for voltage detecting system	6 kV	– Z	C 0 6
	10 kV	– Z	C 1 0
	15 kV	– Z	C 1 5
Differential earth-fault balance in protection core		– Z	D 1 0
Other special versions on request			

Configuration example

Indoor support-type current transformer, block-type design	4 M A 7
Maximum operating voltage $U_m = 12$ kV	
Rated lightning impulse withstand voltage $U_p = 75$ kV	
Rated short-duration power-frequency withstand voltage $U_d = 28$ kV	2
Rated short-time thermal current $I_{th} = 63$ kA	7 1 –
Rated primary current $I_{PN} = 2\times 100$ A	3 M
Thermal strength 800 x I_{PN}	7
1st core class 0.5; instrument security factor FS5; rating 5 VA	
2nd core class 10P; accuracy limit factor 10; rating 5 VA	E 1 … – 1 Q
Rated secondary current 1st core 1A; 2nd core 5A	E
Power frequency 50 Hz; marking according to IEC	1
With routine test certificate in German/English	– Z A 1 0
With capacitive layer for voltage detecting system 10 kV	– Z C 1 0

Example for Order No.: 4 M A 7 2 7 1 – 3 M E 1 7 – 1 Q E 1 – Z

Order codes: A 1 0 + C 1 0

673

2

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

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	Order codes
Order No.:	4	M	B	1	■	■	■	–	■	■	■	■	■	–	■	■	■	■	– ✱	■ ■ ■
											See page 42	See page 42	See page 42		See page 42	See page 42	See page 43	See page 43	See page 43	

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M B 1 2
17.5	95	38	4 M B 1 3
24	128	50	4 M B 1 4

6th/7th position
Rated short-time thermal current

Rated short-time thermal current I_{th} kA		
150	7	8
200	8	2
250	8	4
300	8	5
500	8	8

8th/9th position
Rated primary current

Rated primary current I_N A	Remark	Rated short-time thermal current 150 kA	200 kA	250 kA	300 kA	500 kA		
1500		■					1	D
2000			■				1	F
2500				■			1	G
3000					■		1	H
4000						■	1	J
5000	Only 4MB13					■	1	K
6000	Only 4MB13					■	1	L

■ Feasible (other combinations on request)

Configuration example

	Order No.
Indoor support-type current transformer, single-turn design	4 M B 1
Maximum operating voltage U_m = 24 kV	
Rated lightning impulse withstand voltage U_p = 125 kV	
Rated short-duration power-frequency withstand voltage U_d = 50 kV	4
Rated short-time thermal current I_{th} = 300 kA	8 5 –
Rated primary current I_{PN} = 3000 A	1 H

Example for Order No.: 4 M B 1 4 8 5 – 1 H ■ ■ ■ – ■ ■ ■ ■
Order codes:

674

Equipment Selection

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

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M B 1 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Position 15: See page 43; Position 16: See page 43; Order codes: See page 43

At rated primary current I_{PN}	Thermal strength	Position 12
1500 A 2000 A 2500 A 3000 A 4000 A 5000 A 6000 A	$100 \times I_{PN}$	0

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1500 A	2000 A	2500 A	3000 A	4000 A	5000 A	6000 A	Order No. (pos. 10–14)
0.2	FS10	15				■	■	■	■	■	■	■	C 3 – 0 A
		30				■	■	■	■	■	■	■	C 4 – 0 A
0.5	FS10	15				■	■	■	■	■	■	■	F 3 – 0 A
		30				■	■	■	■	■	■	■	F 4 – 0 A
		60				■	■	■	■	■	■	■	F 6 – 0 A
1	FS10	15				■	■	■	■	■	■	■	J 3 – 0 A
		30				■	■	■	■	■	■	■	J 4 – 0 A
		60				■	■	■	■	■	■	■	J 6 – 0 A
5P	10	30				■	■	■	■	■	■	■	L 4 – 0 A
		60				■	■	■	■	■	■	■	L 6 – 0 A
10P	10	30				■	■	■	■	■	■	■	Q 4 – 0 A
		60				■	■	■	■	■	■	■	Q 6 – 0 A
0.5	FS10	15	5P	10	15	■	■	■	■	■	■	■	F 3 – 3 L
		30			30	■	■	■	■	■	■	■	F 4 – 4 L
		30			60						■	■	F 6 – 6 L
1	FS10	15	5P	10	15	■	■	■	■	■	■	■	J 3 – 3 L
		30			30	■	■	■	■	■	■	■	J 4 – 4 L
		60			60						■	■	J 6 – 6 L
0.5	FS10	15	10P	10	15	■	■	■	■	■	■	■	F 3 – 3 Q
		30			30	■	■	■	■	■	■	■	F 4 – 4 Q
		60			60						■	■	F 6 – 6 Q
1	FS10	15	10P	10	15	■	■	■	■	■	■	■	J 3 – 3 Q
		30			30	■	■	■	■	■	■	■	J 4 – 4 Q
		60			60						■	■	J 6 – 6 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, single-turn design
(U_m = 24 kV, I_{th} = 300 kA, I_{PN} = 3000 A) — 4 M B 1 4 8 5 – 1 H
Thermal strength **100 x I_{PN}** — 0
1st core class **0.5**; instrument security factor **FS10**; rating **30 VA**
2nd core class **5P**; accuracy limit factor **10**; rating **30 VA** — F 4 – 4 L

Example for Order No.: 4 M B 1 4 8 5 – 1 H F 4 0 – 4 L ■ ■
Order codes:

675

Equipment Selection

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

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M B 1 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	
1 A	Without 2nd core	0 A A
5 A	Without 2nd core	0 A B
1 A	1 A	C
5 A	5 A	D
1 A	5 A	E
5 A	1 A	F

16th position
Additional features

Options	
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval [1]	2
60 Hz, IEC marking	6
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
Other special versions on request	

Configuration example

Indoor support-type current transformer, single-turn design	4 M B 1
Maximum operating voltage U_m = 24 kV	4
Rated lightning impulse withstand voltage U_p = 125 kV	B 5 –
Rated short-duration power-frequency withstand voltage U_d = 50 kV	
Rated short-time thermal current I_{th} = 300 kA	1 H
Rated primary current I_{PN} = 3000 A	0
Thermal strength 100 x I_{PN}	
1st core class 0.5; instrument security factor FS10; rating 30 VA	F 4 – 4 L
2nd core class 5P; accuracy limit factor 10; rating 30 VA	
Rated secondary current 1st core 5 A; 2nd core 5 A	D
Power frequency 60 Hz; marking according to IEC	6

Example for Order No.: 4 M B 1 4 B 5 – 1 H F 4 0 – 4 L D 6
Order codes:

2

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Equipment Selection

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

2

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

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M C 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Positions 10–14: See page 45 · Positions 15–16: See page 46 · ★: See page 46

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M C 2 2
24	125	50	4 M C 2 4
36	170	70	4 M C 2 6

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Order No.
15	150	4 3 – 0 P
20	200	4 8 – 0 Q
30	300	5 6 – 0 S
40	400	6 3 – 0 T
50	500	6 7 – 0 U
60	600	7 0 – 0 V
80	800	7 3 – 0 X
100	1000	7 5 – 1 A
120	1200	7 6 – 1 B
150	1500	7 8 – 1 D
200	2000	8 2 – 1 F
250	2500	8 4 – 1 G
300	3000	8 5 – 1 H

Configuration example

Indoor bushing-type current transformer, single-turn design	4 M C 2
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	6
Rated short-time thermal current I_{th} = 50 kA Rated primary current I_{PN} = 500 A	6 7 – 0 U

Example for Order No.: 4 M C 2 6 6 7 – 0 U ■ ■ ■ – ■ ■ ■ ■

Order codes:

677

Equipment Selection

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

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	C	2	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■

See page 46 (position 15)
See page 46 (position 16)
See page 46 (★)

At rated primary current I_{PN}	Thermal strength	Position 12
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}	0

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	Rated primary current I_{PN} 150 A	200 A	300–600 A	800–1500 A	2000–3000 A	Position 10 11 12 – 13 14
0.2	FS10	10				■	■	■	■	■	C 2 – 0 A
		15				■	■	■	■	■	C 3 – 0 A
0.5	FS5	15				■	■	■	■		E 3 – 0 A
		30				■	■	■	■	■	E 4 – 0 A
0.5	FS10	15								■	F 3 – 0 A
1	FS5	15				■	■	■	■		H 3 – 0 A
		30				■	■	■	■	■	H 4 – 0 A
1	FS10	15								■	J 3 – 0 A
10P	10	15				■	■	■	■	■	Q 3 – 0 A
		30				■	■	■	■	■	Q 4 – 0 A
		60				■	■	■	■	■	Q 6 – 0 A
0.2	FS10	10	10P	10	30	■	■	■	■	■	C 2 – 4 Q
		15			30	■	■	■	■	■	C 3 – 4 Q
0.5	FS5	15	10P	10	15	■	■	■	■		E 3 – 3 Q
		15			30	■	■	■	■		E 3 – 4 Q
		30			30	■	■	■	■	■	E 4 – 4 Q
		30			60		■	■	■	■	E 4 – 6 Q
0.5	FS10	15	10P	10	15					■	F 3 – 3 Q
		15			30					■	F 3 – 4 Q
1	FS5	15	10P	10	15	■	■	■	■		H 3 – 3 Q
		15			30	■	■	■	■		H 3 – 4 Q
		30			30	■	■	■	■	■	H 4 – 4 Q
		30			60		■	■	■	■	H 4 – 6 Q
1	FS10	15	10P	10	15					■	J 3 – 3 Q
		15			30					■	J 3 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor bushing-type current transformer, single-turn design
(U_m = 36 kV, I_{th} = 50 kA, I_{PN} = 500 A)
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

4 M C 2
6 6 7 – 0 U
0
H 4 – 4 Q

Example for Order No.: 4 M C 2 6 6 7 – 0 U H 4 0 – 4 Q ■ ■
Order codes:

678

Equipment Selection

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

	Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	★	Order codes		
	Order No.:	4	M	C	2	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Order No. (pos. 13 14 15)
1 A	Without 2nd core	0 A A
5 A	Without 2nd core	0 A B
1 A	1 A	C
5 A	5 A	D
1 A	5 A	E
5 A	1 A	F

16th position
Additional features

Options	Order No. (pos. 16)
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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	Order codes
With routine test certificate in German/English	– Z A 1 0
Other special versions on request	

Configuration example

Indoor bushing-type current transformer, single-turn design	4 M C 2
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	6
Rated short-time thermal current I_{th} = 50 kA	6 7 –
Rated primary current I_{PN} = 500 A	0 U
Thermal strength 100 x I_{PN}	0
1st core class 1; instrument security factor FS5; rating 30 VA	H 4 – 4 Q
2nd core class 10P; accuracy limit factor 10; rating 30 VA	
Rated secondary current 1st core 5 A; 2nd core 1 A	F
Power frequency 50 Hz; marking according to VDE	0

Example for Order No.: 4 M C 2 6 6 7 – 0 U H 4 0 – 4 Q F 0

Order codes:

679

4MC3 indoor bar-primary bushing-type current transformer

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M C 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Position 10: See page 48
Position 11: See page 48
Position 12: See page 48
Position 13: See page 48
Position 14: See page 48
Position 15: See page 49
Position 16: See page 49
★: See page 49

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M C 3 2
24	125	50	4 M C 3 4
36	170	70	4 M C 3 6

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Order No.
200	2000	8 2 – 1 F
250	2500	8 4 – 1 G
300	3000	8 5 – 1 H
400	4000	8 7 – 1 J
500	5000	8 8 – 1 K
600	6000	7 0 – 1 L
800	8000	7 2 – 1 N
1000	10000	7 3 – 1 P

Configuration example

Indoor bar-primary bushing-type current transformer	4 M C 3
Maximum operating voltage U_m = 12 kV Rated lightning impulse withstand voltage U_p = 75 kV Rated short-duration power-frequency withstand voltage U_d = 28 kV	2
Rated short-time thermal current I_{th} = 400 kA Rated primary current I_{PN} = 4000 A	8 7 – 1 J

Example for Order No.: 4 M C 3 2 8 7 – 1 J ■ ■ ■ – ■ ■ ■ ■

Order codes:

2

680

Equipment Selection

4MC3 indoor bar-primary bushing-type current transformer

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M C 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

15: See page 49; 16: See page 49; ★: See page 49

At rated primary current I_{PN}	Thermal strength	10	11	12	13	14
2000 A 2500 A 3000 A 4000 A 5000 A 6000 A 8000 A 10000 A	100 x I_{PN}			0		

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	3rd core Class	3rd core Factor	3rd core VA rating	4th core Class	4th core Factor	4th core VA rating	Rated primary current I_{PN} 2000–3000 A	4000–6000 A	8000–10000 A	10	11	12	–	13	14
0.2	FS10	15										■	■	■	C	3		–	0	A
		30										■	■	■	C	4		–	0	A
0.5	FS10	15										■	■	■	F	3		–	0	A
		30										■	■	■	F	4		–	0	A
1	FS10	30										■	■	■	J	4		–	0	A
		60										■	■	■	J	6		–	0	A
10P	10	30										■	■	■	Q	4		–	0	A
		60										■	■	■	Q	6		–	0	A
10P	20	60										■	■	■	S	6		–	0	A
		100										■	■	■	S	8		–	0	A
0.5	FS10	15	10P	10	30							■	■	■	F	3		–	4	Q
		15			60							■	■	■	F	3		–	6	Q
		15	10P	20	60							■	■	■	F	3		–	6	S
		30			60							■	■	■	F	4		–	6	S
1	FS10	60	10P	20	100							■	■	■	J	6		–	8	S
10P	10	60										■	■	■	Q	6		–	8	S
10P	20	60										■	■	■	S	6		–	8	S
		100										■	■	■	S	8		–	8	S
0.5	FS10	15	10P	10	30	10P	10	60				■	■	■	Y	0		–	0	A
1	FS10	30	10P	20	60	10P	20	100				■	■	■	Y	0		–	0	B
0.2	FS10	15	0.2	FS10	30	10P	10	30				■	■	■	Y	0		–	0	C
0.5	FS10	15			30			30				■	■	■	Y	0		–	0	D
0.2	FS10	30	1	FS10	60	10P	10	60	10P	20	100	■	■	■	Y	0		–	1	A
0.5	FS10	30			60			60			100	■	■	■	Y	0		–	1	B
1	FS10	30			60			60			100	■	■	■	Y	0		–	1	C
0.2	FS10	30	1	FS10	60	10P	10	60	10P	20	100	■	■	■	Y	0		–	1	D
0.5	FS10	30			60			60			100	■	■	■	Y	0		–	1	E
1	FS10	30			60			60			100	■	■	■	Y	0		–	1	F

■ Feasible (other combinations on request)

Configuration example

Indoor bar-primary bushing-type current transformer
(U_m = 12 kV, I_{th} = 400 kA, I_{PN} = 4000 A)
Thermal strength 100 x I_{PN}
1st core class 0.5; instrument security factor FS10; rating 15 VA
2nd core class 0.2; instrument security factor FS10; rating 30 VA
3rd core class 10P; accuracy limit factor 10; rating 30 VA

4 M C 3
2 8 7 – 1 J
0
Y 0 – 0 D

Example for Order No.: 4 M C 3 2 8 7 – 1 J Y 0 0 – 0 D ■ ■

Order codes:

2

6 8 1

Equipment Selection

4MC3 indoor bar-primary bushing-type current transformer

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes		
Order No.:	4	M	C	3	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Rated current for 3rd core	Rated current for 4th core	Order No. position 13	14	15
1 A	Without	Without	Without	0	A	A
5 A	Without	Without	Without	0	A	B
1 A	1 A	Without	Without			C
5 A	5 A	Without	Without			D
1 A	5 A	Without	Without			E
5 A	1 A	Without	Without			F
1 A	1 A	1 A	Without			G
5 A	5 A	5 A	Without			H
1 A	1 A	1 A	1 A			J
5 A	5 A	5 A	5 A			K

16th position
Additional features

Options	Position 16
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval [1]	2
60 Hz, IEC marking	6
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		Order code
With routine test certificate in German/English		– Z A 1 0
Size (for specification see the following pages)	11	– Z A 1 1
	12	– Z A 1 2
	21	– Z A 2 1
	22	– Z A 2 2
	31	– Z A 3 1
	32	– Z A 3 2
	41	– Z A 4 1
	42	– Z A 4 2
	51	– Z A 5 1
	52	– Z A 5 2
	61	– Z A 6 1
	62	– Z A 6 2
	72	– Z A 7 2
	73	– Z A 7 3
Other special versions on request		

Configuration example

Indoor bar-primary bushing-type current transformer	4 M C 3
Maximum operating voltage U_m = 12 kV	
Rated lightning impulse withstand voltage U_p = 75 kV	
Rated short-duration power-frequency withstand voltage U_d = 28 kV	2
Rated short-time thermal current I_{th} = 400 kA	
Rated primary current I_{PN} = 4000 A	8 7 – 1 J
Thermal strength 100 x I_{PN}	0
1st core class 0.5; instrument security factor FS10; rating 15 VA	
2nd core class 0.2; instrument security factor FS10; rating 30 VA	
3rd core class 10P; accuracy limit factor 10; rating 30 VA	Y 0 – 0 D
Rated secondary current 1st core 1 A; 2nd core 1 A; 3rd core 1 A	G
Power frequency 50 Hz; marking according to IEC	1
Size 42	– Z A 4 2

Example for Order No.: 4 M C 3 2 8 7 – 1 J Y 0 0 – 0 D G 1 – Z A 4 2

Order codes: A 4 2

2

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

2

Size specification for 4MC32 transformers 1)

10th to 14th position of Order No.	6th to 9th position of Order No. 82-1F	84-1G	85-1H	87-1J	88-1K	90-1L	92-1N	93-1P
C30-0A C40-0A F30-0A F40-0A J40-0A J60-0A Q40-0A Q60-0A S60-0A	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
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	12, 21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52, 61, 62, 72, 73	31, 32, 41, 42, 51, 52, 62, 72, 73	41, 42, 51, 52, 62, 72, 73
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
F30-6Q	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	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	42, 51, 52, 62, 72, 73
F30-6S F40-6S	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	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
J60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	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	42, 52, 62, 72, 73
Q60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 51, 52, 61, 62	32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 52, 61, 62	32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S80-8S	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, 52	22, 32, 41, 42, 51, 52, 62	41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
Y00-0A	11, 12, 21, 22, 31, 32	11,12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52	32, 42, 51, 52, 61, 62	52, 62, 72, 73	52, 62, 72, 73
Y00-0B	21, 22, 32	21, 22, 32	22, 32, 41, 42	22, 32, 42, 51, 52	22, 32, 42, 52	22, 42, 52, 62	42, 52, 62, 72, 73	52, 62, 72, 73
Y00-0C Y00-0D	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	12, 22, 32, 41, 42, 51, 52	22, 32, 42, 51, 52	52, 62, 72, 73	52, 62, 72, 73
Y00-1A Y00-1B Y00-1C	12, 22, 32	22, 32	22, 32, 42	22, 32, 42, 52	42, 52	52, 62	73	73
Y00-1D Y00-1E Y00-1F	22, 32	22, 32	22, 32, 42	41, 52	52	52, 62	73	73

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

683

Size specification for 4MC34 transformers 1)

10th to 14th position of Order No.	6th to 9th position of Order No.							
	82-1F	84-1G	85-1H	87-1J	88-1K	90-1L	92-1N	93-1P
C30-0A C40-0A F30-0A F40-0A J40-0A J60-0A Q40-0A Q60-0A S60-0A	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	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
S80-0A	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52, 61, 62, 72, 73	31, 32, 41, 42, 51, 52, 62, 72, 73	41, 42, 51, 52, 62, 72, 73
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	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
F30-6Q	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	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	42, 51, 52, 62, 72, 73
F30-6S F40-6S	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	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
J60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	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	42, 52, 62, 72, 73
Q60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 61, 62	32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S60-8S	21, 22, 31, 32	21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 41, 42, 52, 61, 62	42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S80-8S	21, 22, 32	21, 22, 32	21, 22, 31, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 62	41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
Y00-0A	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	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 42, 51, 52, 61, 62	22, 32, 42, 51, 52, 61, 62, 72, 73	42, 52, 62, 72, 73
Y00-0B	22, 32	21, 22, 32	22, 32, 41, 42	22, 32, 42, 51, 52	22, 32, 42, 52	22, 42, 52, 62	42, 52, 62, 72, 73	52, 62, 72, 73
Y00-0C Y00-0D	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 32, 42, 51, 52	52, 62, 72, 73	52, 62, 72, 73
Y00-1A Y00-1B Y00-1C	12, 22, 32	22, 32	22, 32, 42	22, 32, 42, 52	42, 52	52, 62	73	73
Y00-1D Y00-1E Y00-1F	22, 32	22, 32	22, 32, 42	41, 52	52	52, 62	73	73

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

2

684

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

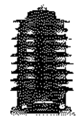
2

Size specification for 4MC36 transformers 1)

10th to 14th position of Order No.	6th to 9th position of Order No.							
	82-1F	84-1G	85-1H	87-1J	88-1K	90-1L	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, 61, 62	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	22, 31, 32, 41, 42, 51, 52, 61, 62	41, 42, 51, 52, 62, 72, 73	41, 42, 51, 52, 62, 72, 73
F30-4Q	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	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
F30-6Q	12, 21, 22, 31, 32	12, 21, 22, 31, 32	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
F30-6S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 42, 51, 52, 61, 62	42, 52, 62, 72, 73	52, 62, 72, 73
F40-6S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 51, 52, 61, 62	41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
J60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	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, 61, 62	41, 42, 51, 52, 61, 62, 72, 73	42, 52, 62, 72, 73
Q60-8S	21, 22, 31, 32	12, 21, 22, 31, 32	21, 22, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 61, 62	42, 51, 52	42, 52, 62, 72, 73
S60-8S	21, 22, 32	21, 22, 32	21, 22, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 41, 42, 51, 52, 61, 62	42, 52, 62, 72, 73	52, 62, 72, 73
S80-8S	21, 22, 32	31, 32, 42	21, 22, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 62	42, 52, 62, 72, 73	52, 62, 72, 73
Y00-0A	11, 12, 21, 22, 31, 32	11,12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 42, 52, 61, 62	52	52, 62, 72, 73
Y00-0B	22, 32	22, 32	22, 32	22, 42, 52	42, 52	42, 52, 62	52	73
Y00-0C Y00-0D	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 52, 62	73	73
Y00-1A Y00-1B Y00-1C	22, 32	22, 32	22, 32	42, 52	52	–	73	73
Y00-1D Y00-1E Y00-1F	22	22	22, 42	52	–	–	73	73

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

685



4ME2 outdoor support-type current transformer

5th position
Operating voltage (maximum value)

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M E 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Positions 10, 11, 12: See page 55; positions 13, 14: See page 55; positions 15, 16: See page 56; ★: See page 56

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M E 2 2
24	125	50	4 M E 2 4
36	170	70	4 M E 2 6

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multi-ratio I_{PN} A	Thermal strength 300 x I_{PN}	200 x I_{PN}	100 x I_{PN}	Positions 6 7 – 8 9
0.5		2x 5	■		■	0 0 – 3 A
0.6		2x 10	■		■	0 1 – 3 B
1		2x 5		■		0 3 – 3 A
1.5		2x 15	■		■	0 7 – 3 D
2.5		2x 25	■		■	1 6 – 3 F
3		2x 15		■		1 7 – 3 D
5		2x 25		■		2 5 – 3 F
5		2x 50	■		■	2 5 – 3 J
7.5		2x 75	■	■	■	3 2 – 3 L
10		2x 50		■		3 6 – 3 J
10		2x 100	■		■	3 6 – 3 M
15		2x 75		■		4 3 – 3 L
15		2x 150	■		■	4 3 – 3 P
20		2x 100		■		4 8 – 3 M
20		2x 200	■		■	4 8 – 3 Q
25		2x 250	■		■	5 4 – 3 R
30		2x 150		■		5 6 – 3 P
30		2x 300	■		■	5 6 – 3 S
40		2x 200		■		6 3 – 3 Q
40		2x 400	■		■	6 3 – 3 T
50		2x 250		■		6 7 – 3 R
50		2x 500	■		■	6 7 – 3 U
60		2x 300		■		7 0 – 3 S
60		2x 600	■		■	7 0 – 3 V

6th to 9th position continued on page 54

Configuration example
Outdoor support-type current transformer — 4 M E 2
Maximum operating voltage U_m = 24 kV
Rated lightning impulse withstand voltage U_p = 125 kV
Rated short-duration power-frequency withstand voltage U_d = 50 kV — 4
Rated short-time thermal current I_{th} = 15 kA
Rated primary current I_{PN} = 2x 75 A — 4 3 – 3 L

Example for Order No.: 4 M E 2 4 4 3 – 3 L ■ ■ ■ – ■ ■ ■ ■
Order codes:

2

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Equipment Selection
4ME2 outdoor support-type current transformer

2

6th to 9th position (continued)
Rated short-time thermal current/
Rated primary current

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	E	2	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	✱	■ ■ ■
											See page 55	See page 55	See page 55		See page 55	See page 55	See page 56	See page 56		See page 56	

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multi-ratio I_{PN} A	Thermal strength $300 \times I_{PN}$	Thermal strength $200 \times I_{PN}$	Thermal strength $100 \times I_{PN}$	6	7	–	8	9
0.5	5		■		■	0	0	–	0	A
0.6	10		■		■	0	1	–	0	B
1	5			■		0	3	–	0	A
1.5	15		■		■	0	7	–	0	D
2	10			■		1	3	–	0	B
2	20		■		■	1	3	–	0	E
3	15			■		1	7	–	0	D
3	30		■		■	1	7	–	0	G
4	20			■		2	2	–	0	E
4	40		■		■	2	2	–	0	H
5	50		■		■	2	5	–	0	J
6	30			■		2	6	–	0	G
6	60		■		■	2	6	–	0	K
7.5	75		■		■	3	2	–	0	L
8	40			■		3	3	–	0	H
10	50			■		3	6	–	0	J
10	100		■		■	3	6	–	0	M
12	60			■		3	8	–	0	K
15	75			■		4	3	–	0	L
15	150		■		■	4	3	–	0	P
20	100			■		4	8	–	0	M
20	200		■		■	4	8	–	0	Q
25	250		■		■	5	3	–	0	R
30	150			■		5	6	–	0	P
30	300		■		■	5	6	–	0	S
40	200			■		6	3	–	0	Q
40	400		■		■	6	3	–	0	T
50	250			■		6	7	–	0	R
50	500		■		■	6	7	–	0	U
60	300			■		7	0	–	0	S
60	600		■		■	7	0	–	0	V
80	400			■		7	3	–	0	T
80	800		■		■	7	3	–	0	X
100	500			■		7	5	–	0	U
100	1000		■		■	7	5	–	1	A
120	600			■		7	6	–	0	V
120	1200		■		■	7	6	–	1	B

Configuration example
Outdoor support-type current transformer
(U_m = 24 kV, U_p = 125 kV, U_d = 50 kV)
Rated short-time thermal current I_{th} = 100 kA
Rated primary current I_{PN} = 1000 A

4 M E 2
4
7 5 – 1 A

Example for Order No.: 4 M E 2 4 7 5 – 1 A ■ ■ ■ – ■ ■ ■ ■
Order codes:

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Equipment Selection

4ME2 outdoor support-type current transformer

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M E 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

See page 56 See page 56 See page 56

At rated primary current I_{PN}	Thermal strength	Pos. 12
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	100 x I_{PN}	0
1 2 3 4 5 6 8 10 12 15 20 30 40 50 60 80 100 120	200 x I_{PN}	2
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 x I_{PN}	3

1st core			2nd core			3rd core			Rated primary current I_{PN}			Pos. 10	Pos. 11		Pos. 13	Pos. 14
Class	Factor	VA rating	Class	Factor	VA rating	Class	Factor	VA rating	300 x I_{PN}	200 x I_{PN}	100 x I_{PN}					
0.2	FS10	5							■	■	■	C	1	–	0	A
		10							■	■	■	C	2	–	0	A
		15							■	■	■	C	3	–	0	A
		30							■	■	■	C	4	–	0	A
0.5	FS5	10							■	■	■	E	2	–	0	A
		15							■	■	■	E	3	–	0	A
		30							■	■	■	E	4	–	0	A
1	FS5	15							■	■	■	H	3	–	0	A
		30							■	■	■	H	4	–	0	A
5P	10	15							■	■	■	L	3	–	0	A
		30							■	■	■	L	4	–	0	A
		60							■	■	■	L	6	–	0	A
10P	10	15							■	■	■	Q	3	–	0	A
		30							■	■	■	Q	4	–	0	A
		60							■	■	■	Q	6	–	0	A
0.2	FS10	10	5P	10	30				■	■	■	C	2	–	4	L
		15			30				■	■	■	C	3	–	4	L
		30			60				■	■	■	C	4	–	6	L
0.5	FS5	10	5P	10	30				■	■	■	E	2	–	4	L
		15			30				■	■	■	E	3	–	4	L
		30			30				■	■	■	E	4	–	4	L
		30			60				■	■	■	E	4	–	6	L
1	FS5	15	5P	10	30				■	■	■	H	3	–	4	L
		30			30				■	■	■	H	4	–	4	L
		30			60				■	■	■	H	4	–	6	L
1	FS5	15	10P	10	30				■	■	■	H	3	–	4	Q
		30			30				■	■	■	H	4	–	4	Q
		30			60				■	■	■	H	4	–	6	Q
0.2	FS10	15	0.5	FS5	15	5P	10	15	■	■	■	Y	0	–	0	E
		15			30			30	■	■	■	Y	0	–	0	F
0.5	FS5	15	5P	10	15	5P	10	15	■	■	■	Y	0	–	0	G
		15			30			30	■	■	■	Y	0	–	0	H

■ Feasible (other combinations on request)

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

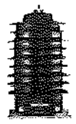
4 M E 2
4 7 5 – 1 A
3
Q 6 – 0 A

Example for Order No.: 4 M E 2 4 7 5 – 1 A Q 6 3 – 0 A ■ ■
Order codes:

2

688

Equipment Selection
4ME2 outdoor support-type current transformer



2

15th position
Rated secondary current

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – ★ Order codes
Order No.: 4 M E 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Rated current for 1st core	Rated current for 2nd core	Rated current for 3rd core	Position 13	Position 14	Position 15
1 A	Without	Without	0	A	A
5 A	Without	Without	0	A	B
1 A	1 A	Without			C
5 A	5 A	Without			D
1 A	5 A	Without			E
5 A	1 A	Without			F
1 A	1 A	1 A			G
5 A	5 A	5 A			H

16th position
Additional features

Options	Position 16
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval [1)]	2
60 Hz, IEC marking	6
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		Code	Order code
With routine test certificate in German/English		– Z	A 1 0
Size (for specification see the following page)	0	– Z	A 0 0
	1	– Z	A 0 1
	2	– Z	A 0 2
	3	– Z	A 0 3
Other special versions on request			

Configuration example

Outdoor support-type current transformer	4 M E 2
Maximum operating voltage U_m = 24 kV	
Rated lightning impulse withstand voltage U_p = 125 kV	
Rated short-duration power-frequency withstand voltage U_d = 50 kV	4
Rated short-time thermal current I_{th} = 100 kA	7 5 – 1 A
Rated primary current I_{PN} = 1000 A	
Thermal strength 300 x I_{PN}	3
1st core class 10P; instrument security factor 10; rating 60 VA	
2nd core without	
3rd core without	Q 6 – 0 A
Rated secondary current 1st core 5 A; 2nd core without; 3rd core without	B
Power frequency 50 Hz; marking according to IEC	1
Size 1	– Z A 0 1

Example for Order No.: 4 M E 2 4 7 5 – 1 A Q 6 3 – 0 A B 1 – Z A 0 1
Order codes: A 0 1

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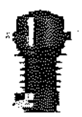
Size specification for 4ME2 transformers

Order No.	Up to 12 kV			At 24 kV		At 36 kV
	with rated short-time thermal current					
	100 x I_{PN}	200 x I_{PN}	300 x I_{PN}	100 x I_{PN}	200 x I_{PN}	100 x I_{PN}
. . . C1.-0A . . .	1	1	1	1	1	1
. . . C2.-0A . . .	1	1	1	1	1	1
. . . C3.-0A . . .	1	1	1	1	1	1
. . . C4.-0A . . .	1	1	1	1	1	1
. . . E2.-0A . . .	1	1	1	1	1	1
. . . E3.-0A . . .	1	1	1	1	1	1
. . . E4.-0A . . .	1	1	1	1	1	1
. . . H3.-0A . . .	1	1	1	1	1	1
. . . H4.-0A . . .	1	1	1	1	1	1
. . . L3.-0A . . .	1	1	1	1	1	1
. . . L4.-0A . . .	1	1	2	1	1	1
. . . L6.-0A . . .	2	2	2	1	2	1
. . . Q3.-0A . . .	1	1	1	1	1	1
. . . Q4.-0A . . .	1	1	2	1	1	1
. . . Q6.-0A . . .	2	2	2	1	2	2
. . . C2.-4L . . .	1	2	2	1	2	2
. . . C3.-4L . . .	1	1	2	1	2	2
. . . C4.-6L . . .	2	2	2	2	2	2
. . . E2.-4L . . .	1	1	2	1	2	2
. . . E3.-4L . . .	1	1	2	2	2	1
. . . E4.-4L . . .	1	2	2	2	2	1
. . . E4.-6L . . .	2	2	2	2	2	2
. . . H3.-4L . . .	1	2	2	1	2	2
. . . H4.-4L . . .	1	2	2	1	2	2
. . . H4.-6L . . .	2	2	2	2	2	2
. . . H3.-4Q . . .	1	2	2	1	2	2
. . . H4.-4Q . . .	1	2	2	1	2	2
. . . H4.-6Q . . .	2	2	2	2	2	2
. . . Y0.-0E . . .	2	2	2	1	2	2
. . . Y0.-0F . . .	2	2	2	2	2	2
. . . Y0.-0G . . .	2	2	2	2	2	2
. . . Y0.-0H . . .	2	2	2	2	2	2

690

Equipment Selection
4ME3 outdoor support-type current transformer



4ME3 outdoor support-type current transformer

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	E	3	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
											See page 60	See page 60	See page 60		See page 60	See page 60	See page 61	See page 61		See page 61	

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M E 3 2
24	125	50	4 M E 3 4
36	170	70	4 M E 3 6
52	250	95	4 M E 3 8

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multiratio I_{PN} A		Thermal strength 300 × I_{PN}	200 × I_{PN}	100 × I_{PN}	Order No. (6–9)
0.5		2x	5	■		■	0 0 – 3 A
0.6		2x	10	■		■	0 1 – 3 B
1		2x	5		■		0 3 – 3 A
1.5		2x	15	■		■	0 7 – 3 D
2.5		2x	25	■		■	1 6 – 3 F
3		2x	15		■		1 7 – 3 D
5		2x	25		■		2 5 – 3 F
5		2x	50	■		■	2 5 – 3 J
7.5		2x	75	■	■	■	3 2 – 3 L
10		2x	50		■		3 6 – 3 J
10		2x	100	■		■	3 6 – 3 M
15		2x	75		■		4 3 – 3 L
15		2x	150	■		■	4 3 – 3 P
20		2x	100		■		4 8 – 3 M
20		2x	200	■		■	4 8 – 3 Q
25		2x	250	■		■	5 4 – 3 R
30		2x	150		■		5 6 – 3 P
30		2x	300	■		■	5 6 – 3 S
40		2x	200		■		6 3 – 3 Q
40		2x	400	■		■	6 3 – 3 T
50		2x	250		■		6 7 – 3 R
50		2x	500	■		■	6 7 – 3 U
60		2x	300		■		7 0 – 3 S
60		2x	600	■		■	7 0 – 3 V

6th to 9th position continued on page 59

Configuration example

Outdoor support-type current transformer — 4 M E 3

Maximum operating voltage U_m = 52 kV
Rated lightning impulse withstand voltage U_p = 250 kV
Rated short-duration power-frequency withstand voltage U_d ≈ 95 kV — 8

Rated short-time thermal current I_{th} = 25 kA
Rated primary current I_{PN} = 2x 250 A — 5 4 – 3 R

Example for Order No.: 4 M E 3 8 5 4 – 3 R ■ ■ ■ – ■ ■ ■ ■
Order codes:

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Equipment Selection

4ME3 outdoor support-type current transformer

6th to 9th position (continued)
Rated short-time thermal current/ Rated primary current

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M E 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – + ■ ■ ■

Position 10: See page 60
Position 11: See page 60
Position 12: See page 60
Position 13: See page 60
Position 14: See page 60
Position 15: See page 61
Position 16: See page 61
Order codes: See page 61

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multiratio I_{PN} A	Thermal strength $300 \times I_{PN}$	Thermal strength $200 \times I_{PN}$	Thermal strength $100 \times I_{PN}$	Position 6	7	–	8	9
0.5	5		■		■	0	0	–	0	A
0.6	10		■		■	0	1	–	0	B
1	5			■		0	3	–	0	A
1.5	15		■		■	0	7	–	0	D
2	10			■		1	3	–	0	B
2	20		■		■	1	3	–	0	E
3	15			■		1	7	–	0	D
3	30		■		■	1	7	–	0	G
4	20			■		2	2	–	0	E
4	40		■		■	2	2	–	0	H
5	50		■		■	2	5	–	0	J
6	30			■		2	6	–	0	G
6	60		■		■	2	6	–	0	K
7.5	75		■		■	3	2	–	0	L
8	40			■		3	3	–	0	H
10	50			■		3	6	–	0	J
10	100		■		■	3	6	–	0	M
12	60			■		3	8	–	0	K
15	75			■		4	3	–	0	L
15	150		■		■	4	3	–	0	P
20	100			■		4	8	–	0	M
20	200		■		■	4	8	–	0	Q
25	250		■		■	5	3	–	0	R
30	150			■		5	6	–	0	P
30	300		■		■	5	6	–	0	S
40	200			■		6	3	–	0	Q
40	400		■		■	6	3	–	0	T
50	250			■		6	7	–	0	R
50	500		■		■	6	7	–	0	U
60	300			■		7	0	–	0	S
60	600		■		■	7	0	–	0	V
80	400			■		7	3	–	0	T
80	800		■		■	7	3	–	0	X
100	500			■		7	5	–	0	U
100	1000		■		■	7	5	–	1	A
120	600			■		7	6	–	0	V
120	1200		■		■	7	6	–	1	B
150	1500				■	7	8	–	1	D
200	2000				■	8	2	–	1	F
250	2500				■	8	4	–	1	G
300	3000				■	8	5	–	1	H

Configuration example

Outdoor support-type current transformer
($U_m = 52$ kV, $U_p = 250$ kV, $U_d = 95$ kV)
Rated short-time thermal current $I_{th} = 100$ kA
Rated primary current $I_{PN} = 1000$ A

4 M E 3
8
7 5 – 1 A

Example for Order No.: 4 M E 3 8 7 5 – 1 A ■ ■ ■ – ■ ■ ■ ■

Order codes:

2

692

Equipment Selection
4ME3 outdoor support-type current transformer

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M E 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

See page 61 (position 15) · See page 61 (position 16) · See page 61 (order codes)

At rated primary current I_{PN}	Thermal strength	Position 12
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}	0
1 2 3 4 5 6 8 10 12 15 20 30 40 50 60 80 100 120	200 x I_{PN}	2
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 x I_{PN}	3

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	3rd core Class	3rd core Factor	3rd core VA rating	Rated primary current 300 x I_{PN}	200 x I_{PN}	100 x I_{PN}	Order No.
0.2	FS10	5							■	■	■	C 1 – 0 A
		10							■	■	■	C 2 – 0 A
		15							■	■	■	C 3 – 0 A
		30							■	■	■	C 4 – 0 A
0.5	FS5	10							■	■	■	E 2 – 0 A
		15							■	■	■	E 3 – 0 A
		30							■	■	■	E 4 – 0 A
1	FS5	15							■	■	■	H 3 – 0 A
		30							■	■	■	H 4 – 0 A
5P	10	15							■	■	■	L 3 – 0 A
		30							■	■	■	L 4 – 0 A
		60							■	■	■	L 6 – 0 A
10P	10	15							■	■	■	Q 3 – 0 A
		30							■	■	■	Q 4 – 0 A
		60							■	■	■	Q 6 – 0 A
0.2	FS10	10	5P	10	30				■	■	■	C 2 – 4 L
		15			30				■	■	■	C 3 – 4 L
		30			60				■	■	■	C 4 – 6 L
0.5	FS5	10	5P	10	30				■	■	■	E 2 – 4 L
		15			30				■	■	■	E 3 – 4 L
		30			30				■	■	■	E 4 – 4 L
		30			60				■	■	■	E 4 – 6 L
1	FS5	15	5P	10	30				■	■	■	H 3 – 4 L
		30			30				■	■	■	H 4 – 4 L
		30			60				■	■	■	H 4 – 6 L
1	FS5	15	10P	10	30				■	■	■	H 3 – 4 Q
		30			30				■	■	■	H 4 – 4 Q
		30			60				■	■	■	H 4 – 6 Q
0.2	FS10	15	0.5	FS5	15	5P	10	15	■	■	■	Y 0 – 0 E
		15			30			30	■	■	■	Y 0 – 0 F
0.5	FS5	15	5P	10	15	5P	10	15	■	■	■	Y 0 – 0 G
		15			30			30	■	■	■	Y 0 – 0 H

■ Feasible (other combinations on request)

Configuration example

Outdoor support-type current transformer
(U_m = 52 kV, I_{th} = 100 kA, I_{PN} = 1000 A)
Thermal strength 300 x I_{PN}
1st core class 10P; instrument security factor 10; rating 60 VA
2nd core without
3rd core without

4 M E 3
8 7 5 – 1 A
3
Q 6 – 0 A

Example for Order No.: 4 M E 3 8 7 5 – 1 A Q 6 3 – 0 A ■ ■

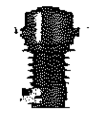
Order codes:

2

693

Equipment Selection

4ME3 outdoor support-type current transformer



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15th position
Rated secondary current

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M E 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Rated current for 1st core	Rated current for 2nd core	Rated current for 3rd core	Order No.
1 A	Without	Without	0 A A
5 A	Without	Without	0 A B
1 A	1 A	Without	C
5 A	5 A	Without	D
1 A	5 A	Without	E
5 A	1 A	Without	F
1 A	1 A	1 A	G
5 A	5 A	5 A	H

16th position
Additional features

Options	Order No.
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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

Optionen	Order codes
With routine test certificate in German/English	– Z A 1 0
Other special versions on request	

Configuration example

Outdoor support-type current transformer	4 M E 3
Maximum operating voltage U_m = 52 kV	
Rated lightning impulse withstand voltage U_p = 250 kV	
Rated short-duration power-frequency withstand voltage U_d = 95 kV	8
Rated short-time thermal current I_{th} = 100 kA	
Rated primary current I_{PN} = 1000 A	7 5 – 1 A
Thermal strength 300 x I_{PN}	3
1st core class 10P; instrument security factor 10; rating 60 VA	
2nd core without	
3rd core without	Q 6 – 0 A
Rated secondary current 1st core 5 A; 2nd core without; 3rd core without	B
Power frequency 50 Hz; marking according to IEC	1

Example for Order No.: 4 M E 3 8 7 5 – 1 A Q 6 3 – 0 A B 1
Order codes:

694

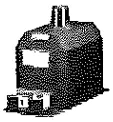
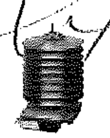
Equipment Selection

Product overview of voltage transformers

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

Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Illustration	Type of design	Order No.	
 R-HG24-058.eps	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**
 R-HG24-059.eps	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**
 R-HG24-063.eps	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**
 R-HG24-064.eps	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 6	Selection from page **63ff**
 R-HG24-065.eps	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**
 R-HG24-055.eps	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	4 M S 4	Selection from page **63ff**
 R-HG24-066.eps	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**
 R-HG24-067.eps	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.: 4 M S 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■

Order codes:

2

695

Maximum operating voltage U_{max} = 52 kV

12 kV

50/60 Hz

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – ... Order codes

Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ ... – ★ ■ ■ ■

Position 8: See page 65; Position 9: See page 65; Position 10: See page 66; Position 11: See page 66; Position 12: See page 67; ★: See page 67

Maximum operating voltage U_{max} kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated primary voltage U_{prim} kV	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	Pos. 5	Pos. 6	Pos. 7
12	75	28	3.3/√3	■		■						2	0	8
			3.3		■		■					2	0	8
			3.6/√3	■		■						2	7	0
			3.6		■		■					2	7	0
			4.8/√3	■		■						2	7	1
			4.8		■		■					2	7	1
			5 /√3	■		■		■		■		2	1	3
			5		■		■		■		■	2	1	3
			6 /√3	■		■		■		■		2	1	5
			6		■		■		■		■	2	1	5
			6.6/√3	■		■		■		■		2	1	7
			6.6		■		■		■		■	2	1	7
			7.2/√3	■		■						2	2	2
			7.2		■		■					2	2	2
			10 /√3	■		■		■		■		2	2	7
			10		■		■		■		■	2	2	7
			11 /√3	■		■		■		■		2	3	0
			11		■		■		■		■	2	3	0
			6–10 /√3			■						2	6	1
			6–10				■					2	6	1
			Others	■	■	■	■					2	9	9

Configuration example
Voltage transformer: 4 M
Outdoor design, single-phase: S 3
Rated primary voltage U_{prim} = 6.6/√3 kV: 2 1 7

Example for Order No.: 4 M S 3 2 1 7 – ■ ■ ■ ■ ■
Order codes:

2

696

Equipment Selection
Voltage transformers

24 kV
50/60 Hz

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 Order codes

Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ★ ■ ■ ■

Position 8: See page 65; Position 9: See page 65; Position 10: See page 66; Position 11: See page 66; Position 12: See page 67; ★: See page 67

Maximum operating voltage U_{max} kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated primary voltage U_{prim} kV	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	5	6	7
24	125	50	13.8/√3	■		■		■		■		4	3	5
			13.8		■		■		■		■	4	3	5
			15 /√3	■		■		■		■		4	3	8
			15		■		■		■		■	4	3	8
			17.5/√3	■		■		■		■		4	7	2
			17.5		■		■		■		■	4	7	2
			20 /√3	■		■		■		■		4	4	2
			20		■		■		■		■	4	4	2
			22 /√3	■		■		■		■		4	4	3
			22		■		■		■		■	4	4	3
			10–20 /√3	■		■		■		■		4	6	5
			10–20		■		■		■		■	4	6	5
			15–20 /√3	■		■						4	6	2
			15–20		■		■					4	6	2
			Others	■	■	■	■					4	9	9

36 kV
50/60 Hz

U_{max} kV	U_p kV	U_d kV	U_{prim} kV	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	5	6	7
36	170	70	20 /√3			■						6	4	2
			20				■					6	4	2
			22 /√3			■						6	4	3
			22				■					6	4	3
			25 /√3			■		■		■		6	4	5
			25				■		■		■	6	4	5
			30 /√3			■		■		■		6	4	6
			30				■		■		■	6	4	6
			33 /√3			■		■		■		6	4	7
			33				■		■		■	6	4	7
			35 /√3			■		■		■		6	4	8
			35				■		■		■	6	4	8
			20–30 /√3			■						6	6	4
			20–30				■					6	6	4
			Others			■	■					6	9	9

Configuration example
Voltage transformer → 4 M
Outdoor design, single-phase → S 3
Rated primary voltage U_{prim} = 20/√3 kV → 4 4 2

Example for Order No.: 4 M S 3 4 4 2 – ■ ■ ■ ■ ■
Order codes:

697

52 kV
50/60 Hz

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12		Order codes
Order No.:	4	M	■	■	■	■	■	–	■	■	■	■	■	– ★	■ ■ ■

See page 66 | See page 66 | See page 67 | See page 67

Maximum operating voltage U_{max} kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated primary voltage U_{prim} kV	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	Position 5 6 7
52	250	95	33/√3					■				8 4 7
			35/√3					■				8 4 8
			40/√3					■				8 5 0
			45/√3					■				8 5 1

8th position
Auxiliary residual voltage winding

Voltage V	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	Position 8
Without auxiliary winding	■	■	■	■	■	■	■	■	0
100/3	■		■		■		■		1
110/3	■		■		■		■		2
120/3	■		■		■		■		3

9th position
Rated secondary voltage

Voltage V	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	Position 9
100/√3	■		■		■		■		A
100		■		■		■		■	A
110/√3	■		■		■		■		B
110		■		■		■		■	B
120/√3	■		■		■		■		C
120		■		■		■		■	C

Configuration example
Voltage transformer — 4 M
Outdoor design, single-phase — S 3
Rated primary voltage with multi-ratio U_{prim} = 35/√3 kV — 8 4 8 –
Without auxiliary residual voltage winding — 0
Rated secondary voltage U_{sec} = 110 V — B

Example for Order No.: 4 M S 3 8 4 8 – 0 B ■ ■ ■
Order codes:

698

Equipment Selection
Voltage transformers

10th/11th position
Rated output of measuring winding and accuracy class

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – Order codes
Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ★ ■ ■ ■

Voltage level U_{max} kV	Class %	Rated output S_N VA	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	10	11
12	0.2	20	■	■							E	1
	0.2	30			■	■	■	■	■	■	G	1
	0.5	50	■	■							K	2
	0.5	90						■		■	N	2
	0.5	100			■	■	■		■		P	2
	1	100	■	■							P	3
	1	180						■		■	S	3
	1	200			■	■	■		■		T	3
24	0.2	20	■	■							E	1
	0.2	25						■		■	F	1
	0.2	30					■		■		G	1
	0.2	45			■	■					J	1
	0.5	50	■	■							K	2
	0.5	75						■		■	M	2
	0.5	100			■	■	■		■		P	2
	1	100	■	■							P	3
	1	150						■		■	R	3
	1	200			■	■	■		■		T	3
36	0.2	25					■		■		F	1
	0.2	50			■	■					K	1
	0.2	60						■		■	L	1
	0.5	75					■		■		M	2
	0.5	100			■	■					P	2
	0.5	150						■		■	R	2
	1	150					■		■		R	3
	1	200			■	■					T	3
	1	400						■		■	V	3
52	0.2	60					■		■		L	1
	0.5	180					■		■		S	2
	1	400					■		■		V	3

See page 67

See page 67

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

4 M
S 3 8 4 8 – 0 B
S 2

Example for Order No.: 4 M S 3 8 4 8 – 0 B S 2 ■
Order codes:

699

12th position
Additional features

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 — Order codes
Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ★ ■ ■ ■

Options	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	12
50 Hz, VDE marking	■	■	■	■	■	■	■	■	0
50 Hz, IEC marking	■	■	■	■	■	■	■	■	1
50 Hz, VDE marking with approval 1)	■	■	■	■	■	■	■	■	2
60 Hz, IEC marking	■	■	■	■	■	■	■	■	6
Other features on request	■	■	■	■	■	■	■	■	9

1) Only for class 0.2 and 0.5

Additional equipment

Options	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	Order code
With routine test certificate in German/English	■	■	■	■	■	■	■	■	– Z A 1 0

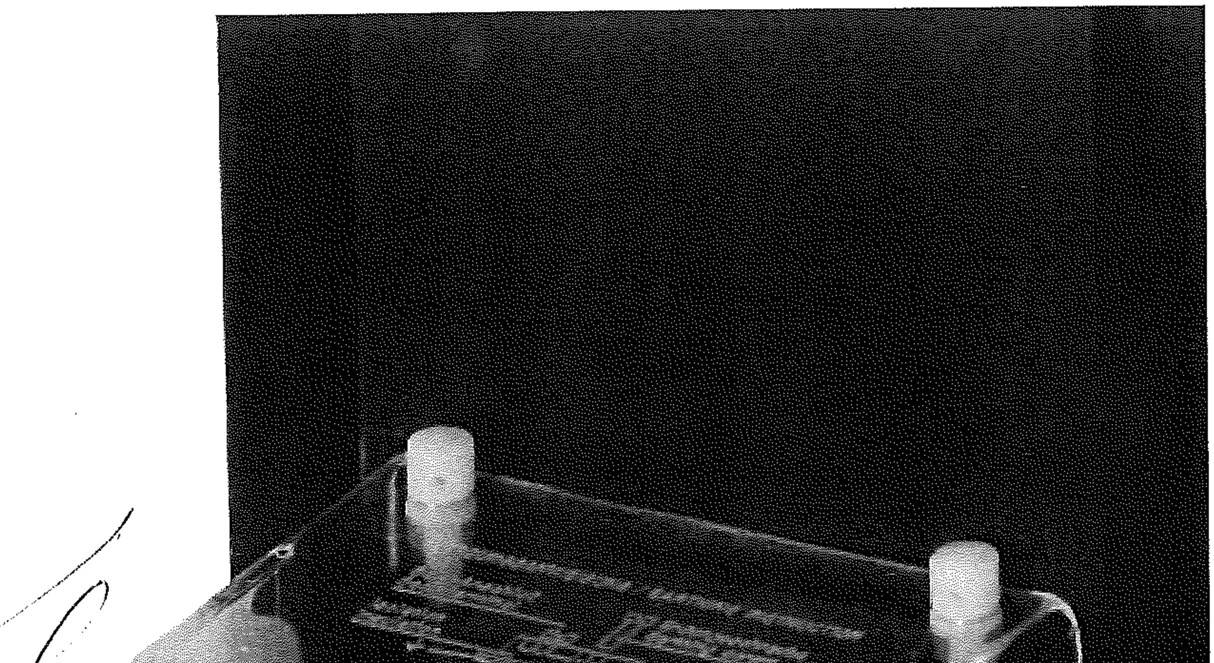
2

Configuration example

Voltage transformer — 4 M
Outdoor design, single-phase, cast-resin insulated — S 3
Rated primary voltage with multi-ratio $U_{prim} = 35/\sqrt{3}$ kV — B 4 B –
Without auxiliary residual voltage winding — 0
Rated secondary voltage U_{sec} = **110 V** — B
Rated output of measuring winding **180 VA** — S 2
Accuracy class **0.5**
Additional features **50 Hz, IEC** marking — 1
With routine test certificate in German/English — – Z A 1 0

Example for Order No.: 4 M S 3 B 4 B – 0 B S 2 1 – Z
Order codes: A 1 0

700



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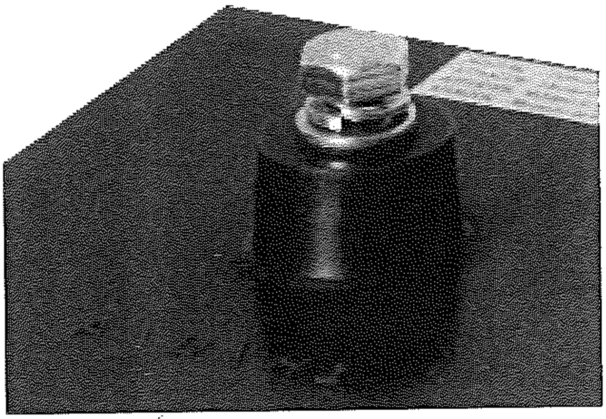
701



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Primary connection terminal of 4MR12 voltage transformer

Contents — Page

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Technical Data
Electrical data, dimensions and weights of current transformers

Order No.	Operating voltage (maximum value) U_m kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated lightning impulse withstand voltage U_p kV	Rated frequency Hz	Rated primary current I_{PN} A	Multi-ratio	Secondary current I_{SN} kA	Maximum rated continuous thermal current $x\ I_{PN}$	Rated short-time thermal current (minimum $100 \times I_{PN}$) I_{th} kA	Rated dynamic current (I_{dyn} $2.5 \times I_{th}$) I_{dyn} kA	Number of cores maximum	Short-time load (mechanical) N	Weight kg	Catalog dimension drawing
4MA72	12	28	75	50/60	20 to 2500	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	20	1
4MA72...Z F18	17.5	38	95	50/60	20 to 2500	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	20	1
4MA74	24	50	125	50/60	20 to 2500	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	25	2
4MA76	36	70	170	50/60	20 to 2000	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	35	3
4MB12	12	28	75	50/60	1500 to 4000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	3000	19 or 26	4
4MB13	12	28	75	50/60	1500 to 6000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	3000	34	4
4MB14	24 1)	50 1)	125 1)	50/60	1500 to 4000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	3000	26	4
4MC22	12	28	75	50/60	150 to 3000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	5000	12 to 48	5
4MC24	24	50	125	50/60	150 to 3000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	5000	28 to 48	5
4MC26	36	70	170	50/60	150 to 3000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	5000	35 to 48	5
4MC32	12	28	75	50/60	2000 to 10000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	4	5000	32 to 150	6
4MC34	24	50	125	50/60	2000 to 10000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	4	5000	32 to 150	7
4MC36	36	70	170	50/60	2000 to 10000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	4	5000	32 to 150	8
4ME22	12	28	75	50/60	5 to 1200	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x I_{th}	3	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 x I_{th}	3	2400	22	9/10
4ME26	36	70	170	50/60	5 to 1200	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x I_{th}	3	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 I_{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	5000	65	15

1) Also possible on request: $U_m = 17.5$, $U_d = 38$ kV and $U_p = 75$ kV

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Size specification for 4MC2 transformers

10th to 14th position of Order No.	6th to 9th position of Order No.												
	43-0P	48-0Q	56-0S	63-0T	67-0U	70-0V	73-0X	75-1A	76-1B	78-1D	82-1F	84-1G	86-1H
	Sizes of 4MC22 transformers												
C20-0A	1	0	0	0	0	0	0	0	0	0	0	0	21
C30-0A	2	0	0	0	0	0	0	0	0	0	0	0	21
E30-0A	1	0	0	0	0	0	0	0	0	0	0	0	21
E40-0A	2	0	0	0	0	0	0	0	0	0	0	0	21
H30-0A	0	0	0	0	0	0	0	0	0	0	0	0	21
H40-0A	1	2	2	2	2	2	2	2	2	2	2	2	21
Q30-0A	2	1	0	0	0	0	0	0	0	0	0	0	21
Q40-0A	2	1	1	1	0	0	0	0	0	0	0	0	21
Q60-0A	21	3	2	1	1	0	0	0	1	1	1	1	21
C20-4Q	3	2	1	0	0	0	0	0	0	0	0	0	21
C30-4Q	3	2	1	1	0	0	0	0	0	0	0	0	21
E30-3Q	3	2	1	0	0	0	0	0	0	0	0	0	21
E30-4Q	3	2	1	0	0	0	0	0	0	0	0	0	21
E40-4Q	3	2	1	0	0	0	0	0	0	0	0	0	21
E40-6Q	–	21	3	2	2	1	1	1	1	2	2	2	21
H30-3Q	1	1	0	0	0	0	0	0	0	0	0	0	21
H30-4Q	2	2	1	0	0	0	0	0	0	0	0	0	21
H40-4Q	2	2	1	0	0	0	0	0	0	0	0	0	21
H40-6Q	–	21	2	2	1	1	1	1	1	2	2	2	21
	Sizes of 4MC24 transformers												
C20-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
C30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
E30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
E40-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
H30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
H40-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
Q30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
Q40-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
Q60-0A	11	2	1	1	1	1	1	1	1	1	1	11	11
C20-4Q	2	1	1	1	1	1	1	1	1	1	1	11	11
C30-4Q	2	1	1	1	1	1	1	1	1	1	1	11	11
E30-3Q	2	2	1	1	1	1	1	1	1	1	1	11	11
E30-4Q	2	2	1	1	1	1	1	1	1	1	1	11	11
E40-4Q	2	2	1	1	1	1	1	1	1	1	1	11	11
E40-6Q	–	11	2	1	1	1	1	1	1	1	1	11	11
H30-3Q	1	1	1	1	1	1	1	1	1	1	1	11	11
H30-4Q	1	1	1	1	1	1	1	1	1	1	1	11	11
H40-4Q	2	1	1	1	1	1	1	1	1	1	1	11	11
H40-6Q	–	11	2	1	1	1	1	1	1	1	1	11	11
	Sizes of 4MC26 transformers												
C20-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
C30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
E30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
E40-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
H30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
H40-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
Q30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
Q40-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
Q60-0A	–	01	1	1	1	1	1	1	1	1	01	01	01
C20-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
C30-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E30-3Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E30-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E40-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E40-6Q	–	–	1	1	1	1	1	1	1	1	01	01	01
H30-3Q	1	1	1	1	1	1	1	1	1	1	01	01	01
H30-4Q	1	1	1	1	1	1	1	1	1	1	01	01	01
H40-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
H40-6Q	–	–	1	1	1	1	1	1	1	1	01	01	01

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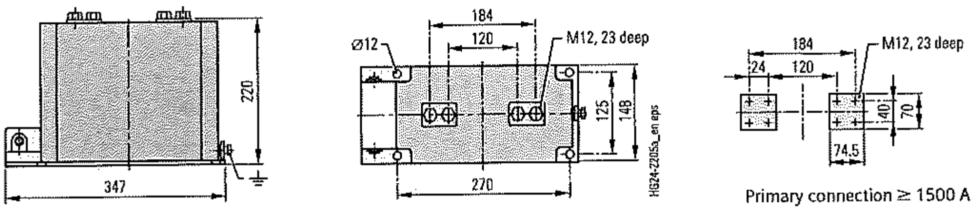
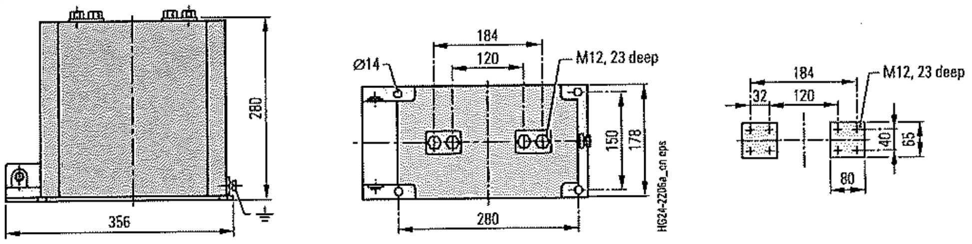
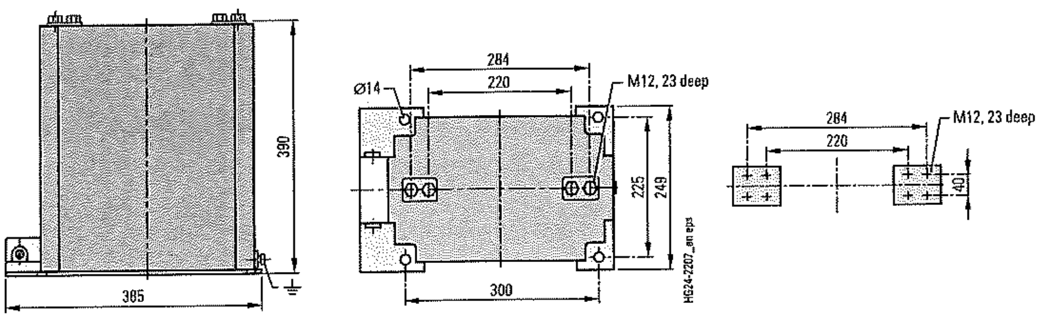
Dimension drawings for current transformers



Dimension drawing 1



Dimension drawing 2

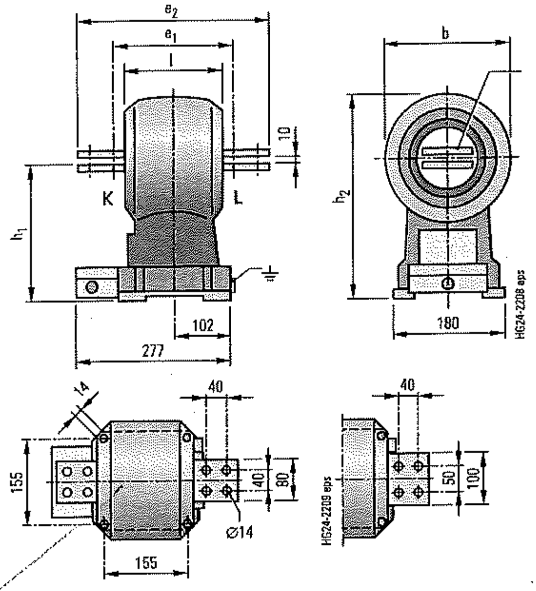


Dimension drawing 3

705

Technical Data

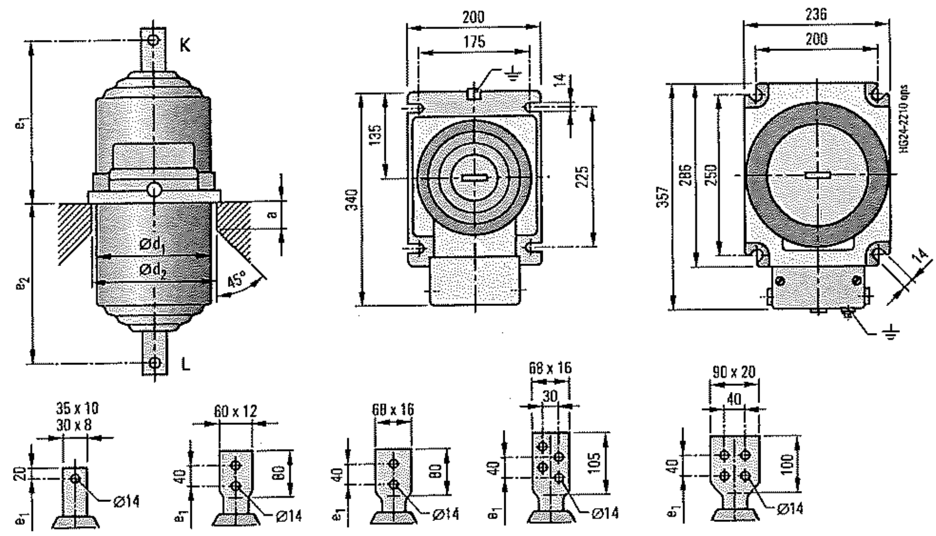
Electrical data, dimensions and weights of current transformers



Type	b	e_1	e_2	h_1	h_2	l
4MB12, size 1	214	210	350	235	342	176
4MB12, size 2	260	230	350	295	425	196
4MB13	273	–	–	288	425	300
4MB14	260	230	350	295	425	196

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

Dimension drawing 4



Dimension drawing 5

Type	Size	a	d_1	d_2	e_1			e_2			Weight
		max. mm	mm	mm	up to 1500 A mm	2000 A mm	up to 3000 A[1)] mm	up to 1500 A mm	2000 A mm	up to 3000 A[1)] mm	approx. kg
4MC22	0	50	180	185	190	195	215	150	155	175	12 to 18
	1	60	180	185	190	195	215	210	215	235	16 to 22
	2	115	180	185	255	260	280	270	275	295	28 to 32
	3	195	180	185	315	320	340	330	335	355	35 to 40
	21	150	230	235	280	285	315	290	295	325	40 to 48
4MC24	1	60	180	185	255	260	280	270	275	295	28 to 32
	2	140	180	185	315	320	340	330	335	355	35 to 40
	11	100	230	235	280	285	315	290	295	325	40 to 48
4MC26	1	60	180	185	315	320	340	330	335	355	35 to 40
	01	50	230	253	280	285	315	290	295	325	40 to 48

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

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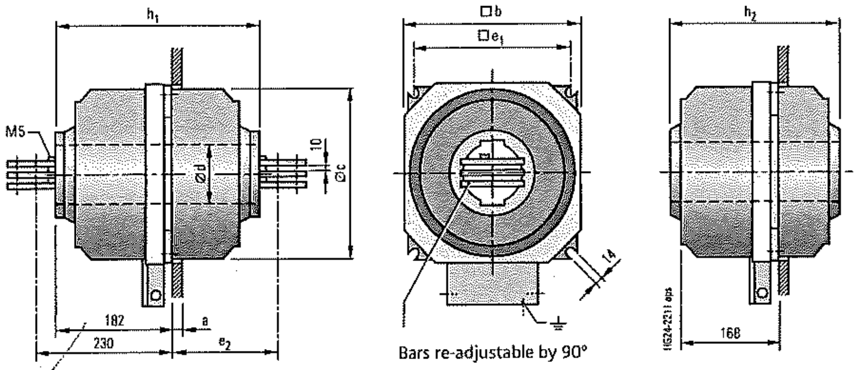
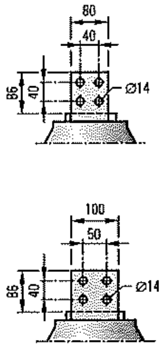
Technical Data
Electrical data, dimensions and weights of current transformers



Bars re-adjustable by 90°



Dimension drawing 6

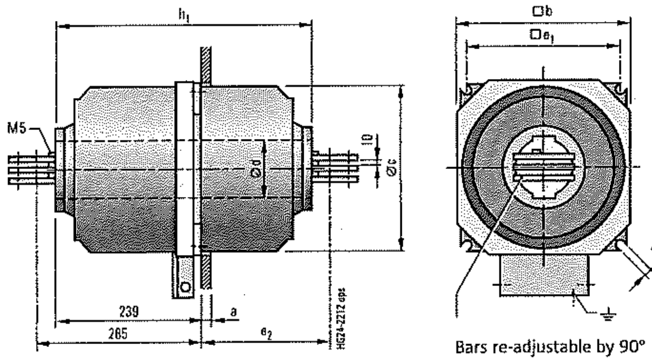
Size	a_{max}	b	Øc	Ød	e_1	e_2	h_1	h_2
11	10	295	278	115	255	175	313	285
12	60	295	278	115	255	250	288	360
21	10	370	356	115	325	175	313	285
22	60	370	356	115	325	250	288	360
31	10	370	356	155	325	–	–	285
32	60	370	356	155	325	–	–	360
41	10	440	440	205	490	–	–	285
42	60	440	440	205	490	–	–	360
51	10	530	530	297	490	–	–	285
52	60	530	530	297	490	–	–	360
61	10	530	530	310	490	–	–	–
62	60	530	530	310	490	–	–	–
72	10	650	650	380	600	–	–	–
73	60	650	650	380	600	–	–	–

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

3



Bars re-adjustable by 90°

Dimension drawing 7

Size	a_{max}	b	Øc	Ød	e_1	e_2	h_1	h_2
11	10	295	278	115	255	230	427	399
12	60	295	278	115	255	305	502	474
21	10	370	356	115	325	230	427	399
22	60	370	356	115	325	305	50	474
31	10	370	356	155	325	–	–	399
32	60	370	356	155	325	–	–	474
41	10	440	440	205	490	–	–	399
42	60	440	440	205	490	–	–	474
51	10	530	530	297	490	–	–	399
52	60	530	530	297	490	–	–	474
61	10	530	530	310	490	–	–	399
62	60	530	530	310	490	–	–	474
72	10	650	650	380	600	–	–	–
73	60	650	650	380	600	–	–	–

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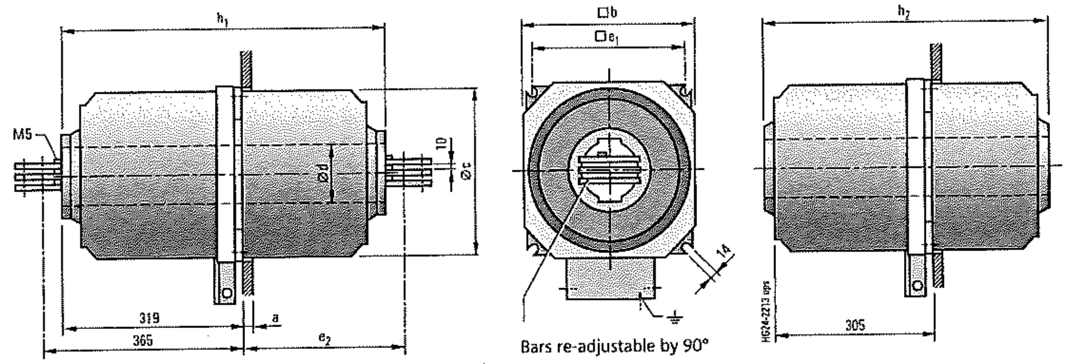
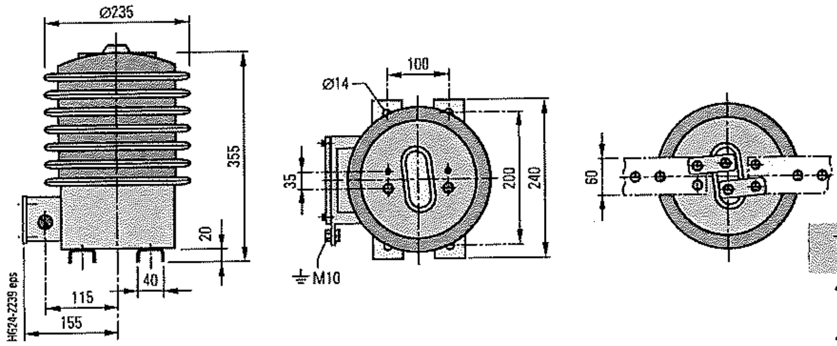


Dimension drawing 8

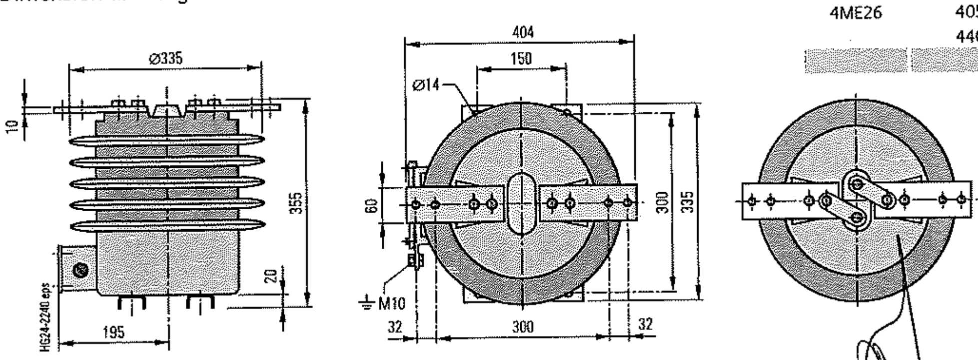
Size	a_{max}	b	Øc	Ød	e_1	e_2	h_1	h_2
11	10	295	278	115	255	175	313	285
12	60	295	278	115	255	250	288	360
21	10	370	356	115	325	175	313	285
22	60	370	356	115	325	250	288	360
31	10	370	356	155	325	–	–	285
32	60	370	356	155	325	–	–	360
41	10	440	440	205	490	–	–	285
42	60	440	440	205	490	–	–	360
51	10	530	530	297	490	–	–	285
52	60	530	530	297	490	–	–	360
61	10	530	530	310	490	–	–	–
62	60	530	530	310	490	–	–	–
72	10	650	650	380	600	–	–	–
73	60	650	650	380	600	–	–	–

3



Dimension drawing 9

Type	Arcing distance	Creepage distance
4ME22	229	486
	310	400
4ME24	229	486
	440	1010
4ME26	405	945
	440	1010



Dimension drawing 10

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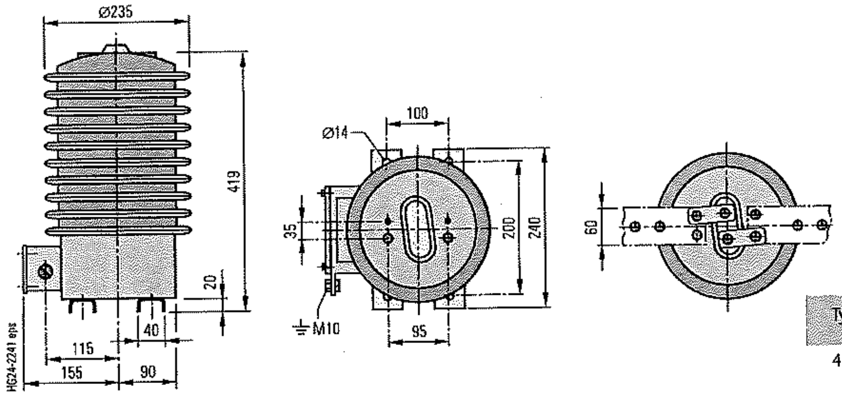
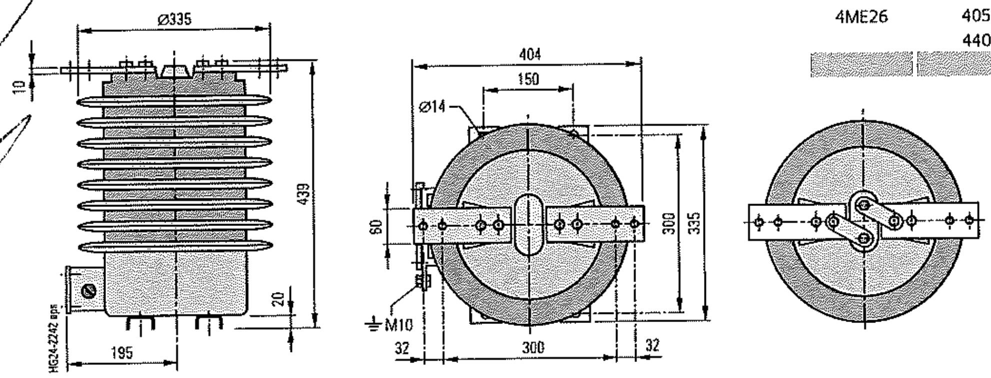
Technical Data

Electrical data, dimensions and weights of current transformers



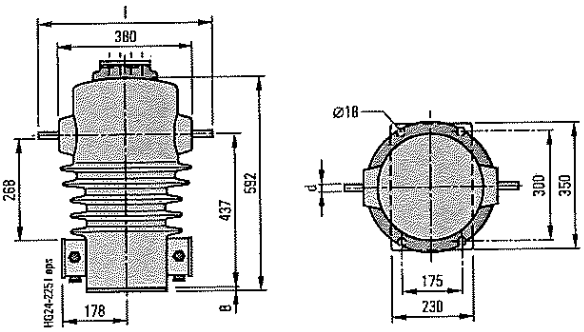
Dimension drawing 11

Type	Arcing distance	Creepage distance
4ME22	229	486
	310	400
4ME24	229	486
	440	1010
4ME26	405	945
	440	1010



Dimension drawing 12

3



Dimension drawing 13

I_{PN}	d	l	Arcing distance	Creepage distance
Up to 600 A	20	500	268	665
600 to 1250 A	30	560	268	665
1250 to 2000 A	42	600	268	665
2000 to 3000 A	48	620	268	665

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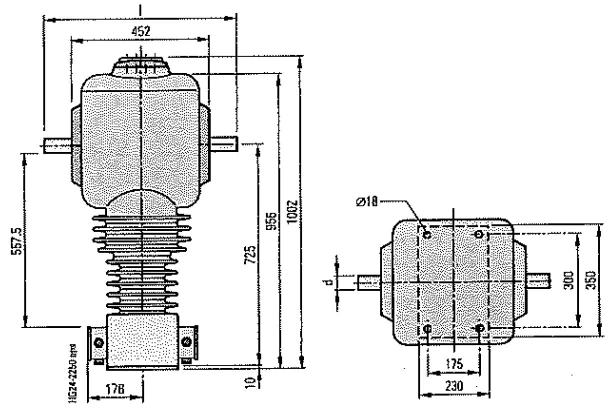
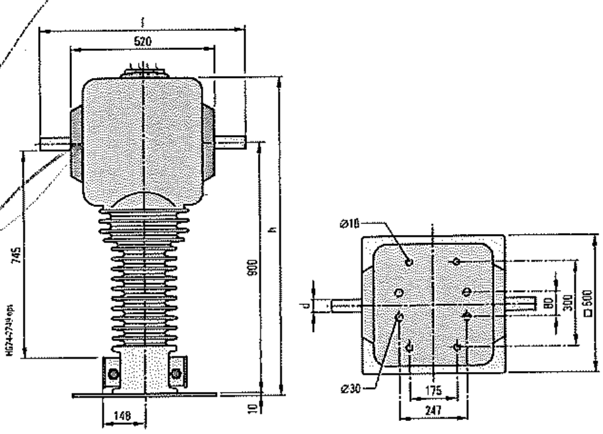


I_{PN}	d	l	Arcing distance	Creepage distance
Up to 600 A	20	572	557.5	1290
600 to 1250 A	30	632	557.5	1290
1250 to 2000 A	42	672	557.5	1290
2000 to 3000 A	48	692	557.5	1290

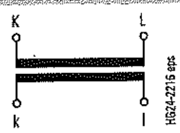
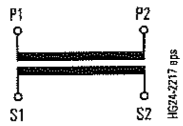
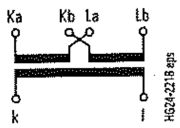
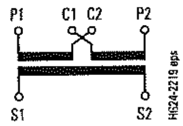
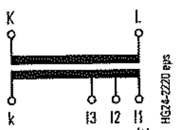
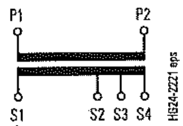
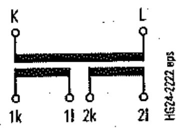
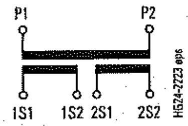
Dimension drawing 14



I_{PN}	d	l	h	Arcing distance	Creepage 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

Dimension drawing 15

Terminal designations of current transformers

Transformer design	Designation of connection terminals acc. to VDE	acc. to IEC	Example for rated current data
1 primary winding 1 secondary winding			100/1 A
2 equivalent primary windings 1 secondary winding			2 x 100/1 A
	with primary multi-ratio		
1 primary winding 1 secondary winding with tappings			1000–800 ... 200/1A
	with secondary multi-ratio, highest rated current at l1 or S4		
1 primary winding 2 or more secondary windings on separate cores			100/1/1 A

3

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Technical Data
Electrical data, dimensions and weights of voltage transformers

Order No.	Operating voltage (maximum value) U_m kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated lightning impulse withstand voltage U_p kV	Rated frequency Hz	Maximum rated primary voltage U_{PN} kV	Multi-ratio U_{SN} kV	Thermal limiting output S_{th} VA	Rated voltage factor (8h)	Rated thermal limiting output of the residual voltage winding VA/A	Short-time load (mechanical) N	Weight kg	Catalog dimension drawing
4MR12	12	28	75	50/60	11.5/√3	100/√3; 110/√3; 120/√3	350	1.9	230/4	–	18	16
4MR14	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	–	–	–	18	17
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	–	25	18
4MR54	24	50	125	50/60	22/√3	100/√3; 110/√3; 120/√3	600	1.9	350/6	–	35	18
4MR56	36	70	170	50/60	35/√3	100/√3; 110/√3; 120/√3	800	1.9	350/6	–	60	18
4MR62	12	28	75	50/60	11.5	100; 110; 120	600	–	–	–	25	19
4MR64	24	50	125	50/60	22	100; 110; 120	600	–	–	–	35	19
4MR66	36	70	170	50/60	35	100; 110; 120	800	–	–	–	70	19
4MS32	12	28	75	50/60	12/√3	100/√3; 110/√3; 120/√3	400	1.9	230/4	1000	72	20
4MS34	24	50	125	50/60	22/√3	100/√3; 110/√3; 120/√3	400	1.9	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
4MS44	24	50	125	50/60	22	100; 110; 120	500	–	–	1000	76	21
4MS46	12	28	75	50/60	35	100; 110; 120	900	–	–	1000	82	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; 110/√3; 120/√3	400	1.9	230/4	1000	35.5	22
4MS56	36	28	75	50/60	35/√3	100/√3; 110/√3; 120/√3	400	1.9	230/4	1000	51	23
4MS62	12	28	75	50/60	12	100; 110; 120	500	–	–	1000	37	24
4MS64	24	50	125	50/60	22	100; 110; 120	500	–	–	1000	37	24
4MS66	36	28	75	50/60	35	100; 110; 120	500	–	–	1000	57	25

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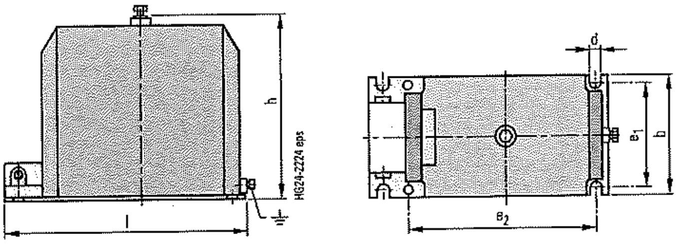
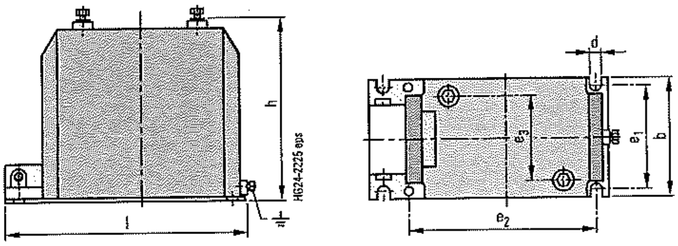
Dimension drawings for voltage transformers



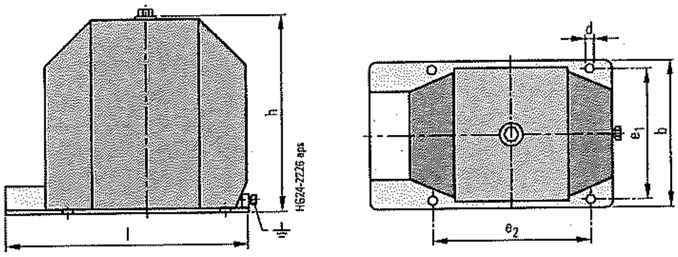
Dimension drawing 16

Type	b	h	l	e_1	e_2	d
4MR12	148	220	335	125	270	11
4MR14	178	280	357	150	280	14



Dimension drawing 17

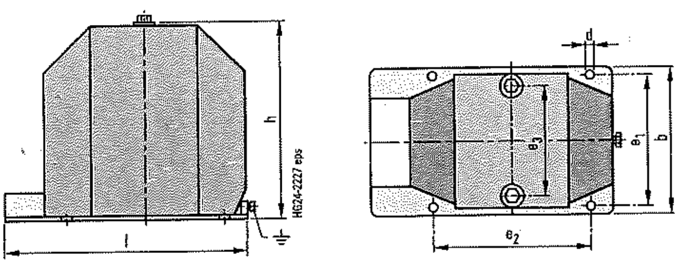
Type	b	h	l	e_1	e_2	e_3	d
4MR12	148	220	335	125	270	110	11
4MR14	178	280	357	150	280	130	14



Dimension drawing 18

Type	b	h	l	e_1	e_2	d
4MR52	200	240	342	175	225	11
4MR54	225	300	370	200	250	14
4MR54 1)	200	300	324	175	225	14
4MR56	249	390	395	225	300	14

1) Design on request



Dimension drawing 19

Type	b	h	l	e_1	e_2	e_3	d
4MR62	200	240	342	175	225	150	11
4MR64	225	300	370	200	250	210	14
4MR64 1)	200	260	324	175	225	155	14
4MR66	249	390	395	225	300	320	14

1) Design on request

3

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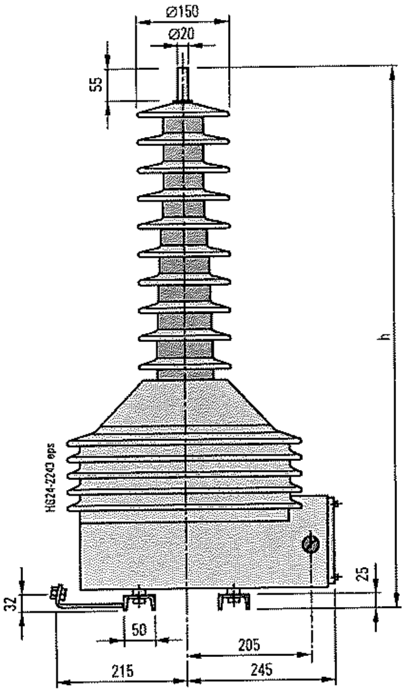
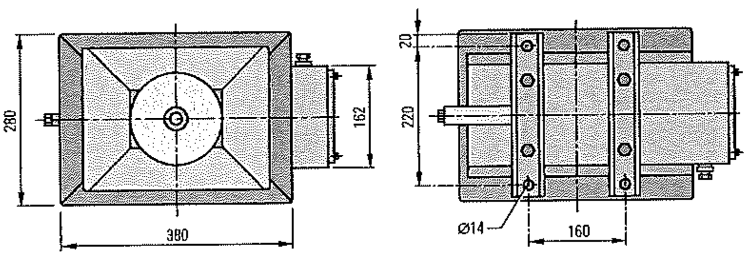
Technical Data

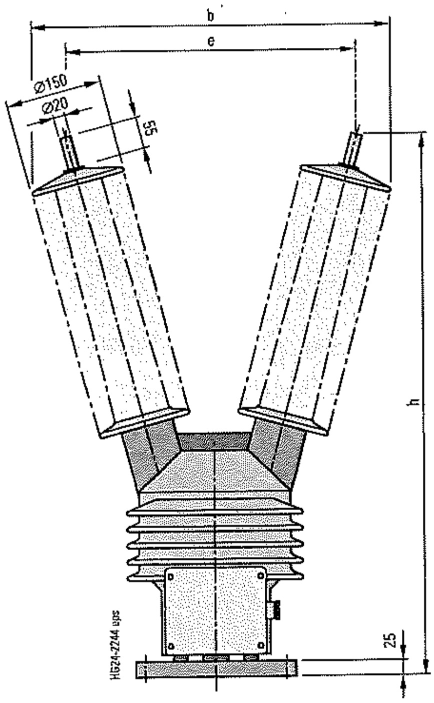
Electrical data, dimensions and weights of voltage transformers

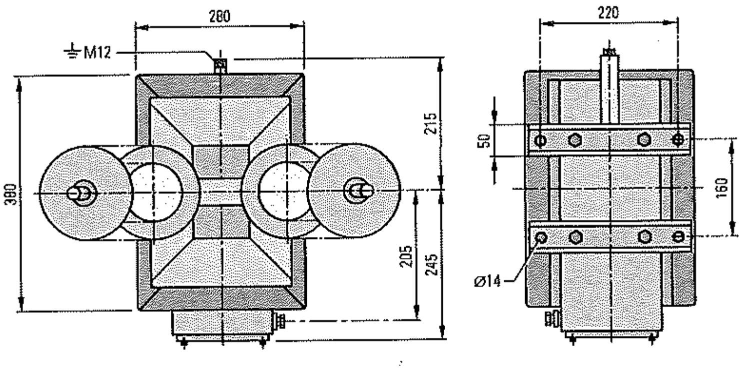




Dimension drawing 20

Type	h	Arcing distance	Creepage distance	Number of sheds
4MS32	520	420	790	2
4MS34	655	550	1055	5
4MS36	880	760	1615	10
4MS38	880	760	1615	10





Dimension drawing 21

Type	h	b	e	Arcing distance	Creepage distance	Number of sheds
4MS42	515	375	270	420	760	2 x 2
4MS44	645	445	340	550	1035	2 x 5
4MS46	865	560	455	760	1595	2 x 10

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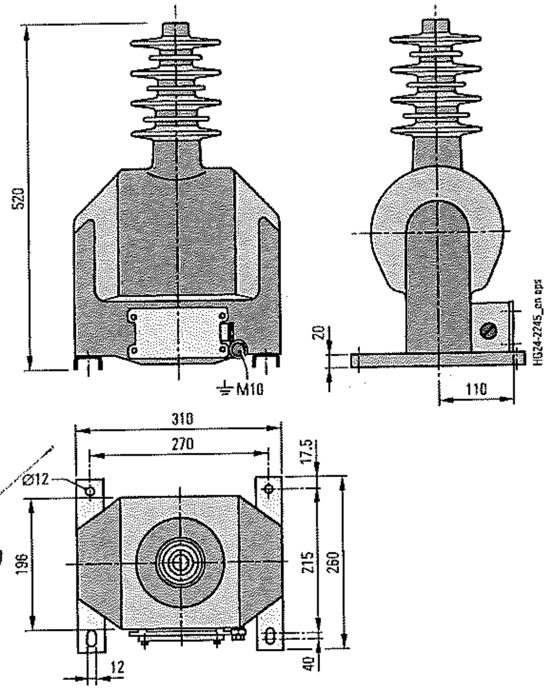
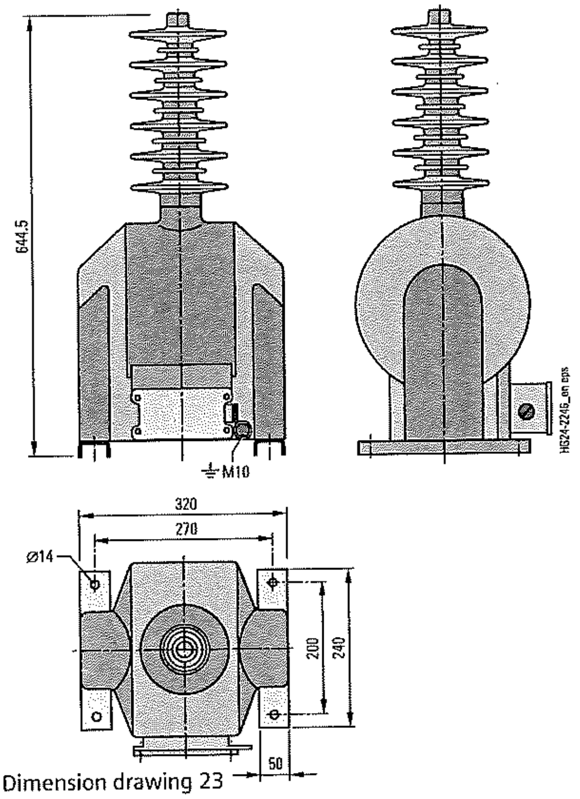
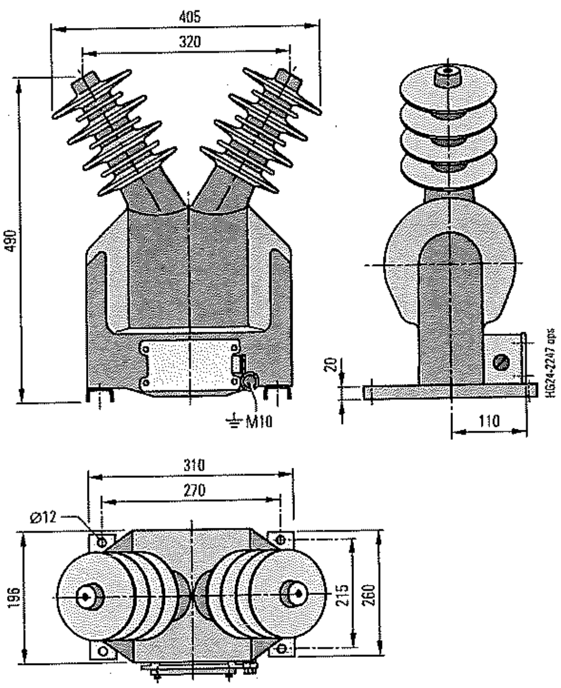


Dimension drawing 22

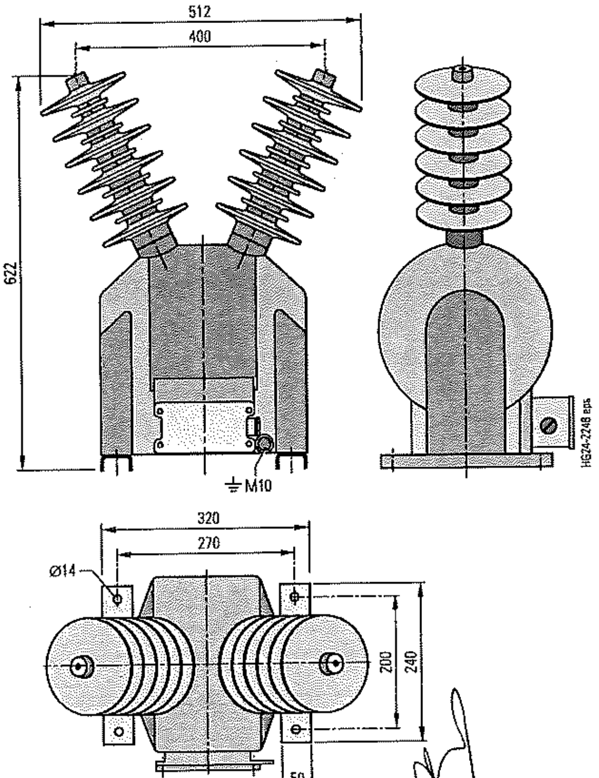


Dimension drawing 23

3



Dimension drawing 24



Dimension drawing 25

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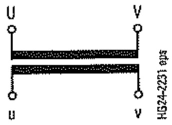
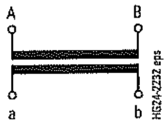
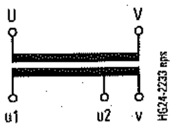
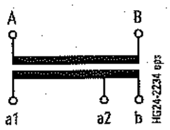
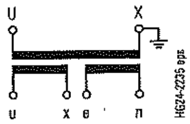
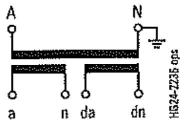
Technical Data

Electrical data, dimensions and weights of voltage transformers

Terminal designations of the voltage transformers

Transformer design	Designation of the connection terminals		Example for low-voltage data
	acc. to VDE	acc. to IEC	
Unearthed 1 secondary winding			10000/100 V
Unearthed 1 secondary winding with tappings	 highest rated voltage at u1 or a1		5000–10000/100 V
Earthed 1 measuring winding 1 auxiliary residual voltage winding			10000/√3 / 100/√3 / 100/3 V

3

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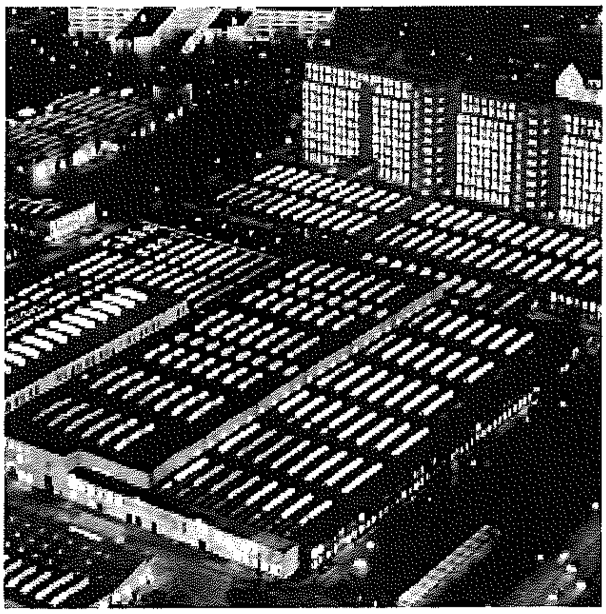
R-HG11-181.tif

Brandenburg Gate, Berlin, Germany


R-HG11-180.tif

Switchgear Factory Berlin, Germany

Contents Page

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Annex
Inquiry form

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

Inquiry concerning

- ☐ 4MA7 current transformer
- ☐ 4MB1 current transformer
- ☐ 4MC2 current transformer
- ☐ 4MC3 current transformer
- ☐ 4ME2 current transformer
- ☐ 4ME3 current transformer
- ☐ 4MR voltage transformer
- ☐ 4MS voltage transformer

Please

- ☐ Submit an offer
- ☐ Call us
- ☐ Visit us

Your address

Company ______

Dept. ______

Name ______

Street ______

Postal code/city ______

Phone ______

Fax ______

E-mail ______

Siemens AG

Dept. ______

Name ______

Street ______

Postal code/city ______

Fax ______

4

Technical data of current transformer

				Other values
Operating voltage	☐ 12 kV ☐ 36 kV	☐ 17.5 kV ☐ 52 kV	☐ 24 kV	☐ ___ kV
Rated lightning impulse withstand voltage	☐ 75 kV ☐ 170 kV	☐ 95 kV ☐ 250 kV	☐ 125 kV	☐ ___ kV
Rated short-duration power-frequency withstand voltage	☐ 28 kV ☐ 70 kV	☐ 38 kV ☐ 95 kV	☐ 50 kV	☐ ___ kV
Rated primary current	☐ ___ A	☐ 2x___ A		
Secondary current	☐ 1 A	☐ 5 A		
Thermal strength	☐ 100 x I_{PN} ☐ 300 x I_{PN} ☐ 600 x I_{PN}	☐ 150 x I_{PN} ☐ 400 x I_{PN} ☐ 800 x I_{PN}	☐ 200 x I_{PN} ☐ 500 x I_{PN} ☐ 1000 x I_{PN}	☐ ___ x I_{PN}
1st core	☐ Protection core ☐ Measuring core	☐ ___ Class ☐ ___ Class	☐ ___ Factor ☐ ___ Factor	☐ ___ VA ☐ ___ VA
2nd core	☐ Protection core ☐ Measuring core	☐ ___ Class ☐ ___ Class	☐ ___ Factor ☐ ___ Factor	☐ ___ VA ☐ ___ VA
3rd core	☐ Protection core ☐ Measuring core	☐ ___ Class ☐ ___ Class	☐ ___ Factor ☐ ___ Factor	☐ ___ VA ☐ ___ VA

Technical data of voltage transformer

				Other values
Maximum operating voltage	☐ 12 kV ☐ 36 kV	☐ 24 kV ☐ 52 kV		☐ ___ kV
Rated lightning impulse withstand voltage	☐ 75 kV ☐ 170 kV	☐ 95 kV ☐ 250 kV	☐ 125 kV	☐ ___ kV
Rated short-duration power-frequency withstand voltage	☐ 28 kV ☐ 70 kV	☐ 38 kV ☐ 95 kV	☐ 50 kV	☐ ___ kV
Rated primary voltage	☐ ___ kV	☐ ___/$\sqrt{3}$		
Rated secondary voltage	☐ 100 V ☐ 100/$\sqrt{3}$ V	☐ 110 V ☐ 110/$\sqrt{3}$ V	☐ 120 V ☐ 120/$\sqrt{3}$ V	☐ ___ V ☐ ___/$\sqrt{3}$ V
Auxiliary residual voltage winding	☐ Without	☐ 100/3 V	☐ 110/3 V	☐ 120/3 V
Rated output of the measuring winding	☐ Class 0.2 ☐ 20 VA	☐ Class 0.5 ☐ 50 VA	☐ Class 1 ☐ 100 VA	☐ ___ VA

Application and other requirements

______

______

______

______

______

☐ Please check off ___ Please fill in

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You prefer to configure your instrument tra[illegible]ner on your own?

Please follow the steps for configuration and enter the order number in the configuration aid.

For configuration of your
4M protective and measuring transformers

Instruction for configuration of the 4M protective and measuring transformers

1st step: Definition of the current transformer

Please specify the following ratings:	Possible options:
Transformer design	Block-type transformer, bushing-type transformer, outdoor transformer, etc.
Operating voltage (U_m)	U_m: 12 kV to 52 kV
Rated lightning impulse withstand voltage (U_p)	U_p: 75 kV to 250 kV
Rated short-duration power-frequency withstand voltage (U_d)	U_d: 28 kV to 95 kV
Rated primary current (I_{PN})	I_{PN}: 20 A to 10000 A
Secondary current (I_{SN})	I_{SN}: 1 A or 5 A
Thermal strength	100 x I_{PN} to 1000 I_{PN}
Core data	Quantity, type, class, factor and rating of cores

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

2nd step: Definition of the voltage transformer

Please specify the following ratings:	Possible options:
Transformer design	Block-type transformer, outdoor transformer
Number of phases	Single-phase or double-phase
Operating voltage (U_m)	U_m: 12 kV to 52 kV
Rated lightning impulse withstand voltage (U_p)	U_p: 75 kV to 250 kV
Rated short-duration power-frequency withstand voltage (U_d)	U_d: 28 kV to 95 kV
Rated primary voltage (U_{PN})	U_{PN}: 3.3 kV to 45 kV or values divided by $\sqrt{3}$
Rated secondary voltage (U_{SN})	U_{SN}: 100 V, 110 V, 120 V or values divided by $\sqrt{3}$
Rated output of the measuring winding	25 VA, class 0.2 up to 400 VA, class 1

These ratings define the positions 3 to 11 of the order number of the voltage transformer.

3rd 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 certificate, etc., please contact your responsible sales partner.

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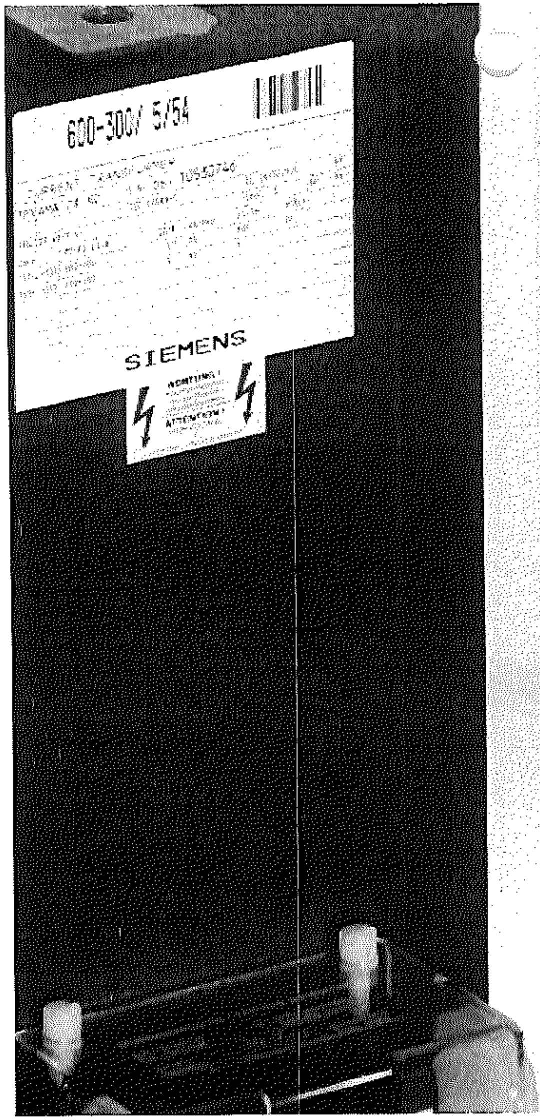

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Energy Sector
Freyeslebenstrasse 1
91058 Erlangen, Germany

Siemens AG
Energy Sector
Power Distribution Division
Medium Voltage
Nonnendammallee 104
13623 Berlin, Germany

For more information, please contact our
Customer Support Center.
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РЕПУБЛИКА БЪЛГАРИЯ
Български институт по метрология

REPUBLIC OF BULGARIA
Bulgarian Institute of Metrology

ДОПЪЛНЕНИЕ № 17.01.5109.1

КЪМ УДОСТОВЕРЕНИЕ
ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ № 16.11.5109
Measuring Instrument Type-approval Certificate-Revision 1

Издадено на производител: *Issued to manufacturer:*	SIEMENS AG - Germany Wittelsbacherplatz 2, D-80333 Munich, Germany
На основание на: *In Accordance with:*	Чл. 32, ал.1 от Закона за измерванията
Относно: *In Respect of:*	измервателни токови трансформатори тип 4MAxx
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване
Срок на валидност: *Valid until:*	15.11.2026 г.
Средството за измерване е вписано в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	5109
Дата на издаване на допълнението към удостоверението за одобрен тип: *Date:*	05.01.2017 г.

ВЯРНО С ОРИГИНАЛА

На основание чл.36а ал.3 от ЗОП

И.Д. ПРЕДСЕДАТ
Паун И

210

Приложение към Допълнение № 17.01.5109.1 към удостоверение № 16.11.5109

Издадено на производител: SIEMENS AG - Germany
Wittelsbacherplatz 2, D-80333 Munich, Germany

Относно: измервателни токови трансформатори тип 4MAxx

Описание на допълнение № 17.01.5109.1 към удостоверение за одобрен тип № 16.11.5109:

Към т.2 **Технически и метрологични характеристики** се добавя към **Мощност, VA/клас на точност:** от **5** до 15/0,2S; 0,2

Таблицата от т.2 Технически и метрологични характеристики добива вида:

Характеристика	**Трансформатор тип 4MAxx**		
	4MA72	**4MA74**	**4MA76**
Максимално работно напрежение, kV	до 12	до 24	до 36
Номинален първичен ток, А	до 4000		
Номинален вторичен ток, А	1 и 5		
Честота, Hz	50		
Клас на точност **- измервателна намотка** **- защитна намотка**	 0,2S; 0,2; 0,5S; 0,5; 1 5P10; 10P10		
Мощност, VA/клас на точност	от 5 до 15/0,2S; 0,2 от 5 до 30/0,5S; 0,5; 1 от 5 до 30/5P10; 10P10		

ВЯРНО С ОРИГИНАЛА

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INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH IPH BERLIN

Independent, accredited test laboratory · Registration with STLA and LOVAG

TYPE TEST REPORT

NO. 1416.0077.3.036

Siemens Sanayi ve Tic. A. Ş. Power Transmission and Distribution (PTD) Yakacik Yolu No: 111 81430 Kartal-ISTANBUL (TURKEY)	CLIENT
ALCE Elektrik Sanayi ve Ticaret A. Ş.	MANUFACTURER
Block-type current transformer	TEST OBJECT
4MA72	TYPE
03/00815	MANUFACTURING NO.

Rated primary current	1250	A	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated secondary current	5 - 5	A	
Rated frequency	50 - 60	Hz	
Rated output	15 - 15	VA	
Accuracy class	0.5FS5 - 5P10		
Highest voltage for equipment	12	kV	
Rated power-frequency withstand voltage	28	kV	
Rated lightning impulse withstand voltage	75	kV	
Rated short-time thermal current (I_{th}) 3 s	31.5	kA	
Rated dynamic current (I_{dyn})	80	kA	

IEC 60044-1: 1996-12, mod. + am1: 2000-07 STL Guide to the interpretation of IEC 60044-1 1st Edition 1996-12	NORMATIVE DOCUMENT
• Impulse tests on the primary winding • Determination of errors • Short-time current test • Temperature-rise test	RANGE OF TESTS PERFORMED
24 February to 7 March 2003	DATE OF TEST
The test object has PASSED the above-mentioned type tests performed at 50 Hz.	TEST RESULT

На основание чл.36а ал.3 от ЗОП

ВЯРНО С ОРИГИНАЛА

INSTITUT "PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH IPH BERLIN

Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Technik (DATech) e.V. in the fields of h.v. apparatus and switchgear, power cables and power cable accessories, l.v. apparatus and switchgear, installation equipment and switching and control equipment

Deutscher Akkreditierungs Rat DAR DAT - P - 019/92

Contents

ВЯРНО С ОРИГИНАЛА

ВЯРНО С ОРИГИНАЛА

This test document consists of 30 sheets.

Distribution Copy No.: 1

Copies Nos. 1 and 2 in English: ALCE Elektrik Sanayi ve Ticaret A. Ş.

1. Present at the test

Mr.	Moritz	IPH test engineer in charge
Mrs.	Hauschild	IPH test engineer
Mr.	Vogler	IPH test engineer
Mr.	Wittwer	IPH test engineer
Mr.	Çiftçioğlu	ALCE Elektrik Sanayi ve Ticaret A. Ş.

2. Test performed

- Lightning impulse test on the primary winding
- Determination of errors
- Short-time current test
- Temperature-rise test

ВЯРНО С ОРИГИНАЛА

3. Identity of the test object

3.1 Technical data and characteristics

The technical data and characteristics of the test object are defined by the following parameters and specified by the client.

Test object:	Block-type current transformer
Type:	4MA72
Manufacturer:	ALCE Elektrik Sanayi ve Ticaret A. Ş.
Serial No.:	03/00815
Year of manufacture:	2003

Data:	Rated primary current (I_n)		1250 A
	Rated continuous thermal current (I_{cont})		1.2 x I_n
	Rated secondary current	core 1	5 A
		core 2	5 A
	Rated frequency		50 - 60 Hz
	Rated output	core 1	15 VA
		core 2	15 VA
	Accuracy class	core 1	0.5FS5
		core 2	5P10
	Rated dynamic current (I_{dyn})		80 kA
	Rated short-time thermal current (I_{th})		31.5 kA
	Duration of short-circuit		3 s
	Rated insulation level		
	Highest voltage for equipment (U_m)		12 kV
	Rated power-frequency withstand voltage		28 kV
	Rated lightning impulse withstand voltage (list 2)		75 kV
	Insulating material class		E
Characteristics:	Winding material	Primary winding	Cu
		Secondary winding, core 1	Cu
		Secondary winding, core 2	Cu
	Cross-section of windings	Primary winding	660 mm^2
		Secondary winding, core 1	2.55 mm^2
		Secondary winding, core 2	2.54 mm^2

ВЯРНО С ОРИГИНАЛА

3.2 Identity documents

The manufacturer confirms that the test object has been manufactured in compliance with the drawings given in this document. IPH did not verify this compliance in detail.

The identity of the test object is fixed by the following drawings and data submitted by the client:

Name of drawing	Drawing No.	Date of drawing	Author	Notes
4MA72 BLOCK TYPE CURRENT TRANSFORMER	415	06.02.03	ALCE	Sheet 30

Entry of test object at IPH: 13 February 2003

4. Impulse test on the primary winding

4.1 Test laboratory

High-voltage test laboratory, high-voltage hall 2

4.2 Normative document

IEC 60044-1: 1996-12, mod. + A1: 2000-07, Sub-clause 7.3.2

4.3 Required test parameters

Lightning impulse voltage 1.2/50 µs	75 kV	Peak value
Polarity		Positive and negative
Impulse sequence	1 impulse	Full wave at approx. 50 % of test voltage (reference impulse)
	15 impulses	Full wave at 100 % of test voltage
Atmospheric correction		Without

4.4 Test arrangement

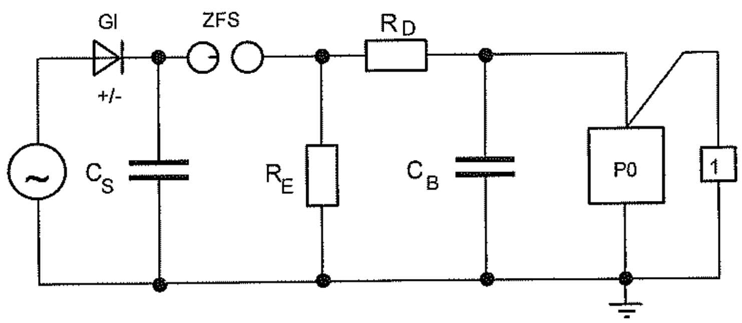
The test voltage was applied between the connected terminals of primary winding and earth. The fastening screws, the core and the terminals of the secondary windings were earthed.

ВЯРНО С ОРИГИНАЛА

4.5 Test and measuring circuits

Technical data of test circuit

Impulse circuit:	Number of stages	n	=	2
	Impulse capacitance	C_S	=	70 nF
	Loading capacitance	C_B	=	1.5 nF
	Damping resistance	R_D	=	122 Ω
	Discharge resistance	R_E	=	1100 Ω



GI	Rectifier	R_D	Damping resistance
C_S	Impulse capacitance	C_B	Loading capacitance
ZFS	Spark gap	PO	Test object
R_E	Discharge resistance	1	Voltage measurement

Figure 1: Test and measuring circuit for the lightning impulse voltage withstand test

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	R divider of SMR 10/770 type (TURD) with digital measuring instrument of DMI 551 type (Haefely) and LC 574 AL digital oscilloscope type (LeCroy)	Ratio 472.4

ВЯРНО С ОРИГИНАЛА

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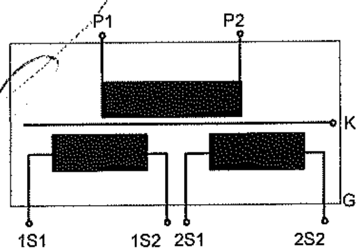
4.6 Test results

Front time of lightning impulse wave:	0.99 µs
Tail time of lightning impulse wave:	55.6 µs
Air temperature:	18.0 °C
Air pressure:	1001 mbar
Air humidity (relative):	50 %
Atmospheric correction of test voltage:	Without

Circuit diagram of the test object 			Test voltage	Impulse	Result
Test No.:	Voltage applied to	Earthed	kV		No. of impulses/ disruptive discharges
1003 02129 to 1003 02144	P1 and P2	1S1-1S2, 2S1-2S2 K, G	+37.5 +75	50 % FW impulse 100 % FW impulse	1/0 [1] 15/0 [1]
1003 02145 to 1003 02160	P1 and P2	1S1-1S2, 2S1-2S2 K, G	-37.5 -75	50 % FW impulse 100 % FW impulse	1/0 [1] 15/0 [1]

Notes:

1) The Appendices include only the oscillograms of the reference impulse and of each first and last 100 % full wave (FW) impulse.

ВЯРНО С ОРИГИНАЛА

4.7 Routine tests after the lightning impulse test

The routine tests to Sub-clause 6.2 of the normative document are part of the type test – lightning impulse test – and serve to assess the latter.

Results

Test	Test parameters	Test results	
Power-frequency withstand test on the primary winding	Test voltage: 28 kV Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.
Partial discharge measurement	Procedure A Prestress duration: 60 s Measuring voltage (points 1 to 3): $1.2 \times U_m = 14.4$ kV $U_m = 12.0$ kV $1.2 \times U_m/\sqrt{3} = 8.3$ kV Measuring time: 30 s	 Partial discharge < 2 pC < 50 pC Partial discharge < 2 pC < 50 pC Partial discharge < 2 pC < 20 pC	o.k.
Power-frequency withstand test on the secondary windings	Test voltage: 3 kV Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.
Intertum overvoltage test	Procedure A Test current (primary): 1250 A Test voltage (secondary 1): 373 V Test voltage (secondary 2): 1093 V Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.

Notes:

The routine tests did not show anything that could have indicated a damage done to the test object during the previous lightning impulse test.

ВЯРНО С ОРИГИНАЛА

5. Determination of errors

5.1 Test laboratory

Low-voltage test laboratory, test room 3

5.2 Normative document

IEC 60044-1: 1996-12, mod. + A1: 2000-07, Sub-clauses 11.4 and 12.4

5.3 Required test parameters

Protective current transformer: The current errors shall be determined at 100 % of rated current and 100 % of rated burden.

Measuring current transformer: The current errors shall be determined at 5 %, 20 %, 100 % and 120 % of rated current and 25 % and 100 % of rated burden.

For a burden less than 5 VA a power factor of cos $\beta = 1$ shall be used, otherwise a power factor of cos $\beta = 0.8$ shall be applied.

The test frequency shall equal the rated frequency and be 50 Hz.

Maximum permissible error limits of current transformers for measuring and protecting purposes:

Accuracy class	Current error at percentage of rated current				Phase displacement at percentage of rated current			
	%				Minutes			
	5	20	100	120	5	20	100	120
0.5	1.5	0.75	0.5	0.5	90	45	30	30
5P	1				60			

5.4 Test arrangement

To IEC 60044-1: 1996, mod. + A1: 2000, Sub-clauses 11.4 and 12.4

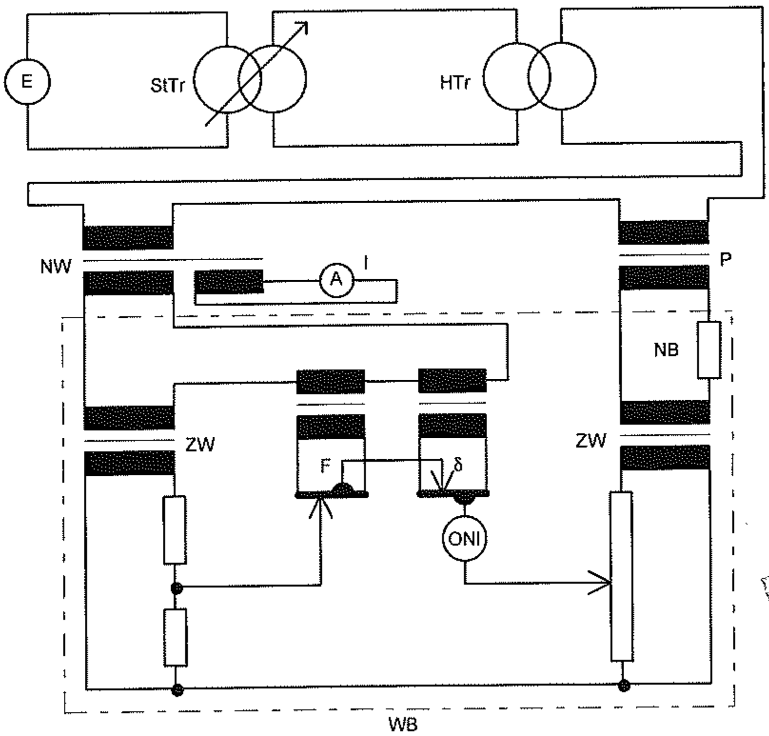
After it had been demagnetised, the test object was connected via a matching transformer to an instrument transformer measuring device including a measurement standard transformer. An oscillographic null detector was used for the visual check of the comparison. The test object was subjected to the prescribed test conditions by connection of a standard burden.

ВЯРНО С ОРИГИНАЛА

5.5 Test and measuring circuits

Technical data of test and measuring circuits

Device	Type	Technical data
Standard current transformer NW	ITN 0.5a (TuR Dresden)	Ratio 5 A .. 3 kA / 5 and 5 A, resp. Class 0.1, 15 VA
Standard burden of current transformer NB	(AEG)	50 Hz, 1.25 .. 90 VA ß = 0.8/1, 1..2A
Instrument transformer measuring bridge I	Hohle type (AEG)	16 $^2/_3$, 50 and 60 Hz
Matching transformer to the bridge ZW	Hohle type (AEG)	Matching transformer for 1, 2, 5, 10 A
Null detector ONI	OIK (MWB)	20 mm/µV



E Power supply
StTr Adjusting transformer
HTr High-current transformer

Figure 2: Test and measuring circuit for the determination of errors

ВЯРНО С ОРИГИНАЛА

5.6 Test results

Rated current: 1250 A
Transformation ratio: 1250 A/5 A Burden: 15 VA, cos β = 0.8

At percentage of rated current	Errors		Permissible error for accuracy class 0.5	
	Current error	Phase displacement	Current error	Phase displacement
	%	Minutes	%	Minutes
120 %	-0.10	5.1	± 0.5	± 30
100 %	-0.08	2.9	± 0.5	± 30
20 %	-0.48	6.1	± 0.75	± 45
5 %	-1.28	19.1	± 1.5	± 90

Rated current: 1250 A
Transformation ratio: 1250 A/5 A Burden: 3.75 VA, cos β = 1

At percentage of rated current	Errors		Permissible errors for accuracy class 0.5	
	Current error	Phase displacement	Current error	Phase displacement
	%	Minutes	%	Minutes
120 %	0.29	5.6	± 0.5	± 30
100 %	0.27	6.0	± 0.5	± 30
20 %	0.09	14.9	± 0.75	± 45
5 %	-0.22	30.2	± 1.5	± 90

Rated current: 1250 A
Transformation ratio: 1250 A/5 A Burden: 15 VA, cos β = 0.8

At percentage of rated current	Errors		Permissible error for accuracy class 5P	
	Current error	Phase displacement	Current error	Phase displacement
	%	Minutes	%	Minutes
100 %	-0.1	1.5	± 1	± 60

ВЯРНО С ОРИГИНАЛА

The measured current error and phase displacement values are within the limits permissible for accuracy class 0.5 for measuring current transformers and class 5P for protective current transformers.

6. Short-time current tests

6.1 Dynamic test and thermal short-time current test

6.1.1 Test laboratory

High-power test laboratory, high current test bay

6.1.2 Normative document

IEC 60044-1: 1996-12, mod. + am1: 2000-07, Sub-clause 7.1

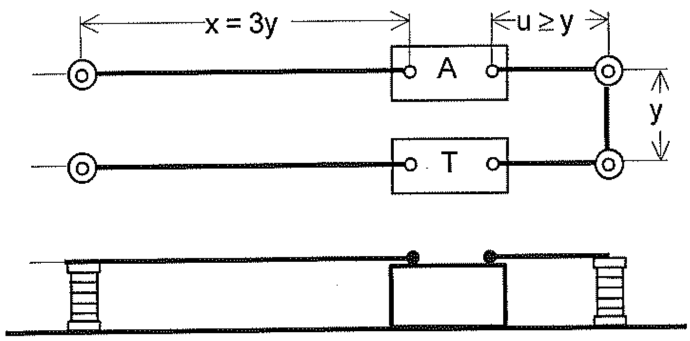
6.1.3 Required test parameters

Short-circuit current	31.5	kA
Peak current	80	kA
Duration of short-circuit	3	s
Joule integral	2977×10^6	A^2s

6.1.4 Test arrangement

The test was carried out single-phase in accordance with the STL guide to the interpretation of IEC 60044-1. A second current transformer of the same type was set up in the return conductor.
The pole centres distance was to the manufacturer's instructions.
The distance x was 540 mm, the distances u and y were 180 mm.
The test object was connected by copper bars of 80 mm x 10 mm.
The secondary windings were short-circuited by flexible copper conductors of 10-mm^2 cross-section.

See Figures 9 and 10, Sheet 24.



A Auxiliary current transformer
T Test object
y Minimum pole centre distance declared by the client

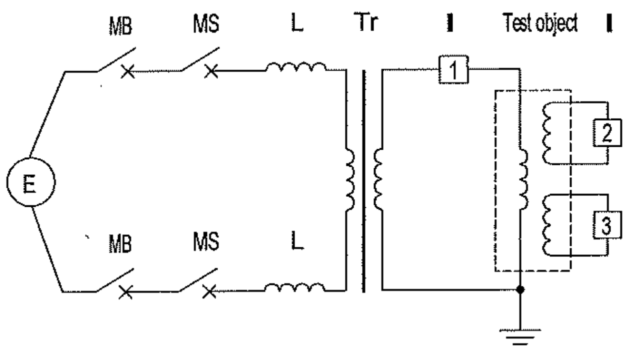
Figure 3: Test arrangement for the short-time current tests

ВЯРНО С ОРИГИНАЛА

6.1.5 Test and measuring circuits

Technical data of the test circuit

Test requirement		Short-time current tests
Test No.		103 0788 and 103 0789
Number of phases	(Test circuit)	1
Number of poles/phases	(Test object)	1
Power frequency	Hz	50
Power factor cos φ		‹ 0.15
Earthing conditions	Grid	Not earthed
	Short-circuit transformer	Not earthed
	Short-circuit point	Earthed
Short-circuit power of the test circuit		150 MVA
Current measurement		Rogowski measuring device



E	Power supply	Tr	Short-circuit transformer
MB	Master breaker	I	Current measurement
MS	Making switch	1 - 3	Measuring points
L	Current limiting reactor		

Figure 4: Test circuit

Technical data of the measuring circuits

Test No.	Measuring point	Symbol in oscillograms	Measuring quantity	Measuring sensor/device
103 0788 and 103 0789	1	i	Short-circuit current primary winding	Rogowski measuring device
	2	i1 sek	Short-circuit current secondary winding 1	Rogowski measuring device
	3	i2 sek	Short-circuit current secondary winding 2	Rogowski measuring device
Recording instrument: BE256 transient recorder				

ВЯРНО С ОРИГИНАЛА

6.1.6 Test results

Test object:	Current transformer, Serial No. 03/00815
Condition of test object before test:	Prestressed
Connection of test object:	See Sheet 13
Short-circuit point:	Secondary windings
Ambient temperature:	15 °C

Test values:

Test No.			103 ... 0788	0789
Peak current primary winding		kA	80.6	48.3
Short-circuit current, primary winding	r.m.s. value	kA	30.0	31.5
Short-circuit current, secondary winding 1	r.m.s. value	A	197	221
Short-circuit current, secondary winding 2	r.m.s. value	A	60.9	75.4
Short-circuit duration		ms	205	3005
Joule integral 10^6		A^2s	-	2982
Short-circuit current 3 s		kA	-	31.5
Note			1)	2)

Notes:

1) Test with dynamic current
2) Test with short-time thermal current

Condition of test object after test:

The current transformer did not show any visible damage. See Figure 10, Sheet 24.

ВЯРНО С ОРИГИНАЛА

6.2 Determination of errors after the short-time current test

Rated current: 1250 A
Transformation ratio: 1250 A/5 A Burden: 15 VA, cos β = 0.8

At percentage of rated current	Difference between the errors measured before and after the short-time current test		Permissible errors for accuracy class 0.5	
	Current error	Phase displacement	Current error	Phase displacement
	%	Minutes	%	Minutes
120 %	0.04	-0.9	± 0.25	± 15
100 %	0.03	-1.1	± 0.25	± 15
20 %	0.02	0.1	± 0.375	± 22.5
5 %	-0.09	11.1	± 0.75	± 45

Rated current: 1250 A
Transformation ratio: 1250 A/5 A Burden: 3.75 VA, cos β = 1

At percentage of rated current	Difference between the errors measured before and after the short-time current test		Permissible errors for accuracy class 0.5	
	Current error	Phase displacement	Current error	Phase displacement
	%	Minutes	%	Minutes
120 %	0.02	-0.4	± 0.25	± 15
100 %	0.02	-0.3	± 0.25	± 15
20 %	0.04	-0.8	± 0.375	± 22.5
5 %	0.04	-0.5	± 0.75	± 45

The measured differences of current error and phase displacement are within the limits permissible for accuracy class 0.5. The test object is able to comply with the requirements of accuracy class 0.5 after the short-time current test.

ВЯРНО С ОРИГИНАЛА

Determination of errors after the short-time current test (continued)

Rated current: 1250 A
Transformation ratio: 1250 A/5 A Burden: 15 VA, cos β = 0.8

At percentage of rated current	Difference between the errors measured before and after the short-time current test		Permissible error for accuracy class 5P	
	Current error	Phase displacement	Current error	Phase displacement
	%	Minutes	%	Minutes
100 %	0.0	-0.1	± 0.5	± 30

The measured differences of current error and phase displacement are within the limits permissible for accuracy class 5P. The test object is able to comply with the requirements of accuracy class 5P after the short-time current test.

ВЯРНО С ОРИГИНАЛА

6.3 Routine test after the short-time current test

The dielectric routine tests to Sub-clause 6.2 of the normative document are part of the type test – short-time current test – and serve to assess the latter.

Results

Test	Test parameters	Test results	
Power-frequency withstand test on the primary winding	Test voltage: 25.3 kV Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.
Partial discharge measurement	Procedure A Prestress duration: 60 s Measuring voltage (points 1 to 3): $1.2 \times U_m = 14.4$ kV $U_m = 12.0$ kV $1.2 \times U_m/\sqrt{3} = 8.3$ kV Measuring time: 30 s	 Partial discharge < 3 pC < 50 pC Partial discharge < 2 pC < 50 pC Partial discharge < 2 pC < 20 pC	o.k.
Power-frequency withstand test on the secondary windings	Test voltage: 2.7 kV Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.
Interturn overvoltage test	Procedure A Test current (primary): 1250 A Test voltage (secondary 1): 373 V Test voltage (secondary 2): 1093 V Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.

Notes:

The routine tests did not show anything that could have indicated a damage done to the test object during the previous short-time current test.

ВЯРНО С ОРИГИНАЛА

7. Temperature rise test

7.1 Test laboratory

Low-voltage test laboratory, test room 3

7.2 Normative document

IEC 60044-1: 1996-12, mod. + A1: 2000-07, Sub-clause 7.2

7.3 Required test parameters

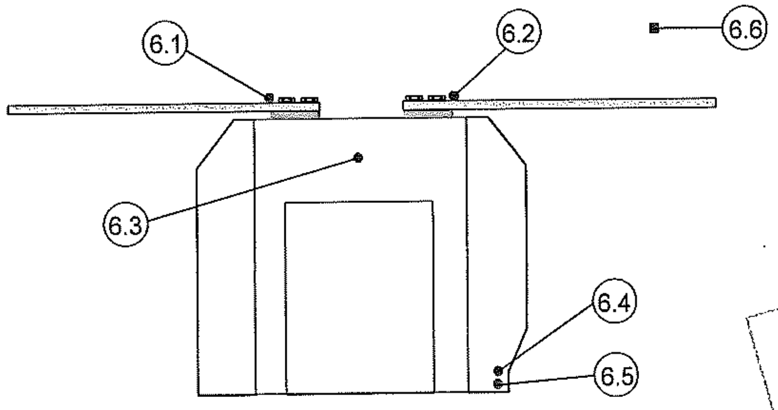
Test current	1500 A
Test frequency	50 Hz

7.4 Test arrangement

To IEC 60044-1: 1996, mod. + A1: 2000, Sub-clause 7.2

The current transformer was tested in a single-phase outdoor current circuit. Both cores were subjected to their rated burden with a power factor cos β = 1.

7.5 Test and measuring circuits



ВЯРНО С ОРИГИНАЛА

Figure 5: Arrangement of temperature measuring points

Test and measuring circuits (continued)

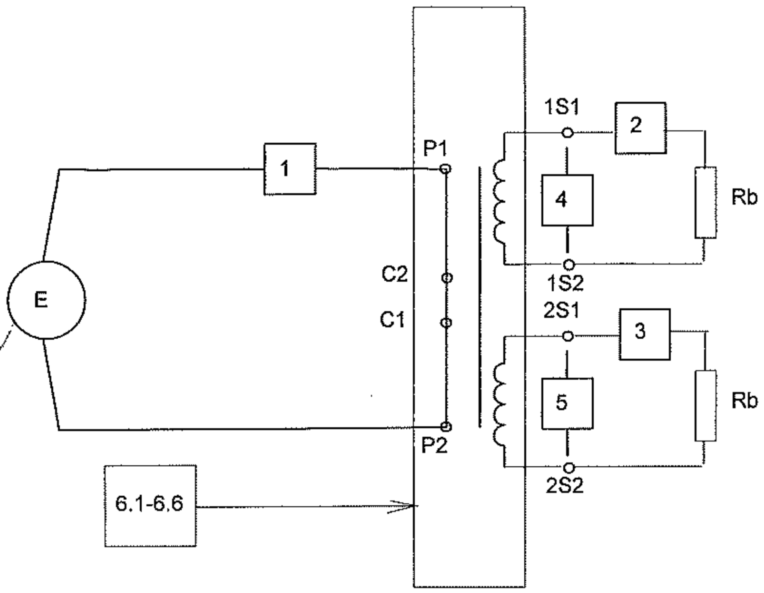


Figure 6: Circuit for the temperature-rise test

Technical data of measuring circuits

Measuring point	Measured quantity	Measuring sensor/device
1	Test current	Current transformer, digital display device
2 and 3	Secondary current	Digital display device
4 and 5	Winding resistance	Milliohmmeter PM 04
6.1 to 6.6	Temperature	Therm 5500-3, CoCo thermocouples

ВЯРНО С ОРИГИНАЛА

7.6 Test results

The test current was 1500 A (50 Hz). This is equivalent to the rated primary continuous thermal current of the current transformer.

Meas. point	Designation of the part	Material	Permissible temperature-rise limit K	Measured final temperature at $\Delta T \leq 1 K/h$ °C	Final temperature rise (related to average ambient air temperature) K
6.1	Current bar	Cu	80	69.9	52.4
6.2	Current bar	Cu	80	70.2	52.7
6.3	Transformer case	Insulating material	-	47.6	-
6.4	5-A winding 1	Cu wire	75	76.9	59.4
6.5	5-A winding 2	Cu wire	75	81.6	64.1
6.6	Ambient air	Air	-	17.5	-

Determination of the current transformer's winding temperature rise.

The current transformer was tested at rated burden. The temperature rise θ of the current transformer winding was determined on the basis of the rise of winding resistance from the cold state to the steady state of temperature rise of the complete assembly using the following formula given by DIN VDE 0532 Teil 2, Sub-clause 3.3 (transformers and reactors).

$$\theta_W = \frac{R_W}{R_k}\,(235 + \theta_k) - 235$$

Where:
- R_k Cold resistance of the winding at 18.5 °C
- R_W Warm resistance of the winding at 17.5 °C of ambient air temperature
- θ_k Cold temperature of winding
- θ_W Final temperature of the winding

The hot resistance of the secondary winding was calculated on the basis of the measurement of the cooling curve.

	R_k mΩ	R_W mΩ	R_W/R_k	θ_W °C	θ K	Permissible K
Core 1/5 A	137.8	169.6	1.23	76.9	59.4	75
Core 2/5 A	223.1	278.6	1.25	81.6	64.1	75

ВЯРНО С ОРИГИНАЛА

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Test results (continued)

Graphic representation of resistance variation (core 1)

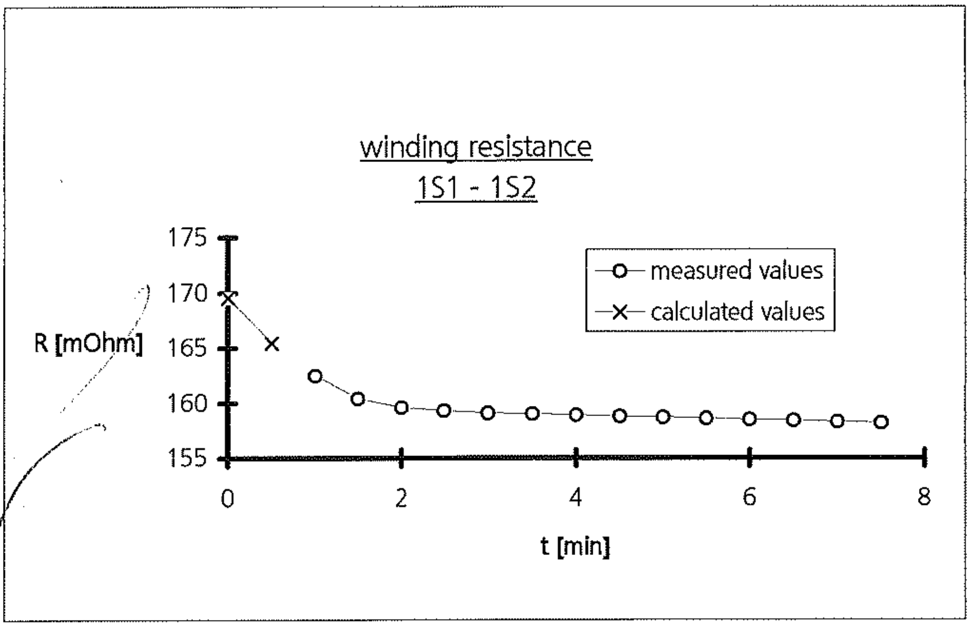


Figure 7: Cooling curve of core 1

Graphic representation of resistance variation (core 2)

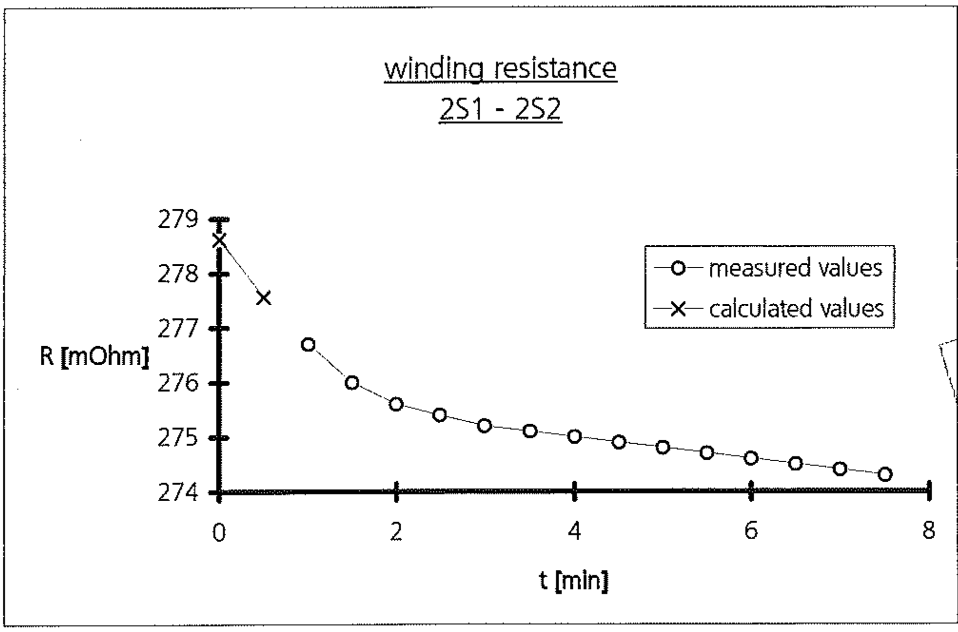


Figure 8: Cooling curve of core 2

8. Evaluation of all tests

- **Lightning impulse test**

During the test at 75-kV lightning impulse voltage, no disruptive discharge occurred. The recorded voltage curve did not present any significant variation between recordings at reference impulse and at full impulse level.
The routine tests have successfully been repeated.

The requirements specified by IEC 60044-1: 1996, Sub-clause 7.3.2 have been met.

The current transformer has PASSED the type test – impulse voltage test.

- **Determination of errors**

The measured current error and phase displacement values are within the limits permissible for accuracy class 0.5 for measuring current transformers and class 5P for protective current transformers.

The requirements specified by IEC 60044-1: 1996, Sub-clauses 11.4 and 12.4 have been met.

The current transformer has PASSED the type test – determination of errors.

- **Short-time current test**

The current transformer is capable of properly carrying its rated dynamic current of 80 kA and its rated short-time thermal current of 31.5 kA for a duration of short-circuit of 3 s.

- After test, the current transformer was not visibly damaged.
- The errors determined after test did not differ from those recorded before test by more than half the limits of error appropriate to its accuracy class.
- During the dielectric tests done after the short-time current test, no disruptive discharge occurred. The partial discharge magnitude was below the permissible limit of 50 pC at 1.2 x U_m.
- The visual inspection of the insulation of the primary winding was not necessary as the current density in the primary winding, related to the rated short-time thermal current, does not exceed 180 A/mm².

The requirements specified by IEC 60044-1: 1996-12, Sub-clause 7.1 have been met.

The current transformer has PASSED the type test – short-time current test.

ВЯРНО С ОРИГИНАЛА

- **Temperature-rise test**

Subjected to its rated primary continuous thermal current of 1500 A, the test object reaches a maximum final temperature rise of 64.1 K in the secondary windings. The final winding temperature-rise limit of 75 K permissible for the class of insulation "E" was not exceeded.

The requirements specified by IEC 60044-1: 1996, Sub-clause 7.2 have been met.

The current transformer has PASSED the type test – temperature-rise test.

9. Appendices

9.1 Photos

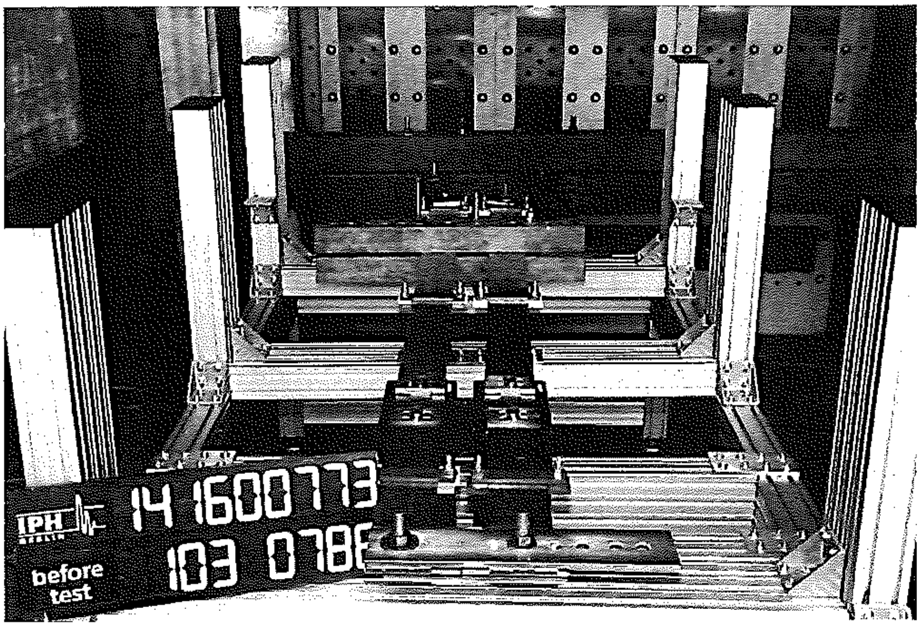
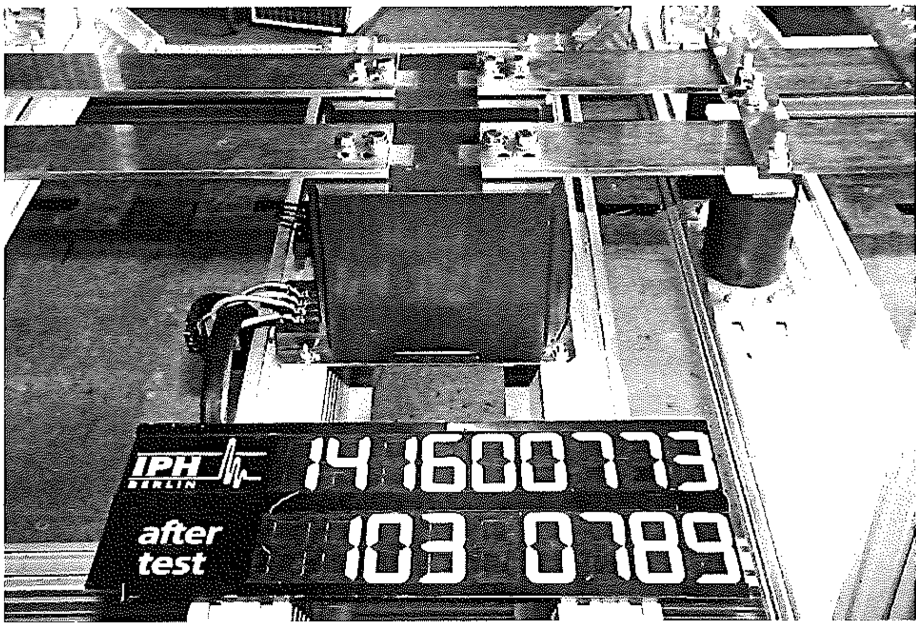


Figure 9: Test arrangement for the short-time current test

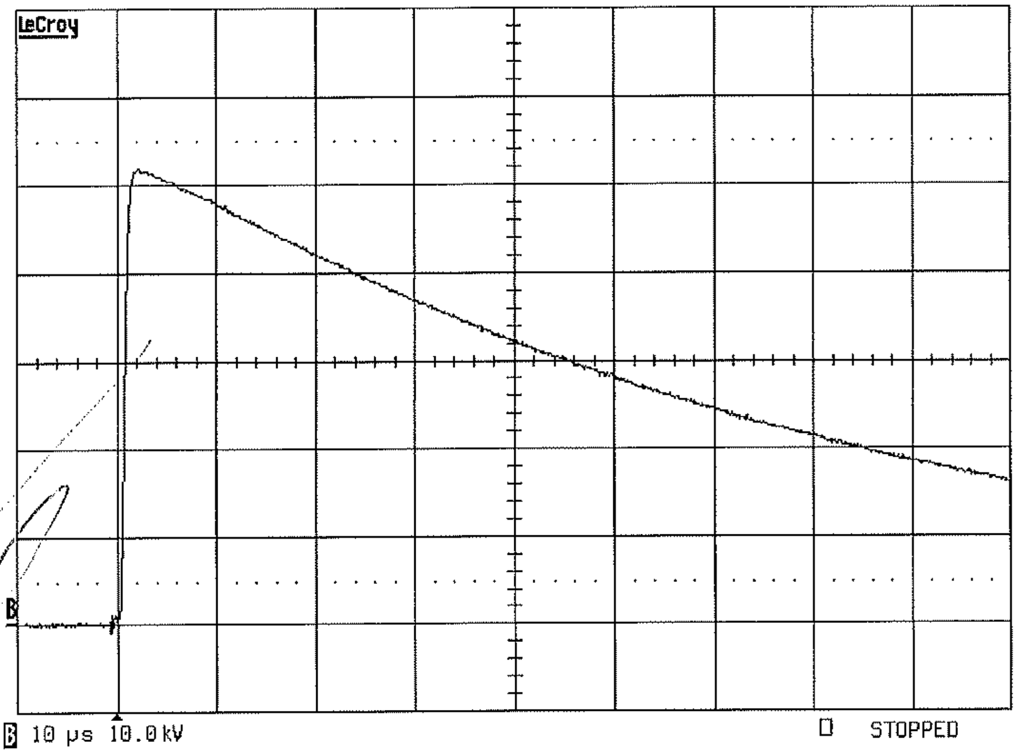


ВЯРНО С ОРИГИНАЛА

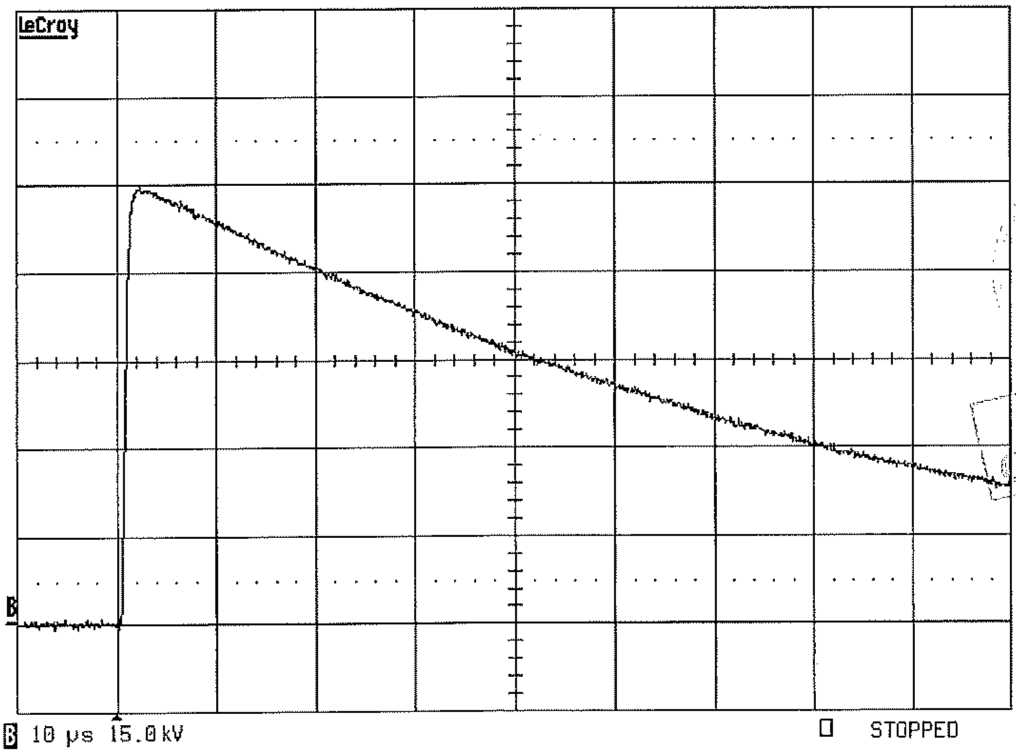
Figure 10: Test object after the short-time withstand current test

9.2 Oscillograms

- Impulse tests on the primary winding

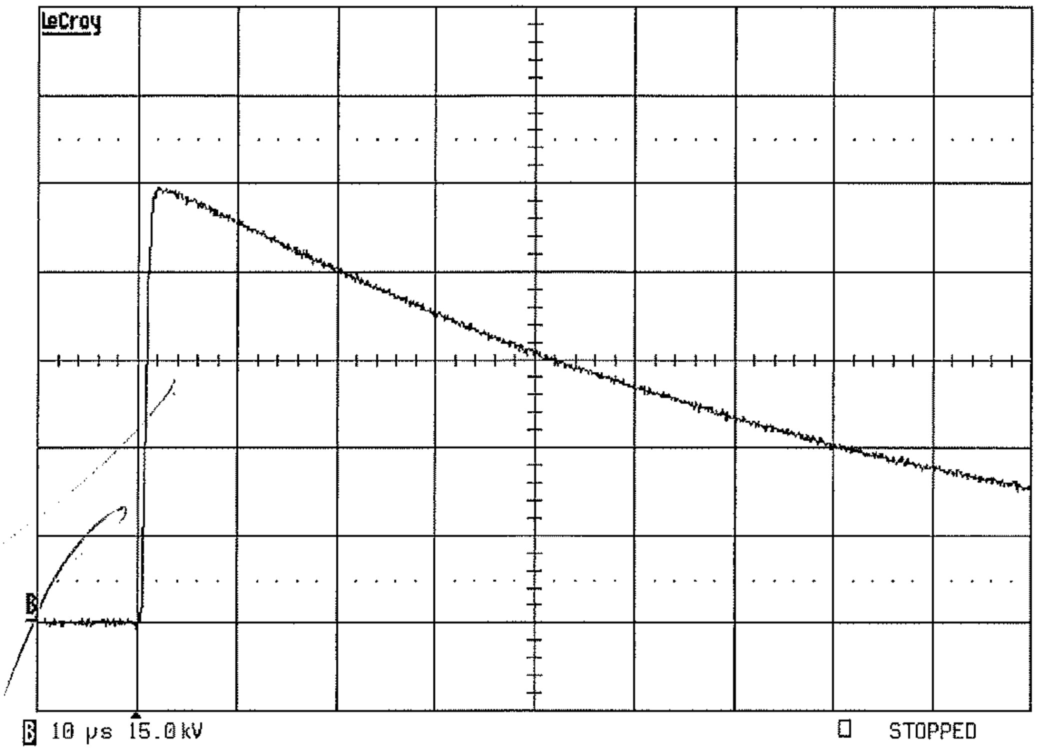


Test No. 1003 02129



Test No. 1003 02130

ВЯРНО С ОРИГИНАЛА



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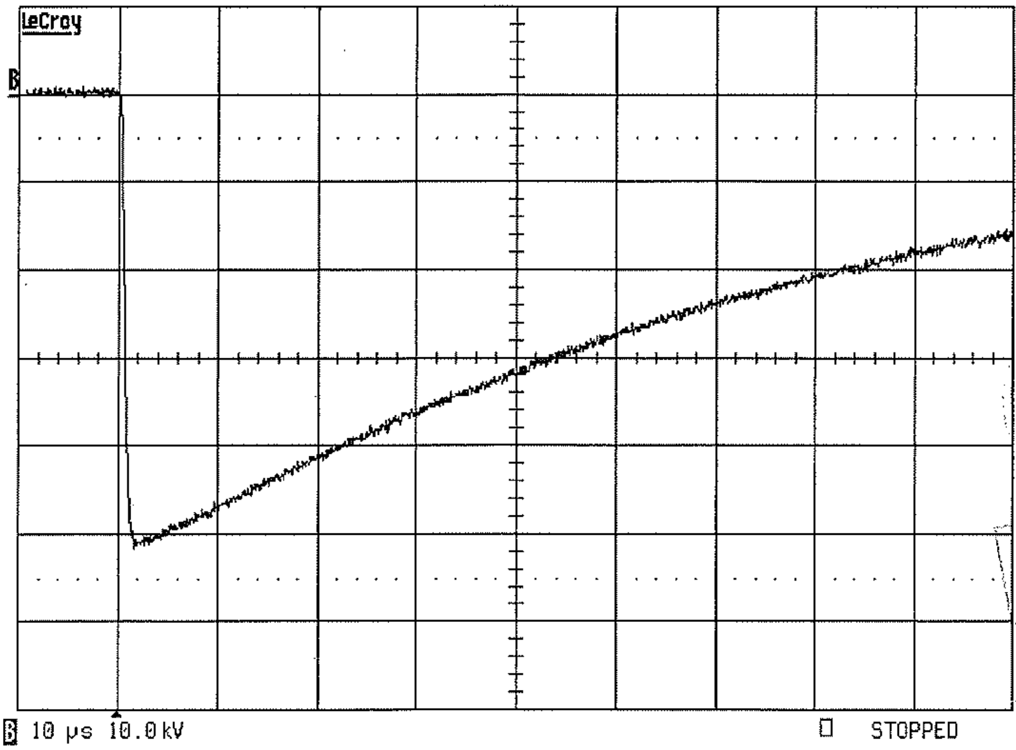

Test No. 1003 02145

ВЯРНО С ОРИГИНАЛА

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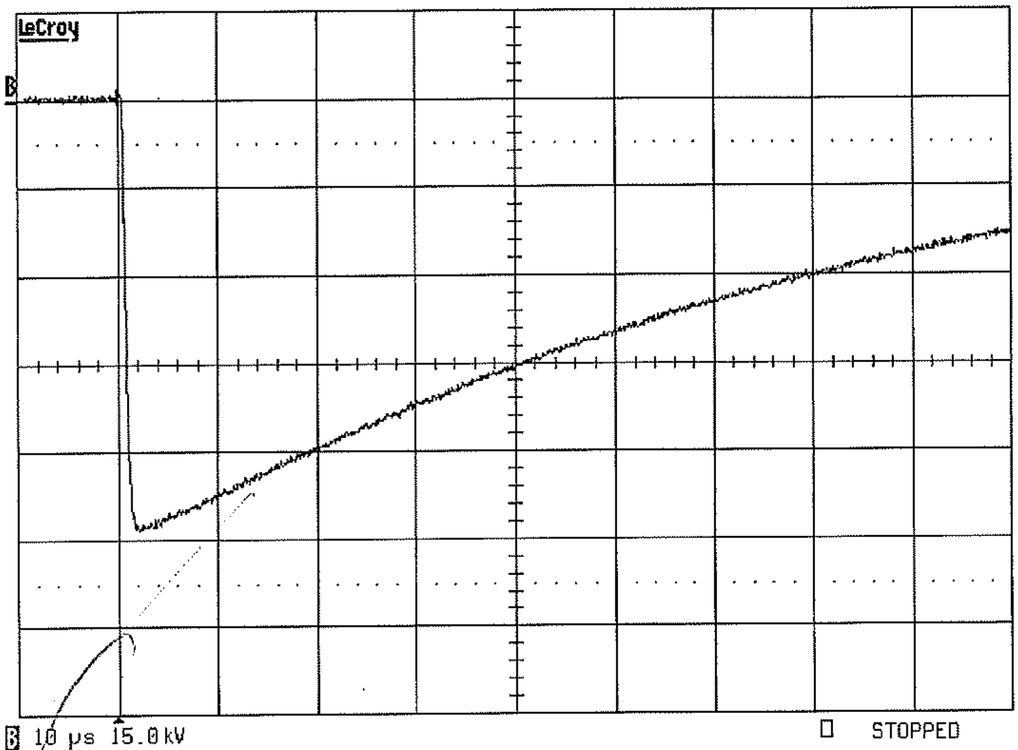
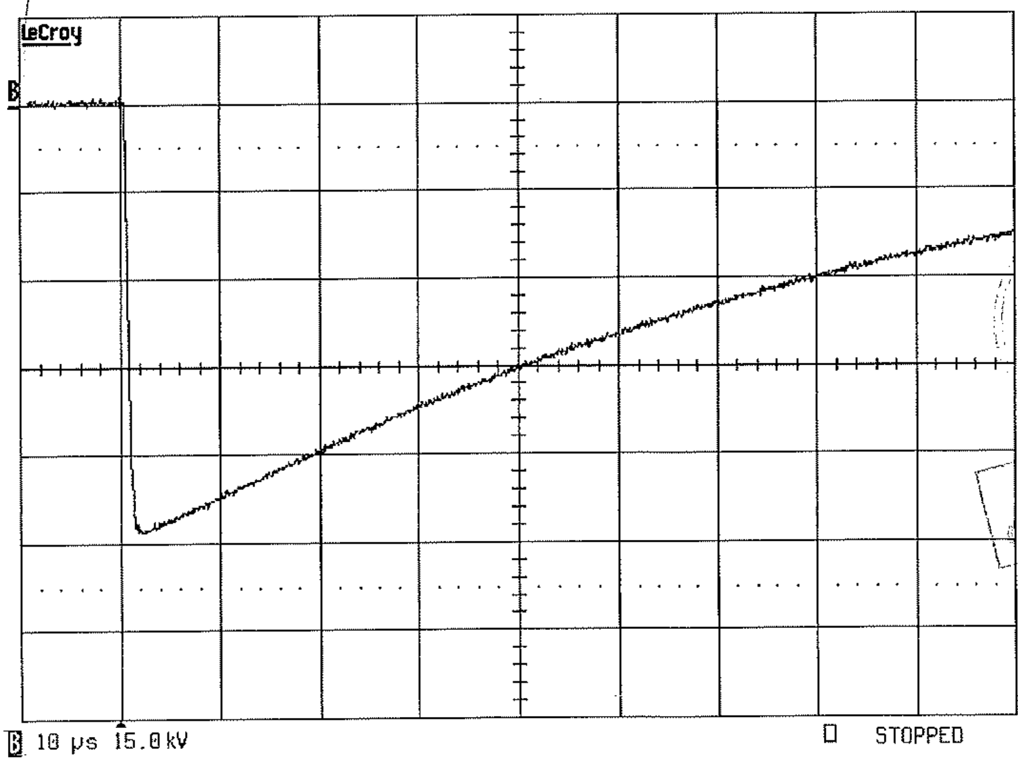


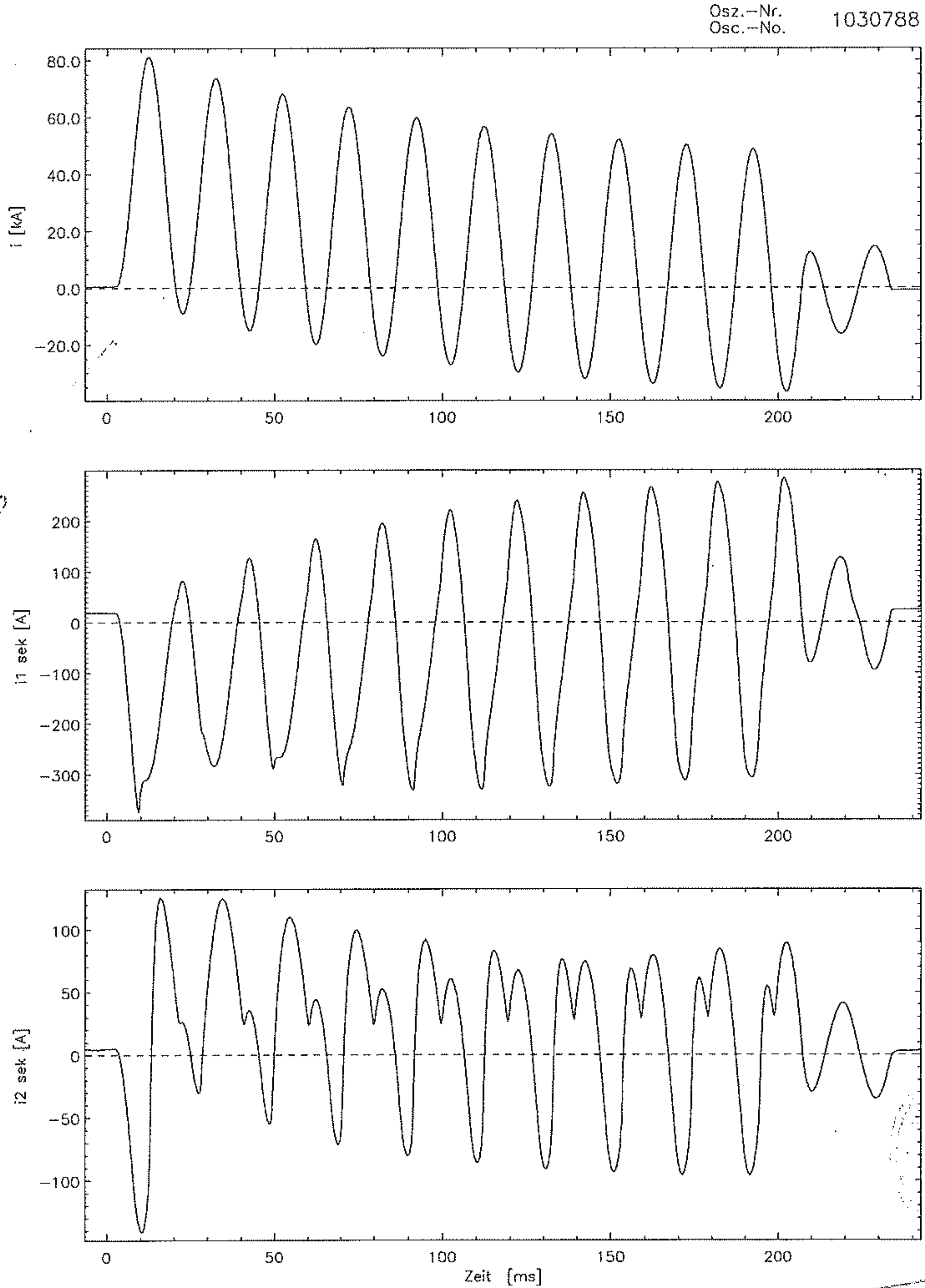
Test No. 1003 02146



Test No. 1003 02160

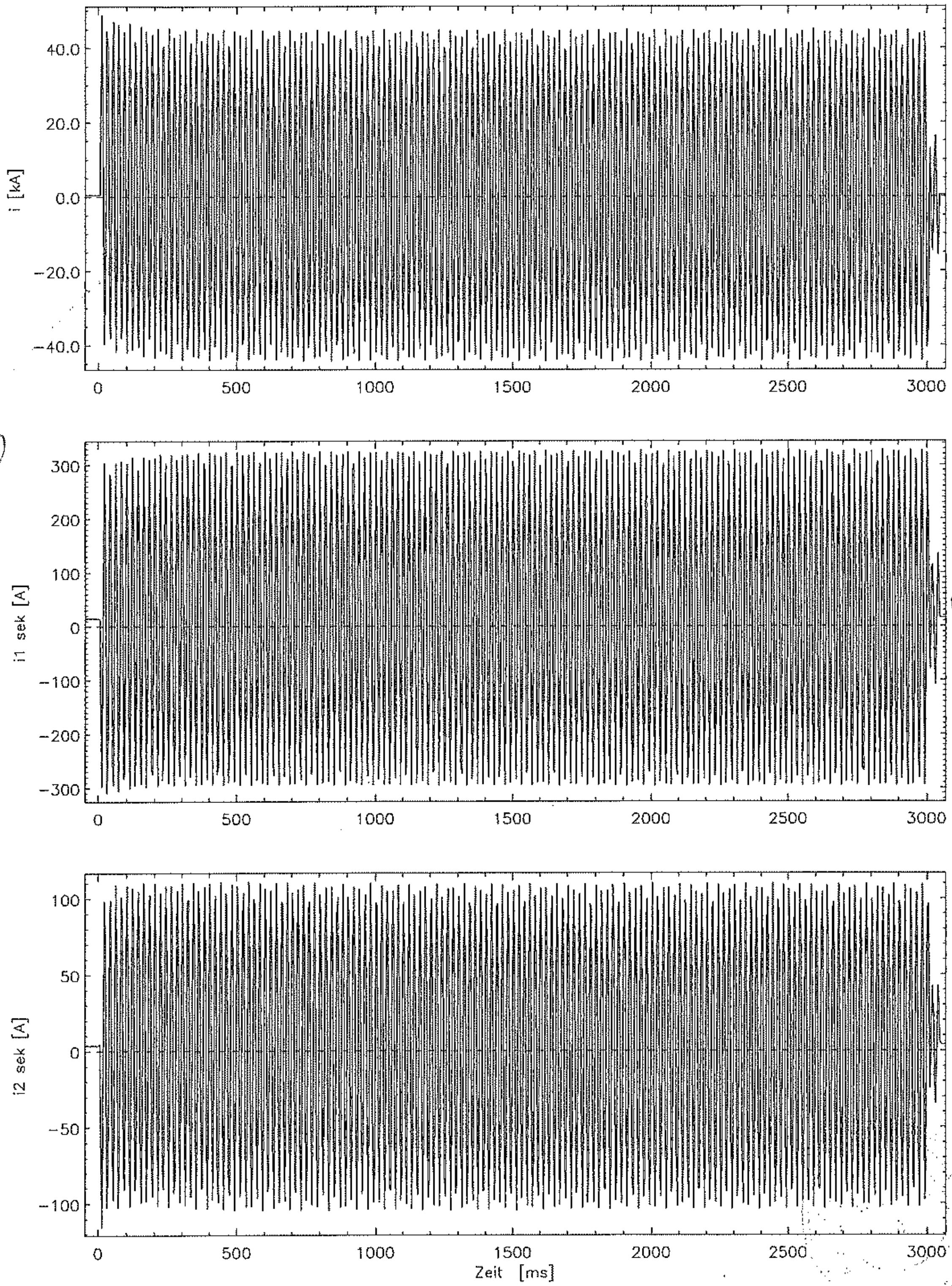
ВЯРНО С ОРИГИНАЛА

- **Short-circuit test**



ВЯРНО С ОРИГИНАЛА

Osz.–Nr.
Osc.–No. 1030789



ВЯРНО С ОРИГИНАЛА

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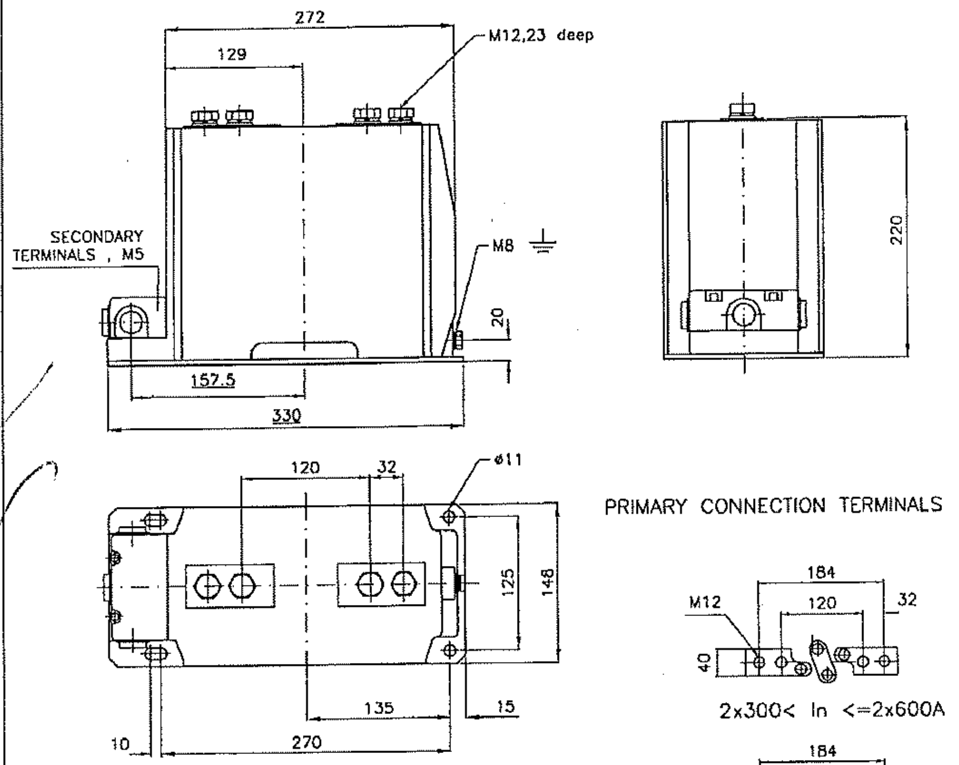
9.3 Drawing



TYPE : 4MA72 Nr: 03/00815
Um : 12/28/75kV 50-60Hz
Ratio : 1250/5-5A
Icont : 1,2xIn
1.Core : 0.5FS5 15VA
2.Core : 5P10 15VA
Ith : 31.5kA (3sec.)
Idyn : 2,5xIth
Copper cross-section
Primary winding : 660m...
1.Secondary winding : 2,55m...
2.Secondary winding : 2,54m...

На основание чл.36а ал.3 от ЗОП

						Epoxy-resin
QTY	DESCRIPTION	POS	DIMENSIONS	WEIGHT	PART OR DIN NO.	MATERIAL

NO	DATE	NAME	MODIFICATION

TOLERANCES DIN 7168 g	4MA72 BLOCK TYPE CURRENT TRANSFORMER	MAT...
SCALE 1:5	REPLACES THE DRAWING NO.	DR'N / CH'D / APP'D / INFORM
C.C		

На основание чл.36а ал.3 от ЗОП

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Deutsche Akkreditierungsstelle GmbH
(Германски акредитационен орган ГмбХ)

Упълномощен в съответствие с Подраздел 1 на Раздел 8 на AkkStelleG във връзка с Подраздел 1 на Раздел 1 на AkkStelleG
Подписал Многостранните споразумения на EA, ILAF и IAF за взаимно признаване

Акредитация

Deutsche Akkreditierungsstelle GmbH (Германски акредитационен орган ГмбХ) удостоверява, че изпитвателната лаборатория

IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH
Landsberger Alee 378 A, 12681 Berlin
(Институт ИПХ „Прюфелд фюр Електрише Хохлайщунгстехник" ГмбХ
Алея Ландсбергер 378 А, 12681 Берлин)

е компетентна по условията на DIN EN ISO/IEC 17025:2005 да извършва изпитания в следните области:

Апаратура и компоненти за високо напрежение
Апаратура и компоненти за ниско напрежение
Комутационна, защитна и управляваща апаратура
Кабели и кабелни аксесоари за високо, средно и ниско напрежение

Акредитационният сертификат важи във връзка с известието за акредитация от 11.11.2015 г. с акредитационен номер D-PL-12107-01 и е валиден до 10.11.2020 г. Той се състои от заглавния лист, обратната страна на заглавния лист и следващия анекс с общо 42 страници.

Регистрационен номер на сертификата: **D-PL-12107-01-00**

Франкфурт на Майн, 11.11.2015 г.

/подпис – не се чете/
инж. Ралф Егнер
Ръководител отделение

Този документ е превод. Определящата версия е оригиналният германски акредитационен сертификат.

Вж. забележките на обратната страна на листа.

ВЯРНО С ОРИГИНАЛА

Deutsche Akkreditierungsstelle GmbH
(Германски акредитационен орган ГмбХ)

Офис Берлин
Шпителмаркт 10
10117 Берлин

Офис Франкфурт на Майн
Еуропа алее 52
60327 Франкфурт на Майн

Офис Брауншвайг
Бундесалее 100
38116 Брауншвайг

Публикуването на извадки от акредитационния сертификат подлежи на предварително писмено одобрение от Deutsche Akkreditierungsstelle GmbH (DAkkS). Изключение е непроменената форма на отделни разпространения на заглавния лист от споменатия на обратната страна на листа орган за оценка на съответствието.

Не трябва да се създава впечатление, че акредикацията е разширена до области извън обхвата на акредитация , удостоверен от DAkkS.

Акредитацията е дадена съгласно Закона за акредитационния орган (AkkStelleG) от 31 юли 2009 г. (Вестник за федерални закони I стр. 2625) и РЕГЛАМЕНТ (ЕО) № 765/2008 на Европейския парламент и на Съвета от 9 юли 2008 г. за определяне на изискванията за акредитация и надзор на пазара във връзка с предлагането на пазара на продукти (Официален вестник на Европейския съюз L 218 от 9 юли 2008 г., стр. 30). DAkkS е подписал Многостранното споразумение за взаимно признаване на европейското сътрудничество за акредитация (EA), Международния акредитационен форум (IAF) и Международното сътрудничество за акредитиране на лаборатории (ILAC). Подписалите тези споразумения признават взаимно своите акредитации.

Текущото състояние на членството може да бъде намерено на следните уебсайтове:
EA: www.european-accreditation.org
ILAC: www. ilac.org
IAF: www.iaf.nu

ВЯРНО С ОРИГИНАЛА

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DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory

IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH
Landsberger Allee 378 A, 12681 Berlin

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

High-voltage equipment and components
Low-voltage equipment and components
Installation, switching, control and protective equipment
High-voltage, medium-voltage and low-voltage cables and their accessories

The accreditation certificate shall only apply in connection with the notice of accreditation of 2015-11-11 with the accreditation number D-PL-12107-01 and is valid until 2020-11-10. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 42 pages.

Registration number of the certificate: **D-PL-12107-01-00**

ВЯРНО С
ОРИГИНАЛА

Frankfurt, 2015-11-11

Dipl.-Ing. (FH) Ralf Egner
Head of Division

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

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Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkkS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkkS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

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Annex to the Accreditation Certificate D-PL-12107-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 2015-11-11 to 2020-11-10 Date of issue: 2015-11-11

Holder of certificate:

IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH
Landsberger Allee 378 A, 12681 Berlin

Tests in the fields:

High-voltage equipment and components
Low-voltage equipment and components
Railway applications
Installation, switching control and protective equipment
High-voltage, medium-voltage and low-voltage cables and their accessories

The testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use standards or equivalent testing methods listed here with different issue dates.

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Testing of high-voltage equipment and components as described in the subsequent listed standards			
High-voltage Switchgear, Control gear and Assemblies (general)			
Electrical engineering	IEC 62271-1 (2011-08) Ed. 1.1 EN 62271-1:2008/A1:2011 DIN EN 62271-1 VDE 0671-1/A1): 2012-04	High-voltage switchgear and controlgear – Part 1: Common specifications	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
High-voltage Switchgear and Control gear			
Electrical engineering	IEC 62271-100 (2012-09) Ed. 2.1 STL-Guide EN 62271-100:2009 + A1:2012 DIN EN 62271-100:2013-08 VDE 0671-100	High-voltage switchgear and controlgear – Part 100: High-voltage alternating-current circuit-breakers	
Electrical engineering	IEC 62271-101 (2012-10) Ed. 2.0 STL-Guide EN 62271-101:2013 DIN EN 62271-101:2013-08 VDE 0671-101	High-voltage switchgear and controlgear – Part 101: Synthetic testing	
Electrical engineering	IEC 62271-108 (2005-10) Ed. 1.0 EN 62271-108:2006 DIN EN 62271-108:2006-10 VDE 0671-108	High-voltage switchgear and controlgear – Part 108: High-voltage alternating current disconnecting circuit-breakers for rated voltages of 72,5 kV and above	
Electrical engineering	IEC 62271-109 EN 62271-109:2009 + A1:2013 DIN EN 62271-109:2014-02 VDE 0671-109	High-voltage switchgear and controlgear – Part 109: Alternating-current series capacitor by-pass switches	
Electrical engineering	IEC 62271-110 (2012-09) Ed. 3.0 EN 62271-110:2012 DIN EN 62271-110:2013-08 VDE 0671-110	High-voltage switchgear and controlgear – Part 110: Inductive load switching	
Electrical engineering	IEEE C37.60-2012 IEC 62271-111 (2012-09) Ed. 2.0 VDE 0671-111	Overhead, pad-mounted, dry vault, and submers-ible automatic circuit reclosersand fault interrupters for alternating current systems up to 38 kV.	
Electrical engineering	IEC 62271-205 EN 62271-205:2008 DIN EN 62271-205:2008-12 VDE 0671-205	High-voltage switchgear and controlgear – Part 205: Compact switchgear assemblies for rated voltages above 52 kV.	

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DAkkS Deutsche Akkreditierungsstelle

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Load switches			
Electrical engineering	IEC 62271-103 DIN IEC 62271-103 EN 62271-103:2011 DIN EN 62271-103:2012-04 VDE 0671-103 STL-Guide	High-voltage switchgear and controlgear – Part 103: Switches for rated voltages above 1 kV up to and including 52 kV.	
Electrical engineering	IEC 62271-104 (2015-02) Ed. 2.0 EN 62271-104:2009 DIN EN 62271-104:2010-03 VDE 0671-104	High-voltage switchgear and controlgear – Part 104: Alternating current switches for rated voltages higher than 52 kV.	
Electrical engineering	IEC 62271-105 (2012-09) Ed. 2.0 EN 62271-105:2012 DIN EN 62271-105:2013-08 VDE 0671-105	High-voltage switchgear and controlgear – Part 105: Alternating current switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV.	
Electrical engineering	IEC 62271-107 (2012-05) Ed. 2.0 EN 62271-107:2012 DIN EN 62271-107:2013-03 VDE 0671-107	High-voltage switchgear and controlgear – Part 107: Alternating current fused circuit-switchers for rated voltages above 1 kV up to and including 52 kV.	
Current contactors and motor starters			
Electrical engineering	IEC 62271-106 (2014-02) Ed. 1.0 + Corr 1 EN 62271-106:2011 DIN IEC 62271-106:2012-06 VDE 0671-106	High-voltage alternating current contactors and contactor-based motor starters.	
Current disconnectors and earthing switches			
Electrical engineering	IEC 62271-102 (2013-02) Ed. 1.0 + am2 EN 62271-102:2002/A2:2013 DIN EN 62271-102/A2:2013-12 VDE 0671-102/A2	High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches.	

ВЯРНО С ОРИГИНАЛА

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Fuses			
Electrical engineering	IEC 60282-1 (2014-07) Ed. 7.1 STL-Guide EN 60282-1:2009 + A1:2014 DIN EN 60282-1:2015-05 VDE 0670-4	High-voltage fuses – Part 1: Current-limiting fuses.	
Electrical engineering	IEC 60282-2 (2008-04) Ed. 3.0	High-voltage fuses; – Part 2: Expulsion fuses	
Electrical engineering	IEC 60644 (2009-08) Ed. 2.0 EN 60644:2009 DIN EN 60644:2010-07 VDE 0670-401	Specification for high-voltage fuse-links for motor circuit applications.	
High-voltage switchgear and control gear assemblies			
Electrical engineering	IEC 62271-200 (2011-10) Ed. 2.0 STL- Guide EN 62271-200:2012 DIN EN 62271-200:2012-08 VDE 0671-200	High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.	
Electrical engineering	IEC 62271-201 (2014-03) Ed. 2.0 EN 62271-201:2014 DIN EN 62271-201:2015-03 VDE 0671-201	High-voltage switchgear and controlgear – Part 201: A.C. insulation-enclosed switch-gear and controlgear for rated voltages above 1 kV and up to and including 52 kV.	
Electrical engineering	IEC 62271-203 (2013-07) Ed. 2.0 + Corr. 1 STL-Guide EN 62271-203:2012 DIN EN 62271-203:2012-11 VDE 0671-203	High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV.	
Electrical engineering	IEC 62271-204 (2011-07) Ed. 1.0 STL-Guide EN 62271-204:2011 DIN EN 62271-204:2012-05 VDE 0671-204	High-voltage switchgear and controlgear – Part 204: Rigid gas-insulated transmission lines for rated voltage above 52 kV.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 62271-209 (2007-08) Ed. 1.0 EN 62271-209:2007 DIN EN 62271-209:2008-07 VDE 0671-209	High-voltage switchgear and controlgear – Part 209: Cable connections for gas-insulated metal-enclosed switchgear for rated voltages above 52 kV – Fluid-filled and extruded insulation cables – Fluid-filled and dry-type cable-terminations.	
Electrical engineering	IEC 62271-202 EN 62271-202:2014 + AC:2014 DIN EN 62271-202:2015-02 VDE 0671-202	High-voltage switchgear and controlgear – Part 202: High voltage / low voltage prefabricated substation.	
Electrical engineering	IEC 62271-205 (2008-01) Ed. 1.0 EN 62271-205:2008 DIN EN 62271-205:2008-12 VDE 0671-205	High-voltage switchgear and controlgear – Part 205: Compact switchgear assemblies for rated voltages above 52 kV.	
Electrical engineering	ANSI / IEEE C37.23-2003	IEEE Standard for Metal-Enclosed Bus	
Switch gear for direct current			
Electrical engineering	DIN VDE 0660-112:1987-02 VDE 0660-112	Schaltgeräte; Zusatzbestimmungen für Gleichstrom-Lastschalter, -Trenner und -Lasttrenner über 1200 V bis 3000 V.	
Power transformers, reactors, line traps, tap-changers			
Electrical engineering	IEC 60076-1 (2011-04) Ed. 3.0 EN 60076-1:2011 DIN EN 50076-1:2012-03 VDE 0532-76-1	Power transformers – Part 1: General.	
Electrical engineering	IEC 60076-2 (2011-02) Ed. 3.0 EN 60076-2:2011 DIN EN 60076-2:2012-02 VDE 0532-76-2	Power transformers – Part 2: Temperature rise for liquid-immersed transformers.	
Electrical engineering	IEC 60076-3 (2013-07) Ed. 3.0 EN 60076-3:2013 DIN EN 60076-3:2014-08 VDE 0532-76-3	Power transformers – Part 3: Insulation levels, dielectric tests and external clearances in air.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0532-76 -4 DIN EN 60076-4:2003-06 IEC 60076-4 (2002-06) Ed. 1.0	Power transformers – Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors.	
Electrical engineering	IEC 60076-5 (2006-02) Ed. 3.0 STL-Guide EN 60076-5:2006 DIN EN 60076-5:2007-01 VDE 0532-76-5	Power transformers – Part 5: Ability to withstand short circuit.	
Electrical engineering	IEC 60076-6 (2007-12) Ed. 1.0 EN 60076-6:2008 DIN EN 60076-6:2009-02 VDE 0532-76-6	Power transformers – Part 6: Reactors.	
Electrical engineering	IEC 60076-10 (2001-05) Ed. 1.0 IEC 60076-10-1 (2005-10) Ed. 1.0 EN 60076-10:2001 DIN EN 60076-10:2002-04 VDE 0532-76-10	Power transformers – Part 10-1: Determination of sound levels (+ Application guide).	
Electrical engineering	IEC 60076-11 (2004-05) Ed. 1.0 EN 60076-11:2004 DIN EN 60076-11:2005-04 VDE 0532-76-11	Power transformers – Part 11: Dry-type transformers.	
Electrical engineering	IEC 60076-13 EN 60076-13:2006 DIN EN 60076-13:2007-07 VDE 0532-76-13	Power transformers – Part 13: Self-protected liquid-filled transformers.	
Electrical engineering	DIN 57532-21:1982-03 VDE 0532-21	Transformatoren und Drosselspulen; Anlasstransformatoren und Anlassdrosselspulen	
Electrical engineering	VDE 0532 Teil 30 DIN EN 60214:2015-04 IEC 60214-1 (2014-05) Ed. 2.0	Tap-changer	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0851 IEC 60353 (2004-04) Ed. 2.0	Line traps for a.c. power systems.	
Instrument transformers			
Electrical engineering	IEC 61869-1 (2007-10) Ed. 1.0 EN 61869-1:2009 DIN EN 61869-1:2010-04 VDE 0414-9-1	Instrument transformers – Part 1: General requirements.	
Electrical engineering	IEC 61869-2(2012-09) Ed. 1.0 EN 61869-2:2012 DIN EN 61869-2:2013-07 + Ber. VDE 0414-9-2	Instrument transformers – Part 2: Additional requirements for current transformers.	
Electrical engineering	IEC 61869-3 (2011-07) Ed. 1.0 EN 61869-3:2011 DIN EN 61869-3:2012-05 VDE 0414-9-3	Instrument transformers – Part 3: Additional requirements for inductive voltage transformers.	
Electrical engineering	IEC 61869-4 (2013-11) Ed. 1.0 EN 61869-4:2014 DIN EN 61869-4:2015-04 VDE 0414-9-4	Instrument transformers – Part 4: Additional requirements for combined transformers.	
Electrical engineering	VDE 0414-9-5 DIN EN 61869-5:2012-05 IEC 61869-5 (2015-08) Ed. 1.0	Capacitive Voltage Transformers.	
Electrical engineering	VDE 0414-44-8 DIN EN 60044-8:2003-06 IEC 60044-8 (2002-07) Ed.1.0 IEC 61869-8	Instrument transformers – Part 8: Electronic current transformers	
Electrical engineering	IEC 60044-7 (1999-12) Ed. 1.0 EN 60044-7:2000-11 DIN EN 60044-7:2000-11 VDE 0414-44-7 IEC 61869-7	Instrument transformers – Part 7: Electronic voltage transformers.	
Capacitors			
Electrical engineering	DIN VDE 0560-1:1969-12 VDE 0560-1	Bestimmungen für Kondensatoren – Teil 1: Allgemeine Bestimmungen.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60252-1 (2013-08) Ed. 2.1 EN 60252-1:2011 + A1:2013 DIN EN 60252-1:2014-07 VDE 0560-8	AC motor capacitors – Part 1: General - Performance, testing and rating - Safety requirements - Guidance for installation and operation.	
Electrical engineering	IEC 60110-1 (1998-06) Ed. 1.0 EN 60110-1:1998 DIN EN 61110-1:1999-09 VDE 0560-9	Power capacitors for induction heating installations – Part 1: General.	
Electrical engineering	DIN VDE 0560-10:1964-10 VDE 0560-10	Regeln für Kondensatoren – Teil 10: Regeln für Hochfrequenz-Leistungskondensatoren.	
Electrical engineering	DIN VDE 0560-11:1970-05 VDE 0560-11	Regeln für Kondensatoren – Teil 11: Regeln für Kondensatoren ab 600 V zum Glätten pulsierender Gleichspannung.	
Insulators and bushings			
Electrical engineering	DIN VDE 0441-1:1985-07 VDE 0441-1	Prüfung von Kunststoff-Isolatoren für Betriebswechselspannungen über 1 kV; Prüfung von Werkstoffen für Freiluftisolatoren.	
Electrical engineering	IEC 60660 (1999-10) Ed. 2.0 EN 60660:1999 DIN EN 60660:2000-12 VDE 0441-3	Insulators – Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1000 V up to but not including 300 kV.	
Electrical engineering	IEC 60383-1 (1993-04) Ed. 4.0 EN 60383-1:1996 DIN EN 60383-1:1997-05 VDE 0446-1	Insulators for overhead lines with a nominal voltage above 1000 V – Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria.	
Electrical engineering	IEC 60383-2 (1993-04) Ed. 1.0 EN 60383-2:1995 DIN EN 60383-2:1995-08 VDE 0446-4	Insulators for overhead lines with a nominal voltage above 1000 V – Part 2: Insulator strings and insulator sets for a.c. systems - Definitions, test methods and acceptance criteria.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60168 (2001-04) Ed. 4.2 EN 60168:1994 DIN EN 60168:2001-12 VDE 0674-1	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V.	
Electrical engineering	IEC 62155 (2003-05) Ed. 1.0 EN 62155:2003 DIN EN 62155:2004 VDE 0674-200	Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V.	
Electrical engineering	IEC 60137 (2008-07) Ed. 6.0 EN 60137:2008 DIN EN 60137:2009-07 VDE 0674-5	Insulated bushings for alternating voltages above 1000 V.	
Overhead lines			
Electrical engineering	IEC 61284 (1997-09) Ed. 2.0 + Corr. EN 61284:1997 DIN EN 61284:1998-05 VDE 0212-1	Overhead lines – Requirements and tests for fittings.	
Electrical engineering	IEC 61854 (1998-09) Ed. 1.0 EN 61854:1998 DIN EN 61854:1999-08 VDE 0212-2	Overhead lines – Requirements and tests for spacers.	
Electrical engineering	IEC 61897 (1998-09) Ed. 1.0 EN 61897:1998 DIN EN 61897:1999-08 VDE 0212-3	Overhead lines – Requirements and tests for Stockbridge type aeolian vibration dampers.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	DIN VDE 0216:1986-2 VDE 0216	Armaturen für Fahrleitungsanlagen; Statisch-mechanisches Verhalten – Anforderungen, Prüfung.	
HVDC Thyristor valves			
Electrical engineering	IEC 60700-1 (2008-11) Ed. 1.2 EN 60700-1:1998 + A1:2003 + A2:2008 DIN EN 60700-1:2009-07 VDE 0553-1	Thyristor valves for high voltage direct current (HVDC) power transmission – Part 1: Electrical testing.	
Equipment for operating, testing, marking off, live working. Equipment for earthing, short-circuiting.			
Electrical engineering	DIN VDE 0681-1:1986-10 VDE 0681-1	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Allgemeine Festlegungen.	
Electrical engineering	DIN 57681-2:1977-03 DIN VDE 0681-2:1977-03 VDE 0681-2	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Schaltstangen.	
Electrical engineering	DIN 57681-3:1977-03 DIN VDE 0681-3 VDE 0681-3	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Sicherungszangen.	
Electrical engineering	DIN VDE 0681-6:1985-06 VDE 0681-6	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Spannungsprüfer für Oberleitungsanlagen elektrischer Bahnen; 15 kV, 16 2/3 Hz.	
Electrical engineering	DIN VDE 0681-8:2003-10 VDE 0681-8	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Isolierende Schutzplatten.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60832-1 (2010-02) Ed. 1.0 EN 60832-1:2010 + Cor.:2010 DIN EN 60832-1:2010-12 VDE 0682-211	Live working – Insulating sticks and attachable devices – Part 1: Insulating sticks.	
Electrical engineering	IEC 61229 (2002-06) Ed. 1.2 EN 61229:1995/A2:2002 DIN EN 61229/A2:2003-09 VDE 0682-551 /A2	Rigid protective covers for live working on a.c. installations.	
Electrical engineering	IEC 61230 (2008-07) Ed. 2.0 EN 61230:2008 DIN EN 61230:2009-07 VDE 0683-100	Live working – Portable equipment for earthing or earthing and short-circuiting.	
Electrical engineering	IEC 61219 (1993-10) Ed. 1.0 + Cor.200-05 EN 61219:1993 DIN EN 61219:1995-01 VDE 0683-200	Live working – Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device – Lance earthing.	
High-voltage test techniques			
Electrical engineering	IEC 60270 (2000-12) Ed. 3.0 + Cor.1 EN 60270:2001 + Ber. DIN EN 60270:2001-08 + Ber. VDE 0434	High-voltage test techniques – Partial discharge measurements.	
Electrical engineering	IEC 60060-1 (2010-09) Ed. 3.0 STL-Guide HD 558.1 S1 EN 60060-1:2010 DIN EN 60060-1:2011-10 VDE 0432-1	High-voltage test techniques – Part 1: General definitions and test requirements.	
Electrical engineering	IEC 60060-2 (2010-11) Ed. 3.0 EN 60060-2:2011 DIN EN 60060-2:2011-10 VDE 0432-2	High-voltage test techniques – Part 2: Measuring systems.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0432-3 DIN-EN 60060-3:2006-08 IEC 60060-3 (2006-02) Ed. 1.0	High-voltage test techniques – Part 3: Definitions and requirements for on-site testing	
Electrical engineering	IEC 60052 (2002-10) Ed. 3.0 EN 60052:2002 DIN EN 60052:2003-06 VDE 0432-9	Voltage measurement by means of standard air gaps.	
Environmental and protection degree testing			
Electrical engineering	IEC 60068-2-78 (2012-10) Ed. 2.0 EN 60068-2-78:2013 DIN EN 60068-2-78:2014-02 VDE 0468-2-78	Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state.	
Electrical engineering	IEC 60068-3-4 (2001-08) Ed. 1.0	Environmental testing – Part 3-4: Supporting documentation and guidance – Damp heat tests.	
Electrical engineering	IEC 60068-2-30 (2005-08) Ed. 3.0	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle).	
Electrical engineering	IEC 60068-2-75 (2014-09) Ed. 2.0	Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests.	

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Technical responsibility for the test reports:

Approval:

Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Wirt.-Ing. Rainer Schiller
Herr Dipl.-Ing. Hannes Zinnbauer

Technical verification:

Herr Dipl.-Ing. Rainer Borchert
Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Jens Haring
Frau Dipl.-Ing. Dagmar Hauschild
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Ing. Manfred Thom
Herr Dr.-Ing. Frank Wachholz
Herr Dipl.-Ing. Jürgen Wittwer
Herr Dipl.-Ing. Sven Georgias
Herr Dipl.-Ing. Michael Heise
Herr Dipl.-Ing. Christian Juraschek
Herr Dipl.-Ing. Markus Gührs
Herr Dipl.-Ing. Klaus Vaterrodt
Herr Dipl.-Ing. Matthias Schröder-Heske
Herr Dipl.-Ing. Christian Kruscha
Frau Dipl.-Ing. Antje Köhler
Herr Dipl.-Ing. Stephan Wacker
Herr Dipl.-Ing. Lars Eberschulz

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Testing of low-voltage equipment and components as well as of installation, switching, control and protective equipment and railway applications as described in the subsequent listed standards.			
Railway applications			
Electrical engineering	VDE 0115 - 300-1 DIN EN 50123-1:2003-12 EN 50123-1:2003 IEC 61992-1 (2014-04) Ed. 2.1	Railway applications – Fixed installations – DC switchgear – Part 1: General.	
Electrical engineering	VDE 0115 - 300-2 DIN EN 50123-2:11-2003 EN 50123-2:2003 IEC 61992-2 (2014-04) Ed. 2.1	Railway applications – Fixed installations – DC switchgear – Part 2: DC circuit-breakers.	
Electrical engineering	VDE 0115 - 300-3 DIN EN 50123-3:10-2003 EN 50123-3:2003 IEC 61992-3 (2006-02) Ed. 2.0	Railway applications – Fixed installations – DC switchgear – Part 3: Indoor d.c. disconnectors, switch-disconnectors and earthing switches.	
Electrical engineering	VDE 0115 - 300-4 DIN EN 50123-4/A1 02-2014 EN 50123-4/A1:2013 IEC 61992-4 (2006-02) Ed 1.0	Railway applications – Fixed installations – DC switchgear – Part 4: Outdoor d.c. disconnectors, switch-disconnectors and earthing switches.	
Electrical engineering	IEC 61992-5 (2006-02) Ed. 1.0 DIN EN 50526-1:2012 VDE 0115-526-1:2012 EN 50526-1:2012	Railway applications – Fixed installations – DC switchgear – Part 5: Surge arresters and low-voltage limiters for specific use in d.c. systems.	
Electrical engineering	DIN EN 50526-2:2014 VDE 0115-526-2:2014 EN 50526-2:2014	Bahnanwendungen – Ortsfeste Anlagen – Überspannungsableiter und Spannungsbegrenzungseinrichtungen für Gleichspannungsnetze – Teil 2: Spannungsbegrenzungseinrichtungen.	
Electrical engineering	VDE 0115 - 300-6 DIN EN 50123-6:09-2003 EN 50123-6:2003 IEC 61992-6 (2014-04) Ed. 1.1	Railway applications – Fixed installations – DC switchgear – Part 6: DC switchgear assemblies.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0115 Teil 420 DIN EN 60310:2005-01 IEC 60310 (2004-02) Ed. 3.0	Railway applications – Traction transformers and inductors on board rolling stock.	
Electrical engineering	IEC 60077-1 (1999-10) Ed. 1.0 DIN EN 60077-1:2003-04 VDE 0115-460-1	Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules.	
Electrical engineering	IEC 60077-2 (1999-03) Ed. 1.0 DIN EN 60077-2:2003-04 VDE 0115-460-2	Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components – General rules.	
Electrical engineering	IEC 60077-3 (2001-12) Ed. 1.0 DIN EN 60077-3:2003-04 VDE 0115-460-3	Railway applications – Electric equipment for rolling stock – Part 3: Electrotechnical components – Rules for d.c. circuit-breakers.	
Electrical engineering	IEC 60077-4 (2003-02) Ed. 1.0 DIN EN 60077-4:2004-01 VDE 0115-460-4	Railway applications – Electric equipment for rolling stock – Part 4: Electrotechnical components – Rules for AC circuit-breakers.	
Electrical engineering	IEC 60077-5 (2003-07) Ed. 1.0 DIN EN 60077-5:2004-07 VDE 0115-460-5	Railway applications – Electric equipment for rolling stock – Part 5: Electrotechnical components – Rules for HV fuses.	
Electrical engineering	VDE 0115-327 DIN EN 50327:2006-03 EN 50327:2006-03 IEC 62589 (2010-07) Ed. 1.0	Railway applications – Fixed installations – Harmonisation of the rated values for converter groups and tests on converter groups.	
Electrical engineering	VDE 0115-328 DIN EN 50328:2010-11 EN 50328:2010-11 IEC 62590 (2010-06) Ed. 1.0	Railway applications – Fixed installations – Electronic power converters for substations.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0560-700 DIN EN 61921:2004-02 EN 61921:2003-07 IEC 61921 (2003-04) Ed. 1.0	Power capacitors Low-voltage power factor correction banks.	
Electrical engineering	VDE 0115 - 410 DIN EN 61287-1:2014-12 EN 61278-1:2014-07 IEC 61287-1 (2014-07) Ed. 3.0	Railway applications – Power convertors installed on board rolling stock – Part 1: Characteristics and test methods.	
Low-voltage switchgear and control gear			
Electrical engineering	VDE 0660 - 100 DIN EN 60947-1:2011-10 EN 60947-1:2011 IEC 60947-1 (2014-09) Ed. 5.2	Low-voltage switchgear and control gear – Part 1: General rules.	
Electrical engineering	VDE 0660 - 101 DIN EN 60947-2:2014-01 EN 60947-2:2013 IEC 60947-2 (2013-01) Ed. 4.2	Low-voltage switchgear and control gear – Part 2: Circuit-breakers.	
Electrical engineering	VDE 0660 - 107 DIN EN 60947-3:2015:03 EN 60947-3:2009 IEC 60947-3 (2012-09) Ed. 3.1	Low-voltage switchgear and control gear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units.	
Electrical engineering	VDE 0660 - 102 DIN EN 60947-4-1:2014-02 EN 60947-4-1:2012 IEC 60947-4-1 (2012-07) Ed. 3.1	Low-voltage switchgear and control gear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters.	
Electrical engineering	VDE 0660 - 117 DIN EN 60947-4-2:2013-05 EN 60947-4-2:2012 IEC 60947-4-2 (2012-03) Ed. 3.0	Low-voltage switchgear and control gear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters.	
Electrical engineering	VDE 0660 - 109 DIN EN 60947-4-3:2015-04 EN 60947-4-3:2014 IEC 60947-4-3 (2014-05) Ed. 2.0	Low-voltage switchgear and controlgear – Part 4-3: Contactors and motor-starters – AC semiconductor controllers and contactors for non-motor loads.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0660 - 200 DIN EN 60947-5-1:2010-04 EN 60947-5-1:2009 IEC 60947-5-1 (2009-07) Ed. 3.1	Low-voltage switchgear and control gear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices.	
Electrical engineering	VDE 0660 - 208 DIN EN 60947-5-2:2014-01 EN 60947-5-2:2012 IEC 60947-5-2 (2012-09) Ed. 3.1	Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches.	
Electrical engineering	VDE 0660 - 210 DIN EN 60947-5-5:2005-11 EN 60947-5-5:2005 IEC 60947-5-5 (2005-04) Ed. 1.1	Low-voltage switchgear and controlgear – Part 5-5: Control circuit devices and switching elements – Electrical emergency stop device with mechanical latching function.	
Electrical engineering	VDE 0660 - 114 DIN EN 60947-6-1:2014-09 EN 60947-6-1:2014 IEC 60947-6-1 (2013-12) Ed. 2.1	Low-voltage switchgear and controlgear – Part 6-1: Multiple function equipment – Transfer switching equipment.	
Electrical engineering	VDE 0660 - 115 DIN EN 60947-6-2:2007-12 EN 60947-6-2:2007 IEC 60947-6-2 (2007-03) Ed. 2.1	Low-voltage switchgear and controlgear – Part 6-2: Multiple function equipment – Control and protective switching devices (or equipment) (CPS).	
Electrical engineering	VDE 0611 - 1 DIN EN 60947-7-1:2010-03 EN 60947-7-1:2009 IEC 60947-7-1 (2009-04) Ed. 3.0	Niederspannungsschaltgeräte – Teil 7.1: Hilfseinrichtungen: Reihenklemmen für Kupferleiter. Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors.	
Electrical engineering	VDE 0611 - 3 DIN EN 60947-7-2:2010-03 EN 60947-7-2:2009 IEC 60947-7-2 (2009-04) Ed. 3.0	Low-voltage switchgear and controlgear – Part 7-2: Ancillary equipment – Protective conductor terminal blocks for copper conductors.	
Electrical engineering	VDE 0611 - 4 DIN VDE 0611- 4:1991-02	Niederspannungsschaltgeräte; Mehrstöckige Verteiler-Reihenklemmen bis 6 mm^2	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0637 - 3 DIN EN 61095:2009-11 EN 61095:2009 IEC 61095 (2009-02) Ed. 2.0	Electromechanical contactors for household and similar purposes.	
Electrical engineering	VDE 0220-100 DIN EN 61238-1:2004-03 IEC 61238-1 (2003-05) Ed. 2.0	Compression and mechanical connectors for power cables for rated voltages up to 30 kV (Um = 36 kV) – Part 1: Test methods and requirements.	
Fuses			
Electrical engineering	DIN EN 60269-1:2015-05 IEC 60269-1 (2014-06) Ed. 4.2 VDE 0636-1	Low-voltage fuses – Part 1: General requirements	
Electrical engineering	DIN VDE 0636-2:2014-09 IEC 60269-2 (2013-07(Ed. 5.0 HD 60269-2:2013 VDE 0636-2	Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) - Examples of standardized systems of fuses A to K	
Electrical engineering	DIN VDE 0636-3:2013-12 IEC 60269-3 (2013-01) Ed. 4.1 HD 60269-2:2013 VDE 0636-3	Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household or similar applications) - Examples of standardized systems of fuses A to F	
Electrical engineering	DIN EN 60269-4:2013-01 EN 60269-4:2012 IEC 60269-4 (2012-05) Ed. 5.1 VDE 0636-4	Low-voltage fuses – Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices	
Electrical engineering	DIN CLC 60269-5 IEC/TR 60269-5 (2014-03) Ed. 2.0 VDE 0636-5	Low-voltage fuses – Part 5: Guidance for the application of low-voltage fuses	
Electrical engineering	DIN EN 60269-6:2012-06 EN 60269-6:2011 IEC 60269-6 (2010-12) Ed. 1.0 + Cor. 1 VDE 0636-6	Low-voltage fuses – Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60127-1 (2015-02) Ed. 2.2	Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links.	
Electrical engineering	IEC 60127-2 (2014-09) Ed. 3.0	Miniature fuses – Part 2: Cartridge fuse-links.	
Power Transformers and Reactors			
Electrical engineering	VDE 0532-76-1 DIN EN 60076-1:2012-03 EN 60076-1:2011 IEC 60076-1 (2011-04) Ed. 3.0	Power transformers – Part 1: General.	
Electrical engineering	VDE 0532-76-2 DIN EN 60076-2:2012-02 EN 60076-2:2011 IEC 60076-2 (2011-02) Ed. 3.0	Power transformers – Part 2: Temperature rise for liquid-immersed transformers.	
Electrical engineering	VDE 0532-76-5 DIN EN 60076-5:2007-01 EN 60076-5:2006 IEC 60076-5 (2006-02) Ed. 3.0	Power transformers – Part 5: Ability to withstand short circuit.	
Electrical engineering	VDE 0532-76-6 DIN EN 60076-6:2009-02 EN 60076-6:2008 IEC 60076-6 (2013-09) Ed. 1.0	Power transformers – Part 6: Reactors.	
Electrical engineering	VDE 0532-214-1 DIN EN 60214-1:2015-04 EN 60214-1:2014 IEC 60214-1 (2014-05) Ed. 2.0	Tap-changers – Part 1: Performance requirements and test methods.	
Electrical engineering	IEC 60353 (2002-04) Ed. 2.0	Line traps for a.c. power systems.	
Electrical Installation Material			
Electrical engineering	VDE 0220 -3	Kabelklemmen	
Electrical engineering	VDE 0603-1 DIN VDE 0603-1:1991-01	Installationskleinverteiler und Zählerplätze AC 400 V; Installationskleinverteiler und Zählerplätze.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0603-2 DIN VDE 0603-2:1098-03	Installationskleinverteiler und Zählerplätze AC 400 V; Hauptleitungsabzweigklemmen.	
Electrical engineering	VDE 0609 -1 DIN EN 60999:2000-12 EN 60999:2000 IEC 60999 (1999-11) Ed. 2.0	Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm^2 up to 35 mm^2 (included).	
Electrical engineering	VDE 0623 -1 DIN EN 60309-1:2014-12 EN 60309-1:2005 IEC 60309-1 (2012-06) Ed. 4.2	Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements.	
Electrical engineering	VDE 0604-202 DIN EN 61914:2010-01 IEC 61914 (2009-01) Ed. 1.0	Cable cleats for electrical installations.	
Electrical engineering	VDE 0623 -20 DIN EN 60309-2:2013-01 EN 60309-2:2012 IEC 60309-2 (2012-05) Ed. 4.2	Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories.	
Electrical engineering	VDE 0630 - 1 DIN EN 61058-1:2001-10 EN 61058-1:2008 IEC 61058-1 (2008-04) Ed. 3.2	Switches for appliances – Part 1: General requirements.	
Electrical engineering	VDE 0630 - 2-1 DIN EN 61058-2-1:2001-08 EN 61058-2-1:2011 IEC 61058-2-1 (2010-11) Ed. 2.0	Switches for appliances – Part 2-1: Particular requirements for cord switches.	
Electrical engineering	VDE 0640 DIN EN 62019:2006-01 EN 62019:2005 IEC 62019 (2003-01)	Electrical accessories – Circuit-breakers and similar equipment for household use – Auxiliary contact units.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60898-1 (2015-03) Ed. 2.0 EN 60898-1 DIN EN 60898-1:2013 VDE 0641-1	Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation	
Electrical engineering	IEC 60898-2 (2003-07) Ed. 1.1 EN 60898-2: 2007 DIN EN 60898-2:2007 VDE 0641-2	Circuit-breakers for overcurrent protection for household and similar installations – Part 2: Circuit-breakers for a.c. and d.c. operation	
Electrical engineering	IEC 60934 (2013-01) Ed. 3.2 DIN EN 60934:2013-11 VDE 0642	Circuit-breakers for equipment (CBE).	
Electrical engineering	IEC 61008-1 (2013-09) Ed. 3.2 DIN EN 61008-10:2015-11 VDE 0664-10	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules	
Electrical engineering	IEC 61008-2-1 (1990-12) Ed. 1.0 DIN EN 61008-2-11:1999-12 VDE 0664-2-11	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCB's). – Part 2-1: Applicability of the general rules to RCCB's functionally independent of line voltage	
Electrical engineering	IEC 61008-2-2 (1990-12) Ed. 1.0 DIN EN 61008-2-2 VDE 0664-2-2	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCB's). – Part 2-2: Applicability of the general rules to RCCB's functionally dependent on line voltage	
Electrical engineering	IEC 61009-1 (2013-09) Ed. 3.2 DIN EN 61009-20:2015-11 VDE 0664-20	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 61009-2-1 (1991-09) Ed. 1.0 DIN EN 61009-21:1999-12 VDE 0664-21	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBO's) – Part 2-1: Applicability of the general rules to RCBO's functionally independent of line voltage	
Electrical engineering	IEC 61009-2-2 (1991-09) Ed. 1.0 DIN EN 61009-2-2 VDE 0664-2-2	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBO's) – Part 2-2: Applicability of the general rules to RCBO's functionally dependent on line voltage	
Electrical engineering	IEC 60099-4 (2014-06) Ed. 3.0 DIN EN 60099-4:2015-07 VDE 0675-4	Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems	
Electrical engineering	IEC 60099-5 (2013-05) Ed. 2.0 DIN EN 60099-5:2014-09 VDE 0675-5	Surge arresters – Part 5: Selection and application recommendations	
Electrical engineering	IEC 60099-6 (2002-08) Ed. 1.0	Surge arresters – Part 6: Surge arresters containing both series and parallel gapped structures - Rated 52 kV and less	
Electrical engineering	IEC 60099-8 (2011-01) Ed. 1.0 DIN EN 60099-8:2011-11 VDE 0675-8	Surge arresters – Part 8: Metal-oxide surge arresters with external series gap (EGLA) for overhead transmission and distribution lines of a.c. systems above 1 kV	
Electrical engineering	IEC 60099-9 (2014-06) Ed. 1.0 DIN EN 60099-9:2015-08 VDE 0675-9	Surge arresters – Part 9: Metal-oxide surge arresters without gaps for HVDC converter stations	
Electrical engineering	IEC 61643-11 (2011-03) Ed. 1.0 DIN EN 61643-11/A1:2015-09 VDE 0675-6-11	Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 61643-12 (2008-11) Ed. 2.0 DIN EN 61643-12:2013-04 VDE 0675-6-12	Low-voltage surge protective devices – Part 12: Surge protective devices connected to low-voltage power distribution systems - Selection and application principles	
Electrical engineering	IEC 61643-21 (2012-07) Ed. 1.2	Low voltage surge protective devices – Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods	
Electrical engineering	IEC 61643-22 (2015-06) Ed. 2.0	Low-voltage surge protective devices – Part 22: Surge protective devices connected to telecommunications and signalling net-works – Selection and application principles	
Electrical engineering	IEC 61643-311 (2013-04) Ed. 1.0	Components for low-voltage surge protective devices – Part 311: Performance requirements and test circuits for gas discharge tubes (GDT)	
Electrical engineering	IEC 61643-312 (2013-04) Ed. 1.0	Components for low-voltage surge protective devices – Part 312: Selection and application principles for gas discharge tubes	
Electrical engineering	IEC 61643-321 (2001-12) Ed. 1.0	Components for low-voltage surge protective devices – Part 321: Specifications for avalanche breakdown diode (ABD)	
Electrical engineering	IEC 61643-331 (2003-05) Ed. 1.0	Components for low-voltage surge protective devices – Part 331: Specification for metal oxide varistors (MOV)	
Electrical engineering	IEC 61643-341 (2001-11) Ed. 1.0	Components for low-voltage surge protective devices – Part 341: Specification for thyristor surge suppressors (TSS)	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0675-39-11 DIN EN 50539-11:2013-12 EN 50539-11:2013	Überspannungsschutzgeräte für Niederspannung - Überspannungsschutzgeräte für besondere Anwendungen einschließlich Gleichspannung – Teil 11: Anforderungen und Prüfungen für Überspannungsschutzgeräte für den Einsatz in Photovoltaik-Installationen.	
Low-voltage switchgear and controlgear assemblies			
Electrical engineering	IEC 61439-1 (2011-08) Ed. 2.0 DIN EN 61439-1:2014-06 VDE 0660-600-1	Low-voltage switchgear and controlgear assemblies – Part 1: General rules	
Electrical engineering	IEC 61439-2 (2011-08) Ed.2.0 DIN EN 61439-2:2012-06 VDE 0660-600-2	Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies	
Electrical engineering	IEC 61439-3 (2012-02) Ed. 1.0 DIN EN 61439-3:2014-10 VDE 0660-600-3	Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)	
Electrical engineering	IEC 61439-4 (2012-11) Ed.1.0 DIN EN 61439-4:2013-09 VDE 0660-600-4	Low-voltage switchgear and controlgear assemblies – Part 4: Particular requirements for assemblies for construction sites (ACS)	
Electrical engineering	IEC 61439-5 (2015-03) Ed. 2.0 DIN EN 61439-5:2015-10 VDE 0660-600-5	Low-voltage switchgear and controlgear assemblies – Part 5: Assemblies for power distribution in public networks	
Electrical engineering	IEC 61439-6 (2012-05) Ed. 1.0 DIN EN 61439-6:2013-06 VDE 0660-600-6	Low-voltage switchgear and controlgear assemblies – Part 6: Busbar trunking systems (busways)	
Electrical engineering	IEC/TS 61439-7 (2014-02) Ed. 1.0 DIN EN 61439-7:2014-10 VDE 0660-600-7	Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Switching, control and protective equipment			
Electrical engineering	VDE 0435 Teil 201 DIN EN 61810-1:2009-02 EN 61810-1:2008 IEC 61810-1 (2015-02) Ed. 4.0	Electromechanical elementary relays – Part 1: General and safety requirements.	
Electrical engineering	VDE 0435 - 300 DIN EN 60255-1:2010-09 EN 60255-1:2010 IEC 60255-1 (2009-08) Ed. 1.0	Measuring relays and protection equipment – Part 1: Common requirements.	
Electrical engineering	VDE 0435 - 2021 DIN EN 61812-1:2015-04 EN 61812-1:2011 IEC 61812-1 (2011-05) Ed. 2.0	Time relays for industrial and residential use – Part 1: Requirements and tests.	
Electrical engineering	VDE 0631-2-1 DIN EN 60730-2-1:2012-10 EN 60730-2-1:2010 IEC 60730-2-1 (2014-09) Ed. 5.0	Automatic electrical controls – Part 1: General requirements.	
Electrical engineering	VDE 0631 Teil 2-10 DIN EN 60730-2-10:2008-06 EN 60730-2-10:2007 IEC 60730-2-10 (2006-10)	Automatic electrical controls for household and similar use – Part 2-10: Particular requirements for motor-starting relays	
Instrument transformers			
Electrical engineering	VDE 0414-9-2 DIN EN 61869-2:2014-06 EN 61869-2:2012 IEC 61869-2 (2012-09) Ed. 2.0	Instrument transformers – Part 2: Additional requirements for current transformers.	
Electrical engineering	VDE 0414-9-3 DIN EN 61869-3:2012-05 EN 61869-3:2011 IEC 61869-3 (2011-07) Ed. 1.0	– Part 3: Additional requirements for inductive voltage transformers.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 414-9-4 HD 548.3 S1 DIN EN 61869-4:2015-04 EN 61869-4:2014 IEC 61869-4 (2013-11) Ed. 1.0	Instrument transformers – Part 4: Additional requirements for combined transformers.	
Low-voltage equipment			
Electrical engineering	VDE 0558-11 DIN EN 60146-1-1:2011-04 EN 60146-1-1:2010 IEC 60146-1-1 (2009-06) Ed. 4.0	Semiconductor converters – General requirements and line commutated converters – Part 1-1: Specification of basic requirements.	
Electrical engineering	VDE 0558 - 8 DIN EN 60146-1-3:1994-03 EN 60146-1-3:1993 IEC 60146-1-3 (1991-04) Ed. 3.0	Semiconductor convertors – General requirements and line commutated convertors – Part 1-3: Transformers and reactors.	
Electrical engineering	VDE 0638 DIN 57638:1981-09	Niederspannungs-Schaltgeräte - Schalter-Sicherungs-Einheiten D0-System.	

Technical responsibility for the test reports:

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ОРИГИНАЛА

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Approval:

Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Wirt.-Ing. Rainer Schiller
Herr Dipl.-Ing. Stefan Schwanck

Technical verification:

Herr Dipl.-Ing. Rainer Borchert
Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Sven Georgias
Herr Dipl.-Ing. Jens Haring
Frau Dipl.-Ing. Dagmar Hauschild
Herr Dipl.-Ing. Michael Heise
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Ing. Manfred Thom
Herr Dr.-Ing. Frank Wachholz
Herr Dipl.-Ing. Jörg Kremzow
Herr Dipl.-Ing. Jürgen Wittwer
Herr Dipl.-Ing. Christian Juraschek
Herr Dipl.-Ing. Markus Gührs
Herr Dipl.-Ing. Stephan Wacker
Herr Dipl.-Ing. Christian Kruscha
Frau Dipl.-Ing. Antje Köhler
Herr Dipl.-Ing. Lars Eberschulz
Herr Dipl.-Ing. Uwe Fischer

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Testing of high-voltage, medium-voltage and low-voltage cables and their accessories as described in the subsequent listed standards.			
Polyvinyl chloride insulated cables			
Electrical engineering	IEC 60227-1 (2007-10) Ed. 3.0	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 1: General requirements.	
Electrical engineering	IEC 60227-3 (1997-11) Ed. 2.1	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 3: Non-sheathed cables for fixed wiring.	
Electrical engineering	IEC 60227-4 (1997-12) Ed. 2.1	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 4: Sheathed cables for fixed wiring.	
Electrical engineering	IEC 60227-5 (2011-09) Ed. 3.0	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 5: Flexible cables (cords).	
Electrical engineering	IEC 60227-6 (2001-06) Ed. 3.0	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 6: Lift cables and cables for flexible connections.	
Electrical engineering	IEC 60227-7 (2012-01) Ed. 1.2	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 7: Flexible cables screened and unscreened with two or more conductors	
Electrical engineering	VDE 0281 - 8 DIN VDE 0281-8: 2000-09 HD 21.8 S2 + A1:1999	Polyvinylchlorid-isolierte Leitungen mit Nennspannungen bis 450 V / 750 V. Einadrige Leitungen ohne Mantel für Lichterketten.	
Electrical engineering	VDE 0281 - 9 DIN VDE 0281-9:2001-01 HD 21.9 S2 + A1:1999	Polyvinylchlorid-isolierte Leitungen mit Nennspannungen bis 450 V / 750 V. Einadrige Leitungen ohne Mantel zur Verlegung bei tiefen Temperaturen.	
Electrical engineering	VDE 0285-525-1 DIN EN 50525-1:2012-01 EN 50525-1:2011	Starkstromleitungen mit Nennspannungen bis 450 V / 750 V (U_0/U) – Teil 1: Allgemeine Anforderungen.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0285-525-2-11 DIN EN 50525-2-11:2012-01 EN 50525-2-11:2011	– Flexible Leitungen mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-12 DIN EN 50525-2-12:2012-01 EN 50525-2-12:2011	– Wendelleitungen mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-21 DIN EN 50525-2-21:2012-01 EN 50525-2-21:2011	– Flexible Leitungen mit vernetzter Elastomer-Isolierung.	
Electrical engineering	VDE 0285-525-2-31 DIN EN 50525-2-31:2012-01 EN 50525-2-31:2011	– Ader und Verdrahtungsleitung mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-41 DIN EN 50525-2-41:2012-01 EN 50525-2-41:2011	– Einadrige Leitung mit vernetzter Silicon-Isolierung.	
Electrical engineering	VDE 0285-525-2-42 DIN EN 50525-2-42:2012-01 EN 50525-2-42:2011	– Ader- und Verdrahtungsleitungen mit vernetzter EVA-Isolierung.	
Electrical engineering	VDE 0285-525-2-51 DIN EN 50525-2-51:2012-01 EN 50525-2-51:2011	– Ölbeständige Steuerleitung mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-71 DIN EN 50525-2-71:2012-01 EN 50525-2-71:2011	– Lahnlitzen-Leitung mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-72 DIN EN 50525-2-72:2012-01 EN 50525-2-72:2011	– Trennbare Zwillingsleitungen mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-81 DIN EN 50525-2-81:2012-01 EN 50525-2-81:2011	– Lichtbogenschweißleitungen mit vernetzter Elstomer- Hülle.	
Electrical engineering	VDE 0285-525-2-82 DIN EN 50525-2-82:2012-01 EN 50525-2-82:2011	– Leitungen für Lichterketten mit vernetzter Elastomer-Isolierung.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0285-525-2-83 DIN EN 50525-2-83:2012-01 EN 50525-2-83:2011	– Mehradrige Leitungen mit vernetzter Silicon-Isolierung.	
Electrical engineering	VDE 0285-525-3-11 DIN EN 50525-3-11:2012-01 EN 50525-3-11:2011	– Teil 3-11: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Flexible halogenfreie, raucharme Leitungen mit thermoplastischer Isolierung.	
Electrical engineering	VDE 0285-525-3-21 DIN EN 50525-3-21:2012-01 EN 50525-3-21:2011	– Teil 3-21: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Flexible halogenfreie, raucharme Leitungen mit vernetzter Isolierung.	
Electrical engineering	VDE 0285-525-3-31 DIN EN 50525-3-31:2012-01 EN 50525-3-31:2011	– Teil 3-31: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Halogenfreie, raucharme Ader- und Verdraht-ungsleitungen mit thermoplastischer Isolierung.	
Electrical engineering	VDE 0285-525-3-41 DIN EN 50525-3-41:2012-01 EN 50525-3-41:2011	– Teil 4-31: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Halogenfreie, raucharme Ader- und Verdrahtungsleitungen mit vernetzter Isolierung.	
Electrical engineering	VDE 0262 DIN VDE 0262:2004-01	Installationskabel mit Isolierungen aus vernetzten Polyethylen und Mantel aus thermoplastischem PVC mit Nennspannung 0,6 / 1 kV.	
Electrical engineering	DIN VDE 0276-603:2010-03 VDE 0276-603 HD 603:2007	Starkstromkabel – Teil 603: Energiekabel mit Nennspannung 0,6 / 1 kV.	
Electrical engineering	DIN VDE 0276-604:2008-02 VDE 0276-604 HD 604:2005	Starkstromkabel – Teil 603: Energiekabel mit Nennspannung 0,6 / 1 kV mit verbessertem Verhalten im Brandfall für Kraftwerke.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Test methodes			
Electrical engineering	IEC 60332-1-1 (2004-07) Ed. 1.0 IEC 60332-1-2 (2004-07) Ed. 1.0 IEC 60332-1-3 (2004-07) Ed. 1.0 DIN EN 60332 -1-1:2005-06 DIN EN 60332 -1-2:2005-06 DIN EN 60332 -1-3:2005-06 VDE 0482-332 -1-1 VDE 0482-332 -1-2 VDE 0482-332 -1-3	Tests on electric and optical fiber cables under fire conditions – 1-1 Test for vertical flame propagation for a single insulated wire or cable – Apparatus – 1-2 Procedure for 1 kW pre-mixed flame – 1-3 Procedure for determination of flaming droplets/particles. Prüfungen an Kabeln, isolierten Leitungen und Glasfaserkabeln im Brandfall.	
Electrical engineering	VDE 0432 - 1:2011-10	Hochspannungs-Prüftechnik Allgemeine Festlegungen zu Prüfbedingungen.	
Electrical engineering	VDE 0432 - 2:2011-10	Hochspannungs-Prüftechnik Messsysteme.	
Electrical engineering	VDE 0472 - 401 DIN 57472-401:1984-06	Prüfung an Kabel und isolierten Leitungen Außenmaße.	
Electrical engineering	VDE 0472 - 402 DIN 57472-402:1984-06	Prüfung an Kabel und isolierten Leitungen. Wanddicke sowie Dicke von Bewehrungsdrähten und –bändern.	
Electrical engineering	VDE 0472 -1 DIN VDE 0472 -1:1987-06	Prüfung an Kabel und isolierten Leitungen ; Allgemeines.	
Electrical engineering	VDE 0472 – 505:1983-04 DIN 57472-505	Prüfung an Kabel und isolierten Leitungen. Verlustfaktor, dielektrische Verlustzahl und Ableitung.	
Electrical engineering	VDE 0472 - 509 DIN VDE 0472-509:1986-10	Prüfung an Kabel und isolierten Leitungen. Spannungsfestigkeit bei Kabeln und Leitungen, isolierten Schaltdrähten und Schnüren für Fernmeldeanlagen.	
Electrical engineering	VDE 0472 - 512 DIN VDE 0472-512:1985-05	Prüfung an Kabel und isolierten Leitungen. Widerstand zwischen Schutzleiter und Leitschicht.	
Electrical engineering	VDE 0472 – 604:1985-05 DIN VDE 0472-604	Prüfung an Kabel und isolierten Leitungen Dichtheit von Kabelmänteln.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0472 - 605 DIN VDE 0472-605:1985-01	Prüfung an Kabel und isolierten Leitungen Abrieb.	
Electrical engineering	DE 0472 - 613 DIN VDE 0472-613:1986-03	Prüfung an Kabel und isolierten Leitungen Weiterreißwiderstand.	
Electrical engineering	VDE 0472 - 626 DIN 57472-626:1983-01	Prüfung an Kabel und isolierten Leitungen Reißlänge.	
Electrical engineering	DIN EN 50497:2008-11 VDE 0473-497 EN 50497:2007	Empfohlenes Prüfverfahren zur Einschätzung des Risikos von Weichmacher-ausschwitzungen bei PVC-isolierten und –ummantelten Kabeln und Leitungen.	
Electrical engineering	VDE 0473-811-100 DIN EN 60811 – 100:2012-12 EN 60811 – 100:2008 IEC 60811 – 100 (2008-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 100: General.	
Electrical engineering	VDE 0473-811-201 DIN EN 60811 – 201:2012-12 EN 60811 - 201 IEC 60811 – 201 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness.	
Electrical engineering	VDE 0473-811-202 DIN EN 60811 – 202:2012-12 EN 60811 - 202 IEC 60811 – 202 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath.	
Electrical engineering	VDE 0473-811-203 DIN EN 60811 – 203:2012-12 EN 60811 - 203 IEC 60811 – 203 (2012-03) Ed. 1.0	Messung der Außenmaße.	
Electrical engineering	VDE 0473-811-301 DIN EN 60811 - 301:2012-12 EN 60811 - 301 IEC 60811 – 301 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 301: Electrical tests – Measurement of the permittivity at 23 °C of filling compounds	

ВЯРНО С
ОРИГИНАЛА

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-302 DIN EN 60811 - 302:2012-12 EN 60811 - 302 IEC 60811 – 302 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 302: Electrical tests – Measurement of the d.c. resistivity at 23 °C and 100 °C of filling.	
Electrical engineering	VDE 0473-811-401 DIN EN 60811 - 401:2012-12 EN 60811 - 401 IEC 60811 – 401 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven.	
Electrical engineering	VDE 0473-811-402 DIN EN 60811 - 402:2012-12 EN 60811 - 402 IEC 60811 – 402 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 402: Miscellaneous tests – Water absorption tests.	
Electrical engineering	VDE 0473-811-404 DIN EN 60811 - 404:2012-12 EN 60811 - 404 IEC 60811 – 404 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 404: Miscellaneous tests – Mineral oil immersion tests for sheaths.	
Electrical engineering	VDE 0473-811-405 DIN EN 60811 - 405:2012-12 EN 60811 - 405 IEC 60811 – 405 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 405: Miscellaneous tests – Thermal stability test for PVC insulations and PVC sheaths.	
Electrical engineering	VDE 0473-811-406 DIN EN 60811 - 406:2012-12 EN 60811 - 406 IEC 60811 – 406 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 406: Miscellaneous tests – Resistance to stress cracking of polyethylene and polypropylene compounds.	
Electrical engineering	VDE 0473-811-407 DIN EN 60811 - 407:2012-12 EN 60811 - 407 IEC 60811 – 407 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 407: Miscellaneous tests – Measurement of mass increase of polyethylene and polypropylene compounds.	

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ОРИГИНАЛА

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-408 DIN EN 60811 - 408:2012-12 EN 60811 - 408 IEC 60811 – 408 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 408: Miscellaneous tests – Long-term stability test of polyethylene and polypropylene compounds.	
Electrical engineering	VDE 0473-811-409 DIN EN 60811 - 409:2012-12 EN 60811 - 409 IEC 60811 – 409 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 409: Miscellaneous tests – Loss of mass test for thermoplastic insulations and sheaths.	
Electrical engineering	VDE 0473-811-501 DIN EN 60811 - 501:2012-12 EN 60811 - 501 IEC 60811 – 501 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds.	
Electrical engineering	VDE 0473-811-502 DIN EN 60811 - 502:2012-12 EN 60811 - 502 IEC 60811 – 502 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 502: Mechanical tests – Shrinkage test for insulations.	
Electrical engineering	VDE 0473-811-503 DIN EN 60811 - 503:2012-12 EN 60811 - 503 IEC 60811 – 503 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 503: Mechanical tests – Shrinkage test for sheaths.	
Electrical engineering	VDE 0473-811-504 DIN EN 60811 - 504:2012-12 EN 60811 - 504 IEC 60811 – 504 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 504: Mechanical tests – Bending tests at low temperature for insulation and sheaths.	
Electrical engineering	VDE 0473-811-505 DIN EN 60811 - 505:2012-12 EN 60811 - 505 IEC 60811 – 505 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 505: Mechanical tests – Elongation at low temperature for insulations and sheaths.	

ВЯРНО С ОРИГИНАЛА

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-506 DIN EN 60811 - 506:2012-12 EN 60811 - 506 IEC 60811 – 506 (2012-03) Ed. 1.0	Schlagprüfung bei niedrigen Temperaturen für Isolierhüllen und Mäntel. Electric and optical fibre cables – Test methods for non-metallic materials – Part 506: Mechanical tests – Impact test at low temperature for insulations and sheaths.	
Electrical engineering	VDE 0473-811-507 DIN EN 60811 - 507:2012-12 EN 60811 - 507 IEC 60811 – 507 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 507: Mechanical tests – Hot set test for cross-linked materials.	
Electrical engineering	VDE 0473-811-508 DIN EN 60811 - 508:2012-12 EN 60811 - 508 IEC 60811 – 508 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 508: Mechanical tests – Pressure test at high temperature for insulation and sheaths.	
Electrical engineering	VDE 0473-811-509 DIN EN 60811 - 509:2012-12 EN 60811 - 509 IEC 60811 – 509 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 509: Mechanical tests – Test for resistance of insulations and sheaths to cracking (heat shock test).	
Electrical engineering	VDE 0473-811-512 DIN EN 60811 - 512:2012-12 EN 60811 - 512 IEC 60811 – 512 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 512: Mechanical tests – Methods specific to polyethylene and polypropylene compounds – Tensile strength and elongation at break after conditioning at elevated temperature.	
Electrical engineering	VDE 0473-811-513 DIN EN 60811 - 513:2012-12 EN 60811 - 513 IEC 60811 – 513 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 513: Mechanical tests – Methods specific to polyethylene and polypropylene compounds – Wrapping test after conditioning.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-605 DIN EN 60811 - 605:2012-12 EN 60811 - 605 IEC 60811 – 605 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 605: Physical tests – Measurement of carbon black and/or mineral filler in polyethylene compounds.	
Electrical engineering	VDE 0473-811-606 DIN EN 60811 - 606:2012-12 EN 60811 - 606 IEC 60811 – 606 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 606: Physical tests – Methods for determining the density.	
Accessories for power cables with rated voltages up to 30 kV			
Electrical engineering	DIN EN 61442:2006-01 VDE 0278-442 EN 61442:2005 IEC 61442 (2005-03) Ed. 2.0	Test methods for accessories for power cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV).	
Electrical engineering	VDE 0278 - 629-1 DIN VDE 0278-629-1:2009-07 HD 629.1:2008	Prüfanforderungen für Kabelgarnituren für extrudierte Kunststoffkabel mit einer Nennspannung von 3,6 / 6 (7,2) kV bis 20,8 / 36 (42) kV, – Teil 1: Kabel mit extrudierter Kunststoffisolierung.	
Electrical engineering	VDE 0278 - 629-2 DIN VDE 0278-629-2:2009-07 HD 629.2:2008	Prüfanforderungen für Kabelgarnituren für extrudierte Kunststoffkabel mit einer Nennspannung von 3,6 / 6 (7,2) kV bis 20,8 / 36 (42) kV, – Teil 2: Kabel mit massegetränkter Papierisolierung.	
Electrical engineering	VDE 0279 DIN 57279:1982-10	Leitungs-Garnituren des Bergbaus unter Tage Muffen (U_0/U) = 0,6 / 1 kV.	
Electrical engineering	DIN EN 61238-1:2004-03 VDE 0220-100 IEC 61238-1 (2003-05) Ed. 2.0	Compression and mechanical connectors for power cables for rated voltages up to 30 kV (Um = 36 kV) – Part 1: Test methods and requirements.	
Electrical engineering	DIN V 47640	Verbindungsmuffen aus wärmeschrumpfendem Kunststoffschlauch für Kunststoffisolierte Starkstromkabel mit Nennspannung 0,6 / 1 (1,2) kV.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Power cables and Accessories for power cables with rated voltages up to 400 kV (Um ≤ 420 kV)			
Electrical engineering	DIN VDE 0276–632:1999-05 HD 632 S1:1996	Kabel mit Isolierung aus vernetztem Polyethylen und ihre Garnituren für Nennspannung von 30 bis 150 kV.	
Electrical engineering	DIN VDE 0276–633:1999-05 HD 633 S1:1997	Niederdruck Ölkabel und ihre Garnituren für Nennspannungen bis 220 kV.	
Electrical engineering	DIN VDE 0276 – 634:1999-05 HD 634 S1:1997	Gasinnendruckkabel und ihre Garnituren für Nennspannungen bis 220 kV.	
Electrical engineering	DIN VDE 0276 – 635:1999-05 HD 635 S1:1997	Gasaußendruckkabel und ihre Garnituren für Nennspannungen bis 220 kV.	
Electrical engineering	VDE 0265 DIN VDE 0265:1995-12	Kabel mit Kunststoffisolierung und Bleimantel für Starkstromanlagen.	
Electrical engineering	VDE 0266 DIN VDE 0266:2006-03	Starkstromkabel mit verbessertem Verhalten im Brandfall.	
Electrical engineering	VDE 0271 DIN VDE 0271:2008-02	Kabel; Starkstromkabel mit Isolierung und Mantel aus thermoplastischem PVC und Nennspannungen bis Uo/U (Um): 3,6 / 6 (7,2) kV.	
Electrical engineering	VDE 0276 - 605 DIN VDE 0276-605:2008-02	Starkstromkabel Ergänzende Prüfverfahren.	
Electrical engineering	VDE 0276 - 620 DIN VDE 0276-620:2010-11	Energieverteilungskabel mit extrudierter Isolierung für Nennspannungen Uo/U: 3,6 / 6 kV bis 20,8 / 36 kV.	
Electrical engineering	VDE 0276 - 621 DIN VDE 0276-621:1997-05	Energieverteilungskabel mit getränkter Papierisolierung für Mittelspannung.	
Electrical engineering	VDE 0276 - 622 DIN VDE 0276-622:2006-05	Starkstromkabel mit Nennspannungen von3,6 / 6 (7,2) kV bis 20,8 / 36 (42) kV mit verbessertem Verhalten im Brandfall für Kraftwerke.	
Electrical engineering	VDE 0276 - 626 DIN VDE 0276-626:1997-01	Isolierte Freileitungsseile für oberirdische Verteilungsnetze mit Nennspannung Uo/U (Um): 0,6 / 1 (1,2) kV.	
Electrical engineering	VDE 0276 - 627 DIN VDE 0276-627:2006-09	Vieladrige und vielpaarige Kabel für die Verlegung in Luft und in Erde.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0279 DIN 50279:1982-10	Leitungsgarnituren des Bergbaus unter Tage, Muffen 1 kV.	
Electrical engineering	VDE 0278-393 DIN EN 50393:2006-11 EN 50393:2006	Prüfverfahren und Prüfanforderungen für die Garnituren von Verteilerkabeln mit Nennspannung von 0,6 / 1,0 (1,2) kV.	
Electrical engineering	IEC 60141-1 (1998-08) Ed. 3.0	Tests on oil-filled and gas-pressure cables and their accessories – Part 1: Oil-filled, paper-insulated, metal-sheathed cables and accessories for alternating voltages up to and including 400 kV.	
Electrical engineering	IEC 60141-2 (1967-01) Ed. 1.0	Tests on oil-filled and gas-pressure cables and their accessories. – Part 2: Internal gas-pressure cables and accessories for alternating voltages up to 275 kV.	
Electrical engineering	IEC 60141-3 (1967-01) Ed. 1.0	Tests on oil-filled and gas-pressure cables and their accessories. – Part 3: External gas-pressure (gas compression) cables and accessories for alternating voltages up to 275 kV.	
Electrical engineering	IEC 60141-4 (1990-10) Ed. 1.0	Tests on oil-filled and gas-pressure cables and their accessories. – Part 4: Oil-impregnated paper-insulated high pressure oil-filled pipe-type cables and accessories for alternating voltages up to and including 400 kV.	
Electrical engineering	IEC 60840 (2011-11) Ed. 4.0	Tests for power cables with extruded insulation for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV).	
Electrical engineering	IEC 60055-1 (2005-05) Ed. 5.1	Paper-insulated metal-sheathed cables for rated voltages up to 18 / 30 kV (with copper or aluminum conductors and excluding gas-pressure and oil-filled cables) – Part 1: Tests on cables and their accessories.	

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ОРИГИНАЛА

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60055-2 (2005-02) Ed. 1.0	Paper-insulated metal-sheathed cables for rated voltages up to 18 / 30 kV (with copper or aluminium conductors and excludeing gaspressure and oil-filled cables). – Part 2: General and construction requirements.	
Electrical engineering	EC 60502-1 (2009-09) Ed. 2.0	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 1: Cables for rated voltages of 1 kV (Um = 1,2 kV) and 3 kV (Um = 3,6 kV).	
Electrical engineering	IEC 60502-2 (2014-02) Ed. 2.0	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 2: Cables for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV.	
Electrical engineering	IEC 60502-4 (2010-12) Ed. 3.0	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 4: Test requirements on accessories for cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV).	
Electrical engineering	VDE 0276-2067 DIN IEC 62067:2013-08 IEC 62067 (2011-11) Ed. 2.0	Starkstromkabel mit extrudierter Isolierung und ihre Garnituren für Nennspannungen über 150 kV (Um = 170 kV) bis einschließlich 500 kV (Um = 550 kV) – Prüfverfahren und Anforderungen. Power cables with extruded insulation and their accessories for rated voltage above 150 kV (Um = 170 kV) up to 500 kV (Um = 550 kV) – Test methods and requirements.	
Electrical engineering	IEC 60227-2 (2003-04) Ed. 2.1	Electrical test methods for electric cables. – Part 1: Electrical tests for cables, cords and wires for voltages up to and including 450 V / 750 V.	
Electrical engineering	VDE 0481 - 885-2 DIN EN 60885-2 IEC 60885-2 (1987-03) Ed. 1.0	Prüfung an Kabeln und isolierten Leitungen; Teilentladung. Electrical test methods for electric cables. – Part 2: Partial discharge tests.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0481 - 885-3 DIN EN 60885-3 IEC 60885-3 (2015-04) Ed. 2.0	Prüfung an Kabeln und isolierten Leitungen; Teilentladung an extrudierten Kabellängen. Electrical test methods for electric cables. – Part 3: Test methods for partial discharge measurements on lengths of extruded power cables.	
Electrical engineering	VDE 0473-229 DIN EN 60229:2009-04 EN 60229:2008 IEC 60229 (2007-10) Ed. 3.0	Tests on cable oversheaths which have a special protective function and are applied by extrusion.	
Electrical engineering	VDE 0481-395 DIN EN 50395:2006-07 EN 50395:2005	Elektrische Prüfung für Niederspannungskabel und -leitungen.	
Electrical engineering	VDE 0473-396 DIN EN 50396:2006-07 EN 50396:2005	Nicht-elektrische Prüfverfahren für Niederspannungskabel und -leitungen.	
Electrical engineering	VDE 0481 - 230 DIN EN 60230:2003-03 EN 60230:2002 IEC 60230 (1966-01) Ed. 1.0	Impulse tests on cables and their accessories.	
Electrical engineering	IEEE 48:2009	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV.	
Electrical engineering	IEEE 404:2012	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500.000 V.	
Electrical engineering	IEEE 386:2006	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.	

ВЯРНО С ОРИГИНАЛА

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEEE 592:2007	IEEE Standard for Exposed Semiconducting Shields on High-Voltage Cable Joints and Separable Connectors.	

ВЯРНО С
ОРИГИНАЛА

Technical responsibility for the test reports:

Approval:

Herr Dipl.-Wirt.-Ing. Rainer Schiller
Herr Dipl.-Ing. Hannes Zinnbauer
Herr Dipl.-Ing. Detlef Jegust

Technical verification:

Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Ing. Klaus Vaterrodt
Herr Dipl.-Ing. Jürgen Wittwer
Herr Dipl.-Ing. Detlef Jegust
Herr Dipl.-Ing. Uwe Fischer
Herr Dipl.-Ing. Michael Scheide
Herr Dipl.-Ing. Matthias Schröder-Heske
Herr Dipl.-Ing. Carlos Pereira
Herr Dipl.-Ing. Martin Brüggemann
Herr Ronny Baumgart

ВЯРНО С
ОРИГИНАЛА

Приложение 5.5

ДЕКЛАРАЦИЯ

че предложеното оборудване в процедурата отговаря на минималните технически изисквания на Възложителя

Аз, долуподписаният Стоил Колев Стоилов, в качеството ми на представляващ „Старт-Инженеринг“ АД, участник в открита процедура за възлагане на обществена поръчка с реф. № PPD18-103 и предмет: “Модернизация (ретрофит) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика“,

ДЕКЛАРИРАМ ЧЕ:

1. Предложеното от нас оборудване в процедурата за позиция „Токов измервателен трансформатор 12 kV, 400/5/5 A за монтиране на закрито“ отговаря на минималните технически изисквания на Възложителя, посочени в таблица 5.

2. Доставяните от нас материали, апаратура, оборудване и съоръжения отговарят на посочените от възложителя в документацията за участие стандарти за изпълнение на поръчката.

3. Предложените от нас материали, апаратура, оборудване и съоръжения са с технически характеристики и показатели, които съответстват на техническите характеристики и показатели, посочени от възложителя за изпълнение на поръчката в документацията за участие.

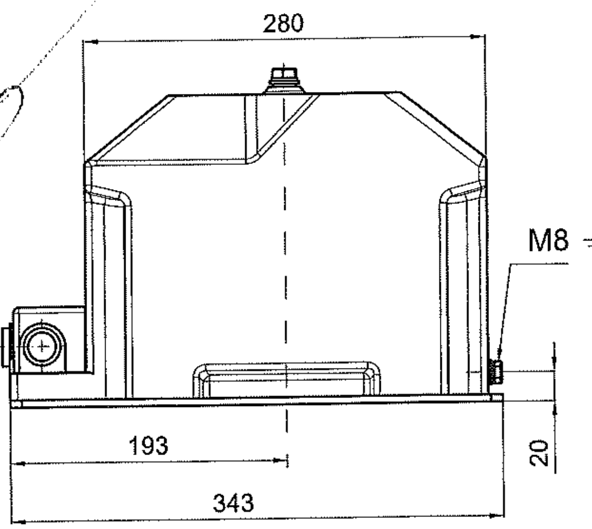
Информиран съм, че Възложителят (включително чрез неговия помощен орган, а именно назначената за провеждане на поръчката оценителна комисия) ще обработва и съхранява личните ми данни, посочени в настоящата декларация, за целите на провеждане на обществената поръчка, като за целта ще предприеме всички необходими според действащата нормативна уредба мерки за защита на личните ми данни.

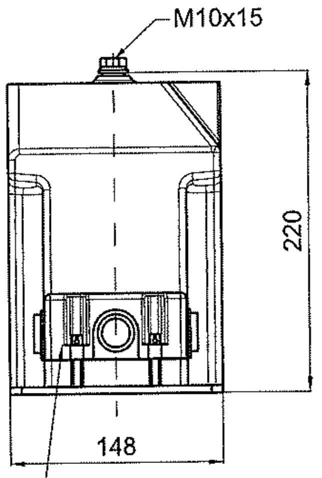
Дата 17.12.2018 г.

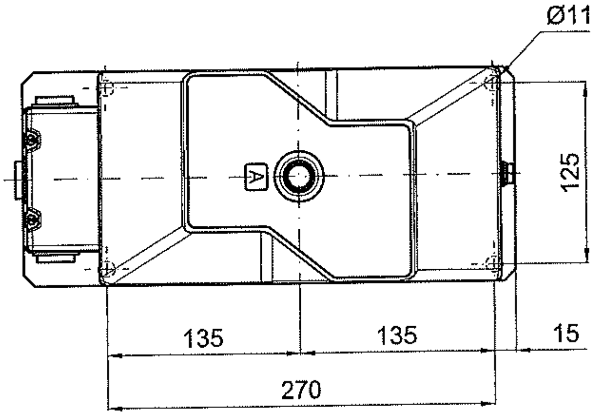
ПОДПИС и ПЕЧАТ: На основание чл.36а ал.3 от ЗОП

Председател на Съвета на директорите
на „Старт-Инженеринг“ АД

SIEMENS Technical Specification No :2-A359-305

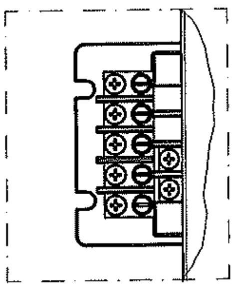






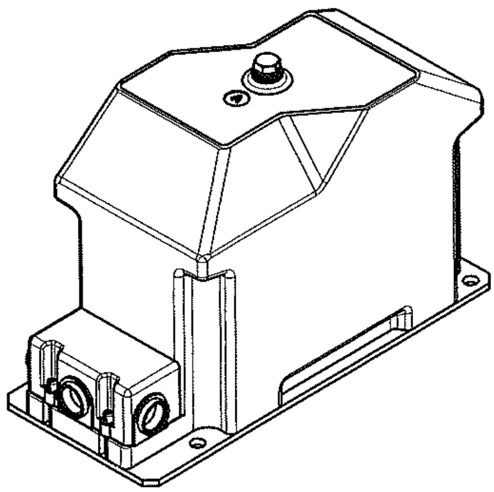
SECONDARY
TERMINAL , M5
max. 7 TERMINAL

DEGISIKLIK
TEKNIK BÜRO
Tarih 23/06/2011



SECONDARY TERMINAL'S DETAIL

SCREW	TORQUE Nm
M5	4
M8	16-20
M10	30-40



QTY	DESCRIPTION	POS	DIMENSIONS	WEIGHT	PART OR DIN NO.	MATERIAL

NO	DATE	NAME	MODIFICATION
G	05-01-09	ARZU	Base plate dimension changed.
H	10-07-09	NİL	Secondary terminals changed.
I	10-07-09	NİL	Second plate code canceled.
J	09-11-10	AYŞE	Procedure no changed
K	10-02-11	AYŞE	Secondary terminals changed.

TOLERANCES DIN 7168 g

SCALE 1:5

4MR12
BLOCK TYPE VOLTAGE TRANSFORMER
SIEMENS

REPLACES THE DRAWING NO.

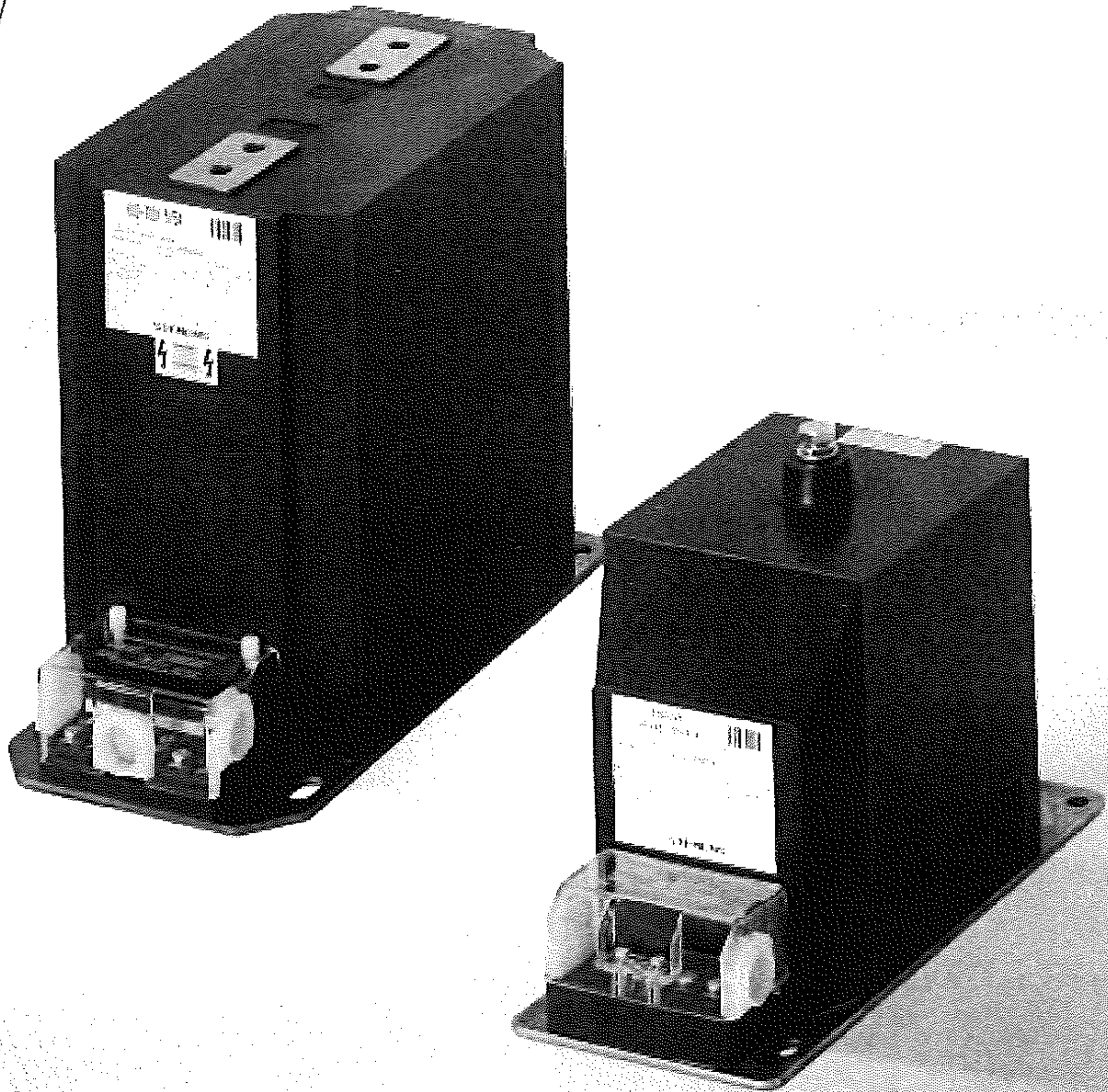
PLATE CODE: M PLK TRF ST 50

417 REV. K

DR'N
CH'D
APP'D
INFORMATION

ALCE ÖLÇÜ TRAFO

C.C MT



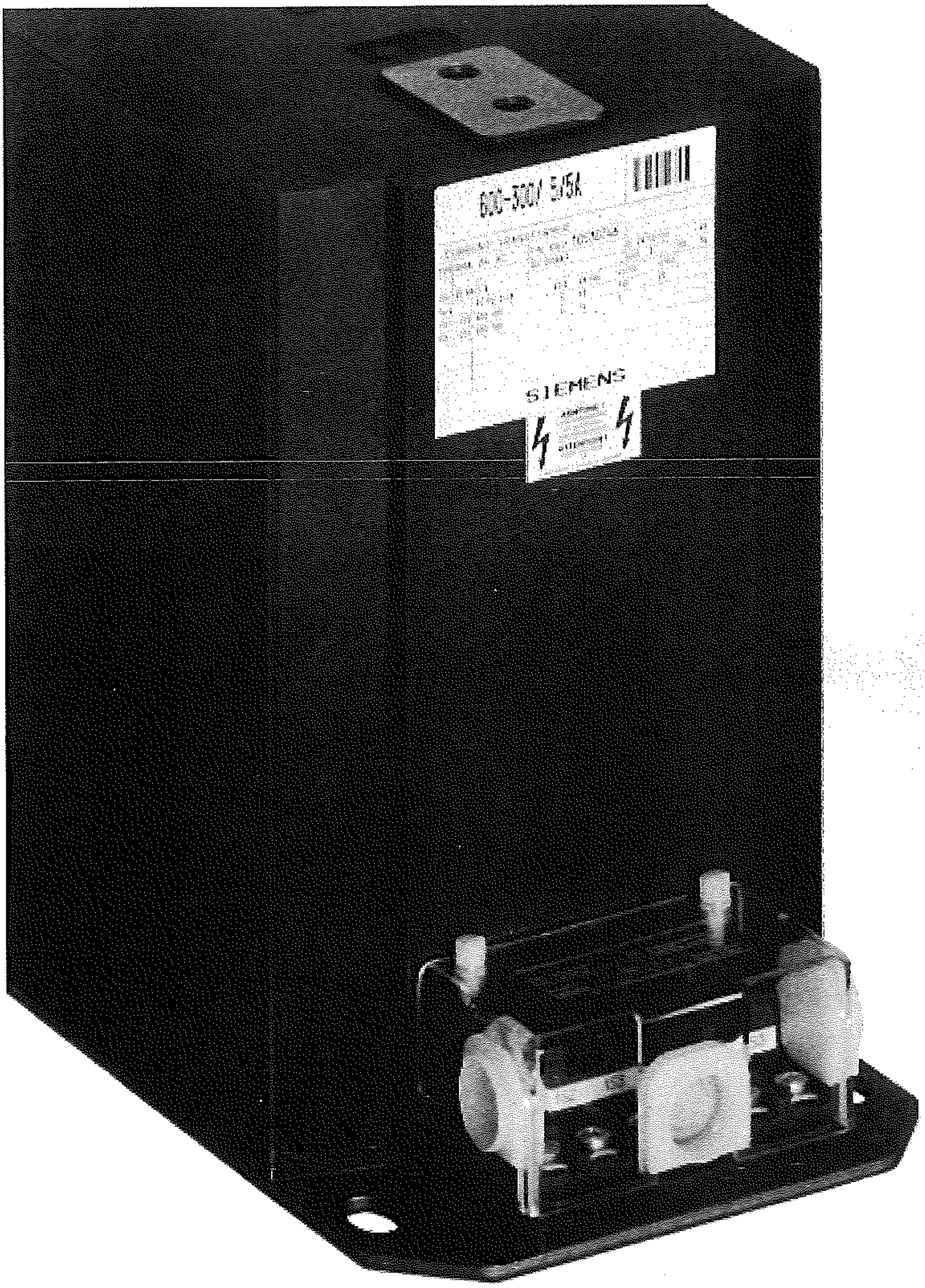
4M Protective and Measuring Transformers

Medium-Voltage Equipment
Selection and Ordering Data

Catalog HG 24 · 2009

Answers for energy.

SIEMENS



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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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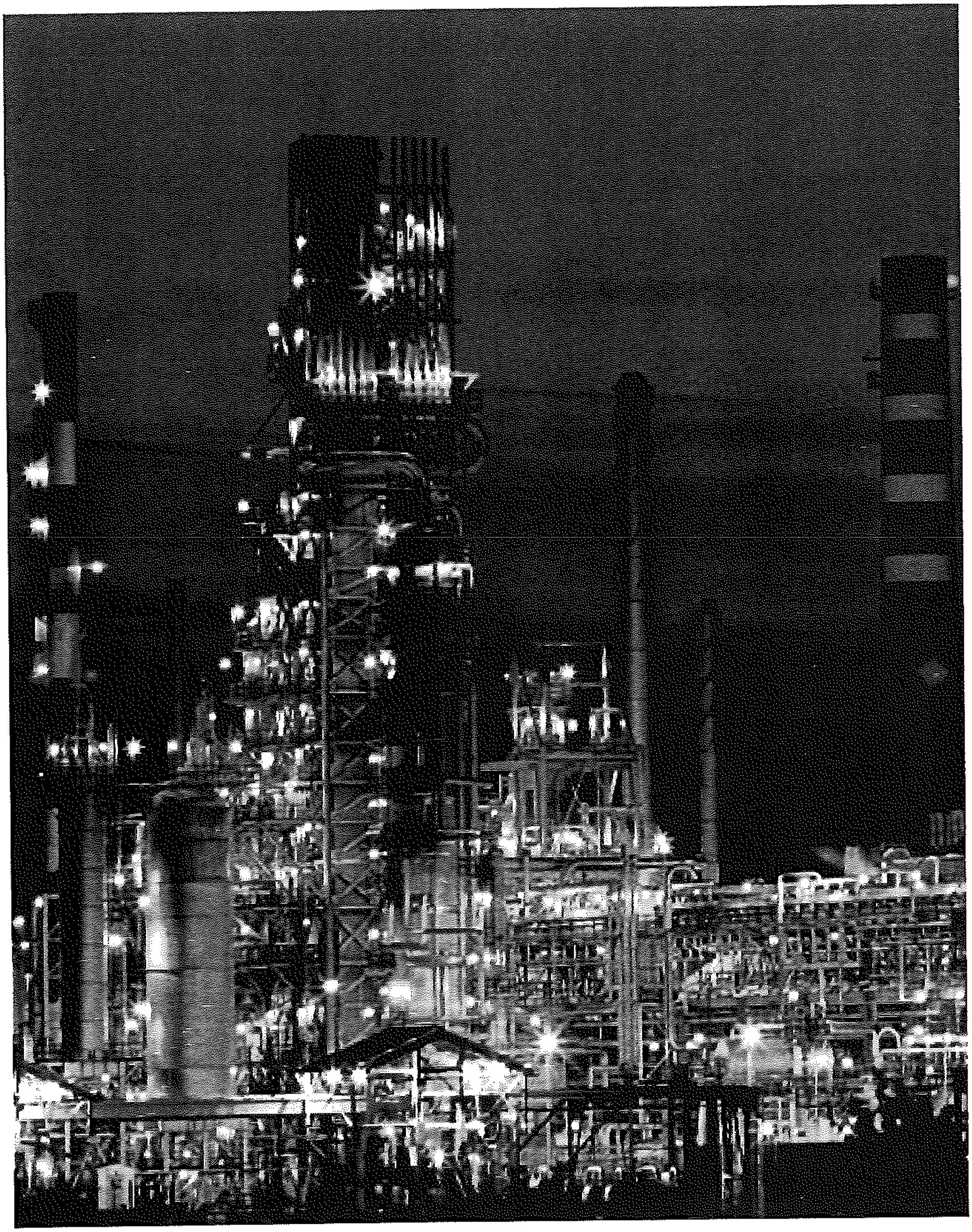
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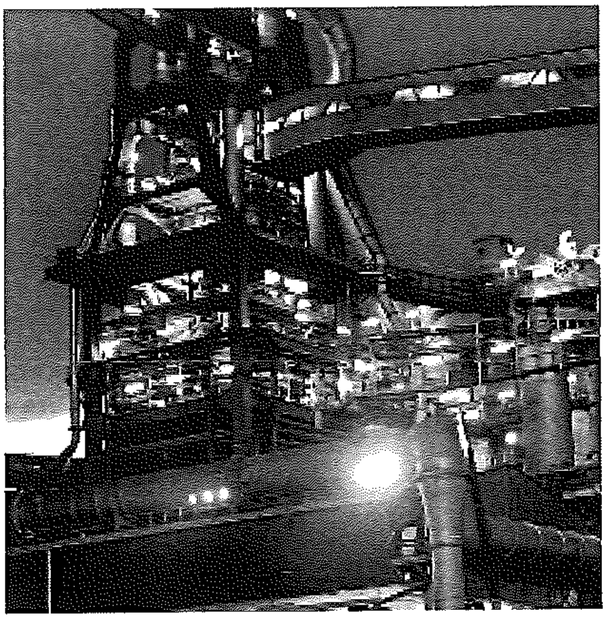

Industrial application: Refinery

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Protective and Measuring Transformers – The Adaptable

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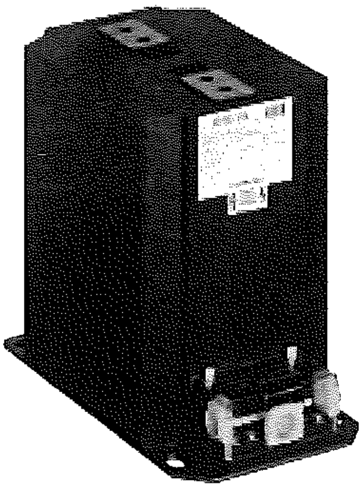
The task of instrument transformers is to transform high currents and voltages proportionally and in-phase into small current or voltage values for measuring or protection purposes. So they are used either to measure and record the transmitted power or to feed protection devices with evaluable signals,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



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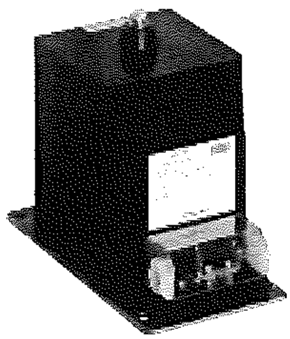
Current transformers can be regarded as transformers working in short-circuit, with the full normal current flowing through their primary side. Devices connected on the secondary side are series-connected. Current transformers can have several secondary windings with magnetically separated cores of the 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 transformer



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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 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 in operation.

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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:

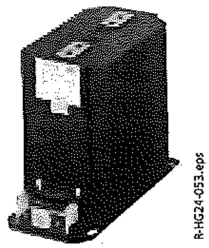
Current transformers

- 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

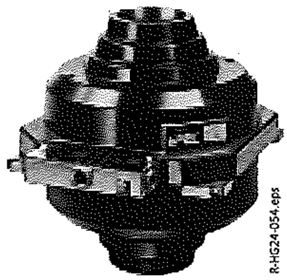
Voltage transformers

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

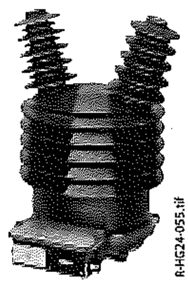
The transformers offered in the selection are only a part of the possible variations. If the transformer required is not shown, please clarify the feasibility with the responsible sales partner or the order processing department in the Switchgear Factory Berlin. The same applies to transformers according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



Example for transformer in block-type design



Example for bushing-type transformer



Example for outdoor transformer

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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.

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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 I_N (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 (I_{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.

I_D is often equal to I_N, but it can also be defined as a multiple thereof.

Rated short-time thermal current I_{th}

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 I_{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_i

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

$$F_i = 100 \cdot \frac{K_N \cdot I_{sec} - I_{prim}}{I_{prim}}$$

K_N Rated transformation ratio
I_{prim} Actual primary current
I_{sec} Actual secondary current

Phase displacement d_i

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

Accuracy class	± current error in percent at rated current I_n				± phase displacement in minutes at rated current I_n			
	120 %	100 %	20 %	5 %	120 %	100 %	20 %	5 %
Measuring current transformers								
0.2	0.2	0.2	0.35	0.75	10	10	15	30
0.5	0.5	0.5	0.75	1.5	30	30	45	80
1	1	1	1.5	3	60	60	90	100
Protective current transformers								
5P	–	1	–	–	–	60	–	–
10P	–	3	–	–	–	–	–	–

Measuring current transformers

Current transformers 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_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_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 multi-ratio 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 connection area. Ratings, instrument security factors as well as the secondary internal resistance remain constant during reconnection.

Secondary multi-ratio

In single-turn and wound-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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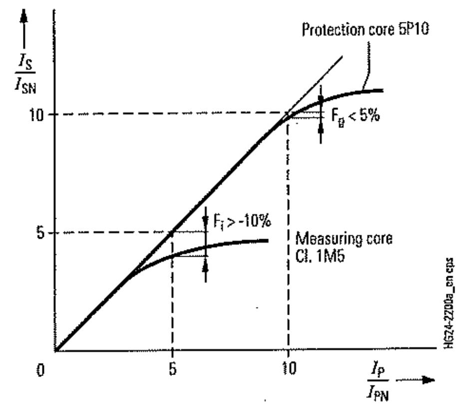


Overcurrent performance of current transformers when loaded with rated burden

F_i Current error
F_g Composite error

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.

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.

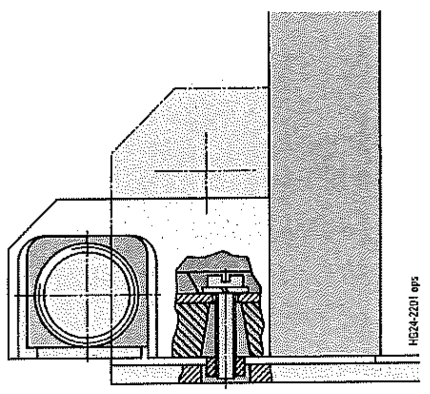
For measuring cores, the current error F_i is > −10 % in order to protect the supplied measuring devices, meters, etc. safely in case of overcurrent.

In protection cores, the composite error F_g 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:

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

n' Actual instrument security factor
n Rated instrument security factor
Z_N Rated burden in VA
S_E Internal power consumption of the transformer in VA (approx. 5 % to 20 % of Z_N)
S Actually connected burden in VA



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

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.

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Capacitively coupled voltage detecting system

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.

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.

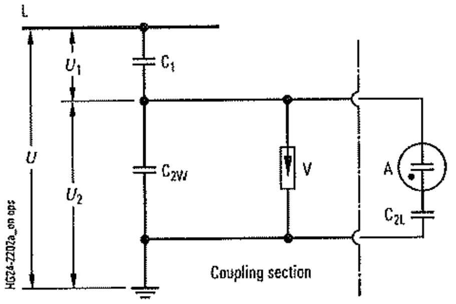
Indication range:
At 0.01 x U_N, no indication,
as of 0.40 x U_N, secure indication.

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_1 High-voltage capacitance (transformer)
C_{2W} Low-voltage capacitance (transformer)
C_{2L} Low-voltage capacitance (lead)
L High-voltage phase
U Voltage between phase and earth
U_1 Partial voltage at C_1
U_2 Partial voltage at C_2 and A
V Surge arrester

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Voltage transformers

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 U_m

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_{PN} or secondary U_{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 $U/\sqrt{3}$, with U being the phase-to-phase voltage.

U_m kV	Rated primary voltage kV	Rated secondary voltage V
up to 52	3.3 3.6 4.8 5 6 6.6 7.2 10 11 13.8 15 17.5 20 22 30 33 35 40 45	100 110 120
	or the values divided by $\sqrt{3}$	or the values divided by $\sqrt{3}$

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.
$10000/\sqrt{3}$ V / $100/\sqrt{3}$ V (single-phase)
10000 V/100 V (double-phase).

Voltage error F_U

The voltage error expressed in percent is defined by the formula:

$$F_U = 100 \cdot \frac{K_N \cdot U_{sec} - U_{prim}}{U_{prim}}$$

U_{prim} Actual primary voltage
U_{sec} 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.

Accuracy class	± voltage error %	± phase displacement Minutes
0.2	0.2	10
0.5	0.5	20
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 class	Rated output VA						
0.2	10	15	30	50	–	–	–
0.5	10	15	30	50	75	100	–
1	–	–	30	50	75	100	200

Thermal limiting output S_{th}

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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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.

Attention

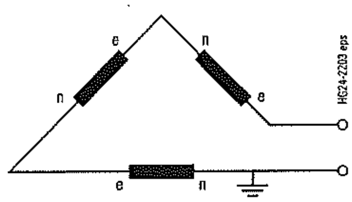
This connection must not be opened during operation.

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

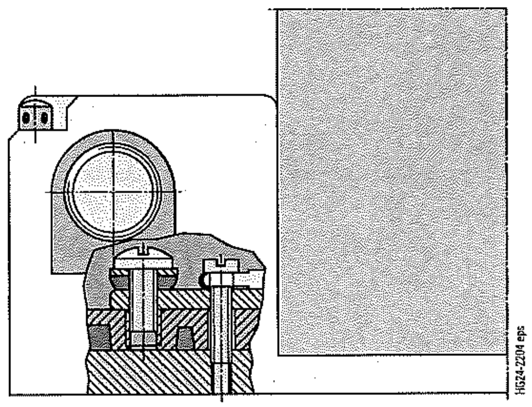
For earthing the secondary windings, a thread is provided under each secondary terminal. The earth connection required is established by fitting a special screw.

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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Description
Ambient conditions and dielectric strength

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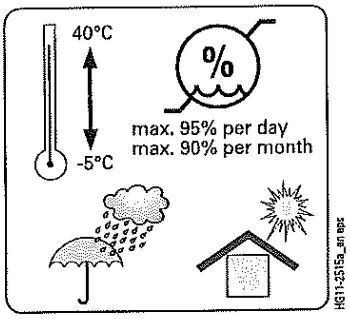

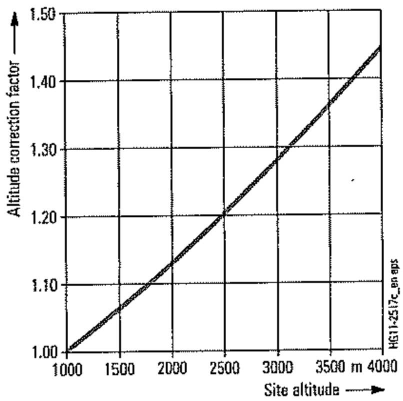

Highest voltage for equipment U_m kV	Rated short-duration power-frequency withstand voltage kV	Rated lightning impulse withstand voltage V
7.2	20	60
12	28	75
17.5	38	95
24	50	125
36	70	170
52	95	250

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

Outdoor transformers class 25	–25 °C
Outdoor transformers class 40	–40 °C

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:

$U \geq U_0 \times K_a$

U Rated withstand voltage under reference atmosphere
U_0 Rated withstand voltage requested for the place of installation
K_a Altitude correction factor according to the opposite diagram

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 °C.

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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.

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 $U_m = 3.6$ kV.

Type of earthing	Type of transformer	Pre-stressing voltage ≥ 10 s	Measuring voltage ≥ 1 min	Permissible partial discharge level Apparent load
Systems with isolated or impedance earthed neutral	Current transformers and earthed voltage transformers	$1.3\ U_m$	$1.1\ U_m$	250 pC
			$1.1 \frac{U_m}{\sqrt{3}}$	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	$0.8 \times 1.3\ U_m$	$1.1 \frac{U_m}{\sqrt{3}}$	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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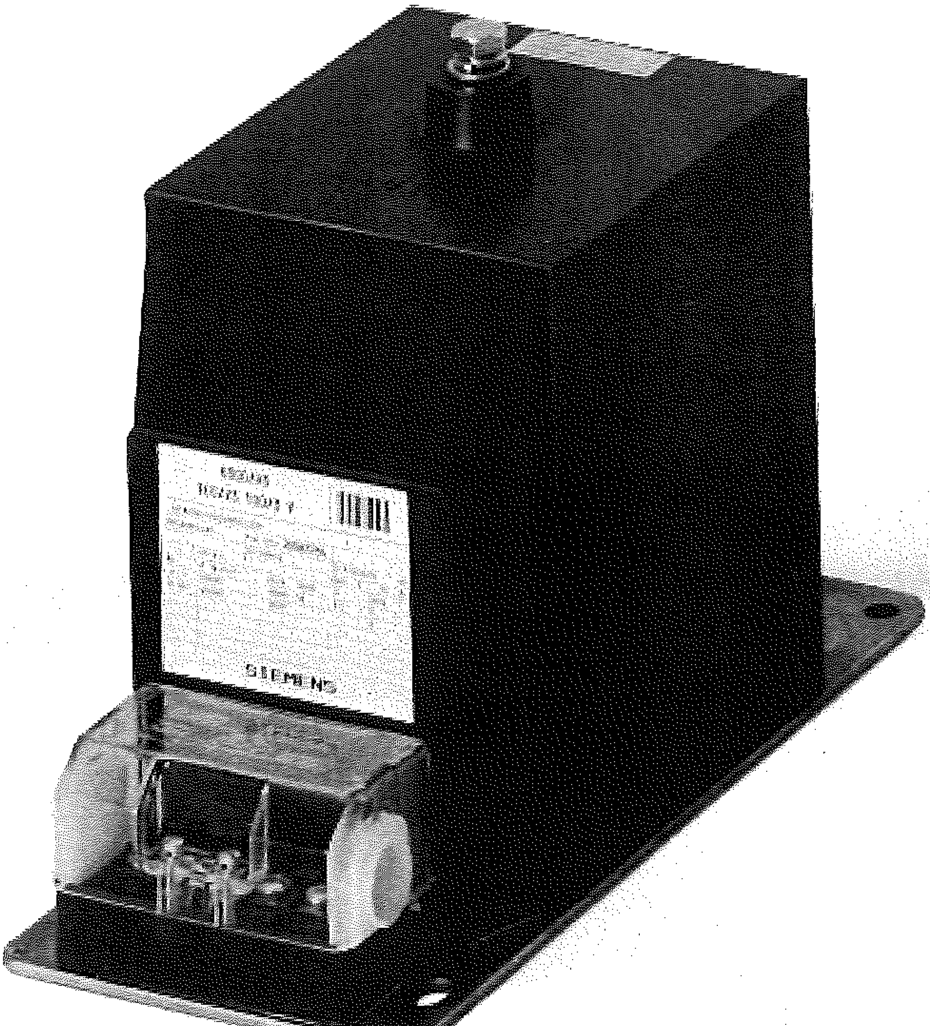

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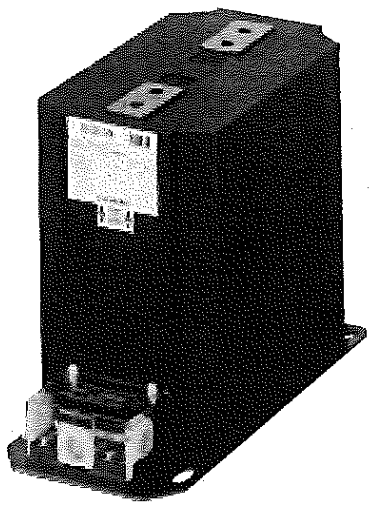

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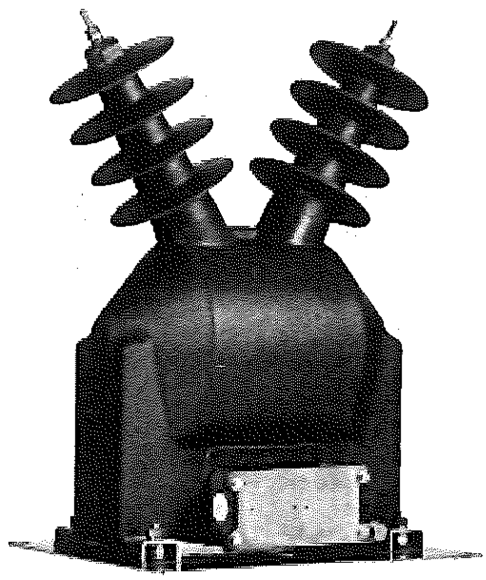
4MA74 current transformer



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4MS6 outdoor voltage transformer

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Equipment Selection

Ordering data and configuration example

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 9th to 16th 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.

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a: alphabetical n: numerical

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		Order codes		
Order No.:	4	M	a	n	n	n	n	–	n	a	a	n	n	–	n	a	a	n	– ★	■	■	■

	Primary part	
1st position	Superior group Transformers	
2nd position	Main group Current and voltage transformers for medium voltage	
3rd position	Subgroup Transformer type	
4th and 5th position	Basic equipment Design and operating voltage of the transformer	
	Core data	
6th to 16th position 6th to 12th position	Design and data of the current transformer Design and data of the voltage transformer	
	Special versions (★) Initiated with "-Z" Group of 3 after the Order No. Format: a n n	

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.

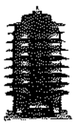
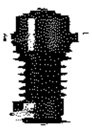
On the foldout page we offer a configuring aid. Here you can fill in the order number you have determined for your transformer.

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

186

Current transformer, 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
Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Illustration	Type of design	Order No.	
 R-HG24-056.eps	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**
 R-HG24-060.eps	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**
 R-HG24-061.eps	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**
 R-HG24-054.eps	Indoor bar-primary bushing-type current transformer, cast-resin insulated, operating voltage up to 12 kV, 24 kV or 36 kV	4 M C 3	Selection from page **47ff**
 R-HG24-062.eps	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**
 R-HG24-071.eps	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

2

Example for Order No.: 4 M A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■
Order codes:

817

Equipment Selection

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

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

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 | Order codes

Order No.: 4 M A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ | ■ ■ ■

Positions 8, 9: See page 21 · See page 21; Positions 10 to 14: See page 22 to page 39; Positions 15, 16: See page 40 · See page 40; Order code: See page 40

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.	Order codes
12	75	28	4 M A 7 2	
17.5	95	38	4 M A 7 2	– Z F 1 B
24	125	50	4 M A 7 4	
36	170	70	4 M A 7 6	

6th/7th position
Rated short-time thermal current

Rated short-time thermal current I_{th} kA	Remark	
8		3 3
12.5		4 0
16		4 4
20		4 8
25		5 4
31.5		5 7
40		6 3
50	Not for U_m = 36 kV	6 7
63	Not for U_m = 24 kV and U_m = 36 kV	7 1

Configuration example

Indoor support-type current transformer, block-type design	4 M A 7
Maximum operating voltage U_m = 12 kV Rated lightning impulse withstand voltage U_p = 75 kV Rated short-duration power-frequency withstand voltage U_d = 28 kV	2
Rated short-time thermal current I_{th} = 16 kA	4 4

Example for Order No.: 4 M A 7 2 4 4 – ■ ■ ■ ■ ■ – ■ ■ ■ ■

Order codes:

818

Equipment Selection

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

8th/9th position
Rated primary current

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Positions 10, 11, 12, 13, 14: See page 22 to page 39
Position 15: See page 40
Position 16: See page 40
Order codes: See page 40

Rated primary current I_{PN} A	Rated primary current, with primary multi-ratio I_{PN} A	Rated short-time thermal current I_{th}: 8 kA	12.5 kA	16 kA	20 kA	25 kA	31.5 kA	40 kA	50 kA	63 kA	8	9
20		■	■	■							0	E
25		■	■	■	■						0	F
30		■	■	■	■						0	G
40		■	■	■	■	■	■				0	H
50		■	■	■	■	■	■	■			0	J
60		■	■	■	■	■	■	■	■		0	K
75		■	■	■	■	■	■	■	■	■	0	L
100		■	■	■	■	■	■	■	■	■	0	M
125		■	■	■	■	■	■	■	■	■	0	N
150		■	■	■	■	■	■	■	■	■	0	P
200		■	■	■	■	■	■	■	■	■	0	Q
250		■	■	■	■	■	■	■	■	■	0	R
300		■	■	■	■	■	■	■	■	■	0	S
400		■	■	■	■	■	■	■	■	■	0	T
500		■	■	■	■	■	■	■	■	■	0	U
600		■	■	■	■	■	■	■	■	■	0	V
750		■	■	■	■	■	■	■	■	■	0	W
800				■							0	X
1000		■	■	■	■	■	■	■	■	■	1	A
1200		■	■	■	■	■	■	■	■	■	1	B
1250		■	■	■	■	■	■	■	■	■	1	C
1500		■	■	■	■	■	■	■	■	■	1	D
2000		■	■	■	■	■	■	■	■	■	1	F
2500		■	■	■	■	■	■	■	■	■	1	G
	2x 20	■	■	■							3	E
	2x 25	■	■	■	■						3	F
	2x 30	■	■	■	■						3	G
	2x 40	■	■	■	■	■	■				3	H
	2x 50	■	■	■	■	■	■	■	■		3	J
	2x 60	■	■	■	■	■	■	■	■		3	K
	2x 75	■	■	■	■	■	■	■	■	■	3	L
	2x 100	■	■	■	■	■	■	■	■	■	3	M
	2x 125	■	■	■	■	■	■	■	■	■	3	N
	2x 150	■	■	■	■	■	■	■	■	■	3	P
	2x 200	■	■	■	■	■	■	■	■	■	3	Q
	2x 250	■	■	■	■	■	■	■	■	■	3	R
	2x 300	■	■	■	■	■	■	■	■	■	3	S
	2x 400	■	■	■	■	■	■	■	■	■	3	T
	2x 500	■	■	■	■	■	■	■	■	■	3	U
	2x 600	■	■	■	■	■	■	■	■	■	3	V
■ Feasible (other combinations on request)		Page 22	Page 24	Page 26	Page 28	Page 30	Page 32	Page 34	Page 36	Page 38		

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, U_p = 75 kV, U_d = 28 kV, I_{th} = 16 kA)
Rated primary current I_{PN} = 100 A

4 M A 7
2 4 4 –
0 M

Example for Order No.: 4 M A 7 2 4 4 – 0 M ■ ■ ■ – ■ ■ ■ ■
Order codes:

2

B.19

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

8 kA

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M A 7 ■ 3 3 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■
(15: s. p. 40; 16: s. p. 40; ★: s. p. 40)

At rated primary current I_{PN}	Thermal strength	Position 12
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	100 x I_{PN}	0
60 A 75 A	150 x I_{PN}	1
40 A 50 A	200 x I_{PN}	2
30 A	300 x I_{PN}	3
20 A 25 A	400 x I_{PN}	4

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Order No. pos. 10–14
0.2	FS10	10								■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10								■	■	■	■	■	E 2 – 0 A
		15								■	■	■	■	■	E 3 – 0 A
		30								■	■	■	■	■	E 4 – 0 A
1	FS5	10								■	■	■	■	■	H 2 – 0 A
		15								■	■	■	■	■	H 3 – 0 A
		30								■	■	■	■	■	H 4 – 0 A
5P	10	5								■	■	■	■	■	L 1 – 0 A
		10								■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5								■	■	■	■	■	Q 1 – 0 A
		10								■	■	■	■	■	Q 2 – 0 A
		15								■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5					■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15								■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5					■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15								■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5					■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15							■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5					■	■	■	■	■	H 1 – 1 Q
		10			10					■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15							■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design — 4 M A 7
(U_m = 12 kV, I_{th} = 8 kA, I_{PN} = 100 A) — 2 3 3 – 0 M
Thermal strength 100 x I_{PN} — 0
1st core class 5P; instrument security factor 10; rating 30 VA
2nd core without — L 4 – 0 A

Example for Order No.: 4 M A 7 2 3 3 – 0 M L 4 0 – 0 A ■ ■
Order codes:

2

820

8 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ 3 3 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Pos. 12
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}	0
2x 60 A 2x 75 A	150 x I_{PN}	1
2x 40 A 2x 50 A	200 x I_{PN}	2
2x 30 A	300 x I_{PN}	3
2x 20 A 2x 25 A	400 x I_{PN}	4

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Order No. pos. 10 11 – 13 14
0.2	FS10	10								■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10								■	■	■	■	■	E 2 – 0 A
		15								■	■	■	■	■	E 3 – 0 A
		30								■	■	■	■	■	E 4 – 0 A
1	FS5	10								■	■	■	■	■	H 2 – 0 A
		15								■	■	■	■	■	H 3 – 0 A
		30								■	■	■	■	■	H 4 – 0 A
5P	10	5								■	■	■	■	■	L 1 – 0 A
		10								■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5								■	■	■	■	■	Q 1 – 0 A
		10								■	■	■	■	■	Q 2 – 0 A
		15								■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5					■	■	■	■	■	E 1 – 1 L
		10			10							■	■	■	E 2 – 2 L
		15			15							□	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5					■	■	■	■	■	E 1 – 1 Q
		10			10							■	■	■	E 2 – 2 Q
		15			15								■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5					■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15							■	■	■	H 3 – 3 L
		15			30							□	■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5					■	■	■	■	■	H 1 – 1 Q
		10			10					■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15							■	■	■	H 3 – 3 Q
		15			30							□	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request) □ Not for 2x 40 A

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 8 kA, I_{PN} = 2x 100 A)
Thermal strength 100 x I_{PN}
1st core class 1; instrument security factor FS5; rating 15 VA
2nd core class 10P; accuracy limit factor 10; rating 30 VA

4 M A 7
2 3 3 – 3 M
0
H 3 – 4 Q

Example for Order No.: 4 M A 7 2 3 3 – 3 M H 3 0 – 4 Q ■ ■
Order codes:

2

821

Equipment Selection

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

2

12.5 kA

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	4	0	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s.p. 40	s.p. 40		s.p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
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	100 x I_{PN}	0
100 A	150 x I_{PN}	1
75 A	200 x I_{PN}	2
50 A 60 A	300 x I_{PN}	3
40 A	400 x I_{PN}	4
25 A 30 A	500 x I_{PN}	5
20 A	800 x I_{PN}	7

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15							■	■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15					■		■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10				■	■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10				■	■	■	■	■	■	E 2 – 2 Q
		15			15						■	■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10				■	■	■	■	■	■	H 2 – 2 L
		10			15					■	■	■	■	■	H 2 – 3 L
		15			15					■	■	■	■	■	H 3 – 3 L
		15			30							■	■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15					■	■	■	■	■	H 2 – 3 Q
		15			15					■	■	■	■	■	H 3 – 3 Q
		15			30						■	■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 12.5 kA, I_{PN} = 100 A) — 4 M A 7
Thermal strength 150 x I_{PN} — 2 4 0 – 0 M / 1
1st core class 10P; instrument security factor 10; rating 5 VA
2nd core without — Q 1 – 0 A

Example for Order No.: 4 M A 7 2 4 0 – 0 M Q 1 1 – 0 A ■ ■
Order codes:

612

12.5 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M A 7 ■ 4 0 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■
s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
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}	0
2x 100 A	150 x I_{PN}	1
2x 75 A	200 x I_{PN}	2
2x 50 A 2x 60 A	300 x I_{PN}	3
2x 40 A	400 x I_{PN}	4
2x 25 A 2x 30 A	500 x I_{PN}	5
2x 20 A	800 x I_{PN}	7

1st core			2nd core			Thermal strength									Position 10–14
Class	Factor	VA rating	Class	Factor	VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	
0.2	FS10	10								■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15							■	■	■	■	■	■	E 3 – 0 A
		30								■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30										■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10						■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10						■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10				■	■	■	■	■	■	H 2 – 2 L
		10			15					■	■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30							■	■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15					■	■	■	■	■	H 2 – 3 Q
		15			15					■	■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 12.5 kA, I_{PN} = 2x 100 A) — 4 M A 7 / 2 4 0 – 3 M
Thermal strength 150 x I_{PN} — 1
1st core class 0.5; instrument security factor FS5; rating 15 VA
2nd core class 10P; accuracy limit factor 10; rating 15 VA — E 3 – 3 Q

Example for Order No.: 4 M A 7 2 4 0 – 3 M E 3 1 – 3 Q ■ ■
Order codes:

2

823

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

16 kA
10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	4	4	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s. p. 40	s. p. 40		s. p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
200 A 250 A 300 A 400 A 500 A 600 A 750 A 800 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
125 A 150 A	150 x I_{PN}	1
100 A	200 x I_{PN}	2
60 A 75 A	300 x I_{PN}	3
40 A 50 A	400 x I_{PN}	4
30 A	600 x I_{PN}	6
25 A	800 x I_{PN}	7
20 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	12	–	13	14
0.2	FS10	10								■	■	■	■	■	C	2		–	0	A
		15								■	■	■	■	■	C	3		–	0	A
0.5	FS5	10				■	■	■		■	■	■	■	■	E	2		–	0	A
		15					■	■		■	■	■	■	■	E	3		–	0	A
		30								■	■	■	■	■	E	4		–	0	A
1	FS5	10				■	■	■		■	■	■	■	■	H	2		–	0	A
		15				■	■	■		■	■	■	■	■	H	3		–	0	A
		30						■		■	■	■	■	■	H	4		–	0	A
5P	10	5				■	■	■		■	■	■	■	■	L	1		–	0	A
		10						■		■	■	■	■	■	L	2		–	0	A
		15								■	■	■	■	■	L	3		–	0	A
		30										■	■	■	L	4		–	0	A
10P	10	5				■	■	■		■	■	■	■	■	Q	1		–	0	A
		10				■	■	■		■	■	■	■	■	Q	2		–	0	A
		15						■		■	■	■	■	■	Q	3		–	0	A
		30									■	■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5		■	■		■	■	■	■	■	E	1		–	1	L
		10			10			■		■	■	■	■	■	E	2		–	2	L
		15			15							■	■	■	E	3		–	3	L
		30			30								■	■	E	4		–	4	L
0.5	FS5	5	10P	10	5		■	■		■	■	■	■	■	E	1		–	1	Q
		10			10					■	■	■	■	■	E	2		–	2	Q
		15			15						■	■	■	■	E	3		–	3	Q
		30			30							■	■	■	E	4		–	4	Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H	1		–	1	L
		10			10					■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15						■	■	■	■	H	3		–	3	L
		15			30							■	■	■	H	3		–	4	L
		30			30							■	■	■	H	4		–	4	L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H	1		–	1	Q
		10			10					■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15						■	■	■	■	H	3		–	3	Q
		15			30							■	■	■	H	3		–	4	Q
		30			30							■	■	■	H	4		–	4	Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 16 kA, I_{PN} = 100 A)
Thermal strength 200 x I_{PN}
1st core class 0.5; instrument security factor FS5; rating 10 VA
2nd core class 5P; accuracy limit factor 10; rating 10 VA

4 M A 7
2 4 4 – 0 M
2
E 2 – 2 L

Example for Order No.: 4 M A 7 2 4 4 – 0 M E 2 2 – 2 L ■ ■
Order codes:

824

16 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ 4 4 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – + ■ ■ ■

s. p. 40 | s. p. 40 | s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
2x 200 A 2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}	0
2x 125 A 2x 150 A	150 x I_{PN}	1
2x 100 A	200 x I_{PN}	2
2x 60 A 2x 75 A	300 x I_{PN}	3
2x 40 A 2x 50 A	400 x I_{PN}	4
2x 30 A	600 x I_{PN}	6
2x 25 A	800 x I_{PN}	7
2x 20 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Order No.
0.2	FS10	10								■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■	■		■	■	■	■	■	E 2 – 0 A
		15						■		■	■	■	■	■	E 3 – 0 A
		30								■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■	■		■	■	■	■	■	H 2 – 0 A
		15				■	■	■		■	■	■	■	■	H 3 – 0 A
		30								■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■	■		■	■	■	■	■	L 1 – 0 A
		10						■		■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■	■		■	■	■	■	■	Q 1 – 0 A
		10				■	■	■		■	■	■	■	■	Q 2 – 0 A
		15						■		■	■	■	■	■	Q 3 – 0 A
		30										■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5			■		■	■	■	■	■	E 1 – 1 L
		10			10						■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5			■		■	■	■	■	■	E 1 – 1 Q
		10			10						■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30							■	■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H 1 – 1 Q
		10			10					■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 16 kA, I_{PN} = 2x 100 A)
Thermal strength 200 x I_{PN}
1st core class 0.5; instrument security factor FS5; rating 10 VA
2nd core without

4 M A 7
2 4 4 – 3 M
2
E 2 – 0 A

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

B25

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

20 kA

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	4	8	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s. p. 40	s. p. 40		s. p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
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	100 x I_{PN}	0
150 A	150 x I_{PN}	1
100 A 125 A	200 x I_{PN}	2
75 A	300 x I_{PN}	3
50 A 60 A	400 x I_{PN}	4
40 A	500 x I_{PN}	5
30 A	800 x I_{PN}	7
25 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10 11 12 – 13 14
0.2	FS10	10					■		■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■		■	■	■	■	■	■	E 2 – 0 A
		15					■		■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■		■	■	■	■	■	■	H 2 – 0 A
		15				■	■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■		■	■	■	■	■	■	Q 1 – 0 A
		10				■	■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5	■	■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5	■	■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 20 kA, I_{PN} = 100 A)
Thermal strength 200 x I_{PN}
1st core class 1; instrument security factor FS5; rating 10 VA
2nd core class 5P; accuracy limit factor 10; rating 15 VA

4 M A 7
2 4 8 – 0 M
2
H 2 – 3 L

Example for Order No.: 4 M A 7 2 4 8 – 0 M H 2 2 – 3 L ■ ■
Order codes:

826

Equipment Selection

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

20 kA – with primary multi-ratio

10th to 14th position

Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes		
Order No.:	4	M	A	7	■	4	8	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
																	s. p. 40	s. p. 40		s. p. 40			

At rated primary current I_{PN}	Thermal strength	Position 12
2x 200 A 2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}	0
2x 150 A	150 x I_{PN}	1
2x 100 A 2x 125 A	200 x I_{PN}	2
2x 75 A	300 x I_{PN}	3
2x 50 A 2x 60 A	400 x I_{PN}	4
2x 40 A	500 x I_{PN}	5
2x 30 A	800 x I_{PN}	7
2x 25 A	1000 x I_{PN}	8

1st core			2nd core			Thermal strength									Position					
Class	Factor	VA rating	Class	Factor	VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	12	–	13	14
0.2	FS10	10								■	■	■	■	■	C	2		–	0	A
		15								■	■	■	■	■	C	3		–	0	A
0.5	FS5	10				■	■		■	■	■	■	■	■	E	2		–	0	A
		15							■	■	■	■	■	■	E	3		–	0	A
		30								■	■	■	■	■	E	4		–	0	A
1	FS5	10				■	■		■	■	■	■	■	■	H	2		–	0	A
		15				■	■		■	■	■	■	■	■	H	3		–	0	A
		30							■	■	■	■	■	■	H	4		–	0	A
5P	10	5				■	■		■	■	■	■	■	■	L	1		–	0	A
		10							■	■	■	■	■	■	L	2		–	0	A
		15								■	■	■	■	■	L	3		–	0	A
		30										■	■	■	L	4		–	0	A
10P	10	5				■	■		■	■	■	■	■	■	Q	1		–	0	A
		10					■		■	■	■	■	■	■	Q	2		–	0	A
		15							■	■	■	■	■	■	Q	3		–	0	A
		30										■	■	■	Q	4		–	0	A
0.5	FS5	5	5P	10	5				■	■	■	■	■	■	E	1		–	1	L
		10			10						■	■	■	■	E	2		–	2	L
		15			15							■	■	■	E	3		–	3	L
		30			30								■	■	E	4		–	4	L
0.5	FS5	5	10P	10	5				■	■	■	■	■	■	E	1		–	1	Q
		10			10				■		■	■	■	■	E	2		–	2	Q
		15			15							■	■	■	E	3		–	3	Q
		30			30								■	■	E	4		–	4	Q
1	FS5	5	5P	10	5	■	■		■	■	■	■	■	■	H	1		–	1	L
		10			10					■	■	■	■	■	H	2		–	2	L
		10			15						■	■	■	■	H	2		–	3	L
		15			15						■	■	■	■	H	3		–	3	L
		15			30								■	■	H	3		–	4	L
		30			30								■	■	H	4		–	4	L
1	FS5	5	10P	10	5	■	■		■	■	■	■	■	■	H	1		–	1	Q
		10			10					■	■	■	■	■	H	2		–	2	Q
		10			15						■	■	■	■	H	2		–	3	Q
		15			15						■	■	■	■	H	3		–	3	Q
		15			30								■	■	H	3		–	4	Q
		30			30								■	■	H	4		–	4	Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design (U_m = 12 kV, I_{th} = 20 kA, I_{PN} = 2x 100 A) — 4 M A 7

2 4 8 – 3 M

Thermal strength 200 x I_{PN} — 2

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

2nd core class 10P; accuracy limit factor 10; rating 5 VA — H 1 – 1 Q

Example for Order No.: 4 M A 7 2 4 8 – 3 M H 1 2 – 1 Q ■ ■

Order codes:

2

827

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

2

25 kA

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M A 7 ■ 5 4 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
250 A 300 A 400 A 500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
200 A	150 x I_{PN}	1
125 A 150 A	200 x I_{PN}	2
100 A	300 x I_{PN}	3
75 A	400 x I_{PN}	4
50 A 60 A	500 x I_{PN}	5
40 A	800 x I_{PN}	7

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Order No. pos. 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15							■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 25 kA, I_{PN} = 100 A)
Thermal strength 300 x I_{PN}
1st core class **10P**; instrument security factor **10**; rating **15 VA**
2nd core **without**

4 M A 7
2 5 4 – 0 M
3
Q 3 – 0 A

Example for Order No.: 4 M A 7 2 5 4 – 0 M Q 3 3 – 0 A ■ ■
Order codes:

828

25 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ 5 4 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
2x 250 A 2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}	0
2x 200 A	150 x I_{PN}	1
2x 125 A 2x 150 A	200 x I_{PN}	2
2x 100 A	300 x I_{PN}	3
2x 75 A	400 x I_{PN}	4
2x 50 A 2x 60 A	500 x I_{PN}	5
2x 40 A	800 x I_{PN}	7

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Order No. pos. 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10					■		■	■	■	■	■	■	E 2 – 0 A
		15							■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10					■		■	■	■	■	■	■	H 2 – 0 A
		15					■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5					■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5					■		■	■	■	■	■	■	Q 1 – 0 A
		10							■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30										■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5				■	■	■	■	■	■	E 1 – 1 L
		10			10						■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30								■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 25 kA, I_{PN} = 2x 100 A)
Thermal strength 300 x I_{PN}
1st core class **10P**; instrument security factor **10**; rating **15 VA**
2nd core without

4 M A 7
2 5 4 – 3 M
3
Q 3 – 0 A

Example for Order No.: 4 M A 7 2 5 4 – 3 M Q 3 3 – 0 A ■ ■
Order codes:

829

Equipment Selection

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

31.5 kA

10th to 14th position

Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M A 7 ■ 5 7 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Positions 15, 16 and ★: s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
400 A 500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
250 A 300 A	150 x I_{PN}	1
200 A	200 x I_{PN}	2
125 A 150 A	300 x I_{PN}	3
100 A	400 x I_{PN}	4
75 A	500 x I_{PN}	5
60 A	600 x I_{PN}	6
50 A	800 x I_{PN}	7
40 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Positions 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■	■	■	■	■	■	■	■	E 2 – 0 A
		15					■	■	■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■	■	■	■	■	■	■	■	H 2 – 0 A
		15					■	■	■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■	■	■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■	■	■	■	■	■	■	■	Q 1 – 0 A
		10				■	■	■	■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■	■	■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■	■	■	■	■	■	■	■	E 1 – 1 Q
		10			10				■	■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5	■	■	■	■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5	■	■	■	■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design — 4 M A 7

(U_m = **12 kV**, I_{th} = **31.5 kA**, I_{PN} = **100 A**) — 2 5 7 – 0 M

Thermal strength **400 x I_{PN}** — 4

1st core class **0.2**; instrument security factor **FS10**; rating **15 VA** — C 3

2nd core **without** — – 0 A

Example for Order No.: 4 M A 7 2 5 7 – 0 M C 3 4 – 0 A ■ ■

Order codes:

830

31.5 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – ★ Order codes
Order No.: 4 M A 7 ■ 5 7 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s. p. 40 s. p. 40 s. p. 40

At rated primary current I_{PN}	Thermal strength	12th position
2x 300 A 2x 400 A 2x 500 A 2x 600 A	100 x I_{PN}	0
250 A 300 A	150 x I_{PN}	1
200 A	200 x I_{PN}	2
125 A 150 A	300 x I_{PN}	3
100 A	400 x I_{PN}	4
75 A	500 x I_{PN}	5
60 A	600 x I_{PN}	6
50 A	800 x I_{PN}	7
40 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	12	13	14
0.2	FS10	10						■	■	■	■	■	■	■	C	2	–	0	A
		15							■	■	■	■	■	■	C	3	–	0	A
0.5	FS5	10				■	■	■	■	■	■	■	■	■	E	2	–	0	A
		15					■	■	■	■	■	■	■	■	E	3	–	0	A
		30						■	■	■	■	■	■	■	E	4	–	0	A
1	FS5	10				■	■	■	■	■	■	■	■	■	H	2	–	0	A
		15				■	■	■	■	■	■	■	■	■	H	3	–	0	A
		30						■	■	■	■	■	■	■	H	4	–	0	A
5P	10	5				■	■	■	■	■	■	■	■	■	L	1	–	0	A
		10						■	■	■	■	■	■	■	L	2	–	0	A
		15							■	■	■	■	■	■	L	3	–	0	A
		30									■	■	■	■	L	4	–	0	A
10P	10	5				■	■	■	■	■	■	■	■	■	Q	1	–	0	A
		10					■	■	■	■	■	■	■	■	Q	2	–	0	A
		15						■	■	■	■	■	■	■	Q	3	–	0	A
		30									■	■	■	■	Q	4	–	0	A
0.5	FS5	5	5P	10	5		■	■	■	■	■	■	■	■	E	1	–	1	L
		10			10					■	■	■	■	■	E	2	–	2	L
		15			15							■	■	■	E	3	–	3	L
		30			30							■	■	■	E	4	–	4	L
0.5	FS5	5	10P	10	5		■	■	■	■	■	■	■	■	E	1	–	1	Q
		10			10					■	■	■	■	■	E	2	–	2	Q
		15			15							■	■	■	E	3	–	3	Q
		30			30								■	■	E	4	–	4	Q
1	FS5	5	5P	10	5	■	■	■	■	■	■	■	■	■	H	1	–	1	L
		10			10				■	■	■	■	■	■	H	2	–	2	L
		10			15						■	■	■	■	H	2	–	3	L
		15			15						■	■	■	■	H	3	–	3	L
		15			30								■	■	H	3	–	4	L
		30			30								■	■	H	4	–	4	L
1	FS5	5	10P	10	5	■	■	■	■	■	■	■	■	■	H	1	–	1	Q
		10			10				■	■	■	■	■	■	H	2	–	2	Q
		10			15						■	■	■	■	H	2	–	3	Q
		15			15						■	■	■	■	H	3	–	3	Q
		15			30							■	■	■	H	3	–	4	Q
		30			30								■	■	H	4	–	4	Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 31.5 kA, I_{PN} = 2x 100 A)
Thermal strength 400 x 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

4 M A 7
2 5 7 – 3 M
4
E 1 – 1 Q

Example for Order No.: 4 M A 7 2 5 7 – 3 M E 1 4 – 1 Q ■ ■
Order codes:

2

831

Equipment Selection

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

40 kA

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes
Order No.: 4 M A 7 ■ 6 3 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

15: s. p. 40 · 16: s. p. 40 · ★: s. p. 40

At rated primary current I_{PN}	Thermal strength	12
400 A 500 A 600 A 750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
300 A	150 x I_{PN}	1
200 A 250 A	200 x I_{PN}	2
150 A	300 x I_{PN}	3
100 A 125 A	400 x I_{PN}	4
75 A	600 x I_{PN}	6
60 A	800 x I_{PN}	7
50 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	12	13	14
0.2	FS10	10						■		■	■	■	■	■	C	2	–	0	A
		15								■	■	■	■	■	C	3	–	0	A
0.5	FS5	10				■	■	■		■	■	■	■	■	E	2	–	0	A
		15				■	■	■		■	■	■	■	■	E	3	–	0	A
		30								■	■	■	■	■	E	4	–	0	A
1	FS5	10				■	■	■		■	■	■	■	■	H	2	–	0	A
		15				■	■	■		■	■	■	■	■	H	3	–	0	A
		30								■	■	■	■	■	H	4	–	0	A
5P	10	5				■	■	■		■	■	■	■	■	L	1	–	0	A
		10								■	■	■	■	■	L	2	–	0	A
		15								■	■	■	■	■	L	3	–	0	A
		30										■	■	■	L	4	–	0	A
10P	10	5				■	■	■		■	■	■	■	■	Q	1	–	0	A
		10					■	■		■	■	■	■	■	Q	2	–	0	A
		15						■		■	■	■	■	■	Q	3	–	0	A
		30									■	■	■	■	Q	4	–	0	A
0.5	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	E	1	–	1	L
		10			10					■	■	■	■	■	E	2	–	2	L
		15			15							■	■	■	E	3	–	3	L
		30			30									■	E	4	–	4	L
0.5	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	E	1	–	1	Q
		10			10					■	■	■	■	■	E	2	–	2	Q
		15			15							■	■	■	E	3	–	3	Q
		30			30									■	E	4	–	4	Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H	1	–	1	L
		10			10					■	■	■	■	■	H	2	–	2	L
		10			15						■	■	■	■	H	2	–	3	L
		15			15						■	■	■	■	H	3	–	3	L
		15			30								■	■	H	3	–	4	L
		30			30									■	H	4	–	4	L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H	1	–	1	Q
		10			10					■	■	■	■	■	H	2	–	2	Q
		10			15						■	■	■	■	H	2	–	3	Q
		15			15						■	■	■	■	H	3	–	3	Q
		15			30							■	■	■	H	3	–	4	Q
		30			30								■	■	H	4	–	4	Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 40 kA, I_{PN} = 100 A) — 4 M A 7 · 2 6 3 – 0 M
Thermal strength 400 x I_{PN} — 4
1st core class 1; instrument security factor FS5; rating 5 VA
2nd core class 5P; accuracy limit factor 10; rating 5 VA — E 1 – 1 L

Example for Order No.: 4 M A 7 2 6 3 – 0 M E 1 4 – 1 L ■ ■
Order codes:

802

40 kA – with primary multi-ratio

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ 6 3 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Position 15: s. p. 40; position 16: s. p. 40; ★: s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
2x 400 A 2x 500 2x 600 A	100 x I_{PN}	0
2x 300 A	150 x I_{PN}	1
2x 200 A 2x 250 A	200 x I_{PN}	2
2x 150 A	300 x I_{PN}	3
2x 100 A 2x 125 A	400 x I_{PN}	4
2x 75 A	600 x I_{PN}	6
2x 60 A	800 x I_{PN}	7
2x 50 A	1000 x I_{PN}	8

1st core			2nd core			Thermal strength									Order No.				
Class	Factor	VA rating	Class	Factor	VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	10	11	–	13	14
0.2	FS10	10						■		■	■	■	■	■	C	2	–	0	A
		15								■	■	■	■	■	C	3	–	0	A
0.5	FS5	10				■	■	■		■	■	■	■	■	E	2	–	0	A
		15					■	■		■	■	■	■	■	E	3	–	0	A
		30						■		■	■	■	■	■	E	4	–	0	A
1	FS5	10				■	■	■		■	■	■	■	■	H	2	–	0	A
		15				■	■	■		■	■	■	■	■	H	3	–	0	A
		30						■		■	■	■	■	■	H	4	–	0	A
5P	10	5				■	■	■		■	■	■	■	■	L	1	–	0	A
		10						■		■	■	■	■	■	L	2	–	0	A
		15								■	■	■	■	■	L	3	–	0	A
		30										■	■	■	L	4	–	0	A
10P	10	5				■	■	■		■	■	■	■	■	Q	1	–	0	A
		10					■	■		■	■	■	■	■	Q	2	–	0	A
		15						■		■	■	■	■	■	Q	3	–	0	A
		30									■	■	■	■	Q	4	–	0	A
0.5	FS5	5	5P	10	5		■	■		■	■	■	■	■	E	1	–	1	L
		10			10						■	■	■	■	E	2	–	2	L
		15			15							■	■	■	E	3	–	3	L
		30			30								■	■	E	4	–	4	L
0.5	FS5	5	10P	10	5		■	■		■	■	■	■	■	E	1	–	1	Q
		10			10					■	■	■	■	■	E	2	–	2	Q
		15			15							■	■	■	E	3	–	3	Q
		30			30								■	■	E	4	–	4	Q
1	FS5	5	5P	10	5	■	■	■		■	■	■	■	■	H	1	–	1	L
		10			10					■	■	■	■	■	H	2	–	2	L
		10			15						■	■	■	■	H	2	–	3	L
		15			15						■	■	■	■	H	3	–	3	L
		15			30								■	■	H	3	–	4	L
		30			30								■	■	H	4	–	4	L
1	FS5	5	10P	10	5	■	■	■		■	■	■	■	■	H	1	–	1	Q
		10			10					■	■	■	■	■	H	2	–	2	Q
		10			15						■	■	■	■	H	2	–	3	Q
		15			15						■	■	■	■	H	3	–	3	Q
		15			30								■	■	H	3	–	4	Q
		30			30								■	■	H	4	–	4	Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 40 kA, I_{PN} = 2x 100 A)
Thermal strength **400 x I_{PN}**
1st core class **0.2**; instrument security factor **FS10**; rating **10 VA**
2nd core **without**

4 M A 7
2 6 3 – 3 M
4
C 2 – 0 A

Example for Order No.: 4 M A 7 2 6 3 – 3 M C 2 4 – 0 A ■ ■
Order codes:

835

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

50 kA
10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 | Order codes
Order No.: 4 M A 7 ■ 6 7 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ | ■ ■ ■

Positions 15, 16 and ★: s. p. 40

At rated primary current I_{PN}	Thermal strength	Position 12
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	150 x I_{PN}	1
250 A 300 A	200 x I_{PN}	2
200 A	300 x I_{PN}	3
125 A 150 A	400 x I_{PN}	4
100 A	500 x I_{PN}	5
75 A	800 x I_{PN}	7
60 A	1000 x I_{PN}	8

2

1st core			2nd core			Thermal strength									Order No. (positions 10 11 12 – 13 14)
Class	Factor	VA rating	Class	Factor	VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■		■	■	■	■	■	■	E 2 – 0 A
		15					■		■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■		■	■	■	■	■	■	H 2 – 0 A
		15				■	■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15						■	■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15						■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 50 kA, I_{PN} = 100 A) — 4 M A 7
Thermal strength 500 x I_{PN} — 2 6 7 – 0 M
1st core class 0.5; instrument security factor FS5; rating 5 VA — 5
2nd core class 5P; accuracy limit factor 10; rating 5 VA — E 1 – 1 L

Example for Order No.: 4 M A 7 2 6 7 – 0 M E 1 5 – 1 L ■ ■
Order codes:

B34

50 kA – with primary multi-ratio

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	6	7	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s. p. 40	s. p. 40		s. p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
2x 500 A 2x 600 A	100 x I_{PN}	0
2x 400 A	150 x I_{PN}	1
2x 250 A 2x 300 A	200 x I_{PN}	2
2x 200 A	300 x I_{PN}	3
2x 125 A 2x 150 A	400 x I_{PN}	4
2x 100 A	500 x I_{PN}	5
2x 75 A	800 x I_{PN}	7
2x 50 A 2x 60 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10 11 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■		■	■	■	■	■	■	E 2 – 0 A
		15					■		■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■		■	■	■	■	■	■	H 2 – 0 A
		15				■	■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■		■	■	■	■	■	■	Q 1 – 0 A
		10							■	■	■	■	■	■	Q 2 – 0 A
		15								■	■	■	■	■	Q 3 – 0 A
		30										■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15								■	■	E 3 – 3 L
		30			30								■	■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30								■	■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15							■	■	■	H 2 – 3 L
		15			15							■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30								■	■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15						■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 50 kA, I_{PN} = 2x 100 A)
Thermal strength **500 x I_{PN}**
1st core class **0.5**; instrument security factor **FS5**; rating **5 VA**
2nd core class **5P**; accuracy limit factor **10**; rating **5 VA**

4 M A 7
2 6 7 – 3 M
5
E 1 – 1 L

Example for Order No.: 4 M A 7 2 6 7 – 3 M E 1 5 – 1 L ■ ■
Order codes:

2

Equipment Selection

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

63 kA

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M A 7 ■ 7 1 – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

s.p. 40 (position 15) s.p. 40 (position 16) s.p. 40 (★)

At rated primary current I_{PN}	Thermal strength	Position 12
750 A 1000 A 1200 A 1250 A 1500 A 2000 A 2500 A	100 x I_{PN}	0
500 A 600 A	150 x I_{PN}	1
400 A	200 x I_{PN}	2
250 A 300 A	300 x I_{PN}	3
200 A	400 x I_{PN}	4
125 A 150 A	500 x I_{PN}	5
100 A	800 x I_{PN}	7
75 A	1000 x I_{PN}	8

2

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Position 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■	■	C 2 – 0 A
		15								■	■	■	■	■	C 3 – 0 A
0.5	FS5	10				■	■		■	■	■	■	■	■	E 2 – 0 A
		15					■		■	■	■	■	■	■	E 3 – 0 A
		30							■	■	■	■	■	■	E 4 – 0 A
1	FS5	10				■	■		■	■	■	■	■	■	H 2 – 0 A
		15				■	■		■	■	■	■	■	■	H 3 – 0 A
		30							■	■	■	■	■	■	H 4 – 0 A
5P	10	5				■	■		■	■	■	■	■	■	L 1 – 0 A
		10							■	■	■	■	■	■	L 2 – 0 A
		15								■	■	■	■	■	L 3 – 0 A
		30										■	■	■	L 4 – 0 A
10P	10	5				■	■		■	■	■	■	■	■	Q 1 – 0 A
		10					■		■	■	■	■	■	■	Q 2 – 0 A
		15							■	■	■	■	■	■	Q 3 – 0 A
		30									■	■	■	■	Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■	■	E 1 – 1 L
		10			10					■	■	■	■	■	E 2 – 2 L
		15			15							■	■	■	E 3 – 3 L
		30			30									■	E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■	■	E 1 – 1 Q
		10			10					■	■	■	■	■	E 2 – 2 Q
		15			15							■	■	■	E 3 – 3 Q
		30			30									■	E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■	■	H 1 – 1 L
		10			10					■	■	■	■	■	H 2 – 2 L
		10			15					■	■	■	■	■	H 2 – 3 L
		15			15						■	■	■	■	H 3 – 3 L
		15			30								■	■	H 3 – 4 L
		30			30									■	H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■	■	H 1 – 1 Q
		10			10				■	■	■	■	■	■	H 2 – 2 Q
		10			15					■	■	■	■	■	H 2 – 3 Q
		15			15						■	■	■	■	H 3 – 3 Q
		15			30							■	■	■	H 3 – 4 Q
		30			30								■	■	H 4 – 4 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, block-type design — 4 M A 7
(U_m = 12 kV, I_{th} = 63 kA, I_{PN} = 100 A) — 2 7 1 – 0 M
Thermal strength **800 x I_{PN}** — 7
1st core class **0.5**; instrument security factor **FS5**; rating **15 VA** — E 3 – 0 A
2nd core **without**

Example for Order No.: 4 M A 7 2 7 1 – 0 M E 3 7 – 0 A ■ ■
Order codes:

836

63 kA – with primary multi-ratio

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	A	7	■	7	1	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
																	s.p. 40	s.p. 40		s.p. 40	

At rated primary current I_{PN}	Thermal strength	Position 12
2x 500 A 2x 600 A	150 x I_{PN}	1
2x 400 A	200 x I_{PN}	2
2x 250 A 2x 300 A	300 x I_{PN}	3
2x 200 A	400 x I_{PN}	4
2x 125 A 2x 150 A	500 x I_{PN}	5
2x 100 A	800 x I_{PN}	7
2x 75 A	1000 x I_{PN}	8

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1000 x I_{PN}	800 x I_{PN}	600 x I_{PN}	500 x I_{PN}	400 x I_{PN}	300 x I_{PN}	200 x I_{PN}	150 x I_{PN}	100 x I_{PN}	Positions 10 11 12 – 13 14
0.2	FS10	10							■	■	■	■	■		C 2 – 0 A
		15								■	■	■	■		C 3 – 0 A
0.5	FS5	10				■	■		■	■	■	■	■		E 2 – 0 A
		15					■		■	■	■	■	■		E 3 – 0 A
		30							■	■	■	■	■		E 4 – 0 A
1	FS5	10				■	■		■	■	■	■	■		H 2 – 0 A
		15				■	■		■	■	■	■	■		H 3 – 0 A
		30								■	■	■	■		H 4 – 0 A
5P	10	5				■	■		■	■	■	■	■		L 1 – 0 A
		10							■	■	■	■	■		L 2 – 0 A
		15							□	■	■	■	■		L 3 – 0 A
		30										■	■		L 4 – 0 A
10P	10	5				■	■		■	■	■	■	■		Q 1 – 0 A
		10					■		■	■	■	■	■		Q 2 – 0 A
		15							■	■	■	■	■		Q 3 – 0 A
		30									■	■	■		Q 4 – 0 A
0.5	FS5	5	5P	10	5		■		■	■	■	■	■		E 1 – 1 L
		10			10					■	■	■	■		E 2 – 2 L
		15			15							■	■		E 3 – 3 L
		30			30								■		E 4 – 4 L
0.5	FS5	5	10P	10	5		■		■	■	■	■	■		E 1 – 1 Q
		10			10					■	■	■	■		E 2 – 2 Q
		15			15							■	■		E 3 – 3 Q
		30			30								■		E 4 – 4 Q
1	FS5	5	5P	10	5		■		■	■	■	■	■		H 1 – 1 L
		10			10					■	■	■	■		H 2 – 2 L
		10			15					■	■	■	■		H 2 – 3 L
		15			15						■	■	■		H 3 – 3 L
		15			30								■		H 3 – 4 L
		30			30								■		H 4 – 4 L
1	FS5	5	10P	10	5		■		■	■	■	■	■		H 1 – 1 Q
		10			10				■	■	■	■	■		H 2 – 2 Q
		10			15					■	■	■	■		H 2 – 3 Q
		15			15						■	■	■		H 3 – 3 Q
		15			30							■	■		H 3 – 4 Q
		30			30								■		H 4 – 4 Q

■ Feasible (other combinations on request) □ Not for 2x 125 A

Configuration example
Indoor support-type current transformer, block-type design
(U_m = 12 kV, I_{th} = 63 kA, I_{PN} = 2x 100 A)
Thermal strength 800 x 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

4 M A 7
2 7 1 – 3 M
7
E 1 – 1 Q

Example for Order No.: 4 M A 7 2 7 1 – 3 M E 1 7 – 1 Q ■ ■
Order codes:

837

Equipment Selection

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

15th position
Rated secondary current

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M A 7 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Rated current for 1st core	Rated current for 2nd core	Position 13	Position 14	Position 15
1 A	Without 2nd core	0	A	A
5 A	Without 2nd core	0	A	B
1 A	1 A			C
5 A	5 A			D
1 A	5 A			E
5 A	1 A			F

16th position
Additional features

Options	Position 16
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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		Order code
With routine test certificate in German/English		– Z A 1 0
With capacitive layer for voltage detecting system	6 kV	– Z C 0 6
	10 kV	– Z C 1 0
	15 kV	– Z C 1 5
Differential earth-fault balance in protection core		– Z D 1 0
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 kV**	
Rated lightning impulse withstand voltage U_p = **75 kV**	
Rated short-duration power-frequency withstand voltage U_d = **28 kV**	2
Rated short-time thermal current I_{th} = **63 kA**	7 1 –
Rated primary current I_{PN} = **2x 100 A**	3 M
Thermal strength **800 x I_{PN}**	7
1st core class **0.5**; instrument security factor **FS5**; rating **5 VA**	E 1
2nd core class **10P**; accuracy limit factor **10**; rating **5 VA**	– 1 Q
Rated secondary current 1st core **1A**; 2nd core **5A**	E
Power frequency **50 Hz**; marking according to **IEC**	1
With routine test certificate in German/English	– Z A 1 0
With capacitive layer for voltage detecting system **10 kV**	– Z C 1 0

Example for Order No.: 4 M A 7 2 7 1 – 3 M E 1 7 – 1 Q E 1 – Z

Order codes: A 1 0 + C 1 0

836

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

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	B	1	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
											See page 42	See page 42	See page 42		See page 42	See page 42	See page 43	See page 43		See page 43	

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M B 1 2
17.5	95	38	4 M B 1 3
24	128	50	4 M B 1 4

6th/7th position
Rated short-time thermal current

Rated short-time thermal current I_{th} kA	Positions 6 7
150	7 8
200	8 2
250	8 4
300	8 5
500	8 8

8th/9th position
Rated primary current

Rated primary current I_N A	Remark	Rated short-time thermal current 150 kA	200 kA	250 kA	300 kA	500 kA	Positions 8 9
1500		■					1 D
2000			■				1 F
2500				■			1 G
3000					■		1 H
4000						■	1 J
5000	Only 4MB13					■	1 K
6000	Only 4MB13					■	1 L

■ Feasible (other combinations on request)

Configuration example

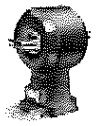
Indoor support-type current transformer, single-turn design — 4 M B 1
Maximum operating voltage U_m = 24 kV
Rated lightning impulse withstand voltage U_p = 125 kV
Rated short-duration power-frequency withstand voltage U_d = 50 kV — 4
Rated short-time thermal current I_{th} = 300 kA — 8 5 –
Rated primary current I_{PN} = 3000 A — 1 H

Example for Order No.: 4 M B 1 4 8 5 – 1 H ■ ■ ■ – ■ ■ ■ ■
Order codes:

839

Equipment Selection

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



10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes		
Order No.:	4	M	B	1	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■

See page 43 (position 15) · See page 43 (position 16) · See page 43 (★)

At rated primary current I_{PN}	Thermal strength	Position 12
1500 A 2000 A 2500 A 3000 A 4000 A 5000 A 6000 A	100 x I_{PN}	0

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	1500 A	2000 A	2500 A	3000 A	4000 A	5000 A	6000 A	Order No. (10 11 12 – 13 14)
0.2	FS10	15				■	■	■	■	■	■	■	C 3 – 0 A
		30				■	■	■	■	■	■	■	C 4 – 0 A
0.5	FS10	15				■	■	■	■	■	■	■	F 3 – 0 A
		30				■	■	■	■	■	■	■	F 4 – 0 A
		60				■	■	■	■	■	■	■	F 6 – 0 A
1	FS10	15				■	■	■	■	■	■	■	J 3 – 0 A
		30				■	■	■	■	■	■	■	J 4 – 0 A
		60				■	■	■	■	■	■	■	J 6 – 0 A
5P	10	30				■	■	■	■	■	■	■	L 4 – 0 A
		60				■	■	■	■	■	■	■	L 6 – 0 A
10P	10	30				■	■	■	■	■	■	■	Q 4 – 0 A
		60				■	■	■	■	■	■	■	Q 6 – 0 A
0.5	FS10	15	5P	10	15	■	■	■	■	■	■	■	F 3 – 3 L
		30			30	■	■	■	■	■	■	■	F 4 – 4 L
		30			60						■	■	F 6 – 6 L
1	FS10	15	5P	10	15	■	■	■	■	■	■	■	J 3 – 3 L
		30			30	■	■	■	■	■	■	■	J 4 – 4 L
		60			60						■	■	J 6 – 6 L
0.5	FS10	15	10P	10	15	■	■	■	■	■	■	■	F 3 – 3 Q
		30			30	■	■	■	■	■	■	■	F 4 – 4 Q
		60			60						■	■	F 6 – 6 Q
1	FS10	15	10P	10	15	■	■	■	■	■	■	■	J 3 – 3 Q
		30			30	■	■	■	■	■	■	■	J 4 – 4 Q
		60			60						■	■	J 6 – 6 Q

■ Feasible (other combinations on request)

Configuration example

Indoor support-type current transformer, single-turn design
(U_m = 24 kV, I_{th} = 300 kA, I_{PN} = 3000 A)
Thermal strength 100 x I_{PN}
1st core class 0.5; instrument security factor FS10; rating 30 VA
2nd core class 5P; accuracy limit factor 10; rating 30 VA

4 M B 1
4 8 5 – 1 H
0
F 4 – 4 L

Example for Order No.: 4 M B 1 4 8 5 – 1 H F 4 0 – 4 L ■ ■

Order codes:

840

Equipment Selection

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

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M B 1 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Code
1 A	Without 2nd core	0 A A
5 A	Without 2nd core	0 A B
1 A	1 A	C
5 A	5 A	D
1 A	5 A	E
5 A	1 A	F

16th position
Additional features

Options	Code
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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	Code
With routine test certificate in German/English	– Z A 1 0
Other special versions on request	

Configuration example

Indoor support-type current transformer, single-turn design	4 M B 1
Maximum operating voltage U_m = 24 kV	
Rated lightning impulse withstand voltage U_p = 125 kV	
Rated short-duration power-frequency withstand voltage U_d = 50 kV	4
Rated short-time thermal current I_{th} = 300 kA	8 5 –
Rated primary current I_{PN} = 3000 A	1 H
Thermal strength 100 x I_{PN}	0
1st core class 0.5; instrument security factor FS10; rating 30 VA	
2nd core class 5P; accuracy limit factor 10; rating 30 VA	F 4 … – 4 L
Rated secondary current 1st core 5 A; 2nd core 5 A	D
Power frequency 60 Hz; marking according to IEC	6

Example for Order No.: 4 M B 1 4 8 5 – 1 H F 4 0 – 4 L D 6

Order codes:

840

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

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

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	C	2	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
											See page 45	See page 45	See page 45		See page 45	See page 45	See page 46	See page 46		See page 46	

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M C 2 2
24	125	50	4 M C 2 4
36	170	70	4 M C 2 6

2

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	
15	150	4 3 – 0 P
20	200	4 8 – 0 Q
30	300	5 6 – 0 S
40	400	6 3 – 0 T
50	500	6 7 – 0 U
60	600	7 0 – 0 V
80	800	7 3 – 0 X
100	1000	7 5 – 1 A
120	1200	7 6 – 1 B
150	1500	7 8 – 1 D
200	2000	8 2 – 1 F
250	2500	8 4 – 1 G
300	3000	8 5 – 1 H

Configuration example

Indoor bushing-type current transformer, single-turn design	4 M C 2
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	6
Rated short-time thermal current I_{th} = 50 kA	
Rated primary current I_{PN} = 500 A	6 7 – 0 U

Example for Order No.: 4 M C 2 6 6 7 – 0 U ■ ■ ■ – ■ ■ ■ ■
Order codes:

842

Equipment Selection

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

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M C 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Position 15: See page 46
Position 16: See page 46
Order codes: See page 46

At rated primary current I_{PN}	Thermal strength	10	11	12	–	13	14
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}			0			

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	Rated primary current I_{PN} 150 A	200 A	300–600 A	800–1500 A	2000–3000 A	10	11	12	–	13	14
0.2	FS10	10				■	■	■	■	■	C	2		–	0	A
		15				■	■	■	■	■	C	3		–	0	A
0.5	FS5	15				■	■	■	■		E	3		–	0	A
		30				■	■	■	■	■	E	4		–	0	A
0.5	FS10	15								■	F	3		–	0	A
1	FS5	15				■	■	■	■		H	3		–	0	A
		30				■	■	■	■	■	H	4		–	0	A
1	FS10	15								■	J	3		–	0	A
10P	10	15				■	■	■	■	■	Q	3		–	0	A
		30				■	■	■	■	■	Q	4		–	0	A
		60				■	■	■	■	■	Q	6		–	0	A
0.2	FS10	10	10P	10	30	■	■	■	■	■	C	2		–	4	Q
		15			30	■	■	■	■	■	C	3		–	4	Q
0.5	FS5	15	10P	10	15	■	■	■	■		E	3		–	3	Q
		15			30	■	■	■	■		E	3		–	4	Q
		30			30	■	■	■	■	■	E	4		–	4	Q
		30			60		■	■	■	■	E	4		–	6	Q
0.5	FS10	15	10P	10	15					■	F	3		–	3	Q
		15			30					■	F	3		–	4	Q
1	FS5	15	10P	10	15	■	■	■	■		H	3		–	3	Q
		15			30	■	■	■	■		H	3		–	4	Q
		30			30	■	■	■	■	■	H	4		–	4	Q
		30			60		■	■	■	■	H	4		–	6	Q
1	FS10	15	10P	10	15					■	J	3		–	3	Q
		15			30					■	J	3		–	4	Q

■ Feasible (other combinations on request)

Configuration example

Indoor bushing-type current transformer, single-turn design

(U_m = 36 kV, I_{th} = 50 kA, I_{PN} = 500 A) — 4 M C 2 6 6 7 – 0 U

Thermal strength 100 x I_{PN} — 0

1st core class 1; instrument security factor FS5; rating 30 VA

2nd core class 10P; accuracy limit factor 10; rating 30 VA — H 4 – 4 Q

Example for Order No.: 4 M C 2 6 6 7 – 0 U H 4 0 – 4 Q ■ ■

Order codes:

2

843

Equipment Selection

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

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 — Order codes

Order No.: 4 M C 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Order No. (pos. 13–15)
1 A	Without 2nd core	0 A A
5 A	Without 2nd core	0 A B
1 A	1 A	C
5 A	5 A	D
1 A	5 A	E
5 A	1 A	F

16th position
Additional features

Options	Order No. (pos. 16)
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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	Order codes
With routine test certificate in German/English	– Z A 1 0
Other special versions on request	

Configuration example

Indoor bushing-type current transformer, single-turn design	4 M C 2
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	6
Rated short-time thermal current I_{th} = 50 kA	6 7 –
Rated primary current I_{PN} = 500 A	0 U
Thermal strength 100 x I_{PN}	0
1st core class 1; instrument security factor FS5; rating 30 VA	H 4
2nd core class 10P; accuracy limit factor 10; rating 30 VA	– 4 Q
Rated secondary current 1st core 5 A; 2nd core 1 A	F
Power frequency 50 Hz; marking according to VDE	0

Example for Order No.: 4 M C 2 6 6 7 – 0 U H 4 0 – 4 Q F 0

Order codes:

8 44

4MC3 indoor bar-primary bushing-type current transformer

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	★	Order codes
Order No.:	4	M	C	3	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
											See page 48	See page 48	See page 48		See page 48	See page 48	See page 49	See page 49		See page 49	

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M C 3 2
24	125	50	4 M C 3 4
36	170	70	4 M C 3 6

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Order No.
200	2000	8 2 – 1 F
250	2500	8 4 – 1 G
300	3000	8 5 – 1 H
400	4000	8 7 – 1 J
500	5000	8 8 – 1 K
600	6000	7 0 – 1 L
800	8000	7 2 – 1 N
1000	10000	7 3 – 1 P

Configuration example

Indoor bar-primary bushing-type current transformer	4 M C 3
Maximum operating voltage U_m = 12 kV Rated lightning impulse withstand voltage U_p = 75 kV Rated short-duration power-frequency withstand voltage U_d = 28 kV	2
Rated short-time thermal current I_{th} = 400 kA Rated primary current I_{PN} = 4000 A	8 7 – 1 J

Example for Order No.: 4 M C 3 2 8 7 – 1 J ■ ■ ■ – ■ ■ ■ ■
Order codes:

845

Equipment Selection

4MC3 indoor bar-primary bushing-type current transformer

10th to 14th position
Core versions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes
Order No.:	4	M	C	3	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■

See page 49 See page 49 See page 49

At rated primary current I_{PN}	Thermal strength	Position 12
2000 A 2500 A 3000 A 4000 A 5000 A 6000 A 8000 A 10000 A	100 x I_{PN}	0

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	3rd core Class	3rd core Factor	3rd core VA rating	4th core Class	4th core Factor	4th core VA rating	Rated primary current I_{PN} 2000–3000 A	4000–6000 A	8000–10000 A	Position 10 11 12 – 13 14
0.2	FS10	15										■	■	■	C 3 – 0 A
		30										■	■	■	C 4 – 0 A
0.5	FS10	15										■	■	■	F 3 – 0 A
		30										■	■	■	F 4 – 0 A
1	FS10	30										■	■	■	J 4 – 0 A
		60										■	■	■	J 6 – 0 A
10P	10	30										■	■	■	Q 4 – 0 A
		60										■	■	■	Q 6 – 0 A
10P	20	60										■	■	■	S 6 – 0 A
		100										■	■	■	S 8 – 0 A
0.5	FS10	15	10P	10	30							■	■	■	F 3 – 4 Q
		15			60							■	■	■	F 3 – 6 Q
		15	10P	20	60							■	■	■	F 3 – 6 S
		30			60							■	■	■	F 4 – 6 S
1	FS10	60	10P	20	100							■	■	■	J 6 – 8 S
10P	10	60										■	■	■	Q 6 – 8 S
10P	20	60										■	■	■	S 6 – 8 S
		100										■	■	■	S 8 – 8 S
0.5	FS10	15	10P	10	30	10P	10	60				■	■	■	Y 0 – 0 A
1	FS10	30	10P	20	60	10P	20	100				■	■	■	Y 0 – 0 B
0.2	FS10	15	0.2	FS10	30	10P	10	30				■	■	■	Y 0 – 0 C
0.5	FS10	15			30			30				■	■	■	Y 0 – 0 D
0.2	FS10	30	1	FS10	60	10P	10	60	10P	20	100	■	■	■	Y 0 – 1 A
0.5	FS10	30			60			60			100	■	■	■	Y 0 – 1 B
1	FS10	30			60			60			100	■	■	■	Y 0 – 1 C
0.2	FS10	30	1	FS10	60	10P	10	60	10P	20	100	■	■	■	Y 0 – 1 D
0.5	FS10	30			60			60			100	■	■	■	Y 0 – 1 E
1	FS10	30			60			60			100	■	■	■	Y 0 – 1 F

■ Feasible (other combinations on request)

2

Configuration example

Indoor bar-primary bushing-type current transformer
(U_m = 12 kV, I_{th} = 400 kA, I_{PN} = 4000 A)
Thermal strength **100 x I_{PN}**
1st core class **0.5**; instrument security factor **FS10**; rating **15 VA**
2nd core class **0.2**; instrument security factor **FS10**; rating **30 VA**
3rd core class **10P**; accuracy limit factor **10**; rating **30 VA**

4 M C 3
2 8 7 – 1 J
0
Y 0 – 0 D

Example for Order No.: 4 M C 3 2 8 7 – 1 J Y 0 0 – 0 D ■ ■
Order codes:

846

Equipment Selection

4MC3 indoor bar-primary bushing-type current transformer

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M C 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Rated current for 3rd core	Rated current for 4th core	Code
1 A	Without	Without	Without	0 A A
5 A	Without	Without	Without	0 A B
1 A	1 A	Without	Without	C
5 A	5 A	Without	Without	D
1 A	5 A	Without	Without	E
5 A	1 A	Without	Without	F
1 A	1 A	1 A	Without	G
5 A	5 A	5 A	Without	H
1 A	1 A	1 A	1 A	J
5 A	5 A	5 A	5 A	K

16th position
Additional features

Options	Code
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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		Code
With routine test certificate in German/English		– Z A 1 0
Size (for specification see the following pages)	11	– Z A 1 1
	12	– Z A 1 2
	21	– Z A 2 1
	22	– Z A 2 2
	31	– Z A 3 1
	32	– Z A 3 2
	41	– Z A 4 1
	42	– Z A 4 2
	51	– Z A 5 1
	52	– Z A 5 2
	61	– Z A 6 1
	62	– Z A 6 2
	72	– Z A 7 2
	73	– Z A 7 3

Other special versions on request

Configuration example

Indoor bar-primary bushing-type current transformer	4 M C 3
Maximum operating voltage U_m = 12 kV	
Rated lightning impulse withstand voltage U_p = 75 kV	
Rated short-duration power-frequency withstand voltage U_d = 28 kV	2
Rated short-time thermal current I_{th} = 400 kA	
Rated primary current I_{PN} = 4000 A	8 7 – 1 J
Thermal strength 100 x I_{PN}	0
1st core class 0.5; instrument security factor FS10; rating 15 VA	
2nd core class 0.2; instrument security factor FS10; rating 30 VA	
3rd core class 10P; accuracy limit factor 10; rating 30 VA	Y 0 – 0 D
Rated secondary current 1st core 1 A; 2nd core 1 A; 3rd core 1 A	G
Power frequency 50 Hz; marking according to IEC	1
Size 42	– Z A 4 2

Example for Order No.: 4 M C 3 2 8 7 – 1 J Y 0 0 – D D G 1 – Z A 4 2

Order codes: A 4 2

2

847

Equipment Selection

4MC3 indoor bar-primary bushing-type current transformer

Size specification for 4MC32 transformers 1)

10th to 14th position of Order No.	6th to 9th position of Order No.							
	82-1F	84-1G	85-1H	87-1J	88-1K	90-1L	92-1N	93-1P
C30-0A C40-0A F30-0A F40-0A J40-0A J60-0A Q40-0A Q60-0A S60-0A	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
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	12, 21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52, 61, 62, 72, 73	31, 32, 41, 42, 51, 52, 62, 72, 73	41, 42, 51, 52, 62, 72, 73
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
F30-6Q	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	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	42, 51, 52, 62, 72, 73
F30-6S F40-6S	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	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
J60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	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	42, 52, 62, 72, 73
Q60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 51, 52, 61, 62	32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 52, 61, 62	32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S80-8S	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, 52	22, 32, 41, 42, 51, 52, 62	41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
Y00-0A	11, 12, 21, 22, 31, 32	11,12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52	32, 42, 51, 52, 61, 62	52, 62, 72, 73	52, 62, 72, 73
Y00-0B	21, 22, 32	21, 22, 32	22, 32, 41, 42	22, 32, 42, 51, 52	22, 32, 42, 52	22, 42, 52, 62	42, 52, 62, 72, 73	52, 62, 72, 73
Y00-0C Y00-0D	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	12, 22, 32, 41, 42, 51, 52	22, 32, 42, 51, 52	52, 62, 72, 73	52, 62, 72, 73
Y00-1A Y00-1B Y00-1C	12, 22, 32	22, 32	22, 32, 42	22, 32, 42, 52	42, 52	52, 62	73	73
Y00-1D Y00-1E Y00-1F	22, 32	22, 32	22, 32, 42	41, 52	52	52, 62	73	73

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

2

848

Equipment Selection

4MC3 indoor bar-primary bushing-type current transformer

Size specification for 4MC34 transformers 1)

10th to 14th position of Order No.	6th to 9th position of Order No. 82-1F	84-1G	85-1H	87-1J	88-1K	90-1L	92-1N	93-1P
C30-0A C40-0A F30-0A F40-0A J40-0A J60-0A Q40-0A Q60-0A S60-0A	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	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
S80-0A	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	11, 12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 31, 32, 41, 42, 51, 52, 61, 62, 72, 73	31, 32, 41, 42, 51, 52, 62, 72, 73	41, 42, 51, 52, 62, 72, 73
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	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
F30-6Q	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	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	42, 51, 52, 62, 72, 73
F30-6S F40-6S	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	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
J60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	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	42, 52, 62, 72, 73
Q60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 61, 62	32, 41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S60-8S	21, 22, 31, 32	21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 41, 42, 52, 61, 62	42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
S80-8S	21, 22, 32	21, 22, 32	21, 22, 31, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 62	41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
Y00-0A	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	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 42, 51, 52, 61, 62	22, 32, 42, 51, 52, 61, 62, 72, 73	42, 52, 62, 72, 73
Y00-0B	22, 32	21, 22, 32	22, 32, 41, 42	22, 32, 42, 51, 52	22, 32, 42, 52	22, 42, 52, 62	42, 52, 62, 72, 73	52, 62, 72, 73
Y00-0C Y00-0D	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32, 41, 42	12, 21, 22, 31, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 32, 42, 51, 52	52, 62, 72, 73	52, 62, 72, 73
Y00-1A Y00-1B Y00-1C	12, 22, 32	22, 32	22, 32, 42	22, 32, 42, 52	42, 52	52, 62	73	73
Y00-1D Y00-1E Y00-1F	22, 32	22, 32	22, 32, 42	41, 52	52	52, 62	73	73

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

2

849

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

Size specification for 4MC36 transformers 1)

10th to 14th position of Order No.	6th to 9th position of Order No. 82-1F	84-1G	85-1H	87-1J	88-1K	90-1L	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, 61, 62	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	22, 31, 32, 41, 42, 51, 52, 61, 62	41, 42, 51, 52, 62, 72, 73	41, 42, 51, 52, 62, 72, 73
F30-4Q	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	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
F30-6Q	12, 21, 22, 31, 32	12, 21, 22, 31, 32	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
F30-6S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	12, 21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	22, 32, 42, 51, 52, 61, 62	42, 52, 62, 72, 73	52, 62, 72, 73
F40-6S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 31, 32, 41, 42, 51, 52	21, 22, 32, 41, 42, 51, 52, 61, 62	41, 42, 51, 52, 62, 72, 73	42, 52, 62, 72, 73
J60-8S	12, 21, 22, 31, 32	12, 21, 22, 31, 32	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, 61, 62	41, 42, 51, 52, 61, 62, 72, 73	42, 52, 62, 72, 73
Q60-8S	21, 22, 31, 32	12, 21, 22, 31, 32	21, 22, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 61, 62	42, 51, 52	42, 52, 62, 72, 73
S60-8S	21, 22, 32	21, 22, 32	21, 22, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 41, 42, 51, 52, 61, 62	42, 52, 62, 72, 73	52, 62, 72, 73
S80-8S	21, 22, 32	31, 32, 42	21, 22, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52, 62	42, 52, 62, 72, 73	52, 62, 72, 73
Y00-0A	11, 12, 21, 22, 31, 32	11,12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 42, 52, 61, 62	52	52, 62, 72, 73
Y00-0B	22, 32	22, 32	22, 32	22, 42, 52	42, 52	42, 52, 62	52	73
Y00-0C Y00-0D	11, 12, 21, 22, 31, 32	11, 12, 21, 22, 31, 32	21, 22, 31, 32, 41, 42	21, 22, 32, 41, 42, 51, 52	22, 32, 41, 42, 51, 52	22, 52, 62	73	73
Y00-1A Y00-1B Y00-1C	22, 32	22, 32	22, 32	42, 52	52	–	73	73
Y00-1D Y00-1E Y00-1F	22	22	22, 42	52	–	–	73	73

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

850

4ME2 outdoor support-type current transformer

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	E	2	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
											See page 55	See page 55	See page 55		See page 55	See page 55	See page 56	See page 56		See page 56	

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M E 2 2
24	125	50	4 M E 2 4
36	170	70	4 M E 2 6

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multi-ratio I_{PN} A	Thermal strength $300 \times I_{PN}$	$200 \times I_{PN}$	$100 \times I_{PN}$	Positions 6 7 – 8 9
0.5		2x 5	■		■	0 0 – 3 A
0.6		2x 10	■		■	0 1 – 3 B
1		2x 5		■		0 3 – 3 A
1.5		2x 15	■		■	0 7 – 3 D
2.5		2x 25	■		■	1 6 – 3 F
3		2x 15		■		1 7 – 3 D
5		2x 25		■		2 5 – 3 F
5		2x 50	■		■	2 5 – 3 J
7.5		2x 75	■	■	■	3 2 – 3 L
10		2x 50		■		3 6 – 3 J
10		2x 100	■		■	3 6 – 3 M
15		2x 75		■		4 3 – 3 L
15		2x 150	■		■	4 3 – 3 P
20		2x 100		■		4 8 – 3 M
20		2x 200	■		■	4 8 – 3 Q
25		2x 250	■		■	5 4 – 3 R
30		2x 150		■		5 6 – 3 P
30		2x 300	■		■	5 6 – 3 S
40		2x 200		■		6 3 – 3 Q
40		2x 400	■		■	6 3 – 3 T
50		2x 250		■		6 7 – 3 R
50		2x 500	■		■	6 7 – 3 U
60		2x 300		■		7 0 – 3 S
60		2x 600	■		■	7 0 – 3 V

6th to 9th position continued on page 54

Configuration example

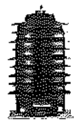
Outdoor support-type current transformer	4 M E 2
Maximum operating voltage U_m = 24 kV Rated lightning impulse withstand voltage U_p = 125 kV Rated short-duration power-frequency withstand voltage U_d = 50 kV	4
Rated short-time thermal current I_{th} = 15 kA Rated primary current I_{PN} = 2x 75 A	4 3 – 3 L

Example for Order No.: 4 M E 2 4 4 3 – 3 L ■ ■ ■ – ■ ■ ■ ■
Order codes:

2

851

Equipment Selection
4ME2 outdoor support-type current transformer



2

6th to 9th position (continued)
Rated short-time thermal current/
Rated primary current

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes		
Order No.:	4	M	E	2	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
											See page 55	See page 55	See page 55		See page 55	See page 55	See page 56	See page 56		See page 56			

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multi-ratio I_{PN} A	Thermal strength $300 \times I_{PN}$	Thermal strength $200 \times I_{PN}$	Thermal strength $100 \times I_{PN}$	Order No. positions 6 7 – 8 9
0.5	5		■		■	0 0 – 0 A
0.6	10		■		■	0 1 – 0 B
1	5			■		0 3 – 0 A
1.5	15		■		■	0 7 – 0 D
2	10			■		1 3 – 0 B
2	20		■		■	1 3 – 0 E
3	15			■		1 7 – 0 D
3	30		■		■	1 7 – 0 G
4	20			■		2 2 – 0 E
4	40		■		■	2 2 – 0 H
5	50		■		■	2 5 – 0 J
6	30			■		2 6 – 0 G
6	60		■		■	2 6 – 0 K
7.5	75		■		■	3 2 – 0 L
8	40			■		3 3 – 0 H
10	50			■		3 6 – 0 J
10	100		■		■	3 6 – 0 M
12	60			■		3 8 – 0 K
15	75			■		4 3 – 0 L
15	150		■		■	4 3 – 0 P
20	100			■		4 8 – 0 M
20	200		■		■	4 8 – 0 Q
25	250		■		■	5 3 – 0 R
30	150			■		5 6 – 0 P
30	300		■		■	5 6 – 0 S
40	200			■		6 3 – 0 Q
40	400		■		■	6 3 – 0 T
50	250			■		6 7 – 0 R
50	500		■		■	6 7 – 0 U
60	300			■		7 0 – 0 S
60	600		■		■	7 0 – 0 V
80	400			■		7 3 – 0 T
80	800		■		■	7 3 – 0 X
100	500			■		7 5 – 0 U
100	1000		■		■	7 5 – 1 A
120	600			■		7 6 – 0 V
120	1200		■		■	7 6 – 1 B

Configuration example
Outdoor support-type current transformer
(U_m = 24 kV, U_p = 125 kV, U_d = 50 kV)
Rated short-time thermal current I_{th} = 100 kA
Rated primary current I_{PN} = 1000 A

4 M E 2
4
7 5 – 1 A

Example for Order No.: 4 M E 2 4 7 5 – 1 A ■ ■ ■ – ■ ■ ■ ■
Order codes:

852

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes
Order No.: 4 M E 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Position 15: See page 56
Position 16: See page 56
Order codes: See page 56

At rated primary current I_{PN}	Thermal strength	12
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	100 x I_{PN}	0
1 2 3 4 5 6 8 10 12 15 20 30 40 50 60 80 100 120	200 x I_{PN}	2
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 x I_{PN}	3

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	3rd core Class	3rd core Factor	3rd core VA rating	Rated primary current I_{PN}: 300 x I_{PN}	200 x I_{PN}	100 x I_{PN}	10	11	12	–	13	14
0.2	FS10	5							■	■	■	C	1		–	0	A
		10							■	■	■	C	2		–	0	A
		15							■	■	■	C	3		–	0	A
		30							■	■	■	C	4		–	0	A
0.5	FS5	10							■	■	■	E	2		–	0	A
		15							■	■	■	E	3		–	0	A
		30							■	■	■	E	4		–	0	A
1	FS5	15							■	■	■	H	3		–	0	A
		30							■	■	■	H	4		–	0	A
5P	10	15							■	■	■	L	3		–	0	A
		30							■	■	■	L	4		–	0	A
		60							■	■	■	L	6		–	0	A
10P	10	15							■	■	■	Q	3		–	0	A
		30							■	■	■	Q	4		–	0	A
		60							■	■	■	Q	6		–	0	A
0.2	FS10	10	5P	10	30				■	■	■	C	2		–	4	L
		15			30				■	■	■	C	3		–	4	L
		30			60				■	■	■	C	4		–	6	L
0.5	FS5	10	5P	10	30				■	■	■	E	2		–	4	L
		15			30				■	■	■	E	3		–	4	L
		30			30				■	■	■	E	4		–	4	L
		30			60				■	■	■	E	4		–	6	L
1	FS5	15	5P	10	30				■	■	■	H	3		–	4	L
		30			30				■	■	■	H	4		–	4	L
		30			60				■	■	■	H	4		–	6	L
1	FS5	15	10P	10	30				■	■	■	H	3		–	4	Q
		30			30				■	■	■	H	4		–	4	Q
		30			60				■	■	■	H	4		–	6	Q
0.2	FS10	15	0.5	FS5	15	5P	10	15	■	■	■	Y	0		–	0	E
		15			30			30	■	■	■	Y	0		–	0	F
0.5	FS5	15	5P	10	15	5P	10	15	■	■	■	Y	0		–	0	G
		15			30			30	■	■	■	Y	0		–	0	H

■ Feasible (other combinations on request)

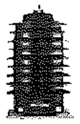
Configuration example
Outdoor support-type current transformer
(U_m = 24 kV, I_{th} = 100 kA, I_{PN} = 1000 A)
Thermal strength **300 x I_{PN}**
1st core class **10P**; instrument security factor **10**; rating **60 VA**
2nd core **without**
3rd core **without**

4 M E 2
4 7 5 – 1 A
3
Q 6 – 0 A

Example for Order No.: 4 M E 2 4 7 5 – 1 A Q 6 3 – 0 A ■ ■
Order codes:

853

Equipment Selection
4ME2 outdoor support-type current transformer



2

15th position
Rated secondary current

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 Order codes

Order No.: 4 M E 2 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Rated current for 1st core	Rated current for 2nd core	Rated current for 3rd core	13	14	15
1 A	Without	Without	0	A	A
5 A	Without	Without	0	A	B
1 A	1 A	Without			C
5 A	5 A	Without			D
1 A	5 A	Without			E
5 A	1 A	Without			F
1 A	1 A	1 A			G
5 A	5 A	5 A			H

16th position
Additional features

Options	16
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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		Order No.	Order codes
With routine test certificate in German/English		– Z	A 1 0
Size (for specification see the following page)	0	– Z	A 0 0
	1	– Z	A 0 1
	2	– Z	A 0 2
	3	– Z	A 0 3
Other special versions on request			

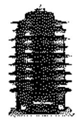
Configuration example

Outdoor support-type current transformer	4 M E 2
Maximum operating voltage U_m = 24 kV	
Rated lightning impulse withstand voltage U_p = 125 kV	
Rated short-duration power-frequency withstand voltage U_d = 50 kV	4
Rated short-time thermal current I_{th} = 100 kA	
Rated primary current I_{PN} = 1000 A	7 5 – 1 A
Thermal strength 300 x I_{PN}	3
1st core class 10P; instrument security factor 10; rating 60 VA	
2nd core without	
3rd core without	Q 6 – 0 A
Rated secondary current 1st core 5 A; 2nd core without; 3rd core without	B
Power frequency 50 Hz; marking according to IEC	1
Size 1	– Z A 0 1

Example for Order No.: 4 M E 2 4 7 5 – 1 A Q 6 3 – 0 A B 1 – Z A 0 1

Order codes: A 0 1

854

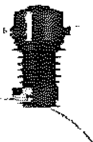


Size specification for 4ME2 transformers

Order No.	Up to 12 kV			At 24 kV		At 36 kV
	with rated short-time thermal current					
	100 x I_{PN}	200 x I_{PN}	300 x I_{PN}	100 x I_{PN}	200 x I_{PN}	100 x I_{PN}
. . . C1.-0A . . .	1	1	1	1	1	1
. . . C2.-0A . . .	1	1	1	1	1	1
. . . C3.-0A . . .	1	1	1	1	1	1
. . . C4.-0A . . .	1	1	1	1	1	1
. . . E2.-0A . . .	1	1	1	1	1	1
. . . E3.-0A . . .	1	1	1	1	1	1
. . . E4.-0A . . .	1	1	1	1	1	1
. . . H3.-0A . . .	1	1	1	1	1	1
. . . H4.-0A . . .	1	1	1	1	1	1
. . . L3.-0A . . .	1	1	1	1	1	1
. . . L4.-0A . . .	1	1	2	1	1	1
. . . L6.-0A . . .	2	2	2	1	2	1
. . . Q3.-0A . . .	1	1	1	1	1	1
. . . Q4.-0A . . .	1	1	2	1	1	1
. . . Q6.-0A . . .	2	2	2	1	2	2
. . . C2.-4L . . .	1	2	2	1	2	2
. . . C3.-4L . . .	1	1	2	1	2	2
. . . C4.-6L . . .	2	2	2	2	2	2
. . . E2.-4L . . .	1	1	2	1	2	2
. . . E3.-4L . . .	1	1	2	2	2	1
. . . E4.-4L . . .	1	2	2	2	2	1
. . . E4.-6L . . .	2	2	2	2	2	2
. . . H3.-4L . . .	1	2	2	1	2	2
. . . H4.-4L . . .	1	2	2	1	2	2
. . . H4.-6L . . .	2	2	2	2	2	2
. . . H3.-4Q . . .	1	2	2	1	2	2
. . . H4.-4Q . . .	1	2	2	1	2	2
. . . H4.-6Q . . .	2	2	2	2	2	2
. . . Y0.-0E . . .	2	2	2	1	2	2
. . . Y0.-0F . . .	2	2	2	2	2	2
. . . Y0.-0G . . .	2	2	2	2	2	2
. . . Y0.-0H . . .	2	2	2	2	2	2

855

Equipment Selection
4ME3 outdoor support-type current transformer



4ME3 outdoor support-type current transformer

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	E	3	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
											See page 60	See page 60	See page 60		See page 60	See page 60	See page 61	See page 61		See page 61	

5th position
Operating voltage (maximum value)

Operating voltage U_m kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Order No.
12	75	28	4 M E 3 2
24	125	50	4 M E 3 4
36	170	70	4 M E 3 6
52	250	95	4 M E 3 8

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

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multiratio I_{PN} A		Thermal strength $300 \times I_{PN}$	$200 \times I_{PN}$	$100 \times I_{PN}$	Order No.
0.5		2x	5	■		■	0 0 – 3 A
0.6		2x	10	■		■	0 1 – 3 B
1		2x	5		■		0 3 – 3 A
1.5		2x	15	■		■	0 7 – 3 D
2.5		2x	25	■		■	1 6 – 3 F
3		2x	15		■		1 7 – 3 D
5		2x	25		■		2 5 – 3 F
5		2x	50	■		■	2 5 – 3 J
7.5		2x	75	■	■	■	3 2 – 3 L
10		2x	50		■		3 6 – 3 J
10		2x	100	■		■	3 6 – 3 M
15		2x	75		■		4 3 – 3 L
15		2x	150	■		■	4 3 – 3 P
20		2x	100		■		4 8 – 3 M
20		2x	200	■		■	4 8 – 3 Q
25		2x	250	■		■	5 4 – 3 R
30		2x	150		■		5 6 – 3 P
30		2x	300	■		■	5 6 – 3 S
40		2x	200		■		6 3 – 3 Q
40		2x	400	■		■	6 3 – 3 T
50		2x	250		■		6 7 – 3 R
50		2x	500	■		■	6 7 – 3 U
60		2x	300		■		7 0 – 3 S
60		2x	600	■		■	7 0 – 3 V

6th to 9th position continued on page 59

Configuration example
Outdoor support-type current transformer
Maximum operating voltage U_m = 52 kV
Rated lightning impulse withstand voltage U_p = 250 kV
Rated short-duration power-frequency withstand voltage U_d = 95 kV
Rated short-time thermal current I_{th} = 25 kA
Rated primary current I_{PN} = 2x 250 A

4 M E 3 | 8 | 5 4 – 3 R

Example for Order No.: 4 M E 3 8 5 4 – 3 R ■ ■ ■ – ■ ■ ■ ■
Order codes:

856

Equipment Selection

4ME3 outdoor support-type current transformer

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes
Order No.:	4	M	E	3	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■
											See page 60	See page 60	See page 60		See page 60	See page 60	See page 61	See page 61		See page 61	

6th to 9th position (continued)
Rated short-time thermal current/ Rated primary current

Rated short-time thermal current I_{th} kA	Rated primary current I_{PN} A	Rated primary current, with primary multiratio I_{PN} A	Thermal strength $300 \times I_{PN}$	Thermal strength $200 \times I_{PN}$	Thermal strength $100 \times I_{PN}$	Position 6	Position 7	–	Position 8	Position 9
0.5	5		■		■	0	0	–	0	A
0.6	10		■		■	0	1	–	0	B
1	5			■		0	3	–	0	A
1.5	15		■		■	0	7	–	0	D
2	10			■		1	3	–	0	B
2	20		■		■	1	3	–	0	E
3	15			■		1	7	–	0	D
3	30		■		■	1	7	–	0	G
4	20			■		2	2	–	0	E
4	40		■		■	2	2	–	0	H
5	50		■		■	2	5	–	0	J
6	30			■		2	6	–	0	G
6	60		■		■	2	6	–	0	K
7.5	75		■		■	3	2	–	0	L
8	40			■		3	3	–	0	H
10	50			■		3	6	–	0	J
10	100		■		■	3	6	–	0	M
12	60			■		3	8	–	0	K
15	75			■		4	3	–	0	L
15	150		■		■	4	3	–	0	P
20	100			■		4	8	–	0	M
20	200		■		■	4	8	–	0	Q
25	250		■		■	5	3	–	0	R
30	150			■		5	6	–	0	P
30	300		■		■	5	6	–	0	S
40	200			■		6	3	–	0	Q
40	400		■		■	6	3	–	0	T
50	250			■		6	7	–	0	R
50	500		■		■	6	7	–	0	U
60	300			■		7	0	–	0	S
60	600		■		■	7	0	–	0	V
80	400			■		7	3	–	0	T
80	800		■		■	7	3	–	0	X
100	500			■		7	5	–	0	U
100	1000		■		■	7	5	–	1	A
120	600			■		7	6	–	0	V
120	1200		■		■	7	6	–	1	B
150	1500				■	7	8	–	1	D
200	2000				■	8	2	–	1	F
250	2500				■	8	4	–	1	G
300	3000				■	8	5	–	1	H

Configuration example

Outdoor support-type current transformer
(U_m = 52 kV, U_p = 250 kV, U_d = 95 kV)
Rated short-time thermal current I_{th} = 100 kA
Rated primary current I_{PN} = 1000 A

4 M E 3 | 8 | 7 5 – 1 A

Example for Order No.: 4 M E 3 8 7 5 – 1 A ■ ■ ■ – ■ ■ ■ ■
Order codes:

2

857

Equipment Selection
4ME3 outdoor support-type current transformer

10th to 14th position
Core versions

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – 13 14 15 16 – Order codes

Order No.: 4 M E 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

See page 61 · See page 61 · See page 61

At rated primary current I_{PN}	Thermal strength	Position 12
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}	0
1 2 3 4 5 6 8 10 12 15 20 30 40 50 60 80 100 120	200 x I_{PN}	2
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 x I_{PN}	3

1st core Class	1st core Factor	1st core VA rating	2nd core Class	2nd core Factor	2nd core VA rating	3rd core Class	3rd core Factor	3rd core VA rating	Rated primary current I_{PN} 300 x I_{PN}	200 x I_{PN}	100 x I_{PN}	10	11	12	–	13	14
0.2	FS10	5							■	■	■	C	1		–	0	A
		10							■	■	■	C	2		–	0	A
		15							■	■	■	C	3		–	0	A
		30							■	■	■	C	4		–	0	A
0.5	FS5	10							■	■	■	E	2		–	0	A
		15							■	■	■	E	3		–	0	A
		30							■	■	■	E	4		–	0	A
1	FS5	15							■	■	■	H	3		–	0	A
		30							■	■	■	H	4		–	0	A
5P	10	15							■	■	■	L	3		–	0	A
		30							■	■	■	L	4		–	0	A
		60							■	■	■	L	6		–	0	A
10P	10	15							■	■	■	Q	3		–	0	A
		30							■	■	■	Q	4		–	0	A
		60							■	■	■	Q	6		–	0	A
0.2	FS10	10	5P	10	30				■	■	■	C	2		–	4	L
		15			30				■	■	■	C	3		–	4	L
		30			60				■	■	■	C	4		–	6	L
0.5	FS5	10	5P	10	30				■	■	■	E	2		–	4	L
		15			30				■	■	■	E	3		–	4	L
		30			30				■	■	■	E	4		–	4	L
		30			60				■	■	■	E	4		–	6	L
1	FS5	15	5P	10	30				■	■	■	H	3		–	4	L
		30			30				■	■	■	H	4		–	4	L
		30			60				■	■	■	H	4		–	6	L
1	FS5	15	10P	10	30				■	■	■	H	3		–	4	Q
		30			30				■	■	■	H	4		–	4	Q
		30			60				■	■	■	H	4		–	6	Q
0.2	FS10	15	0.5	FS5	15	5P	10	15	■	■	■	Y	0		–	0	E
		15			30			30	■	■	■	Y	0		–	0	F
0.5	FS5	15	5P	10	15	5P	10	15	■	■	■	Y	0		–	0	G
		15			30			30	■	■	■	Y	0		–	0	H

■ Feasible (other combinations on request)

Configuration example
Outdoor support-type current transformer
(U_m = 52 kV, I_{th} = 100 kA, I_{PN} = 1000 A)
Thermal strength 300 x I_{PN}
1st core class 10P; instrument security factor 10; rating 60 VA
2nd core without
3rd core without

4 M E 3
8 7 5 – 1 A
3
Q 6 – 0 A

Example for Order No.: 4 M E 3 8 7 5 – 1 A Q 6 3 – 0 A ■ ■
Order codes:

85B

Equipment Selection

4ME3 outdoor support-type current transformer

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes		
Order No.:	4	M	E	3	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■

15th position
Rated secondary current

Rated current for 1st core	Rated current for 2nd core	Rated current for 3rd core	13	14	15
1 A	Without	Without	0	A	A
5 A	Without	Without	0	A	B
1 A	1 A	Without			C
5 A	5 A	Without			D
1 A	5 A	Without			E
5 A	1 A	Without			F
1 A	1 A	1 A			G
5 A	5 A	5 A			H

2

16th position
Additional features

Options	16
50 Hz, VDE marking	0
50 Hz, IEC marking	1
50 Hz, VDE marking with approval 1)	2
60 Hz, IEC marking	6
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

Optionen			Order codes		
With routine test certificate in German/English	–	Z	A	1	0
Other special versions on request					

Configuration example

Outdoor support-type current transformer	4 M E 3
Maximum operating voltage U_m = 52 kV	
Rated lightning impulse withstand voltage U_p = 250 kV	
Rated short-duration power-frequency withstand voltage U_d = 95 kV	8
Rated short-time thermal current I_{th} = 100 kA	
Rated primary current I_{PN} = 1000 A	7 5 – 1 A
Thermal strength 300 x I_{PN}	3
1st core class 10P; instrument security factor 10; rating 60 VA	
2nd core without	
3rd core without	Q 6 – 0 A
Rated secondary current 1st core 5 A; 2nd core without; 3rd core without	B
Power frequency 50 Hz; marking according to IEC	1

Example for Order No.: 4 M E 3 8 7 5 – 1 A Q 6 3 – 0 A B 1

Order codes:

859

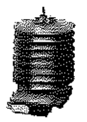
Equipment Selection

Product overview of voltage transformers

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

Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■ – ★ ■ ■ ■

Illustration		Type of design	Order No.	
	R-HG24-058.eps	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**
	R-HG24-059.eps	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**
	R-HG24-063.eps	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**
	R-HG24-064.eps	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 6	Selection from page **63ff**
	R-HG24-065.eps	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**
	R-HG24-055.eps	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	4 M S 4	Selection from page **63ff**
	R-HG24-066.eps	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**
	R-HG24-067.eps	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.: 4 M S 3 ■ ■ ■ – ■ ■ ■ ■ ■ – ■ ■ ■ ■

Order codes:

860

Maximum operating voltage U_{max} = 52 kV

12 kV

50/60 Hz

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12		Order codes
Order No.:	4	M	■	■	■	■	■	–	■	■	■	■	■	– ★	■ ■ ■
									See page 65	See page 65	See page 66	See page 66	See page 67	See page 67	

Maximum operating voltage U_{max} kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated primary voltage U_{prim} kV	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	Positions 5 6 7
12	75	28	3.3/√3	■		■						2 0 8
			3.3		■		■					2 0 8
			3.6/√3	■		■						2 7 0
			3.6		■		■					2 7 0
			4.8/√3	■		■						2 7 1
			4.8		■		■					2 7 1
			5 /√3	■		■		■		■		2 1 3
			5		■		■		■		■	2 1 3
			6 /√3	■		■		■		■		2 1 5
			6		■		■		■		■	2 1 5
			6.6/√3	■		■		■		■		2 1 7
			6.6		■		■		■		■	2 1 7
			7.2/√3	■		■						2 2 2
			7.2		■		■					2 2 2
			10 /√3	■		■		■		■		2 2 7
			10		■		■		■		■	2 2 7
			11 /√3	■		■		■		■		2 3 0
			11		■		■		■		■	2 3 0
			6–10 /√3			■						2 6 1
			6–10				■					2 6 1
			Others	■	■	■	■					2 9 9

Configuration example
Voltage transformer — 4 M
Outdoor design, single-phase — S 3
Rated primary voltage U_{prim} = 6.6/√3 kV — 2 1 7

Example for Order No.: 4 M S 3 2 1 7 – ■ ■ ■ ■ ■
Order codes:

2

861

Equipment Selection
Voltage transformers

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 Order codes

Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ★ ■ ■ ■

Positions 8, 9: See page 65 · Positions 10, 11: See page 66 · Position 12: See page 67 · ★: See page 67

24 kV
50/60 Hz

Maximum operating voltage U_{max} kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated primary voltage U_{prim} kV	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	5	6	7
24	125	50	13.8/√3	■		■		■		■		4	3	5
			13.8		■		■		■		■	4	3	5
			15 /√3	■		■		■		■		4	3	8
			15		■		■		■		■	4	3	8
			17.5/√3	■		■		■		■		4	7	2
			17.5		■		■		■		■	4	7	2
			20 /√3	■		■		■		■		4	4	2
			20		■		■		■		■	4	4	2
			22 /√3	■		■		■		■		4	4	3
			22		■		■		■		■	4	4	3
			10–20 /√3	■		■		■		■		4	6	5
			10–20		■		■		■		■	4	6	5
			15–20 /√3	■		■						4	6	2
			15–20		■		■					4	6	2
			Others	■	■	■	■					4	9	9

36 kV
50/60 Hz

U_{max} kV	U_p kV	U_d kV	U_{prim} kV	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	5	6	7
36	170	70	20 /√3			■						6	4	2
			20				■					6	4	2
			22 /√3			■						6	4	3
			22				■					6	4	3
			25 /√3			■		■		■		6	4	5
			25				■		■		■	6	4	5
			30 /√3			■		■		■		6	4	6
			30				■		■		■	6	4	6
			33 /√3			■		■		■		6	4	7
			33				■		■		■	6	4	7
			35 /√3			■		■		■		6	4	8
			35				■		■		■	6	4	8
			20–30 /√3			■						6	6	4
			20–30				■					6	6	4
			Others			■	■					6	9	9

Configuration example
Voltage transformer → 4 M
Outdoor design, single-phase → S 3
Rated primary voltage U_{prim} = 20/√3 kV → 4 4 2

Example for Order No.: 4 M S 3 4 4 2 – ■ ■ ■ ■ ■

Order codes:

B62

52 kV
50/60 Hz

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12		Order codes
Order No.:	4	M	■	■	■	■	■	–	■	■	■	■	■	– ★	■ ■ ■
											See page 66	See page 66	See page 67	See page 67	

Maximum operating voltage U_{max} kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated primary voltage U_{prim} kV	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	5	6	7
52	250	95	$33/\sqrt{3}$					■				8	4	7
			$35/\sqrt{3}$					■				8	4	8
			$40/\sqrt{3}$					■				8	5	0
			$45/\sqrt{3}$					■				8	5	1

8th position
Auxiliary residual voltage winding

Voltage V	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	8
Without auxiliary winding	■	■	■	■	■	■	■	■	0
100/3	■		■		■		■		1
110/3	■		■		■		■		2
120/3	■		■		■		■		3

9th position
Rated secondary voltage

Voltage V	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	9
$100/\sqrt{3}$	■		■		■		■		A
100		■		■		■		■	A
$110/\sqrt{3}$	■		■		■		■		B
110		■		■		■		■	B
$120/\sqrt{3}$	■		■		■		■		C
120		■		■		■		■	C

Configuration example

Voltage transformer	4 M
Outdoor design, single-phase	S 3
Rated primary voltage with multi-ratio $U_{prim} = 35/\sqrt{3}$ kV	8 4 8 –
Without auxiliary residual voltage winding	0
Rated secondary voltage U_{sec} = 110 V	B

Example for Order No.: 4 M S 3 8 4 8 – 0 B ■ ■ ■
Order codes:

2

B65

Equipment Selection
Voltage transformers

10th/11th position
Rated output of measuring winding and accuracy class

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 | Order codes
Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ ... – ★ | ■ ■ ■

Voltage level U_{max} kV	Class %	Rated output S_N VA	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	10	11
12	0.2	20	■	■							E	1
	0.2	30			■	■	■	■	■	■	G	1
	0.5	50	■	■							K	2
	0.5	90						■		■	N	2
	0.5	100			■	■	■		■		P	2
	1	100	■	■							P	3
	1	180						■		■	S	3
	1	200			■	■	■		■		T	3
24	0.2	20	■	■							E	1
	0.2	25						■		■	F	1
	0.2	30					■		■		G	1
	0.2	45			■	■					J	1
	0.5	50	■	■							K	2
	0.5	75						■		■	M	2
	0.5	100			■	■	■		■		P	2
	1	100	■	■							P	3
	1	150						■		■	R	3
	1	200			■	■	■		■		T	3
36	0.2	25					■		■		F	1
	0.2	50			■	■					K	1
	0.2	60						■		■	L	1
	0.5	75					■		■		M	2
	0.5	100			■	■					P	2
	0.5	150						■		■	R	2
	1	150					■		■		R	3
	1	200			■	■					T	3
	1	400						■		■	V	3
52	0.2	60					■		■		L	1
	0.5	180					■		■		S	2
	1	400					■		■		V	3

See page 67

See page 67

2

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

4 M
S 3 8 4 8 – 0 B
S 2

Example for Order No.: 4 M S 3 8 4 8 – 0 B S 2 ■
Order codes:

B64

Equipment Selection
Voltage transformers

12th position
Additional features

Position: 1 2 3 4 5 6 7 – 8 9 10 11 12 – ★ Order codes

Order No.: 4 M ■ ■ ■ ■ ■ – ■ ■ ■ ■ ■ – ★ ■ ■ ■

Options	4MR1	4MR2	4MR5	4MR6	4MS3	4MS4	4MS5	4MS6	12
50 Hz, VDE marking	■	■	■	■	■	■	■	■	0
50 Hz, IEC marking	■	■	■	■	■	■	■	■	1
50 Hz, VDE marking with approval 1)	■	■	■	■	■	■	■	■	2
60 Hz, IEC marking	■	■	■	■	■	■	■	■	6
Other features on request	■	■	■	■	■	■	■	■	9

1) Only for class 0.2 and 0.5

Additional equipment

Options	Type 4MR1 – single-phase	Type 4MR2 – double-phase	Type 4MR5 – single-phase	Type 4MR6 – double-phase	Type 4MS3 – single-phase	Type 4MS4 – double-phase	Type 4MS5 – single-phase	Type 4MS6 – double-phase	Order codes
With routine test certificate in German/English	■	■	■	■	■	■	■	■	– Z A 1 0

Configuration example

Voltage transformer	4 M
Outdoor design, single-phase, cast-resin insulated	S 3
Rated primary voltage with multi-ratio $U_{prim} = 35/\sqrt{3}$ kV	8 4 8 –
Without auxiliary residual voltage winding	0
Rated secondary voltage U_{sec} = **110 V**	B
Rated output of measuring winding **180 VA**	
Accuracy class **0.5**	S 2
Additional features **50 Hz**, IEC marking	1
With routine test certificate in German/English	– Z A 1 0

Example for Order No.: 4 M S 3 8 4 8 – 0 B S 2 1 – Z

Order codes: A 1 0

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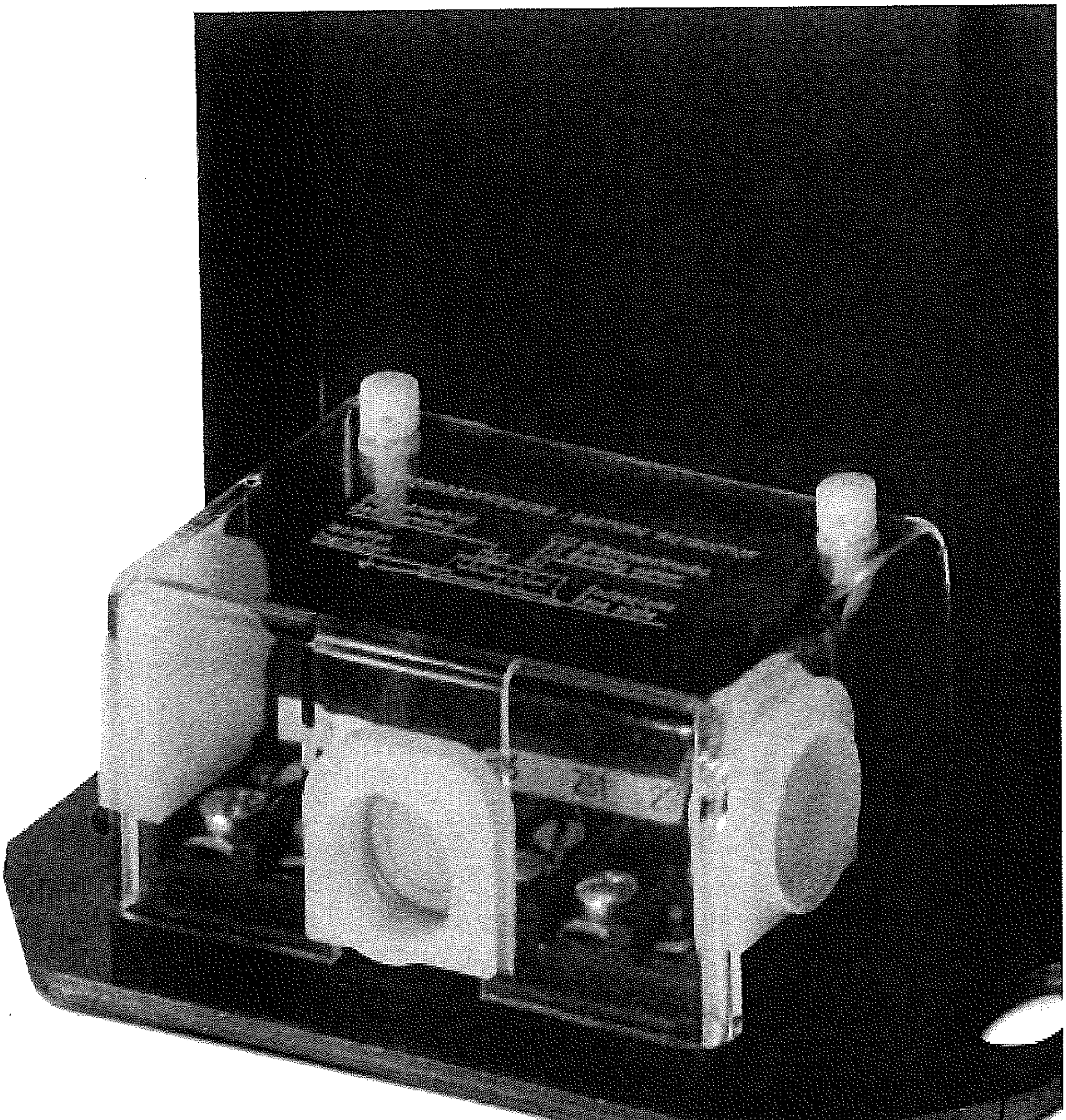

R-HG24-068.tif

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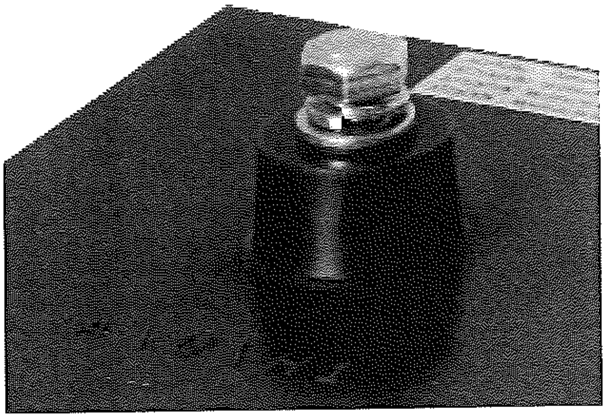

R-HG11-069.tif

Primary connection terminal of 4MR12 voltage transformer

3

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Technical Data

Electrical data, dimensions and weights of current transformers

Order No.	Operating voltage (maximum value) U_m kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated lightning impulse withstand voltage U_p kV	Rated frequency Hz	Rated primary current I_{PN} A	Multi-ratio	Secondary current I_{SN} kA	Maximum rated continuous thermal current x I_{PN}	Rated short-time thermal current (minimum 100 x I_{PN}) I_{th} kA	Rated dynamic current (I_{dyn} 2.5 x I_{th}) I_{dyn} kA	Number of cores maximum	Short-time load (mechanical) N	Weight kg	Catalog dimension drawing
4MA72	12	28	75	50/60	20 to 2500	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	20	1
4MA72...Z F18	17.5	38	95	50/60	20 to 2500	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	20	1
4MA74	24	50	125	50/60	20 to 2500	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	25	2
4MA76	36	70	170	50/60	20 to 2000	2 x 20 to 2 x 600	1/5	1.2	80	120	–	5000	35	3
4MB12	12	28	75	50/60	1500 to 4000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	3000	19 or 26	4
4MB13	12	28	75	50/60	1500 to 6000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	3000	34	4
4MB14	24[1]	50[1]	125[1]	50/60	1500 to 4000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	3000	26	4
4MC22	12	28	75	50/60	150 to 3000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	5000	12 to 48	5
4MC24	24	50	125	50/60	150 to 3000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	5000	28 to 48	5
4MC26	36	70	170	50/60	150 to 3000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	3	5000	35 to 48	5
4MC32	12	28	75	50/60	2000 to 10000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	4	5000	32 to 150	6
4MC34	24	50	125	50/60	2000 to 10000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	4	5000	32 to 150	7
4MC36	36	70	170	50/60	2000 to 10000	only possible on secondary side	1/5	1.2	100 x I_{PN}	practically unlimited	4	5000	32 to 150	8
4ME22	12	28	75	50/60	5 to 1200	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x I_{th}	3	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 x I_{th}	3	2400	22	9/10
4ME26	36	70	170	50/60	5 to 1200	2 x 5 to 2 x 600	1/5	1.2	80	2.5 x I_{th}	3	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 I_{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	5000	65	15

1) Also possible on request: U_m = 17.5, U_d = 38 kV and U_p = 75 kV

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Size specification for 4MC2 transformers

10th to 14th position of Order No.	6th to 9th position of Order No.												
	43-0P	48-0Q	56-0S	63-0T	67-0U	70-0V	73-0X	75-1A	76-1B	78-1D	82-1F	84-1G	86-1H
	Sizes of 4MC22 transformers												
C20-0A	1	0	0	0	0	0	0	0	0	0	0	0	21
C30-0A	2	0	0	0	0	0	0	0	0	0	0	0	21
E30-0A	1	0	0	0	0	0	0	0	0	0	0	0	21
E40-0A	2	0	0	0	0	0	0	0	0	0	0	0	21
H30-0A	0	0	0	0	0	0	0	0	0	0	0	0	21
H40-0A	1	2	2	2	2	2	2	2	2	2	2	2	21
Q30-0A	2	1	0	0	0	0	0	0	0	0	0	0	21
Q40-0A	2	1	1	1	0	0	0	0	0	0	0	0	21
Q60-0A	21	3	2	1	1	0	0	0	1	1	1	1	21
C20-4Q	3	2	1	0	0	0	0	0	0	0	0	0	21
C30-4Q	3	2	1	1	0	0	0	0	0	0	0	0	21
E30-3Q	3	2	1	0	0	0	0	0	0	0	0	0	21
E30-4Q	3	2	1	0	0	0	0	0	0	0	0	0	21
E40-4Q	3	2	1	0	0	0	0	0	0	0	0	0	21
E40-6Q	–	21	3	2	2	1	1	1	1	2	2	2	21
H30-3Q	1	1	0	0	0	0	0	0	0	0	0	0	21
H30-4Q	2	2	1	0	0	0	0	0	0	0	0	0	21
H40-4Q	2	2	1	0	0	0	0	0	0	0	0	0	21
H40-6Q	–	21	2	2	1	1	1	1	1	2	2	2	21
	Sizes of 4MC24 transformers												
C20-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
C30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
E30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
E40-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
H30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
H40-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
Q30-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
Q40-0A	1	1	1	1	1	1	1	1	1	1	1	11	11
Q60-0A	11	2	1	1	1	1	1	1	1	1	1	11	11
C20-4Q	2	1	1	1	1	1	1	1	1	1	1	11	11
C30-4Q	2	1	1	1	1	1	1	1	1	1	1	11	11
E30-3Q	2	2	1	1	1	1	1	1	1	1	1	11	11
E30-4Q	2	2	1	1	1	1	1	1	1	1	1	11	11
E40-4Q	2	2	1	1	1	1	1	1	1	1	1	11	11
E40-6Q	–	11	2	1	1	1	1	1	1	1	1	11	11
H30-3Q	1	1	1	1	1	1	1	1	1	1	1	11	11
H30-4Q	1	1	1	1	1	1	1	1	1	1	1	11	11
H40-4Q	2	1	1	1	1	1	1	1	1	1	1	11	11
H40-6Q	–	11	2	1	1	1	1	1	1	1	1	11	11
	Sizes of 4MC26 transformers												
C20-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
C30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
E30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
E40-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
H30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
H40-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
Q30-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
Q40-0A	1	1	1	1	1	1	1	1	1	1	01	01	01
Q60-0A	–	01	1	1	1	1	1	1	1	1	01	01	01
C20-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
C30-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E30-3Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E30-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E40-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
E40-6Q	–	–	1	1	1	1	1	1	1	1	01	01	01
H30-3Q	1	1	1	1	1	1	1	1	1	1	01	01	01
H30-4Q	1	1	1	1	1	1	1	1	1	1	01	01	01
H40-4Q	01	1	1	1	1	1	1	1	1	1	01	01	01
H40-6Q	–	–	1	1	1	1	1	1	1	1	01	01	01

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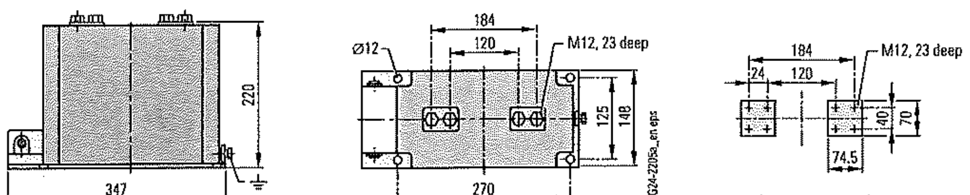
Technical Data

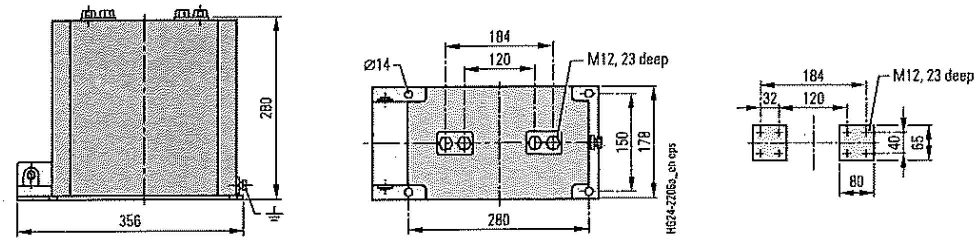
Electrical data, dimensions and weights of current transformers

Dimension drawings for current transformers



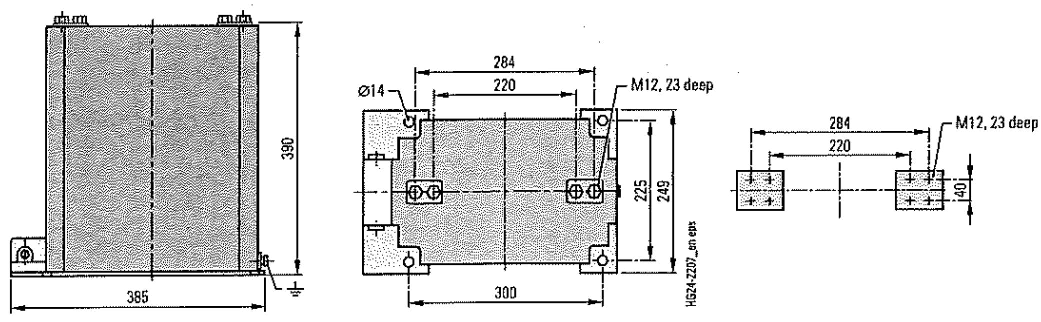
Primary connection ≥ 1500 A

Dimension drawing 1



Dimension drawing 2

3



Dimension drawing 3

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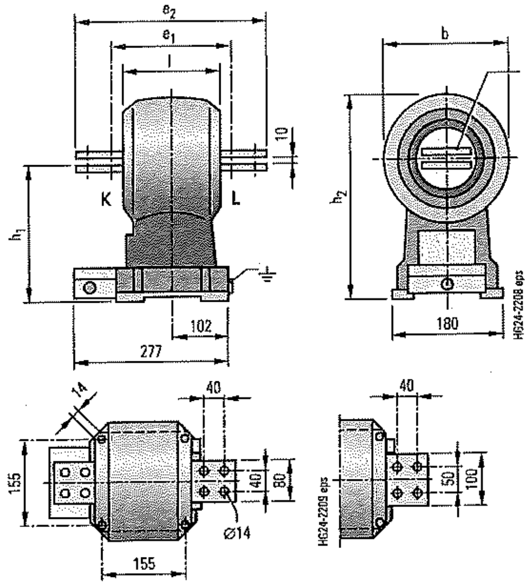
Technical Data

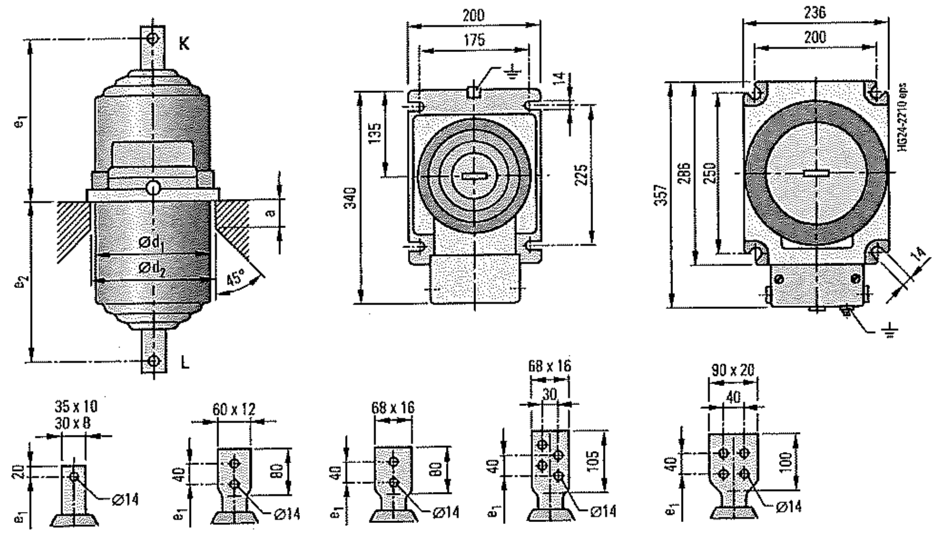
Electrical data, dimensions and weights of current transformers



Type	b	e_1	e_2	h_1	h_2	l
4MB12, size 1	214	210	350	235	342	176
4MB12, size 2	260	230	350	295	425	196
4MB13	273	–	–	288	425	300
4MB14	260	230	350	295	425	196

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

Dimension drawing 4



Dimension drawing 5

Type	Size	a	d_1	d_2	e_1			e_2			Weight
		max. mm	mm	mm	up to 1500 A mm	2000 A mm	up to 3000 A[1] mm	up to 1500 A mm	2000 A mm	up to 3000 A[1] mm	approx. kg
4MC22	0	50	180	185	190	195	215	150	155	175	12 to 18
	1	60	180	185	190	195	215	210	215	235	16 to 22
	2	115	180	185	255	260	280	270	275	295	28 to 32
	3	195	180	185	315	320	340	330	335	355	35 to 40
	21	150	230	235	280	285	315	290	295	325	40 to 48
4MC24	1	60	180	185	255	260	280	270	275	295	28 to 32
	2	140	180	185	315	320	340	330	335	355	35 to 40
	11	100	230	235	280	285	315	290	295	325	40 to 48
4MC26	1	60	180	185	315	320	340	330	335	355	35 to 40
	01	50	230	253	280	285	315	290	295	325	40 to 48

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

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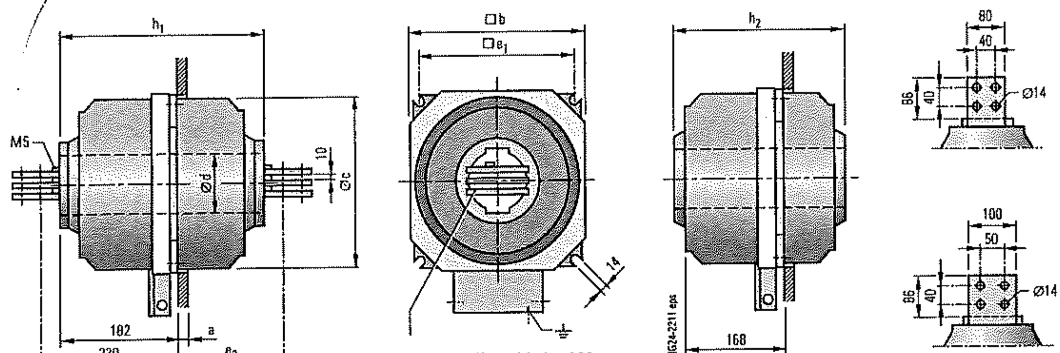
Technical Data

Electrical data, dimensions and weights of current transformers



Bars re-adjustable by 90°

Dimension drawing 6

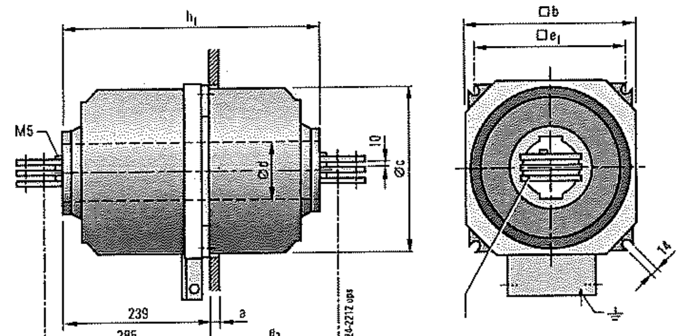
Size	a_{max}	b	Øc	Ød	e_1	e_2	h_1	h_2
11	10	295	278	115	255	175	313	285
12	60	295	278	115	255	250	288	360
21	10	370	356	115	325	175	313	285
22	60	370	356	115	325	250	288	360
31	10	370	356	155	325	–	–	285
32	60	370	356	155	325	–	–	360
41	10	440	440	205	490	–	–	285
42	60	440	440	205	490	–	–	360
51	10	530	530	297	490	–	–	285
52	60	530	530	297	490	–	–	360
61	10	530	530	310	490	–	–	–
62	60	530	530	310	490	–	–	–
72	10	650	650	380	600	–	–	–
73	60	650	650	380	600	–	–	–

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

3



Bars re-adjustable by 90°

Dimension drawing 7

Size	a_{max}	b	Øc	Ød	e_1	e_2	h_1	h_2
11	10	295	278	115	255	230	427	399
12	60	295	278	115	255	305	502	474
21	10	370	356	115	325	230	427	399
22	60	370	356	115	325	305	50	474
31	10	370	356	155	325	–	–	399
32	60	370	356	155	325	–	–	474
41	10	440	440	205	490	–	–	399
42	60	440	440	205	490	–	–	474
51	10	530	530	297	490	–	–	399
52	60	530	530	297	490	–	–	474
61	10	530	530	310	490	–	–	399
62	60	530	530	310	490	–	–	474
72	10	650	650	380	600	–	–	–
73	60	650	650	380	600	–	–	–

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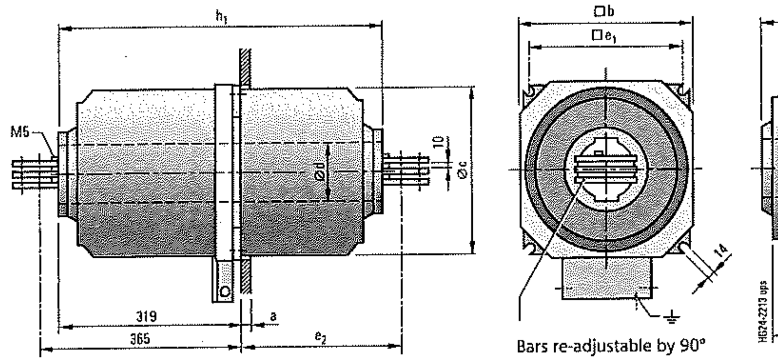
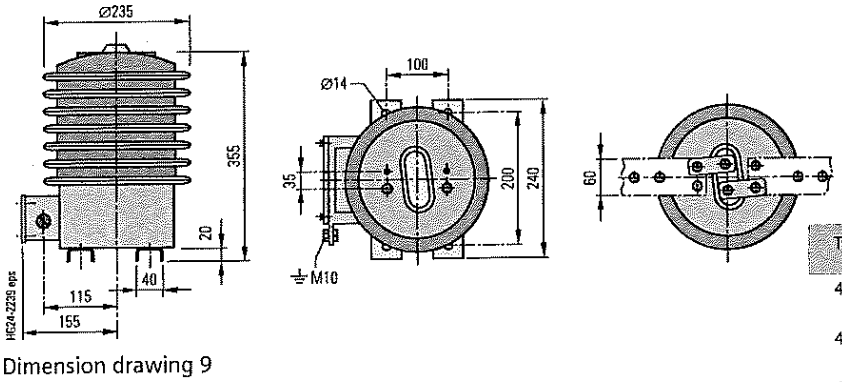
Technical Data

Electrical data, dimensions and weights of current transformers



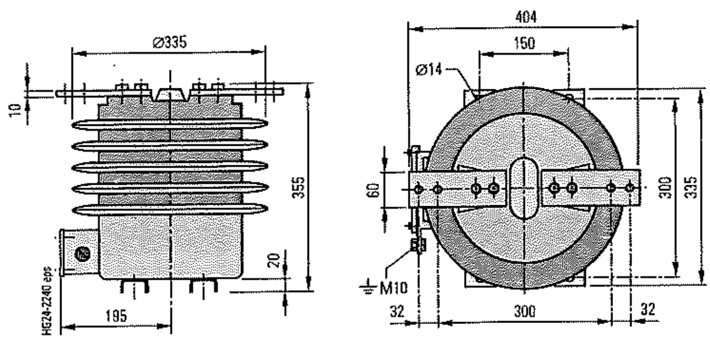
Dimension drawing 8

Size	a_{max}	b	Øc	Ød	e_1	e_2	h_1	h_2
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
31	10	370	356	155	325	–	–	285
32	60	370	356	155	325	–	–	360
41	10	440	440	205	490	–	–	285
42	60	440	440	205	490	–	–	360
51	10	530	530	297	490	–	–	285
52	60	530	530	297	490	–	–	360
61	10	530	530	310	490	–	–	–
62	60	530	530	310	490	–	–	–
72	10	650	650	380	600	–	–	–
73	60	650	650	380	600	–	–	–



Dimension drawing 9

Type	Arcing distance	Creepage distance
4ME22	229	486
	310	400
4ME24	229	486
	440	1010
4ME26	405	945
	440	1010



Dimension drawing 10

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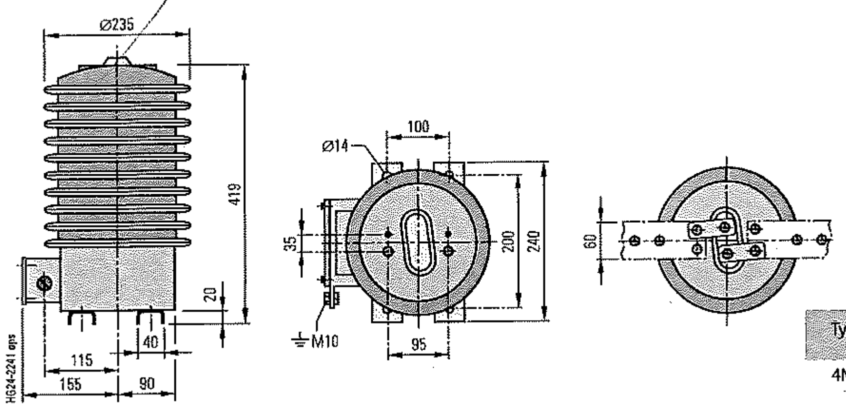
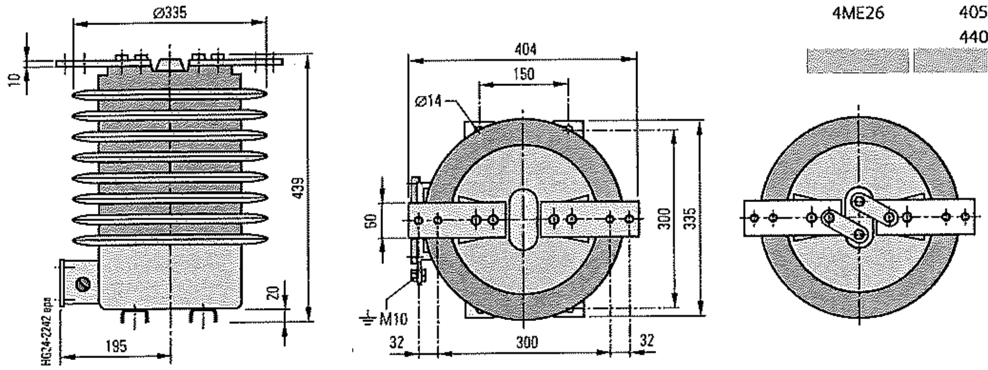
Technical Data
Electrical data, dimensions and weights of current transformers

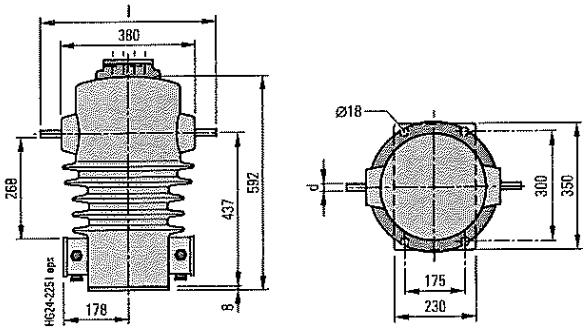


Dimension drawing 11

Type	Arcing distance	Creepage distance
4ME22	229	486
	310	400
4ME24	229	486
	440	1010
4ME26	405	945
	440	1010



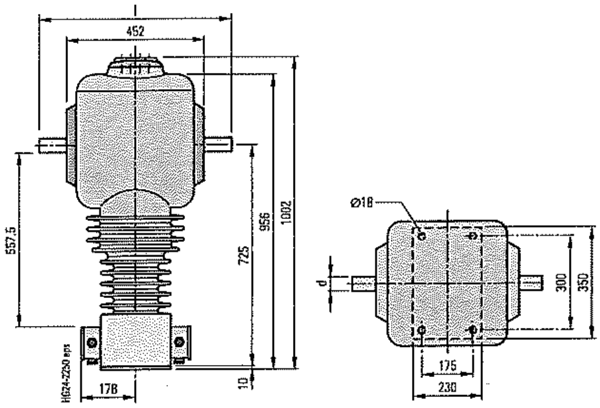
Dimension drawing 12



Dimension drawing 13

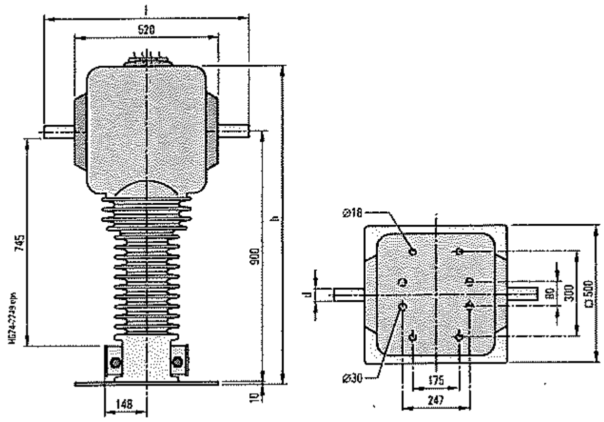
I_{PN}	d	l	Arcing distance	Creepage distance
Up to 600 A	20	500	268	665
600 to 1250 A	30	560	268	665
1250 to 2000 A	42	600	268	665
2000 to 3000 A	48	620	268	665

B 24



I_{PN}	d	l	Arcing distance	Creepage distance
Up to 600 A	20	572	557.5	1290
600 to 1250 A	30	632	557.5	1290
1250 to 2000 A	42	672	557.5	1290
2000 to 3000 A	48	692	557.5	1290

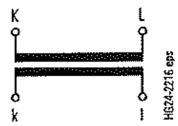
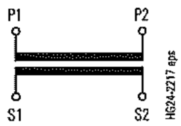
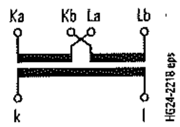
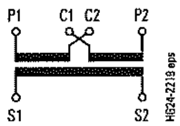
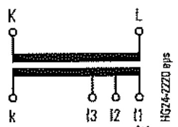
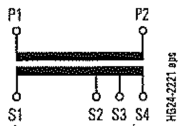
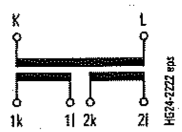
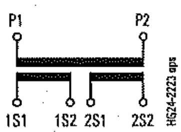
Dimension drawing 14



I_{PN}	d	l	h	Arcing distance	Creepage 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

Dimension drawing 15

Terminal designations of current transformers

Transformer design	Designation of connection terminals acc. to VDE	Designation of connection terminals acc. to IEC	Example for rated current data
1 primary winding 1 secondary winding	 K L k l (HG24-2216 eps)	 P1 P2 S1 S2 (HG24-2217 eps)	100/1 A
2 equivalent primary windings 1 secondary winding	 Ka Kb La Lb k l (HG24-2218 eps)	 P1 C1 C2 P2 S1 S2 (HG24-2219 eps)	2 x 100/1 A
	with primary multi-ratio		
1 primary winding 1 secondary winding with tappings	 K L k l3 l2 l1 (HG24-2220 eps)	 P1 P2 S1 S2 S3 S4 (HG24-2221 eps)	1000–800 ... 200/1A
	with secondary multi-ratio, highest rated current at l1 or S4		
1 primary winding 2 or more secondary windings on separate cores	 K L 1k 1l 2k 2l (HG24-2222 eps)	 P1 P2 1S1 1S2 2S1 2S2 (HG24-2223 eps)	100/1/1 A

3

В 75

Technical Data

Electrical data, dimensions and weights of voltage transformers

Order No.	Operating voltage (maximum value) U_m kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated lightning impulse withstand voltage U_P kV	Rated frequency Hz	Maximum rated primary voltage U_{PN} kV	Multi-ratio U_{SN} kV	Thermal limiting output S_{th} VA	Rated voltage factor (8h)	Rated thermal limiting output of the residual voltage winding VA/A	Short-time load (mechanical) N	Weight kg	Catalog dimension drawing
4MR12	12	28	75	50/60	$11.5/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	350	1.9	230/4	–	18	16
4MR14	24	50	125	50/60	$22/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	500	1.9	230/4	–	28	16
4MR22	12	28	75	50/60	11.5	100; 110; 120	400	–	–	–	18	17
4MR24	24	50	125	50/60	22	100; 110; 120	400	–	–	–	30	17
4MR52	12	28	75	50/60	$11.5/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	600	1.9	350/6	–	25	18
4MR54	24	50	125	50/60	$22/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	600	1.9	350/6	–	35	18
4MR56	36	70	170	50/60	$35/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	800	1.9	350/6	–	60	18
4MR62	12	28	75	50/60	11.5	100; 110; 120	600	–	–	–	25	19
4MR64	24	50	125	50/60	22	100; 110; 120	600	–	–	–	35	19
4MR66	36	70	170	50/60	35	100; 110; 120	800	–	–	–	70	19
4MS32	12	28	75	50/60	$12/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	400	1.9	230/4	1000	72	20
4MS34	24	50	125	50/60	$22/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	400	1.9	230/4	1000	75	20
4MS36	12	28	75	50/60	$35/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	400	1.9	230/4	1000	79	20
4MS38	52	70	250	50/60	$50/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	800	1.9	500/9	1000	79	20
4MS42	12	28	75	50/60	12	100; 110; 120	500	–	–	1000	73	21
4MS44	24	50	125	50/60	22	100; 110; 120	500	–	–	1000	76	21
4MS46	12	28	75	50/60	35	100; 110; 120	900	–	–	1000	82	21
4MS52	12	28	75	50/60	$12/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	400	1.9	230/4	1000	35.5	22
4MS54	24	50	125	50/60	$22/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	400	1.9	230/4	1000	35.5	22
4MS56	36	28	75	50/60	$35/\sqrt{3}$	$100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$	400	1.9	230/4	1000	51	23
4MS62	12	28	75	50/60	12	100; 110; 120	500	–	–	1000	37	24
4MS64	24	50	125	50/60	22	100; 110; 120	500	–	–	1000	37	24
4MS66	36	28	75	50/60	35	100; 110; 120	500	–	–	1000	57	25

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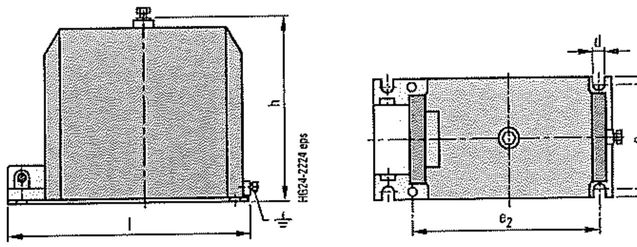
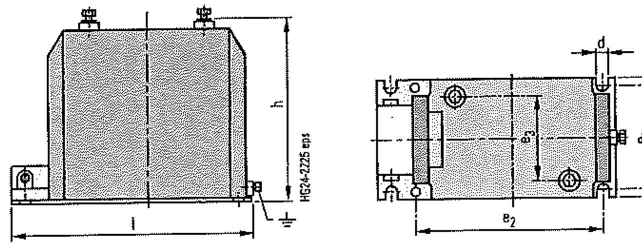
Dimension drawings for voltage transformers



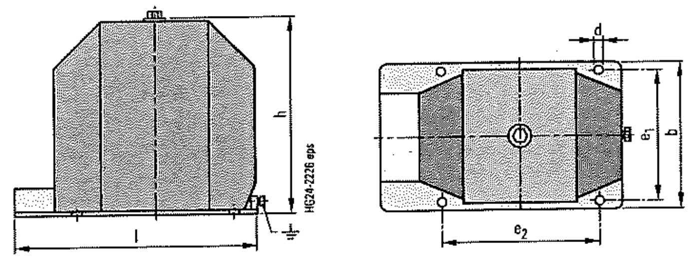
Dimension drawing 16

Type	b	h	l	e_1	e_2	d
4MR12	148	220	335	125	270	11
4MR14	178	280	357	150	280	14



Dimension drawing 17

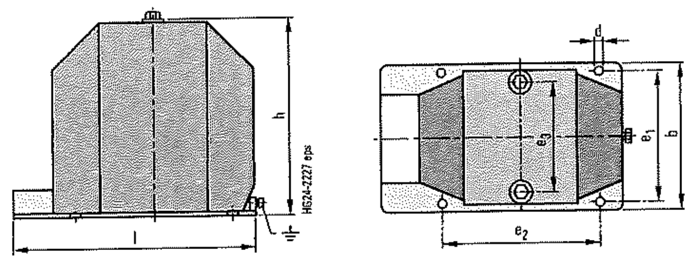
Type	b	h	l	e_1	e_2	e_3	d
4MR12	148	220	335	125	270	110	11
4MR14	178	280	357	150	280	130	14



Dimension drawing 18

Type	b	h	l	e_1	e_2	d
4MR52	200	240	342	175	225	11
4MR54	225	300	370	200	250	14
4MR54 1)	200	300	324	175	225	14
4MR56	249	390	395	225	300	14

1) Design on request



Dimension drawing 19

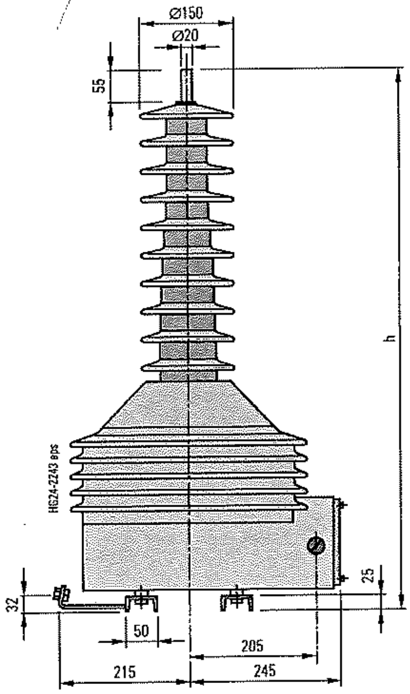
Type	b	h	l	e_1	e_2	e_3	d
4MR62	200	240	342	175	225	150	11
4MR64	225	300	370	200	250	210	14
4MR64 1)	200	260	324	175	225	155	14
4MR66	249	390	395	225	300	320	14

1) Design on request

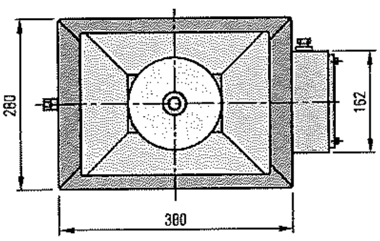
3

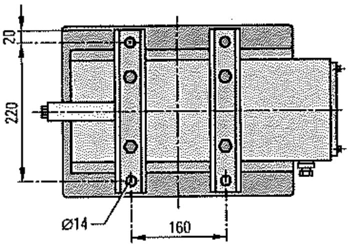
B77

Technical Data
Electrical data, dimensions and weights of voltage transformers



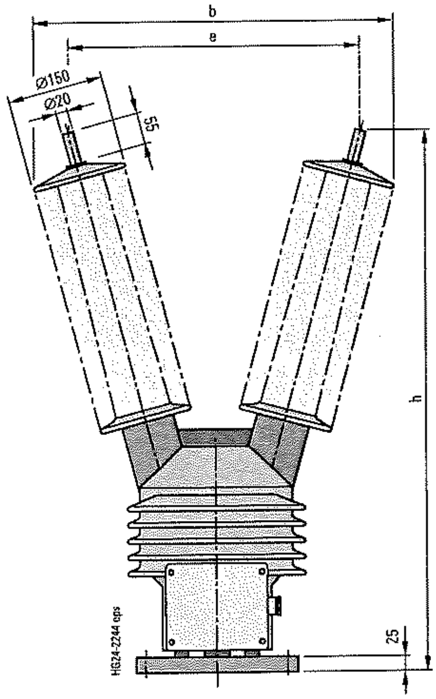
Type	h	Arcing distance	Creepage distance	Number of sheds
4MS32	520	420	790	2
4MS34	655	550	1055	5
4MS36	880	760	1615	10
4MS38	880	760	1615	10



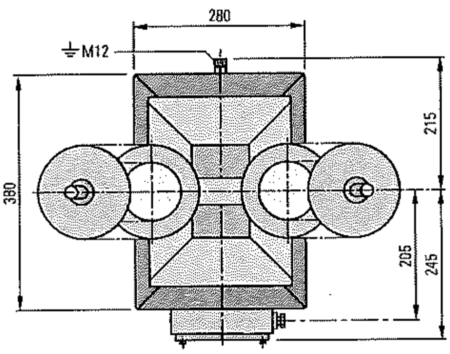


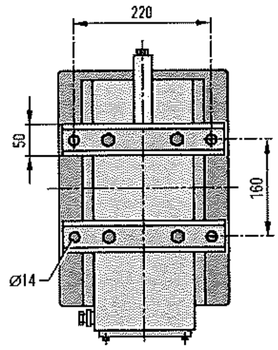
Dimension drawing 20

3



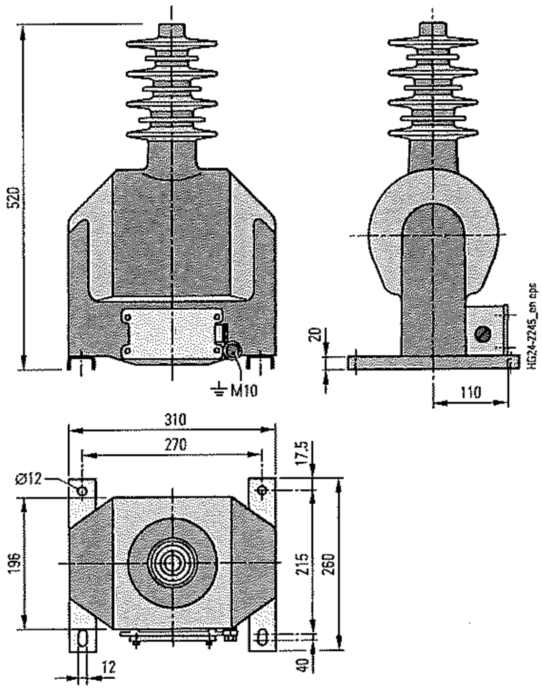
Type	h	b	e	Arcing distance	Creepage distance	Number of sheds
4MS42	515	375	270	420	760	2 x 2
4MS44	645	445	340	550	1035	2 x 5
4MS46	865	560	455	760	1595	2 x 10



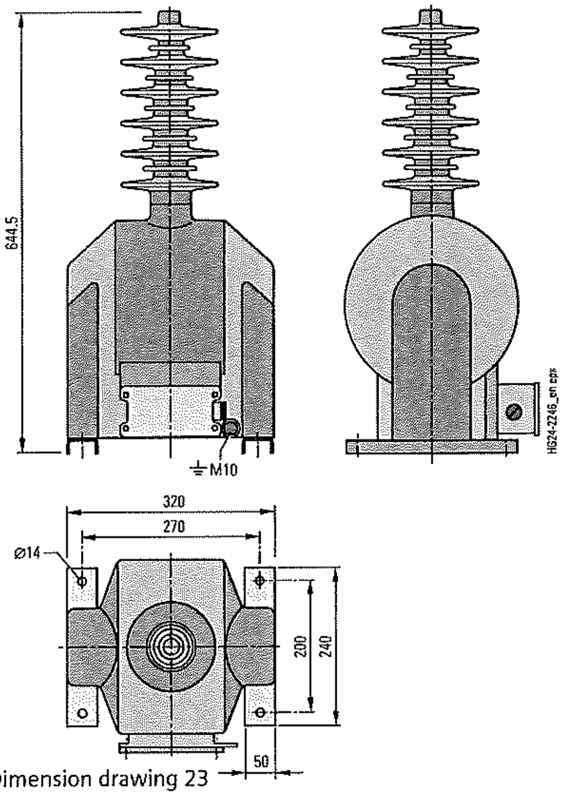


Dimension drawing 21

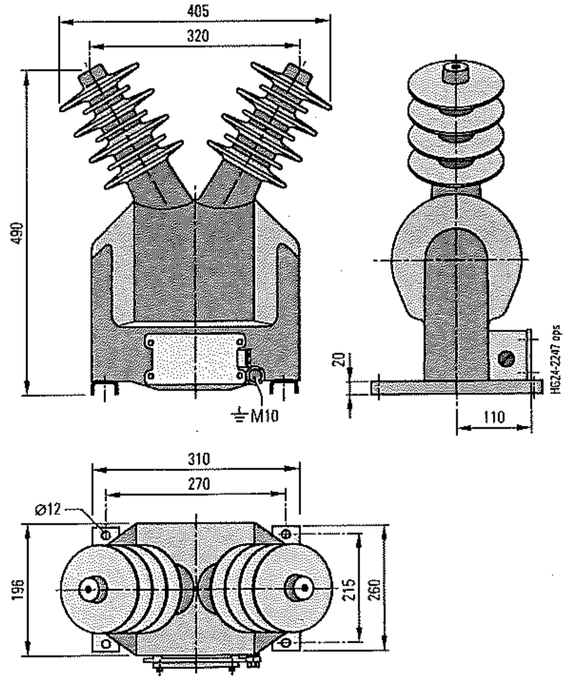
878



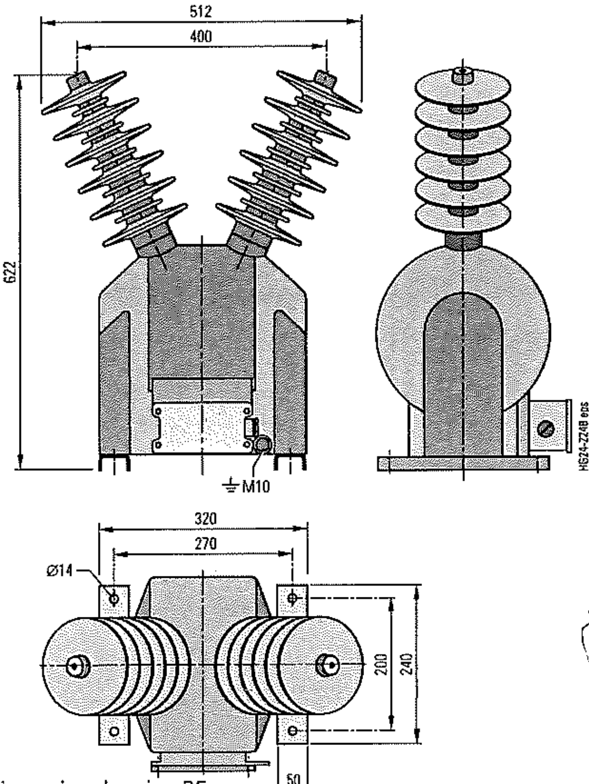
Dimension drawing 22



Dimension drawing 23



Dimension drawing 24



Dimension drawing 25

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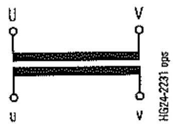
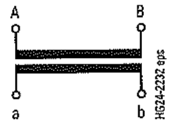
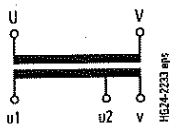
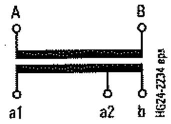
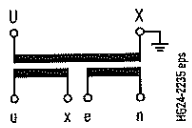
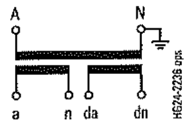
Technical Data

Electrical data, dimensions and weights of voltage transformers

Terminal designations of the voltage transformers

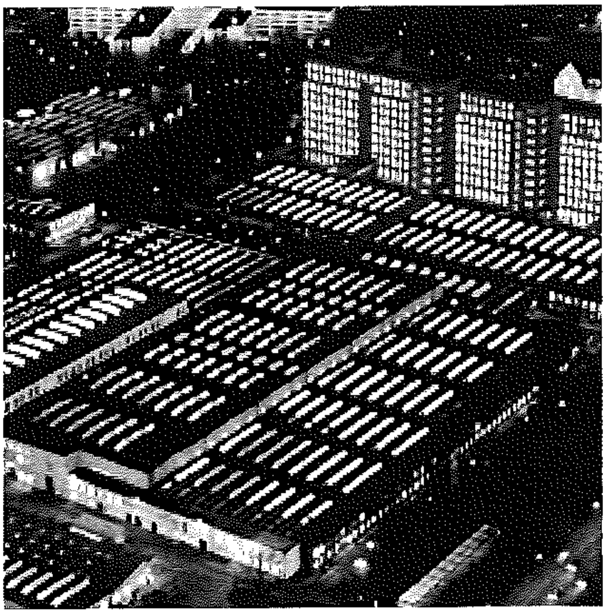
Transformer design	Designation of the connection terminals acc. to VDE	Designation of the connection terminals acc. to IEC	Example for low-voltage data
Unearthed 1 secondary winding			10000/100 V
Unearthed 1 secondary winding with tappings			5000–10000/100 V
	highest rated voltage at u1 or a1		
Earthed 1 measuring winding 1 auxiliary residual voltage winding			$10000/\sqrt{3}$ / $100/\sqrt{3}$ / 100/3 V

3

880

R-HG11-181.tif

Brandenburg Gate, Berlin, Germany



R-HG11-180.tif

Switchgear Factory Berlin, Germany

Contents | Page

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BB1

Annex
Inquiry form

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

Inquiry concerning

- ☐ 4MA7 current transformer
- ☐ 4MB1 current transformer
- ☐ 4MC2 current transformer
- ☐ 4MC3 current transformer
- ☐ 4ME2 current transformer
- ☐ 4ME3 current transformer
- ☐ 4MR voltage transformer
- ☐ 4MS voltage transformer

Please

- ☐ Submit an offer
- ☐ Call us
- ☐ Visit us

Your address

Company ______

Dept. ______

Name ______

Street ______

Postal code/city ______

Phone ______

Fax ______

E-mail ______

Siemens AG

Dept. ______

Name ______

Street ______

Postal code/city ______

Fax ______

Technical data of current transformer

				Other values
Operating voltage	☐ 12 kV ☐ 36 kV	☐ 17.5 kV ☐ 52 kV	☐ 24 kV	☐ ___kV
Rated lightning impulse withstand voltage	☐ 75 kV ☐ 170 kV	☐ 95 kV ☐ 250 kV	☐ 125 kV	☐ ___kV
Rated short-duration power-frequency withstand voltage	☐ 28 kV ☐ 70 kV	☐ 38 kV ☐ 95 kV	☐ 50 kV	☐ ___kV
Rated primary current	☐ ___A	☐ 2x___A		
Secondary current	☐ 1 A	☐ 5 A		
Thermal strength	☐ 100 x I_{PN} ☐ 300 x I_{PN} ☐ 600 x I_{PN}	☐ 150 x I_{PN} ☐ 400 x I_{PN} ☐ 800 x I_{PN}	☐ 200 x I_{PN} ☐ 500 x I_{PN} ☐ 1000 x I_{PN}	☐ ___x I_{PN}
1st core	☐ Protection core ☐ Measuring core	☐ ___Class ☐ ___Class	☐ ___Factor ☐ ___Factor	☐ ___VA ☐ ___VA
2nd core	☐ Protection core ☐ Measuring core	☐ ___Class ☐ ___Class	☐ ___Factor ☐ ___Factor	☐ ___VA ☐ ___VA
3rd core	☐ Protection core ☐ Measuring core	☐ ___Class ☐ ___Class	☐ ___Factor ☐ ___Factor	☐ ___VA ☐ ___VA

Technical data of voltage transformer

				Other values
Maximum operating voltage	☐ 12 kV ☐ 36 kV	☐ 24 kV ☐ 52 kV		☐ ___kV
Rated lightning impulse withstand voltage	☐ 75 kV ☐ 170 kV	☐ 95 kV ☐ 250 kV	☐ 125 kV	☐ ___kV
Rated short-duration power-frequency withstand voltage	☐ 28 kV ☐ 70 kV	☐ 38 kV ☐ 95 kV	☐ 50 kV	☐ ___kV
Rated primary voltage	☐ ___kV	☐ ___/√3		
Rated secondary voltage	☐ 100 V ☐ 100/√3 V	☐ 110 V ☐ 110/√3 V	☐ 120 V ☐ 120/√3 V	☐ ___V ☐ ___/√3 V
Auxiliary residual voltage winding	☐ Without	☐ 100/3 V	☐ 110/3 V	☐ 120/3 V
Rated output of the measuring winding	☐ Class 0.2 ☐ 20 VA	☐ Class 0.5 ☐ 50 VA	☐ Class 1 ☐ 100 VA	☐ ___VA

Application and other requirements

______

______

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______

______

☐ Please check off ___ Please fill in

882

You prefer to configure your instrument tra[illegible]mer on your own?

Please follow the steps for configuration and enter the order number in the configuration aid.

For configuration of your
4M protective and measuring transformers

Instruction for configuration of the 4M protective and measuring transformers

1st step: Definition of the current transformer

Please specify the following ratings:	Possible options:
Transformer design	Block-type transformer, bushing-type transformer, outdoor transformer, etc.
Operating voltage (U_m)	U_m: 12 kV to 52 kV
Rated lightning impulse withstand voltage (U_p)	U_p: 75 kV to 250 kV
Rated short-duration power-frequency withstand voltage (U_d)	U_d: 28 kV to 95 kV
Rated primary current (I_{PN})	I_{PN}: 20 A to 10000 A
Secondary current (I_{SN})	I_{SN}: 1 A or 5 A
Thermal strength	100 x I_{PN} to 1000 I_{PN}
Core data	Quantity, type, class, factor and rating of cores

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

2nd step: Definition of the voltage transformer

Please specify the following ratings:	Possible options:
Transformer design	Block-type transformer, outdoor transformer
Number of phases	Single-phase or double-phase
Operating voltage (U_m)	U_m: 12 kV to 52 kV
Rated lightning impulse withstand voltage (U_p)	U_p: 75 kV to 250 kV
Rated short-duration power-frequency withstand voltage (U_d)	U_d: 28 kV to 95 kV
Rated primary voltage (U_{PN})	U_{PN}: 3.3 kV to 45 kV or values divided by $\sqrt{3}$
Rated secondary voltage (U_{SN})	U_{SN}: 100 V, 110 V, 120 V or values divided by $\sqrt{3}$
Rated output of the measuring winding	25 VA, class 0.2 up to 400 VA, class 1

These ratings define the positions 3 to 11 of the order number of the voltage transformer.

3rd 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 certificate, etc., please contact your responsible sales partner.

1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16

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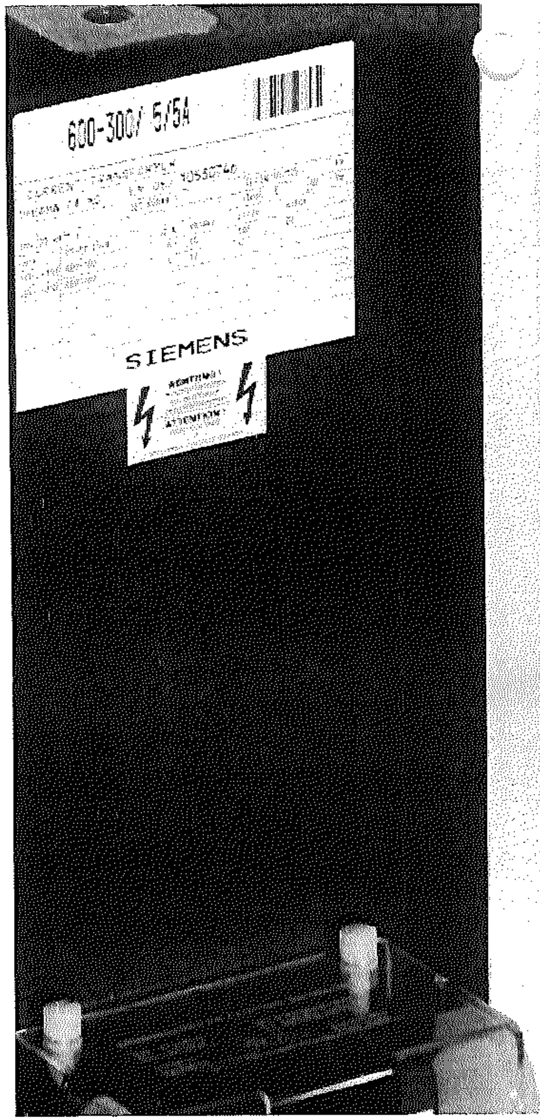

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Freyeslebenstrasse 1
91058 Erlangen, Germany

Siemens AG
Energy Sector
Power Distribution Division
Medium Voltage
Nonnendammallee 104
13623 Berlin, Germany

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.energy@siemens.com

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Български институт по метрология

REPUBLIC OF BULGARIA
Bulgarian Institute of Metrology

УДОСТОВЕРЕНИЕ
ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ

Measuring Instrument Type-approval Certificate

№ 16.11.5110

Издадено на производител: *Issued to manufacturer:*	SIEMENS AG - Germany Wittelsbacherplatz 2, D-80333 Munich, Germany
На основание на: *In Accordance with:*	чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от 2002 г., изм. бр. 88 от 05 г., изм. и доп. бр. 95 от 2005 г.)
Относно: *In Respect of:*	измервателни напреженови трансформатори тип 4MRxx
Знак за одобрен тип: *Type Approval Mark:*	BG 16 5110
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване
Срок на валидност: *Valid until:*	15.11.2026 г.
Вписва се в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	5110
Дата на издаване на удостоверението за одобрен тип: *Date:*	15.11.2016 г.

ВЯРНО С ОРИГИНАЛА

На основание чл.36а ал.3 от ЗОП

И. Д. ПРЕДСЕДАТЕ

Паун

865

Приложение към удостоверение за одобрен тип № 16.11.5110

Издадено на производител: SIEMENS AG - Germany
Wittelsbacherplatz 2, D-80333 Munich, Germany

Относно: измервателни напреженови трансформатори тип 4MRxx

1. Описание на типа:

Измервателни напреженови трансформатори тип 4MRxx се използват за измерване и защита на електрически мрежи с максимално допустимо работно напрежение до 36 kV.

Измервателните трансформатори тип 4MRxx са предназначени за вътрешен монтаж. Монтират се на подходящи поставки, проектирани за тях, в зависимост от конкретната ситуация.

Измервателни напреженови трансформатори могат да имат няколко вторични намотки, с еднакви или различни характеристики. Изолирани са една от друга електрически, но на един и същи магнитопровод. Те могат да бъдат с различен коефициент на трансформация и с различна мощност.

Измервателните трансформатори тип 4MRxx се произвеждат обикновенно само с едно ядро, което може да нарасне четири пъти, в зависимост от мощността и броя на вторичните намотки.

Първичната намотка е свързана към земя в клемната кутия. Тази връзка не може да бъде разкачвана по време на работа. За заземяване на вторичната намотка има специални болтове, по един за всеки край на намотката.

Основата на измервателните напреженови трансформатори тип 4MRxx е горещо галванизирана метална плоча.

Кутията с клемите на вторичната намотка е излята заедно с тялото на трансформатора от същата смола. Капакът е херметически затворен. Изводите са бронзови, никелирани, предназначени за присъединяване на болт с размер M6. Всеки край може да се свърже към заземителна клема, намираща се вътре в клемната кутия. За преминаване на кабелите през стените на кутията са осигурени два отвора - по един от двете й страни, с диаметър от 10 mm до 14 mm. Уплътнението е чрез щуцер с размер PG 16.

Измервателните трансформатори тип 4MRxx могат да се монтират вертикално или хоризонтално.

2. Технически и метрологични характеристики:

Тип на трансформатора	4MR 12 (22)	4MR 14 (24)	4MR 56 (66)
Максимално работно напрежение, kV	до 12	до 24	до 36
Номинално първично напрежение, kV	от $3/\sqrt{3}$ до $11/\sqrt{3}$	от $13/\sqrt{3}$ до $22/\sqrt{3}$	от $20/\sqrt{3}$ до $35/\sqrt{3}$
Номинално вторично напрежение, V	100/3; 110/3; 120/3; $100/\sqrt{3}$; $110/\sqrt{3}$; $120/\sqrt{3}$		
Номинална честота, Hz	50		
Клас на точност: - измервателна намотка - защитна намотка	0,2; 0,5; 1; 3 3P; 6P		
Мощност на вторичните намотки, VA/клас на точност: - измервателна намотка - защитна намотка	(от 5 до 70)/0,2; (от 5 до 200)/0,5; (от 5 до 200)/1; (от 5 до 300)/3; (от 5до 300)/3P; (от 5 до 300)/6P		

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Приложение към удостоверение за одобрен тип № 16.11.5110

3. Типово означение: 4MRxx:

4MR	**x**	**x**
Напреженов измервателен трансформатор	**1** - за вътрешен монтаж, еднофазен, малък; **2** - за вътрешен монтаж, двуфазен, малък; **5** - за вътрешен монтаж, еднофазен, голям; **6** - за вътрешен монтаж, двуфазен, голям	Максимално работно напрежение: **2** – до 12 kV **4** – до 24 kV **6** – до 36 kV

4. Описание на местата, предназначени за поставяне на знаци от метрологичен контрол:

- Знакът за одобрен тип (марка за залепване) се поставя до табелката с технически данни;
- Знакът за първоначална проверка (марка за залепване) се поставя до знака за одобрен тип.

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Independent, accredited testing station · Member laboratory of STL and LOVAG

TYPE TEST REPORT

NO. 1416.0004.4.012

Siemens Sanayi ve Ticaret A. Ş. Power Transmission and Distribution (PTD) Yakacik Yolu No: 111 81430 Kartal-ISTANBUL (TURKEY)	CLIENT
ALCE Elektrik Sanayi ve Ticaret A. Ş.	MANUFACTURER
Indoor medium voltage single-pole cast-resin voltage transformer	TEST OBJECT
4MR12 AYC	TYPE
03/57159	MANUFACTURING NO.

Rated insulation level	12/28/75	kV	RATED CHARACTERISTICS GIVEN BY THE CLIENT
Rated primary voltage A-N	10000/√3	V	
Rated secondary voltage a-n	100/√3	V	
Rated secondary voltage da-dn	100/3	V	
Rated frequency	50 - 60	Hz	
Rated output	50/45	VA	
Accuracy class	0.5/3P		
Thermal limiting output	4/4	A	

IEC 60044-2: 1997 + A1: 2000 + A2: 2002	NORMATIVE DOCUMENT
• Lightning impulse test (type test) - Routine test after the lightning impulse test • Short-circuit withstand capability test (type test) - Routine tests after the short-circuit withstand capability test • Temperature-rise test (type test) • Determination of errors (type test)	RANGE OF TESTS PERFORMED
26 January to 12 February 2004	DATE OF TEST
The test object has PASSED the above-mentioned type tests performed at 50 Hz.	TEST RESULT

На основание чл.36а ал.3 от ЗОП

ВЯРНО С ОРИГИНАЛА

INSTITUT „PRÜFFELD FÜR ELEKTRISCHE HOCHLEISTUNGSTECHNIK" GMBH IPH BERLIN

Independent test laboratory, accredited by Deutsche Akkreditierungsstelle Technik (DATech) e.V. in the fields of h.v. apparatus and switchgear, power cables and power cable accessories, l.v. apparatus and switchgear, installation equipment and switching and control equipment

Deutscher Akkreditierungs Rat DAR

DAT - P - 019/92

Contents Sheet

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ВЯРНО С ОРИГИНАЛА

This test document consists of 39 sheets.

Distribution Copy No.: 1

Copies Nos. 1 and 2 in English: ALCE Elektrik Sanayi ve Ticaret A. Ş.

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1. Present at the test

Mr.	Staritz	IPH test engineer in charge
Mrs.	Hauschild	IPH test engineer
Mr.	Wittwer	IPH test engineer
Dr.	Wachholz	IPH test engineer
Mr.	Çiftçioğlu	ALCE Elektrik Sanayi ve Ticaret A. Ş.
Mr.	Yilmaz	ALCE Elektrik Sanayi ve Ticaret A. Ş.

2. Test performed

- Lightning impulse test (type test)
  - Routine test after the lightning impulse test
- Short-circuit withstand capability test (type test)
  - Routine tests after the short-circuit withstand capability test
- Temperature-rise test (type test)
- Determination of errors (type test)

ВЯРНО С ОРИГИНАЛА

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3. Identity of the test object

3.1 Technical data and characteristics

The technical data and characteristics of the test object are defined by the following parameters and specified by the client.

Test object:	Indoor medium voltage single-pole cast-resin voltage transformer	
Type:	4MR12 AYC	
Manufacturer:	ALCE Elektrik Sanayi ve Ticaret A. Ş.	
Serial No.:	03/57159	
Year of manufacture:	2003	
Rated characteristics:	Rated primary voltage A-N	10000/√3 V
	Rated secondary voltage a-n	100/√3 V
	Rated secondary voltage da-dn	100/3 V
	Rated output	50/45 VA
	Accuracy class	0.5/3P
	Thermal limiting output	4/4 A
	Rated frequency	50 - 60 Hz
	Rated voltage factor	1.9 Un (8 h)
	Rated insulation level	
	Highest voltage for equipment	12 kV
	Rated power-frequency withstand voltage	28 kV
	Rated lightning impulse withstand voltage	75 kV
	Duration of short-circuit	1 s
Characteristics:	Class of insulating material	E
	Dimensions	See Sheet 39

ВЯРНО С ОРИГИНАЛА

3.2 Identity documents

The manufacturer confirms that the test object has been manufactured in compliance with the drawings given in this document. IPH did not verify this compliance in detail.
The identity of the test object is fixed by the following drawings and data submitted by the client:

Name of drawing	Drawing No.	Date of drawing	Author	Notes
4MR12 Block type voltage transformer	417	13.01.2004	ALCE	Sheet 39

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4. Lightning impulse test

4.1 Test laboratory

High-voltage test laboratory, high-voltage test hall 2

4.2 Normative document

IEC 60044-2: 1997 + A1: 2000 + A2: 2002, Sub-clause 8.3.2

4.3 Required test parameters

Lightning impulse voltage 1.2/50 μs	75 kV	Peak value
Polarity		Positive and negative
Impulse sequence	1 impulse	Full wave at approx. 50 % of test voltage (reference impulse)
	15 impulses	Full wave at 100 % of test voltage
Atmospheric correction		Without

4.4 Test arrangement

Voltage application was between the high-voltage terminal of the primary winding and the earth-sided terminal of this winding. Both terminals of the secondary windings were directly earthed. The earth-sided terminal of the primary winding was connected over a shunt with the test earth in order to obtain an additional measuring quantity (current from this point to earth). This was useful for the assessment of the impulses ranging between 50 and 100 % of test voltage.

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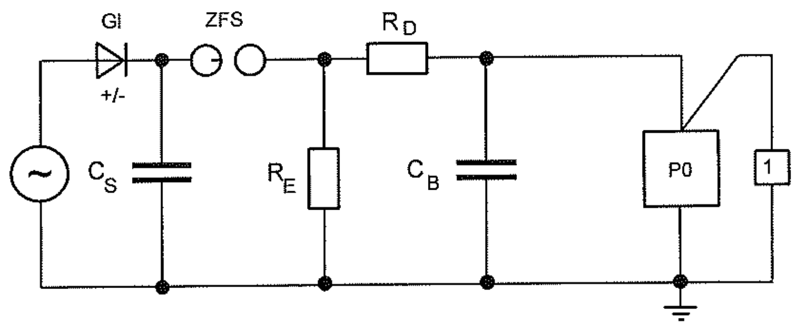
4.5 Test and measuring circuits

Technical data of test circuit

Impulse circuit:	Number of stages	n	=	2
	Impulse capacitance	C_S	=	70 nF
	Loading capacitance	C_B	=	1.5 nF
	Damping resistance	R_D	=	122 Ω
	Discharge resistance	R_E	=	1100 Ω



Gl	Rectifier	C_B	Loading capacitance
C_S	Impulse capacitance	PO	Test object
ZFS	Spark gap	1	Voltage measurement
R_E	Parallel resistance		
R_D	Serial resistance		

Figure 1: Test and measuring circuit for the lightning impulse test

Technical data of measuring circuit

Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
1	Test voltage	R divider of SMR 10/770 type (TuRD) with digital measuring instrument of DMI 551 type (Haefely) and TDS 220 digital oscilloscope type (Tektronix)	Ratio 472.4

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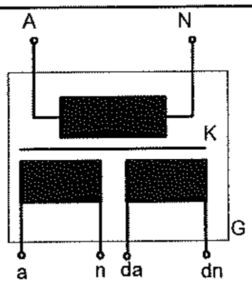
4.6 Test results

Front time of lightning impulse wave:	1.20 µs
Tail time of lightning impulse wave:	50.0 µs
Air temperature:	8.5 °C
Air pressure:	1007 hPa
Air humidity (relative):	45 %
Atmospheric correction of test voltage:	Without

Circuit diagram of the test object



Test No.	Voltage applied to	Earthed	Test withstand voltage kV	Impulse	Result No. of impulses/ disruptive discharges
1004 0329 to 1004 0344	A	N, a, n, da, dn, G	+37.5 +75	50 % FW 100 % FW	1/0 1) 15/0 1)
1004 0345 to 1004 0360	A	N, a, n, da, dn, G	-37.5 -75	50 % FW 100 % FW	1/0 1) 15/0 1)

Notes:

1) The appendices include only the oscillograms of the reference impulse and of each first and last 100 % full wave (FW) impulse.

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4.7 Routine test after the lightning impulse test

The routine tests to Sub-clause 7.2 of the normative document are part of the type test "lightning impulse test" and serve to assess the latter.

Test	Test parameters	Test results	
Interturn overvoltage test	Test voltage: 28 kV Test frequency: 150 Hz Duration of test: 40 s	No disruptive discharge	o.k.
Partial discharge (PD) measurement	Procedure B Prestress duration: 60 s Measuring voltage (points 1 to 3): $1.2 \times U_m$ = 14.4 kV U_m = 12 kV $1.2 \times U_m/\sqrt{3}$ = 8.8 kV Measuring time: 30 s	PD 6 ... 7 pC < 50 pC PD 5 pC < 50 pC PD 4 pC < 20 pC	o.k.
Power-frequency withstand test on the secondary windings	Test voltage: 3 kV Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.
Power-frequency withstand test on the earth side of primary winding	Test voltage: 3 kV Test frequency: 50 Hz Duration of test: 60 s	No disruptive discharge	o.k.

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5. Short-circuit withstand capability test

5.1 Test laboratory

Low-voltage test laboratory, test room 4

5.2 Normative document

IEC 60044-2: 1997 + A1: 2000 + A2: 2002, Sub-clause 8.2

5.3 Required test parameters

Test 1: Test voltage of 100/√3 V with supply on the secondary side a-n and short-circuit on the primary side. The duration of short-circuit was 1 s.

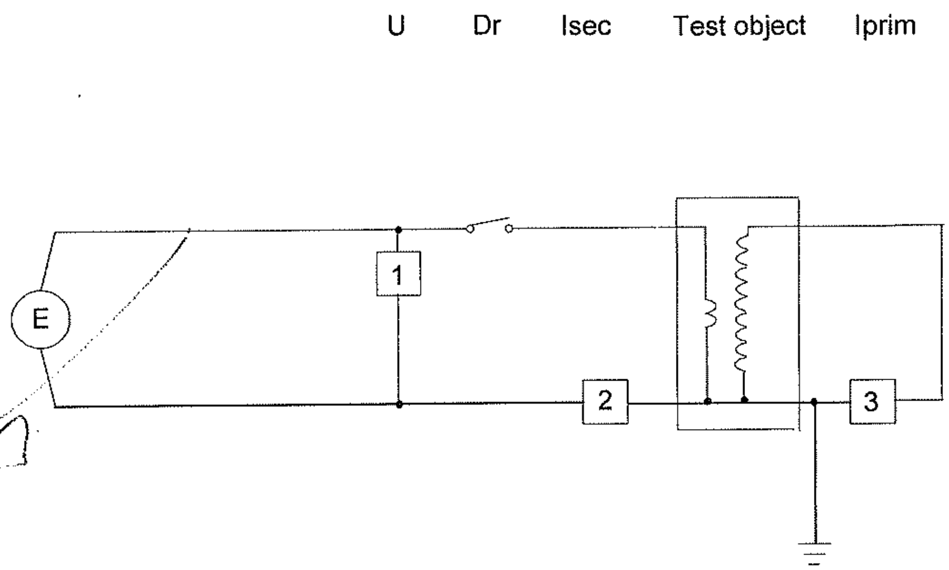
Test 2: Test voltage of 100/3 V with supply on the secondary side da-dn and short-circuit on the primary side. The duration of short-circuit was 1 s.

5.4 Test arrangement

The connection to the test current source was on the secondary terminals of the voltage transformer. The voltage transformer was short-circuited on its primary side.

ВЯРНО С ОРИГИНАЛА

5.5 Test and measuring circuits



E	Power supply	U	Test voltage measurement
Dr	Making switch	Isec	Current measurement, secondary side
1 - 3	Measuring points	Iprim	Current measurement, primary side

Figure 2: Test circuit for the test of short-circuit withstand capability of the voltage transformer

Technical data of measuring circuits

Test No.	Measuring point	Measured quantity	Measuring sensor/device	Technical parameters
404 0511	1	Voltage measurement	Divider	Ratio 199.3
and	2	Primary current	Shunt	2.406 A/V
404 0515	3	Secondary current	Shunt	241.2 A/V

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5.6 Test results

Test requirement:	Short-circuit withstand capability test
Condition of test object after test:	Prestressed by previous tests
Connection of test object:	By copper cable of 6 mm²
Ambient temperature:	18.5 °C

Test No.		404 0511	404 0515
Test voltage	V	58.3	34.4
Symmetrical short-circuit current, secondary side	A	105	121.9
Symmetrical short-circuit current, primary side	A	1.06	0.718
Duration of current flow	ms	1087	1090
Notes		1)	2)
Evaluation		o.k.	o.k.

Notes:

1) Power supply on secondary side to a-n, short-circuit on primary side
2) Power supply on secondary side to da-dn, short-circuit on primary side

o.k.: The test object is capable of properly carrying the short-circuit current

ВЯРНО С ОРИГИНАЛА

5.7 Routine tests after the short-circuit withstand capability test

• Determination of errors

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 50 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 0.5	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
80 %	0.02	-0.4	± 0.25	± 10
100 %	0.02	-0.5	± 0.25	± 10
120 %	0.02	-0.6	± 0.25	± 10

Notes:
The secondary winding da-dn was open.

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 50 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 0.5	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
80 %	0.03	-0.2	± 0.25	± 10
100 %	0.02	-0.3	± 0.25	± 10
120 %	0.02	-0.2	± 0.25	± 10

Notes:
At secondary winding da-dn was 45 VA

ВЯРНО С ОРИГИНАЛА

• **Determination of errors (continued)**

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 12.5 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 0.5	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
80 %	0.01	-0.2	± 0.25	± 10
100 %	0.01	-0.1	± 0.25	± 10
120 %	0.01	-0.2	± 0.25	± 10

Notes:
The secondary winding da-dn was open.

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 12.5 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 0.5	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
80 %	0.02	-0.1	± 0.25	± 10
100 %	0.01	0.0	± 0.25	± 10
120 %	0.01	-0.1	± 0.25	± 10

Notes:
At secondary winding da-dn was 45 VA

ВЯРНО С ОРИГИНАЛА

Determination of errors (continued)

Terminals: da-dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 45 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 3P	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
5 %	0.00	-2.1	± 1.5	± 60
190 %	-0.13	1.8	± 1.5	± 60

Notes:
The secondary winding a-n was open.

Terminals: da-dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 45 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 3P	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
5 %	0.04	-0.6	± 1.5	± 60
190 %	0.0	1.4	± 1.5	± 60

Notes:
At secondary winding a-n was 50 VA.

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Determination of errors (continued)

Terminals: da-dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 11.25 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 3P	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
5 %	0.01	-0.2	± 1.5	± 60
190 %	0.03	0.8	± 1.5	± 60

Notes:
The secondary winding a-n was open.

Terminals: da - dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 11.25 VA, power factor cos β = 0.8

At percentage of rated voltage	Difference between the errors measured before and after the circuit withstand capability test		Permissible errors for accuracy class 3P	
	Voltage error	Phase displacement	Voltage error	Phase displacement
	%	Minutes	%	Minutes
5 %	0.00	0.3	± 1.5	± 60
190 %	0.25	-1.8	± 1.5	± 60

Notes:
At secondary winding a-n was 50 VA.

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- **Dielectric routine test**

Test	**Test parameters**		**Test results**	
Interturn overvoltage test	Test voltage: Test frequency: Duration of test:	25.2 kV 150 Hz 40 s	No disruptive discharge	o.k.
Partial discharge (PD) measurement	Procedure B Prestress duration: Measuring voltage (points 1 to 3): $1.2 \times U_m$ = U_m = $1.2 \times U_m/\sqrt{3}$ = Measuring time:	 60 s 14.4 kV 12 kV 8.8 kV 30 s	 PD 10 pC < 50 pC PD 4 pC < 50 pC PD 4 pC < 20 pC	o.k.
Power-frequency withstand test on the secondary windings	Test voltage: Test frequency: Duration of test:	2.7 kV 50 Hz 60 s	No disruptive discharge	o.k.
Power-frequency withstand test on the earth side of primary winding	Test voltage: Test frequency: Duration of test:	2.7 kV 50 Hz 60 s	No disruptive discharge	o.k.

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6. Temperature-rise test

6.1 Test laboratory

Low-voltage test laboratory, test room 4/5

6.2 Normative document

IEC 60044-2: 1997 + A1: 2000 + A2: 2002, Sub-clauses 8.1 and 13.6

6.3 Required test parameters

• Tests for the measuring winding

	1.2 times rated primary voltage	1.9 times rated primary voltage for 8 h	Thermal limiting output
Test voltage	1.2 * 10/√3 kV	1.9 * 10/√3 kV	10/√3 kV
Rated output at measuring winding a-n	50 VA	50 VA	4 A [1]
Rated output at residual voltage winding da-dn	45 VA	45 VA	- VA
Frequency	50 Hz	50 Hz	50 Hz

• Tests for the residual voltage winding

	1.2 times rated primary voltage	Thermal limiting output for 8 h
Test voltage	1.2 * 10/√3 kV	1.9 * 10/√3 kV
Rated output at measuring winding a-n	50 VA	50 VA
Rated output at residual voltage winding da-dn	- VA	4 A [1]
Frequency	50 Hz	50 Hz

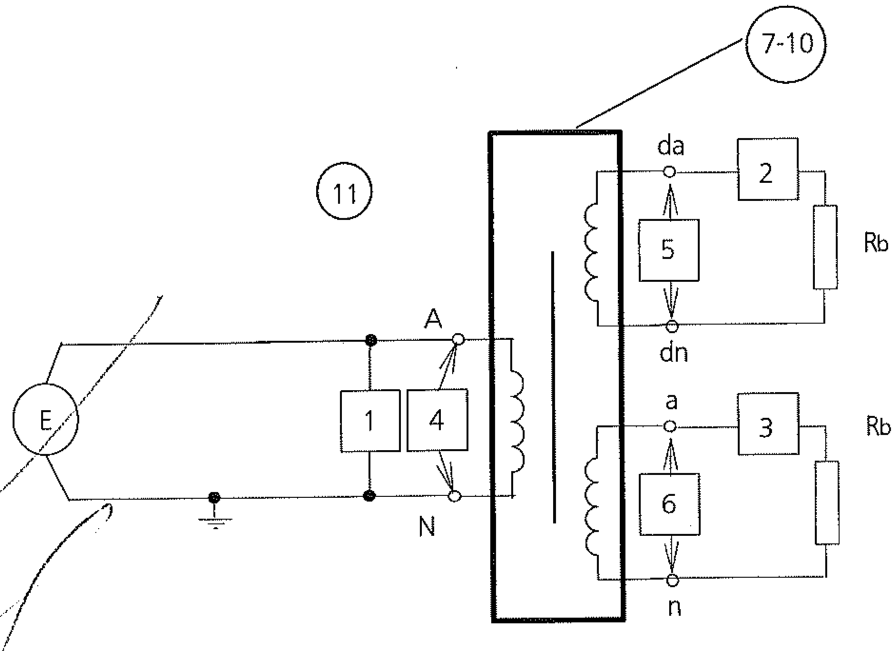
Notes:
1) The thermal output limit given in "Ampere" is not in accordance with IEC 60044-2.

ВЯРНО С ОРИГИНАЛА

6.4 Test arrangement

The test object was set up in a room which was draught-free to a large extent. Voltage application was between the high-voltage terminal of the primary winding and the earth-sided terminal of this winding. The test object with its test arrangement is shown in Figure 7 on Sheet 33.

6.5 Test and measuring circuits



E Power supply
1 Measurement of primary voltage
2 - 3 Current measurement on the secondary side
4 - 6 Resistance measurement
7 - 11 Temperature measurement
Rb Burden

Figure 3: Test and measuring circuits

ВЯРНО С ОРИГИНАЛА

Technical data of measuring circuits

Measuring point	Measured quantity	Measuring sensor/device
1	Test voltage	Divider, digital display device
2 and 3	Secondary current	Digital display device
4 to 6	Winding resistance	Resistance measuring bridge
7 to 11	Temperature	Therm 5500-3 Constantan, constantan thermocouples

6.6 Test results

The test voltage was 6930 V (50 Hz). This is equivalent to 1.2 times rated primary voltage of the transformer. The voltage transformers were tested at rated burden. Until the steady state temperature was reached.

Meas. point (Figure 3)	Designation of the part	Material	Permissible temperature-rise limit K	Measured final temperature at ΔT≤1K/h °C	Final temperature rise (related to average ambient air temperature) K
4	Primary winding A-N	Cu wire	75	36.9	18.4
5	Secondary winding a-n	Cu wire	75	36.2	17.7
6	Secondary winding da-dn	Cu wire	75	37.0	18.5
7	Transformer case front	Insulating material	75	23.2	4.7
8	Transformer case left	Insulating material	75	22.9	4.4
9	Transformer case back	Insulating material	75	23.0	4.5
10	Transformer case right	Insulating material	75	22.9	4.4
11	Ambient air	Air	-	18.5	-

Class of insulation "E" allows a winding temperature-rise limit of 75 K at a maximum permissible ambient air temperature of 40 °C. The final winding temperature rise of 18.5 K is permissible for the class of insulation "E".

ВЯРНО С ОРИГИНАЛА

Test results (continued)

Afterwards the steady state temperature was reached, the test voltage was 10970 V (50 Hz). This is equivalent to 1.9 times rated primary voltage of the transformer. The voltage transformers were tested at rated burden for 8 hours.

Meas. point (Figure 3)	Designation of the part	Material	Permissible temperature-rise limit K	Measured final temperature at ΔT≤1K/h °C	Final temperature rise (related to average ambient air temperature) K
4	Primary winding A-N	Cu wire	75	49.8	30.7
5	Secondary winding a-n	Cu wire	75	51.1	32.0
6	Secondary winding da-dn	Cu wire	75	51.2	32.1
7	Transformer case front	Insulating material	75	30.5	11.4
8	Transformer case left	Insulating material	75	29.5	10.4
9	Transformer case back	Insulating material	75	30.2	11.1
10	Transformer case right	Insulating material	75	29.5	10.4
11	Ambient air	Air	-	19.1	-

Class of insulation "E" allows a winding temperature-rise limit of 75 K at a maximum permissible ambient air temperature of 40 °C. The final winding temperature rise of 32.1 K is permissible for the class of insulation "E".

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Test results (continued)

Determination of the voltage transformer's winding temperature rise

The temperature rise θ of the voltage transformer winding was determined on the basis of the rise of winding resistance from the cold state to the steady state of temperature rise using the following formula given by DIN VDE 0532 Teil 2, Sub-clause 3.3 (transformers and reactors).

$$\theta_w = \frac{R_w}{R_k}\,(235 + \theta_k) - 235$$

Where: R_k Cold resistance of the winding at 17.5 °C

R_W Warm resistance of the winding

θ_k Cold temperature of winding

θ_W Final temperature of the winding

The hot resistance of the secondary winding was calculated on the basis of the measurement of the cooling curve.

	1.2 times rated primary voltage	1.9 times rated primary voltage for 8 h
Primary voltage	6930 V	10970 V
Resistance of burden a-n	66.5 Ω	66.5 Ω
Current a-n	1.04 A	1.65 A
Resistance of burden da-dn	24.6 Ω	24.6 Ω
Current da-dn	1.62 A	2.57 A
Ambient air	18.5 °C	19.1 °C

1.2 times rated primary voltage	R_k Ω	R_W Ω	R_W/R_k	θ_W °C	θ K	Permissible K
Primary winding A-N	2600	2799	1.077	36.9	18.4	75
Secondary winding a-n	0.2163	0.2324	1.074	36.2	17.7	75
Secondary winding da-dn	0.1588	0.1710	1.077	37.0	18.5	75

1.9 times rated primary voltage	R_k Ω	R_W Ω	R_W/R_k	θ_W °C	θ K	Permissible K
Primary winding A-N	2600	2933	1.128	49.8	30.7	75
Secondary winding a-n	0.2163	0.2451	1.133	51.1	32.0	75
Secondary winding da-dn	0.1588	0.180	1.133	51.2	32.1	75

ВЯРНО С ОРИГИНАЛА

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Test results (continued)

The temperature-rise test was performed with 5775 V (50Hz) and loaded with 4 A at winding a-n. Until the steady state temperature was reached.
This is equivalent to the rated primary voltage of the transformer. The resistance of burden a-n was 14.4 Ω, this is equivalent to the thermal limiting output. The residual voltage winding da-dn was open.

Meas. point (Figure 3)	Designation of the part	Material	Permissible temperature-rise limit K	Measured final temperature at $\Delta T \leq 1 K/h$ °C	Final temperature rise (related to average ambient air temperature) K
4	Primary winding A-N	Cu wire	75	45.3	26.6
5	Secondary winding a-n	Cu wire	75	45.3	26.6
6	Secondary winding da-dn	Cu wire	75	-	-
7	Transformer case front	Insulating material	75	25.4	6.7
8	Transformer case left	Insulating material	75	25.9	7.2
9	Transformer case back	Insulating material	75	25.3	6.6
10	Transformer case right	Insulating material	75	26.0	7.3
11	Ambient air	Air	-	18.7	-

Thermal limiting output	R_k Ω	R_w Ω	R_w/R_k	θ_w °C	θ K	Permissible K
Primary winding A-N	2600	2885	1.110	45.3	26.6	75
Secondary winding a-n	0.2163	0.240	1.110	45.3	26.6	75

Class of insulation "E" allows a winding temperature-rise limit of 75 K at a maximum permissible ambient air temperature of 40 °C. The final winding temperature rise of 26.6 K is permissible for the class of insulation "E".

ВЯРНО С ОРИГИНАЛА

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Test results (continued)

The test voltage was 10970 V (50 Hz). This is equivalent to 1.9 times rated primary voltage of the transformer. The resistance of burden da-dn was 8.3 Ω, this is equivalent to the thermal limiting output (test current residual voltage winding = 7.6 A for 8 hours). The measuring winding a-n was tested at rated burden.

Meas. point (Figure 3)	Designation of the part	Material	Permissible temperature-rise limit K	Measured final temperature at $\Delta T \leq 1 K/h$ °C	Final temperature rise (related to average ambient air temperature) K
4	Primary winding A-N	Cu wire	75	76.8	57.1
5	Secondary winding a-n	Cu wire	75	91.7	72.0
6	Secondary winding da-dn	Cu wire	75	76.6	56.9
7	Transformer case front	Insulating material	75	36.4	16.7
8	Transformer case left	Insulating material	75	36.4	16.7
9	Transformer case back	Insulating material	75	35.5	15.8
10	Transformer case right	Insulating material	75	37.2	17.5
11	Ambient air	Air	-	19.7	-

Notes: Before the residual voltage winding was subjected to thermal limiting output, only the measuring winding was tested at 1.2 times rated voltage and at rated burden until the thermal steady-state was reached.

Thermal limiting output	R_k Ω	R_w Ω	R_w/R_k	θ_w °C	θ K	Permissible K
Primary winding A-N	2600	3210	1.235	76.8	57.1	75
Secondary winding a-n	0.2163	0.280	1.294	91.7	72.0	75
Secondary winding da-dn	0.1588	0.196	1.234	76.6	56.9	75

Class of insulation "E" allows a winding temperature-rise limit of 75 K at a maximum permissible ambient air temperature of 40 °C. The final winding temperature rise of measuring winding of 72.0 K is permissible for the class of insulation "E".

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7. Determination of errors

7.1 Test laboratory

Low-voltage test laboratory, test room 3

7.2 Normative document

IEC 60044-2: 1997 + A1: 2000 + A2: 2002, Sub-clauses 12.2 and 13.1

7.3 Required test parameters

Residual voltage winding: The voltage errors shall be determined at 5% and 190% of rated voltage and 25% and 100% of rated burden.

Measuring winding: The voltage errors shall be determined at 80%, 100% and 120% of rated voltage and 25% and 100% of rated burden with a power factor of $\cos\beta = 0.8$.

The test frequency shall equal the rated frequency and be 50 Hz.

Maximum permissible error limits of voltage transformers for measuring and protecting purposes:

Accuracy class	Voltage error at percentage of rated voltage			Phase displacement at percentage of rated voltage		
	%			Minutes		
	80	100	120	80	100	120
0.5	± 0.5			± 20		
	5	190		5	190	
3P	± 3			± 120		

7.4 Test arrangement

To IEC 60044-2: 1997, Sub-clauses 12.2 and 13.1

The test object was connected via a matching transformer to an instrument transformer measuring device including a measurement standard transformer. An oscillographic null detector was used for the visual check of the comparison. The test object was subjected to the prescribed test conditions by connection of a standard burden.

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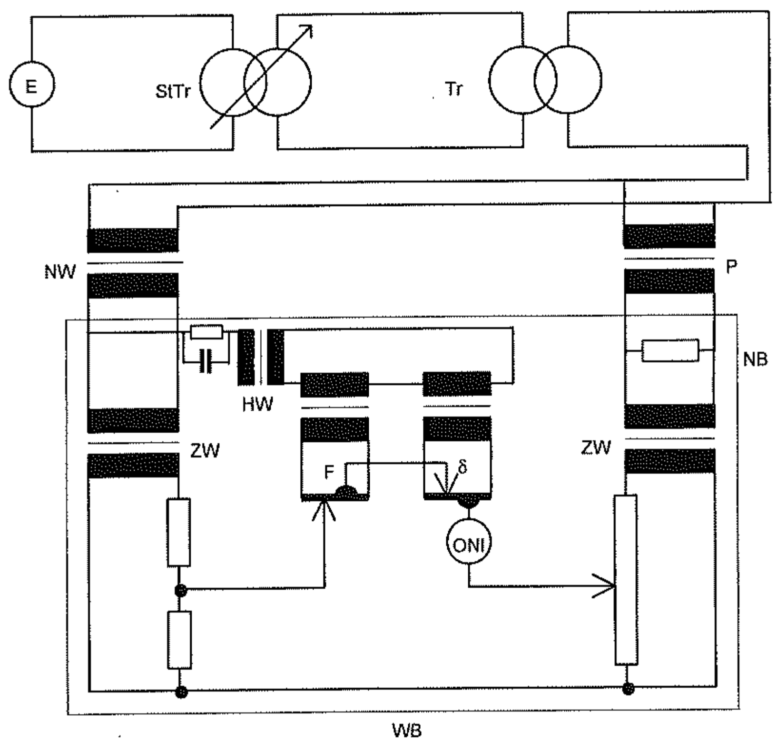
7.5 Test and measuring circuits

Technical data of test and measuring circuits

Device	Type	Technical data
Standard voltage transformer NW	UZON 30 (TuR Dresden)	Ratio 5 ... 30 kV / 110 and 100 V Class 0.2, 30 VA
Standard burden of voltage transformer NB	(AEG)	50 Hz, 1.25 ... 300 VA, ß = 0.8/1
Instrument transformer measuring bridge I	Hohle type (AEG)	$16\,{}^2/_3$, 50 and 60 Hz
Matching transformer to the bridge ZW	Hohle type (AEG)	Matching transformer for 1, 2, 5, 10 A
Null detector ONI	OIK (MWB)	20 mm / µV



E Power supply
StTr Matching transformer

Figure 4: Test and measuring circuit for the determination of errors

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7.6 Test results

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 50 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 0.5		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
80	-0.19	3.2	± 0.5	± 20	o.k.
100	-0.19	3.2	± 0.5	± 20	o.k.
120	-0.20	4.0	± 0.5	± 20	o.k.

Notes:
At secondary winding da-dn was 11.25 VA

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 50 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 0.5		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
80	-0.45	-5.1	± 0.5	± 20	o.k.
100	-0.46	-5.1	± 0.5	± 20	o.k.
120	-0.47	-4.5	± 0.5	± 20	o.k.

Notes:
At secondary winding da-dn was 45 VA

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Test results (continued)

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 12.5 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 0.5		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
80	0.41	-1.0	± 0.5	± 20	o.k.
100	0.40	-0.9	± 0.5	± 20	o.k.
120	0.39	-0.3	± 0.5	± 20	o.k.

Notes:
At secondary winding da-dn was 11.25 VA.

Terminals: a-n
Rated voltage: 10000/√3 V / 100/√3 V
Burden: 12.5 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 0.5		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
80	0.14	-9.5	± 0.5	± 20	o.k.
100	0.13	-9.3	± 0.5	± 20	o.k.
120	0.12	-8.8	± 0.5	± 20	o.k.

Notes:
At secondary winding da-dn was 45 VA.

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Test results (continued)

Terminals: da-dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 45 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 3P		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
5	0.45	11.2	± 3	± 120	o.k.
190	0.16	21.6	± 3	± 120	o.k.

Notes:
The secondary winding a-n was open.

Terminals: da-dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 45 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 3P		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
5	0.02	-1.5	± 3	± 120	o.k.
190	-0.25	9.0	± 3	± 120	o.k.

Notes:
At secondary winding a-n was 50 VA

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Test results (continued)

Terminals: da-dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 11.25 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 3P		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
5	1.2	3.3	± 3	± 120	o.k.
190	0.88	13.8	± 3	± 120	o.k.

Notes:
The secondary winding a-n was open.

Terminals: da-dn
Rated voltage: 10000/√3 V / 100/3 V
Burden: 11.25 VA, power factor cos β = 0.8

At percentage of rated voltage	Errors		Permissible difference for accuracy class 3P		Result
	Voltage error	Phase displacement	Voltage error	Phase displacement	
%	%	Minutes	%	Minutes	
5	0.81	-10.0	± 3	± 120	o.k.
190	1.0	1.0	± 3	± 120	o.k.

Notes:
At secondary winding a-n was 50 VA

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8. Evaluation of all tests

- **Lightning impulse test (type test)**

The voltage transformer was tested at 75-kV lightning impulse voltage on the primary side. There were no disruptive discharges and the recorded voltage curve did not present any significant variation between the recordings of reference impulse and full impulse level which could indicate an insulation failure.

All routine tests were repeated without errors.

The requirements specified by IEC 60044-2: 1997, Sub-clause 8.3.2 have been met

The voltage transformer has PASSED the type test

- **Short-circuit withstand capability test (type test)**

After test the voltage transformer was not visibly damaged.

The errors determined after test differed from those recorded before test by less than half the limits of error appropriate to its accuracy class.

During the dielectric tests done after the short-circuit withstand capability test, no disruptive discharge occurred.

The requirements specified by IEC 60044-2: 1997, Sub-clause 8.2 have been met

The voltage transformer has PASSED the type test

- **Temperature-rise test (type test)**

Class of insulation "E" allows a winding temperature-rise limit of 75 K at a maximum permissible ambient air temperature of 40 °C. The primary winding reached a temperature rise of 57.1 K. The secondary winding a-n reached a temperature rise of 72.0 K. The secondary winding da-dn reached a temperature rise of 56.9 K.

The final temperature-rise values of the windings determined at rated voltage and with the application of limit burden to the secondary winding are permissible for this class of insulation.
The temperature-rise limit of 75 K was also not exceeded when the test object's secondary windings were subjected to thermal limiting output

The requirements specified by IEC 60044-2: 1997, Sub-clause 8.1 have been met

The voltage transformer has PASSED the type test

- **Determination of errors (type test)**

The voltage errors and phase displacements were within the permissible error limits of accuracy class 0.5 respectively 3P.

The requirements specified by IEC 60044-2: 1997, Sub-clauses 12.2 and 13.1 have been met

The voltage transformer has PASSED the type test

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9. Appendices

9.1 Photos

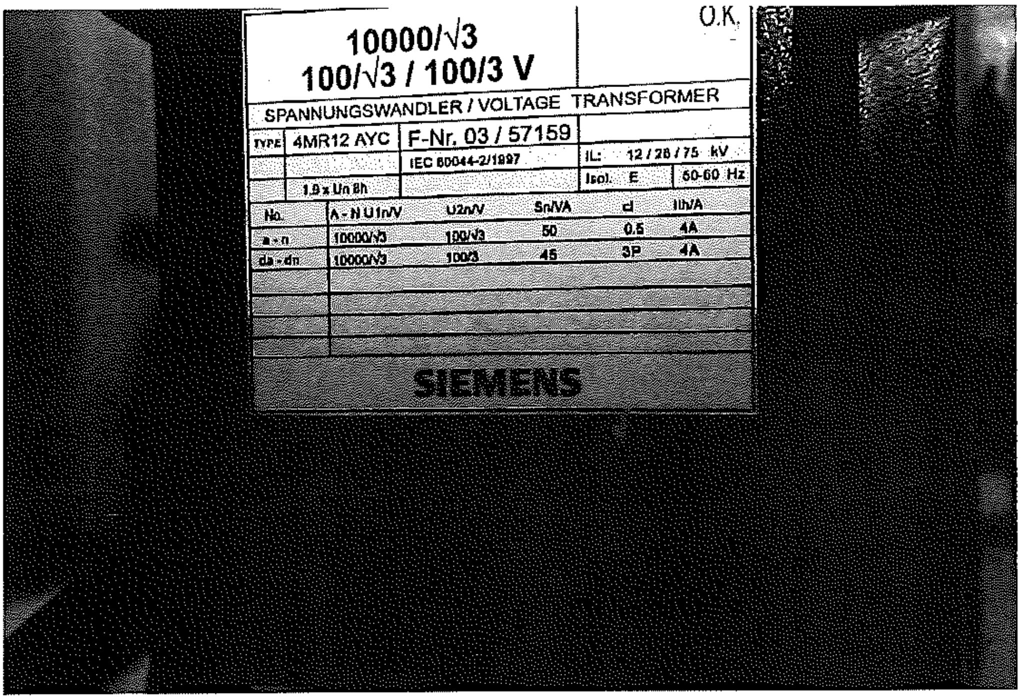


Figure 5: Nameplate of the test object

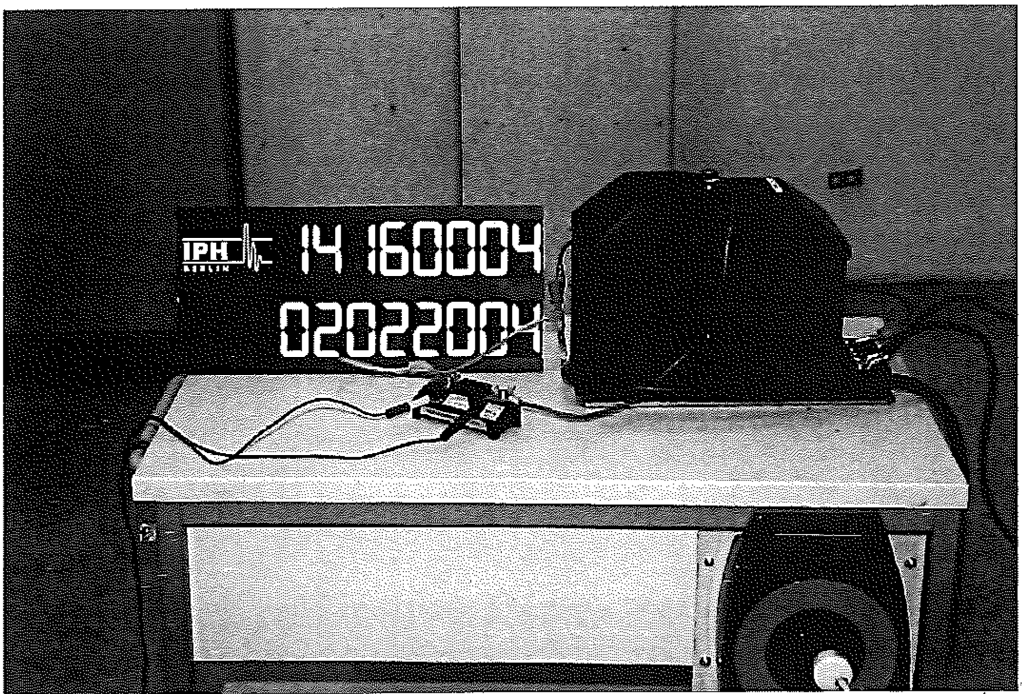


Figure 6: Test object after the short-circuit test

ВЯРНО С ОРИГИНАЛА

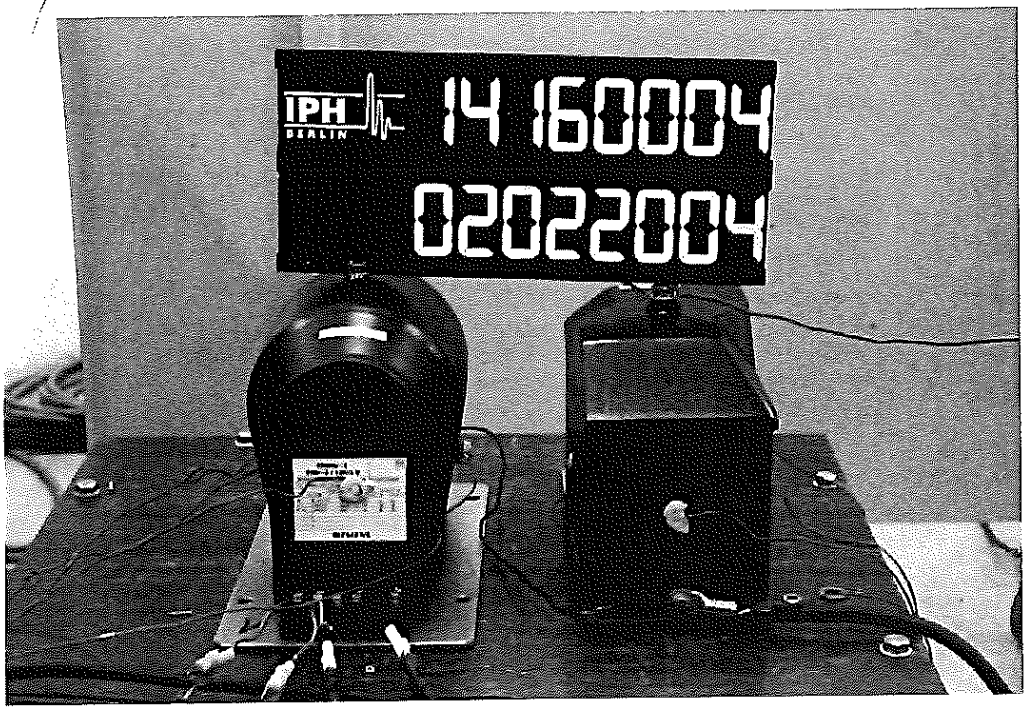
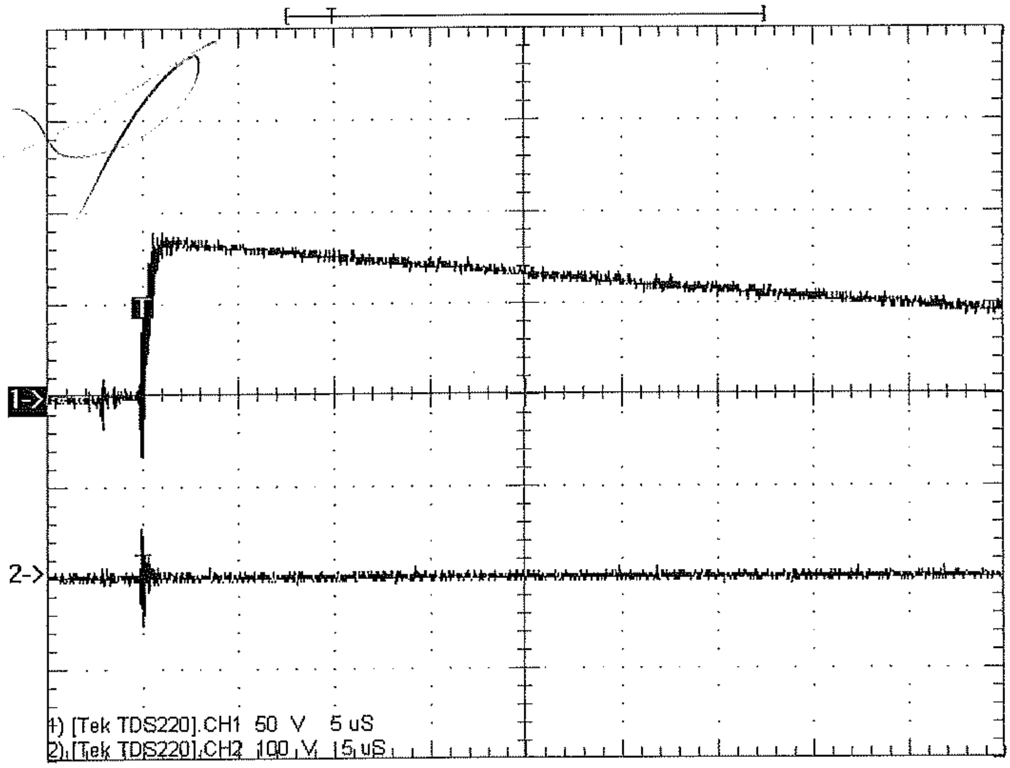


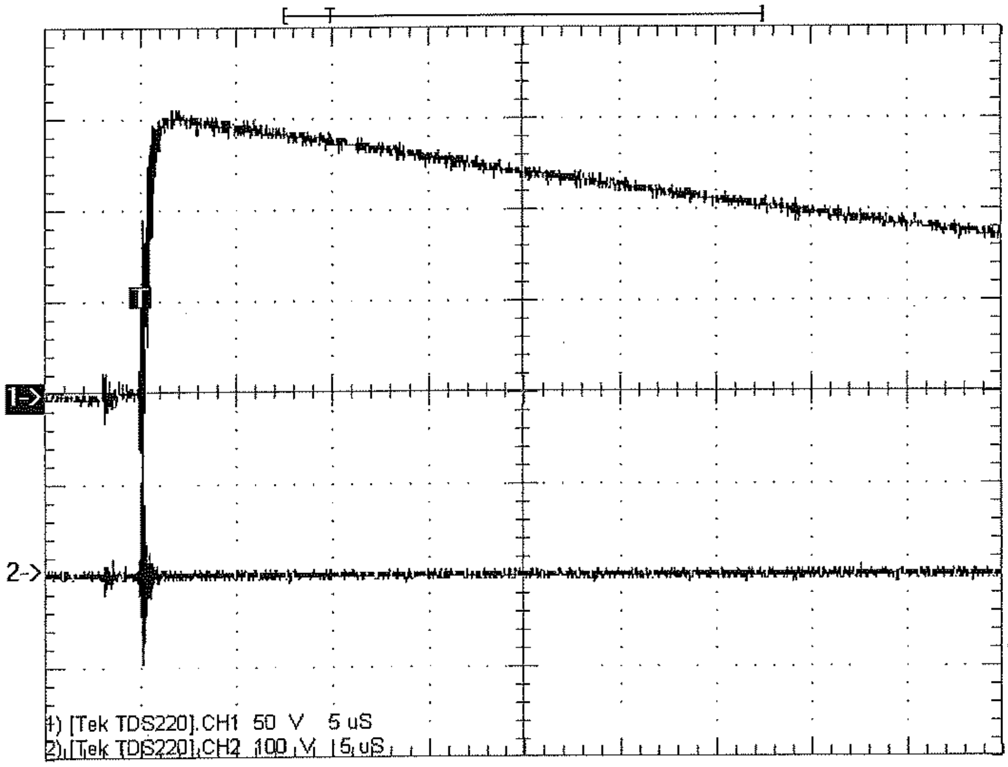
Figure 7: Test object during the temperature-rise test (right sample)

ВЯРНО С ОРИГИНАЛА

9.2 Oscillograms

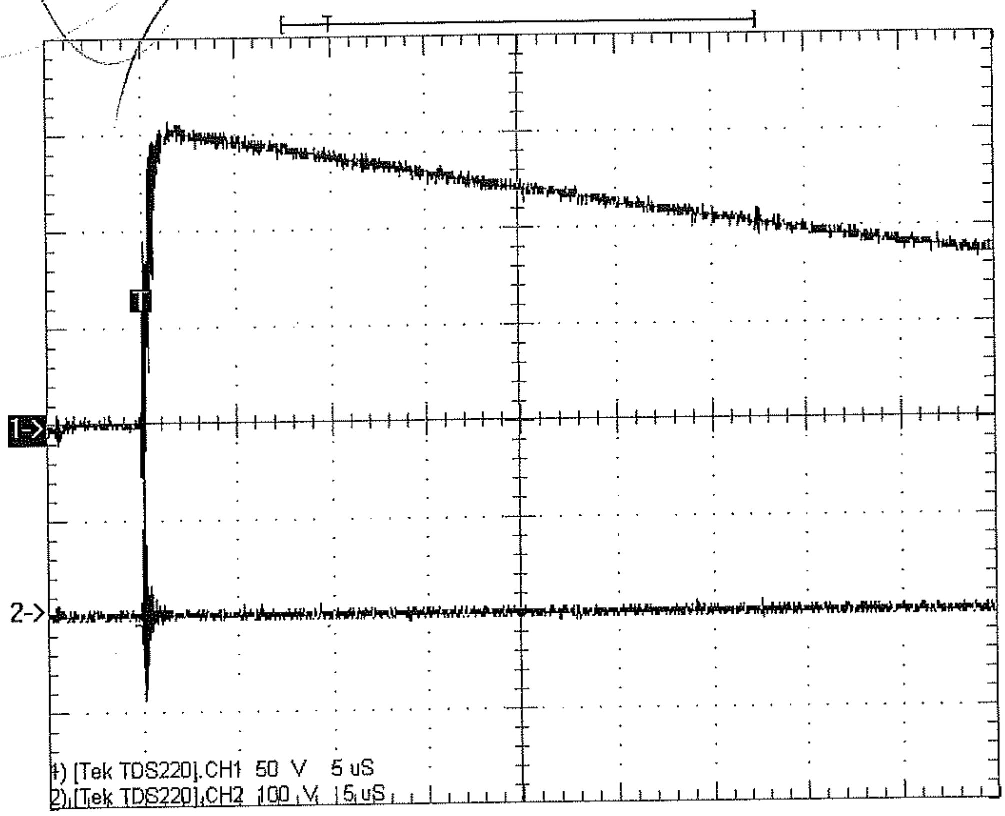


Test No. 1004 0329

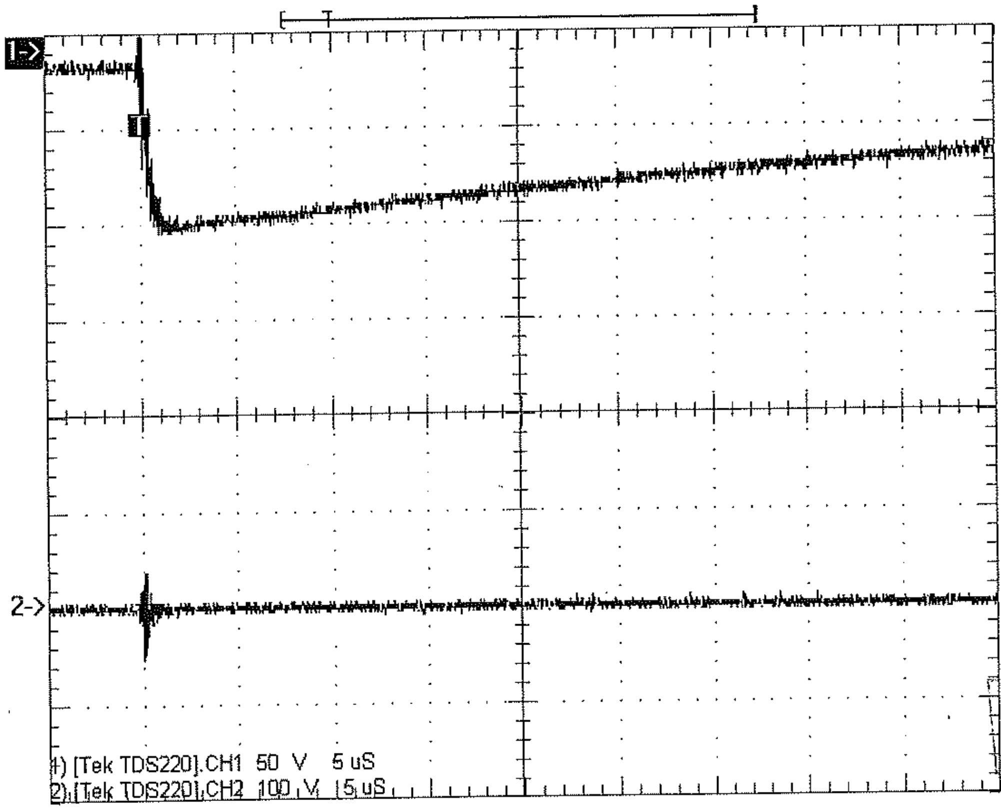


Test No. 1004 0330

ВЯРНО С ОРИГИНАЛА

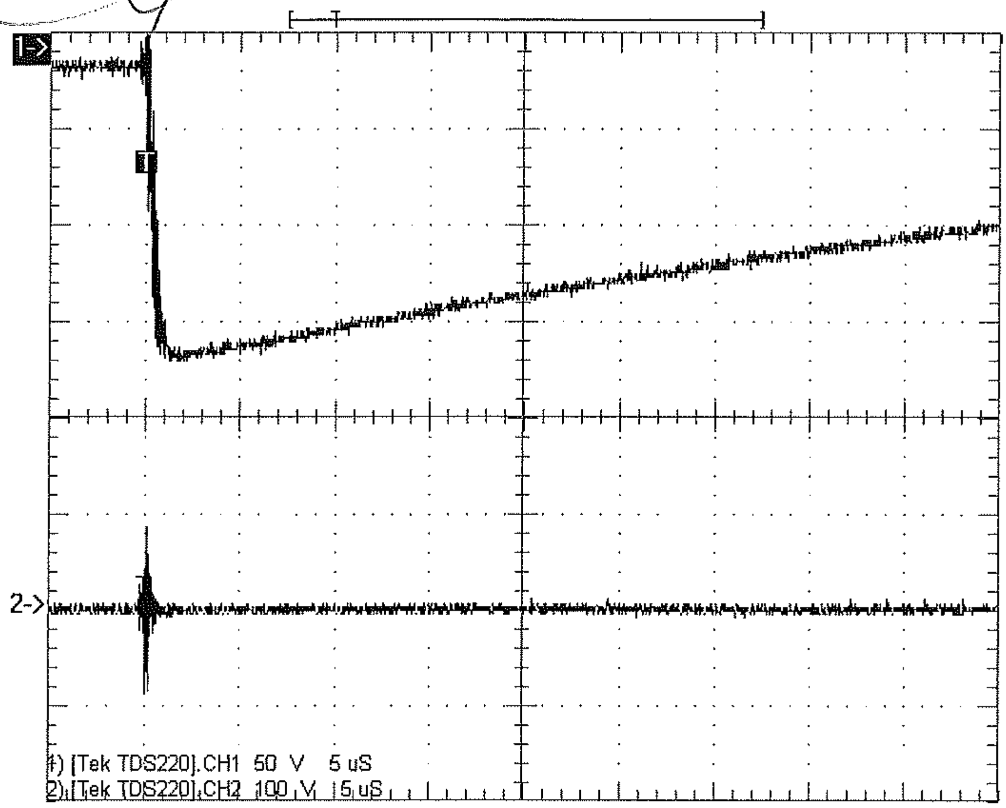


Test No. 1004 0344

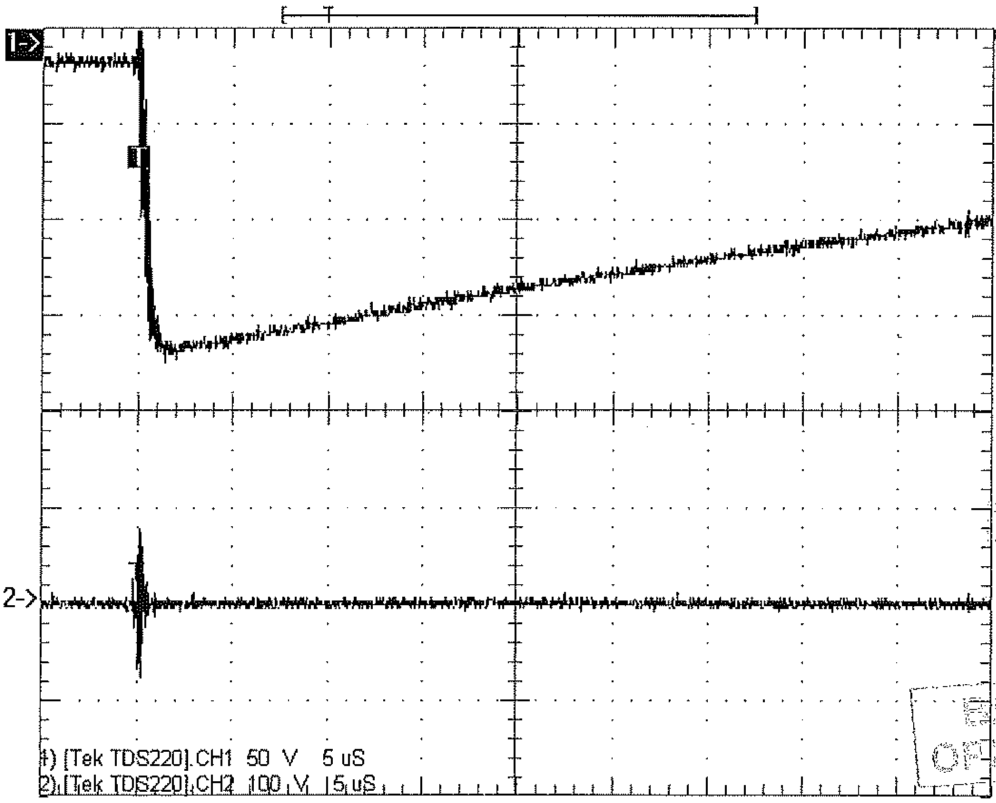


Test No. 1004 0345

ВЯРНО С ОРИГИНАЛА



Test No. 1004 0346



Test No. 1004 0360

ВЯРНО С ОРИГИНАЛА

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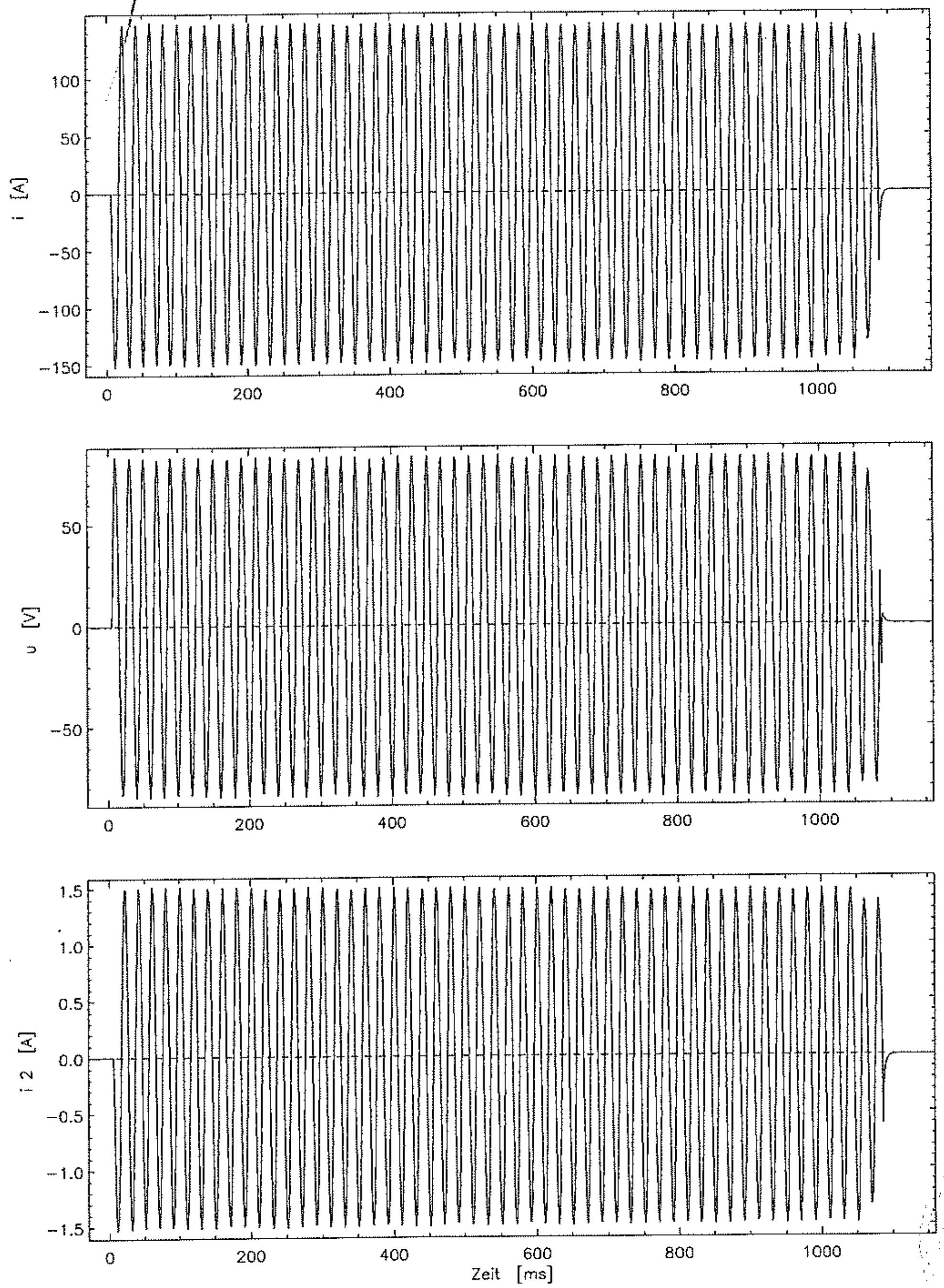
TYPE TEST REPORT NO. 1416.0004.4.012

Osz.–Nr.
Osc.–No. 4040511



ВЯРНО С
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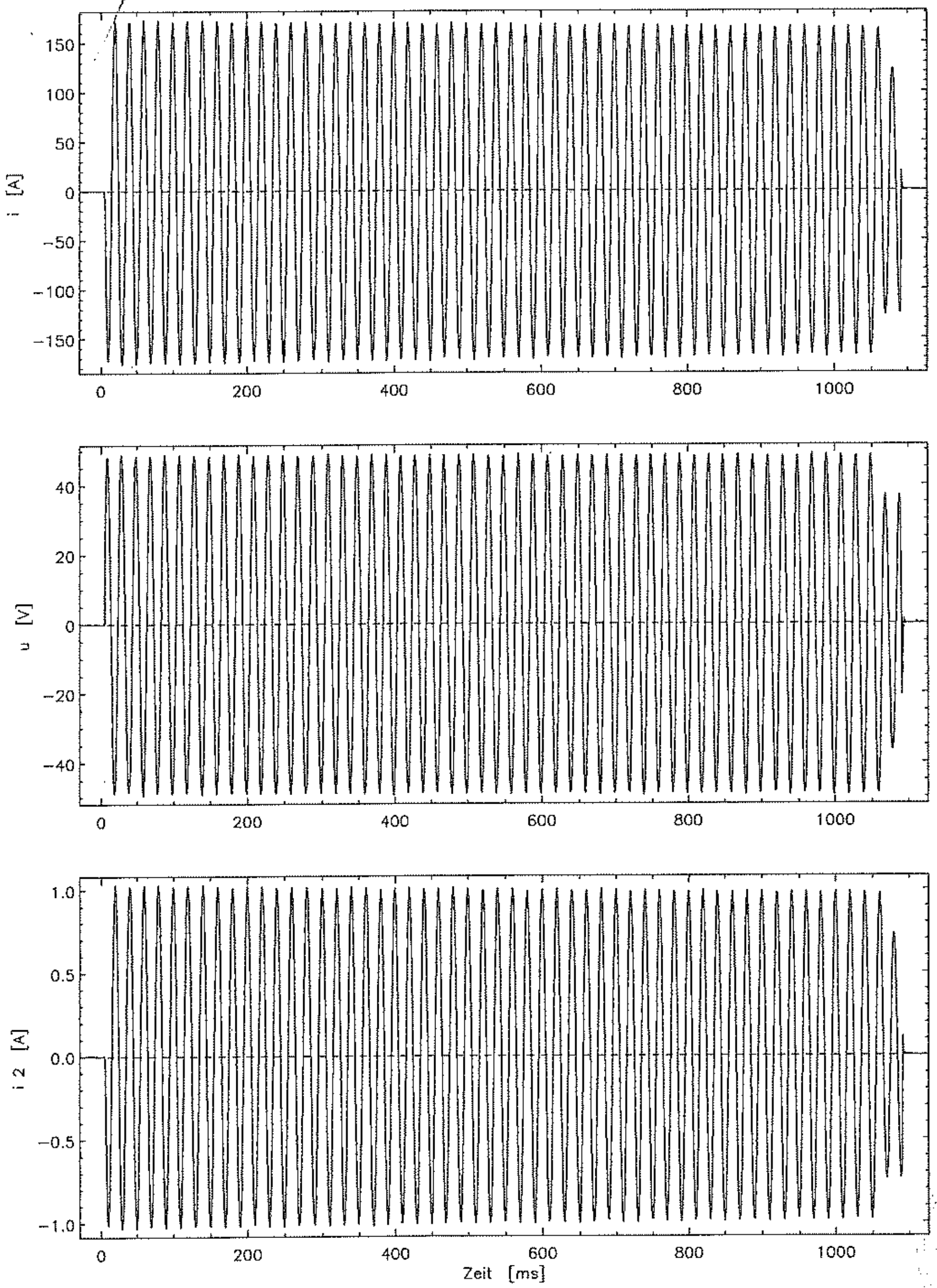
Osz.–Nr.
Osc.–No. 4040515



ВЯРНО С ОРИГИНАЛА

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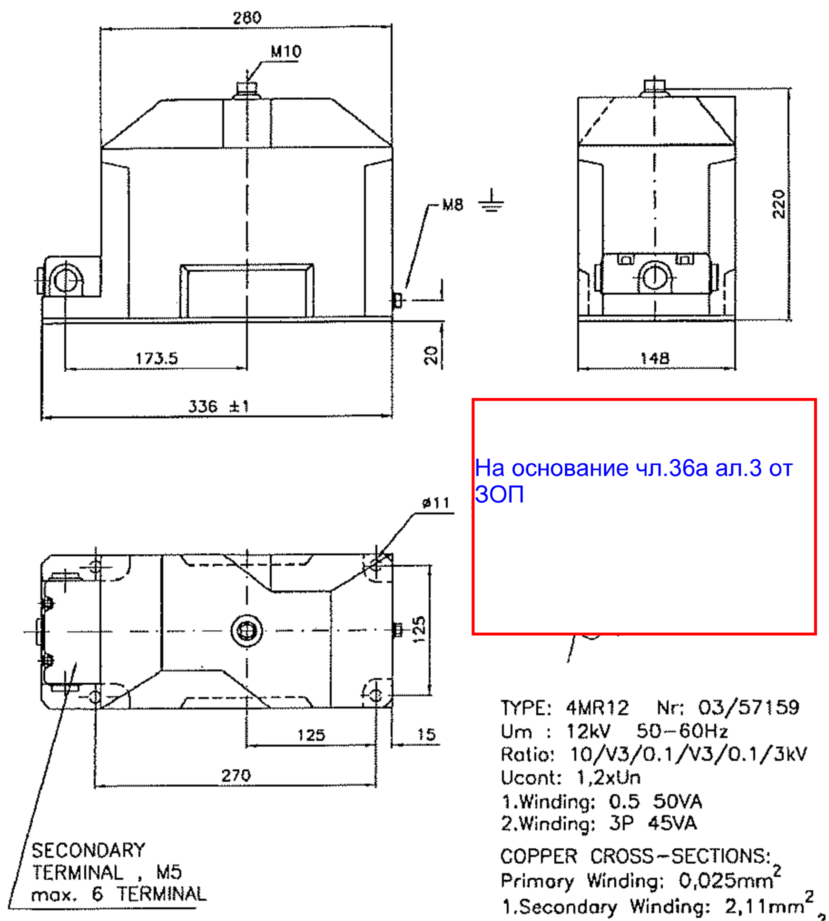
9.3 Drawing



На основание чл.36а ал.3 от ЗОП

TYPE: 4MR12 Nr: 03/57159
Um : 12kV 50–60Hz
Ratio: 10/V3/0.1/V3/0.1/3kV
Ucont: 1,2xUn
1.Winding: 0.5 50VA
2.Winding: 3P 45VA

COPPER CROSS–SECTIONS:
Primary Winding: 0,025mm²
1.Secondary Winding: 2,11mm²
2.Secondary Winding: 1,766mm²
I_2 sec: 4A 1,9xUn (8h)

QTY	DESCRIPTION	POS	DIMENSIONS	WEIGHT	PART OR DIN NO.	MATERIAL
						Epoxy–resin

NO	DATE	NAME	MODIFICATION

TOLERANCES DIN 7168 g	4MR12 BLOCK TYPE VOLTAGE TRANSFORMER
SCALE 1:5	REPLACES THE DRAWING NO.
ALCE	OLCU TRAFO
C.C	

На основание чл.36а ал.3 от ЗОП

ВЯРНО С ОРИГИНАЛА

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Deutsche Akkreditierungsstelle GmbH
(Германски акредитационен орган ГмбХ)

Упълномощен в съответствие с Подраздел 1 на Раздел 8 на AkkStelleG във връзка с Подраздел 1 на Раздел 1 на AkkStelleG
Подписал Многостранните споразумения на EA, ILAF и IAF за взаимно признаване

Акредитация

Deutsche Akkreditierungsstelle GmbH (Германски акредитационен орган ГмбХ) удостоверява, че изпитвателната лаборатория

IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH
Landsberger Alee 378 A, 12681 Berlin
(Институт ИПХ „Прюфелд фюр Електрише Хохлайщунгстехник" ГмбХ
Алея Ландсбергер 378 А, 12681 Берлин)

е компетентна по условията на DIN EN ISO/IEC 17025:2005 да извършва изпитания в следните области:

Апаратура и компоненти за високо напрежение
Апаратура и компоненти за ниско напрежение
Комутационна, защитна и управляваща апаратура
Кабели и кабелни аксесоари за високо, средно и ниско напрежение

Акредитационният сертификат важи във връзка с известието за акредитация от 11.11.2015 г. с акредитационен номер D-PL-12107-01 и е валиден до 10.11.2020 г. Той се състои от заглавния лист, обратната страна на заглавния лист и следващия анекс с общо 42 страници.

Регистрационен номер на сертификата: **D-PL-12107-01-00**

Франкфурт на Майн, 11.11.2015 г.

/подпис – не се чете/
инж. Ралф Егнер
Ръководител отделение

Този документ е превод. Определящата версия е оригиналният германски акредитационен сертификат.

Вж. забележките на обратната страна на листа.

ВЯРНО С ОРИГИНАЛА

927

Deutsche Akkreditierungsstelle GmbH
(Германски акредитационен орган ГмбХ)

Офис Берлин
Шпителмаркт 10
10117 Берлин

Офис Франкфурт на Майн
Еуропа алее 52
60327 Франкфурт на Майн

Офис Брауншвайг
Бундесалее 100
38116 Брауншвайг

Публикуването на извадки от акредитационния сертификат подлежи на предварително писмено одобрение от Deutsche Akkreditierungsstelle GmbH (DAkkS). Изключение е непромененатa форма на отделни разпространения на заглавния лист от споменатия на обратната страна на листа орган за оценка на съответствието.

Не трябва да се създава впечатление, че акредикацията е разширена до области извън обхвата на акредитация , удостоверен от DAkkS.

Акредитацията е дадена съгласно Закона за акредитационния орган (AkkStelleG) от 31 юли 2009 г. (Вестник за федерални закони I стр. 2625) и РЕГЛАМЕНТ (ЕО) № 765/2008 на Европейския парламент и на Съвета от 9 юли 2008 г. за определяне на изискванията за акредитация и надзор на пазара във връзка с предлагането на пазара на продукти (Официален вестник на Европейския съюз L 218 от 9 юли 2008 г., стр. 30). DAkkS е подписал Многостранното споразумение за взаимно признаване на европейското сътрудничество за акредитация (EA), Международния акредитационен форум (IAF) и Международното сътрудничество за акредитиране на лаборатории (ILAC). Подписалите тези споразумения признават взаимно своите акредитации.

Текущото състояние на членството може да бъде намерено на следните уебсайтове:
EA: www.european-accreditation.org
ILAC: www. ilac.org
IAF: www.iaf.nu

ВЯРНО С
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DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory

IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH
Landsberger Allee 378 A, 12681 Berlin

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

High-voltage equipment and components
Low-voltage equipment and components
Installation, switching, control and protective equipment
High-voltage, medium-voltage and low-voltage cables and their accessories

The accreditation certificate shall only apply in connection with the notice of accreditation of 2015-11-11 with the accreditation number D-PL-12107-01 and is valid until 2020-11-10. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 42 pages.

Registration number of the certificate: **D-PL-12107-01-00**

ВЯРНО С
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Frankfurt, 2015-11-11

Dipl.-Ing. (FH) Ralf Egner
Head of Division

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkkS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

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DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-PL-12107-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 2015-11-11 to 2020-11-10 Date of issue: 2015-11-11

Holder of certificate:

IPH Institut "Prüffeld für elektrische Hochleistungstechnik" GmbH
Landsberger Allee 378 A, 12681 Berlin

Tests in the fields:

High-voltage equipment and components
Low-voltage equipment and components
Railway applications
Installation, switching control and protective equipment
High-voltage, medium-voltage and low-voltage cables and their accessories

The testing laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use standards or equivalent testing methods listed here with different issue dates.

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Testing of high-voltage equipment and components as described in the subsequent listed standards			
High-voltage Switchgear, Control gear and Assemblies (general)			
Electrical engineering	IEC 62271-1 (2011-08) Ed. 1.1 EN 62271-1:2008/A1:2011 DIN EN 62271-1 VDE 0671-1/A1): 2012-04	High-voltage switchgear and controlgear – Part 1: Common specifications	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
High-voltage Switchgear and Control gear			
Electrical engineering	IEC 62271-100 (2012-09) Ed. 2.1 STL-Guide EN 62271-100:2009 + A1:2012 DIN EN 62271-100:2013-08 VDE 0671-100	High-voltage switchgear and controlgear – Part 100: High-voltage alternating-current circuit-breakers	
Electrical engineering	IEC 62271-101 (2012-10) Ed. 2.0 STL-Guide EN 62271-101:2013 DIN EN 62271-101:2013-08 VDE 0671-101	High-voltage switchgear and controlgear – Part 101: Synthetic testing	
Electrical engineering	IEC 62271-108 (2005-10) Ed. 1.0 EN 62271-108:2006 DIN EN 62271-108:2006-10 VDE 0671-108	High-voltage switchgear and controlgear – Part 108: High-voltage alternating current disconnecting circuit-breakers for rated voltages of 72,5 kV and above	
Electrical engineering	IEC 62271-109 EN 62271-109:2009 + A1:2013 DIN EN 62271-109:2014-02 VDE 0671-109	High-voltage switchgear and controlgear – Part 109: Alternating-current series capacitor by-pass switches	
Electrical engineering	IEC 62271-110 (2012-09) Ed. 3.0 EN 62271-110:2012 DIN EN 62271-110:2013-08 VDE 0671-110	High-voltage switchgear and controlgear – Part 110: Inductive load switching	
Electrical engineering	IEEE C37.60-2012 IEC 62271-111 (2012-09) Ed. 2.0 VDE 0671-111	Overhead, pad-mounted, dry vault, and submers-ible automatic circuit reclosersand fault interrupters for alternating current systems up to 38 kV.	
Electrical engineering	IEC 62271-205 EN 62271-205:2008 DIN EN 62271-205:2008-12 VDE 0671-205	High-voltage switchgear and controlgear – Part 205: Compact switchgear assemblies for rated voltages above 52 kV.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Load switches			
Electrical engineering	IEC 62271-103 DIN IEC 62271-103 EN 62271-103:2011 DIN EN 62271-103:2012-04 VDE 0671-103 STL-Guide	High-voltage switchgear and controlgear – Part 103: Switches for rated voltages above 1 kV up to and including 52 kV.	
Electrical engineering	IEC 62271-104 (2015-02) Ed. 2.0 EN 62271-104:2009 DIN EN 62271-104:2010-03 VDE 0671-104	High-voltage switchgear and controlgear – Part 104: Alternating current switches for rated voltages higher than 52 kV.	
Electrical engineering	IEC 62271-105 (2012-09) Ed. 2.0 EN 62271-105:2012 DIN EN 62271-105:2013-08 VDE 0671-105	High-voltage switchgear and controlgear – Part 105: Alternating current switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV.	
Electrical engineering	IEC 62271-107 (2012-05) Ed. 2.0 EN 62271-107:2012 DIN EN 62271-107:2013-03 VDE 0671-107	High-voltage switchgear and controlgear – Part 107: Alternating current fused circuit-switchers for rated voltages above 1 kV up to and including 52 kV.	
Current contactors and motor starters			
Electrical engineering	IEC 62271-106 (2014-02) Ed. 1.0 + Corr 1 EN 62271-106:2011 DIN IEC 62271-106:2012-06 VDE 0671-106	High-voltage alternating current contactors and contactor-based motor starters.	
Current disconnectors and earthing switches			
Electrical engineering	IEC 62271-102 (2013-02) Ed. 1.0 + am2 EN 62271-102:2002/A2:2013 DIN EN 62271-102/A2:2013-12 VDE 0671-102/A2	High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Fuses			
Electrical engineering	IEC 60282-1 (2014-07) Ed. 7.1 STL-Guide EN 60282-1:2009 + A1:2014 DIN EN 60282-1:2015-05 VDE 0670-4	High-voltage fuses – Part 1: Current-limiting fuses.	
Electrical engineering	IEC 60282-2 (2008-04) Ed. 3.0	High-voltage fuses; – Part 2: Expulsion fuses	
Electrical engineering	IEC 60644 (2009-08) Ed. 2.0 EN 60644:2009 DIN EN 60644:2010-07 VDE 0670-401	Specification for high-voltage fuse-links for motor circuit applications.	
High-voltage switchgear and control gear assemblies			
Electrical engineering	IEC 62271-200 (2011-10) Ed. 2.0 STL- Guide EN 62271-200:2012 DIN EN 62271-200:2012-08 VDE 0671-200	High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.	
Electrical engineering	IEC 62271-201 (2014-03) Ed. 2.0 EN 62271-201:2014 DIN EN 62271-201:2015-03 VDE 0671-201	High-voltage switchgear and controlgear – Part 201: A.C. insulation-enclosed switch-gear and controlgear for rated voltages above 1 kV and up to and including 52 kV.	
Electrical engineering	IEC 62271-203 (2013-07) Ed. 2.0 + Corr. 1 STL-Guide EN 62271-203:2012 DIN EN 62271-203:2012-11 VDE 0671-203	High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV.	
Electrical engineering	IEC 62271-204 (2011-07) Ed. 1.0 STL-Guide EN 62271-204:2011 DIN EN 62271-204:2012-05 VDE 0671-204	High-voltage switchgear and controlgear – Part 204: Rigid gas-insulated transmission lines for rated voltage above 52 kV.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 62271-209 (2007-08) Ed. 1.0 EN 62271-209:2007 DIN EN 62271-209:2008-07 VDE 0671-209	High-voltage switchgear and controlgear – Part 209: Cable connections for gas-insulated metal-enclosed switchgear for rated voltages above 52 kV – Fluid-filled and extruded insulation cables – Fluid-filled and dry-type cable-terminations.	
Electrical engineering	IEC 62271-202 EN 62271-202:2014 + AC:2014 DIN EN 62271-202:2015-02 VDE 0671-202	High-voltage switchgear and controlgear – Part 202: High voltage / low voltage prefabricated substation.	
Electrical engineering	IEC 62271-205 (2008-01) Ed. 1.0 EN 62271-205:2008 DIN EN 62271-205:2008-12 VDE 0671-205	High-voltage switchgear and controlgear – Part 205: Compact switchgear assemblies for rated voltages above 52 kV.	
Electrical engineering	ANSI / IEEE C37.23-2003	IEEE Standard for Metal-Enclosed Bus	
Switch gear for direct current			
Electrical engineering	DIN VDE 0660-112:1987-02 VDE 0660-112	Schaltgeräte; Zusatzbestimmungen für Gleichstrom-Lastschalter, -Trenner und -Lasttrenner über 1200 V bis 3000 V.	
Power transformers, reactors, line traps, tap-changers			
Electrical engineering	IEC 60076-1 (2011-04) Ed. 3.0 EN 60076-1:2011 DIN EN 50076-1:2012-03 VDE 0532-76-1	Power transformers – Part 1: General.	
Electrical engineering	IEC 60076-2 (2011-02) Ed. 3.0 EN 60076-2:2011 DIN EN 60076-2:2012-02 VDE 0532-76-2	Power transformers – Part 2: Temperature rise for liquid-immersed transformers.	
Electrical engineering	IEC 60076-3 (2013-07) Ed. 3.0 EN 60076-3:2013 DIN EN 60076-3:2014-08 VDE 0532-76-3	Power transformers – Part 3: Insulation levels, dielectric tests and external clearances in air.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0532-76 -4 DIN EN 60076-4:2003-06 IEC 60076-4 (2002-06) Ed. 1.0	Power transformers – Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors.	
Electrical engineering	IEC 60076-5 (2006-02) Ed. 3.0 STL-Guide EN 60076-5:2006 DIN EN 60076-5:2007-01 VDE 0532-76-5	Power transformers – Part 5: Ability to withstand short circuit.	
Electrical engineering	IEC 60076-6 (2007-12) Ed. 1.0 EN 60076-6:2008 DIN EN 60076-6:2009-02 VDE 0532-76-6	Power transformers – Part 6: Reactors.	
Electrical engineering	IEC 60076-10 (2001-05) Ed. 1.0 IEC 60076-10-1 (2005-10) Ed. 1.0 EN 60076-10:2001 DIN EN 60076-10:2002-04 VDE 0532-76-10	Power transformers – Part 10-1: Determination of sound levels (+ Application guide).	
Electrical engineering	IEC 60076-11 (2004-05) Ed. 1.0 EN 60076-11:2004 DIN EN 60076-11:2005-04 VDE 0532-76-11	Power transformers – Part 11: Dry-type transformers.	
Electrical engineering	IEC 60076-13 EN 60076-13:2006 DIN EN 60076-13:2007-07 VDE 0532-76-13	Power transformers – Part 13: Self-protected liquid-filled transformers.	
Electrical engineering	DIN 57532-21:1982-03 VDE 0532-21	Transformatoren und Drosselspulen; Anlasstransformatoren und Anlassdrosselspulen	
Electrical engineering	VDE 0532 Teil 30 DIN EN 60214:2015-04 IEC 60214-1 (2014-05) Ed. 2.0	Tap-changer	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0851 IEC 60353 (2004-04) Ed. 2.0	Line traps for a.c. power systems.	
Instrument transformers			
Electrical engineering	IEC 61869-1 (2007-10) Ed. 1.0 EN 61869-1:2009 DIN EN 61869-1:2010-04 VDE 0414-9-1	Instrument transformers – Part 1: General requirements.	
Electrical engineering	IEC 61869-2(2012-09) Ed. 1.0 EN 61869-2:2012 DIN EN 61869-2:2013-07 + Ber. VDE 0414-9-2	Instrument transformers – Part 2: Additional requirements for current transformers.	
Electrical engineering	IEC 61869-3 (2011-07) Ed. 1.0 EN 61869-3:2011 DIN EN 61869-3:2012-05 VDE 0414-9-3	Instrument transformers – Part 3: Additional requirements for inductive voltage transformers.	
Electrical engineering	IEC 61869-4 (2013-11) Ed. 1.0 EN 61869-4:2014 DIN EN 61869-4:2015-04 VDE 0414-9-4	Instrument transformers – Part 4: Additional requirements for combined transformers.	
Electrical engineering	VDE 0414-9-5 DIN EN 61869-5:2012-05 IEC 61869-5 (2015-08) Ed. 1.0	Capacitive Voltage Transformers.	
Electrical engineering	VDE 0414-44-8 DIN EN 60044-8:2003-06 IEC 60044-8 (2002-07) Ed.1.0 IEC 61869-8	Instrument transformers – Part 8: Electronic current transformers	
Electrical engineering	IEC 60044-7 (1999-12) Ed. 1.0 EN 60044-7:2000-11 DIN EN 60044-7:2000-11 VDE 0414-44-7 IEC 61869-7	Instrument transformers – Part 7: Electronic voltage transformers.	
Capacitors			
Electrical engineering	DIN VDE 0560-1:1969-12 VDE 0560-1	Bestimmungen für Kondensatoren – Teil 1: Allgemeine Bestimmungen.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60252-1 (2013-08) Ed. 2.1 EN 60252-1:2011 + A1:2013 DIN EN 60252-1:2014-07 VDE 0560-8	AC motor capacitors – Part 1: General - Performance, testing and rating - Safety requirements - Guidance for installation and operation.	
Electrical engineering	IEC 60110-1 (1998-06) Ed. 1.0 EN 60110-1:1998 DIN EN 61110-1:1999-09 VDE 0560-9	Power capacitors for induction heating installations – Part 1: General.	
Electrical engineering	DIN VDE 0560-10:1964-10 VDE 0560-10	Regeln für Kondensatoren – Teil 10: Regeln für Hochfrequenz-Leistungskondensatoren.	
Electrical engineering	DIN VDE 0560-11:1970-05 VDE 0560-11	Regeln für Kondensatoren – Teil 11: Regeln für Kondensatoren ab 600 V zum Glätten pulsierender Gleichspannung.	
Insulators and bushings			
Electrical engineering	DIN VDE 0441-1:1985-07 VDE 0441-1	Prüfung von Kunststoff-Isolatoren für Betriebswechselspannungen über 1 kV; Prüfung von Werkstoffen für Freiluftisolatoren.	
Electrical engineering	IEC 60660 (1999-10) Ed. 2.0 EN 60660:1999 DIN EN 60660:2000-12 VDE 0441-3	Insulators – Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1000 V up to but not including 300 kV.	
Electrical engineering	IEC 60383-1 (1993-04) Ed. 4.0 EN 60383-1:1996 DIN EN 60383-1:1997-05 VDE 0446-1	Insulators for overhead lines with a nominal voltage above 1000 V – Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria.	
Electrical engineering	IEC 60383-2 (1993-04) Ed. 1.0 EN 60383-2:1995 DIN EN 60383-2:1995-08 VDE 0446-4	Insulators for overhead lines with a nominal voltage above 1000 V – Part 2: Insulator strings and insulator sets for a.c. systems - Definitions, test methods and acceptance criteria.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60168 (2001-04) Ed. 4.2 EN 60168:1994 DIN EN 60168:2001-12 VDE 0674-1	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V.	
Electrical engineering	IEC 62155 (2003-05) Ed. 1.0 EN 62155:2003 DIN EN 62155:2004 VDE 0674-200	Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V.	
Electrical engineering	IEC 60137 (2008-07) Ed. 6.0 EN 60137:2008 DIN EN 60137:2009-07 VDE 0674-5	Insulated bushings for alternating voltages above 1000 V.	
Overhead lines			
Electrical engineering	IEC 61284 (1997-09) Ed. 2.0 + Corr. EN 61284:1997 DIN EN 61284:1998-05 VDE 0212-1	Overhead lines – Requirements and tests for fittings.	
Electrical engineering	IEC 61854 (1998-09) Ed. 1.0 EN 61854:1998 DIN EN 61854:1999-08 VDE 0212-2	Overhead lines – Requirements and tests for spacers.	
Electrical engineering	IEC 61897 (1998-09) Ed. 1.0 EN 61897:1998 DIN EN 61897:1999-08 VDE 0212-3	Overhead lines – Requirements and tests for Stockbridge type aeolian vibration dampers.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	DIN VDE 0216:1986-2 VDE 0216	Armaturen für Fahrleitungsanlagen; Statisch-mechanisches Verhalten – Anforderungen, Prüfung.	
HVDC Thyristor valves			
Electrical engineering	IEC 60700-1 (2008-11) Ed. 1.2 EN 60700-1:1998 + A1:2003 + A2:2008 DIN EN 60700-1:2009-07 VDE 0553-1	Thyristor valves for high voltage direct current (HVDC) power transmission – Part 1: Electrical testing.	
Equipment for operating, testing, marking off, live working. Equipment for earthing, short-circuiting.			
Electrical engineering	DIN VDE 0681-1:1986-10 VDE 0681-1	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Allgemeine Festlegungen.	
Electrical engineering	DIN 57681-2:1977-03 DIN VDE 0681-2:1977-03 VDE 0681-2	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Schaltstangen.	
Electrical engineering	DIN 57681-3:1977-03 DIN VDE 0681-3 VDE 0681-3	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Sicherungszangen.	
Electrical engineering	DIN VDE 0681-6:1985-06 VDE 0681-6	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Spannungsprüfer für Oberleitungsanlagen elektrischer Bahnen; 15 kV, 16 2/3 Hz.	
Electrical engineering	DIN VDE 0681-8:2003-10 VDE 0681-8	Geräte zum Betätigen, Prüfen und Abschranken unter Spannung stehender Teile mit Nennspannungen über 1 kV; Isolierende Schutzplatten.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60832-1 (2010-02) Ed. 1.0 EN 60832-1:2010 + Cor.:2010 DIN EN 60832-1:2010-12 VDE 0682-211	Live working – Insulating sticks and attachable devices – Part 1: Insulating sticks.	
Electrical engineering	IEC 61229 (2002-06) Ed. 1.2 EN 61229:1995/A2:2002 DIN EN 61229/A2:2003-09 VDE 0682-551 /A2	Rigid protective covers for live working on a.c. installations.	
Electrical engineering	IEC 61230 (2008-07) Ed. 2.0 EN 61230:2008 DIN EN 61230:2009-07 VDE 0683-100	Live working – Portable equipment for earthing or earthing and short-circuiting.	
Electrical engineering	IEC 61219 (1993-10) Ed. 1.0 + Cor.200-05 EN 61219:1993 DIN EN 61219:1995-01 VDE 0683-200	Live working – Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device – Lance earthing.	
High-voltage test techniques			
Electrical engineering	IEC 60270 (2000-12) Ed. 3.0 + Cor.1 EN 60270:2001 + Ber. DIN EN 60270:2001-08 + Ber. VDE 0434	High-voltage test techniques – Partial discharge measurements.	
Electrical engineering	IEC 60060-1 (2010-09) Ed. 3.0 STL-Guide HD 558.1 S1 EN 60060-1:2010 DIN EN 60060-1:2011-10 VDE 0432-1	High-voltage test techniques – Part 1: General definitions and test requirements.	
Electrical engineering	IEC 60060-2 (2010-11) Ed. 3.0 EN 60060-2:2011 DIN EN 60060-2:2011-10 VDE 0432-2	High-voltage test techniques – Part 2: Measuring systems.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0432-3 DIN-EN 60060-3:2006-08 IEC 60060-3 (2006-02) Ed. 1.0	High-voltage test techniques – Part 3: Definitions and requirements for on-site testing	
Electrical engineering	IEC 60052 (2002-10) Ed. 3.0 EN 60052:2002 DIN EN 60052:2003-06 VDE 0432-9	Voltage measurement by means of standard air gaps.	
Environmental and protection degree testing			
Electrical engineering	IEC 60068-2-78 (2012-10) Ed. 2.0 EN 60068-2-78:2013 DIN EN 60068-2-78:2014-02 VDE 0468-2-78	Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state.	
Electrical engineering	IEC 60068-3-4 (2001-08) Ed. 1.0	Environmental testing – Part 3-4: Supporting documentation and guidance – Damp heat tests.	
Electrical engineering	IEC 60068-2-30 (2005-08) Ed. 3.0	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle).	
Electrical engineering	IEC 60068-2-75 (2014-09) Ed. 2.0	Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests.	

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Technical responsibility for the test reports:

Approval:

Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Wirt.-Ing. Rainer Schiller
Herr Dipl.-Ing. Hannes Zinnbauer

Technical verification:

Herr Dipl.-Ing. Rainer Borchert
Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Jens Haring
Frau Dipl.-Ing. Dagmar Hauschild
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Ing. Manfred Thom
Herr Dr.-Ing. Frank Wachholz
Herr Dipl.-Ing. Jürgen Wittwer
Herr Dipl.-Ing. Sven Georgias
Herr Dipl.-Ing. Michael Heise
Herr Dipl.-Ing. Christian Juraschek
Herr Dipl.-Ing. Markus Gührs
Herr Dipl.-Ing. Klaus Vaterrodt
Herr Dipl.-Ing. Matthias Schröder-Heske
Herr Dipl.-Ing. Christian Kruscha
Frau Dipl.-Ing. Antje Köhler
Herr Dipl.-Ing. Stephan Wacker
Herr Dipl.-Ing. Lars Eberschulz

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Testing of low-voltage equipment and components as well as of installation, switching, control and protective equipment and railway applications as described in the subsequent listed standards.			
Railway applications			
Electrical engineering	VDE 0115 - 300-1 DIN EN 50123-1:2003-12 EN 50123-1:2003 IEC 61992-1 (2014-04) Ed. 2.1	Railway applications – Fixed installations – DC switchgear – Part 1: General.	
Electrical engineering	VDE 0115 - 300-2 DIN EN 50123-2:11-2003 EN 50123-2:2003 IEC 61992-2 (2014-04) Ed. 2.1	Railway applications – Fixed installations – DC switchgear – Part 2: DC circuit-breakers.	
Electrical engineering	VDE 0115 - 300-3 DIN EN 50123-3:10-2003 EN 50123-3:2003 IEC 61992-3 (2006-02) Ed. 2.0	Railway applications – Fixed installations – DC switchgear – Part 3: Indoor d.c. disconnectors, switch-disconnectors and earthing switches.	
Electrical engineering	VDE 0115 - 300-4 DIN EN 50123-4/A1 02-2014 EN 50123-4/A1:2013 IEC 61992-4 (2006-02) Ed 1.0	Railway applications – Fixed installations – DC switchgear – Part 4: Outdoor d.c. disconnectors, switch-disconnectors and earthing switches.	
Electrical engineering	IEC 61992-5 (2006-02) Ed. 1.0 DIN EN 50526-1:2012 VDE 0115-526-1:2012 EN 50526-1:2012	Railway applications – Fixed installations – DC switchgear – Part 5: Surge arresters and low-voltage limiters for specific use in d.c. systems.	
Electrical engineering	DIN EN 50526-2:2014 VDE 0115-526-2:2014 EN 50526-2:2014	Bahnanwendungen – Ortsfeste Anlagen – Überspannungsableiter und Spannungsbegrenzungseinrichtungen für Gleichspannungsnetze – Teil 2: Spannungsbegrenzungseinrichtungen.	
Electrical engineering	VDE 0115 - 300-6 DIN EN 50123-6:09-2003 EN 50123-6:2003 IEC 61992-6 (2014-04) Ed. 1.1	Railway applications – Fixed installations – DC switchgear – Part 6: DC switchgear assemblies.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0115 Teil 420 DIN EN 60310:2005-01 IEC 60310 (2004-02) Ed. 3.0	Railway applications – Traction transformers and inductors on board rolling stock.	
Electrical engineering	IEC 60077-1 (1999-10) Ed. 1.0 DIN EN 60077-1:2003-04 VDE 0115-460-1	Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules.	
Electrical engineering	IEC 60077-2 (1999-03) Ed. 1.0 DIN EN 60077-2:2003-04 VDE 0115-460-2	Railway applications – Electric equipment for rolling stock – Part 2: Electrotechnical components – General rules.	
Electrical engineering	IEC 60077-3 (2001-12) Ed. 1.0 DIN EN 60077-3:2003-04 VDE 0115-460-3	Railway applications – Electric equipment for rolling stock – Part 3: Electrotechnical components – Rules for d.c. circuit-breakers.	
Electrical engineering	IEC 60077-4 (2003-02) Ed. 1.0 DIN EN 60077-4:2004-01 VDE 0115-460-4	Railway applications – Electric equipment for rolling stock – Part 4: Electrotechnical components – Rules for AC circuit-breakers.	
Electrical engineering	IEC 60077-5 (2003-07) Ed. 1.0 DIN EN 60077-5:2004-07 VDE 0115-460-5	Railway applications – Electric equipment for rolling stock – Part 5: Electrotechnical components – Rules for HV fuses.	
Electrical engineering	VDE 0115-327 DIN EN 50327:2006-03 EN 50327:2006-03 IEC 62589 (2010-07) Ed. 1.0	Railway applications – Fixed installations – Harmonisation of the rated values for converter groups and tests on converter groups.	
Electrical engineering	VDE 0115-328 DIN EN 50328:2010-11 EN 50328:2010-11 IEC 62590 (2010-06) Ed. 1.0	Railway applications – Fixed installations – Electronic power converters for substations.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0560-700 DIN EN 61921:2004-02 EN 61921:2003-07 IEC 61921 (2003-04) Ed. 1.0	Power capacitors Low-voltage power factor correction banks.	
Electrical engineering	VDE 0115 - 410 DIN EN 61287-1:2014-12 EN 61278-1:2014-07 IEC 61287-1 (2014-07) Ed. 3.0	Railway applications – Power convertors installed on board rolling stock – Part 1: Characteristics and test methods.	
Low-voltage switchgear and control gear			
Electrical engineering	VDE 0660 - 100 DIN EN 60947-1:2011-10 EN 60947-1:2011 IEC 60947-1 (2014-09) Ed. 5.2	Low-voltage switchgear and control gear – Part 1: General rules.	
Electrical engineering	VDE 0660 - 101 DIN EN 60947-2:2014-01 EN 60947-2:2013 IEC 60947-2 (2013-01) Ed. 4.2	Low-voltage switchgear and control gear – Part 2: Circuit-breakers.	
Electrical engineering	VDE 0660 - 107 DIN EN 60947-3:2015:03 EN 60947-3:2009 IEC 60947-3 (2012-09) Ed. 3.1	Low-voltage switchgear and control gear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units.	
Electrical engineering	VDE 0660 - 102 DIN EN 60947-4-1:2014-02 EN 60947-4-1:2012 IEC 60947-4-1 (2012-07) Ed. 3.1	Low-voltage switchgear and control gear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters.	
Electrical engineering	VDE 0660 - 117 DIN EN 60947-4-2:2013-05 EN 60947-4-2:2012 IEC 60947-4-2 (2012-03) Ed. 3.0	Low-voltage switchgear and control gear – Part 4-2: Contactors and motor-starters – AC semiconductor motor controllers and starters.	
Electrical engineering	VDE 0660 - 109 DIN EN 60947-4-3:2015-04 EN 60947-4-3:2014 IEC 60947-4-3 (2014-05) Ed. 2.0	Low-voltage switchgear and controlgear – Part 4-3: Contactors and motor-starters – AC semiconductor controllers and contactors for non-motor loads.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0660 - 200 DIN EN 60947-5-1:2010-04 EN 60947-5-1:2009 IEC 60947-5-1 (2009-07) Ed. 3.1	Low-voltage switchgear and control gear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices.	
Electrical engineering	VDE 0660 - 208 DIN EN 60947-5-2:2014-01 EN 60947-5-2:2012 IEC 60947-5-2 (2012-09) Ed. 3.1	Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches.	
Electrical engineering	VDE 0660 - 210 DIN EN 60947-5-5:2005-11 EN 60947-5-5:2005 IEC 60947-5-5 (2005-04) Ed. 1.1	Low-voltage switchgear and controlgear – Part 5-5: Control circuit devices and switching elements – Electrical emergency stop device with mechanical latching function.	
Electrical engineering	VDE 0660 - 114 DIN EN 60947-6-1:2014-09 EN 60947-6-1:2014 IEC 60947-6-1 (2013-12) Ed. 2.1	Low-voltage switchgear and controlgear – Part 6-1: Multiple function equipment – Transfer switching equipment.	
Electrical engineering	VDE 0660 - 115 DIN EN 60947-6-2:2007-12 EN 60947-6-2:2007 IEC 60947-6-2 (2007-03) Ed. 2.1	Low-voltage switchgear and controlgear – Part 6-2: Multiple function equipment – Control and protective switching devices (or equipment) (CPS).	
Electrical engineering	VDE 0611 - 1 DIN EN 60947-7-1:2010-03 EN 60947-7-1:2009 IEC 60947-7-1 (2009-04) Ed. 3.0	Niederspannungsschaltgeräte – Teil 7.1: Hilfseinrichtungen: Reihenklemmen für Kupferleiter. Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors.	
Electrical engineering	VDE 0611 - 3 DIN EN 60947-7-2:2010-03 EN 60947-7-2:2009 IEC 60947-7-2 (2009-04) Ed. 3.0	Low-voltage switchgear and controlgear – Part 7-2: Ancillary equipment – Protective conductor terminal blocks for copper conductors.	
Electrical engineering	VDE 0611 - 4 DIN VDE 0611- 4:1991-02	Niederspannungsschaltgeräte; Mehrstöckige Verteiler-Reihenklemmen bis 6 mm^2	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0637 - 3 DIN EN 61095:2009-11 EN 61095:2009 IEC 61095 (2009-02) Ed. 2.0	Electromechanical contactors for household and similar purposes.	
Electrical engineering	VDE 0220-100 DIN EN 61238-1:2004-03 IEC 61238-1 (2003-05) Ed. 2.0	Compression and mechanical connectors for power cables for rated voltages up to 30 kV (Um = 36 kV) – Part 1: Test methods and requirements.	
Fuses			
Electrical engineering	DIN EN 60269-1:2015-05 IEC 60269-1 (2014-06) Ed. 4.2 VDE 0636-1	Low-voltage fuses – Part 1: General requirements	
Electrical engineering	DIN VDE 0636-2:2014-09 IEC 60269-2 (2013-07(Ed. 5.0 HD 60269-2:2013 VDE 0636-2	Low-voltage fuses – Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) - Examples of standardized systems of fuses A to K	
Electrical engineering	DIN VDE 0636-3:2013-12 IEC 60269-3 (2013-01) Ed. 4.1 HD 60269-2:2013 VDE 0636-3	Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household or similar applications) - Examples of standardized systems of fuses A to F	
Electrical engineering	DIN EN 60269-4:2013-01 EN 60269-4:2012 IEC 60269-4 (2012-05) Ed. 5.1 VDE 0636-4	Low-voltage fuses – Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices	
Electrical engineering	DIN CLC 60269-5 IEC/TR 60269-5 (2014-03) Ed. 2.0 VDE 0636-5	Low-voltage fuses – Part 5: Guidance for the application of low-voltage fuses	
Electrical engineering	DIN EN 60269-6:2012-06 EN 60269-6:2011 IEC 60269-6 (2010-12) Ed. 1.0 + Cor. 1 VDE 0636-6	Low-voltage fuses – Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60127-1 (2015-02) Ed. 2.2	Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links.	
Electrical engineering	IEC 60127-2 (2014-09) Ed. 3.0	Miniature fuses – Part 2: Cartridge fuse-links.	
Power Transformers and Reactors			
Electrical engineering	VDE 0532-76-1 DIN EN 60076-1:2012-03 EN 60076-1:2011 IEC 60076-1 (2011-04) Ed. 3.0	Power transformers – Part 1: General.	
Electrical engineering	VDE 0532-76-2 DIN EN 60076-2:2012-02 EN 60076-2:2011 IEC 60076-2 (2011-02) Ed. 3.0	Power transformers – Part 2: Temperature rise for liquid-immersed transformers.	
Electrical engineering	VDE 0532-76-5 DIN EN 60076-5:2007-01 EN 60076-5:2006 IEC 60076-5 (2006-02) Ed. 3.0	Power transformers – Part 5: Ability to withstand short circuit.	
Electrical engineering	VDE 0532-76-6 DIN EN 60076-6:2009-02 EN 60076-6:2008 IEC 60076-6 (2013-09) Ed. 1.0	Power transformers – Part 6: Reactors.	
Electrical engineering	VDE 0532-214-1 DIN EN 60214-1:2015-04 EN 60214-1:2014 IEC 60214-1 (2014-05) Ed. 2.0	Tap-changers – Part 1: Performance requirements and test methods.	
Electrical engineering	IEC 60353 (2002-04) Ed. 2.0	Line traps for a.c. power systems.	
Electrical Installation Material			
Electrical engineering	VDE 0220 -3	Kabelklemmen	
Electrical engineering	VDE 0603-1 DIN VDE 0603-1:1991-01	Installationskleinverteiler und Zählerplätze AC 400 V; Installationskleinverteiler und Zählerplätze.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0603-2 DIN VDE 0603-2:1098-03	Installationskleinverteiler und Zählerplätze AC 400 V; Hauptleitungsabzweigklemmen.	
Electrical engineering	VDE 0609 -1 DIN EN 60999:2000-12 EN 60999:2000 IEC 60999 (1999-11) Ed. 2.0	Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm^2 up to 35 mm^2 (included).	
Electrical engineering	VDE 0623 -1 DIN EN 60309-1:2014-12 EN 60309-1:2005 IEC 60309-1 (2012-06) Ed. 4.2	Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements.	
Electrical engineering	VDE 0604-202 DIN EN 61914:2010-01 IEC 61914 (2009-01) Ed. 1.0	Cable cleats for electrical installations.	
Electrical engineering	VDE 0623 -20 DIN EN 60309-2:2013-01 EN 60309-2:2012 IEC 60309-2 (2012-05) Ed. 4.2	Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories.	
Electrical engineering	VDE 0630 - 1 DIN EN 61058-1:2001-10 EN 61058-1:2008 IEC 61058-1 (2008-04) Ed. 3.2	Switches for appliances – Part 1: General requirements.	
Electrical engineering	VDE 0630 - 2-1 DIN EN 61058-2-1:2001-08 EN 61058-2-1:2011 IEC 61058-2-1 (2010-11) Ed. 2.0	Switches for appliances – Part 2-1: Particular requirements for cord switches.	
Electrical engineering	VDE 0640 DIN EN 62019:2006-01 EN 62019:2005 IEC 62019 (2003-01)	Electrical accessories – Circuit-breakers and similar equipment for household use – Auxiliary contact units.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60898-1 (2015-03) Ed. 2.0 EN 60898-1 DIN EN 60898-1:2013 VDE 0641-1	Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation	
Electrical engineering	IEC 60898-2 (2003-07) Ed. 1.1 EN 60898-2: 2007 DIN EN 60898-2:2007 VDE 0641-2	Circuit-breakers for overcurrent protection for household and similar installations – Part 2: Circuit-breakers for a.c. and d.c. operation	
Electrical engineering	IEC 60934 (2013-01) Ed. 3.2 DIN EN 60934:2013-11 VDE 0642	Circuit-breakers for equipment (CBE).	
Electrical engineering	IEC 61008-1 (2013-09) Ed. 3.2 DIN EN 61008-10:2015-11 VDE 0664-10	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules	
Electrical engineering	IEC 61008-2-1 (1990-12) Ed. 1.0 DIN EN 61008-2-11:1999-12 VDE 0664-2-11	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCB's). – Part 2-1: Applicability of the general rules to RCCB's functionally independent of line voltage	
Electrical engineering	IEC 61008-2-2 (1990-12) Ed. 1.0 DIN EN 61008-2-2 VDE 0664-2-2	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCB's). – Part 2-2: Applicability of the general rules to RCCB's functionally dependent on line voltage	
Electrical engineering	IEC 61009-1 (2013-09) Ed. 3.2 DIN EN 61009-20:2015-11 VDE 0664-20	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 61009-2-1 (1991-09) Ed. 1.0 DIN EN 61009-21:1999-12 VDE 0664-21	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBO's) – Part 2-1: Applicability of the general rules to RCBO's functionally independent of line voltage	
Electrical engineering	IEC 61009-2-2 (1991-09) Ed. 1.0 DIN EN 61009-2-2 VDE 0664-2-2	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBO's) – Part 2-2: Applicability of the general rules to RCBO's functionally dependent on line voltage	
Electrical engineering	IEC 60099-4 (2014-06) Ed. 3.0 DIN EN 60099-4:2015-07 VDE 0675-4	Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems	
Electrical engineering	IEC 60099-5 (2013-05) Ed. 2.0 DIN EN 60099-5:2014-09 VDE 0675-5	Surge arresters – Part 5: Selection and application recommendations	
Electrical engineering	IEC 60099-6 (2002-08) Ed. 1.0	Surge arresters – Part 6: Surge arresters containing both series and parallel gapped structures - Rated 52 kV and less	
Electrical engineering	IEC 60099-8 (2011-01) Ed. 1.0 DIN EN 60099-8:2011-11 VDE 0675-8	Surge arresters – Part 8: Metal-oxide surge arresters with external series gap (EGLA) for overhead transmission and distribution lines of a.c. systems above 1 kV	
Electrical engineering	IEC 60099-9 (2014-06) Ed. 1.0 DIN EN 60099-9:2015-08 VDE 0675-9	Surge arresters – Part 9: Metal-oxide surge arresters without gaps for HVDC converter stations	
Electrical engineering	IEC 61643-11 (2011-03) Ed. 1.0 DIN EN 61643-11/A1:2015-09 VDE 0675-6-11	Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 61643-12 (2008-11) Ed. 2.0 DIN EN 61643-12:2013-04 VDE 0675-6-12	Low-voltage surge protective devices – Part 12: Surge protective devices connected to low-voltage power distribution systems - Selection and application principles	
Electrical engineering	IEC 61643-21 (2012-07) Ed. 1.2	Low voltage surge protective devices – Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods	
Electrical engineering	IEC 61643-22 (2015-06) Ed. 2.0	Low-voltage surge protective devices – Part 22: Surge protective devices connected to telecommunications and signalling net-works – Selection and application principles	
Electrical engineering	IEC 61643-311 (2013-04) Ed. 1.0	Components for low-voltage surge protective devices – Part 311: Performance requirements and test circuits for gas discharge tubes (GDT)	
Electrical engineering	IEC 61643-312 (2013-04) Ed. 1.0	Components for low-voltage surge protective devices – Part 312: Selection and application principles for gas discharge tubes	
Electrical engineering	IEC 61643-321 (2001-12) Ed. 1.0	Components for low-voltage surge protective devices – Part 321: Specifications for avalanche breakdown diode (ABD)	
Electrical engineering	IEC 61643-331 (2003-05) Ed. 1.0	Components for low-voltage surge protective devices – Part 331: Specification for metal oxide varistors (MOV)	
Electrical engineering	IEC 61643-341 (2001-11) Ed. 1.0	Components for low-voltage surge protective devices – Part 341: Specification for thyristor surge suppressors (TSS)	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0675-39-11 DIN EN 50539-11:2013-12 EN 50539-11:2013	Überspannungsschutzgeräte für Niederspannung - Überspannungsschutzgeräte für besondere Anwendungen einschließlich Gleichspannung – Teil 11: Anforderungen und Prüfungen für Überspannungsschutzgeräte für den Einsatz in Photovoltaik-Installationen.	
Low-voltage switchgear and controlgear assemblies			
Electrical engineering	IEC 61439-1 (2011-08) Ed. 2.0 DIN EN 61439-1:2014-06 VDE 0660-600-1	Low-voltage switchgear and controlgear assemblies – Part 1: General rules	
Electrical engineering	IEC 61439-2 (2011-08) Ed.2.0 DIN EN 61439-2:2012-06 VDE 0660-600-2	Low-voltage switchgear and controlgear assemblies – Part 2: Power switchgear and controlgear assemblies	
Electrical engineering	IEC 61439-3 (2012-02) Ed. 1.0 DIN EN 61439-3:2014-10 VDE 0660-600-3	Low-voltage switchgear and controlgear assemblies – Part 3: Distribution boards intended to be operated by ordinary persons (DBO)	
Electrical engineering	IEC 61439-4 (2012-11) Ed.1.0 DIN EN 61439-4:2013-09 VDE 0660-600-4	Low-voltage switchgear and controlgear assemblies – Part 4: Particular requirements for assemblies for construction sites (ACS)	
Electrical engineering	IEC 61439-5 (2015-03) Ed. 2.0 DIN EN 61439-5:2015-10 VDE 0660-600-5	Low-voltage switchgear and controlgear assemblies – Part 5: Assemblies for power distribution in public networks	
Electrical engineering	IEC 61439-6 (2012-05) Ed. 1.0 DIN EN 61439-6:2013-06 VDE 0660-600-6	Low-voltage switchgear and controlgear assemblies – Part 6: Busbar trunking systems (busways)	
Electrical engineering	IEC/TS 61439-7 (2014-02) Ed. 1.0 DIN EN 61439-7:2014-10 VDE 0660-600-7	Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations	

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DAkkS Deutsche Akkreditierungsstelle

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Switching, control and protective equipment			
Electrical engineering	VDE 0435 Teil 201 DIN EN 61810-1:2009-02 EN 61810-1:2008 IEC 61810-1 (2015-02) Ed. 4.0	Electromechanical elementary relays – Part 1: General and safety requirements.	
Electrical engineering	VDE 0435 - 300 DIN EN 60255-1:2010-09 EN 60255-1:2010 IEC 60255-1 (2009-08) Ed. 1.0	Measuring relays and protection equipment – Part 1: Common requirements.	
Electrical engineering	VDE 0435 - 2021 DIN EN 61812-1:2015-04 EN 61812-1:2011 IEC 61812-1 (2011-05) Ed. 2.0	Time relays for industrial and residential use – Part 1: Requirements and tests.	
Electrical engineering	VDE 0631-2-1 DIN EN 60730-2-1:2012-10 EN 60730-2-1:2010 IEC 60730-2-1 (2014-09) Ed. 5.0	Automatic electrical controls – Part 1: General requirements.	
Electrical engineering	VDE 0631 Teil 2-10 DIN EN 60730-2-10:2008-06 EN 60730-2-10:2007 IEC 60730-2-10 (2006-10)	Automatic electrical controls for household and similar use – Part 2-10: Particular requirements for motor-starting relays	
Instrument transformers			
Electrical engineering	VDE 0414-9-2 DIN EN 61869-2:2014-06 EN 61869-2:2012 IEC 61869-2 (2012-09) Ed. 2.0	Instrument transformers – Part 2: Additional requirements for current transformers.	
Electrical engineering	VDE 0414-9-3 DIN EN 61869-3:2012-05 EN 61869-3:2011 IEC 61869-3 (2011-07) Ed. 1.0	– Part 3: Additional requirements for inductive voltage transformers.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 414-9-4 HD 548.3 S1 DIN EN 61869-4:2015-04 EN 61869-4:2014 IEC 61869-4 (2013-11) Ed. 1.0	Instrument transformers – Part 4: Additional requirements for combined transformers.	
Low-voltage equipment			
Electrical engineering	VDE 0558-11 DIN EN 60146-1-1:2011-04 EN 60146-1-1:2010 IEC 60146-1-1 (2009-06) Ed. 4.0	Semiconductor converters – General requirements and line commutated converters – Part 1-1: Specification of basic requirements.	
Electrical engineering	VDE 0558 - 8 DIN EN 60146-1-3:1994-03 EN 60146-1-3:1993 IEC 60146-1-3 (1991-04) Ed. 3.0	Semiconductor convertors – General requirements and line commutated convertors – Part 1-3: Transformers and reactors.	
Electrical engineering	VDE 0638 DIN 57638:1981-09	Niederspannungs-Schaltgeräte - Schalter-Sicherungs-Einheiten D0-System.	

Technical responsibility for the test reports:

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Akkreditierungsstelle

Approval:

Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Wirt.-Ing. Rainer Schiller
Herr Dipl.-Ing. Stefan Schwanck

Technical verification:

Herr Dipl.-Ing. Rainer Borchert
Herr Dipl.-Ing. Ronald Borchert
Herr Dipl.-Ing. Sven Georgias
Herr Dipl.-Ing. Jens Haring
Frau Dipl.-Ing. Dagmar Hauschild
Herr Dipl.-Ing. Michael Heise
Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Ing. Manfred Thom
Herr Dr.-Ing. Frank Wachholz
Herr Dipl.-Ing. Jörg Kremzow
Herr Dipl.-Ing. Jürgen Wittwer
Herr Dipl.-Ing. Christian Juraschek
Herr Dipl.-Ing. Markus Gührs
Herr Dipl.-Ing. Stephan Wacker
Herr Dipl.-Ing. Christian Kruscha
Frau Dipl.-Ing. Antje Köhler
Herr Dipl.-Ing. Lars Eberschulz
Herr Dipl.-Ing. Uwe Fischer

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Testing of high-voltage, medium-voltage and low-voltage cables and their accessories as described in the subsequent listed standards.			
Polyvinyl chloride insulated cables			
Electrical engineering	IEC 60227-1 (2007-10) Ed. 3.0	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 1: General requirements.	
Electrical engineering	IEC 60227-3 (1997-11) Ed. 2.1	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 3: Non-sheathed cables for fixed wiring.	
Electrical engineering	IEC 60227-4 (1997-12) Ed. 2.1	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 4: Sheathed cables for fixed wiring.	
Electrical engineering	IEC 60227-5 (2011-09) Ed. 3.0	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 5: Flexible cables (cords).	
Electrical engineering	IEC 60227-6 (2001-06) Ed. 3.0	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 6: Lift cables and cables for flexible connections.	
Electrical engineering	IEC 60227-7 (2012-01) Ed. 1.2	Polyvinyl chloride insulated cables of rated voltages up to and including 450 V / 750 V – Part 7: Flexible cables screened and unscreened with two or more conductors	
Electrical engineering	VDE 0281 - 8 DIN VDE 0281-8: 2000-09 HD 21.8 S2 + A1:1999	Polyvinylchlorid-isolierte Leitungen mit Nennspannungen bis 450 V / 750 V. Einadrige Leitungen ohne Mantel für Lichterketten.	
Electrical engineering	VDE 0281 - 9 DIN VDE 0281-9:2001-01 HD 21.9 S2 + A1:1999	Polyvinylchlorid-isolierte Leitungen mit Nennspannungen bis 450 V / 750 V. Einadrige Leitungen ohne Mantel zur Verlegung bei tiefen Temperaturen.	
Electrical engineering	VDE 0285-525-1 DIN EN 50525-1:2012-01 EN 50525-1:2011	Starkstromleitungen mit Nennspannungen bis 450 V / 750 V (U_0/U) – Teil 1: Allgemeine Anforderungen.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0285-525-2-11 DIN EN 50525-2-11:2012-01 EN 50525-2-11:2011	– Flexible Leitungen mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-12 DIN EN 50525-2-12:2012-01 EN 50525-2-12:2011	– Wendelleitungen mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-21 DIN EN 50525-2-21:2012-01 EN 50525-2-21:2011	– Flexible Leitungen mit vernetzter Elastomer-Isolierung.	
Electrical engineering	VDE 0285-525-2-31 DIN EN 50525-2-31:2012-01 EN 50525-2-31:2011	– Ader und Verdrahtungsleitung mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-41 DIN EN 50525-2-41:2012-01 EN 50525-2-41:2011	– Einadrige Leitung mit vernetzter Silicon-Isolierung.	
Electrical engineering	VDE 0285-525-2-42 DIN EN 50525-2-42:2012-01 EN 50525-2-42:2011	– Ader- und Verdrahtungsleitungen mit vernetzter EVA-Isolierung.	
Electrical engineering	VDE 0285-525-2-51 DIN EN 50525-2-51:2012-01 EN 50525-2-51:2011	– Ölbeständige Steuerleitung mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-71 DIN EN 50525-2-71:2012-01 EN 50525-2-71:2011	– Lahnlitzen-Leitung mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-72 DIN EN 50525-2-72:2012-01 EN 50525-2-72:2011	– Trennbare Zwillingsleitungen mit thermoplastischer PVC-Isolierung.	
Electrical engineering	VDE 0285-525-2-81 DIN EN 50525-2-81:2012-01 EN 50525-2-81:2011	– Lichtbogenschweißleitungen mit vernetzter Elstomer- Hülle.	
Electrical engineering	VDE 0285-525-2-82 DIN EN 50525-2-82:2012-01 EN 50525-2-82:2011	– Leitungen für Lichterketten mit vernetzter Elastomer-Isolierung.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0285-525-2-83 DIN EN 50525-2-83:2012-01 EN 50525-2-83:2011	– Mehradrige Leitungen mit vernetzter Silicon-Isolierung.	
Electrical engineering	VDE 0285-525-3-11 DIN EN 50525-3-11:2012-01 EN 50525-3-11:2011	– Teil 3-11: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Flexible halogenfreie, raucharme Leitungen mit thermoplastischer Isolierung.	
Electrical engineering	VDE 0285-525-3-21 DIN EN 50525-3-21:2012-01 EN 50525-3-21:2011	– Teil 3-21: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Flexible halogenfreie, raucharme Leitungen mit vernetzter Isolierung.	
Electrical engineering	VDE 0285-525-3-31 DIN EN 50525-3-31:2012-01 EN 50525-3-31:2011	– Teil 3-31: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Halogenfreie, raucharme Ader- und Verdraht-ungsleitungen mit thermoplastischer Isolierung.	
Electrical engineering	VDE 0285-525-3-41 DIN EN 50525-3-41:2012-01 EN 50525-3-41:2011	– Teil 4-31: Starkstromleitungen mit verbessertem Verhalten im Brandfall – Halogenfreie, raucharme Ader- und Verdrahtungsleitungen mit vernetzter Isolierung.	
Electrical engineering	VDE 0262 DIN VDE 0262:2004-01	Installationskabel mit Isolierungen aus vernetzten Polyethylen und Mantel aus thermoplastischem PVC mit Nennspannung 0,6 / 1 kV.	
Electrical engineering	DIN VDE 0276-603:2010-03 VDE 0276-603 HD 603:2007	Starkstromkabel – Teil 603: Energiekabel mit Nennspannung 0,6 / 1 kV.	
Electrical engineering	DIN VDE 0276-604:2008-02 VDE 0276-604 HD 604:2005	Starkstromkabel – Teil 603: Energiekabel mit Nennspannung 0,6 / 1 kV mit verbessertem Verhalten im Brandfall für Kraftwerke.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Test methodes			
Electrical engineering	IEC 60332-1-1 (2004-07) Ed. 1.0 IEC 60332-1-2 (2004-07) Ed. 1.0 IEC 60332-1-3 (2004-07) Ed. 1.0 DIN EN 60332 -1-1:2005-06 DIN EN 60332 -1-2:2005-06 DIN EN 60332 -1-3:2005-06 VDE 0482-332 -1-1 VDE 0482-332 -1-2 VDE 0482-332 -1-3	Tests on electric and optical fiber cables under fire conditions – 1-1 Test for vertical flame propagation for a single insulated wire or cable – Apparatus – 1-2 Procedure for 1 kW pre-mixed flame – 1-3 Procedure for determination of flaming droplets/particles. Prüfungen an Kabeln, isolierten Leitungen und Glasfaserkabeln im Brandfall.	
Electrical engineering	VDE 0432 - 1:2011-10	Hochspannungs-Prüftechnik Allgemeine Festlegungen zu Prüfbedingungen.	
Electrical engineering	VDE 0432 - 2:2011-10	Hochspannungs-Prüftechnik Messsysteme.	
Electrical engineering	VDE 0472 - 401 DIN 57472-401:1984-06	Prüfung an Kabel und isolierten Leitungen Außenmaße.	
Electrical engineering	VDE 0472 - 402 DIN 57472-402:1984-06	Prüfung an Kabel und isolierten Leitungen. Wanddicke sowie Dicke von Bewehrungsdrähten und –bändern.	
Electrical engineering	VDE 0472 -1 DIN VDE 0472 -1:1987-06	Prüfung an Kabel und isolierten Leitungen ; Allgemeines.	
Electrical engineering	VDE 0472 – 505:1983-04 DIN 57472-505	Prüfung an Kabel und isolierten Leitungen. Verlustfaktor, dielektrische Verlustzahl und Ableitung.	
Electrical engineering	VDE 0472 - 509 DIN VDE 0472-509:1986-10	Prüfung an Kabel und isolierten Leitungen. Spannungsfestigkeit bei Kabeln und Leitungen, isolierten Schaltdrähten und Schnüren für Fernmeldeanlagen.	
Electrical engineering	VDE 0472 - 512 DIN VDE 0472-512:1985-05	Prüfung an Kabel und isolierten Leitungen. Widerstand zwischen Schutzleiter und Leitschicht.	
Electrical engineering	VDE 0472 – 604:1985-05 DIN VDE 0472-604	Prüfung an Kabel und isolierten Leitungen Dichtheit von Kabelmänteln.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0472 - 605 DIN VDE 0472-605:1985-01	Prüfung an Kabel und isolierten Leitungen Abrieb.	
Electrical engineering	DE 0472 - 613 DIN VDE 0472-613:1986-03	Prüfung an Kabel und isolierten Leitungen Weiterreißwiderstand.	
Electrical engineering	VDE 0472 - 626 DIN 57472-626:1983-01	Prüfung an Kabel und isolierten Leitungen Reißlänge.	
Electrical engineering	DIN EN 50497:2008-11 VDE 0473-497 EN 50497:2007	Empfohlenes Prüfverfahren zur Einschätzung des Risikos von Weichmacher-ausschwitzungen bei PVC-isolierten und –ummantelten Kabeln und Leitungen.	
Electrical engineering	VDE 0473-811-100 DIN EN 60811 – 100:2012-12 EN 60811 – 100:2008 IEC 60811 – 100 (2008-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 100: General.	
Electrical engineering	VDE 0473-811-201 DIN EN 60811 – 201:2012-12 EN 60811 - 201 IEC 60811 – 201 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness.	
Electrical engineering	VDE 0473-811-202 DIN EN 60811 – 202:2012-12 EN 60811 - 202 IEC 60811 – 202 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath.	
Electrical engineering	VDE 0473-811-203 DIN EN 60811 – 203:2012-12 EN 60811 - 203 IEC 60811 – 203 (2012-03) Ed. 1.0	Messung der Außenmaße.	
Electrical engineering	VDE 0473-811-301 DIN EN 60811 - 301:2012-12 EN 60811 - 301 IEC 60811 – 301 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 301: Electrical tests – Measurement of the permittivity at 23 °C of filling compounds	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-302 DIN EN 60811 - 302:2012-12 EN 60811 - 302 IEC 60811 – 302 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 302: Electrical tests – Measurement of the d.c. resistivity at 23 °C and 100 °C of filling.	
Electrical engineering	VDE 0473-811-401 DIN EN 60811 - 401:2012-12 EN 60811 - 401 IEC 60811 – 401 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven.	
Electrical engineering	VDE 0473-811-402 DIN EN 60811 - 402:2012-12 EN 60811 - 402 IEC 60811 – 402 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 402: Miscellaneous tests – Water absorption tests.	
Electrical engineering	VDE 0473-811-404 DIN EN 60811 - 404:2012-12 EN 60811 - 404 IEC 60811 – 404 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 404: Miscellaneous tests – Mineral oil immersion tests for sheaths.	
Electrical engineering	VDE 0473-811-405 DIN EN 60811 - 405:2012-12 EN 60811 - 405 IEC 60811 – 405 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 405: Miscellaneous tests – Thermal stability test for PVC insulations and PVC sheaths.	
Electrical engineering	VDE 0473-811-406 DIN EN 60811 - 406:2012-12 EN 60811 - 406 IEC 60811 – 406 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 406: Miscellaneous tests – Resistance to stress cracking of polyethylene and polypropylene compounds.	
Electrical engineering	VDE 0473-811-407 DIN EN 60811 - 407:2012-12 EN 60811 - 407 IEC 60811 – 407 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 407: Miscellaneous tests – Measurement of mass increase of poly-ethylene and polypropylene compounds.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-408 DIN EN 60811 - 408:2012-12 EN 60811 - 408 IEC 60811 – 408 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 408: Miscellaneous tests – Long-term stability test of polyethylene and polypropylene compounds.	
Electrical engineering	VDE 0473-811-409 DIN EN 60811 - 409:2012-12 EN 60811 - 409 IEC 60811 – 409 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 409: Miscellaneous tests – Loss of mass test for thermoplastic insulations and sheaths.	
Electrical engineering	VDE 0473-811-501 DIN EN 60811 - 501:2012-12 EN 60811 - 501 IEC 60811 – 501 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds.	
Electrical engineering	VDE 0473-811-502 DIN EN 60811 - 502:2012-12 EN 60811 - 502 IEC 60811 – 502 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 502: Mechanical tests – Shrinkage test for insulations.	
Electrical engineering	VDE 0473-811-503 DIN EN 60811 - 503:2012-12 EN 60811 - 503 IEC 60811 – 503 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 503: Mechanical tests – Shrinkage test for sheaths.	
Electrical engineering	VDE 0473-811-504 DIN EN 60811 - 504:2012-12 EN 60811 - 504 IEC 60811 – 504 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 504: Mechanical tests – Bending tests at low temperature for insulation and sheaths.	
Electrical engineering	VDE 0473-811-505 DIN EN 60811 - 505:2012-12 EN 60811 - 505 IEC 60811 – 505 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 505: Mechanical tests – Elongation at low temperature for insulations and sheaths.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-506 DIN EN 60811 - 506:2012-12 EN 60811 - 506 IEC 60811 – 506 (2012-03) Ed. 1.0	Schlagprüfung bei niedrigen Temperaturen für Isolierhüllen und Mäntel. Electric and optical fibre cables – Test methods for non-metallic materials – Part 506: Mechanical tests – Impact test at low temperature for insulations and sheaths.	
Electrical engineering	VDE 0473-811-507 DIN EN 60811 - 507:2012-12 EN 60811 - 507 IEC 60811 – 507 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 507: Mechanical tests – Hot set test for cross-linked materials.	
Electrical engineering	VDE 0473-811-508 DIN EN 60811 - 508:2012-12 EN 60811 - 508 IEC 60811 – 508 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 508: Mechanical tests – Pressure test at high temperature for insulation and sheaths.	
Electrical engineering	VDE 0473-811-509 DIN EN 60811 - 509:2012-12 EN 60811 - 509 IEC 60811 – 509 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 509: Mechanical tests – Test for resistance of insulations and sheaths to cracking (heat shock test).	
Electrical engineering	VDE 0473-811-512 DIN EN 60811 - 512:2012-12 EN 60811 - 512 IEC 60811 – 512 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 512: Mechanical tests – Methods specific to polyethylene and polypropylene compounds – Tensile strength and elongation at break after conditioning at elevated temperature.	
Electrical engineering	VDE 0473-811-513 DIN EN 60811 - 513:2012-12 EN 60811 - 513 IEC 60811 – 513 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 513: Mechanical tests – Methods specific to polyethylene and polypropylene compounds – Wrapping test after conditioning.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0473-811-605 DIN EN 60811 - 605:2012-12 EN 60811 - 605 IEC 60811 – 605 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 605: Physical tests – Measurement of carbon black and/or mineral filler in polyethylene compounds.	
Electrical engineering	VDE 0473-811-606 DIN EN 60811 - 606:2012-12 EN 60811 - 606 IEC 60811 – 606 (2012-03) Ed. 1.0	Electric and optical fibre cables – Test methods for non-metallic materials – Part 606: Physical tests – Methods for determining the density.	
Accessories for power cables with rated voltages up to 30 kV			
Electrical engineering	DIN EN 61442:2006-01 VDE 0278-442 EN 61442:2005 IEC 61442 (2005-03) Ed. 2.0	Test methods for accessories for power cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV).	
Electrical engineering	VDE 0278 - 629-1 DIN VDE 0278-629-1:2009-07 HD 629.1:2008	Prüfanforderungen für Kabelgarnituren für extrudierte Kunststoffkabel mit einer Nennspannung von 3,6 / 6 (7,2) kV bis 20,8 / 36 (42) kV, – Teil 1: Kabel mit extrudierter Kunststoffisolierung.	
Electrical engineering	VDE 0278 - 629-2 DIN VDE 0278-629-2:2009-07 HD 629.2:2008	Prüfanforderungen für Kabelgarnituren für extrudierte Kunststoffkabel mit einer Nennspannung von 3,6 / 6 (7,2) kV bis 20,8 / 36 (42) kV, – Teil 2: Kabel mit massegetränkter Papierisolierung.	
Electrical engineering	VDE 0279 DIN 57279:1982-10	Leitungs-Garnituren des Bergbaus unter Tage Muffen (U_0/U) = 0,6 / 1 kV.	
Electrical engineering	DIN EN 61238-1:2004-03 VDE 0220-100 IEC 61238-1 (2003-05) Ed. 2.0	Compression and mechanical connectors for power cables for rated voltages up to 30 kV (Um = 36 kV) – Part 1: Test methods and requirements.	
Electrical engineering	DIN V 47640	Verbindungsmuffen aus wärmeschrumpfendem Kunststoffschlauch für Kunststoffisolierte Starkstromkabel mit Nennspannung 0,6 / 1 (1,2) kV.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Power cables and Accessories for power cables with rated voltages up to 400 kV (Um ≤ 420 kV)			
Electrical engineering	DIN VDE 0276–632:1999-05 HD 632 S1:1996	Kabel mit Isolierung aus vernetztem Polyethylen und ihre Garnituren für Nennspannung von 30 bis 150 kV.	
Electrical engineering	DIN VDE 0276–633:1999-05 HD 633 S1:1997	Niederdruck Ölkabel und ihre Garnituren für Nennspannungen bis 220 kV.	
Electrical engineering	DIN VDE 0276 – 634:1999-05 HD 634 S1:1997	Gasinnendruckkabel und ihre Garnituren für Nennspannungen bis 220 kV.	
Electrical engineering	DIN VDE 0276 – 635:1999-05 HD 635 S1:1997	Gasaußendruckkabel und ihre Garnituren für Nennspannungen bis 220 kV.	
Electrical engineering	VDE 0265 DIN VDE 0265:1995-12	Kabel mit Kunststoffisolierung und Bleimantel für Starkstromanlagen.	
Electrical engineering	VDE 0266 DIN VDE 0266:2006-03	Starkstromkabel mit verbessertem Verhalten im Brandfall.	
Electrical engineering	VDE 0271 DIN VDE 0271:2008-02	Kabel; Starkstromkabel mit Isolierung und Mantel aus thermoplastischem PVC und Nennspannungen bis Uo/U (Um): 3,6 / 6 (7,2) kV.	
Electrical engineering	VDE 0276 - 605 DIN VDE 0276-605:2008-02	Starkstromkabel Ergänzende Prüfverfahren.	
Electrical engineering	VDE 0276 - 620 DIN VDE 0276-620:2010-11	Energieverteilungskabel mit extrudierter Isolierung für Nennspannungen Uo/U: 3,6 / 6 kV bis 20,8 / 36 kV.	
Electrical engineering	VDE 0276 - 621 DIN VDE 0276-621:1997-05	Energieverteilungskabel mit getränkter Papierisolierung für Mittelspannung.	
Electrical engineering	VDE 0276 - 622 DIN VDE 0276-622:2006-05	Starkstromkabel mit Nennspannungen von3,6 / 6 (7,2) kV bis 20,8 / 36 (42) kV mit verbessertem Verhalten im Brandfall für Kraftwerke.	
Electrical engineering	VDE 0276 - 626 DIN VDE 0276-626:1997-01	Isolierte Freileitungsseile für oberirdische Verteilungsnetze mit Nennspannung Uo/U (Um): 0,6 / 1 (1,2) kV.	
Electrical engineering	VDE 0276 - 627 DIN VDE 0276-627:2006-09	Vieladrige und vielpaarige Kabel für die Verlegung in Luft und in Erde.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0279 DIN 50279:1982-10	Leitungsgarnituren des Bergbaus unter Tage, Muffen 1 kV.	
Electrical engineering	VDE 0278-393 DIN EN 50393:2006-11 EN 50393:2006	Prüfverfahren und Prüfanforderungen für die Garnituren von Verteilerkabeln mit Nennspannung von 0,6 / 1,0 (1,2) kV.	
Electrical engineering	IEC 60141-1 (1998-08) Ed. 3.0	Tests on oil-filled and gas-pressure cables and their accessories – Part 1: Oil-filled, paper-insulated, metal-sheathed cables and accessories for alternating voltages up to and including 400 kV.	
Electrical engineering	IEC 60141-2 (1967-01) Ed. 1.0	Tests on oil-filled and gas-pressure cables and their accessories. – Part 2: Internal gas-pressure cables and accessories for alternating voltages up to 275 kV.	
Electrical engineering	IEC 60141-3 (1967-01) Ed. 1.0	Tests on oil-filled and gas-pressure cables and their accessories. – Part 3: External gas-pressure (gas compression) cables and accessories for alternating voltages up to 275 kV.	
Electrical engineering	IEC 60141-4 (1990-10) Ed. 1.0	Tests on oil-filled and gas-pressure cables and their accessories. – Part 4: Oil-impregnated paper-insulated high pressure oil-filled pipe-type cables and accessories for alternating voltages up to and including 400 kV.	
Electrical engineering	IEC 60840 (2011-11) Ed. 4.0	Tests for power cables with extruded insulation for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV).	
Electrical engineering	IEC 60055-1 (2005-05) Ed. 5.1	Paper-insulated metal-sheathed cables for rated voltages up to 18 / 30 kV (with copper or aluminum conductors and excluding gas-pressure and oil-filled cables) – Part 1: Tests on cables and their accessories.	

Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEC 60055-2 (2005-02) Ed. 1.0	Paper-insulated metal-sheathed cables for rated voltages up to 18 / 30 kV (with copper or aluminium conductors and excludeing gaspressure and oil-filled cables). – Part 2: General and construction requirements.	
Electrical engineering	EC 60502-1 (2009-09) Ed. 2.0	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 1: Cables for rated voltages of 1 kV (Um = 1,2 kV) and 3 kV (Um = 3,6 kV).	
Electrical engineering	IEC 60502-2 (2014-02) Ed. 2.0	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 2: Cables for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV.	
Electrical engineering	IEC 60502-4 (2010-12) Ed. 3.0	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) – Part 4: Test requirements on accessories for cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV).	
Electrical engineering	VDE 0276-2067 DIN IEC 62067:2013-08 IEC 62067 (2011-11) Ed. 2.0	Starkstromkabel mit extrudierter Isolierung und ihre Garnituren für Nennspannungen über 150 kV (Um = 170 kV) bis einschließlich 500 kV (Um = 550 kV) – Prüfverfahren und Anforderungen. Power cables with extruded insulation and their accessories for rated voltage above 150 kV (Um = 170 kV) up to 500 kV (Um = 550 kV) – Test methods and requirements.	
Electrical engineering	IEC 60227-2 (2003-04) Ed. 2.1	Electrical test methods for electric cables. – Part 1: Electrical tests for cables, cords and wires for voltages up to and including 450 V / 750 V.	
Electrical engineering	VDE 0481 - 885-2 DIN EN 60885-2 IEC 60885-2 (1987-03) Ed. 1.0	Prüfung an Kabeln und isolierten Leitungen; Teilentladung. Electrical test methods for electric cables. – Part 2: Partial discharge tests.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	VDE 0481 - 885-3 DIN EN 60885-3 IEC 60885-3 (2015-04) Ed. 2.0	Prüfung an Kabeln und isolierten Leitungen; Teilentladung an extrudierten Kabellängen. Electrical test methods for electric cables. – Part 3: Test methods for partial discharge measurements on lengths of extruded power cables.	
Electrical engineering	VDE 0473-229 DIN EN 60229:2009-04 EN 60229:2008 IEC 60229 (2007-10) Ed. 3.0	Tests on cable oversheaths which have a special protective function and are applied by extrusion.	
Electrical engineering	VDE 0481-395 DIN EN 50395:2006-07 EN 50395:2005	Elektrische Prüfung für Niederspannungskabel und -leitungen.	
Electrical engineering	VDE 0473-396 DIN EN 50396:2006-07 EN 50396:2005	Nicht-elektrische Prüfverfahren für Niederspannungskabel und -leitungen.	
Electrical engineering	VDE 0481 - 230 DIN EN 60230:2003-03 EN 60230:2002 IEC 60230 (1966-01) Ed. 1.0	Impulse tests on cables and their accessories.	
Electrical engineering	IEEE 48:2009	IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV.	
Electrical engineering	IEEE 404:2012	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500.000 V.	
Electrical engineering	IEEE 386:2006	IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.	

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Testing field	Standard / In-House Procedure / Version	Title of Standard or In-House Procedure (Deviations / Modifications of Standard)	Test Range / Restrictions
Electrical engineering	IEEE 592:2007	IEEE Standard for Exposed Semiconducting Shields on High-Voltage Cable Joints and Separable Connectors.	

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Technical responsibility for the test reports:

Approval:

Herr Dipl.-Wirt.-Ing. Rainer Schiller
Herr Dipl.-Ing. Hannes Zinnbauer
Herr Dipl.-Ing. Detlef Jegust

Technical verification:

Herr Dipl.-Ing. Winfried Moritz
Herr Dipl.-Ing. Klaus Vaterrodt
Herr Dipl.-Ing. Jürgen Wittwer
Herr Dipl.-Ing. Detlef Jegust
Herr Dipl.-Ing. Uwe Fischer
Herr Dipl.-Ing. Michael Scheide
Herr Dipl.-Ing. Matthias Schröder-Heske
Herr Dipl.-Ing. Carlos Pereira
Herr Dipl.-Ing. Martin Brüggemann
Herr Ronny Baumgart

ВЯРНО С
ОРИГИНАЛА

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Приложение 6.5

ДЕКЛАРАЦИЯ

че предложеното оборудване в процедурата отговаря на минималните технически изисквания на Възложителя

Аз, долуподписаният Стоил Колев Стоилов, в качеството ми на представляващ „Старт-Инженеринг“ АД, участник в открита процедура за възлагане на обществена поръчка с реф. № PPD18-103 и предмет: “Модернизация (ретрофит) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика“,

ДЕКЛАРИРАМ ЧЕ:

1. Предложеното от нас оборудване в процедурата за позиция „Напреженов измервателен трансформатор 12 kV, еднополюсен, с две вторични намотки, за монтиране на закрито“ отговаря на минималните технически изисквания на Възложителя, посочени в таблица 6.

2. Доставяните от нас материали, апаратура, оборудване и съоръжения отговарят на посочените от възложителя в документацията за участие стандарти за изпълнение на поръчката.

3. Предложените от нас материали, апаратура, оборудване и съоръжения са с технически характеристики и показатели, които съответстват на техническите характеристики и показатели, посочени от възложителя за изпълнение на поръчката в документацията за участие.

Информиран съм, че Възложителят (включително чрез неговия помощен орган, а именно назначената за провеждане на поръчката оценителна комисия) ще обработва и съхранява личните ми данни, посочени в настоящата декларация, за целите на провеждане на обществената поръчка, като за целта ще предприеме всички необходими според действащата нормативна уредба мерки за защита на личните ми данни.

Дата 17.12.2018 г.

ПОДПИС и ПЕЧАТ: На основание чл.36а ал.3 от ЗОП

Председател на Съвета на директорите
на „Старт-Инженеринг“ АД

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Приложение 7.1

Техническо описание

включващо гарантирани параметри, съгласно общите изисквания към обекта на поръчката

Предлаганите от нас устройства за позиция „Посочна цифрова защита за въздушни и кабелни електропроводни линии СР. Н." са модел SIPROTEC 7SJ66 с № на продукта 7SJ6615-6JB90-1FC1+L0R, и отговарят на следната,

СПЕЦИФИКАЦИЯ:

Housing width Ширина на корпуса	1/3x19 inch 1/3x19 инча
Binary / indication inputs, number Двоични/индикационни входове, брой	16
Signal / command outputs Сигнални/командни изходи	7
Live status contact Контакт за актуален статус	1
Power relays, number Силови релета, брой	4
Function keys Функционални ключове	-
Nominal current of current transformer Номинален ток на токов трансформатор	5 A
Hilfsspannung Спомагателно напрежение	110 ... 250 V DC, 115 ... 230 V AC
Binary input threshold Двоичен входен праг	138 V
Type of housing Тип корпус	Flush-mounting case, screw-type terminals Корпус за вграждане, винтов тип клеми
Direct connection/ring-type cable lugs Директна връзка/ пръстеновидни кабелни обувки	Without Без
Display Дисплей	Graphic Графичен
Region-specific default settings 50/60 Hz, IEC/ANSI (language changeable) Регионални специфични настройки по подразбиране 50/60 Hz, IEC/ANSI (език, който може да се променя)	World Свят
Operating Language Език на работа	English Английски
System interface (Port B) Системен интерфейс (Порт B)	RJ 45 plug-connection RJ 45 куплунг
System interface protocol (Port B) Системен интерфейсен протокол(Порт B)	IEC 61850, 100 Mbit Ethernet, electrical, double IEC 61850, 100 Mbit Ethernet, електрическиl, двоен
Port C Порт C	-
System interface (Port C) Системен интерфейц(порт C)	-

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Basic version Базова версия	Basic version Control Базова версия управление (in allen Ausfuhrungen enthalten) (налично във всички модели) 50/51 Overcurrent protection I>, I>>, I>>>, Ip, 50N/51N 50/51 Максимално токова защита(МТЗ) I>, I>>, I>>>, Ip, 50N/51N Earth-fault protection TOC earth IE>, IE >>, IE >>>, IEp 50N/51N Земна защита IE>, IE >>, IE >>>, IEp 50N/51N Ground-fault protection via insensitive IEE-function: IEE>, IEE>>, IEEp 1) 50N/51N Чувствителна земна защита: IEE>, IEE>>, IEEp 1) 50/50N Flexible protection functions (index quantities derived from current): Additional time-overcurrent protection I>>>>, I2 50/50N Гъвкави защитни функции(входни величини ток): Допълнителни максималнотокови стъпала stages I>>>>, I2 51V Voltage dependent inverse-time overcurrent protection 51V МТЗ с контрол по напрежение 49 Overload protection (with 2 time constants) 49 Защита от претоварване(с 2 времеви константи) 46Negative sequence protection 46 Фазна защита от небаланс(защита от обратна последователност) 37 Undercurrent monitoring 37 Контрол понижен ток 47 Phase sequence 47 Следене последователността на фазите 59N/64 Displacement voltage 59N/64 Заместващо напрежение 50BF Circuit-breaker failure protection 50BF Защита срещу отказ на прекъсвача 74TC Trip circuit supervision 4 setting groups; cold load pick-up Inrush blocking 74TC Контрол на изключвателните вериги 4 групи с настройки, Динамично студено пускане Ограничаване на втория хармоник при включване 86 Lock out 86 Блокиращи функции

Additional Functions Допълнителни функции	67/67N Direction determination for overcurrent, phase and ground 67/67N Засичане и определяне за максимално токови, фазни и земни защити
Extended measuring function Допълнителни	Fault recording Записи на к.с.
AWE АПВ	With Със
Faultlocator Определяне на място на к.с.	Without Без
Synchrocheck Проверка за синхронизация	Without Без

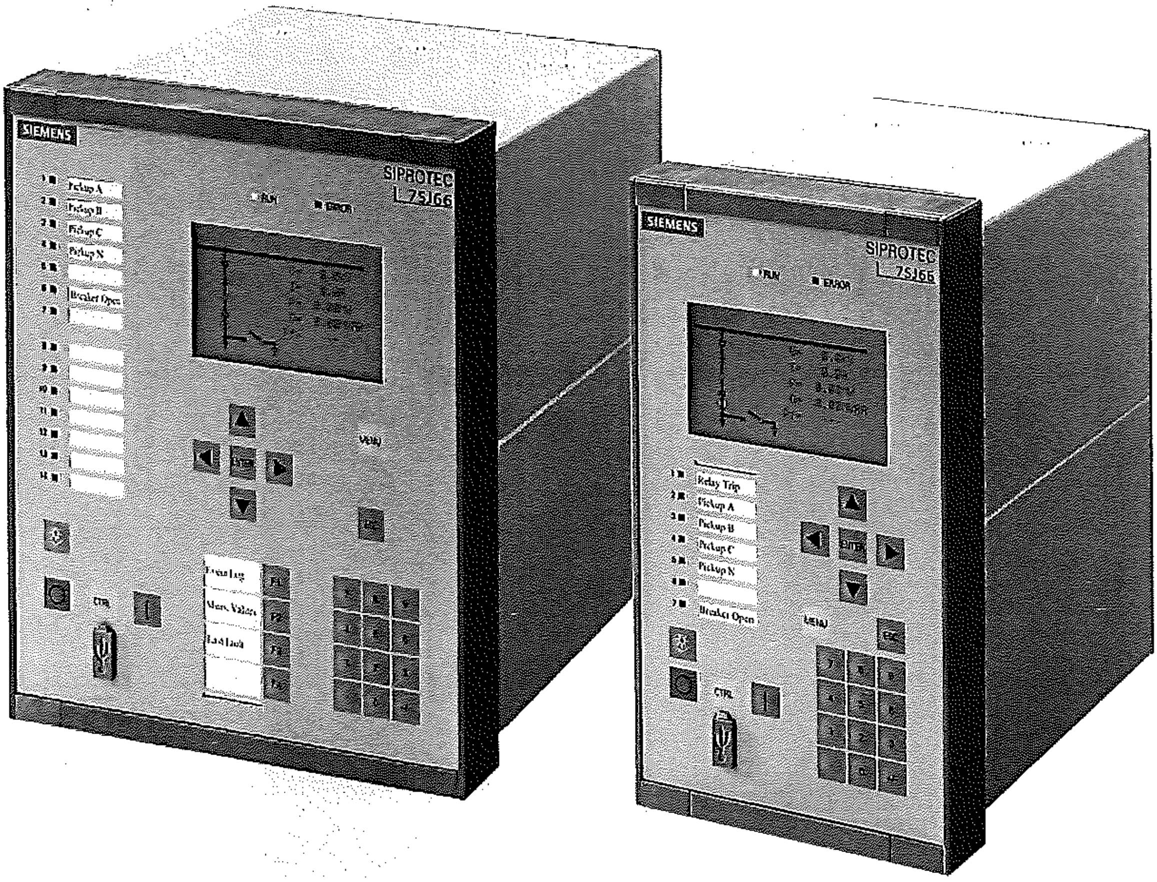
Дата 17.12.2018 г.

ПОДПИС и ПЕЧАТ:

На основание чл.36а ал.3 от ЗОП

Председател на Съвета на директорите
на „Старт-Инженеринг“ АД

SIEMENS



Protection Systems

SIPROTEC 7SJ66
Overcurrent Protection

Chapter for the Catalog SIP · Edition No. 8

siemens.com/protection

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SIPROTEC 7SJ66

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

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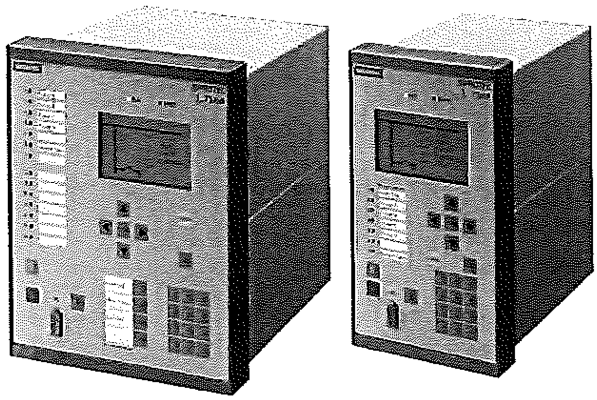

Fig. 1 SIPROTEC 4 7SJ66 multifunction protection relay

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-/overvoltage protection
- Under-/overfrequency 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 for Ethernet)
- Front USB interface for DIGSI 4
- Time synchronization via IRIG B/DCF77

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 relays
- Graphical or 8 line text display

SIPROTEC 7SJ66

Application

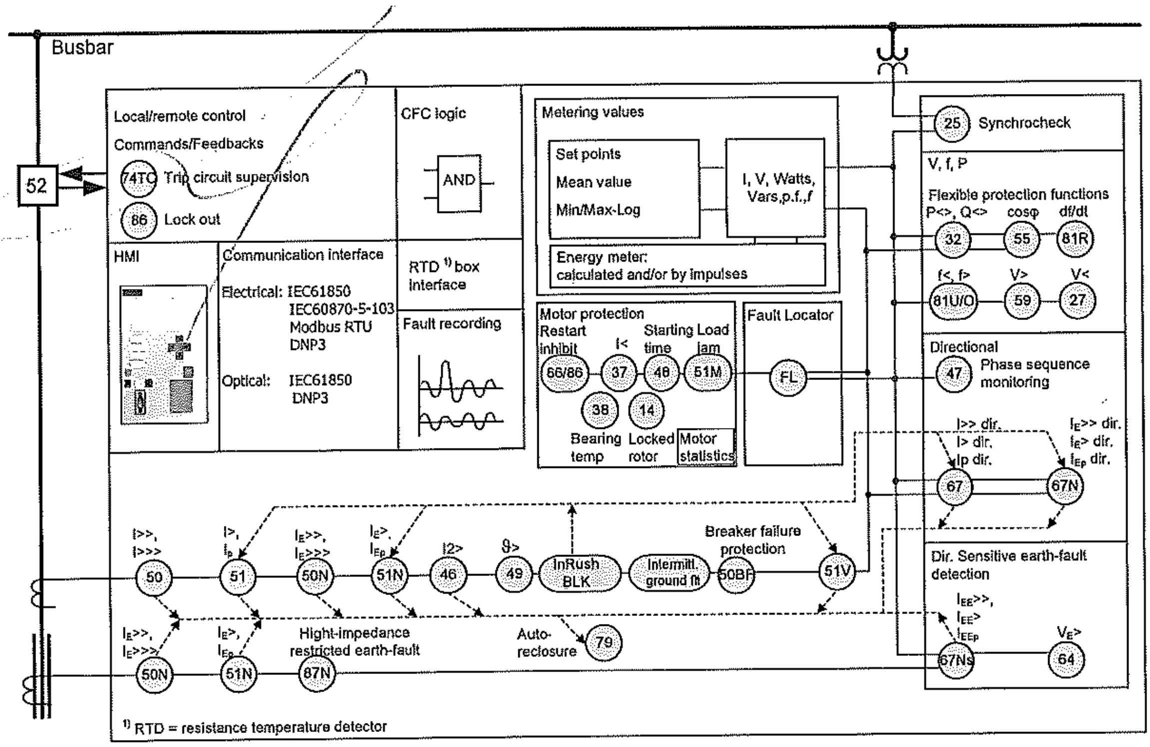

Fig. 2 Function diagram

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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ANSI	IEC	Protection functions
50, 50N	$I>$, $I>>$, $I>>>$, $I_E>$, $I_E>>$, $I_E>>>$	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	$I_{EE}>$, $I_{EE}>>$, 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
–	$I_{IE}>$	Intermittent ground fault
67Ns	$I_{IE\,dir}>$	Directional intermittent ground fault protection
87N		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)
47	$V_2>$, phase-sequence	Unbalance-voltage protection and/or phase-sequence monitoring
49	$\vartheta>$	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	$P<>$, $Q<>$	Reverse-power, forward-power protection
27/Q	$Q>/V<$	Undervoltage-controlled reactive power protection
55	$\cos\varphi$	Power factor protection
81O/U	$f>$, $f<$	Overfrequency/underfrequency protection
81R	df/dt	Rate-of-frequency-change protection
21FL		Fault locator

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SIPROTEC 7SJ66

Construction, protection functions

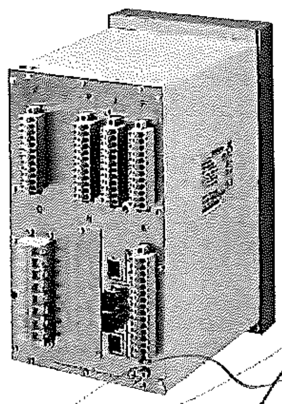

Fig. 3 SIPROTEC 7SJ66 rear view with optical Ethernet system interfaces

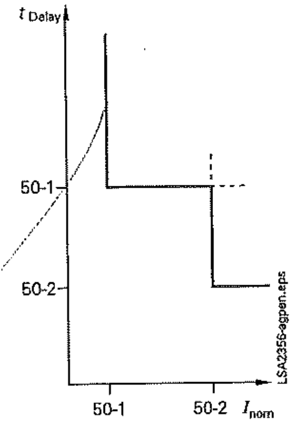

Fig. 4 Definite-time overcurrent protection

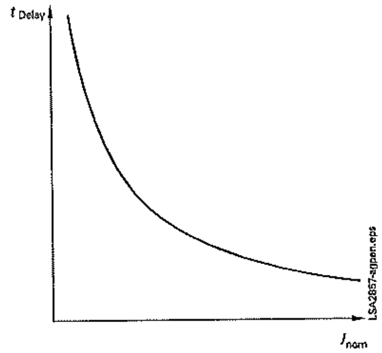

Fig. 5 Inverse-time overcurrent protection

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.

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.

Available inverse-time characteristics		
Characteristics acc. to	*ANSI/IEEE*	*IEC 60255-3*
Inverse	•	•
Short inverse	•	
Long inverse	•	•
Moderately inverse	•	
Very inverse	•	•
Extremely inverse	•	•

Reset characteristics

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

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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Directional overcurrent protection (ANSI 67, 67N)

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

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

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

Directional comparison protection (cross-coupling)

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

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

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

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

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

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

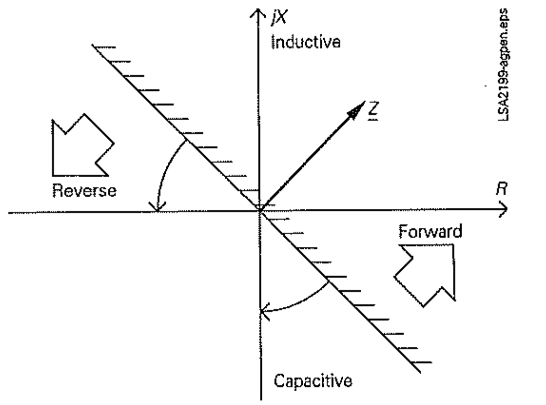

Fig. 6 Directional characteristic of the directional overcurrent protection

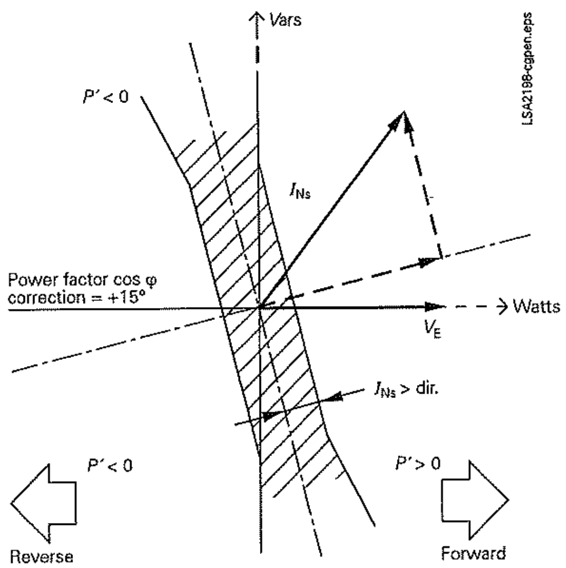

Fig. 7 Directional determination using cosine measurements for compensated networks

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

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

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

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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_{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 condi tions 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 specifi cally 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 high-resistance faults beyond the transformer.

Breaker failure protection (ANSI 50BF)

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

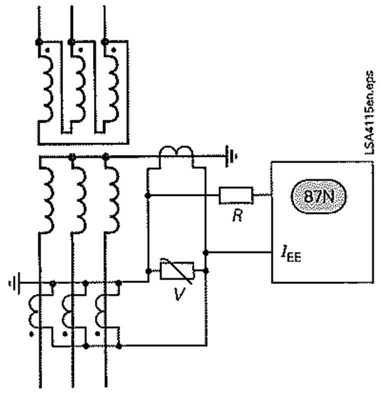

Fig. 8 High-impedance restricted ground-fault protection

High-impedance restricted ground-fault protection (ANSI 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_{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.

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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
$3I_0>$, $I_1>$, $I_2>$, I_2/I_1, $3V_0>$, $V_1><$, $V_2><$	50N, 46, 59N, 47
$P><$, $Q><$	32
cos φ (p.f.)><	55
$f><$	81O, 81U
df/dt><	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)

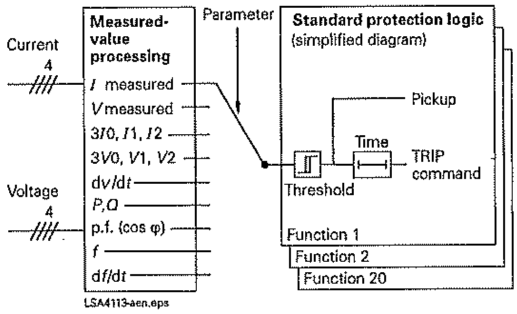

Fig. 9 Flexible protection functions

- 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 auto-reclosure cycle
- Dynamic setting change of the directional and non-directional elements can be activated depending on the ready AR

Thermal overload protection (ANSI 49)

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

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

Settable dropout delay times

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

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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).

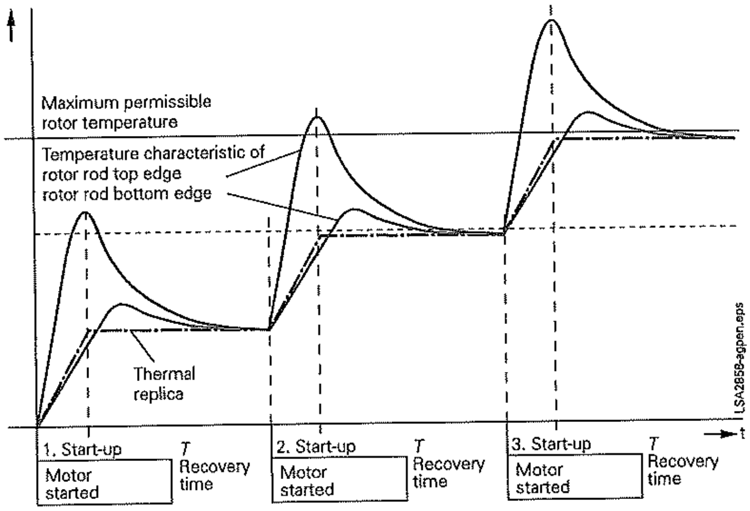

Fig. 10

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 $I > I_{MOTOR\ START}$

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

I = Actual current flowing

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

t = Tripping time

I_A = Rated motor starting current

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

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

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

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

Load jam protection (ANSI 51M)

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

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

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

The negative-sequence / phase-balance current protection detects a phase failure or load 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 function is active over a

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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 81O/U)

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

There are four elements (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:

- ΣI
- ΣI^x, with x = 1... 3
- Σi^2t

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.

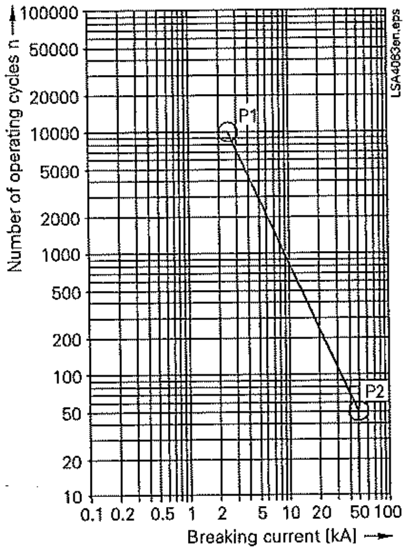

Fig. 11 CB switching cycle diagram

Commissioning

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

Test operation

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

■ Control and automatic functions

Control

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

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

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

The switchgear or circuit-breaker can be controlled via:
– integrated operator panel
– binary inputs
– substation control and protection system
– DIGSI 4

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SIPROTEC 7SJ66

Functions

Automation / user-defined logic

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

Switching authority

Switching authority is determined according to parameters and communication.

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

Command processing

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

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

Assignment of feedback to command

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

Chatter disable

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

Indication filtering and delay

Binary indications can be filtered or delayed.

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

Indication derivation

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

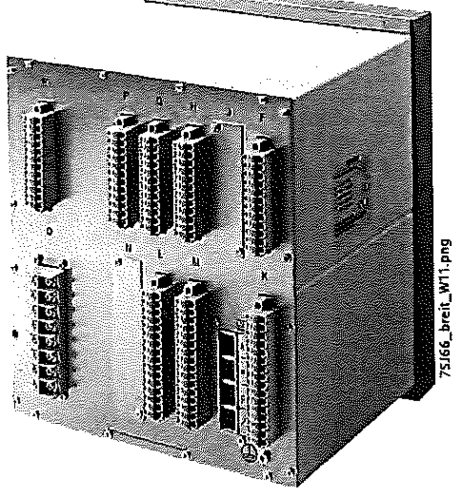

Fig. 12 SIPROTEC 7SJ663 rear view with communication ports

Switchgear cubicles for high/medium voltage

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

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

Measured values

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

- Currents I_{L1}, I_{L2}, I_{L3}, I_E, I_{EE} (67Ns)
- Voltages 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, VA/*P*, *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.

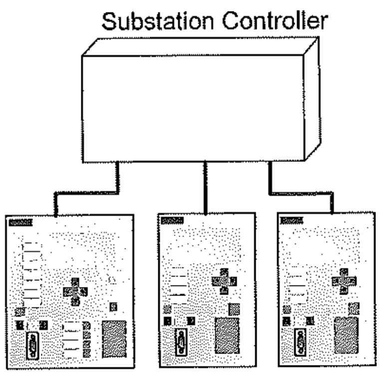

Fig. 13 IEC 60870-5-103: Radial electrical connection

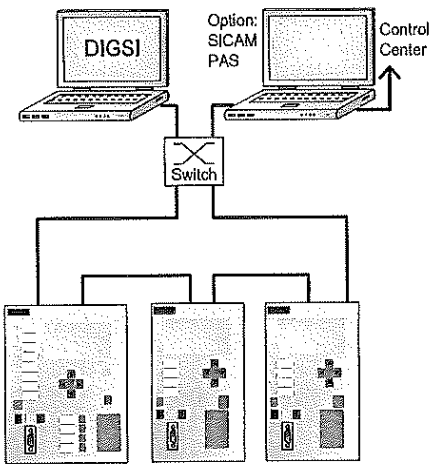

Fig. 14 Bus structure for station bus with Ethernet and IEC 61850, electrical and optical ring

DNP3

DNP (Distributed Network Protocol, version 3) is a messaging-based 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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SIPROTEC 7SJ66

Selection table

Selection table for multifunctional overcurrent protection devices							
Device	*7SJ80*	*7SJ61*	*7SJ62*	*7SJ63*	*7SJ64*	*7SJ82*	7SJ66
Multifunctional protection functions	✓	✓	✓	✓	✓	✓	✓
CTs	4	4	4	4	4	4	4
VTs	0/3	0	3/4	3	4	0/4	4
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	7 - 24
Spring-type terminals	-	-	-	-	-	-	✓
Auxiliary voltage	DC 24 - 250 V AC 115 - 230 V	DC 24 - 250 V AC 115 - 230 V	DC 24 - 250 V AC 115 - 230 V	DC 24 - 250 V AC 115 - 230 V	DC 24 - 250 V AC 115 - 230 V	DC 24 - 250 V AC 115 - 230 V	DC 110 - 250 V AC 115 - 230 V
UL listing	✓	✓	✓	✓	✓	✓	-
Surface mounting case	●	●	●	●	●	-	-
Detached operator panel	-	-	-	●	●	-	-
Languages	ge/en/es/fr/it/ru/ch	ge/en/es/fr/it/ru	ge/en/es/fr/it/ru	ge/en/es/fr	ge/en/es/fr/it/ru	ge/en/pt/es/ru	en/es/ru
Front USB	✓	-	-	-	-	✓	✓
Interfaces exchangeable	✓	✓	✓	✓	✓	✓	-
IEC 61850	●	●	●	●	●	●	●
IEC 60870-5-103	●	●	●	●	●	●	● (elec.)
Modbus RTU	●	●	●	●	●	●	● (elec.)
Profibus FMS	-	●	●	●	●	-	-
Profibus DP	●	●	●	●	●	-	-
PROFINET I/O	●	●	●	-	●	-	-
DNP3 serial/TCP	●	●	●	-	●	●	●
RSTP	✓	✓	✓	✓	✓	✓	✓
PRP	✓	✓	✓	✓	✓	✓	✓
HSR	✓	✓	✓	✓	✓	✓	-

✓ basic
- not available
● optional

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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.

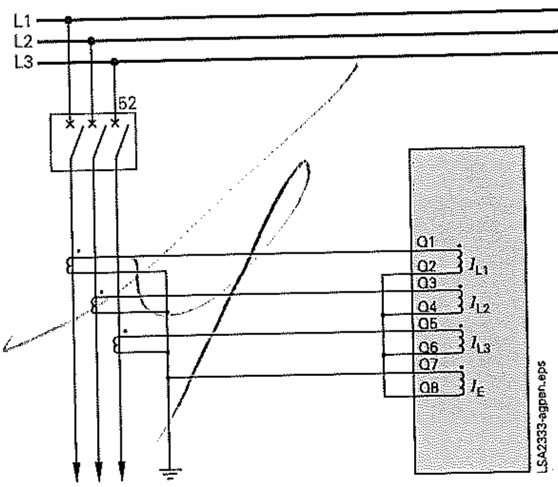

Fig. 15 Residual current circuit without directional element

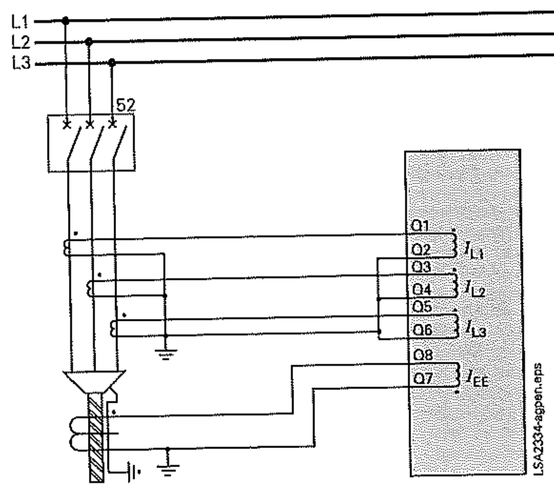

Fig. 16 Sensitive ground-current detection without directional element

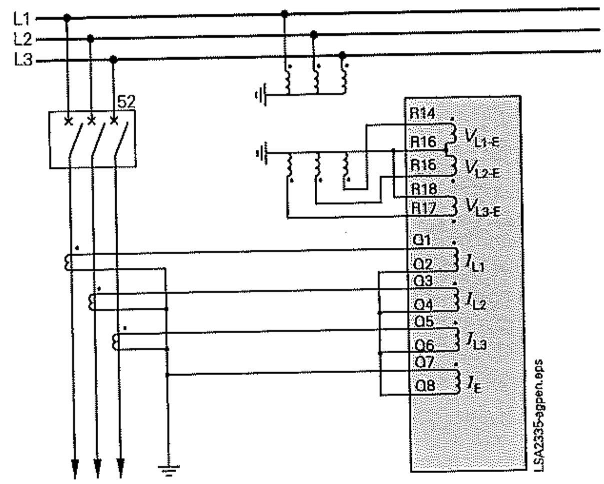

Fig. 17 Residual current circuit with directional element

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Typical connections

Connection for compensated networks

The figure shows the connection of two phase-to-ground voltages and the V_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.

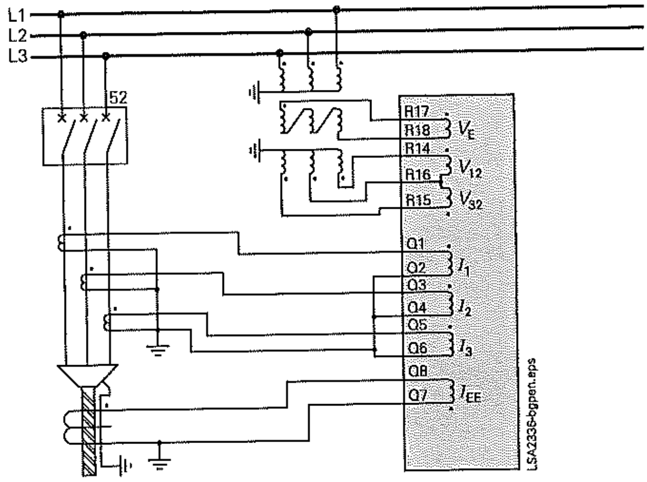

Fig. 18 Sensitive directional ground-fault detection with directional element for phases

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.

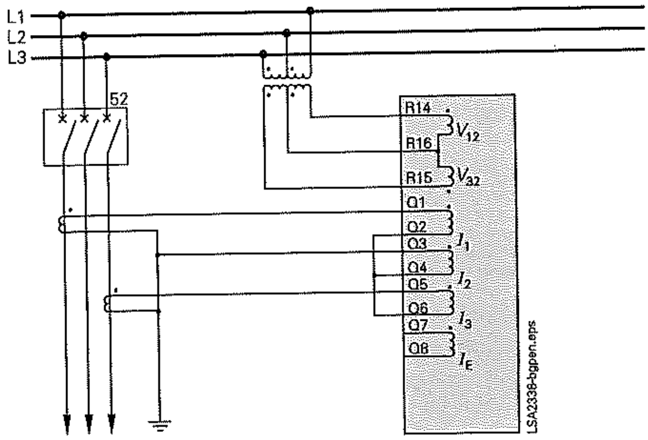

Fig. 19 Isolated-neutral or compensated networks

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.

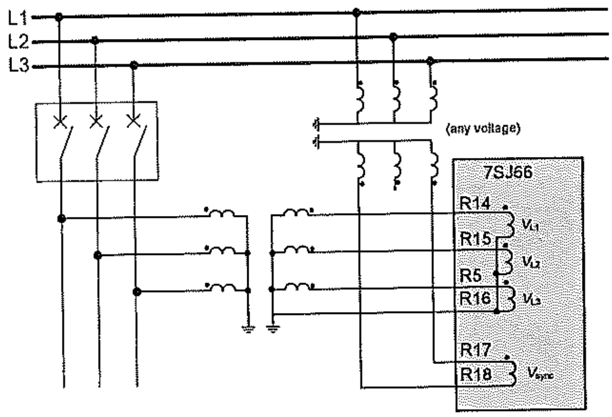

Fig. 20 Measuring of the busbar voltage and the outgoing feeder voltage for the synchro-check

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Overview of connection types			
Type of network	*Function*	*Current connection*	*Voltage 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 cos φ measurement	Phase-balance neutral current transformers required	Phase-to-ground connection with open delta winding required

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Typical applications

▪ Connection of circuit-breaker

Undervoltage releases

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

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

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

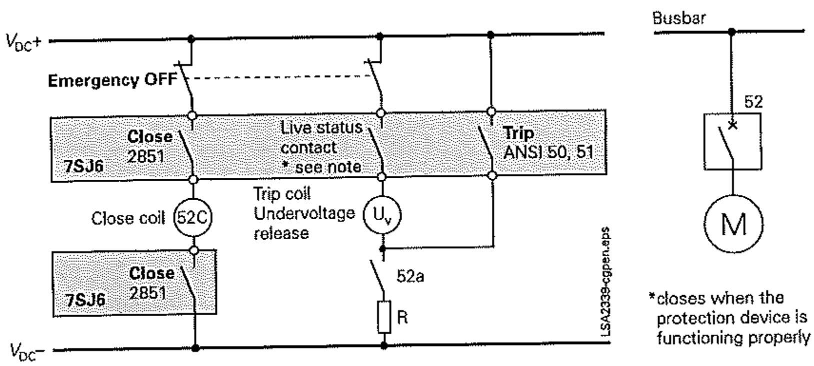

Fig. 21 Undervoltage release with make contact (50, 51)

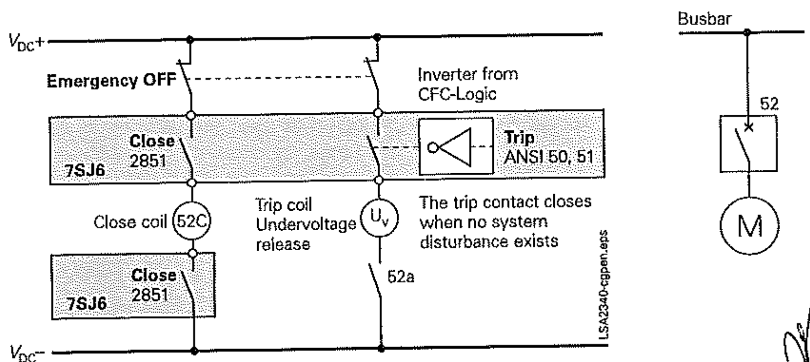

Fig. 22 Undervoltage trip with locking contact (trip signal 50 is inverted)

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Typical applications

Trip circuit supervision (ANSI 74TC)

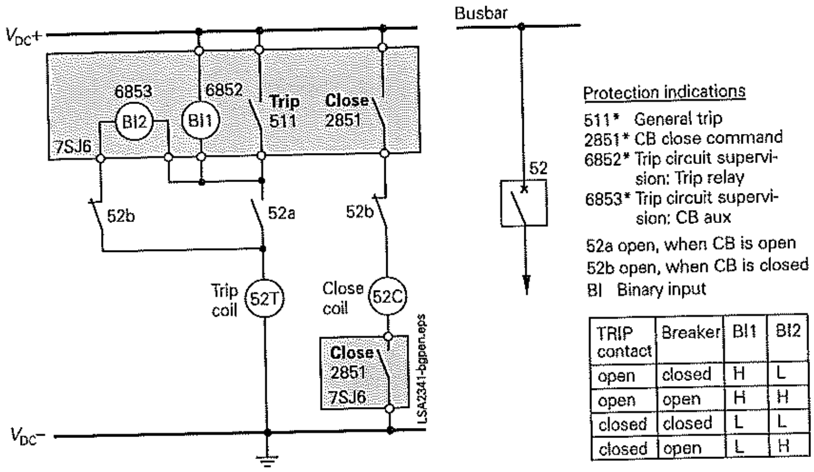
One or two binary inputs can be used for monitoring the circuit-breaker trip coil including its incoming cables. An alarm signal occurs whenever the circuit is interrupted.

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 7SJ66.



TRIP contact	Breaker	BI1	BI2
open	closed	H	L
open	open	H	H
closed	closed	L	L
closed	open	L	H

Fig. 23 Trip circuit supervision with 2 binary inputs

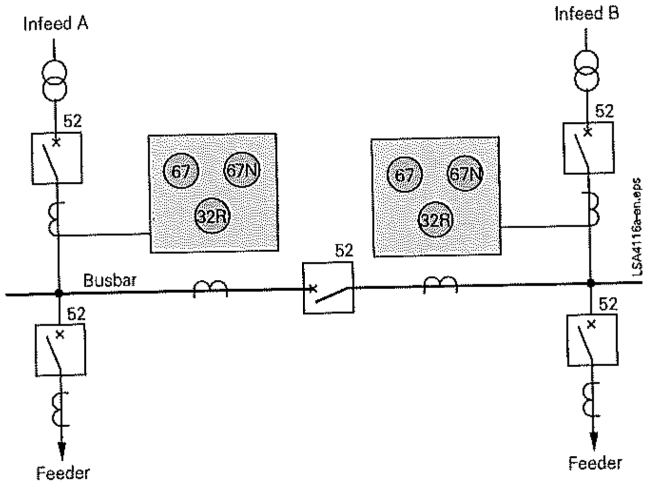


Fig. 24 Reverse-power protection for dual supply

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Description	Order No.
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
SIPROTEC 7SJ66 multifunction protection relay and bay controller	7SJ66☐☐-☐☐☐☐☐-☐☐☐☐-☐☐☐
Housing, inputs, outputs	
Housing 1/3 19", 4 x U, 4 x I, 16 BI, 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 BI, 23 BO, 1 life contact, 4 function keys	3
Measuring inputs	
I_{ph} = 1 A, I_N = 1 A (min. = 0.05 A) Position 15 only with A, C, E, G	1
I_{ph} = 1 A, I_N = sensitive (min. = 0.001 A) Position 15 only with B, D, F, H	2
I_{ph} = 5 A, I_N = 5 A (min. = 0.25 A) Position 15 only with A, C, E, G	5
I_{ph} = 5 A, I_N = sensitive (min. = 0.001 A) Position 15 only with B, D, F, H	6
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	6
Construction	
Flush-mounting case, screw-type terminals, 8-line text display	D
Flush-mounting case, spring-type terminals (direct connection), screw-type terminals for CT connection (direct connection/ring-type cable lugs), 8-line text display	E
Flush-mounting case, screw-type terminals, graphical display	J
Flush-mounting case, spring-type terminals (direct connection), screw-type terminals for CT connection (direct connection/ring-type cable lugs), graphical display	K
Region-specific default settings/function versions and language settings	
Region World, 50/60 Hz, IEC/ANSI, language: English (language can be changed)	B
Region World, 50/60 Hz, IEC/ANSI, language: Spanish (language can be changed)	E
Region RU, 50/60 Hz, IEC/ANSI, language: Russian (language can be changed)	G
System interface (Port B)	
No system interface	0
IEC 60870-5-103, electrical RS485, RJ45-connector 1)	2
Modbus RTU, electrical RS485, RJ45-connector 1)	9 L 0 D
DNP3, RS485 1)	9 L 0 G
IEC 61850, 100 Mbit Ethernet, electrical, double, RJ45-connector 2)	9 L 0 R
IEC 61850, 100 Mbit Ethernet, optical, double, LC-connector 2)	9 L 0 S
DNP3 + IEC 61850, 100 Mbit Ethernet, electrical, double, RJ45-connector 2)	9 L 2 R
DNP3 + IEC 61850, 100 Mbit Ethernet, optical, double, LC-connector 2)	9 L 2 S
Service interface (Port C)	
No interface	0
DIGSI 4 / Modem / RTD-box, electrical RS485, RJ45-connector	2
Ethernet port (DIGSI port, RTD box connection, not IEC 61850), RJ45-connector	6
Functionality	
See next page	

Continued on next page

1) only available with position 12 = 0 or 2

2) only available with position 12 = 0 or 6

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SIPROTEC 7SJ66

Selection and ordering data

Description			Order No. / Order code
			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
SIPROTEC 7SJ66 multifunction protection relay and bay controller			7SJ66□□-□□□□□-□□□□-□□□
Basic version	ANSI No.	Description	F A
	Control		
	50/51	Overcurrent protection $I>$, $I>>$, $I>>>$, I_p	
	50N/51N	Ground-fault protection $I_E>$, $I_E>>$, $I_E>>>$, I_{Ep}	
	50N/51N	Insensitive ground-fault protection via IEE function: $I_{EE}>$, $I_{EE}>>$, I_{EEp} 1)	
	50/50N	Flexible protection functions (index quantities derived from current): Additional time-overcurrent protection stages $I_2>$, $I>>>>$, $I_E>>>>$	
	51 V	Voltage-dependent inverse-time overcurrent protection	
	49	Overload protection (with 2 time constants)	
	46	Phase balance current protection (negative-sequence protection)	
	37	Undercurrent monitoring	
	47	Phase sequence	
	59N/64	Displacement voltage	
	50BF	Breaker failure protection	
	74TC	Trip circuit supervision, 4 setting groups, cold-load pickup	
		Inrush blocking	
	86	Lockout	
Basic+ V,P,f		Basic version (see above)	F E
	27/59	Under-/overvoltage	
	81O/U	Under-/overfrequency	
	27Q	Undervoltage-controlled reactive power protection	
	27/47/59(N) 32/55/81R	Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	
Basic + V,P,f IEF		Basic version (see above)	P E
	27/59	Under-/overvoltage	
	81O/U	Under-/overfrequency	
	27Q	Undervoltage-controlled reactive power protection	
	27/47/59(N) 32/55/81R	Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	
Basic + Dir		Basic version (see above)	F C
	67/67N	Direction determination for overcurrent, phases and ground	
Basic + Dir V,P,f		Basic version (see above)	F G
	67/67N	Direction determination for overcurrent, phases and ground	
	27/59	Under-/overvoltage	
	81O/U	Under-/overfrequency	
	27Q	Undervoltage-controlled reactive power protection	
	27/47/59(N) 32/55/81R	Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	
Basic + Dir V,P,f IEF		Basic version (see above)	P G
	67/67N	Direction determination for overcurrent, phases and ground	
	27/59	Under-/overvoltage	
	81O/U	Under-/overfrequency	
	27Q	Undervoltage-controlled reactive power protection	
	27/47/59(N) 32/55/81R	Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	
Basic + Dir IEF		Basic version (see above)	P C
	67/67N	Direction determination for overcurrent, phases and ground	

Continued on next page

V, P, f = Voltage, power, frequency protection
Dir = Directional overcurrent protection
IEF = Intermittent ground fault

1) only with position 7 = 1 or 5 (non-sensitive ground current input)

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Description	Order No.	Order code
SIPROTEC 7SJ66 multifunction protection relay and bay controller	12345 6 7 8 9 101112 13141516 171819 7SJ66□□-□□□□□-□□□□-□□□	

Description	ANSI No.	Description	Order code
Basic + Sens.earth-f-det. Dir REF	 67/67N 67Ns 67Ns	Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection	F D [2)]
Basic + Sens.earth-f-det. Dir IEF REF	 67/67N 67Ns 67Ns 87N	Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault Intermittent earth-fault	P D [2)]
Basic + Sens.earth-f-det. V,P,f REF	 67Ns 67Ns 87N 27/59 81O/U 27Q 27/47/59(N) 32/55/81R	Basic version (see page before) Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault Under-/overvoltage Under-/overfrequency Undervoltage-controlled reactive power protection Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	F F [2)]
Basic + Sens.earth-f-det. REF	 67Ns 67Ns 87N	Basic version (see page before) Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault	F B [2)]
Basic + Sens.earth-f-det. Motor V,P,f REF	 67Ns 67Ns 87N 48/14 66/86 51M 27/59 81O/U 27Q 27/47/59(N) 32/55/81R	Basic version (see page before) Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault Starting ime supervision, locked rotor Restart inhibit Motor load jam protection Motor statistics Under-/overvoltage Under-/overfrequency Undervoltage-controlled reactive power protection Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	H F [2)]
Basic + Sens.earth-f-det. Motor Dir V,P,f REF	 67/67N 67Ns 67Ns 87N 48/14 66/86 51M 27/59 81O/U 27Q 27/47/59(N) 32/55/81R	Basic version (see page before) Direction determination for overcurrent, phases and ground Directional sensitive ground-fault detection Directional intermittent ground fault protection High-impedance restricted ground fault Starting ime supervision, locked rotor Restart inhibit Motor load jam protection Motor statistics Under-/overvoltage Under-/overfrequency Undervoltage-controlled reactive power protection Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	H H [2)]

Continued on next page

V, P, f = Voltage, power, frequency protection
Dir = Directional overcurrent protection
IEF = 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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SIPROTEC 7SJ66

Selection and ordering data

5

Description	ANSI No.	Description	Order No. / Order code
			12345 6 7 8 9 101112 13141516 171819
SIPROTEC 7SJ66 multifunction protection relay and bay controller			7SJ66☐☐-☐☐☐☐☐-☐☐☐☐ ☐☐☐
	ANSI No.	**Description**	
Basic + Sens.earth-f-det. Motor Dir IEF V,P,f REF		Basic version (see page 20)	R H 2)
	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 jam protection	
		Motor statistics	
	27/59	Under-/overvoltage	
	81O/U	Under-/overfrequency	
	27Q	Undervoltage-controlled reactive power protection	
	27/47/59(N) 32/55/81R	Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	
Basic + Motor Dir V,P,f		Basic version (see page 20)	H G
	67/67N	Direction determination for overcurrent, phases and ground	
	48/14	Starting ime supervision, locked rotor	
	66/86	Restart inhibit	
	51M	Motor load jam protection	
		Motor statistics	
	27/59	Under-/overvoltage	
	81O/U	Under-/overfrequency	
	27Q	Undervoltage-controlled reactive power protection	
	27/47/59(N) 32/55/81R	Flexible protection (index quantities derived from current and voltages): Voltage, power, p.f., rate-of-frequency-change protection	
Basic + Motor		Basic version (see page 20)	H A
	48/14	Starting ime supervision, locked rotor	
	66/86	Restart inhibit	
	51M	Motor load jam protection	
		Motor statistics	
			13 ☐
		Measuring/fault recording	
		With fault recording	1
		With fault recording, average values, min/max values	3
			16 ☐
		Auto reclosing, fault locator, synchro-check	
		Without	0
	79	With 79	1
	21FL	With fault locator	2
	79,21FL	With 79 and fault locator	3
	25	With synchronization	4 3)
	25, 79, 21FL	With synchronization, 79 and fault locator	7 3)

V, P, f = Voltage, power, frequency protection
Dir = Directional overcurrent protection
IEF = Intermittent ground fault

3) Synchrocheck (no asynchronous switching), one function group

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Accessories	Description	Order No.
	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)	7XS5400-0AA00
	Professional DIGSI 4 Basic and additionally SIGRA (fault record analysis), CFC Editor (logic editor), Display Editor (editor for default and control displays) and DIGSI 4 Remote (remote operation)	7XS5402-0AA00
	Professional + IEC 61850 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	7XS5403-0AA00
	IEC 61850 System configurator Software for configuration of stations with IEC 61850 communication under DIGSI, running under MS Windows Server 2008 / XP Professional Edition / Windows 7 Ultimate / Enterprise Optional package for DIGSI 4 Basis or Professional License for 10 PCs. Authorization by serial number. On CD-ROM	7XS5460-0AA00
	SIGRA 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.	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-D77-1
	Manual for 7SJ66	
	English	C53000-B1140-C383-x [1]

5

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

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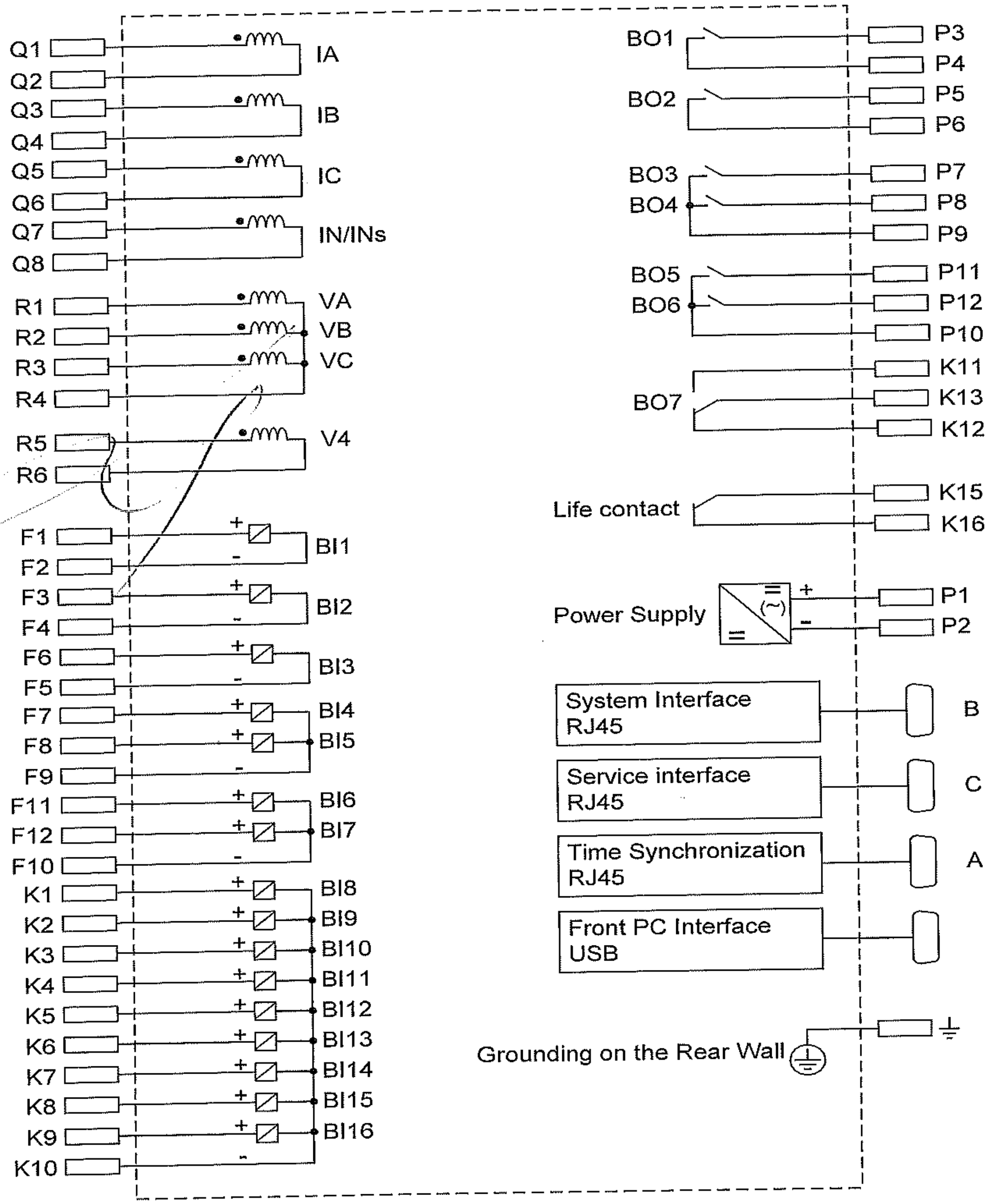

Fig. 25 SIPROTEC 7SJ661 connection diagram

1000

5

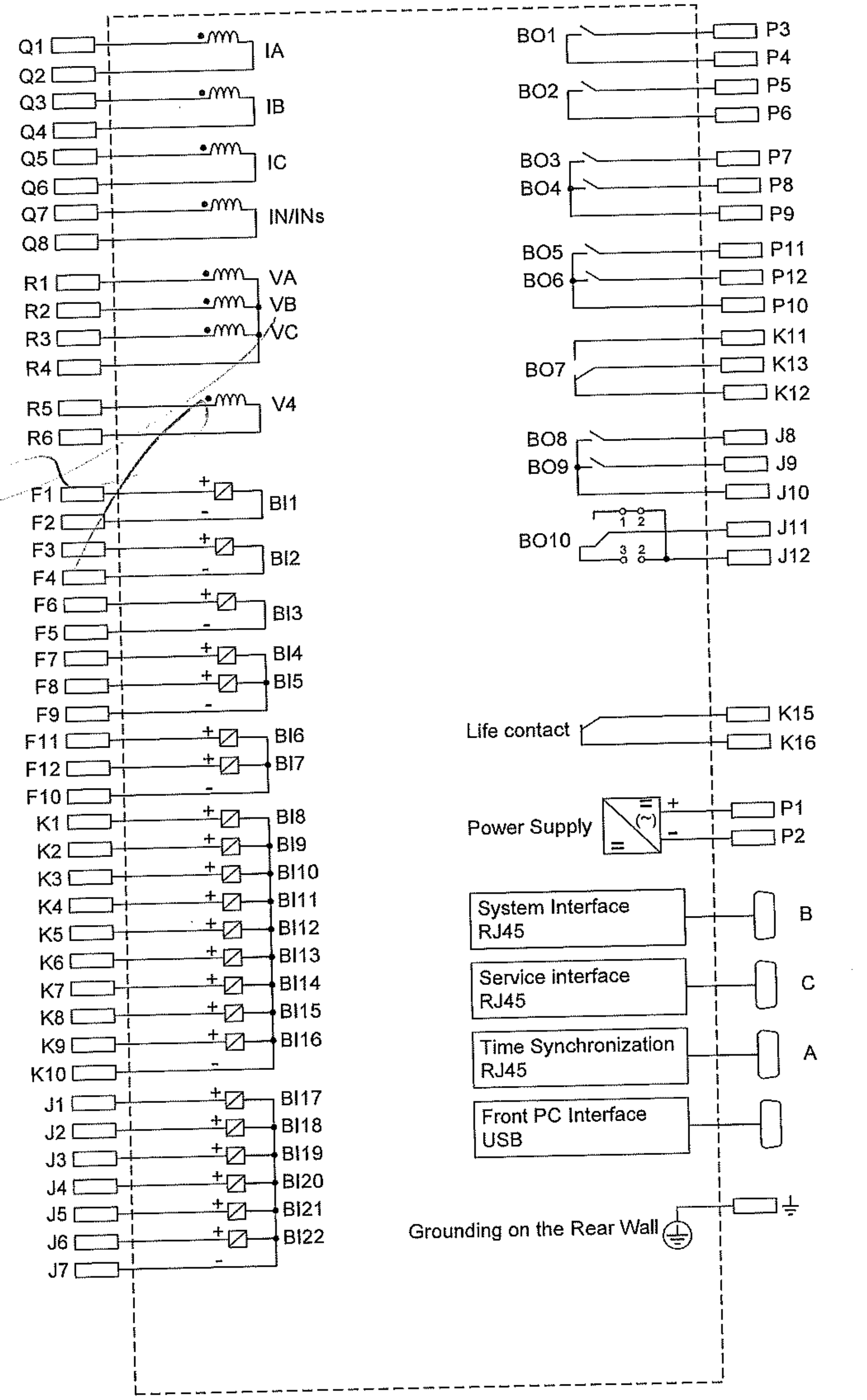

Fig. 26 SIPROTEC 7SJ662 connection diagram

2001

Connection diagram

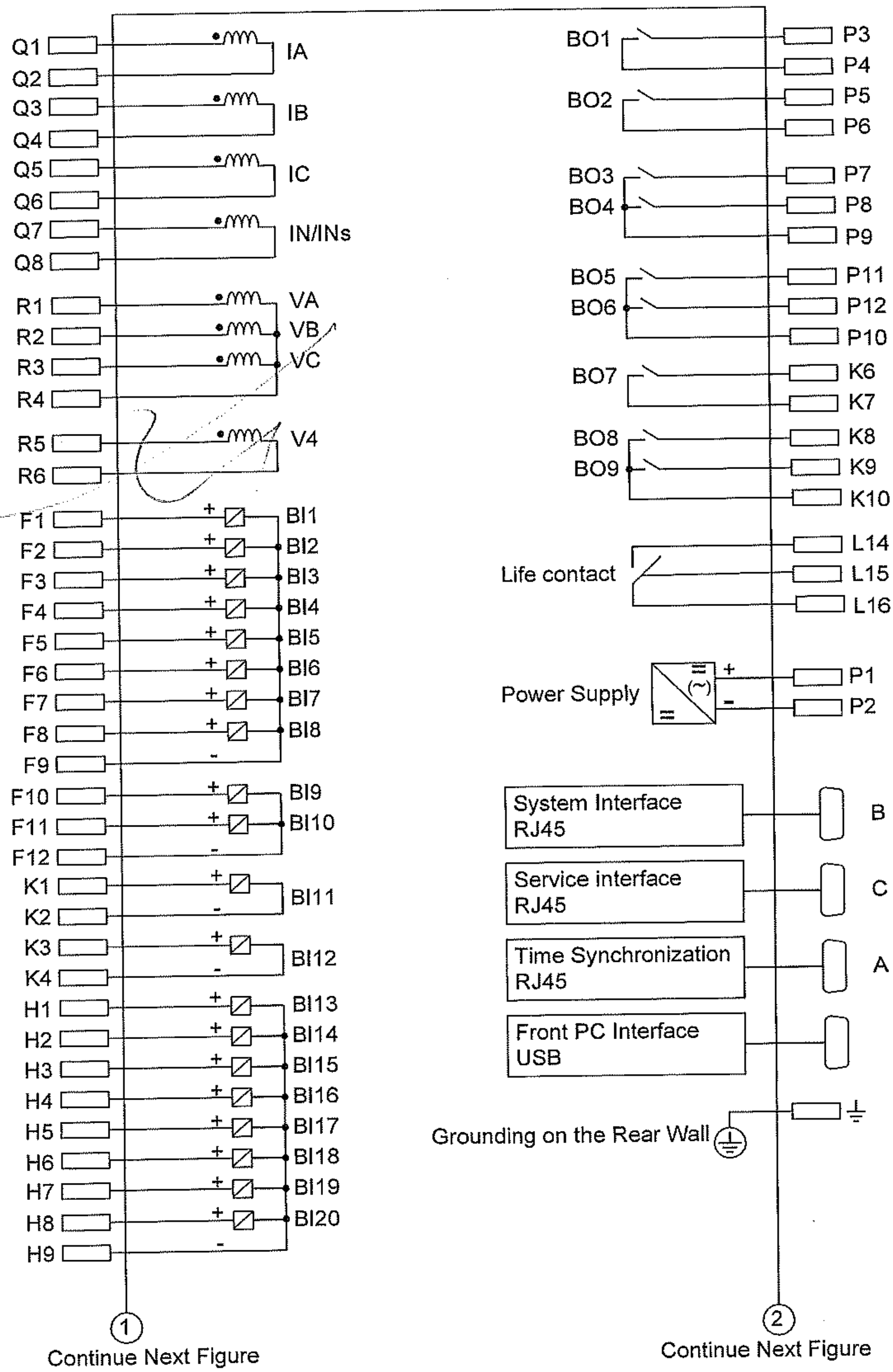

Fig. 27 SIPROTEC 7SJ663 connection diagram

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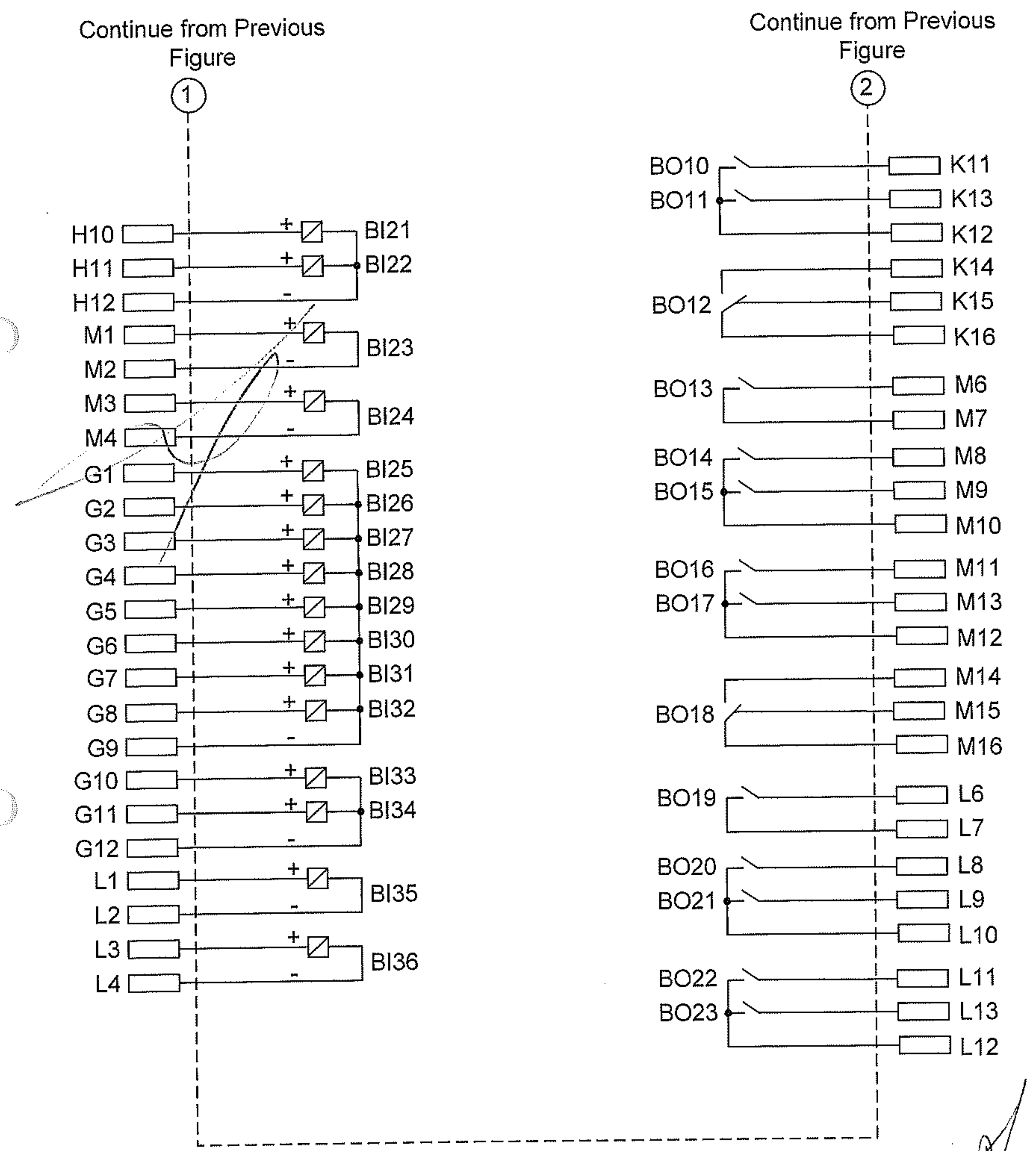

Fig. 28 SIPROTEC 7SJ663 connection diagram

1003

Dimensions

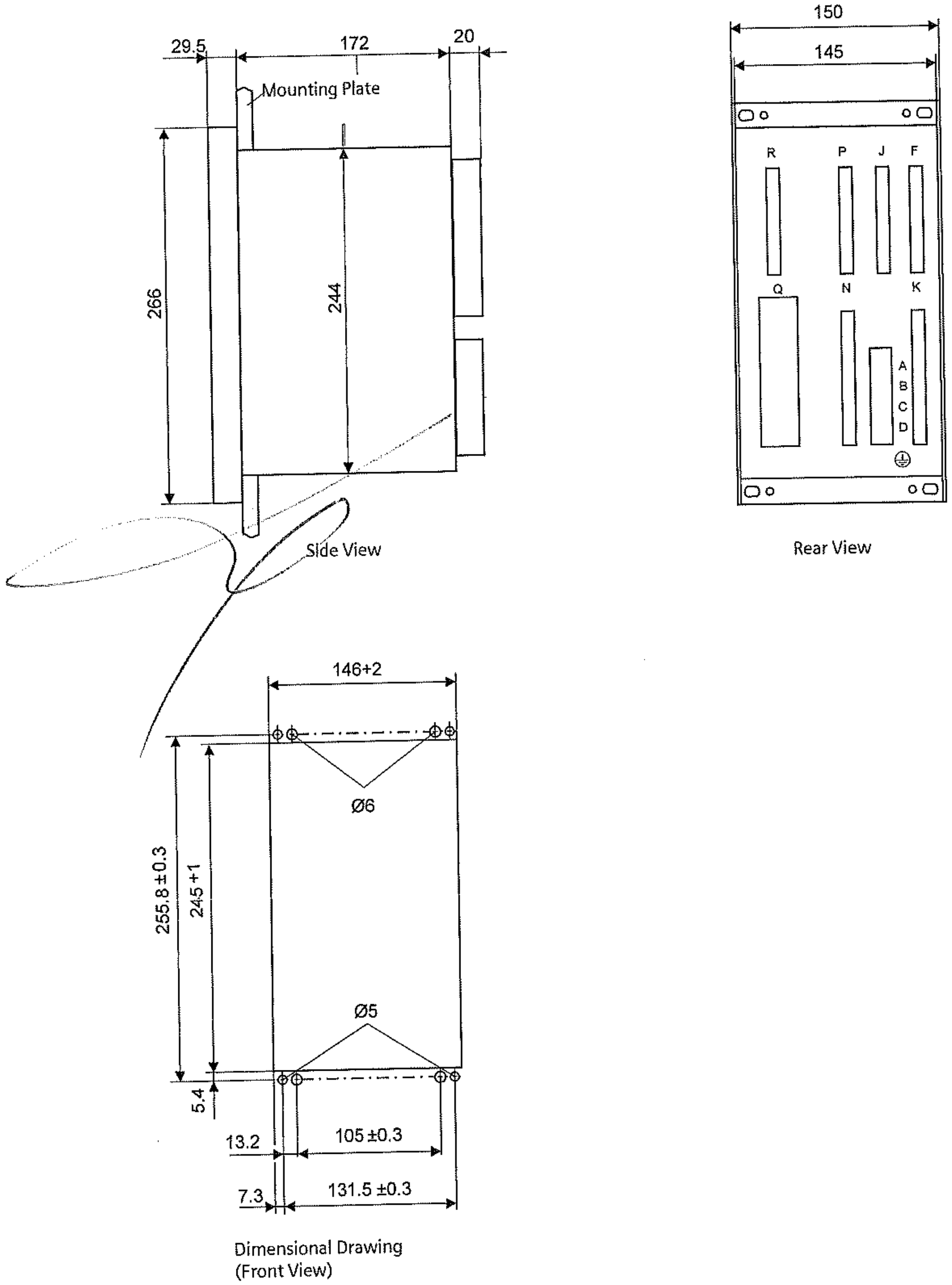

Fig. 29 Dimensional drawing for SIPROTEC 7SJ66 (housing size 1/3)

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Dimensions in mm

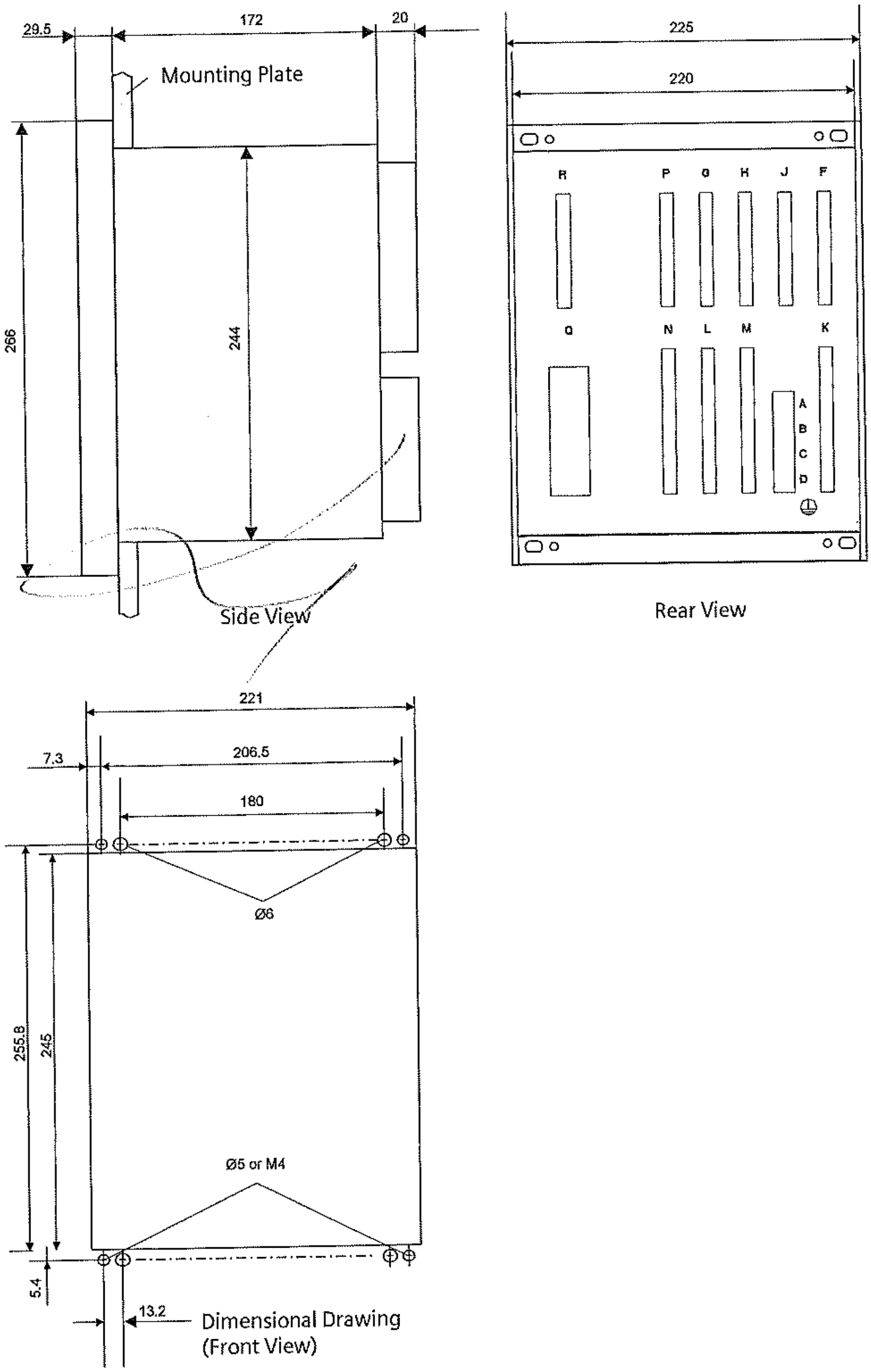

Fig. 30 Dimensional drawing of a SIPROTEC 7SJ66 (housing size 1/2)

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Siemens AG
Energy Management Division
Digital Grid
Automation Products
Humboldtstr. 59
90459 Nuremberg, Germany

For more information, please contact our Customer Support Center.
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Приложение 7.3

ДЕКЛАРАЦИЯ

че предложеното оборудване в процедурата отговаря на минималните технически изисквания на Възложителя

Аз, долуподписаният Стоил Колев Стоилов, в качеството ми на представляващ „Старт-Инженеринг“ АД, участник в открита процедура за възлагане на обществена поръчка с реф. № PPD18-103 и предмет: “Модернизация (ретрофит) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика“,

ДЕКЛАРИРАМ ЧЕ:

1. Предложеното от нас оборудване в процедурата за позиция „Посочна цифрова защита за въздушни и кабелни електропроводни линии Ср. Н“ отговаря на минималните технически изисквания на Възложителя, посочени в таблица 7.

2. Доставяните от нас материали, апаратура, оборудване и съоръжения отговарят на посочените от възложителя в документацията за участие стандарти за изпълнение на поръчката.

3. Предложените от нас материали, апаратура, оборудване и съоръжения са с технически характеристики и показатели, които съответстват на техническите характеристики и показатели, посочени от възложителя за изпълнение на поръчката в документацията за участие.

Информиран съм, че Възложителят (включително чрез неговия помощен орган, а именно назначената за провеждане на поръчката оценителна комисия) ще обработва и съхранява личните ми данни, посочени в настоящата декларация, за целите на провеждане на обществената поръчка, като за целта ще предприеме всички необходими според действащата нормативна уредба мерки за защита на личните ми данни.

Дата 17.12.2018 г.

ПОДПИС и ПЕЧАТ: На основание чл.36а ал.3 от ЗОП

Председател на Съвета на директорите на „Старт-Инженеринг“ АД

1007

Приложение 8.1

ДЕКЛАРАЦИЯ

че предложеното оборудване в процедурата отговаря на минималните технически изисквания на Възложителя

Аз, долуподписаният Стоил Колев Стоилов, в качеството ми на представляващ „Старт-Инженеринг“ АД, участник в открита процедура за възлагане на обществена поръчка с реф. № PPD18-103 и предмет: “Модернизация (ретрофит) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика“,

ДЕКЛАРИРАМ ЧЕ:

1. Предложеното от нас оборудване в процедурата за позиция „Комуникация на ЦЗ и контролери с RTU“ отговаря на минималните технически изисквания на Възложителя, посочени в таблица 8.

2. Доставяните от нас материали, апаратура, оборудване и съоръжения отговарят на посочените от възложителя в документацията за участие стандарти за изпълнение на поръчката.

3. Предложените от нас материали, апаратура, оборудване и съоръжения са с технически характеристики и показатели, които съответстват на техническите характеристики и показатели, посочени от възложителя за изпълнение на поръчката в документацията за участие.

Информиран съм, че Възложителят (включително чрез неговия помощен орган, а именно назначената за провеждане на поръчката оценителна комисия) ще обработва и съхранява личните ми данни, посочени в настоящата декларация, за целите на провеждане на обществената поръчка, като за целта ще предприеме всички необходими според действащата нормативна уредба мерки за защита на личните ми данни.

Дата 17.12.2018 г. ПОДПИС и ПЕЧАТ: На основание чл.36а ал.3 от ЗОП

Председател на Съвета на директорите на „Старт-Инженеринг“ АД

1008

поставя се в комплекта на техническото предложение

ОБРАЗЕЦ

ДЕКЛАРАЦИЯ

за приемане на условията в проекта на договор

Долуподписаният Стоил Колев Стоилов

в качеството ми на Председател на Съвета на директорите на „Старт-Инженеринг" АД

участник в обществена поръчка с предмет:Модернизация (ретрофит) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика, реф. № PPD 18-103, обособена позиция № 1 - Модернизация (ретрофит /проектиране, реконструкция, доставка и монтаж на машини и съоръжения, подготовка и въвеждане в експлоатация/) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика в регион „София"

ДЕКЛАРИРАМ, ЧЕ:

1. Приемам условията в проекта на договор, приложен в документацията за участие.
2.Съм информиран, че Възложителят (включително чрез неговия помощен орган, а именно назначената за провеждане на процедурата оценителна комисия) ще обработва и съхранява личните ми данни, посочени в настоящата декларация, в качеството ми на представляващ дружеството, за целите на провеждане на процедурата за сключване на рамково споразумение, като за целта ще предприеме всички необходими според действащата нормативна уредба мерки за защита на личните ми данни.

На основание чл.36а ал.3 от ЗОП

Дата: 17.12.2018г.

ПОДПИС и ПЕЧАТ: ____

Председател на Съвета на директорите на „Старт-Инженеринг" АД

1009

поставя се в комплекта на техническото предложение

ОБРАЗЕЦ

ДЕКЛАРАЦИЯ
за срока на валидност на офертата

Долуподписаният Стоил Колев Стоилов

в качеството ми на Председател на Съвета на директорите на „Старт-Инженеринг" АД

участник в процедура за възлагане на обществена поръчка с предмет: с предмет: Модернизация (ретрофит) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика, реф. № PPD 18-103,

(наименование на поръчката)

Обособена позиция № 1 - Модернизация (ретрофит /проектиране, реконструкция, доставка и монтаж на машини и съоръжения, подготовка и въвеждане в експлоатация/) на възлови разпределителни станции 20 (10) kV и изграждане на вериги на телемеханика в регион „София"

(*посочва се № и наименование на обособената позиция*)

ДЕКЛАРИРАМ, ЧЕ:

С подаване на офертата за участие в обществената поръчка, направените от нас предложения и поети ангажименти са валидни за 6- месечния срок, посочен в обявлението, считано от крайния срок за подаване на офертите.

Съм информиран, че Възложителят (включително чрез неговия помощен орган, а именно назначената за провеждане на процедурата оценителна комисия) ще обработва и съхранява личните ми данни, посочени в настоящата декларация, в качеството ми на представляващ дружеството, за целите на провеждане на процедурата за сключване на рамково споразумение, като за целта ще предприеме всички необходими според действащата нормативна уредба мерки за защита на личните ми данни.

На основание чл.36а ал.3 от ЗОП

Дата: 17.12.2018г. ПОДПИС и ПЕЧАТ: ____

Председател на Съвета на директорите на „Старт-Инженеринг" АД

Забележка:
1/ Декларацията се подписва от законния представител на участника или от надлежно упълномощено лице, което подава офертата.

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